

ภาคผนวก ง-1

---

เอกสารรับรองห้องปฏิบัติการวิเคราะห์เอกชน



แบบ กบ.บุญ  
นิติบุคคล

กรมสวัสดิการและคุ้มครองแรงงาน  
ใบอนุญาต  
เป็นผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตราย  
ในบรรยากาศของสถานที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย

ใบอนุญาตเลขที่ ๐๒๐๑-๐๓-๒๕๖๕-๐๐๑๓

อนุญาตให้.....บริษัท แมจิสติก แลนด์รพอร์ท จำกัด.....

เลขทะเบียนนิติบุคคล.....๐๑๒๕๕๕๐๐๔๐๘๘.....

ตั้งอยู่ เลขที่ ๑๔/๕๒๕๘ หมู่ที่ ๑๔ ตำบลม่วงน้ำทอง อำเภอเมือง จังหวัดนนทบุรี.....

เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎกระทรวง  
กำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม  
ในการทำงานเกี่ยวกับสารเคมีอันตราย พ.ศ. ๒๕๕๖ ในการเป็นผู้ให้บริการตรวจวัดระดับความเข้มข้น  
ของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย ประกอบกับ  
กฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม  
ในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน  
พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๔๐ ราย

ทั้งนี้ ตั้งแต่วันที่ ๑๑ มกราคม พ.ศ. ๒๕๖๕ ถึงวันที่ ๑๐ มกราคม พ.ศ. ๒๕๖๘

ให้ไว้ ณ วันที่ ๑๑ มกราคม พ.ศ. ๒๕๖๕



ผู้ตรวจราชการกรม ปฏิบัติราชการแทน  
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

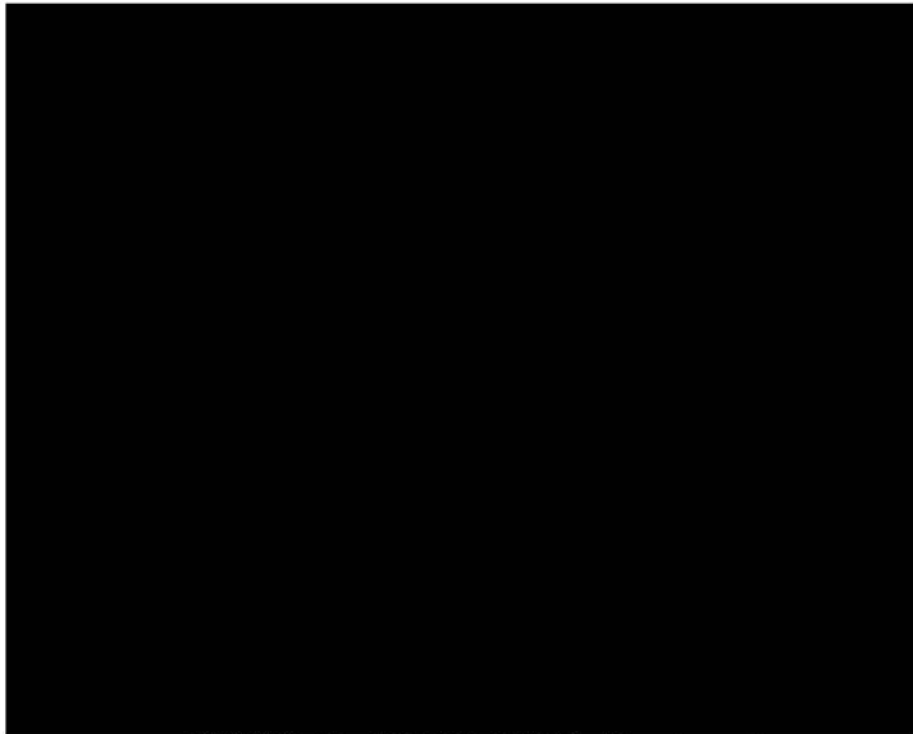
เลขทะเบียนควบคุม

(ลงนาม)

ทะเบียน)

ตำแหน่ง ผู้อำนวยการกองความปลอดภัยแรงงาน

รายชื่อบุคลากรแนบท้ายใบอนุญาต  
เป็นนิติบุคคลผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน  
และสถานที่เก็บรักษาสารเคมีอันตราย  
ของบริษัท แปซิฟิค แลборาตอรี จำกัด  
ใบอนุญาตเลขที่ ๐๒๐๑-๐๓-๒๕๖๕-๐๐๑๓



ทั้งนี้ ตั้งแต่วันที่ ๑๑ มกราคม พ.ศ. ๒๕๖๕ ถึงวันที่ ๑๐ มกราคม พ.ศ. ๒๕๖๘

ให้ไว้ ณ วันที่ ๑๑ มกราคม พ.ศ. ๒๕๖๕



ผู้ตรวจราชการกรม ปฏิบัติราชการแทน  
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



แบบ กภ.บุญ  
นิติบุคคล

กรมสวัสดิการและคุ้มครองแรงงาน

ใบอนุญาต

เป็นผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตราย  
ในบรรยากาศของสถานที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย

ใบอนุญาตเลขที่ ๑๒๐๒-๐๓-๒๕๖๕-๑๑๑๙

อนุญาตให้.....บริษัท แปซิฟิค แลนด์อวดอริ จำกัด.....

เลขทะเบียนนิติบุคคล.....๐๑๒๕๕๕๐๑๔๔๐๕๘.....

ตั้งอยู่เลขที่.....๑๘/๕๓๕๘ หมู่ที่ ๑๔ ตำบลวังบัวทอง อำเภอนางบัวทอง จังหวัดนนทบุรี.....

เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎกระทรวง  
กำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม  
ในการทำงานเกี่ยวกับสารเคมีอันตราย พ.ศ.๒๕๕๖ ในการเป็นผู้ให้บริการวิเคราะห์ระดับความเข้มข้น  
ของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย ประกอบกับ  
กฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม  
ในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน  
พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๙ ราย

ทั้งนี้ ตั้งแต่วันที่ ๑๑ มกราคม พ.ศ. ๒๕๖๕ ถึงวันที่ ๑๐ มกราคม พ.ศ. ๒๕๖๘

ให้ไว้ ณ วันที่ ๑๑ มกราคม พ.ศ. ๒๕๖๕



ผู้ตรวจราชการกรม ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

เลขทะเบียนควบคุม

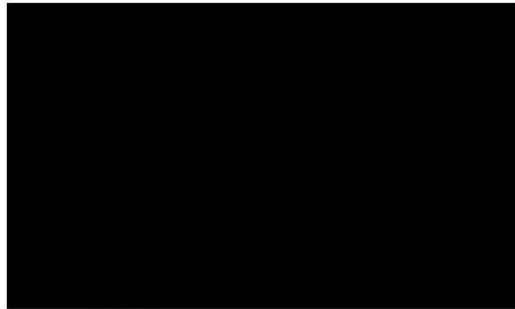
(ลงนาม)

ยทะเบียน)

ตำแหน่ง ผู้อำนวยการกองความปลอดภัยแรงงาน



รายชื่อบุคลากรแนบท้ายใบอนุญาต  
เป็นนิติบุคคลผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน  
และสถานที่เก็บรักษาสารเคมีอันตราย  
ของบริษัท แปซิฟิค แลборาตอรี จำกัด  
ใบอนุญาตเลขที่ ๐๒๐๒-๐๓-๒๕๖๕-๐๐๐๙



ทั้งนี้ ตั้งแต่วันที่ ๑๑ มกราคม พ.ศ. ๒๕๖๕ ถึงวันที่ ๑๐ มกราคม พ.ศ. ๒๕๖๘

ให้ไว้ ณ วันที่ ๑๑ มกราคม พ.ศ. ๒๕๖๕



ผู้ตรวจราชการกรม ปฏิบัติราชการแทน  
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



แบบ กภ.บุญ  
นิติบุคคล

กรมสวัสดิการและคุ้มครองแรงงาน  
ใบอนุญาต  
เป็นผู้ให้บริการตรวจวัดและวิเคราะห์สภาวะการทำงานเกี่ยวกับระดับความร้อน

ใบอนุญาตเลขที่ ๑๔๐๑-๐๓:๒๕๖๕-๐๐๑๒

อนุญาตให้.....บริษัท แมซิฟิต แลนธรวาตอริ จำกัด.....

เลขทะเบียนนิติบุคคล...๐๑๒๕๕๕๐๑๔๔๐๙๘.....

ตั้งอยู่ เลขที่ ๑๔/๕๓๕๘ หมู่ที่ ๑๔ ตำบลบางน้ำทอง อำเภอนางิ้วทอง จังหวัดนนทบุรี.....

เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎกระทรวง  
กำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม  
ในการทำงานเกี่ยวกับความร้อน แสงสว่าง และเสียง พ.ศ. ๒๕๕๙ ในการตรวจวัดและวิเคราะห์  
สภาวะการทำงานเกี่ยวกับระดับความร้อน ประกอบกับกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการ  
เพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติ  
ความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๓ ราย

ทั้งนี้ ตั้งแต่วันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๕ ถึงวันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๘

ให้ไว้ ณ วันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๕



รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

เลขทะเบียนควบคุม

(ลงนาม)

ายทะเบียน)

ตำแหน่ง ผู้อำนวยการกองความปลอดภัยแรงงาน

รายชื่อบุคลากรแนบท้ายใบอนุญาต  
เป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์สภาวะการทำงานเกี่ยวกับระดับความร้อน  
ของบริษัท แปซิฟิค แลบบอราทอรี จำกัด  
ใบอนุญาตเลขที่ ๐๔๐๓-๐๓-๒๕๖๕-๐๐๑๒



ทั้งนี้ ตั้งแต่วันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๕ ถึงวันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๘

ให้ไว้ ณ วันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๕



รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



แบบ กบ.บุญ  
นส.บุคคล

กรมสวัสดิการและคุ้มครองแรงงาน

ใบอนุญาต

เป็นผู้ให้บริการตรวจวัดและวิเคราะห์สภาวะการทำงานเกี่ยวกับระดับเสียง

ใบอนุญาตเลขที่ ๐๔๐๓-๐๓-๒๕๖๕-๐๐๑๒

อนุญาตให้.....บริษัท แปซิฟิค แลนธรอดอร์ จำกัด.....

เลขทะเบียนนิติบุคคล ๐๑๒๕๕๕๐๐๔๕๐๕๘.....

ตั้งอยู่เลขที่ ๑๔/๕๓๕๘ หมู่ที่ ๑๔ ตำบลบางบัวทอง อำเภอบางบัวทอง จังหวัดนนทบุรี.....

เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎกระทรวง  
กำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม  
ในการทำงานเกี่ยวกับความร้อน แสงสว่าง และเสียง พ.ศ. ๒๕๕๔ ในการตรวจวัดและวิเคราะห์สภาวะการทำงาน  
เกี่ยวกับระดับเสียง ประกอบกับกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการ เพื่อส่งเสริมความปลอดภัย  
อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย  
และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๓ ราย

ทั้งนี้ ตั้งแต่วันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๕ ถึงวันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๘

ให้ไว้ ณ วันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๕



รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

เลขทะเบียนควบคุม

(ลงนาม)



ลายทะเบียน)

ตำแหน่ง ผู้อำนวยการกองความปลอดภัยแรงงาน

รายชื่อบุคลากรแนบท้ายใบอนุญาต  
เป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์สภาวะการทำงานเกี่ยวกับระดับเสียง  
ของบริษัท แปซิฟิค แลборาตอรี จำกัด  
ใบอนุญาตเลขที่ ๐๔๐๓-๐๓-๒๕๖๕-๐๐๑๒



ทั้งนี้ ตั้งแต่วันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๕ ถึงวันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๘

ให้ไว้ ณ วันที่ ๒๕ มกราคม พ.ศ. ๒๕๖๕



รองอธิบดี ปฏิบัติราชการแทน  
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

ที่ อก ๐๓๑๐(๓)/๕ ๕ ๖ ๐ ๘



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ เขตราชเทวี  
กรุงเทพมหานคร ๑๐๔๐๐

๓๐ ธันวาคม ๒๕๖๓

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท แปซิฟิค แลборาตอรี จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๒๒ ตุลาคม ๒๕๖๓

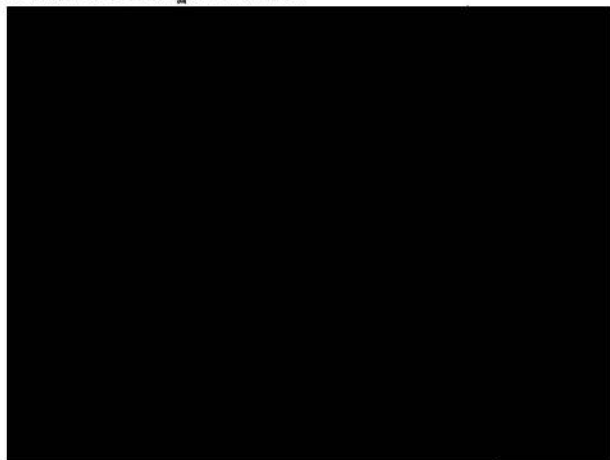
สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท แปซิฟิค แลборาตอรี จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท แปซิฟิค แลборาตอรี จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียน  
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๗๒ สถานที่ตั้งเลขที่ ๑๔/๕๓๕๘ หมู่ที่ ๑๔ ตำบลบางบัวทอง  
อำเภอบางบัวทอง จังหวัดนนทบุรี ต่อกรมโรงงานอุตสาหกรรม นั้น

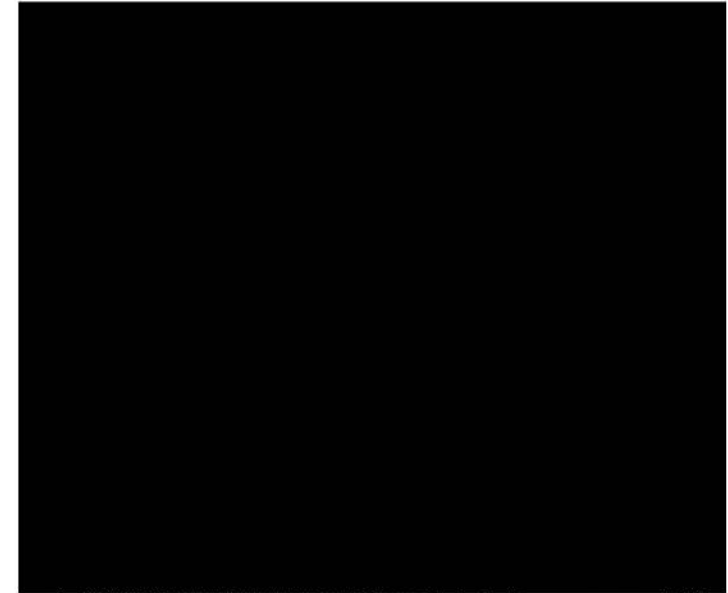
กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท แปซิฟิค แลборาตอรี จำกัด ต่ออายุหนังสือรับ  
ขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้  
ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์



ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์



- ๒ -



ค. ขอบข่ายสารมลพิษที่ตรวจพบในตัวอย่างวิเคราะห์ในน้ำเสีย จำนวน ๑๐ รายการ น้ำใต้ดิน  
จำนวน ๑ รายการ อากาศเสีย จำนวน ๙ รายการ และสิ่งปฏิกลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๑ รายการ  
รวมทั้งสิ้นจำนวน ๒๑ รายการ ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้จะหมดอายุในวันที่ ๑๖ พฤศจิกายน ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือ  
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอ  
ต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์  
เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษโรงงาน  
ผู้ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเฝ้าระวังมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๑๔๖ ๐ ๒๒๐๒ ๔๐๐๒

โทรสาร ๐ ๒๓๕๔ ๓๒๐๘ ๐ ๒๓๕๔ ๓๔๑๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท แปซิฟิก แล็บอราทอรี จำกัด

เลขทะเบียน ว-๒๗๒

ที่ อก ๐๓๑๐(๑)/ ๑๕๖๐๘

ลงวันที่ ๓๐ ธันวาคม ๒๕๖๓

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๑ รายการ

น้ำเสีย จำนวน 10 รายการ

| ลำดับที่ | สารมลพิษ                  | วิธีวิเคราะห์  |
|----------|---------------------------|--|
| 1        | Biochemical Oxygen Demand | 5-Day BOD Test, Azide Modification Method <sup>[2]</sup>   |
| 2        | Chemical Oxygen Demand    | Closed Reflux, Colorimetric Method <sup>[2]</sup>          |
| 3        | Free Chlorine             | Iodometric Method <sup>[2]</sup>                           |
| 4        | Hexavalent Chromium       | Colorimetric Method <sup>[2]</sup>                         |
| 5        | Oil & Grease              | Liquid-Liquid, Partition-Gravimetric Method <sup>[2]</sup> |
| 6        | pH                        | Electrometric Method <sup>[2]</sup>                        |
| 7        | Sulfide                   | Iodometric Method <sup>[2]</sup>                           |
| 8        | Temperature               | Laboratory and Field Methods <sup>[2]</sup>                |
| 9        | Total Dissolved Solids    | Dried at 180 °C <sup>[2]</sup>                             |
| 10       | Total Suspended Solids    | Dried at 103-105 °C <sup>[2]</sup>                         |

น้ำใต้ดิน จำนวน 1 รายการ

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์                       |
|----------|----------|-------------------------------------|
| 1        | pH       | Electrometric Method <sup>[2]</sup> |

อากาศเสีย (ปล่องระบาย) จำนวน 9 รายการ

| ลำดับที่ | สารมลพิษ                    | วิธีวิเคราะห์  |
|----------|-----------------------------|--|
| 1        | Carbon Monoxide             | Instrumental Analyzer Method <sup>[3]</sup>                          |
| 2        | Cresol                      | Adsorption Sampling, Gas Chromatographic Method <sup>[3]</sup>       |
| 3        | Hydrogen Sulfide            | Absorption Sampling, Iodometric Method <sup>[3]</sup>                |
| 4        | Opacity                     | Ringelmann's Method <sup>[3]</sup>                                   |
| 5        | Oxides of Nitrogen          | Absorption Sampling, Phenoldisulfonic Acid Method <sup>[3]</sup>     |
| 6        | Sulfur Dioxide              | Absorption Sampling, Barium-Thorin Titrimetric Method <sup>[3]</sup> |
| 7        | Sulfuric Acid               | Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>[3]</sup> |
| 8        | Total Suspended Particulate | Isokinetic Sampling, Gravimetric Method <sup>[3]</sup>               |
| 9        | Xylene                      | Adsorption Sampling, Gas Chromatographic Method <sup>[3]</sup>       |

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 1 รายการ

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์                         |
|----------|----------|---------------------------------------|
| 1        | pH       | Electrometric Method <sup>[4,5]</sup> |

ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

เอกสารอ้างอิง...

- ๒ -

เอกสารอ้างอิง

1. กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549. เรื่อง กำหนดค่าปริมาณ  
เขม่าควันที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำโรงสีข้าวที่ใช้แก๊สเป็นเชื้อเพลิง.

ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนพิเศษ 125ง.

2. APHA, AWWA, WEF. Standard Methods for the Examination of Water and  
Wastewater. 23<sup>rd</sup> ed. Washington, DC: APHA, 2017.

3. United States Environmental Protection Agency. Standards of Performance  
for New Stationary Sources. 40 CFR 60 Appendix A, 2018.

4. United States Environmental Protection Agency. Test Methods for Evaluation Solid  
Waste Physical/Chemical Methods. pH Electrometric Measurement. SW-846 Method  
9040C, 2004.

5. United States Environmental Protection Agency. Test Methods for Evaluation Solid  
Waste Physical/Chemical Methods. Soil and Waste pH. SW-846 Method 9045D, 2004.

ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

# สำเนา

ที่ อก ๐๓๑๐(๓)/ ๑๒๕๐๐

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ เขตราชเทวี  
กรุงเทพมหานคร ๑๐๕๐๐

๐๓ พฤศจิกายน ๒๕๖๓

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท ฮีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน

ลงวันที่ ๑๕ มิถุนายน ๒๕๖๓

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย

๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย

๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๑๗ รายการ

ตามหนังสือที่อ้างถึง บริษัท ฮีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขาภิบาล ๘ ตำบลหนองขาม อำเภอศรีราชา จังหวัดชลบุรี ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท ฮีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย ตามสิ่งที่ส่งมาด้วย ๑

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย ตามสิ่งที่ส่งมาด้วย ๒

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนไว้วิเคราะห์ในน้ำเสีย จำนวน ๔๓ รายการ

อากาศเสีย (ปล่อยระบาย) จำนวน ๒๑ รายการ น้ำใต้ดิน จำนวน ๑๙ รายการ ดิน จำนวน ๑๖ รายการ และสิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๑๘ รายการ รวมทั้งสิ้นจำนวน ๑๑๗ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๕ กรกฎาคม ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

กองวิจัยและเตือนภัยมลพิษโรงงาน

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออกเฉียงเหนือ

โทร. ๐ ๓๘๐๕ ๗๒๖๑-๓

โทรสาร ๐ ๓๘๐๕ ๗๒๖๓

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติการทางตอนใต้กรมโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

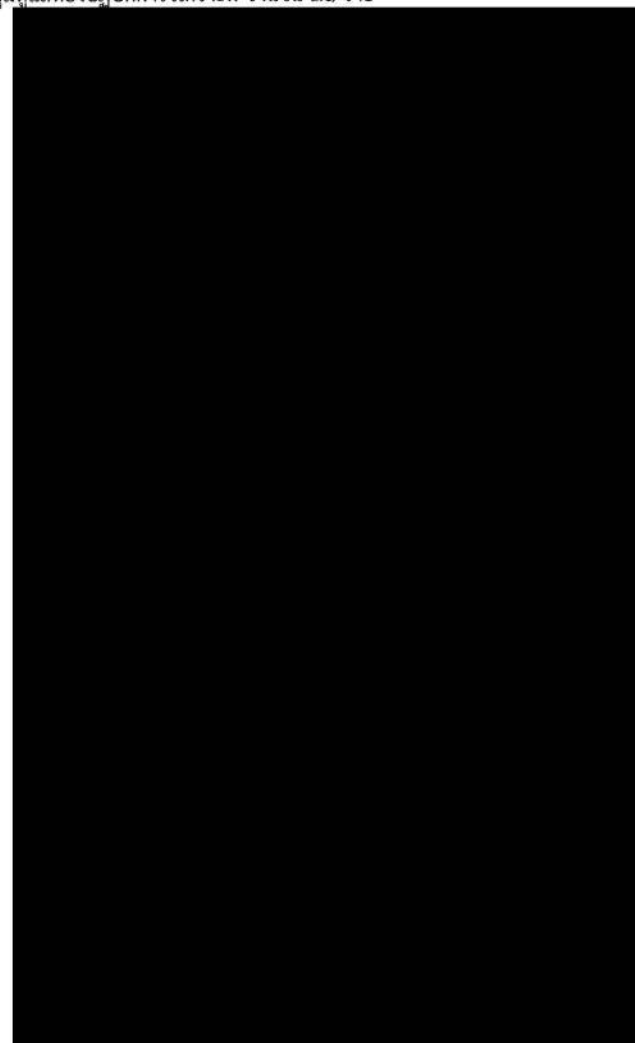
บริษัท ฮีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

เลขทะเบียน ๖-๐๐๓

ที่ อก ๐๓๑๐(๓)/ ๑๒๕๐๐

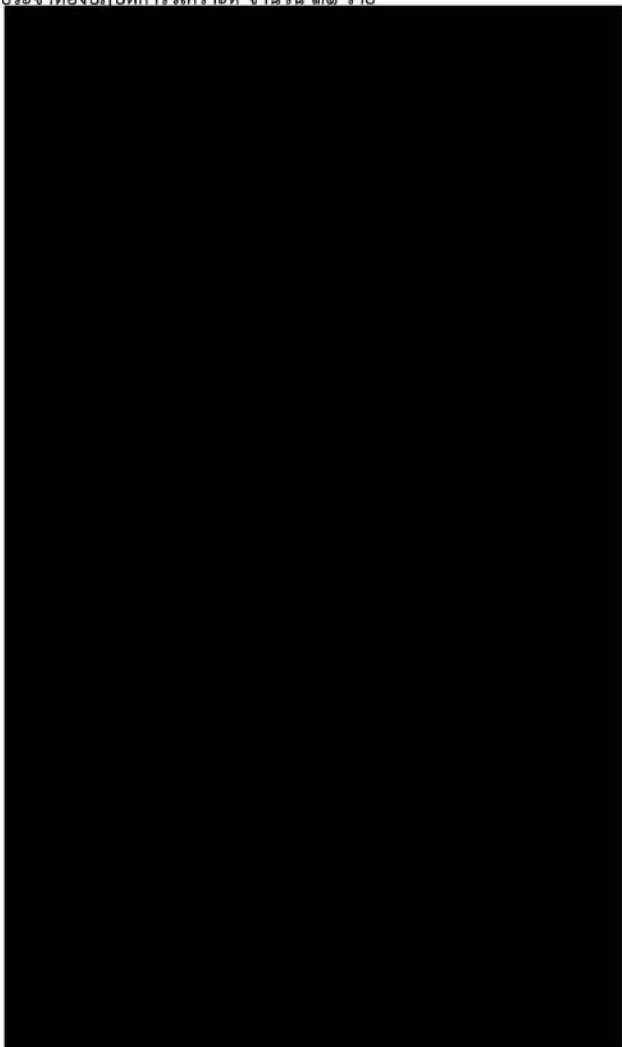
ลงวันที่ ๐๓ พฤศจิกายน ๒๕๖๓

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย





เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด เลขทะเบียน ๖-๐๐๓  
ที่ อก ๐๓๑๐(๓)/ ๑ ๒ ๔ ๐๐ ลงวันที่  
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด เลขทะเบียน ๖-๐๐๓  
ที่ อก ๐๓๑๐(๓)/ ๑ ๒ ๔ ๐๐ ลงวันที่ ๐๓ พฤศจิกายน ๒๕๖๓

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๑๗ รายการ  
น้ำเสีย จำนวน 43 รายการ

| ลำดับที่ | ชนิดสารมลพิษ              | วิธีวิเคราะห์  |
|----------|---------------------------|--|
| 1        | Aldrin                    | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 2        | Arsenic                   | 1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup> |
| 3        | Barium                    | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |
| 4        | α-BHC                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 5        | β-BHC                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 6        | δ-BHC                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 7        | γ-BHC                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 8        | Biochemical Oxygen Demand | 1) 5-Day BOD Test, Membrane Electrode Method <sup>[4]</sup><br>2) 5-Day BOD Test, Azide Modification Method <sup>[4]</sup>                               |
| 9        | Cadmium                   | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |
| 10       | Chemical Oxygen Demand    | Closed Reflux, Titrimetric Method <sup>[4]</sup>   |
| 11       | cis-Chlordane             | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 12       | trans-Chlordane           | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 13       | Chromium                  | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>                         |
| 14       | Color                     | ADMI Weighted-Ordinate Spectrophotometric Method <sup>[4]</sup>  |
| 15       | Copper                    | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>                         |
| 16       | Cyanide                   | Distillation, Colorimetric Method <sup>[4]</sup>   |



รักษาการนักวิทยาศาสตร์ชำนาญการพิเศษ แทนที่แทน  
ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

| ลำดับที่ | ชนิดสารมลพิษ        | วิธีวิเคราะห์  |
|----------|---------------------|--|
| 17       | 4,4'-DDD            | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 18       | 4,4'-DDE            | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 19       | Dieldrin            | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 20       | Endosulfan I        | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 21       | Endosulfan II       | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 22       | Endosulfan sulfate  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 23       | Endrin aldehyde     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 24       | Endrin ketone       | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 25       | Formaldehyde        | Distillation, Colorimetric Method <sup>[3]</sup>   |
| 26       | Free Chlorine       | 1) Iodometric Method <sup>[4]</sup><br>2) Colorimetric Method <sup>[4]</sup>   |
| 27       | Heptachlor          | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 28       | Heptachlor epoxide  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>  |
| 29       | Hexavalent Chromium | Filtration, Colorimetric Method <sup>[4]</sup>   |
| 30       | Lead                | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup> |
| 31       | Manganese           | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |
| 32       | Mercury             | Cold-Vapor Atomic Absorption Spectrometric Method <sup>[4]</sup>   |
| 33       | Nickel              | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup> |
| 34       | Oil and Grease      | Partition-Gravimetric Method <sup>[4]</sup>  |
| 35       | pH                  | Electrometric Method <sup>[4]</sup>  |

รักษาการนักวิทยาศาสตร์ชำนาญการพิเศษ ทำหน้าที่แทน  
ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

36 Phenols...

| ลำดับที่ | ชนิดสารมลพิษ            | วิธีวิเคราะห์  |
|----------|-------------------------|--|
| 36       | Phenols                 | Distillation, Direct Photometric Method <sup>[4]</sup>   |
| 37       | Sulfide                 | ZnS Precipitation, Iodometric Method <sup>[4]</sup>  |
| 38       | Temperature             | Laboratory and Field Method <sup>[4]</sup>   |
| 39       | Trivalent Chromium      | 1) Digestion, Direct Air-Acetylene Flame Method;<br>Filtration, Colorimetric Method; Calculation <sup>[4]</sup><br>2) Digestion, Inductively Coupled Plasma Method;<br>Filtration, Colorimetric Method; Calculation <sup>[4]</sup> |
| 40       | Total Dissolved Solids  | Dried at 180 °C <sup>[4]</sup>   |
| 41       | Total Kjeldahl Nitrogen | Macro Kjeldahl Method <sup>[4]</sup>   |
| 42       | Total Suspended Solids  | Dried at 103-105 °C <sup>[4]</sup>   |
| 43       | Zinc                    | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |

#### อากาศเสีย (ปล่อยระบาย) จำนวน 21 รายการ

| ลำดับที่ | ชนิดสารมลพิษ     | วิธีวิเคราะห์  |
|----------|------------------|--|
| 1        | Antimony         | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup> |
| 2        | Arsenic          | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup> |
| 3        | Cadmium          | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup> |
| 4        | Carbon Monoxide  | Bag, Non-Dispersive Infrared Method <sup>[5]</sup>                               |
| 5        | Chromium         | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup> |
| 6        | Cobalt           | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup> |
| 7        | Copper           | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup> |
| 8        | Hydrogen Sulfide | Absorption Sampling, Iodometric Method <sup>[5]</sup>                            |
| 9        | Lead             | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup> |
| 10       | Manganese        | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup> |

รักษาการนักวิทยาศาสตร์ชำนาญการพิเศษ ทำหน้าที่แทน  
ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

11 Mercury...

| ลำดับที่ | ชนิดสารมลพิษ                | วิธีวิเคราะห์   |
|----------|-----------------------------|---|
| 11       | Mercury                     | Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[5]</sup>                          |
| 12       | Nickel                      | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>  |
| 13       | Opacity                     | Ringelmann's Method <sup>[1]</sup>  |
| 14       | Oxide of Nitrogen           | 1) Absorption Sampling, Phenoldisulfonic Acid Method <sup>[5]</sup><br>2) Instrumental Analyzer Method <sup>[5]</sup>     |
| 15       | Selenium                    | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>  |
| 16       | Sulfur Dioxide              | 1) Absorption Sampling, Barium-Thorin Titrimetric Method <sup>[5]</sup><br>2) Instrumental Analyzer Method <sup>[5]</sup> |
| 17       | Sulfuric Acid               | Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>[5]</sup>  |
| 18       | Tin                         | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>  |
| 19       | Total Suspended Particulate | Isokinetic Sampling, Gravimetric Method <sup>[5]</sup>  |
| 20       | Vanadium                    | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>  |
| 21       | Xylene                      | Adsorption Sampling, Gas Chromatographic Method <sup>[5]</sup>  |

น้ำใต้ดิน จำนวน 19 รายการ

| ลำดับที่ | ชนิดสารมลพิษ        | วิธีวิเคราะห์  |
|----------|---------------------|--|
| 1        | Antimony            | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |
| 2        | Arsenic             | 1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup> |
| 3        | Barium              | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |
| 4        | Beryllium           | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |
| 5        | Cadmium             | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |
| 6        | Chromium            | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>                         |
| 7        | Cyanide             | Distillation, Colorimetric Method <sup>[4]</sup>   |
| 8        | Hexavalent Chromium | Filtration, Colorimetric Method <sup>[4]</sup>   |

รักษาการนักวิทยาศาสตร์ชำนาญการพิเศษ ทำหน้าที่แทน  
ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

9 Lead...

| ลำดับที่ | ชนิดสารมลพิษ       | วิธีวิเคราะห์  |
|----------|--------------------|--|
| 9        | Lead               | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>   |
| 10       | Manganese          | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |
| 11       | Mercury            | Cold-Vapor Atomic Absorption Spectrometric Method <sup>[4]</sup>   |
| 12       | Nickel             | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>   |
| 13       | pH                 | Electrometric Method <sup>[4]</sup>  |
| 14       | Phenols            | Distillation, Direct Photometric Method <sup>[4]</sup>   |
| 15       | Selenium           | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |
| 16       | Silver             | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |
| 17       | Trivalent Chromium | 1) Digestion, Direct Air-Acetylene Flame Method;<br>Filtration, Colorimetric Method; Calculation <sup>[4]</sup><br>2) Digestion, Inductively Coupled Plasma Method;<br>Filtration, Colorimetric Method; Calculation <sup>[4]</sup> |
| 18       | Vanadium           | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |
| 19       | Zinc               | Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>  |

ดิน จำนวน 16 รายการ

| ลำดับที่ | ชนิดสารมลพิษ        | วิธีวิเคราะห์   |
|----------|---------------------|---|
| 1        | Antimony            | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                 |
| 2        | Arsenic             | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                 |
| 3        | Barium              | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                 |
| 4        | Beryllium           | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                 |
| 5        | Cadmium             | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                 |
| 6        | Chromium            | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                 |
| 7        | Hexavalent Chromium | Alkaline Digestion, Colorimetric Method <sup>[9,10]</sup>                     |
| 8        | Lead                | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                 |
| 9        | Manganese           | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                 |
| 10       | Mercury             | Digestion, Cold vapor Atomic Absorption Spectrometric Method <sup>[6,8]</sup> |
| 11       | Nickel              | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                 |
| 12       | Selenium            | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                 |
| 13       | Silver              | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                 |

รักษาการนักวิทยาศาสตร์ชำนาญการพิเศษ ทำหน้าที่แทน  
ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

14 Trivalent...

| ลำดับที่ | ชนิดสารมลพิษ       | วิธีวิเคราะห์   |
|----------|--------------------|---|
| 14       | Trivalent Chromium | 1) Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation <sup>[6,7]</sup><br>2) Alkaline Digestion, Colorimetric Method; Calculation <sup>[9,10]</sup> |
| 15       | Vanadium           | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>   |
| 16       | Zinc               | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>   |

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 18 รายการ

| ลำดับที่ | ชนิดสารมลพิษ        | วิธีวิเคราะห์  |
|----------|---------------------|--|
| 1        | Antimony            | Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>  |
| 2        | Arsenic             | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> |
| 3        | Barium              | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> |
| 4        | Beryllium           | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> |
| 5        | Cadmium             | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> |
| 6        | Chromium            | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> |
| 7        | Cobalt              | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> |
| 8        | Copper              | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> |
| 9        | Hexavalent chromium | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Alkaline Digestion, Colorimetric Method <sup>[9,10]</sup>     |

รักษาการนักวิทยาศาสตร์ชำนาญการพิเศษ ทำหน้าที่แทน  
ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

10 Lead...

| ลำดับที่ | ชนิดสารมลพิษ | วิธีวิเคราะห์  |
|----------|--------------|--|
| 10       | Lead         | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                               |
| 11       | Mercury      | 1) Waste Extraction, Digestion, Cold Vapor Atomic Absorption Spectrometric Method <sup>[2,8]</sup><br>2) Digestion, Cold vapor Atomic Absorption Spectrometric Method <sup>[6,8]</sup> |
| 12       | Nickel       | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                               |
| 13       | Molybdenum   | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                               |
| 14       | Selenium     | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                               |
| 15       | Silver       | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                               |
| 16       | Thallium     | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                               |
| 17       | Vanadium     | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                               |
| 18       | Zinc         | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>                               |

เอกสารอ้างอิง

- กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม พ.ศ.2549 เรื่องกำหนดค่าปริมาณเขม่าควันที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำโรงสีข้าวที่ใช้แก๊สเป็นเชื้อเพลิง. ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนพิเศษ 125 ง.
- กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม พ.ศ.2548 เรื่อง การกำจัดสิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว. ราชกิจจานุเบกษา. 25 มกราคม 2549. เล่มที่ 123 ตอนพิเศษ 11ง.

รักษาการนักวิทยาศาสตร์ชำนาญการพิเศษ ทำหน้าที่แทน  
ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

3 ส.ค.ม...

3. สมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย. คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ: เรือนแก้วการพิมพ์, 2547.
4. APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 23<sup>rd</sup> ed. Washington, DC : APHA, 2017
5. United States Environmental Protection Agency. Standard of Performance for New Stationary Sources. 40 CFR Part 60. Appendix A, 2019.
6. United States Environmental Protection Agency. Acid Digestion of Sediments Sludge and Soils. SW-846 Method 3050B, 1996.
7. United States Environment Protection Agency, Inductively Coupled Plasma-Atomic Emission spectrometry. SW-846 Method 6010C, 2007.
8. United States Environment Protection Agency. Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique). SW-846 Method 7471B, 2007.
9. United States Environment Protection Agency. Alkaline digestion for Hexavalent Chromium. SW-846 Method 3060A, 1996.
10. United States Environment Protection Agency. Chromium. Hexavalent (Colormetric). SW-846 Method 7196A, 1992

รักษาการนักวิทยาศาสตร์ชำนาญการพิเศษ ทำหน้าที่แทน  
ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

## สำเนา

ที่ อก ๐๓๑๐(๓)/ ๗ ๔ ๒๓

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐๔ สิงหาคม ๒๕๖๔

เรื่อง เปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๑๕ มิถุนายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์  
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด จำนวน ๓ แผ่น

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด ห้องปฏิบัติการวิเคราะห์  
เอกชน เลขทะเบียน ๖-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขุมวิท ๘ ตำบลหนองขาม อำเภอศรีราชา  
จังหวัดชลบุรี ขอเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

ก. ให้ยกเลิกควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย

ข. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑ ราย

ค. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ ราย

ง. ให้เพิ่มขอบข่ายสารมลพิษวิเคราะห์ในน้ำใต้ดิน จำนวน ๔๑ รายการ ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์  
เอกชน ที่ อก ๐๓๑๐(๓)/๑๒๕๐๐ ลงวันที่ ๓ พฤศจิกายน ๒๕๖๓ คือในวันที่ ๕ กรกฎาคม ๒๕๖๖

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

กองวิจัยและเตือนภัยมลพิษโรงงาน

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๘๐๕ ๗๒๖๑-๓

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและชนิดสารมลพิษที่วิเคราะห์  
บริษัท อีสเทิร์น ไทย คอนสตรัคติง ๑๙๙๒ จำกัด เลขทะเบียน ๖-๐๐๓  
ที่ ออ ๐๓๑๐(๓)/ ๗ ๔ ๒๓ ลงวันที่ ๐๔ สิงหาคม ๒๕๖๔

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๔๑ รายการ  
น้ำใต้ดิน จำนวน 41 รายการ

| ลำดับที่ | สารมลพิษ             | วิธีวิเคราะห์   |
|----------|----------------------|---|
| 1        | Acetone              | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 2        | Benzene              | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 3        | Bromodichloromethane | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 4        | Bromoform            | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 5        | Butanol              | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 6        | Carbon disulfide     | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 7        | Carbon tetrachloride | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 8        | Chlorobenzene        | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 9        | Chlorodibromomethane | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 10       | Chloroform           | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 11       | Dichloromethane      | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 12       | 1,2-Dichlorobenzene  | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 13       | 1,3-Dichlorobenzene  | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 14       | 1,4-Dichlorobenzene  | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |

ผู้อำนวยการ  
ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

15 1,1-Dichloroethane...

-๒-

| ลำดับที่ | สารมลพิษ                   | วิธีวิเคราะห์   |
|----------|----------------------------|---|
| 15       | 1,1-Dichloroethane         | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 16       | 1,2-Dichloroethane         | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 17       | 1,1-Dichloroethylene       | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 18       | cis-1,2-Dichloroethylene   | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 19       | trans-1,2-Dichloroethylene | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 20       | 1,2-Dichloropropane        | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 21       | 1,3-Dichloropropane        | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 22       | Ethylbenzene               | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 23       | n-Hexane                   | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 24       | Methyl tert-butyl ether    | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 25       | Naphthalene                | Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method |
| 26       | Nitrobenzene               | Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method |
| 27       | Styrene                    | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 28       | 1,1,2,2-Tetrachloroethane  | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 29       | Tetrachloroethylene        | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |
| 30       | Toluene                    | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method           |

ผู้อำนวยการ  
ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

31 1,2,4-Trichlorobenzene...



| ลำดับที่ | สารมลพิษ               | วิธีวิเคราะห์   |
|----------|------------------------|---|
| 31       | 1,2,4-Trichlorobenzene | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 32       | 1,1,1-Trichloroethane  | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 33       | 1,1,2-Trichloroethane  | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 34       | Trichloroethylene      | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 35       | 1,3,5-Trimethylbenzene | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 36       | Vinyl acetate          | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 37       | Vinyl chloride         | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 38       | m-Xylene               | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 39       | o-Xylene               | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 40       | p-Xylene               | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |
| 41       | Xylene Total           | Purge and Trap, Gas Chromatographic / Mass Spectrometric Method |

**เอกสารอ้างอิง**

APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 23<sup>rd</sup> ed. Washington, DC : APHA, 2017

ผู้อำนวยการ  
ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

# สำเนา

ที่ อก ๐๓๑๐(๑)/ ๕๑๕๕

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ เขตราชเทวี  
กรุงเทพมหานคร ๑๐๕๐๐

๐๗ สิงหาคม ๒๕๖๓

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท โกซู โคชั่น จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๑๑ มีนาคม ๒๕๖๓

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท โกซู โคชั่น จำกัด จำนวน ๓๐ แผ่น

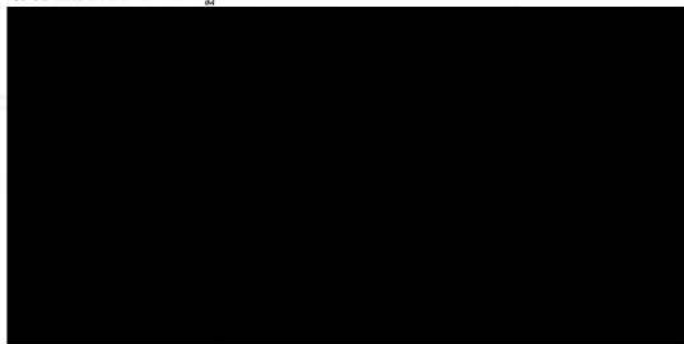
ตามหนังสือที่อ้างถึง บริษัท โกซู โคชั่น จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการ  
วิเคราะห์เอกชน เลขทะเบียน ว-๒๐๑๑ สถานที่ตั้งเลขที่ ๗๐ หมู่ที่ ๕ ถนนกิ่งแก้ว ตำบลราชาเทวะ อำเภอบางพลี  
จังหวัดสมุทรปราการ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท โกซู โคชั่น จำกัด ต่ออายุหนังสือรับขึ้นทะเบียน  
ห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์



ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์



ค. ขอบข่าย...

- ๒ -

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๔๘ รายการ น้ำใต้ดิน  
จำนวน ๑๒๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๓๕ รายการ และดิน จำนวน ๑๒๕ รายการ  
รวมทั้งสิ้นจำนวน ๓๓๔ รายการ ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้จะหมดอายุในวันที่ ๘ เมษายน ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือ  
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอ  
ต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นสุดอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์  
เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ



ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน  
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๑๔๖ ๐ ๒๒๐๒ ๔๐๐๒

โทรสาร ๐ ๒๓๕๔ ๓๒๐๘ ๐ ๒๓๕๔ ๓๔๑๕



# สำเนา

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท โกชู โคชั่น จำกัด

เลขทะเบียน ว-๒๐๑

ที่ ออก ๐๓๑๐(๑)/ ๕๑๕๕

ลงวันที่ ๐๗ สิงหาคม ๒๕๖๑

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๓๔ รายการ

น้ำเสีย จำนวน 48 รายการ

| ลำดับที่ | สารมลพิษ                  | วิธีวิเคราะห์  |
|----------|---------------------------|--|
| 1        | Aldrin                    | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 2        | Arsenic                   | Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[3]</sup>  |
| 3        | Barium                    | Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>  |
| 4        | α-BHC                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 5        | β-BHC                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 6        | γ-BHC                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 7        | δ-BHC                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 8        | Biochemical Oxygen Demand | 5-Day BOD Test, Membrane Electrode Method <sup>[3]</sup>   |
| 9        | Cadmium                   | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup> |
| 10       | Chemical Oxygen Demand    | 1) Closed Reflux, Colorimetric Method <sup>[3]</sup><br>2) Closed Reflux, Titrimetric Method <sup>[3]</sup>                      |
| 11       | α-Chlordane               | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 12       | γ-Chlordane               | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 13       | Chromium                  | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup> |
| 14       | Color                     | ADMI Weighted-Ordinate Spectrophotometric Method <sup>[3]</sup>  |
| 15       | Copper                    | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup> |
| 16       | Cyanide                   | Distillation, Colorimetric Method <sup>[3]</sup>   |
| 17       | 4,4'-DDD                  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 18       | 4,4'-DDE                  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 19       | 4,4'-DDT                  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 20       | Dieldrin                  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 21       | Endosulfan I              | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 22       | Endosulfan II             | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 23       | Endosulfan Sulfate        | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 24       | Endrin                    | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |

25 Endrin Aldehyde...

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

- ๒ -

| ลำดับที่ | สารมลพิษ                | วิธีวิเคราะห์  |
|----------|-------------------------|--|
| 25       | Endrin Aldehyde         | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 26       | Endrin Ketone           | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 27       | Formaldehyde            | Distillation, Colorimetric Method <sup>[1]</sup>   |
| 28       | Free Chlorine           | DPD Colorimetric Method <sup>[3]</sup>   |
| 29       | Heptachlor              | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 30       | Heptachlor Epoxide      | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 31       | Hexavalent Chromium     | Filtration, Colorimetric Method <sup>[3]</sup>   |
| 32       | Lead                    | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>   |
| 33       | Manganese               | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>   |
| 34       | Mercury                 | Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[3]</sup>  |
| 35       | Methoxychlor            | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 36       | Nickel                  | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>   |
| 37       | Oil & Grease            | Liquid-Liquid, Partition-Gravimetric Method <sup>[3]</sup>   |
| 38       | pH                      | Electrometric Method <sup>[3]</sup>  |
| 39       | Phenols                 | Distillation, Chloroform Extraction Method <sup>[3]</sup>  |
| 40       | Phosphorus              | Ascorbic Acid Method <sup>[3]</sup>  |
| 41       | Selenium                | 1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>   |
| 42       | Sulfide                 | ZnS Precipitation, Iodometric Method <sup>[3]</sup>  |
| 43       | Temperature             | Laboratory and Field Methods <sup>[3]</sup>  |
| 44       | Total Dissolved Solids  | Dried at 180 °C <sup>[3]</sup>   |
| 45       | Total Kjeldahl Nitrogen | Semi-Micro-Kjeldahl, Titrimetric Method <sup>[3]</sup>   |
| 46       | Total Suspended Solids  | Dried at 103-105 °C <sup>[3]</sup>   |
| 47       | Trivalent Chromium      | 1) Digestion, Direct Air-Acetylene Flame Method;<br>Filtration, Colorimetric Method; Calculation <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method;<br>Filtration, Colorimetric Method; Calculation <sup>[3]</sup> |
| 48       | Zinc                    | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>   |

น้ำได้ดิน...

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

น้ำใต้ดิน จำนวน 126 รายการ

| ลำดับที่ | สารมลพิษ                   | วิธีวิเคราะห์   |
|----------|----------------------------|---|
| 1        | Acenaphthene               | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 2        | Acetone                    | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 3        | Aldrin                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 4        | Anthracene                 | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 5        | Antimony                   | Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>   |
| 6        | Arsenic                    | 1) Digestion, Hydride Generation/Atomic Absorption<br>Spectrometric Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup> |
| 7        | Atrazine                   | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 8        | Barium                     | Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>   |
| 9        | Benz(a)anthracene          | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 10       | Benzene                    | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 11       | Benzo(b)fluoranthene       | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 12       | Benzo(k)fluoranthene       | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 13       | Benzoic Acid               | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 14       | Benzo(a)pyrene             | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 15       | Benzo(g,h,i)perylene       | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 16       | Beryllium                  | Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>   |
| 17       | Bis(2-chloroethyl)ether    | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 18       | Bis(2-ethylhexyl)phthalate | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 19       | Bromodichloromethane       | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 20       | Bromoform                  | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 21       | Butanol                    | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 22       | Butyl benzyl phthalate     | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |

ผู้ดำเนินการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

23 Cadmium...

| ลำดับที่ | สารมลพิษ             | วิธีวิเคราะห์  |
|----------|----------------------|--|
| 23       | Cadmium              | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>   |
| 24       | Carbazole            | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 25       | Carbon disulfide     | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 26       | Carbon tetrachloride | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 27       | Chlordane            | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 28       | p-Chloroaniline      | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 29       | Chlorobenzene        | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 30       | Chlorodibromomethane | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 31       | Chloroform           | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 32       | 2-Chlorophenol       | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 33       | Chromium             | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>   |
| 34       | Chromium (III)       | 1) Digestion, Direct Air-Acetylene Flame Method;<br>Filtration, Colorimetric Method; Calculation <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method;<br>Filtration, Colorimetric Method; Calculation <sup>[3]</sup> |
| 35       | Chromium (VI)        | Filtration, Colorimetric Method <sup>[3]</sup>   |
| 36       | Chrysene             | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 37       | Cyanide              | Distillation, Colorimetric Method <sup>[3]</sup>   |
| 38       | 2,4-D                | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 39       | DDD                  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 40       | DDE                  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 41       | DDT                  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 42       | Dibenz(a)anthracene  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |

ผู้ดำเนินการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

43 Di-n-Butyl phthalate...



| ลำดับที่ | สารมลพิษ                   | วิธีวิเคราะห์   |
|----------|----------------------------|---|
| 43       | Di-n-Butyl phthalate       | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 44       | 1,2-Dichlorobenzene        | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 45       | 1,3-Dichlorobenzene        | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 46       | 1,4-Dichlorobenzene        | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 47       | 3,3-Dichlorobenzidine      | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 48       | 1,1-Dichloroethane         | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 49       | 1,2-Dichloroethane         | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 50       | 1,1-Dichloroethylene       | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 51       | cis-1,2-Dichloroethylene   | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 52       | trans-1,2-Dichloroethylene | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 53       | 2,4-Dichlorophenol         | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 54       | 1,2-Dichloropropane        | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 55       | 1,3-Dichloropropane        | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 56       | 1,3-Dichloropropene        | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 57       | Dieldrin                   | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 58       | Diethyl Phthalate          | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 59       | 2,4-Dimethylphenol         | 1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup><br>2) Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup> |

60 2,4-Dinitrophenol...

| ลำดับที่ | สารมลพิษ                  | วิธีวิเคราะห์   |
|----------|---------------------------|---|
| 60       | 2,4-Dinitrophenol         | 1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup><br>2) Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup> |
| 61       | 2,4-Dinitrotoluene        | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 62       | 2,6-Dinitrotoluene        | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 63       | Di-n-octyl phthalate      | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 64       | Endosulfan                | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 65       | Endrin                    | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 66       | Ethylbenzene              | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 67       | Fluoranthene              | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 68       | Fluorene                  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 69       | Heptachlor                | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 70       | Heptachlor epoxide        | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 71       | Hexachlorobenzene         | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 72       | Hexachloro-1,3-butadiene  | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 73       | n-Hexane                  | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 74       | α-HCH                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 75       | β-HCH                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 76       | γ-HCH                     | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 77       | Hexachlorocyclopentadiene | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 78       | Hexachloroethane          | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 79       | Indeno(1,2,3-cd)pyrene    | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 80       | Isophorone                | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |

81 Lead...

| ลำดับที่ | สารมลพิษ               | วิธีวิเคราะห์  |
|----------|------------------------|--|
| 116      | 2,4,5-Trichlorophenol  | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>                                       |
| 117      | 2,4,6-Trichlorophenol  | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>                                       |
| 118      | 1,3,5-Trimethylbenzene | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 119      | Vanadium               | Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>  |
| 120      | Vinyl acetate          | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 121      | Vinyl chloride         | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 122      | m-Xylene               | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 123      | o-Xylene               | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 124      | p-Xylene               | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 125      | Xylene (Total)         | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 126      | Zinc                   | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup> |

สิ่งปลูกหรือวัสดุที่ไม่ใช่แล้ว จำนวน 35 รายการ

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์  |
|----------|----------|--|
| 1        | Aldrin   | 1) Waste Extraction, Liquid-Liquid Extraction,<br>Gas Chromatographic Method <sup>[2,6,24]</sup>   |
| 2        | Antimony | 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>1) Waste Extraction, Inductively Coupled Plasma<br>Method <sup>[2,4,15]</sup>   |
| 3        | Arsenic  | 2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup><br>1) Waste Extraction, Hydride Generation/Atomic<br>Absorption Spectrometric Method <sup>[2,4,17]</sup><br>2) Digestion, Hydride Generation/Atomic Absorption<br>Spectrometric Method <sup>[4,17]</sup> |

| ลำดับที่ | สารมลพิษ  | วิธีวิเคราะห์  |
|----------|-----------|--|
| 4        | Barium    | 1) Waste Extraction, Inductively Coupled Plasma<br>Method <sup>[2,4,15]</sup>  |
| 5        | Beryllium | 2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup><br>1) Waste Extraction, Inductively Coupled Plasma<br>Method <sup>[2,4,15]</sup>   |
| 6        | Cadmium   | 2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup><br>1) Waste Extraction, Flame Atomic Absorption<br>Spectrometric Method <sup>[2,4,16]</sup><br>2) Waste Extraction, Inductively Coupled Plasma<br>Method <sup>[2,4,15]</sup><br>3) Digestion, Flame Atomic Absorption Spectrometric<br>Method <sup>[4,16]</sup><br>4) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>   |
| 7        | Chlordane | 1) Waste Extraction, Liquid-Liquid Extraction,<br>Gas Chromatographic Method <sup>[2,6,24]</sup>   |
| 8        | Chromium  | 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>1) Waste Extraction, Flame Atomic Absorption<br>Spectrometric Method <sup>[2,4,16]</sup><br>2) Waste Extraction, Inductively Coupled Plasma<br>Method <sup>[2,4,15]</sup><br>3) Digestion, Flame Atomic Absorption Spectrometric<br>Method <sup>[4,16]</sup><br>4) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup> |
| 9        | Cobalt    | 1) Waste Extraction, Inductively Coupled Plasma<br>Method <sup>[2,4,15]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>   |
| 10       | Copper    | 1) Waste Extraction, Flame Atomic Absorption<br>Spectrometric Method <sup>[2,4,16]</sup><br>2) Waste Extraction, Inductively Coupled Plasma<br>Method <sup>[2,4,15]</sup><br>3) Digestion, Flame Atomic Absorption Spectrometric<br>Method <sup>[4,16]</sup><br>4) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>  |



| ลำดับที่ | สารมลพิษ  | วิธีวิเคราะห์  |
|----------|---|--|
| 81       | Lead  | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup> |
| 82       | Manganese   | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup> |
| 83       | Mercury   | Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[3]</sup>  |
| 84       | Methanol  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 85       | Methoxychlor  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 86       | Methyl bromide  | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 87       | Methylene chloride  | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 88       | 2-Methylphenol  | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>                                       |
| 89       | 2-Methylnaphthalene   | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 90       | Methyl tert-butyl ether   | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>   |
| 91       | Naphthalene   | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |
| 92       | Nickel  | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup> |
| 93       | Nitrobenzene  | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>                                       |
| 94       | N-Nitrosodiphenylamine  | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>                                       |
| 95       | N-Nitrosodi-n-propylamine   | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>                                       |
| 96       | Polychlorinated Biphenyls<br>- Aroclor 1016<br>- Aroclor 1221<br>- Aroclor 1232<br>- Aroclor 1242<br>- Aroclor 1248<br>- Aroclor 1254<br>- Aroclor 1260 | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>  |

97 Pentachlorophenol...

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

| ลำดับที่ | สารมลพิษ                                | วิธีวิเคราะห์   |
|----------|---|---|
| 97       | Pentachlorophenol                       | Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 98       | pH                                      | Electrometric Method <sup>[3]</sup>   |
| 99       | Phenanthrene                            | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 100      | Phenol                                  | 1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup><br>2) Liquid-Liquid Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup> |
| 101      | Pyrene                                  | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 102      | Selenium                                | Digestion, Hydride Generation/Atomic Absorption<br>Spectrometric Method <sup>[3]</sup>  |
| 103      | Silver                                  | 1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>  |
| 104      | Styrene                                 | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 105      | 1,1,2,2-Tetrachloroethane               | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 106      | Tetrachloroethylene                     | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 107      | Toluene                                 | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 108      | Toxaphene                               | Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>   |
| 109      | TPH (C <sub>5</sub> -C <sub>8</sub> )   | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[13,31]</sup>  |
| 110      | TPH (C <sub>8</sub> -C <sub>16</sub> )  | Solvent Extraction, Gas Chromatographic Method <sup>[7,21]</sup>  |
| 111      | TPH (C <sub>16</sub> -C <sub>35</sub> ) | Solvent Extraction, Gas Chromatographic Method <sup>[7,21]</sup>  |
| 112      | 1,2,4-Trichlorobenzene                  | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 113      | 1,1,1-Trichloroethane                   | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 114      | 1,1,2-Trichloroethane                   | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |
| 115      | Trichloroethylene                       | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[3]</sup>  |

116 2,4,5-Trichlorophenol...

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

| ลำดับที่ | สารมลพิษ            | วิธีวิเคราะห์  |
|----------|---------------------|--|
| 11       | 2,4-D               | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>   |
| 12       | DDD                 | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>   |
| 13       | DDE                 | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>   |
| 14       | DDT                 | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>   |
| 15       | Dieldrin            | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>   |
| 16       | Endrin              | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>   |
| 17       | Fluoride            | 1) Waste Extraction, Ion Selective Electrode Method <sup>[2,35]</sup><br>2) Digestion, Ion Selective Electrode Method <sup>[35]</sup>  |
| 18       | Heptachlor          | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>   |
| 19       | Hexavalent Chromium | 1) Waste Extraction, Colorimetric Method <sup>[2,5,16]</sup><br>2) Digestion, Colorimetric Method <sup>[5,16]</sup>  |
| 20       | Lead                | 1) Waste Extraction, Flame Atomic Absorption Spectrometric Method <sup>[2,4,16]</sup><br>2) Waste Extraction, Inductively Coupled Plasma Method <sup>[2,4,15]</sup><br>3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[4,16]</sup><br>4) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup> |
| 21       | Lindane             | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>   |

22 Mercury...

| ลำดับที่ | สารมลพิษ  | วิธีวิเคราะห์  |
|----------|---|--|
| 22       | Mercury   | 1) Waste Extraction, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[2,19]</sup><br>2) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[19]</sup>  |
| 23       | Methoxychlor  | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>   |
| 24       | Molybdenum  | 1) Waste Extraction, Inductively Coupled Plasma Method <sup>[2,4,15]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>  |
| 25       | Nickel  | 1) Waste Extraction, Flame Atomic Absorption Spectrometric Method <sup>[2,4,16]</sup><br>2) Waste Extraction, Inductively Coupled Plasma Method <sup>[2,4,15]</sup><br>3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[4,16]</sup><br>4) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup> |
| 26       | Polychlorinated Biphenyls<br>-2,2',3,4,4',5,5'-<br>Heptachlorobiphenyl<br>-2,2',3,4,4',5-<br>Hexachlorobiphenyl<br>-2,2',4,4',5,5'-<br>Hexachlorobiphenyl<br>-2,2',4,5,5'-<br>Pentachlorobiphenyl<br>-2,2',5,5'-Tetrachlorobiphenyl<br>-2,4,5-Trichlorobiphenyl | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[7,24]</sup>   |
| 27       | Pentachlorophenol   | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>   |
| 28       | Selenium  | 1) Waste Extraction, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[2,4,20]</sup><br>2) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4,20]</sup>  |

29 Silvex...



| ลำดับที่ | สารมลพิษ          | วิธีวิเคราะห์   |
|----------|-------------------|---|
| 29       | Silvex            | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup>   |
| 30       | Silver            | 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[7,24]</sup><br>1) Waste Extraction, Flame Atomic Absorption Spectrometric Method <sup>[2,4,16]</sup><br>2) Waste Extraction, Inductively Coupled Plasma Method <sup>[2,4,15]</sup><br>3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[4,16]</sup><br>4) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup> |
| 31       | Thallium          | 1) Waste Extraction, Inductively Coupled Plasma Method <sup>[2,4,15]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>   |
| 32       | Toxaphene         | 1) Waste Extraction, Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[2,6,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>  |
| 33       | Trichloroethylene | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[13,32]</sup>  |
| 34       | Vanadium          | 1) Waste Extraction, Inductively Coupled Plasma Method <sup>[2,4,15]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>   |
| 35       | Zinc              | 1) Waste Extraction, Flame Atomic Absorption Spectrometric Method <sup>[2,4,16]</sup><br>2) Waste Extraction, Inductively Coupled Plasma Method <sup>[2,4,15]</sup><br>3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[4,16]</sup><br>4) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>  |

ดิน จำนวน 125 รายการ

| ลำดับที่ | สารมลพิษ     | วิธีวิเคราะห์   |
|----------|--------------|---|
| 1        | Acenaphthene | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Gas Chromatographic/<br>Mass Spectrometric Method <sup>[7,33]</sup> |

ผู้ช่วยการกลุ่มมาตรฐานวิธีการวิเคราะห์ดินและตะกอน  
และทะเบียนห้องปฏิบัติการ

2 Acetone...

| ลำดับที่ | สารมลพิษ             | วิธีวิเคราะห์  |
|----------|----------------------|--|
| 2        | Acetone              | 1) Headspace, Gas Chromatographic Method <sup>[12,21]</sup><br>2) Purge and Trap, Gas Chromatographic Method <sup>[14,21]</sup><br>3) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>   |
| 3        | Aldrin               | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 4        | Anthracene           | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 5        | Antimony             | 1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[4,16]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>  |
| 6        | Arsenic              | 1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4,17]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>   |
| 7        | Atrazine             | Ultrasonic Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[9,22]</sup>   |
| 8        | Barium               | 1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[4,16]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>  |
| 9        | Benz(a)anthracene    | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 10       | Benzene              | 1) Headspace, Gas Chromatographic Method <sup>[12,21]</sup><br>2) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>3) Purge and Trap, Gas Chromatographic Method <sup>[14,21]</sup><br>4) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup> |
| 11       | Benzo(b)fluoranthene | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |

ผู้ช่วยการกลุ่มมาตรฐานวิธีการวิเคราะห์ดินและตะกอน  
และทะเบียนห้องปฏิบัติการ

12 Benzo(k)fluoranthene...

| ลำดับที่ | สารมลพิษ                   | วิธีวิเคราะห์  |
|----------|----------------------------|--|
| 12       | Benzo(k)fluoranthene       | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 13       | Benzoic acid               | Ultrasonic Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[9,33]</sup>   |
| 14       | Benzo(a)pyrene             | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 15       | Benzo(g,h,i)perylene       | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 16       | Beryllium                  | Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>   |
| 17       | Bis(2-chloroethyl)ether    | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,28]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 18       | Bis(2-ethylhexyl)phthalate | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,23]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 19       | Bromodichloromethane       | 1) Headspace, Gas Chromatographic Method <sup>[12,21]</sup><br>2) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>3) Purge and Trap, Gas Chromatographic Method <sup>[13,21]</sup><br>4) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[13,32]</sup> |
| 20       | Bromoform                  | 1) Headspace, Gas Chromatographic Method <sup>[12,21]</sup><br>2) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>3) Purge and Trap, Gas Chromatographic Method <sup>[14,21]</sup><br>4) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup> |
| 21       | Butanol                    | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>   |
| 22       | Butyl benzyl phthalate     | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,23]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |

23 Cadmium...

| ลำดับที่ | สารมลพิษ             | วิธีวิเคราะห์  |
|----------|----------------------|--|
| 23       | Cadmium              | 1) Digestion, Flame Atomic Absorption Spectrometric<br>Method <sup>[4,16]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>   |
| 24       | Carbazole            | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>   |
| 25       | Carbon disulfide     | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>   |
| 26       | Carbon tetrachloride | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>  |
| 27       | Chlordane            | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 28       | p-Chloroaniline      | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 29       | Chlorobenzene        | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>  |
| 30       | Chlorodibromomethane | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>   |
| 31       | Chloroform           | 1) Headspace, Gas Chromatographic Method <sup>[12,21]</sup><br>2) Purge and Trap, Gas Chromatographic Method <sup>[14,21]</sup><br>3) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup> |
| 32       | 2-Chlorophenol       | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,22]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 33       | Chromium             | 1) Digestion, Flame Atomic Absorption Spectrometric<br>Method <sup>[4,16]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>   |

34 Chromium (III)...



| ลำดับที่ | สารมลพิษ              | วิธีวิเคราะห์   |
|----------|-----------------------|---|
| 34       | Chromium (III)        | 1) Digestion, Flame Atomic Absorption Spectrophotometric Method; Digestion, Colorimetric Method; Calculation <sup>[4,16,18]</sup><br>2) Digestion, Inductively Coupled Plasma Method; Digestion, Colorimetric Method; Calculation <sup>[4,15,18]</sup>  |
| 35       | Chromium (VI)         | Digestion, Colorimetric Method <sup>[5,18]</sup>  |
| 36       | Chrysene              | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[8,33]</sup>  |
| 37       | Cyanide               | Distillation, Colorimetric Method <sup>[34]</sup>   |
| 38       | 2,4-D                 | Soxhlet Extraction, Gas Chromatographic Method <sup>[8,30]</sup>  |
| 39       | DDD                   | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[8,33]</sup>  |
| 40       | DDE                   | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[8,32]</sup>  |
| 41       | DDT                   | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,26]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[8,33]</sup>  |
| 42       | Dibenz(a,h)anthracene | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[8,33]</sup>  |
| 43       | Di-n-Butyl phthalate  | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,23]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[8,33]</sup>  |
| 44       | 1,2-Dichlorobenzene   | 1) Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>[14,32]</sup><br>3) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>4) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[8,33]</sup> |

ผู้ชำนาญการกรมมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผล  
และประเมินผลปฏิบัติการ

45 1,3-Dichlorobenzene...

| ลำดับที่ | สารมลพิษ                   | วิธีวิเคราะห์   |
|----------|----------------------------|---|
| 45       | 1,3-Dichlorobenzene        | 1) Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>[14,32]</sup><br>3) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>4) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[8,33]</sup> |
| 46       | 1,4-Dichlorobenzene        | 1) Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>[14,32]</sup><br>3) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>4) Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[8,33]</sup> |
| 47       | 3,3-Dichlorobenzidine      | Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[8,33]</sup>  |
| 48       | 1,1-Dichloroethane         | 1) Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>[13,32]</sup>   |
| 49       | 1,2-Dichloroethane         | 1) Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>[14,32]</sup>   |
| 50       | 1,1-Dichloroethylene       | 1) Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>[14,32]</sup>   |
| 51       | cis-1,2-Dichloroethylene   | 1) Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>[14,32]</sup>   |
| 52       | trans-1,2-Dichloroethylene | 1) Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>[14,32]</sup>   |

ผู้ชำนาญการกรมมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผล  
และประเมินผลปฏิบัติการ

53 2,4-Dichlorophenol...

| ลำดับที่ | สารมลพิษ             | วิธีวิเคราะห์  |
|----------|----------------------|--|
| 53       | 2,4-Dichlorophenol   | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,22]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 54       | 1,2-Dichloropropane  | 1) Headspace, Gas Chromatographic Method <sup>[12,21]</sup><br>2) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>3) Purge and Trap, Gas Chromatographic Method <sup>[14,21]</sup><br>4) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup> |
| 55       | 1,3-Dichloropropane  | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>   |
| 56       | 1,3-Dichloropropene  | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>   |
| 57       | Dieldrin             | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 58       | Diethyl Phthalate    | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,23]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 59       | 2,4-Dimethylphenol   | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,22]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 60       | 2,4-Dinitrophenol    | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,26]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 61       | 2,4-Dinitrotoluene   | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,26]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 62       | 2,6-Dinitrotoluene   | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,23]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,32]</sup>  |
| 63       | Di-n-octyl phthalate | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,22]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |

64 Endosulfan...

| ลำดับที่ | สารมลพิษ                 | วิธีวิเคราะห์  |
|----------|--------------------------|--|
| 64       | Endosulfan               | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 65       | Endrin                   | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 66       | Ethylbenzene             | 1) Headspace, Gas Chromatographic Method <sup>[12,21]</sup><br>2) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>3) Purge and Trap, Gas Chromatographic Method <sup>[14,21]</sup><br>4) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup> |
| 67       | Fluoranthene             | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 68       | Fluorene                 | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 69       | Heptachlor               | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 70       | Heptachlor epoxide       | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 71       | Hexachlorobenzene        | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>3) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>   |
| 72       | Hexachloro-1,3-butadiene | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 73       | n-Hexane                 | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>   |

74 α-HCH...



| ลำดับที่ | สารมลพิษ                  | วิธีวิเคราะห์  |
|----------|---------------------------|--|
| 74       | $\alpha$ -HCH             | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup><br>3) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>4) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup> |
| 75       | $\beta$ -HCH              | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup><br>3) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>4) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup> |
| 76       | $\gamma$ -HCH             | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup><br>3) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>4) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup> |
| 77       | Hexachlorocyclopentadiene | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup><br>3) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>4) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup> |
| 78       | Hexachloroethane          | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 79       | Indeno(1,2,3-cd)pyrene    | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |

80 Isophorone...

| ลำดับที่ | สารมลพิษ                | วิธีวิเคราะห์  |
|----------|-------------------------|--|
| 80       | Isophorone              | Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 81       | Lead                    | 1) Digestion, Flame Atomic Absorption Spectrometric<br>Method <sup>[4,16]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>   |
| 82       | Manganese               | 1) Digestion, Flame Atomic Absorption Spectrometric<br>Method <sup>[4,16]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>   |
| 83       | Mercury                 | Digestion, Cold-Vapor Atomic Absorption Spectrometric<br>Method <sup>[19]</sup>  |
| 84       | Methanol                | Headspace, Gas Chromatographic Method <sup>[12,21]</sup>   |
| 85       | Methoxychlor            | Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup>   |
| 86       | Methyl bromide          | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>  |
| 87       | Methylene chloride      | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>  |
| 88       | 2-Methylphenol          | Waste Dilution, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[10,33]</sup>   |
| 89       | 2-Methylnaphthalene     | 1) Ultrasonic Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[9,33]</sup><br>2) Waste Dilution, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[10,33]</sup>   |
| 90       | Methyl tert-butyl ether | 1) Headspace, Gas Chromatographic Method <sup>[12,21]</sup><br>2) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>3) Purge and Trap, Gas Chromatographic Method <sup>[14,21]</sup><br>4) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup> |
| 91       | Naphthalene             | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>3) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>   |

92 Nickel...

| ลำดับที่ | สารมลพิษ   | วิธีวิเคราะห์  |
|----------|--|--|
| 92       | Nickel   | 1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[4,16]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>              |
| 93       | Nitrobenzene   | 1) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup><br>2) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,26]</sup> |
| 94       | N-Nitrosodiphenylamine   | Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 95       | N-Nitrosodi-n-propylamine  | Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 96       | Polychlorinated Biphenyls<br>- Aroclor 1016<br>- Aroclor 1221<br>- Aroclor 1232<br>- Aroclor 1242<br>- Aroclor 1248<br>- Aroclor 1254<br>- Aroclor 1260<br>- 2-Chlorobiphenyl<br>- 2,3-Dichlorobiphenyl<br>- 2,2',5-Trichlorobiphenyl<br>- 2,4',5-Trichlorobiphenyl<br>- 2,2',3,5'-Tetrachlorobiphenyl<br>- 2,2',5,5'-Tetrachlorobiphenyl<br>- 2,3',4,4'-Tetrachlorobiphenyl<br>- 2,2',3,4,5'-<br>Pentachlorobiphenyl<br>- 2,2',4,5,5'-<br>Pentachlorobiphenyl<br>- 2,3,3',4',6-<br>Pentachlorobiphenyl<br>- 2,2',3,4,4',5'-<br>Hexachlorobiphenyl<br>- 2,2',3,4,5,5'-<br>Hexachlorobiphenyl | Soxhlet Extraction, Gas Chromatographic Method <sup>[8,25]</sup>   |

-2,2',3,5,5',6-Hexachlorobiphenyl...

| ลำดับที่ | สารมลพิษ  | วิธีวิเคราะห์   |
|----------|---|---|
|          | -2,2',3,5,5',6-<br>Hexachlorobiphenyl<br>-2,2',4,4',5,5'-<br>Hexachlorobiphenyl<br>2,2',3,3',4,4',5-<br>Heptachlorobiphenyl<br>-2,2',3,4,4',5,5'-<br>Heptachlorobiphenyl<br>-2,2',3,4,4',5',6-<br>Heptachlorobiphenyl<br>-2,2',3,4',5,5',6-<br>Heptachlorobiphenyl<br>-2,2',3,3',4,4',5,5',6-<br>Nonachlorobiphenyl |   |
| 97       | Pentachlorophenol   | 1) Soxhlet Extraction, Gas Chromatographic<br>Method <sup>[8,24,29]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>       |
| 98       | Phenanthrene  | Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>   |
| 99       | Phenol  | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,22]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>             |
| 100      | Pyrene  | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,27]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>             |
| 101      | Selenium  | Digestion, Hydride Generation/Atomic Absorption<br>Spectrometric Method <sup>[4,20]</sup>   |
| 102      | Silver  | 1) Digestion, Flame Atomic Absorption Spectrometric<br>Method <sup>[4,16]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>                          |
| 103      | Styrene   | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup> |

104 1,1,2,2-Tetrachloroethane...

| ลำดับที่ | สารมลพิษ                                | วิธีวิเคราะห์  |
|----------|---|--|
| 104      | 1,1,2,2-Tetrachloroethane               | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>  |
| 105      | Tetrachloroethylene                     | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>  |
| 106      | Toluene                                 | 1) Headspace, Gas Chromatographic Method <sup>[12,21]</sup><br>2) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>3) Purge and Trap, Gas Chromatographic Method <sup>[14,21]</sup><br>4) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup> |
| 107      | Toxaphene                               | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,24]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 108      | TPH (C <sub>5</sub> -C <sub>8</sub> )   | 1) Purge and Trap, Gas Chromatographic Method <sup>[14,21]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,31]</sup><br>3) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 109      | TPH (C <sub>8</sub> -C <sub>16</sub> )  | 1) Purge and Trap, Gas Chromatographic Method <sup>[14,21]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup><br>3) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 110      | TPH (C <sub>16</sub> -C <sub>35</sub> ) | 1) Purge and Trap, Gas Chromatographic Method <sup>[14,21]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup><br>3) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |

ผู้ชำนาญการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

111 1,2,4-Trichlorobenzene...

| ลำดับที่ | สารมลพิษ               | วิธีวิเคราะห์  |
|----------|------------------------|--|
| 111      | 1,2,4-Trichlorobenzene | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup><br>3) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,29]</sup><br>4) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup> |
| 112      | 1,1,1-Trichloroethane  | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>  |
| 113      | 1,1,2-Trichloroethane  | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>  |
| 114      | Trichloroethylene      | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>  |
| 115      | 2,4,5-Trichlorophenol  | 1) Ultrasonic Extraction, Gas Chromatographic Method <sup>[9,22]</sup><br>2) Waste Dilution, Gas Chromatographic Method <sup>[10,22]</sup><br>3) Ultrasonic Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[9,33]</sup><br>4) Waste Dilution, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[10,33]</sup>             |
| 116      | 2,4,6-Trichlorophenol  | 1) Soxhlet Extraction, Gas Chromatographic Method <sup>[8,22]</sup><br>2) Soxhlet Extraction, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[8,33]</sup>  |
| 117      | 1,3,5-Trimethylbenzene | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[12,32]</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>[14,32]</sup>  |
| 118      | Vanadium               | 1) Digestion, Flame Atomic Absorption Spectrometric<br>Method <sup>[4,16]</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>[4,15]</sup>   |

119 Vinyl acetate...

ผู้ชำนาญการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ



| ลำดับที่ | สารมลพิษ       | วิธีวิเคราะห์   |
|----------|----------------|---|
| 119      | Vinyl acetate  | Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>(14,32)</sup>  |
| 120      | Vinyl chloride | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>(12,32)</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>(14,32)</sup> |
| 121      | m-Xylene       | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>(12,32)</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>(14,32)</sup> |
| 122      | o-Xylene       | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>(12,32)</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>(14,32)</sup> |
| 123      | p-Xylene       | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>(12,32)</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>(14,32)</sup> |
| 124      | Xylene (Total) | 1) Headspace, Gas Chromatographic/<br>Mass Spectrometric Method <sup>(12,32)</sup><br>2) Purge and Trap, Gas Chromatographic/<br>Mass Spectrometric Method <sup>(14,32)</sup> |
| 125      | Zinc           | 1) Digestion, Flame Atomic Absorption Spectrometric<br>Method <sup>(4,16)</sup><br>2) Digestion, Inductively Coupled Plasma Method <sup>(4,15)</sup>                          |

#### เอกสารอ้างอิง

1. สมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย. คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ: เรือนแก้วการพิมพ์, 2547.
2. กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2548. เรื่อง การกำจัดสิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว. ราชกิจจานุเบกษา. 25 มกราคม 2549. เล่มที่ 123 ตอนพิเศษ 11ง.
3. APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 23<sup>rd</sup> ed. Washington, DC: APHA, 2017.

ผู้ชำนาญการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

4. United ...

4. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Acid Digestion of Sediment, Sludges, and Soils, SW-846 Method 3050B, 1996.
5. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Alkaline Digestion for Hexavalent Chromium. SW-846 Method 3060A, 1996.
6. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Separatory Funnel Liquid-Liquid Extraction, SW-846 Method 3010C, 1996.
7. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Separatory Funnel Liquid-Liquid Extraction. SW-846 Method 3510C, 1996.
8. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Soxhlet Extraction. SW-846 Method 3540C, 1996.
9. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Ultrasonic Extraction. SW-846 Method 3550C, 2007.
10. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Waste Dilution. SW-846 Method 3580, 1992.
11. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Silica Gel Cleanup. SW-846 Method 3630, 1996.
12. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis. SW-846 Method 5021A, 2014.
13. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Purge-and-Trap for Aqueous Samples. SW-846 Method 5030C, 2003.
14. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Closed System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples. SW-846 Method 5035A, 2002.
15. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Inductively Coupled Plasma-Atomic Emission Spectrometry. SW-846 Method 6010D, 2014.
16. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Flame Atomic Absorption Spectrophotometry. SW-846 Method 7000B, 2007.

ผู้ชำนาญการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

17. United...

17. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Antimony and Arsenic (Atomic Absorption, Borohydride Reduction). SW-846 Method 7062, 1994.

18. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Chromium, Hexavalent (Colorimetric). SW-846 Method 7196A, 1992.

19. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Mercury in Solid or Semisolid Wastes (Manual Cold-Vapor Technique). SW-846 Method 7471B, 1998.

20. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Selenium (Atomic Absorption, Borohydride Reduction). SW-846 Method 7742, 1994.

21. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Nonhalogenated Organics Using GC/FID. SW-846 Method 8015D, 2003.

22. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Phenols by Gas Chromatography. SW-846 Method 8041A, 2007.

23. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Phthalate Esters by Gas Chromatography with Electron Capture Detection (GC/ECD). SW-846 Method 8061A, 1996


24. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Organochlorine Pesticides by Gas Chromatography. SW-846 Method 8081B, 2007.

25. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Polychlorinated Biphenyls (PCBs) by Gas Chromatography. SW-846 Method 8082A, 2007.

26. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Nitroaromatics and Cyclic Ketones by Gas Chromatography. SW-846 Method 8091, 1996.

27. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Polynuclear Aromatic Hydrocarbons. SW-846 Method 8100, 1986.

28. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Haloethers by Gas Chromatography. SW-846 Method 8111, 1996

  
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

29. United...

29. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Chlorinated Hydrocarbons by Gas Chromatography. SW-846 Method 8121, 1994.

30. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Chlorinated Herbicides by GC Using Methylation or Pentafluorobenzoylation Derivatization. SW-846 Method 8151A, 1996.

31. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS). SW-846 Method 8260B, 1996.

32. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS). SW-846 Method 8260C, 2006.

33. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry. SW-846 Method 8270D, 2014.

34. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Cyanide Extraction Procedure for Solids and Oils. SW-846 Method 9013A, 2014.

35. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Potentiometric Determination of Fluoride in Aqueous Samples with Ion-Selective Electrode. SW-846 Method 9214, 1996.

  
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ กองวิจัยและเตือนภัยมลพิษโรงงาน กรมโรงงานอุตสาหกรรม โทร. ๐ ๒๒๐๒ ๔๐๐๒, ๔๑๔๖

ภาคผนวก ง-2

---

เอกสารสอบเทียบเครื่องมือตรวจวัด



## Personal Pump Calibration Report

Calibrate No. : CP0290/2565

Calibrate Date : June 17, 2022

Equipment Type : Personal Pump  
Calibration Type : DRYCAL DC-LITE FLOWMETER  
Volume for Calibration : 2.0, 2.5 l/min  
Environment Conditions : 29.0 Deg.C.  
Environment Pressure : 758.0 mmHg.  
Customer Name : บริษัท ไอจี ฟอรัจ (ไทยแลนด์) จำกัด

| Item | Personal Pump<br>Serial Number | Flow Rate | First Time | Second<br>Time | Third<br>Time | Forth<br>Time | Average | Uncertainty  |
|------|--------------------------------|-----------|------------|----------------|---------------|---------------|---------|--------------|
| 1.   | S/N 20200804097                | 2.0 l/min | 2.058      | 2.060          | 2.056         | 2.060         | 2.059   | $\pm 0.0019$ |
| 2.   | S/N 20200804086                | 2.0 l/min | 2.035      | 2.039          | 2.031         | 2.036         | 2.035   | $\pm 0.0033$ |
| 3.   | S/N 20200804104                | 2.5 l/min | 2.509      | 2.508          | 2.510         | 2.511         | 2.510   | $\pm 0.0013$ |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |
|      |                                |           |            |                |               |               |         |              |

Calibration By

Technician



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0151

MTC.No.23-65/0151

Number of page(s) 2

## CALIBRATION CERTIFICATE

**Nomenclature : DRYCAL DC-LITE FLOWMETER**

Manufacturer : BIOS International Corporation, USA.

Serial No.: 104699

Model : DCL-M, Rev 1.09

Scale range : 100 ml/min to 7 l/min

Subdivision : ( 0.0001, 0.001 ) l/min

**Submitted by : PACIFIC LABORATORY CO.,LTD.**

14/5358 Moo14, T.Bang Bua Thong, A.Bang Bua Thong,

Nonthaburi 11110, Thailand.

**Received date :** 20 December 2021 **Condition of measured item :** Normal

**Calibration date :** 5 January 2022

**Standard :**

| Standard                            | Certificate No. | Date due  | Traceability |
|-------------------------------------|-----------------|-----------|--------------|
| RTD Thermometer                     | PSL-T 336/63    | 6-Apr-22  | TISTR        |
| Molbox/Pressure Transducer/UpStream | MP-0013-21      | 25-Jan-23 | NIMT         |
| Primary Flow Calibrator S/N 117982  | MW-0011-21      | 8-Apr-23  | NIMT         |
| Primary Flow Calibrator S/N 119521  | MW-0012-21      | 31-Mar-23 | NIMT         |

**Calibrated by :**

**Approved by**

Director

**Mechanical Engineering Standards Laboratory**

Ref. 2013264122005240001

**Issued Date 5 January 2022**

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

**Head Office**

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand

Tel. (66) 0 2577 9000

Fax. (66) 0 2577 9009

E-mail : rumpal@tistr.or.th Website:www.tistr.or.th

**Office/Laboratory**

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

**Office**

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0151

2/2

MTC.No.23-65/0151

**Calibration point :** (0.05, 0.1, 0.2, 1.0, 2.0, 3.0 ) l/min

**Ambient condition :** Temperature (  $23 \pm 3$  ) °C , Relative humidity (  $55 \pm 15$  ) %

Atmospheric pressure (  $1010 \pm 13$  ) hPa

**Calibration method :** The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

**Measurement data :**

| UUC Value | Standard Value | Temperature | Pressure | Deviation | Uncertainty |
|-----------|----------------|-------------|----------|-----------|-------------|
| (l/min)   | (l/min)        | (°C)        | (hPa)    | (%)       | (%)         |
| 0.0538    | 0.052932       | 22.341      | 1009.53  | +1.64     | 1.04        |
| 0.1035    | 0.10226        | 22.760      | 1013.89  | +1.24     | 0.99        |
| 0.2021    | 0.20002        | 22.560      | 1013.78  | +1.06     | 0.98        |
| 1.022     | 1.0146         | 22.289      | 1013.97  | +0.72     | 0.85        |
| 2.007     | 1.9940         | 22.340      | 1014.53  | +0.65     | 0.85        |
| 3.009     | 2.9912         | 22.438      | 1015.13  | +0.58     | 0.85        |

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor  $k=2$ , which provides a level of confidence of approximately 95%.

The end of calibration certificate.



The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

**Head Office**

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

**Office/Laboratory**

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th





CERTIFICATE No : 21M7483  
REFERENCE No : 62011-1

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : DIGITAL BALANCE  
**MANUFACTURER** : METTLER TOLEDO  
**MODEL** : DRAGON 204  
**SERIAL No** : 1200500387  
**ID No** : LAB-BL-002  
**CONDITION AS RECEIVED** : USED ITEM  
**SUBMITTED BY** : PACIFIC LABORATORY CO., LTD.  
14/5358 MOO. 14 TAMBOL BANGBUA THONG  
AMPHOE BANG NUA THONG, NONTHABURI  
11110

**CALIBRATED BY** : 

**CALIBRATION DATE** : 06-Aug-21

**APPROVED BY** : 

**ISSUED DATE** : 07-Aug-21

**RECEIVED DATE** : 06-Aug-21



# QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com

CERTIFICATE No : 21M7483

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : DRAGON 204  
MANUFACTURER : METTLER TOLEDO S/N : 1200500387  
ID No : LAB-BL-002 RECEIVED DATE : 06-Aug-21  
AIR PRESSURE : 1009mbar  $\pm$  1mbar CALIBRATION DATE : 06-Aug-21  
AMBIENT TEMPERATURE : 24°C  $\pm$  1°C RELATIVE HUMIDITY : 49 %RH  $\pm$  10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING WEIGHT OF QUALITY CALIBRATION TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

### 2. REFERENCE STANDARD INSTRUMENTS :-

| INSTRUMENT             | MODEL | SERIAL No | CERTIFICATE No | DUE DATE  |
|------------------------|-------|-----------|----------------|-----------|
| 1) STANDARD WEIGHT SET | E2    | QK-I-151  | C02210415      | 09-Feb-23 |

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

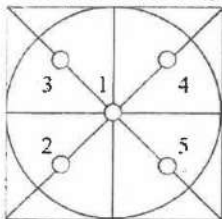
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000042 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

| NOMINAL VALUE (g) | BALANCE READING (g) | CORRECTION (g) | UNCERTAINTY ( $\pm$ g) |
|-------------------|---------------------|----------------|------------------------|
| 0.000             | 0.0000              | 0.0000         | 0.000073               |
| 0.001             | 0.0010              | 0.0000         | 0.000073               |
| 0.010             | 0.0100              | 0.0000         | 0.000074               |
| 0.050             | 0.0500              | 0.0000         | 0.000075               |
| 0.100             | 0.1000              | 0.0000         | 0.000074               |
| 1.000             | 1.0000              | 0.0000         | 0.000075               |
| 2.000             | 2.0000              | 0.0000         | 0.000075               |
| 5.000             | 5.0000              | 0.0000         | 0.000077               |
| 20.000            | 20.0000             | 0.0000         | 0.000085               |
| 50.000            | 50.0000             | 0.0000         | 0.00013                |
| 100.000           | 100.0001            | -0.0001        | 0.00019                |
| 150.000           | 150.0001            | -0.0001        | 0.00026                |
| 200.000           | 200.0000            | 0.0000         | 0.00032                |

### 5. OFF CENTER LOADING ERROR



| POINT              | READING (g) |
|--------------------|-------------|
| 1                  | 100.0000    |
| 2                  | 99.9999     |
| 3                  | 100.0001    |
| 4                  | 99.9999     |
| 5                  | 100.0000    |
| OFF-CENTER LOADING | 0.0001      |

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR  $k=2$ , PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



## Certificate of Calibration

Certificate Number : SPR22020492-2

Page : 1 of 3

Customer : Pacific Laboratory Co.,Ltd.

14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Bua Thong,  
Nonthaburi 11110

Equipment Name : Area Heat Stress Monitor

Manufacturer : 3M

Model : WB-300

Serial Number : WBR080019

ID. Number : N/A

### Environmental Conditions

Ambient Temperature :  $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  Received Date : 26 Feb 2022

Relative Humidity :  $50\% \pm 15\%$  Calibration Date : 28 Feb 2022

Location of Calibration : In-Lab Recommend Due Date : 28 Feb 2023

Calibration Procedure : SP-CPT-04-13 Date of Issue : 01 Mar 2022

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory





## Calibration Report

Certificate Number : SPR22020492-2

Page : 2 of 3

### Reference Standards

| Equipment Name    | Model  | Serial No. | Certificate No. | Due. Date   |
|-------------------|--------|------------|-----------------|-------------|
| Humidity Chamber  | TH-80S | N/A        | SPR21020224-9   | 04 Mar 2022 |
| THERMO-HYGROMETER | 5020A  | A47046     | QR22-0191       | 02 Feb 2023 |

### Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd



## Result of Calibration

Certificate No. : SPR22020492-2

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.019           | 30.0        | -0.019 | 0.50              |
| 32.0                | 32.010           | 32.0        | -0.010 | 0.50              |
| 34.0                | 34.022           | 34.0        | -0.022 | 0.50              |

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.019           | 30.0        | -0.019 | 0.50              |
| 32.0                | 32.010           | 32.0        | -0.010 | 0.50              |
| 34.0                | 34.022           | 34.0        | -0.022 | 0.50              |

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.019           | 30.0        | -0.019 | 0.50              |
| 32.0                | 32.010           | 32.0        | -0.010 | 0.50              |
| 34.0                | 34.022           | 34.0        | -0.022 | 0.50              |

### Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

- End of Certificate -





Request No. 22-65 / 0189

MTC No. PSL-H 0061 / 65

## Certificate of Calibration

**Customer :** Envilab Co.,Ltd.  
540, 540/1 Soi Bangkhae7 , Bangkhae ,Bangkok ,10160  
**Equipment :** Thermo-Hygrometer (Area Heat Stress Monitor)  
**Model /Type :** hs-32  
**Serial Number :** MCF070018  
**Maker :** METROSONICS  
**Date of Request :** 17 December 2021  
**Date of Calibration :** 14 January 2022

This certificate is traceable to International System of Units (SI Units) through Photometry and Temperature Standards Laboratory, Industrial Metrology and Testing Service Centre, Thailand Institute of Scientific and Technology Research (TISTR), NSC-ONSC accredited Calibration No. 0015.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2$ , which for a normal distribution corresponds to a coverage probability of approximately 95 %.

Calibrated by :

Approved by

Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012264121705218014

Issued Date : 27 January 2022

Page 1 of 4

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

**Office/Laboratory**  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**  
196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th



Request No. 22-65 / 0189

MTC No. PSL-H 0061 / 65

### Description of Unit Under Calibration :

**Customer :** Envilab Co.,Ltd.  
**Address :** 540, 540/1 Soi Bangkhae7 , Bangkhae ,Bangkok ,10160  
**Equipment :** Thermo-Hygrometer (Area Heat Stress Monitor)  
**Serial Number :** MCF070018  
**Calibration Required :** Temperature at ( 20, 30, 40 ) °C  
**Ambient Condition :** Ambient temperature (23 ± 3) °C  
Relative humidity (55 ± 20) %  
**Laboratory Address :** Photometry and Temperature Standards Laboratory  
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

### Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 1081/64.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

### Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WI.CP.18.

### Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9145-5116-00AA, S/N : 1403041

**Adjustments :** NONE

Page 2 of 4

P.T.

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

**Office/Laboratory**  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**  
196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th



Request No. 22-65 / 0189

MTC No. PSL-H 0061 / 65

Results of Calibration :-

Table : Temperature Measurement @ Wet Bulb

| Average Measured Temperature (°C) | Average Displayed of UUC (°C) | Correction Measured of UUC (°C) | Expanded Uncertainty of Measurement (± °C) |
|-----------------------------------|-------------------------------|---------------------------------|--|
| 19.9                              | 20.2                          | -0.3                            | 0.50                                       |
| 30.0                              | 30.0                          | 0.0                             | 0.50                                       |
| 39.9                              | 39.7                          | 0.2                             | 0.50                                       |

Table : Temperature Measurement @ Dry Bulb

| Average Measured Temperature (°C) | Average Displayed of UUC (°C) | Correction Measured of UUC (°C) | Expanded Uncertainty of Measurement (± °C) |
|-----------------------------------|-------------------------------|---------------------------------|--|
| 19.9                              | 20.0                          | -0.1                            | 0.53                                       |
| 30.0                              | 30.1                          | -0.1                            | 0.50                                       |
| 39.9                              | 39.9                          | 0.0                             | 0.50                                       |

Page 3 of 4

P.T.

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BLMTC.002 Rev.4

Head Office  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory  
Sri 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

Office  
196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th



Request No. 22-65 / 0189

MTC No. PSL-H 0061 / 65

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb

| Average Measured Temperature (°C) | Average Displayed of UUC (°C) | Correction Measured of UUC (°C) | Expanded Uncertainty of Measurement (± °C) |
|-----------------------------------|-------------------------------|---------------------------------|--|
| 19.9                              | 20.4                          | -0.5                            | 0.50                                       |
| 30.0                              | 30.0                          | 0.0                             | 0.50                                       |
| 39.9                              | 39.7                          | 0.2                             | 0.50                                       |

- Note :
1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
  2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

Page 4 of 4

P.T.

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BLMTC.002 Rev.4

Head Office  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory  
Sri 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

Office  
196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th



## Certificate of Calibration

Certificate Number : SPR22030094-2

Page : 1 of 3

Customer : Pacific Laboratory Co.,Ltd.

14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Bua Thong,  
Nonthaburi 11110

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TED060012

ID. Number : N/A

### Environmental Conditions

Ambient Temperature :  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  Received Date : 07 Mar 2022

Relative Humidity :  $50\% \pm 15\%$  Calibration Date : 08 Mar 2022

Location of Calibration : In-Lab Recommend Due Date : 08 Mar 2023

Calibration Procedure : SP-CPT-04-13 Date of Issue : 09 Mar 2022

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory





## Calibration Report

Certificate Number : SPR22030094-2

Page : 2 of 3

### Reference Standards

| Equipment Name    | Model  | Serial No. | Certificate No. | Due. Date   |
|-------------------|--------|------------|-----------------|-------------|
| Humidity Chamber  | TH-80S | N/A        | SPR22010401-8   | 05 Mar 2023 |
| THERMO-HYGROMETER | 5020A  | A47046     | QR22-0191       | 02 Feb 2023 |

### Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd





## Result of Calibration

Certificate No. : SPR22030094-2

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.011           | 30.1        | 0.089  | 0.50              |
| 32.0                | 32.014           | 32.2        | 0.186  | 0.50              |
| 34.0                | 34.012           | 34.0        | -0.012 | 0.50              |

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.011           | 30.1        | 0.089  | 0.50              |
| 32.0                | 32.014           | 32.2        | 0.186  | 0.50              |
| 34.0                | 34.012           | 33.9        | -0.112 | 0.50              |

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.011           | 30.1        | 0.089  | 0.50              |
| 32.0                | 32.014           | 32.2        | 0.186  | 0.50              |
| 34.0                | 34.012           | 33.9        | -0.112 | 0.50              |

### Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

- End of Certificate -



## Certificate of Calibration

Certificate Number : SPR22030094-1

Page : 1 of 3

Customer : Pacific Laboratory Co.,Ltd.

14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Bua Thong,  
Nonthaburi 11110

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TED060013

ID. Number : N/A

### Environmental Conditions

Ambient Temperature :  $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  Received Date : 07 Mar 2022

Relative Humidity :  $50\% \pm 15\%$  Calibration Date : 15 Mar 2022

Location of Calibration : In-Lab Recommend Due Date : 15 Mar 2023

Calibration Procedure : SP-CPT-04-13 Date of Issue : 16 Mar 2022

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

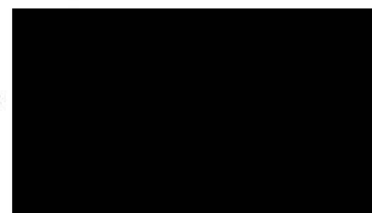
All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Calibration Officer

Approved by :



Authorized Signatory



## Calibration Report

Certificate Number : SPR22030094-1

Page : 2 of 3

### Reference Standards

| Equipment Name    | Model  | Serial No. | Certificate No. | Due. Date   |
|-------------------|--------|------------|-----------------|-------------|
| Humidity Chamber  | TH-80S | N/A        | SPR22010401-8   | 05 Mar 2023 |
| THERMO-HYGROMETER | 5020A  | A47046     | QR22-0191       | 02 Feb 2023 |

### Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd



## Result of Calibration

Certificate No. : SPR22030094-1

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.008           | 30.0        | -0.008 | 0.50              |
| 32.0                | 32.011           | 32.0        | -0.011 | 0.50              |
| 34.0                | 34.014           | 34.0        | -0.014 | 0.50              |

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.008           | 29.9        | -0.108 | 0.50              |
| 32.0                | 32.011           | 31.9        | -0.111 | 0.50              |
| 34.0                | 34.014           | 33.9        | -0.114 | 0.50              |

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

| Temperature Setting | Standard Reading | UUC Reading | Error  | Uncertainty ( ± ) |
|---------------------|------------------|-------------|--------|-------------------|
| 30.0                | 30.008           | 29.9        | -0.108 | 0.50              |
| 32.0                | 32.011           | 31.9        | -0.111 | 0.50              |
| 34.0                | 34.014           | 33.9        | -0.114 | 0.50              |

### Note:

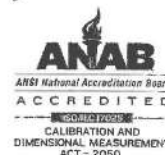
The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

- End of Certificate -





## Certificate of Calibration

Certificate Number : SPR22020059-1

Page : 1 of 3

Customer : Pacific Laboratory Co.,Ltd.

14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Bua Thong,  
Nonthaburi 11110

Equipment Name : Noise Dosimeter

Manufacturer : Cirrus

Model : N/A

Serial Number : 95978

ID. Number : N/A

### Environmental Conditions

Ambient Temperature :  $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 03 Feb 2022

Relative Humidity :  $50\% \pm 15\%$

Calibration Date : 08 Feb 2022

Location of Calibration : In-Lab

Recommend Due Date : 08 Feb 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 09 Feb 2022

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :

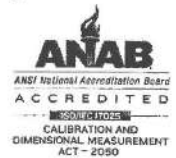


Calibration Officer

Approved by :



Authorized Signatory



## Calibration Report

Certificate Number : SPR22020059-1

Page : 2 of 3

### Reference Standards

| Equipment Name         | Model  | Serial No. | Certificate No. | Due. Date   |
|------------------------|--------|------------|-----------------|-------------|
| Sound Level Calibrator | SC-942 | B014059    | EEL.BP. 34/1264 | 22 Dec 2022 |

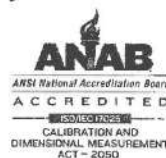
### Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research



## Result of Calibration



Certificate No. : SPR22020059-1

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A (No.1/CB1174)

Unit : dB

| Standard Setting | UUC Reading | Error | Uncertainty ( ± ) |
|------------------|-------------|-------|-------------------|
| 94               | 93.9        | -0.1  | 0.15              |
| 114              | 113.9       | -0.1  | 0.15              |

Select A (No.2/CB1173)

Unit : dB

| Standard Setting | UUC Reading | Error | Uncertainty ( ± ) |
|------------------|-------------|-------|-------------------|
| 94               | 93.9        | -0.1  | 0.15              |
| 114              | 113.9       | -0.1  | 0.15              |

Select A (No.3/CB1172)

Unit : dB

| Standard Setting | UUC Reading | Error | Uncertainty ( ± ) |
|------------------|-------------|-------|-------------------|
| 94               | 93.9        | -0.1  | 0.15              |
| 114              | 113.9       | -0.1  | 0.15              |

Select A (No.4/CB1171)

Unit : dB

| Standard Setting | UUC Reading | Error | Uncertainty ( ± ) |
|------------------|-------------|-------|-------------------|
| 94               | 93.9        | -0.1  | 0.15              |
| 114              | 113.9       | -0.1  | 0.15              |

Select A (No.5/CB1175)

Unit : dB

| Standard Setting | UUC Reading | Error | Uncertainty ( ± ) |
|------------------|-------------|-------|-------------------|
| 94               | 93.9        | -0.1  | 0.15              |
| 114              | 114.0       | 0.0   | 0.15              |

### Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

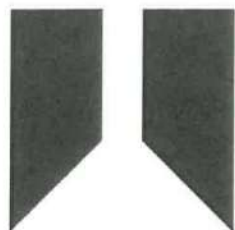
- End of Certificate -

# CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 11/11/21

CERTIFICATE NUMBER 165782



Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 2

Test engineer:

Electronically signed:

## doseBadge Reader

### Instrument

Manufacturer: Cirrus Research plc  
Model Number: RC:110A

Serial Number: 48669  
Notes: Viridian Environmental Service  
Co.,Ltd.  
149/119 Moo 2, Krung Non-  
Chong Thanom Rd.,  
Mahasawat, Bang Krui,  
Nonthaburi 11130 Thailand

### Calibration Procedure

The tests were carried out in accordance with the requirements of IEC 60942:2003 where applicable.

Date of Calibration: 10 November 2021

### Functionality Results

| Function      | Result |
|---------------|--------|
| Keypad        | Pass   |
| Battery Power | Pass   |
| Display       | Pass   |
| Communication | Pass   |
| 2 way IR link | Pass   |
| Clock         | Pass   |

### Calibration Results

|             | Level (dB) | Frequency (Hz) | Distortion (% THD + Noise) |
|-------------|------------|----------------|----------------------------|
| Initial     | 113.80     | 995.3          | 0.28                       |
| Adjusted    | 114.00     | 995.3          | 0.28                       |
| Uncertainty | $\pm 0.11$ | $\pm 0.14$     | $\pm 0.10$                 |
| Tolerances  | $\pm 0.60$ | $\pm 2.00$     | $\pm 4.00$                 |

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a coverage probability of approximately 95%.

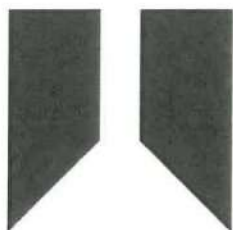


# CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 11/11/21

CERTIFICATE NUMBER 165782



Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 2 of 2

Test engineer:

Electronically signed:

## doseBadge Reader

### Environmental Conditions

Pressure: 101.50 kPa

Temperature: 23.8 °C

Humidity: 49.7 %

### Notes

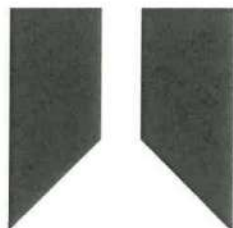
This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a coverage probability of approximately 95%.

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**

DATE OF ISSUE **14/01/22**

CERTIFICATE NUMBER **168439**



**Cirrus Research plc**  
**Acoustic House**  
**Bridlington Road**  
**Hunmanby**  
**North Yorkshire**  
**YO14 0PH**  
**United Kingdom**

Page 1 of 1

Approved signatory

Electronically signed.

## Dosemeter

### Instrument information

Manufacturer: **Cirrus Research plc**

Model: **CR:110A**

Serial number: **CB0451**

Firmware version: **504**

Notes: **Viridian Environmental Service Co.,Ltd.**  
**149/119 Moo 2, Krung Non-Chong Thanom Rd.,**  
**Mahasawat, Bang Kruiy, Nonthaburi 11130 Thailand**

### Test summary

Date of calibration: **14/01/22**

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

| Equipment        | Manufacturer | Model   | Serial number |
|------------------|--------------|---------|---------------|
| Signal Generator | TTi          | TGA1241 | 419342        |
| Multimeter       | Fluke        | 8845A   | 2490007       |
| Multimeter       | Fluke        | 8845A   | 9440020       |

### Notes

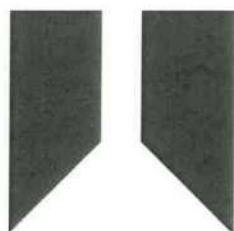
This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a coverage probability of approximately 95%.

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**


DATE OF ISSUE **14/01/22**

CERTIFICATE NUMBER **168435**



**Cirrus Research plc**  
**Acoustic House**  
**Bridlington Road**  
**Hunmanby**  
**North Yorkshire**  
**YO14 0PH**  
**United Kingdom**

Page 1 of 1

Approved signature:  
  
Electronically signed:

## Dosemeter

### Instrument information

Manufacturer: **Cirrus Research plc**

Model: **CR:110A**

Serial number: **CB0453**

Firmware version: **504**

Notes: **Viridian Environmental Service Co.,Ltd.**  
**149/119 Moo 2, Krung Non-Chong Thanom Rd.,**  
**Mahasawat, Bang Krui, Nonthaburi 11130 Thailand**

### Test summary

Date of calibration: **14/01/22**

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

| Equipment        | Manufacturer | Model   | Serial number |
|------------------|--------------|---------|---------------|
| Multimeter       | Fluke        | 8845A   | 2490007       |
| Multimeter       | Fluke        | 8845A   | 9440020       |
| Signal Generator | TTi          | TGA1241 | 419342        |

### Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a coverage probability of approximately 95%.





ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,

Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860 Fax: +66 2324 0917



NSC-TISI-TIS 17025  
CALIBRATION 0119

Certificate No.: CP20220120EA

Operation No.: CP2022030033

## Certificate of Calibration

Equipment: Sound Calibrator

Manufacturer: TENMARS

Model/Type: TM-100

Serial No.: 190301469

ID No.: -

Customer: Pacific Laboratory Co., Ltd.

Address: 14/5358 Moo 14 T. Bang Bua Thong  
A. Bang Bua Thong, Nonthaburi 11110

Received Date: 28 March 2022

Calibrated Date: 31 March 2022

Issued Date: 1 April 2022

Calibrated by:

Approved by:

Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor ( $k$ ) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

Certificate No.: CP20220120EA

## Calibration Report

Equipment: Sound Calibrator  
Manufacturer: TENMARS  
Model/Type: TM-100  
Serial No.: 190301469  
ID No.: -  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-

IEC 60942:2017

### Condition of this result of calibration

1. Reference standards instrument :-

| Instrument                                       | Model  | Serial No. | Cert. No.               | Due Date                    |
|--|--------|------------|-------------------------|-----------------------------|
| 1) Standard microphone                           | 4180   | 2661000    | AA-1010-21              | 13 June 2022                |
| 2) Waveform Generator                            | 33511B | MY52302264 | 0144RF21                | 17 June 2022                |
| 3) Audio Analyzing DMM                           | 2015-P | 000136E    | E1U214805               | 16 November 2022            |
| 4) Pressure humidity and Temperature Transmitter | PTU301 | F0640002   | CL1-P210047<br>0255TE21 | 16 June 2022<br>7 July 2022 |

2. This result of calibration was found accurate as shown on date and place of calibration only.

3. This certification is traceable to the international system of unit maintained at :-

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- Electrical and Electronics Institute; ONSC Accredited Calibration No.0119

### Result of Calibration:-

1. Function : Sound pressure level

| Norminal Frequency (Hz) | Specified Sound Pressure level (dB) | Measured value (dB) | Deviated value <sup>[1]</sup> (dB) | Acceptance limit <sup>[3]</sup> (dB) |
|-------------------------|-------------------------------------|---------------------|------------------------------------|--------------------------------------|
| 1000                    | 94                                  | 93.99               | -0.01                              | ±0.40                                |
| 1000                    | 114                                 | 114.10              | 0.10                               | ±0.40                                |

2. Function : Frequency

| Norminal Sound Pressure level (dB) | Specified Frequency (Hz) | Measured value (Hz) | Deviated value <sup>[2]</sup> (%) | Acceptance limit <sup>[3]</sup> (%) |
|------------------------------------|--------------------------|---------------------|-----------------------------------|-------------------------------------|
| 94                                 | 1000                     | 970.2               | -3.0                              | ±1.7                                |
| 114                                | 1000                     | 965.8               | -3.4                              | ±1.7                                |

Certificate No.: CP20220120EA

### Calibration Report

#### 3. Function : Total distortion + noise

| Nominal<br>Sound Pressure level (dB) | Nominal<br>Frequency (Hz) | Measured value <sup>[4]</sup><br>(%) | Acceptance limit <sup>[5]</sup><br>(%) |
|--------------------------------------|---------------------------|--------------------------------------|--|
| 94                                   | 1000                      | 2.8                                  | 3.0                                    |
| 114                                  | 1000                      | 2.0                                  | 3.0                                    |

#### Uncertainty of measurement

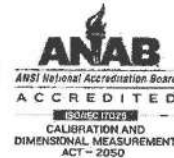
| Function                 | Uncertainty | Maximum-permitted<br>uncertainty of measurement |
|--------------------------|-------------|---|
| Sound pressure level     | 0.10 dB     | 0.35 dB   |
| Frequency                | 0.10 %      | 0.20 %  |
| Total distortion + noise | 0.40 %      | 1.00 %  |

- Note:
- [1] The deviated value is the absolute value of the difference between the measured value and the corresponding specified sound pressure level.
  - [2] The deviated value is the absolute value of the difference in percent between the measured value and the corresponding specified frequency.
  - [3] The acceptance limit is for the deviated value.
  - [4] The measured value is the total distortion + noise, measured over the frequency range from 20 Hz to 20 kHz.
  - [5] The acceptance limit is for the Measured value.

Remarks: 1. Acceptance limit was IEC 60942:2017 Class 2.  
2. The coverage factor  $k = 2.00$

-- End of Report --





## Certificate of Calibration

Certificate Number : SPR22010068-1

Page : 1 of 3

Customer : Viridian Environmental Service Co., Ltd.

149/119 Moo 2, Krung Non-Chong Thanom Rd., Mahasawat, Bang  
Kruay, Nonthaburi 11130

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 160500113

ID. Number : N/A

### Environmental Conditions

Ambient Temperature :  $23\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$

Received Date : 07 Jan 2022

Relative Humidity :  $50\% \pm 15\%$

Calibration Date : 07 Jan 2022

Location of Calibration : In-Lab

Recommend Due Date : 07 Jan 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 08 Jan 2022

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by



Calibration Officer

Approved by



Authorized Signatory



## Calibration Report

Certificate Number : SPR22010068-1

Page : 2 of 3

### Reference Standards

| Equipment Name         | Model  | Serial No. | Certificate No. | Due. Date   |
|------------------------|--------|------------|-----------------|-------------|
| Sound Level Calibrator | SC-942 | B014059    | EEL.BP.19/1063  | 15 Oct 2022 |

### Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research

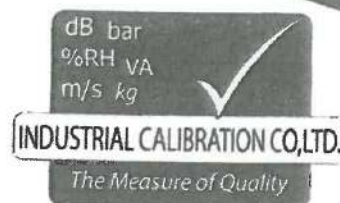




## Industrial Calibration Co., Ltd.

38/41 Moo. 3, Lum Luk Ka Road., Khu Khot Subdistrict,  
Lam Luk Ka District, Phatum Thani 12130 Thailand.

Tel : +66 (02) 991 0440  
Fax : +66 (02) 531 6294  
Email : info@industrial.co.th



CERTIFICATE No. .... CAL12022-21 ..... PAGE ..... 1 ..... OF ..... 4 .....

# Certificate of Calibration

Equipment : NOISE DOSIMETER

Manufacture : EXTECH

Model / Type : SL400

Serial No. : 210100146

ID No. : N/A

Customer : Pacific Laboratory Co.,Ltd.

14/5358 Moo.14 T.Bang Bua Thong A.Bang Bua Thong Nonthaburi 11110

Environment: 25 +/- 3°C (IN-HOUSE); 60 +/- 20%RH

Date Of Receipt : DECEMBER 15, 2021

Date Of Calibration : DECEMBER 16, 2021

Calibration By :

Approved By :



Date of Issue : DECEMBER 16, 2021

### MEASUREMENT UNCERTAINTY :

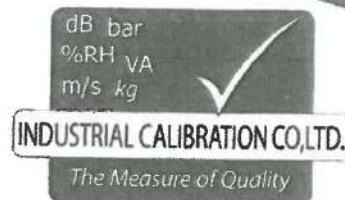
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR  $k = 2$ , WHICH EFFECTIVE DEGREE OF FREEDOM  $V_{eff} > 100$  CORRESPONDS A LEVEL OF CONFIDENCE OF APPROXIMATELY 95 %

This certificate may not be reproduced other than in full except with the prior written approval of industrial calibration laboratory.

## Industrial Calibration Co., Ltd.

38/41 Moo. 3, Lum Luk Ka Road., Khu Khot Subdistrict,  
Lam Luk Ka District, Phatum Thani 12130 Thailand.

Tel : +66 (02) 991 0440  
Fax : +66 (02) 531 6294  
Email : info@industrial.co.th



CERTIFICATE No. .... CAL12022-21 ..... PAGE ..... 2 ..... OF ..... 4 .....

### Calibration Report

ORDER No. : 2008-472

RECEIVED DATE : DECEMBER 15, 2021

CALIBRATION DATE : DECEMBER 16, 2021

|  |                                |                                  |  |
|--|--------------------------------|----------------------------------|--|
| <b>DESCRIPTION:</b><br>NOISE DOSIMETER   |                                | <b>MANUFACTURER:</b><br>EXTECH   |  |
| <b>MODEL:</b><br>SL400   | <b>SERIAL No.</b><br>210100146 | <b>IDENTIFICATION No:</b><br>N/A | <b>MADE IN :</b><br>N/A                    |
| <b>CALIBRATION METHOD :</b><br>CALIBRATION WAS CONDUCTED USING IN-HOUSE METHOD BASED ON COMPARISON TECHNIQUE<br>BY USING SOUND LEVEL CALIBRATOR. |                                |                                  |  |
| <b>REFERENCE STANDARD :</b>  |                                |                                  |  |
| <b>DESCRIPTION :</b><br>SOUND CALIBRATOR   | <b>MODEL</b><br>TM-100         | <b>S/N No.</b><br>160100550      | <b>CERTIFICATE No.</b><br>EEL. BP. 99/0263 |

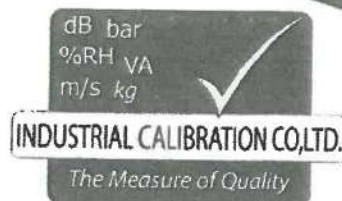
#### TRACEABILITY:

THIS CERTIFICATION IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:  
- NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, NIST.

## Industrial Calibration Co., Ltd.

38/41 Moo. 3, Lum Luk Ka Road., Khu Khot Subdistrict,  
Lam Luk Ka District, Phatum Thani 12130 Thailand.

Tel : +66 (02) 991 0440  
Fax : +66 (02) 531 6294  
Email : info@industrial.co.th



CERTIFICATE No. .... CAL12022-21 ..... PAGE ..... 3 ..... OF ..... 4 .....

### Calibration Report

FUNCTION : SOUND LEVEL MEASUREMENT

RANGE : dBA at 1 kHz

RESOLUTION : 0.1 dB

MODE: FAST

| STANDARD SETTING | UUC READING | CORRECTION | UNCERTAINTY |
|------------------|-------------|------------|-------------|
| (dB)             | (dB)        | (dB)       | (dB)        |
| 94               | 94.0        | 0          | 0.23        |

MODE: SLOW

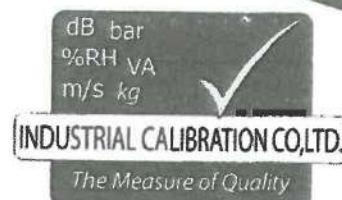
| STANDARD SETTING | UUC READING | CORRECTION | UNCERTAINTY |
|------------------|-------------|------------|-------------|
| (dB)             | (dB)        | (dB)       | (dB)        |
| 94               | 94.0        | 0          | 0.20        |



## Industrial Calibration Co., Ltd.

38/41 Moo. 3, Lum Luk Ka Road., Khu Khot Subdistrict,  
Lam Luk Ka District, Phatum Thani 12130 Thailand.

Tel : +66 (02) 991 0440  
Fax : +66 (02) 531 6294  
Email : info@industrial.co.th



CERTIFICATE No. ....CAL12022-21..... PAGE .....4..... OF .....4.....

### Calibration Report

MODE: FAST

| STANDARD SETTING<br>(dB) | UUC READING<br>(dB) | CORRECTION<br>(dB) | UNCERTAINTY<br>(dB) |
|--------------------------|---------------------|--------------------|---------------------|
| 114                      | 114.0               | 0                  | 0.23                |

MODE: SLOW

| STANDARD SETTING<br>(dB) | UUC READING<br>(dB) | CORRECTION<br>(dB) | UNCERTAINTY<br>(dB) |
|--------------------------|---------------------|--------------------|---------------------|
| 114                      | 114.0               | 0                  | 0.20                |

REMARK : UUC\* UNIT UNDER CALIBRATION  
: WITHOUT ADJUSTMENT

- END OF CERTIFICATE -



## Certificate of Calibration

Certificate Number : SPR22010068-2

Page : 1 of 3

Customer : Viridian Environmental Service Co., Ltd.

149/119 Moo 2, Krung Non-Chong Thanom Rd., Mahasawat, Bang  
Kruay, Nonthaburi 11130

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 160500111

ID. Number : N/A

### Environmental Conditions

Ambient Temperature :  $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 07 Jan 2022

Relative Humidity :  $50\% \pm 15\%$

Calibration Date : 07 Jan 2022

Location of Calibration : In-Lab

Recommend Due Date : 07 Jan 2023

Calibration Procedure : SP-CPE-04-01

Date of Issue : 08 Jan 2022

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

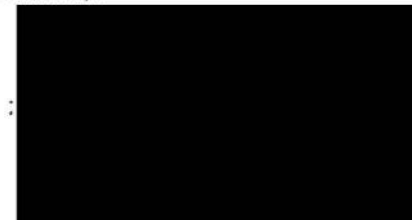
All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :

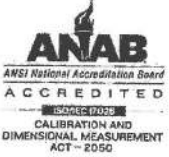


Calibration Officer

Approved by :



Authorized Signatory



## Calibration Report

Certificate Number : SPR22010068-2

Page : 2 of 3

### Reference Standards

| Equipment Name         | Model  | Serial No. | Certificate No. | Due. Date   |
|------------------------|--------|------------|-----------------|-------------|
| Sound Level Calibrator | SC-942 | B014059    | EEL.BP.19/1063  | 15 Oct 2022 |

### Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research



## Result of Calibration

Certificate No. : SPR22010068-2

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

| Standard Setting | UUC Reading |       | Error |      | Uncertainty ( ± ) |
|------------------|-------------|-------|-------|------|-------------------|
|                  | Fast        | Slow  | Fast  | Slow |                   |
| 94               | 92.6        | 92.6  | -1.4  | -1.4 | 0.15              |
| 114              | 112.7       | 112.7 | -1.3  | -1.3 | 0.15              |

Select C

Unit : dB

| Standard Setting | UUC Reading |       | Error |      | Uncertainty ( ± ) |
|------------------|-------------|-------|-------|------|-------------------|
|                  | Fast        | Slow  | Fast  | Slow |                   |
| 94               | 92.6        | 92.6  | -1.4  | -1.4 | 0.15              |
| 114              | 112.7       | 112.7 | -1.3  | -1.3 | 0.15              |

Select Z

Unit : dB

| Standard Setting | UUC Reading |       | Error |      | Uncertainty ( ± ) |
|------------------|-------------|-------|-------|------|-------------------|
|                  | Fast        | Slow  | Fast  | Slow |                   |
| 94               | 92.6        | 92.6  | -1.4  | -1.4 | 0.15              |
| 114              | 112.7       | 112.7 | -1.3  | -1.3 | 0.15              |

### Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2.00$ , providing a level of confidence approximately 95%.

- End of Certificate -





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220109

Customer : Pacific Laboratory Co., Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Thong, Nonthaburi 11110

|               |                    |                      |                   |
|---------------|--------------------|----------------------|-------------------|
| Description   | : Noise Dose Meter | W/O Number           | : SC220109        |
| Manufacturer  | : Soundtek         | Calibration Location | : Laboratory      |
| Model         | : ST-130           | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 220100162        | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : -                | Received Date        | : 24-Feb-2022     |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

Approved Signatory



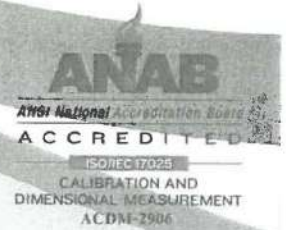
Calibration Date : 24-Feb-2022  
Issued Date : 25-Feb-2022  
Calibrated By : [Redacted]



Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.



**APTITECH CALIBRATION CO., LTD.**  
50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220109

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| A        | 30-140 dB | 93.9 dB        | 93.9 dB     | 0.0 dB    | 0.60 dB               |
|          |           | 113.9 dB       | 113.8 dB    | -0.1 dB   | 0.60 dB               |
| C        | 30-140 dB | 93.9 dB        | 93.9 dB     | 0.0 dB    | 0.60 dB               |
|          |           | 113.9 dB       | 113.9 dB    | 0.0 dB    | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| A        | 30-140 dB | 93.9 dB        | 93.9 dB     | 0.0 dB    | 0.60 dB               |
|          |           | 113.9 dB       | 113.9 dB    | 0.0 dB    | 0.60 dB               |
| C        | 30-140 dB | 93.9 dB        | 93.9 dB     | 0.0 dB    | 0.60 dB               |
|          |           | 113.9 dB       | 113.8 dB    | -0.1 dB   | 0.60 dB               |

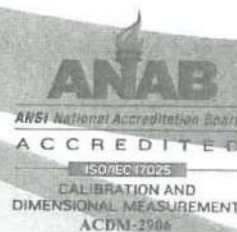
--- End of Certificate ---





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220101

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Thong, Nonthaburi 11110

|               |                    |                      |                   |
|---------------|--------------------|----------------------|-------------------|
| Description   | : Noise Dose Meter | W/O Number           | : SC220101        |
| Manufacturer  | : Soundtek         | Calibration Location | : Laboratory      |
| Model         | : ST-130           | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 220100154        | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : -                | Received Date        | : 24-Feb-2022     |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

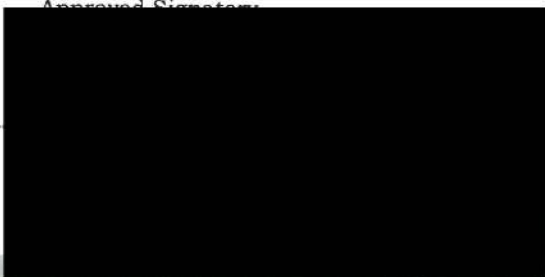
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

Approved Signature:



Calibration Date : 24-Feb-2022  
Issued Date : 25-Feb-2022  
Calibrated By :

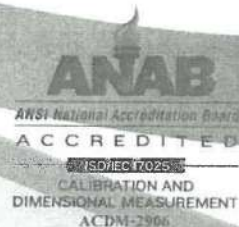


Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.



# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220101

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| A        | 30-140 dB | 93.9 dB        | 94.2 dB     | 0.3 dB    | 0.60 dB         |
|          |           | 113.9 dB       | 114.2 dB    | 0.3 dB    | 0.60 dB         |
| C        | 30-140 dB | 93.9 dB        | 94.2 dB     | 0.3 dB    | 0.60 dB         |
|          |           | 113.9 dB       | 114.3 dB    | 0.4 dB    | 0.60 dB         |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| A        | 30-140 dB | 93.9 dB        | 94.2 dB     | 0.3 dB    | 0.60 dB         |
|          |           | 113.9 dB       | 114.2 dB    | 0.3 dB    | 0.60 dB         |
| C        | 30-140 dB | 93.9 dB        | 94.2 dB     | 0.3 dB    | 0.60 dB         |
|          |           | 113.9 dB       | 114.2 dB    | 0.3 dB    | 0.60 dB         |

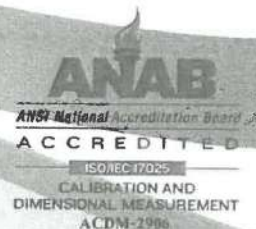
--- End of Certificate ---





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220158

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong, Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC220158        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222132            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : N/A               | Received Date        | : 14-Mar-2022     |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

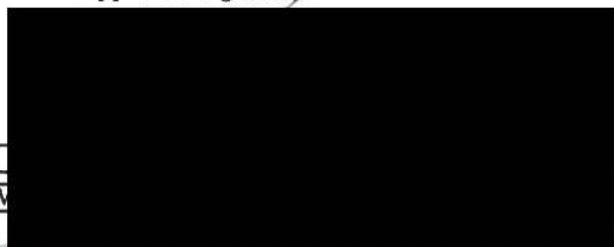
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

Approved Signatory



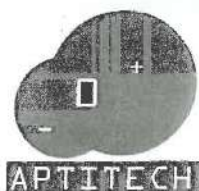
Calibration Date : 15-Mar-2022

Issued Date : 17-Mar-2022

Calibrated By :



Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.

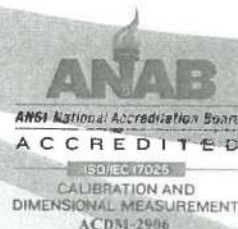


# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150

Tel. +66 2103-6290 Fax. +66 2103-6291

Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220158

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| A        | 30-140 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB         |
| C        | 30-140 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB         |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| A        | 30-140 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB         |
| C        | 30-140 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB         |

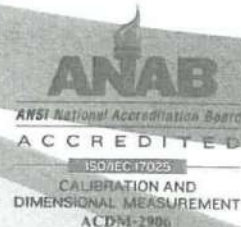
--- End of Certificate ---





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220050

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Thong, Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC220050        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222046            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : -                 | Received Date        | : 13-Jan-22       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

Approved Signatory



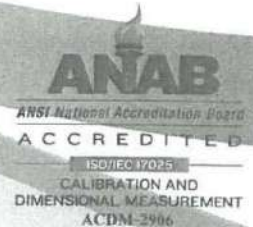
Calibration Date : 15-Jan-2022  
Issued Date : 22-Jan-2022  
Calibrated By : [Redacted]

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.



# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220050

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB               |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |

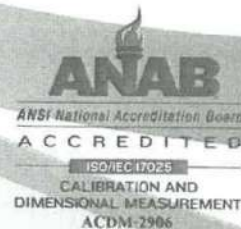
--- End of Certificate ---





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthani 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220173

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Thong, Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC220173        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222174            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : -                 | Received Date        | : 14-Mar-2022     |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

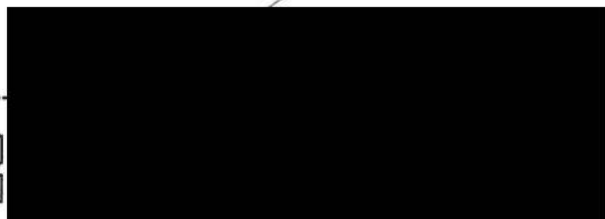
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

Approved Signatory



Calibration Date : 16-Mar-2022  
Issued Date : 18-Mar-2022  
Calibrated By :

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.

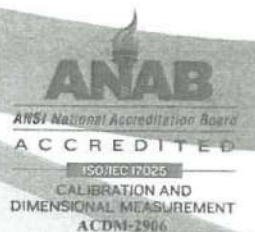


# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lam Lukka, Pathumthai 12150

Tel. +66 2103-6290 Fax. +66 2103-6291

Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220173

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

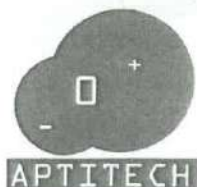
| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| A        | 30-140 dB | 93.9 dB        | 93.8 dB     | -0.1 dB   | 0.60 dB         |
|          |           | 113.9 dB       | 113.9 dB    | 0.0 dB    | 0.60 dB         |
| C        | 30-140 dB | 93.9 dB        | 93.9 dB     | 0.0 dB    | 0.60 dB         |
|          |           | 113.9 dB       | 113.9 dB    | 0.0 dB    | 0.60 dB         |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| A        | 30-140 dB | 93.9 dB        | 93.8 dB     | -0.1 dB   | 0.60 dB         |
|          |           | 113.9 dB       | 113.9 dB    | 0.0 dB    | 0.60 dB         |
| C        | 30-140 dB | 93.9 dB        | 93.9 dB     | 0.0 dB    | 0.60 dB         |
|          |           | 113.9 dB       | 113.9 dB    | 0.0 dB    | 0.60 dB         |

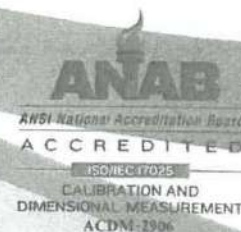
--- End of Certificate ---





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220040

Customer : Pacific Laboratory Co., Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Thong, Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC220040        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222019            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : -                 | Received Date        | : 03-Jan-22       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

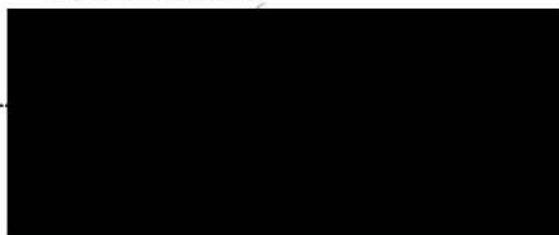
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

Approved Signatory



Calibration Date : 05-Jan-2022  
Issued Date : 12-Jan-2022  
Calibrated By :

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.



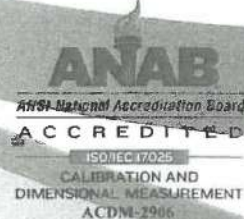


# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150

Tel. +66 2103-6290 Fax. +66 2103-6291

Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220040

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

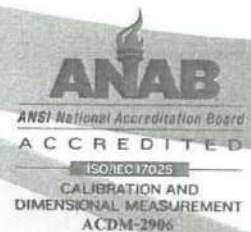
| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.7 dB    | -0.17 dB  | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.7 dB     | -0.16 dB  | 0.60 dB               |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB               |

--- End of Certificate ---



# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthani 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220168

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Thong, Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC220168        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222169            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : -                 | Received Date        | : 14-Mar-2022     |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

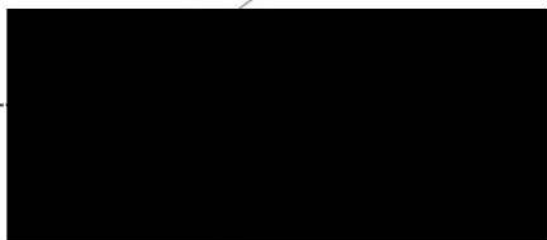
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

Approved Signatory



Calibration Date : 16-Mar-2022  
Issued Date : 18-Mar-2022  
Calibrated By :

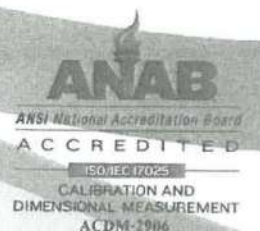
Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220168

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| A        | 30-140 dB | 93.9 dB        | 93.8 dB     | -0.1 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.7 dB    | -0.2 dB   | 0.60 dB               |
| C        | 30-140 dB | 93.9 dB        | 93.8 dB     | -0.1 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.7 dB    | -0.2 dB   | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| A        | 30-140 dB | 93.9 dB        | 93.7 dB     | -0.2 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.7 dB    | -0.2 dB   | 0.60 dB               |
| C        | 30-140 dB | 93.9 dB        | 93.7 dB     | -0.2 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.7 dB    | -0.2 dB   | 0.60 dB               |

--- End of Certificate ---



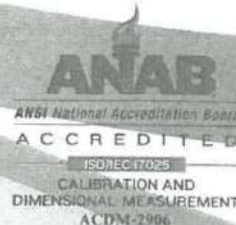


# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150

Tel. +66 2103-6290 Fax. +66 2103-6291

Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220047

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Thong, Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC220047        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222043            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : -                 | Received Date        | : 13-Jan-22       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

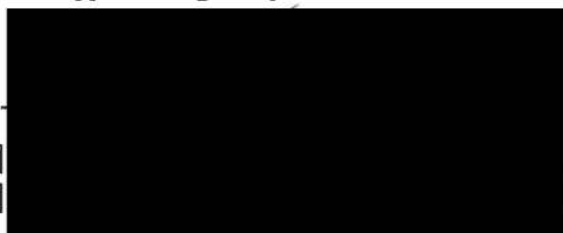
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

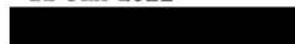
Approved Signatory



Calibration Date : 15-Jan-2022

Issued Date : 22-Jan-2022

Calibrated By :



Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.

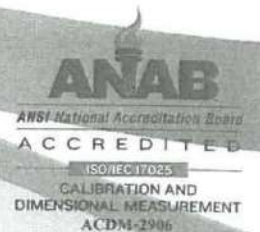


# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150

Tel. +66 2103-6290 Fax. +66 2103-6291

Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220047

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| LA       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB         |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB         |
| LC       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB         |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB         |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| LA       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB         |
| LC       | 40-130 dB | 93.86 dB       | 93.8 dB     | -0.06 dB  | 0.60 dB         |
|          |           | 113.87 dB      | 113.8 dB    | -0.07 dB  | 0.60 dB         |

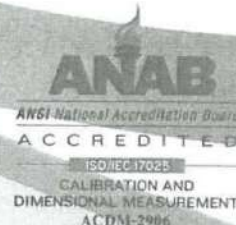
--- End of Certificate ---





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamukha, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220039

Customer : Pacific Laboratory Co., Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Thong, Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC220039        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222018            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : -                 | Received Date        | : 03-Jan-22       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

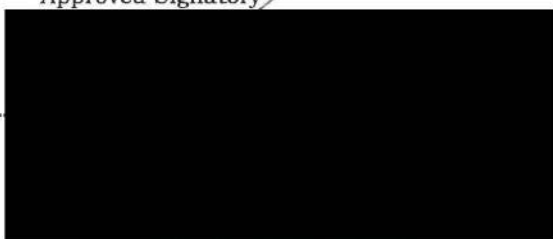
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

Approved Signatory /



Calibration Date : 05-Jan-2022

Issued Date : 12-Jan-2022

Calibrated By :



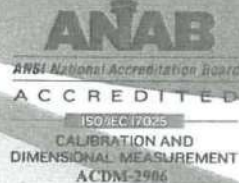
Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO.,





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220039

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB               |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB               |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

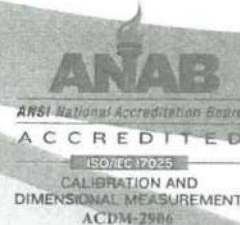
| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| LA       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB               |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB               |
| LC       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB               |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB               |

--- End of Certificate ---



# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220035

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Thong, Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC220035        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222014            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : -                 | Received Date        | : 03-Jan-22       |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

Approved Signatory



Calibration Date : 05-Jan-2022

Issued Date : 12-Jan-2022

Calibrated By :



Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO.,



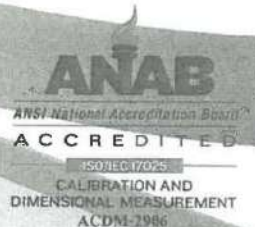


# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150

Tel. +66 2103-6290 Fax. +66 2103-6291

Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220035

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| LA       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB         |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB         |
| LC       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB         |
|          |           | 113.87 dB      | 114.0 dB    | 0.13 dB   | 0.60 dB         |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | (±) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------|
| LA       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB         |
|          |           | 113.87 dB      | 113.9 dB    | 0.03 dB   | 0.60 dB         |
| LC       | 40-130 dB | 93.86 dB       | 93.9 dB     | 0.04 dB   | 0.60 dB         |
|          |           | 113.87 dB      | 114.0 dB    | 0.13 dB   | 0.60 dB         |

--- End of Certificate ---



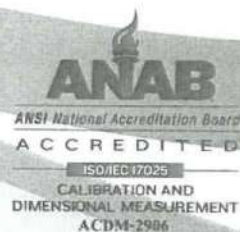


# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamukha, Pathumthani 12150

Tel. +66 2103-6290 Fax. +66 2103-6291

Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220175

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Thong, Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC220175        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222176            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : -                 | Received Date        | : 14-Mar-2022     |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

Approved Signatory



Calibration Date : 16-Mar-2022

Issued Date : 18-Mar-2022

Calibrated By :

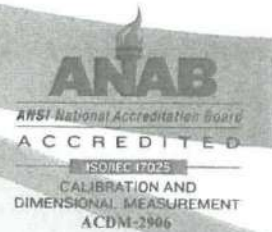


Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.



# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220175

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| A        | 30-140 dB | 93.9 dB        | 93.8 dB     | -0.1 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.9 dB    | 0.0 dB    | 0.60 dB               |
| C        | 30-140 dB | 93.9 dB        | 93.8 dB     | -0.1 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.9 dB    | 0.0 dB    | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| A        | 30-140 dB | 93.9 dB        | 93.7 dB     | -0.2 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.9 dB    | 0.0 dB    | 0.60 dB               |
| C        | 30-140 dB | 93.9 dB        | 93.7 dB     | -0.2 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.9 dB    | 0.0 dB    | 0.60 dB               |

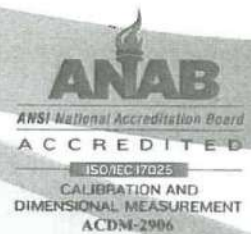
--- End of Certificate ---





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthani 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CERTIFICATE OF CALIBRATION

Certificate Number : SC220170

Customer : Pacific Laboratory Co.,Ltd.  
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Thong, Nonthaburi 11110

|               |                     |                      |                   |
|---------------|---------------------|----------------------|-------------------|
| Description   | : Sound Level Meter | W/O Number           | : SC220170        |
| Manufacturer  | : ACO               | Calibration Location | : Laboratory      |
| Model         | : 6236              | Ambient Temperature  | : $22 \pm 2$ °C   |
| Serial Number | : 222171            | Ambient Humidity     | : $55 \pm 15$ %RH |
| ID. Number    | : -                 | Received Date        | : 14-Mar-2022     |

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

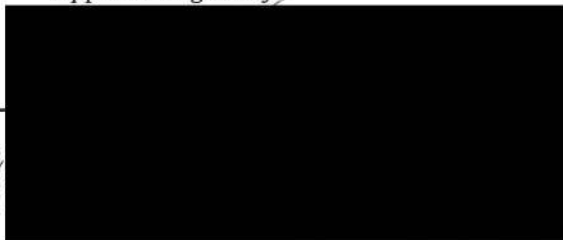
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$  such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

### Standard Equipments

| Description            | Serial No. | Certificate No. | Traceability | Due Date  |
|------------------------|------------|-----------------|--------------|-----------|
| Sound Level Calibrator | 141011576  | 0175SV20        | NIMT         | 23-Apr-22 |

### Authority of Calibration

Approved Signatory



Calibration Date : 16-Mar-2022  
Issued Date : 18-Mar-2022  
Calibrated By :

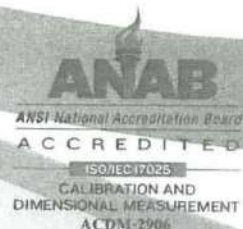
Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.





# APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthai 12150  
Tel. +66 2103-6290 Fax. +66 2103-6291  
Email. sales@aptitech-cal.com



## CALIBRATION REPORT

Certificate Number : SC220170

### Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

### Calibration Results

Appearance and function of use : Good  
Results of Calibration : Without any adjustment

### Sound Level Measurement (Slow Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| A        | 30-140 dB | 93.9 dB        | 93.8 dB     | -0.1 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.7 dB    | -0.2 dB   | 0.60 dB               |
| C        | 30-140 dB | 93.9 dB        | 93.8 dB     | -0.1 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.7 dB    | -0.2 dB   | 0.60 dB               |

### Sound Level Measurement (Fast Mode)

| Function | UUC Range | Standard Value | UUC Reading | UUC Error | ( $\pm$ ) Uncertainty |
|----------|-----------|----------------|-------------|-----------|-----------------------|
| A        | 30-140 dB | 93.9 dB        | 93.8 dB     | -0.1 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.8 dB    | -0.1 dB   | 0.60 dB               |
| C        | 30-140 dB | 93.9 dB        | 93.8 dB     | -0.1 dB   | 0.60 dB               |
|          |           | 113.9 dB       | 113.7 dB    | -0.2 dB   | 0.60 dB               |

--- End of Certificate ---

## Sound Level Meter Calibration Report

Calibrate No. : SLM 169/2565

Calibrate Date : June 17, 2022

Equipment : Sound Calibrator  
Manufacturer : TENMARS  
Model/Type : TM-100  
Serial No. : 190301469  
Customer Name : บริษัท ไอจี พอร์จ (ไทยแลนด์) จำกัด

| Item | Instrument        | Manufacturer  | Model | Serial No. | Before Adjust | After Adjust | Inspection Result |
|------|-------------------|---------------|-------|------------|---------------|--------------|-------------------|
| 1.   | Sound Level Meter | ACO Co., Ltd. | 6226  | 200040     | 93.6          | 94.0         | Pass              |
|      |                   |               |       |            | 114.2         | 114.0        | Pass              |
| 2.   | Sound Level Meter | ACO Co., Ltd. | 6226  | 170091     | 94.4          | 94.0         | Pass              |
|      |                   |               |       |            | 114.5         | 114.0        | Pass              |
| 3.   | Sound Level Meter | ACO Co., Ltd. | 6226  | 180047     | 94.1          | 94.0         | Pass              |
|      |                   |               |       |            | 113.8         | 114.0        | Pass              |
| 4.   | Sound Level Meter | ACO Co., Ltd. | 6226  | 200032     | 93.9          | 94.0         | Pass              |
|      |                   |               |       |            | 113.6         | 114.0        | Pass              |
| 5.   | Sound Level Meter | ACO Co., Ltd. | 6226  | 170108     | 94.3          | 94.0         | Pass              |
|      |                   |               |       |            | 113.9         | 114.0        | Pass              |
|      |                   |               |       |            |               |              |                   |
|      |                   |               |       |            |               |              |                   |
|      |                   |               |       |            |               |              |                   |
|      |                   |               |       |            |               |              |                   |
|      |                   |               |       |            |               |              |                   |
|      |                   |               |       |            |               |              |                   |

Approved By



Technician

PCL

Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tambon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. :E22-01001

Page :1 of 6

## CERTIFICATE OF CALIBRATION

**Customer** : Pacific Laboratory Co., Ltd.

**Address** : 14/5358 Moo 14, Tambon Bang Bua Thong, Amphoe Bang Bua Thong, Nonthaburi 11110

**Description of Equipment** : Console meter

**Manufacturer** : Apex Instrument

**Model Number** : XC-572-OV

**Serial Number** : 1306033

**ID/Control No.** : -

**Environment Conditions** : Temperature (25 ± 2) °C  
Humidity (50 ± 15) % RH

**Cal. Date** : 06/01/2022

**Issue Date** : 06/01/2022

### Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

This certificate is traceable to national standard, which realize the units of measurement according to the International System of Units (IS).

### Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by :

Approved by :

Technical Manager



Certificate No. :E22-01001

Page : 2 of 6

## METHOD 5 CONSOLE CALIBRATION USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425 5-POINT METRIC UNIT

| Meter Console Information |           | Calibration Conditions    |           |            |          | Factors/Conversions |       |       |
|---------------------------|-----------|---------------------------|-----------|------------|----------|---------------------|-------|-------|
| Console Model Number      | XC-572-OV | Date                      | Time      | 06/01/2022 | 10:30 AM | Std Temp            | 293   | K     |
| Console Serial Number     | 1306033   | Calibration Reference No. | E22-01001 |            |          | Std Press           | 760   | mm Hg |
| DGM Model Number          | SK25EX    | Barometric Pressure       | 761.24    |            | mm Hg    | K <sub>1</sub>      | 0.386 |       |
| DGM Serial Number         | 00003603  | Calibration Meter Gamma   | 0.999     |            |          | Console Leak Check  | PASS  |       |

| Calibration Data |                     |                   |                   |                     |                   |                   |                   |                     |                   |
|------------------|---------------------|-------------------|-------------------|---------------------|-------------------|-------------------|-------------------|---------------------|-------------------|
| Run Time         | Metering Console    |                   |                   |                     |                   | Calibration Meter |                   |                     |                   |
| Elapsed          | DGM Orifice DH      | Volume Initial    | Volume Final      | Outlet Temp Initial | Outlet Temp Final | Volume Initial    | Volume Final      | Outlet Temp Initial | Outlet Temp Final |
| (Q)              | (P <sub>m</sub> )   | (V <sub>m</sub> ) | (V <sub>m</sub> ) | (t <sub>m</sub> )   | (t <sub>m</sub> ) | (V <sub>w</sub> ) | (V <sub>w</sub> ) | (t <sub>w</sub> )   | (t <sub>w</sub> ) |
| min              | mm H <sub>2</sub> O | m <sup>3</sup>    | m <sup>3</sup>    | °C                  | °C                | m <sup>3</sup>    | m <sup>3</sup>    | °C                  | °C                |
| 12.33            | 13.0                | 1336.648          | 1336.788          | 26                  | 26                | 52.91720          | 53.05030          | 26                  | 26                |
| 12.50            | 13.0                | 1336.788          | 1336.928          | 26                  | 26                | 53.05030          | 53.18486          | 26                  | 26                |
| 8.65             | 26.0                | 1336.935          | 1337.075          | 27                  | 27                | 53.19182          | 53.32866          | 26                  | 26                |
| 8.58             | 26.0                | 1337.075          | 1337.215          | 27                  | 27                | 53.32866          | 53.46514          | 26                  | 26                |
| 14.12            | 40.0                | 1337.224          | 1337.504          | 29                  | 29                | 53.47394          | 53.74824          | 26                  | 26                |
| 14.05            | 40.0                | 1337.504          | 1337.784          | 29                  | 29                | 53.74824          | 54.02134          | 26                  | 26                |
| 10.40            | 70.0                | 1337.791          | 1338.071          | 29                  | 29                | 54.02794          | 54.30046          | 26                  | 26                |
| 10.40            | 70.0                | 1338.071          | 1338.351          | 30                  | 30                | 54.30046          | 54.57250          | 25                  | 25                |
| 9.17             | 90.0                | 1338.358          | 1338.638          | 30                  | 30                | 54.57908          | 54.85102          | 25                  | 25                |
| 9.15             | 90.0                | 1338.638          | 1338.918          | 30                  | 30                | 54.85102          | 55.12224          | 25                  | 25                |

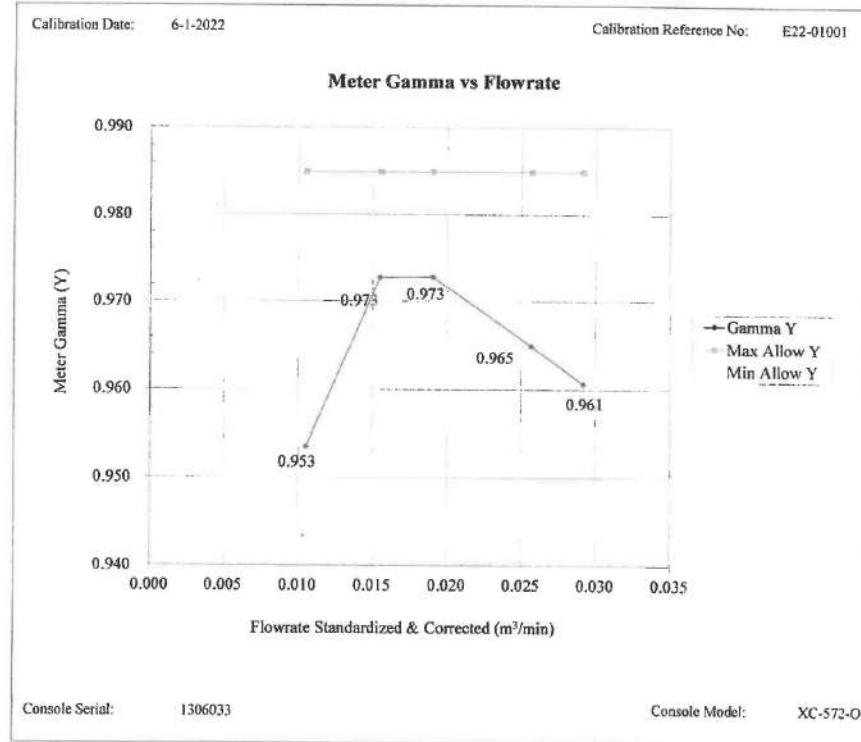




**METHOD 5 CONSOLE CALIBRATION  
USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425  
5-POINT METRIC UNIT**

| Calibration Data       |                        |                        |                        |                    |           |                              |                           |                     |
|------------------------|------------------------|------------------------|------------------------|--------------------|-----------|------------------------------|---------------------------|---------------------|
| Results                |                        |                        |                        |                    |           |                              |                           |                     |
| Standardized Data      |                        |                        |                        | Dry Gas Meter      |           |                              |                           |                     |
| Dry Gas Meter          |                        | Calibration Meter      |                        | Calibration Factor |           | Flowrate                     |                           | Variation           |
| (V <sub>m(std)</sub> ) | (Q <sub>m(std)</sub> ) | (V <sub>w(std)</sub> ) | (Q <sub>w(std)</sub> ) | Value              | Variation | Std & Corr                   | .0212 m <sup>3</sup> /min |                     |
| m <sup>3</sup>         | m <sup>3</sup> /min    | m <sup>3</sup>         | m <sup>3</sup> /min    | (Y)                | (ΔY)      | (Q <sub>m(std)(corr)</sub> ) | mm H <sub>2</sub> O       | (ΔH <sub>2</sub> O) |
| 0.138                  | 0.011                  | 0.130                  | 0.011                  | 0.948              | -0.017    | 0.011                        | 51.572                    | 2.780               |
| 0.138                  | 0.011                  | 0.132                  | 0.011                  | 0.959              | -0.006    | 0.011                        | 51.770                    | 2.978               |
| 0.138                  | 0.016                  | 0.134                  | 0.016                  | 0.974              | 0.009     | 0.016                        | 48.063                    | -0.729              |
| 0.138                  | 0.016                  | 0.134                  | 0.016                  | 0.971              | 0.007     | 0.016                        | 47.575                    | -1.217              |
| 0.276                  | 0.020                  | 0.269                  | 0.019                  | 0.975              | 0.010     | 0.019                        | 49.145                    | 0.353               |
| 0.276                  | 0.020                  | 0.268                  | 0.019                  | 0.971              | 0.006     | 0.019                        | 49.111                    | 0.318               |
| 0.277                  | 0.027                  | 0.267                  | 0.026                  | 0.966              | 0.001     | 0.026                        | 47.564                    | -1.228              |
| 0.278                  | 0.027                  | 0.268                  | 0.026                  | 0.964              | -0.001    | 0.026                        | 47.572                    | -1.220              |
| 0.278                  | 0.030                  | 0.268                  | 0.029                  | 0.962              | -0.003    | 0.029                        | 47.735                    | -1.057              |
| 0.278                  | 0.030                  | 0.267                  | 0.029                  | 0.959              | -0.006    | 0.029                        | 47.815                    | -0.978              |
|                        |                        |                        |                        | 0.965              | Y Average |                              |                           | DH/Δ<br>Average     |
|                        |                        |                        |                        |                    |           |                              |                           | 48.792              |

**Note:** For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.  
For ΔH<sub>2</sub>O, orifice pressure differential that equates to 0.75 cfm (0.0212 m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2 inches (5.1mm) H<sub>2</sub>O.

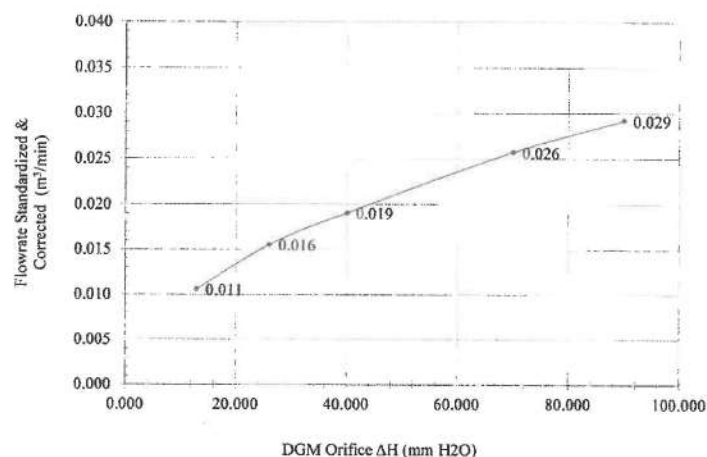


# THERMOCOUPLES SYSTEM CALIBRATION

Calibration Date: 6-1-2022

Calibration Reference No: E22-01001

Meter Pressure vs Flowrate



Console Serial: 1306033

Console Model: XC-572-OV



| Sampling System Equipment Information |              |
|---------------------------------------|--------------|
| Console Model Number                  | XC-572-OV    |
| Console Serial Number                 | 1306033      |
| DGM Model Number                      | SK25EX       |
| DGM Serial Number                     | 00003603     |
| Meter Box Model Number                | JENCO 765 KF |
| Meter Box Serial Number               | JC 13335     |

| Calibration Conditions    |      |            |          |
|---------------------------|------|------------|----------|
| Date                      | Time | 06/01/2022 | 01:00 PM |
| Calibration Reference No. |      | E22-01001  |          |
| Reference Thermometer     |      | DIGICON    |          |
| Serial Number             |      | 183169105  |          |
|                           |      |            |          |

| Results                        |  |      |      |      |       |       |       |       |       |       |
|--------------------------------|--|------|------|------|-------|-------|-------|-------|-------|-------|
| Console Thermocouple Simulator |  |      |      |      |       |       |       |       |       |       |
| Channel and test point         | Meter Box Channel Temperature Reading ( °C ) |      |      |      |       |       |       |       |       |       |
|                                | -18.0  | 25.0 | 38.0 | 93.0 | 149.0 | 260.0 | 371.0 | 482.0 | 593.0 | 816.0 |
| Stack                          | -16.0  | 26.0 | 39.0 | 95.0 | 151.0 | 262.0 | 373.0 | 484.0 | 595.0 | 818.0 |
| Aux                            | -16.0  | 26.0 | 39.0 | 95.0 | 151.0 |       |       |       |       |       |
| Probe                          | -  | -    | -    | -    | -     |       |       |       |       |       |
| Filter                         | -16.0  | 26.0 | 39.0 | 95.0 | 151.0 |       |       |       |       |       |
| Oven                           | -  | -    | -    | -    | -     |       |       |       |       |       |
| Exit                           | N/D  | N/D  | N/D  |      |       |       |       |       |       |       |

Stack ± 1.50% Absolute  
Probe ± 3.0 °C  
Filter ± 3.0 °C

## Tolerance Range

Meter ± 3.0 °C  
Exit ± 2.0 °C



Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tambon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. :E22-01002

Page :1 of 2

## CERTIFICATE OF CALIBRATION

**Customer** : Pacific Laboratory Co., Ltd.

**Address** : 14/5358 Moo 14, Tambon Bang Bua Thong, Amphoe Bang Bua Thong, Nonthaburi 11110

**Description of Equipment** : Nozzle

**Manufacturer** : Apex Instrument

**Model Number** : NS SET

**Serial Number** : -

**ID./Control No.** : -

**Environment Conditions** : Temperature (25 ± 2) °C  
Humidity (50 ± 15) % RH

**Cal. Date** : 05/01/2022

**Issue Date** : 05/01/2022

### Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

This certificate is traceable to national standard, which realize the units of measurement according to the International System of Units (IS).

### Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by :



Approved by :



Technical Manger



Certificate No. :E22-01002

Page : 2 of 2

## CALIBRATION RESULTS

### Sampling System Equipment Information

Nozzle Model : NS SET  
Nozzle Number : -  
Nozzle Type : Stainless Steel

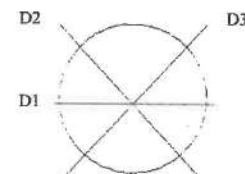
### Calibration Condition

Date : 5 January 2022  
Barometric Pressure : 758.99 mm Hg  
Calibration Device : Vernier, 0-150 mm  
Method Reference : US. EPA Method

| Nozzle ID | Nozzle Diameter |          |          |          | Different<br>ΔD | (D1 + D2 + D3) / 3<br>Davg |
|-----------|-----------------|----------|----------|----------|-----------------|----------------------------|
|           | mm              | D1<br>mm | D2<br>mm | D3<br>mm |                 |                            |
| NS-5      | 3.97            | 3.78     | 3.88     | 3.85     | 0.051           | 3.837                      |
| NS-7      | 5.56            | 5.35     | 5.34     | 5.34     | 0.006           | 5.343                      |
| NS-9      | 7.14            | 6.88     | 6.81     | 6.86     | 0.036           | 6.850                      |
| NS-11     | 8.73            | 8.44     | 8.45     | 8.45     | 0.006           | 8.447                      |
| NS-13     | 10.32           | 10.18    | 10.18    | 10.17    | 0.006           | 10.177                     |
| NS-15     | 11.91           | 11.64    | 11.64    | 11.64    | 0.000           | 11.640                     |
| NS-17     | 13.49           | 13.30    | 13.30    | 13.30    | 0.000           | 13.300                     |

### Remark:

- D1, D2, D3 = There difference nozzle diameters, mm; diameter must be within 0.025 mm  
ΔD = Maximum difference between any two diameters, must be ≤ 0.100 mm  
Davg = (D1 + D2 + D3) / 3





Envi Equipment Service Co., Ltd.  
110/254 Moo 3, Tambon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110  
Tel. 098 362 9152, 089 478 7885  
E-mail: sales@envi-ees.com

Certificate No. : E22-01003  
Page : 1 of 3

## CERTIFICATE OF CALIBRATION

**Customer** : Pacific Laboratory Co., Ltd.  
**Address** : 14/5358 Moo 14, Tambon Bang Bua Thong, Amphoe Bang Bua Thong, Nonthaburi 11110  
**Description of Equipment** : Standard Probe Method 5  
**Manufacturer** : Apex Instrument  
**Model Number** : PS-4HV  
**Serial Number** : -  
**ID./Control No.** : -  
**Environment Conditions** : Temperature (25 ± 2) °C  
: Humidity (50 ± 15) % RH  
**Cal. Date** : 05/01/2022  
**Issue Date** : 05/01/2022

### Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

This certificate is traceable to national standard, which realize the units of measurement according to the International System of Units (IS).

### Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by

Approved by

Technical Manager



Certificate No. : E22-01003  
Page : 2 of 3

## CALIBRATION RESULTS S-Type Geometric Pitot Tube Calibration

### Sampling System Equipment Information

**Probe Model** : PS-4HV  
**Probe Number** : -  
**Pitot Number** : -  
**Pitot Tube Type** : S-type

### Calibration Condition

**Date** : 5 January 2022  
**Barometric Pressure** : 758.99 mm Hg  
**Digital Caliper** : CD-6" ASX  
**Serial number** : A18008059

| Pitot tube/Probe: # PS-4HV |       |                   |       |
|----------------------------|-------|-------------------|-------|
| Parameter                  | Value | Allowable Range   | Check |
| Assembly level?            | Yes   | Yes               | Pass  |
| Ports Damage?              | No    | No                | Pass  |
| α1                         | 0     | -10° < α1 < +10°  | Pass  |
| α2                         | 1     | -10° < α2 < +10°  | Pass  |
| β1                         | 0     | -5° < β1 < +5°    | Pass  |
| β2                         | 0     | -5° < β2 < +5°    | Pass  |
| γ                          | 0     | N/A               | -     |
| θ                          | 0     | N/A               | -     |
| Dt                         | 0.375 | .188" to .375"    | Pass  |
| A                          | 0.904 | 2.1Dt ≤ A ≤ 3Dt   | Pass  |
| A/2Dt                      | 1.205 | 1.05 ≤ A/Dt ≤ 1.5 | Pass  |
| Z = A tan γ                | 0.045 | Z ≤ .125"         | Pass  |
| W = A tan θ                | 0.018 | W ≤ .031"         | Pass  |

### Remark:

I certified that probe model: **PS-4HV** meets or exceeds all specifications, criteria and/or applicable design and is hereby assigned a pitot tube certification factor of **0.84**. See 40 CFR Pt. 60, App. A, EPA Method 2.



**THERMOCOUPLES SYSTEM CALIBRATION**

| Sampling System Equipment Information |              |
|---------------------------------------|--------------|
| Probe Model Number                    | PS-4HV       |
| Probe Serial Number                   | -            |
| Meter Box Model Number                | JENCO 765 KF |
| Meter Box Serial Number               | JC 13335     |

| Calibration Conditions    |      |            |          |
|---------------------------|------|------------|----------|
| Date                      | Time | 05/01/2022 | 04:00 PM |
| Calibration Reference No. |      | E22-01003  |          |
| Reference Thermometer     |      | DIGICON    |          |
| Serial Number             |      | 183169105  |          |

| Thermocouple of Standard Probe method 5 = length 4 foot |                        |                    |            |
|---|------------------------|--------------------|------------|
| Set Point   | Reference Thermocouple | Probe Thermocouple | Difference |
| 100   | 100.0                  | 98.0               | 0.54       |
| 250   | 250.0                  | 247.0              | 0.57       |
| 300   | 300.0                  | 298.0              | 0.35       |
| 350   | 350.0                  | 349.0              | 0.16       |





## TEST REPORT FOR FLUE GAS ANALYZER

**Customer Name** PACIFIC LABORATORY CO.,LTD.

**Brand** TESTO  
**Model** Testo 310  
**Serial No.** 42847340  
**Tested on** 27-Aug-21  
**LCD Display** PASS  
**Lamp LEDS** PASS  
**Overall Result** PASS

Standard gas Mixed : Cylinder No.EB0126329 Expried Date Dec 19, 2022

### Calibration Results

| Gas Applied | Range  | Reading | Calibrated To | Result |
|-------------|--------|---------|---------------|--------|
| Zero Air    | % O2   | 21      | 21            | PASS   |
| Zero Air    | PPM CO | 0       | 0             | PASS   |

| Gas Applied    | Range  | Reading | Calibrated To | Result |
|----------------|--------|---------|---------------|--------|
| 18% Vol Oxygen | % O2   | 18.4    | 18.0          | PASS   |
| 101 PPM CO     | PPM CO | 99      | 101           | PASS   |

Calibrated by :



Approved by :



[www.esithailand.com](http://www.esithailand.com) / E-mail : [info@esithailand.com](mailto:info@esithailand.com)







## Certificate of Calibration

|                             |                   |                         |              |
|-----------------------------|-------------------|-------------------------|--------------|
| <b>Equipment:</b>           | SPECTROPHOTOMETER | <b>Certificate No.:</b> | C06210315    |
| <b>Model:</b>               | DR3900            | <b>Issued Date:</b>     | 13 July 2021 |
| <b>Serial No. (or ID.):</b> | 2076219           | <b>Job No.:</b>         | KSPR2109642  |
| <b>Manufacturer:</b>        | HACH              | <b>Page:</b>            | 1 of 2       |
| <b>Condition:</b>           | New               |                         |              |

**Customer:** PACIFIC LABORATORY CO.,LTD.  
14/5358 Moo 14 Tambol Bang Bua Thong,  
Amphoe Bang Bua Thong, Nonthaburi 11110

**Environment Condition:**

|             |    |     |   |    |     |
|-------------|----|-----|---|----|-----|
| Temperature | 23 | °C  | ± | 2  | °C  |
| Humidity    | 50 | %RH | ± | 15 | %RH |

**Calibration Place:** Environment Laboratory, SPC RT Co., Ltd.  
1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd.,  
Bangchak, Prakhonong, Bangkok 10260 Thailand

**Calibration By:** Mr. Atachai Ngamchanat

**Calibration Date:** 13 July 2021

**The Method used:** In house method, SPCC-WI-24, base on ASTM E 275-08 and ASTM E 387-04

**Traceability:** This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

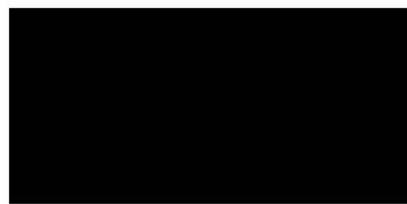
The standard for Wavelength Certificate No. 87146 and 87152

The standard for Photometric Certificate No. 87220



Person in charge

**SERT**  
บริษัท เอสพีซี อาร์ที จำกัด  
SPC RT Co., Ltd.



Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of SPC RT Co., Ltd.

**Calibration Results:**

**Without Adjustment**

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm

| Standard Wavelength | Unit Under Calibration | Correction | Uncertainty |
|---------------------|------------------------|------------|-------------|
| 418.40              | 418                    | 0.40       | 0.59        |
| 537.00              | 536                    | 1.00       | 0.59        |
| 638.00              | 637                    | 1.00       | 0.59        |
| 747.61              | 747                    | 0.61       | 0.59        |
| 807.04              | 807                    | 0.04       | 0.59        |

**Photometric Accuracy (Absorbance)**

| Wavelength | Standard absorbance | Unit Under Calibration | Correction | Uncertainty |
|------------|---------------------|------------------------|------------|-------------|
| 420 nm     | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5890              | 0.587                  | 0.0020     | 0.0045      |
|            | 0.7616              | 0.759                  | 0.0026     | 0.0045      |
|            | 1.0263              | 1.026                  | 0.0003     | 0.0045      |
| 440 nm     | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5787              | 0.576                  | 0.0027     | 0.0045      |
|            | 0.7442              | 0.741                  | 0.0032     | 0.0045      |
|            | 1.0039              | 1.003                  | 0.0009     | 0.0045      |
| 465 nm     | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5292              | 0.529                  | 0.0002     | 0.0045      |
|            | 0.6865              | 0.686                  | 0.0005     | 0.0045      |
|            | 0.9534              | 0.956                  | -0.0026    | 0.0045      |
| 546.1 nm   | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5468              | 0.546                  | 0.0008     | 0.0045      |
|            | 0.6957              | 0.694                  | 0.0017     | 0.0045      |
|            | 0.9991              | 1.000                  | -0.0009    | 0.0045      |
| 590 nm     | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5851              | 0.587                  | -0.0019    | 0.0045      |
|            | 0.7238              | 0.721                  | 0.0028     | 0.0045      |
|            | 1.0957              | 1.093                  | 0.0027     | 0.0045      |
| 635 nm     | 0.0000              | 0.000                  | 0.0000     | 0.0045      |
|            | 0.5692              | 0.567                  | 0.0022     | 0.0045      |
|            | 0.6914              | 0.689                  | 0.0024     | 0.0045      |
|            | 1.0881              | 1.087                  | 0.0011     | 0.0045      |

**The End of Certificate**



## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD. 42 Raminthra 14 yeak 9, Tha Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 21 July 2021

#### Instruments Information

|  |  |
|--|--|
| Analyzer Type: CO Analyzer<br>Model: 48C | Manufacturer Thermo Environmental<br>S/N: 0528012677 |
|--|--|

#### Calibration System

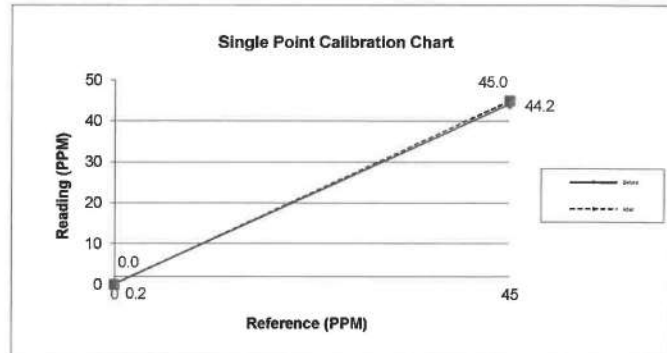
| Calibrator Unit  | Standard Gas   |
|--|--|
| Dilutor Model Dasibi Model 5008<br>S/N: 705<br>ZERO AIR Generator API MODEL 701<br>S/N: 1924 | NO Conc 55.47 PPM<br>SO <sub>2</sub> Conc 55.11 PPM<br>CO Conc 4,535 PPM<br>Cylinder number EB0129027<br>Expire Date: 29 Oct. 2027 |

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

| Status | Zero            |               |             | Span            |               |        |
|--------|-----------------|---------------|-------------|-----------------|---------------|--------|
|        | Reference (PPM) | Reading (PPM) | Drift (PPM) | Reference (PPM) | Reading (PPM) | Drift% |
| Before | 0.0             | 0.2           | 0.2         | 45.0            | 44.2          | -1.7   |
| After  | 0.0             | 0.0           | 0.0         | 45.0            | 45.0          | 0.0    |



Calibrate By





## Certificate of Calibration

### Calibration Certification Information

|                      |                 |                 |        |     |       |       |
|----------------------|-----------------|-----------------|--------|-----|-------|-------|
| Cal. Date:           | August 16, 2021 | Rootsmeter S/N: | 438320 | Ta: | 296   | °K    |
| Operator:            | Jim Tisch       |                 |        | Pa: | 750.8 | mm Hg |
| Calibration Model #: | TE-5025A        | Calibrator S/N: | 710725 |     |       |       |

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1   | 1              | 2               | 1          | 1.3820      | 3.2        | 2.00        |
| 2   | 3              | 4               | 1          | 0.9810      | 6.4        | 4.00        |
| 3   | 5              | 6               | 1          | 0.8740      | 8.0        | 5.00        |
| 4   | 7              | 8               | 1          | 0.8340      | 8.8        | 5.50        |
| 5   | 9              | 10              | 1          | 0.6910      | 12.7       | 8.00        |

### Data Tabulation

| Vstd (m3) | Qstd (x-axis) | $\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis) | Va     | Qa (x-axis) | $\sqrt{\Delta H \left( \frac{Ta}{Pa} \right)}$ (y-axis) |
|-----------|---------------|--|--------|-------------|---|
| 0.9904    | 0.7166        | 1.4104   | 0.9957 | 0.7205      | 0.8880  |
| 0.9861    | 1.0052        | 1.9946   | 0.9915 | 1.0107      | 1.2558  |
| 0.9840    | 1.1259        | 2.2300   | 0.9893 | 1.1320      | 1.4040  |
| 0.9829    | 1.1786        | 2.3389   | 0.9883 | 1.1850      | 1.4725  |
| 0.9778    | 1.4150        | 2.8208   | 0.9831 | 1.4227      | 1.7759  |
| QSTD      | m=            | 2.01649  | QA     | m=          | 1.26269   |
|           | b=            | -0.03554   |        | b=          | -0.02237  |
|           | r=            | 0.99998  |        | r=          | 0.99998   |

### Calculations

|  |   |     |  |
|--|---|-----|--|
| Vstd=                                  | $\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$   | Va= | $\Delta Vol((Pa-\Delta P)/Pa)$   |
| Qstd=                                  | Vstd/ΔTime  | Qa= | Va/ΔTime   |
| For subsequent flow rate calculations: |   |     |  |
| Qstd=                                  | $1/m \left( \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} \right) - b \right)$ | Qa= | $1/m \left( \left( \sqrt{\Delta H \left( \frac{Ta}{Pa} \right)} \right) - b \right)$ |

### Standard Conditions

|   |           |
|---|-----------|
| Tstd:                                     | 298.15 °K |
| Pstd:                                     | 760 mm Hg |
| Key                                       |           |
| ΔH: calibrator manometer reading (in H2O) |           |
| ΔP: rootsmeter manometer reading (mm Hg)  |           |
| Ta: actual absolute temperature (°K)      |           |
| Pa: actual barometric pressure (mm Hg)    |           |
| b: intercept                              |           |
| m: slope                                  |           |

### RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30