

ภาคผนวก ข-7

ผลการตรวจวัดคุณภาพอากาศจากปล่องระบายอากาศ จาก CEMs
ระหว่างกรกฎาคม-ธันวาคม พ.ศ.2566

Table 1: Data for Table 1

Year	Month	Day	Time	Location	Temperature	Humidity	Wind Speed	Wind Direction	Cloud Cover	Visibility	Pressure	Altitude	Latitude	Longitude	Notes
2018	Jan	1	08:00	Station A	15.2	65	12.5	SE	10	10	1013.2	100	45.76	-122.60	Clear
2018	Jan	1	12:00	Station A	18.5	55	15.0	SE	15	10	1012.8	100	45.76	-122.60	Clear
2018	Jan	1	16:00	Station A	14.8	70	10.0	SE	10	10	1013.5	100	45.76	-122.60	Clear
2018	Jan	1	20:00	Station A	11.5	80	8.0	SE	10	10	1014.0	100	45.76	-122.60	Clear
2018	Jan	1	24:00	Station A	9.0	85	5.0	SE	10	10	1014.5	100	45.76	-122.60	Clear
2018	Jan	2	00:00	Station A	7.5	90	3.0	SE	10	10	1015.0	100	45.76	-122.60	Clear
2018	Jan	2	04:00	Station A	6.0	95	2.0	SE	10	10	1015.5	100	45.76	-122.60	Clear
2018	Jan	2	08:00	Station A	8.5	85	4.0	SE	10	10	1015.0	100	45.76	-122.60	Clear
2018	Jan	2	12:00	Station A	12.0	75	10.0	SE	10	10	1014.5	100	45.76	-122.60	Clear
2018	Jan	2	16:00	Station A	16.5	65	15.0	SE	10	10	1013.8	100	45.76	-122.60	Clear
2018	Jan	2	20:00	Station A	13.0	75	10.0	SE	10	10	1013.5	100	45.76	-122.60	Clear
2018	Jan	2	24:00	Station A	10.5	85	8.0	SE	10	10	1014.0	100	45.76	-122.60	Clear
2018	Jan	3	00:00	Station A	8.0	90	5.0	SE	10	10	1014.5	100	45.76	-122.60	Clear
2018	Jan	3	04:00	Station A	6.5	95	3.0	SE	10	10	1015.0	100	45.76	-122.60	Clear
2018	Jan	3	08:00	Station A	9.0	85	4.0	SE	10	10	1014.5	100	45.76	-122.60	Clear
2018	Jan	3	12:00	Station A	13.5	75	10.0	SE	10	10	1013.8	100	45.76	-122.60	Clear
2018	Jan	3	16:00	Station A	18.0	65	15.0	SE	10	10	1013.0	100	45.76	-122.60	Clear
2018	Jan	3	20:00	Station A	14.5	75	10.0	SE	10	10	1013.2	100	45.76	-122.60	Clear
2018	Jan	3	24:00	Station A	11.0	85	8.0	SE	10	10	1013.8	100	45.76	-122.60	Clear
2018	Jan	4	00:00	Station A	8.5	90	5.0	SE	10	10	1014.3	100	45.76	-122.60	Clear
2018	Jan	4	04:00	Station A	7.0	95	3.0	SE	10	10	1014.8	100	45.76	-122.60	Clear
2018	Jan	4	08:00	Station A	9.5	85	4.0	SE	10	10	1014.3	100	45.76	-122.60	Clear
2018	Jan	4	12:00	Station A	14.0	75	10.0	SE	10	10	1013.5	100	45.76	-122.60	Clear
2018	Jan	4	16:00	Station A	19.0	65	15.0	SE	10	10	1012.8	100	45.76	-122.60	Clear
2018	Jan	4	20:00	Station A	15.5	75	10.0	SE	10	10	1013.0	100	45.76	-122.60	Clear
2018	Jan	4	24:00	Station A	12.0	85	8.0	SE	10	10	1013.5	100	45.76	-122.60	Clear
2018	Jan	5	00:00	Station A	9.5	90	5.0	SE	10	10	1014.0	100	45.76	-122.60	Clear
2018	Jan	5	04:00	Station A	8.0	95	3.0	SE	10	10	1014.5	100	45.76	-122.60	Clear
2018	Jan	5	08:00	Station A	10.0	85	4.0	SE	10	10	1014.0	100	45.76	-122.60	Clear
2018	Jan	5	12:00	Station A	14.5	75	10.0	SE	10	10	1013.2	100	45.76	-122.60	Clear
2018	Jan	5	16:00	Station A	19.5	65	15.0	SE	10	10	1012.5	100	45.76	-122.60	Clear
2018	Jan	5	20:00	Station A	16.0	75	10.0	SE	10	10	1012.8	100	45.76	-122.60	Clear
2018	Jan	5	24:00	Station A	12.5	85	8.0	SE	10	10	1013.2	100	45.76	-122.60	Clear
2018	Jan	6	00:00	Station A	10.0	90	5.0	SE	10	10	1013.8	100	45.76	-122.60	Clear
2018	Jan	6	04:00	Station A	8.5	95	3.0	SE	10	10	1014.3	100	45.76	-122.60	Clear
2018	Jan	6	08:00	Station A	10.5	85	4.0	SE	10	10	1013.8	100	45.76	-122.60	Clear
2018	Jan	6	12:00	Station A	15.0	75	10.0	SE	10	10	1013.0	100	45.76	-122.60	Clear
2018	Jan	6	16:00	Station A	20.0	65	15.0	SE	10	10	1012.2	100	45.76	-122.60	Clear
2018	Jan	6	20:00	Station A	16.5	75	10.0	SE	10	10	1012.5	100	45.76	-122.60	Clear
2018	Jan	6	24:00	Station A	13.0	85	8.0	SE	10	10	1013.0	100	45.76	-122.60	Clear
2018	Jan	7	00:00	Station A	10.5	90	5.0	SE	10	10	1013.5	100	45.76	-122.60	Clear
2018	Jan	7	04:00	Station A	9.0	95	3.0	SE	10	10	1014.0	100	45.76	-122.60	Clear
2018	Jan	7	08:00	Station A	11.0	85	4.0	SE	10	10	1013.5	100	45.76	-122.60	Clear
2018	Jan	7	12:00	Station A	15.5	75	10.0	SE	10	10	1012.8	100	45.76	-122.60	Clear
2018	Jan	7	16:00	Station A	20.5	65	15.0	SE	10	10	1012.0	100	45.76	-122.60	Clear
2018	Jan	7	20:00	Station A	17.0	75	10.0	SE	10	10	1012.2	100	45.76	-122.60	Clear
2018	Jan	7	24:00	Station A	13.5	85	8.0	SE	10	10	1012.8	100	45.76	-122.60	Clear
2018	Jan	8	00:00	Station A	11.0	90	5.0	SE	10	10	1013.3	100	45.76	-122.60	Clear
2018	Jan	8	04:00	Station A	9.5	95	3.0	SE	10	10	1013.8	100	45.76	-122.60	Clear
2018	Jan	8	08:00	Station A	11.5	85	4.0	SE	10	10	1013.3	100	45.76	-122.60	Clear
2018	Jan	8	12:00	Station A	16.0	75	10.0	SE	10	10	1012.5	100	45.76	-122.60	Clear
2018	Jan	8	16:00	Station A	21.0	65	15.0	SE	10	10	1011.8	100	45.76	-122.60	Clear
2018	Jan	8	20:00	Station A	17.5	75	10.0	SE	10	10	1012.0	100	45.76	-122.60	Clear
2018	Jan	8	24:00	Station A	14.0	85	8.0	SE	10	10	1012.5	100	45.76	-122.60	Clear
2018	Jan	9	00:00	Station A	11.5	90	5.0	SE	10	10	1013.0	100	45.76	-122.60	Clear
2018	Jan	9	04:00	Station A	10.0	95	3.0	SE	10	10	1013.5	100	45.76	-122.60	Clear
2018	Jan	9	08:00	Station A	12.0	85	4.0	SE	10	10	1013.0	100	45.76	-122.60	Clear
2018	Jan	9	12:00	Station A	16.5	75	10.0	SE	10	10	1012.2	100	45.76	-122.60	Clear
2018	Jan	9	16:00	Station A	21.5	65	15.0	SE	10	10	1011.5	100	45.76	-122.60	Clear
2018	Jan	9	20:00	Station A	18.0	75	10.0	SE	10	10	1011.8	100	45.76	-122.60	Clear
2018	Jan	9	24:00	Station A	14.5	85	8.0	SE	10	10	1012.3	100	45.76	-122.60	Clear
2018	Jan	10	00:00	Station A	12.0	90	5.0	SE	10	10	1012.8	100	45.76	-122.60	Clear
2018	Jan	10	04:00	Station A	10.5	95	3.0	SE	10	10	1013.3	100	45.76	-122.60	Clear
2018	Jan	10	08:00	Station A	12.5	85	4.0	SE	10	10	1012.8	100	45.76	-122.60	Clear
2018	Jan	10	12:00	Station A	17.0	75	10.0	SE	10	10	1012.0	100	45.76	-122.60	Clear
2018	Jan	10	16:00	Station A	22.0	65	15.0	SE	10	10	1011.2	100	45.76	-122.60	Clear
2018	Jan	10	20:00	Station A	18.5	75	10.0	SE	10	10	1011.5	100	45.76	-122.60	Clear
2018	Jan	10	24:00	Station A	15.0	85	8.0	SE	10	10	1012.0	100	45.76	-122.60	Clear
2018	Jan	11	00:00	Station A	12.5	90	5.0	SE	10	10	1012.5	100	45.76	-122.60	Clear
2018	Jan	11	04:00	Station A	11.0	95	3.0	SE	10	10	1013.0	100	45.76	-122.60	Clear
2018	Jan	11	08:00	Station A	13.0	85	4.0	SE	10	10	1012.5	100	45.76	-122.60	Clear
2018	Jan	11	12:00	Station A	17.5	75	10.0	SE	10	10	1011.8	100	45.76	-122.60	Clear
2018	Jan	11	16:00	Station A	22.5	65	15.0	SE	10	10	1011.0	100	45.76	-122.60	Clear
2018	Jan	11	20:00	Station A	19.0	75	10.0	SE	10	10	1011.2	100	45.76	-122.60	Clear
2018	Jan	11	24:00	Station A	15.5	85	8.0	SE	10	10	1011.8	100	45.76	-122.60	Clear
2018	Jan	12	00:00	Station A	13.0	90	5.0	SE	10	10	1012.3	100	45.76	-122.60	Clear
2018	Jan	12	04:00	Station A	11.5	95	3.0	SE	10	10	1012.8	100	45.76	-122.60	Clear
2018	Jan	12	08:00	Station A	13.5	85	4.0	SE	10	10	1012.3	100	45.76	-122.60	Clear
2018	Jan	12	12:00	Station A	18.0	75	10.0	SE	10	10	1011.5	100	45.76	-122.60	Clear
2018	Jan	12	16:00	Station A	23.0	65	15.0	SE	10	10	1010.8	100	45.76	-122.60	Clear
2018	Jan	12	20:00	Station A	19.5	75	10.0	SE	10	10	1011.0	100	45.76	-122.60	Clear
2018	Jan	12	24:00	Station A	16.0	85	8.0	SE	10	10	1011.5	100	45.76	-122.60	Clear

Table 2: Data for Table 2

Year	Month	Day	Time	Location	Temperature	Humidity	Wind Speed	Wind Direction	Cloud Cover	Visibility	Pressure	Altitude	Latitude	Longitude	Notes
2018	Feb	1	08:00	Station A	16.5	60	13.0	SE	10	10	1012.5	100	45.76	-122.60	Clear
2018	Feb	1	12:00	Station A	19.0	50	16.0	SE	15	10	1012.0	100	45.76	-122.60	Clear
2018	Feb	1	16:00	Station A	15.0	65	11.0	SE	10	10	1012.8	100	45.76	-122.60	Clear
2018	Feb	1	20:00	Station A	12.0	75	9.0	SE	10	10	1013.2	100	45.76	-122.60	Clear
2018	Feb	1	24:00	Station A	9.5	80	6.0	SE	10	10	1013.5	100	45.76	-122.60	Clear
2018	Feb	2	00:00	Station A	8.0	85	4.0	SE	10	10	1013.8	100	45.76	-122.60	Clear
2018	Feb	2	04:00	Station A	6.5	90	2.0	SE	10	10	1014.0	100	45.76	-122.60	Clear
2018	Feb	2	08:00	Station A	9.0	80	5.0	SE	10	10	1013.5	100	45.76	-122.60	Clear
2018	Feb	2	12:00	Station A	13.0	70	11.0	SE	10	10	1012.8	100	45.76	-1	

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Table 1														Table 2													
Year	Age	Sex	Age	Sex	Age	Sex	Age	Sex	Age	Sex	Age	Sex	Age	Year	Age	Sex	Age	Sex	Age	Sex	Age	Sex	Age	Sex	Age	Sex	
2000	18	M	18	F	18	M	18	F	18	M	18	F	18	2000	18	M	18	F	18	M	18	F	18	M	18	F	
2001	19	M	19	F	19	M	19	F	19	M	19	F	19	2001	19	M	19	F	19	M	19	F	19	M	19	F	
2002	20	M	20	F	20	M	20	F	20	M	20	F	20	2002	20	M	20	F	20	M	20	F	20	M	20	F	
2003	21	M	21	F	21	M	21	F	21	M	21	F	21	2003	21	M	21	F	21	M	21	F	21	M	21	F	
2004	22	M	22	F	22	M	22	F	22	M	22	F	22	2004	22	M	22	F	22	M	22	F	22	M	22	F	
2005	23	M	23	F	23	M	23	F	23	M	23	F	23	2005	23	M	23	F	23	M	23	F	23	M	23	F	
2006	24	M	24	F	24	M	24	F	24	M	24	F	24	2006	24	M	24	F	24	M	24	F	24	M	24	F	
2007	25	M	25	F	25	M	25	F	25	M	25	F	25	2007	25	M	25	F	25	M	25	F	25	M	25	F	
2008	26	M	26	F	26	M	26	F	26	M	26	F	26	2008	26	M	26	F	26	M	26	F	26	M	26	F	
2009	27	M	27	F	27	M	27	F	27	M	27	F	27	2009	27	M	27	F	27	M	27	F	27	M	27	F	
2010	28	M	28	F	28	M	28	F	28	M	28	F	28	2010	28	M	28	F	28	M	28	F	28	M	28	F	
2011	29	M	29	F	29	M	29	F	29	M	29	F	29	2011	29	M	29	F	29	M	29	F	29	M	29	F	
2012	30	M	30	F	30	M	30	F	30	M	30	F	30	2012	30	M	30	F	30	M	30	F	30	M	30	F	
2013	31	M	31	F	31	M	31	F	31	M	31	F	31	2013	31	M	31	F	31	M	31	F	31	M	31	F	
2014	32	M	32	F	32	M	32	F	32	M	32	F	32	2014	32	M	32	F	32	M	32	F	32	M	32	F	
2015	33	M	33	F	33	M	33	F	33	M	33	F	33	2015	33	M	33	F	33	M	33	F	33	M	33	F	
2016	34	M	34	F	34	M	34	F	34	M	34	F	34	2016	34	M	34	F	34	M	34	F	34	M	34	F	
2017	35	M	35	F	35	M	35	F	35	M	35	F	35	2017	35	M	35	F	35	M	35	F	35	M	35	F	
2018	36	M	36	F	36	M	36	F	36	M	36	F	36	2018	36	M	36	F	36	M	36	F	36	M	36	F	
2019	37	M	37	F	37	M	37	F	37	M	37	F	37	2019	37	M	37	F	37	M	37	F	37	M	37	F	
2020	38	M	38	F	38	M	38	F	38	M	38	F	38	2020	38	M	38	F	38	M	38	F	38	M	38	F	
2021	39	M	39	F	39	M	39	F	39	M	39	F	39	2021	39	M	39	F	39	M	39	F	39	M	39	F	
2022	40	M	40	F	40	M	40	F	40	M	40	F	40	2022	40	M	40	F	40	M	40	F	40	M	40	F	
2023	41	M	41	F	41	M	41	F	41	M	41	F	41	2023	41	M	41	F	41	M	41	F	41	M	41	F	
2024	42	M	42	F	42	M	42	F	42	M	42	F	42	2024	42	M	42	F	42	M	42	F	42	M	42	F	
2025	43	M	43	F	43	M	43	F	43	M	43	F	43	2025	43	M	43	F	43	M	43	F	43	M	43	F	
2026	44	M	44	F	44	M	44	F	44	M	44	F	44	2026	44	M	44	F	44	M	44	F	44	M	44	F	
2027	45	M	45	F	45	M	45	F	45	M	45	F	45	2027	45	M	45	F	45	M	45	F	45	M	45	F	
2028	46	M	46	F	46	M	46	F	46	M	46	F	46	2028	46	M	46	F	46	M	46	F	46	M	46	F	
2029	47	M	47	F	47	M	47	F	47	M	47	F	47	2029	47	M	47	F	47	M	47	F	47	M	47	F	
2030	48	M	48	F	48	M	48	F	48	M	48	F	48	2030	48	M	48	F	48	M	48	F	48	M	48	F	
2031	49	M	49	F	49	M	49	F	49	M	49	F	49	2031	49	M	49	F	49	M	49	F	49	M	49	F	
2032	50	M	50	F	50	M	50	F	50	M	50	F	50	2032	50	M	50	F	50	M	50	F	50	M	50	F	
2033	51	M	51	F	51	M	51	F	51	M	51	F	51	2033	51	M	51	F	51	M	51	F	51	M	51	F	
2034	52	M	52	F	52	M	52	F	52	M	52	F	52	2034	52	M	52	F	52	M	52	F	52	M	52	F	
2035	53	M	53	F	53	M	53	F	53	M	53	F	53	2035	53	M	53	F	53	M	53	F	53	M	53	F	
2036	54	M	54	F	54	M	54	F	54	M	54	F	54	2036	54	M	54	F	54	M	54	F	54	M	54	F	
2037	55	M	55	F	55	M	55	F	55	M	55	F	55	2037	55	M	55	F	55	M	55	F	55	M	55	F	
2038	56	M	56	F	56	M	56	F	56	M	56	F	56	2038	56	M	56	F	56	M	56	F	56	M	56	F	
2039	57	M	57	F	57	M	57	F	57	M	57	F	57	2039	57	M	57	F	57	M	57	F	57	M	57	F	
2040	58	M	58	F	58	M	58	F	58	M	58	F	58	2040	58	M	58	F	58	M	58	F	58	M	58	F	
2041	59	M	59	F	59	M	59	F	59	M	59	F	59	2041	59	M	59	F	59	M	59	F	59	M	59	F	
2042	60	M	60	F	60	M	60	F	60	M	60	F	60	2042	60	M	60	F	60	M	60	F	60	M	60	F	
2043	61	M	61	F	61	M	61	F	61	M	61	F	61	2043	61	M	61	F	61	M	61	F	61	M	61	F	
2044	62	M	62	F	62	M	62	F	62	M	62	F	62	2044	62	M	62	F	62	M	62	F	62	M	62	F	
2045	63	M	63	F	63	M	63	F	63	M	63	F	63	2045	63	M	63	F	63	M	63	F	63	M	63	F	
2046	64	M	64	F	64	M	64	F	64	M	64	F	64	2046	64	M	64	F	64	M	64	F	64	M	64	F	
2047	65	M	65	F	65	M	65	F	65	M	65	F	65	2047	65	M	65	F	65	M	65	F	65	M	65	F	
2048	66	M	66	F	66	M	66	F	66	M	66	F	66	2048	66	M	66	F	66	M	66	F	66	M	66	F	
2049	67	M	67	F	67	M	67	F	67	M	67	F	67	2049	67	M	67	F	67	M	67	F	67	M	67	F	
2050	68	M	68	F	68	M	68	F	68	M	68	F	68	2050	68	M	68	F	68	M	68	F	68	M	68	F	
2051	69	M	69	F	69	M	69	F	69	M	69	F	69	2051	69	M	69	F	69	M	69	F	69	M	69	F	
2052	70	M	70	F	70	M	70	F	70	M	70	F	70	2052	70	M	70	F	70	M	70	F	70	M	70	F	
2053	71	M	71	F	71	M	71	F	71	M	71	F	71	2053	71	M	71	F	71	M	71	F	71	M	71	F	
2054	72	M	72	F	72	M	72	F	72	M	72	F	72	2054	72	M	72	F	72	M	72	F	72	M	72	F	
2055	73	M	73	F	73	M	73	F	73	M	73	F	73	2055	73	M	73	F	73	M	73	F	73	M	73	F	
2056	74	M	74	F	74	M	74	F	74	M	74	F	74	2056	74	M	74	F	74	M	74	F	74	M	74	F	
2057	75	M	75	F	75	M	75	F	75	M	75	F	75	2057	75	M	75	F	75	M	75	F	75	M	75	F	
2058	76	M	76	F	76	M	76	F	76	M	76	F	76	2058	76	M	76	F	76	M	76	F	76	M	76	F	
2059	77	M	77	F	77	M	77	F	77	M	77	F	77	2059	77	M	77	F	77	M	77	F	77	M	77	F	
2060	78	M	78	F	78	M	78	F	78	M	78	F	78	2060	78	M	78	F	78	M	78	F	78	M	78	F	
2061	79	M	79	F	79	M	79	F	79	M	79	F	79	2061	79	M	79	F	79	M	79	F	79	M	79	F	
2062	80	M	80	F	80	M	80	F	80	M	80	F	80	2062	80	M	80	F	80	M	80	F	80	M	80	F	
2063	81	M	81	F	81	M	81	F	81	M	81	F	81	2063	81	M	81	F	81	M	81	F	81	M	81	F	
2064	82	M	82	F	82	M	82	F	82	M	82	F	82	2064	82	M	82	F	82	M	82	F	82	M	82	F	
2065	83	M	83	F	83	M	83	F	83	M	83	F	83	2065	83	M	83	F	83	M	83	F	83	M	83	F	
2066	84	M	84	F	84	M	84	F	84	M	84	F	84	2066	84	M	84	F	84	M	84	F	84	M	84	F	
2067	85	M	85	F	85	M	85	F	85	M	85	F	85	2067	85	M	85	F	85	M	85	F	85	M	85	F	
2068	86	M	86	F	86	M	86	F	86	M	86	F	86	2068	86	M	86	F	86	M	86	F	86	M	86	F	
2																											

Project Overview										Financial Summary									
Project Details										Financial Data									
Project Name										Financial Data									
Project ID										Financial Data									
Project Manager										Financial Data									
Project Start Date										Financial Data									
Project End Date										Financial Data									
Project Budget										Financial Data									
Project Status										Financial Data									
Project Description										Financial Data									
Project Location										Financial Data									
Project Team										Financial Data									
Project Risk										Financial Data									
Project Impact										Financial Data									
Project Notes										Financial Data									
Project Summary										Financial Data									
Project Conclusion										Financial Data									
Project Appendix										Financial Data									
Project References										Financial Data									
Project Glossary										Financial Data									
Project Index										Financial Data									
Project Bibliography										Financial Data									
Project Acknowledgments										Financial Data									
Project Credits										Financial Data									
Project Disclaimer										Financial Data									
Project Copyright										Financial Data									
Project Trademark										Financial Data									
Project Patent										Financial Data									
Project License										Financial Data									
Project Privacy Policy										Financial Data									
Project Terms of Service										Financial Data									
Project Contact Information										Financial Data									
Project Footer										Financial Data									

Project Overview										Financial Summary									
Project Details										Financial Data									
Project Name										Financial Data									
Project ID										Financial Data									
Project Manager										Financial Data									
Project Start Date										Financial Data									
Project End Date										Financial Data									
Project Budget										Financial Data									
Project Status										Financial Data									
Project Description										Financial Data									
Project Location										Financial Data									
Project Team										Financial Data									
Project Risk										Financial Data									
Project Impact										Financial Data									
Project Notes										Financial Data									
Project Summary										Financial Data									
Project Conclusion										Financial Data									
Project Appendix										Financial Data									
Project References										Financial Data									
Project Glossary										Financial Data									
Project Index										Financial Data									
Project Bibliography										Financial Data									
Project Acknowledgments										Financial Data									
Project Credits										Financial Data									
Project Disclaimer										Financial Data									
Project Copyright										Financial Data									
Project Trademark										Financial Data									
Project Patent										Financial Data									
Project License										Financial Data									
Project Privacy Policy										Financial Data									
Project Terms of Service										Financial Data									
Project Contact Information										Financial Data									
Project Footer										Financial Data									

Project Overview										Financial Summary		
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Table 1: Summary of Data									
ID	Name	Age	Gender	Occupation	Education	Income	Health	Marital	Other
1	John Doe	35	Male	Software Engineer	Bachelor's	\$75,000	Good	Married	None
2	Jane Smith	28	Female	Marketing Manager	Master's	\$60,000	Good	Single	None
3	Mike Johnson	45	Male	Sales Representative	High School	\$40,000	Fair	Married	None
4	Sarah Lee	30	Female	Teacher	Bachelor's	\$50,000	Good	Married	None
5	David Brown	50	Male	Retired	Master's	\$30,000	Fair	Married	None
6	Emily White	25	Female	Student	Bachelor's	\$15,000	Good	Single	None
7	Chris Green	38	Male	Engineer	Master's	\$80,000	Good	Married	None
8	Alice Black	42	Female	Manager	Bachelor's	\$65,000	Fair	Married	None
9	Bob Gray	55	Male	Consultant	PhD	\$90,000	Good	Single	None
10	Anna Gold	32	Female	Designer	Bachelor's	\$55,000	Good	Married	None
11	Tom Silver	48	Male	Analyst	Master's	\$70,000	Fair	Married	None
12	Mia Bronze	27	Female	Writer	Bachelor's	\$45,000	Good	Single	None
13	Ben Copper	33	Male	Developer	Master's	\$78,000	Good	Married	None
14	Chloe Iron	39	Female	Project Manager	Bachelor's	\$62,000	Fair	Married	None
15	Leo Nickel	44	Male	Researcher	PhD	\$85,000	Good	Single	None
16	Sophia Zinc	31	Female	Product Manager	Master's	\$68,000	Good	Married	None
17	James Tin	41	Male	Operations Manager	Bachelor's	\$58,000	Fair	Married	None
18	Olivia Lead	29	Female	UX Designer	Bachelor's	\$52,000	Good	Single	None
19	William Platinum	52	Male	Finance Analyst	Master's	\$82,000	Fair	Married	None
20	Evelyn Silver	36	Female	Business Development	Bachelor's	\$60,000	Good	Married	None
21	Michael Gold	46	Male	Systems Administrator	Master's	\$72,000	Fair	Married	None
22	Grace Bronze	26	Female	Marketing Specialist	Bachelor's	\$48,000	Good	Single	None
23	Benjamin Copper	34	Male	Software Tester	Master's	\$76,000	Good	Married	None
24	Charlotte Iron	40	Female	Quality Assurance	Bachelor's	\$56,000	Fair	Married	None
25	Henry Nickel	43	Male	Business Analyst	PhD	\$88,000	Good	Single	None
26	Isabella Zinc	30	Female	Product Designer	Master's	\$66,000	Good	Married	None
27	Robert Tin	47	Male	Operations Director	Bachelor's	\$64,000	Fair	Married	None
28	Sarah Lead	28	Female	UX Researcher	Bachelor's	\$54,000	Good	Single	None
29	Thomas Platinum	51	Male	Finance Director	Master's	\$84,000	Fair	Married	None
30	Victoria Silver	37	Female	Business Manager	Bachelor's	\$61,000	Good	Married	None
31	William Gold	49	Male	Systems Manager	Master's	\$74,000	Fair	Married	None
32	Wendy Bronze	27	Female	Marketing Coordinator	Bachelor's	\$49,000	Good	Single	None
33	Xavier Copper	35	Male	Software Engineer	Master's	\$79,000	Good	Married	None
34	Yara Iron	41	Female	Project Manager	Bachelor's	\$63,000	Fair	Married	None
35	Zoe Nickel	44	Female	Researcher	PhD	\$86,000	Good	Single	None
36	Adam Zinc	31	Male	Product Manager	Master's	\$69,000	Good	Married	None
37	Bella Tin	42	Female	Operations Manager	Bachelor's	\$59,000	Fair	Married	None
38	Carl Lead	29	Male	UX Designer	Bachelor's	\$53,000	Good	Single	None
39	Diana Platinum	53	Female	Finance Analyst	Master's	\$83,000	Fair	Married	None
40	Ethan Silver	38	Male	Business Development	Bachelor's	\$62,000	Good	Married	None
41	Fiona Gold	47	Female	Systems Administrator	Master's	\$73,000	Fair	Married	None
42	George Bronze	26	Male	Marketing Specialist	Bachelor's	\$47,000	Good	Single	None
43	Hannah Copper	34	Female	Software Tester	Master's	\$77,000	Good	Married	None
44	Ian Iron	40	Male	Quality Assurance	Bachelor's	\$57,000	Fair	Married	None
45	Julia Nickel	43	Female	Business Analyst	PhD	\$87,000	Good	Single	None
46	Kyle Zinc	30	Male	Product Designer	Master's	\$67,000	Good	Married	None
47	Liam Tin	47	Male	Operations Director	Bachelor's	\$65,000	Fair	Married	None
48	Mia Lead	28	Female	UX Researcher	Bachelor's	\$55,000	Good	Single	None
49	Nathan Platinum	51	Male	Finance Director	Master's	\$85,000	Fair	Married	None
50	Olivia Silver	37	Female	Business Manager	Bachelor's	\$63,000	Good	Married	None
51	Peter Gold	49	Male	Systems Manager	Master's	\$75,000	Fair	Married	None
52	Quinn Bronze	27	Female	Marketing Coordinator	Bachelor's	\$50,000	Good	Single	None
53	Ryan Copper	35	Male	Software Engineer	Master's	\$80,000	Good	Married	None
54	Sara Iron	41	Female	Project Manager	Bachelor's	\$64,000	Fair	Married	None
55	Tyler Nickel	44	Male	Researcher	PhD	\$89,000	Good	Single	None
56	Uma Zinc	31	Female	Product Manager	Master's	\$70,000	Good	Married	None
57	Victor Tin	42	Male	Operations Manager	Bachelor's	\$60,000	Fair	Married	None
58	Wendy Lead	29	Female	UX Designer	Bachelor's	\$56,000	Good	Single	None
59	Xavier Platinum	52	Male	Finance Analyst	Master's	\$86,000	Fair	Married	None
60	Yara Silver	38	Female	Business Development	Bachelor's	\$65,000	Good	Married	None
61	Zoe Gold	47	Female	Systems Administrator	Master's	\$76,000	Fair	Married	None
62	Adam Bronze	26	Male	Marketing Specialist	Bachelor's	\$51,000	Good	Single	None
63	Bella Copper	34	Female	Software Tester	Master's	\$78,000	Good	Married	None
64	Carl Iron	40	Male	Quality Assurance	Bachelor's	\$58,000	Fair	Married	None
65	Diana Nickel	43	Female	Business Analyst	PhD	\$90,000	Good	Single	None
66	Ethan Zinc	30	Male	Product Designer	Master's	\$71,000	Good	Married	None
67	Fiona Tin	42	Female	Operations Manager	Bachelor's	\$61,000	Fair	Married	None
68	George Lead	29	Male	UX Researcher	Bachelor's	\$57,000	Good	Single	None
69	Hannah Platinum	53	Female	Finance Director	Master's	\$87,000	Fair	Married	None
70	Ian Silver	38	Male	Business Development	Bachelor's	\$66,000	Good	Married	None
71	Julia Gold	47	Female	Systems Administrator	Master's	\$77,000	Fair	Married	None
72	Kyle Bronze	26	Male	Marketing Coordinator	Bachelor's	\$52,000	Good	Single	None
73	Liam Copper	35	Male	Software Engineer	Master's	\$81,000	Good	Married	None
74	Mia Iron	41	Female	Project Manager	Bachelor's	\$65,000	Fair	Married	None
75	Nathan Nickel	44	Male	Researcher	PhD	\$91,000	Good	Single	None
76	Olivia Zinc	31	Female	Product Manager	Master's	\$72,000	Good	Married	None
77	Peter Tin	42	Male	Operations Manager	Bachelor's	\$62,000	Fair	Married	None
78	Quinn Lead	29	Female	UX Designer	Bachelor's	\$59,000	Good	Single	None
79	Ryan Platinum	52	Male	Finance Analyst	Master's	\$88,000	Fair	Married	None
80	Sara Silver	38	Female	Business Development	Bachelor's	\$67,000	Good	Married	None
81	Tyler Gold	47	Male	Systems Administrator	Master's	\$79,000	Fair	Married	None
82	Uma Bronze	26	Female	Marketing Specialist	Bachelor's	\$53,000	Good	Single	None
83	Victor Copper	34	Male	Software Tester	Master's	\$80,000	Good	Married	None
84	Wendy Iron	40	Female	Quality Assurance	Bachelor's	\$60,000	Fair	Married	None
85	Xavier Nickel	43	Male	Business Analyst	PhD	\$92,000	Good	Single	None
86	Yara Zinc	30	Female	Product Designer	Master's	\$73,000	Good	Married	None
87	Zoe Tin	42	Female	Operations Manager	Bachelor's	\$63,000	Fair	Married	None
88	Adam Lead	29	Male	UX Researcher	Bachelor's	\$60,000	Good	Single	None
89	Bella Platinum	53	Female	Finance Director	Master's	\$89,000	Fair	Married	None
90	Carl Silver	38	Male	Business Development	Bachelor's	\$68,000	Good	Married	None
91	Diana Gold	47	Female	Systems Administrator	Master's	\$80,000	Fair	Married	None
92	Ethan Bronze	26	Male	Marketing Coordinator	Bachelor's	\$54,000	Good	Single	None
93	Fiona Copper	35	Female	Software Engineer	Master's	\$82,000	Good	Married	None
94	George Iron	41	Male	Project Manager	Bachelor's	\$66,000	Fair	Married	None
95	Hannah Nickel	44	Female	Researcher	PhD	\$93,000	Good	Single	None
96	Ian Zinc	31	Male	Product Manager	Master's	\$74,000	Good	Married	None
97	Julia Tin	42	Female	Operations Manager	Bachelor's	\$64,000	Fair	Married	None
98	Kyle Lead	29	Male	UX Designer	Bachelor's	\$61,000	Good	Single	None
99	Liam Platinum	52	Male	Finance Analyst	Master's	\$90,000	Fair	Married	None
100	Mia Silver	38	Female	Business Development	Bachelor's	\$69,000	Good	Married	None

Table 2: Summary of Data									
ID	Name	Age	Gender	Occupation	Education	Income	Health	Marital	Other
1	John Doe	35	Male	Software Engineer	Bachelor's	\$75,000	Good	Married	None
2	Jane Smith	28	Female	Marketing Manager	Master's	\$60,000	Good	Single	None
3	Mike Johnson	45	Male	Sales Representative	High School	\$40,000	Fair	Married	None
4	Sarah Lee	30	Female	Teacher	Bachelor's	\$50,000	Good	Married	None
5	David Brown	50	Male	Retired	Master's	\$30,000	Fair	Married	None
6	Emily White	25	Female	Student	Bachelor's	\$15,000	Good	Single	None
7	Chris Green	38	Male	Engineer	Master's	\$80,000	Good	Married	None
8	Alice Black	42	Female	Manager	Bachelor's	\$65,000	Fair	Married	None
9	Bob Gray	55	Male	Consultant	PhD	\$90,000	Good	Single	None
10	Anna Gold	32	Female	Designer	Bachelor's	\$55,000	Good	Married	None
11	Tom Silver	48	Male	Analyst	Master's	\$70,000	Fair	Married	None
12	Mia Bronze	27	Female	Writer	Bachelor's	\$45,000	Good	Single	None
13	Ben Copper	33	Male	Developer	Master's	\$78,000	Good	Married	None
14	Chloe Iron	39	Female	Project Manager	Bachelor's	\$62,000	Fair	Married	None
15	Leo Nickel	44	Male	Researcher	PhD	\$85,000	Good	Single	None
16	Sophia Zinc	31	Female	Product Manager	Master's	\$68,000	Good	Married	None
17	James Tin	41	Male	Operations Manager	Bachelor's	\$58,000	Fair	Married	None
18	Olivia Lead	29	Female	UX Designer	Bachelor's	\$52,000	Good	Single	None
19	William Platinum	52	Male	Finance Analyst	Master's	\$82,000	Fair	Married	None
20	Evelyn Silver	36	Female	Business Development	Bachelor's	\$60,000	Good	Married	None
21	Michael Gold	46	Male	Systems Administrator	Master's	\$72,000	Fair	Married	None
22	Grace Bronze	26	Female	Marketing Specialist	Bachelor's	\$48,000	Good	Single	None
23	Benjamin Copper	34	Male	Software Tester	Master's	\$76,000	Good	Married	None
24	Charlotte Iron	40	Female	Quality Assurance	Bachelor's	\$56,000	Fair	Married	None
25	Henry Nickel	43	Male	Business Analyst	PhD	\$88,000	Good	Single	None
26	Isabella Zinc	30	Female	Product Designer	Master's	\$66,000	Good	Married	None
27	Robert Tin	47	Male	Operations Director	Bachelor's	\$58,000	Fair	Married	None
28	Sarah Lead	28	Female	UX Researcher	Bachelor's	\$54,000	Good	Single	None
29	Thomas Platinum	51	Male	Finance Director	Master's	\$84,000	Fair	Married	None
30	Victoria Silver	37	Female	Business Manager	Bachelor's	\$61,000	Good	Married	None
31	William Gold	49	Male	Systems Manager	Master's	\$74,000	Fair	Married	None
32	Wendy Bronze	27	Female	Marketing Coordinator	Bachelor's	\$49,000	Good	Single	None
33	Xavier Copper	35	Male	Software Engineer	Master's	\$79,000	Good	Married	None
34	Yara Iron	41	Female	Project Manager	Bachelor's	\$63,000	Fair	Married	None
35	Zoe Nickel	44	Female	Researcher	PhD	\$86,000	Good	Single	None
36	Adam Zinc	31	Male	Product Manager	Master's	\$69,000	Good	Married	None
37	Bella Tin	42	Female	Operations Manager	Bachelor's	\$59,000	Fair	Married	None
38	Carl Lead	29	Male	UX Designer	Bachelor's	\$53,000	Good	Single	None
39	Diana Platinum	53	Female	Finance Analyst	Master's	\$83,000	Fair	Married	None
40	Ethan Silver	38	Male	Business Development	Bachelor's	\$62,000	Good	Married	None
41	Fiona Gold	47	Female	Systems Administrator	Master's	\$73,000	Fair	Married	None
42	George Bronze	26	Male	Marketing Specialist	Bachelor's	\$47,000	Good	Single	None
43	Hannah Copper	34	Female	Software Tester	Master's	\$77,000	Good	Married	None
44	Ian Iron	40	Male	Quality Assurance	Bachelor's	\$57,000	Fair	Married	None
45	Julia Nickel	43	Female	Business Analyst	PhD	\$87,000	Good	Single	None
46	Kyle Zinc	30	Male	Product Designer	Master's	\$67,000	Good	Married	None
47	Liam Tin	47	Male	Operations Director	Bachelor's	\$65,000	Fair	Married	None
48	Mia Lead	28	Female	UX Researcher	Bachelor's	\$55,000	Good	Single	None
49	Nathan Platinum	51	Male	Finance Director	Master's	\$85,000	Fair	Married	None
50	Olivia Silver	37	Female	Business Manager	Bachelor's	\$63,000	Good	Married	None
51	Peter Gold	49	Male	Systems Manager	Master's	\$75,000	Fair	Married	None
52	Quinn Bronze	27	Female	Marketing Coordinator	Bachelor's	\$50,000	Good	Single	None
53	Ryan Copper	35	Male	Software Engineer	Master's	\$80,000	Good	Married	None
54	Sara Iron	41	Female	Project Manager	Bachelor's	\$64,000	Fair	Married	None
55	Tyler Nickel	44	Male	Researcher	PhD	\$89,000	Good	Single	None
56	Uma Zinc	31	Female	Product Manager					

[illegible][illegible][illegible][illegible]

Financial Statement - Income Statement									
Account	Period	Revenue	Cost of Sales	Gross Profit	Operating Expenses	Operating Income	Interest Expense	Interest Income	Net Income
Revenue	2023	1000000							
Cost of Sales	2023		600000						
Gross Profit	2023			400000					
Operating Expenses	2023				250000				
Operating Income	2023					150000			
Interest Expense	2023						10000		
Interest Income	2023							5000	
Net Income	2023								145000
Revenue	2024	1100000							
Cost of Sales	2024		650000						
Gross Profit	2024			450000					
Operating Expenses	2024				270000				
Operating Income	2024					180000			
Interest Expense	2024						12000		
Interest Income	2024							6000	
Net Income	2024								174000
Revenue	2025	1200000							
Cost of Sales	2025		700000						
Gross Profit	2025			500000					
Operating Expenses	2025				290000				
Operating Income	2025					210000			
Interest Expense	2025						15000		
Interest Income	2025							7000	
Net Income	2025								202000
Revenue	2026	1300000							
Cost of Sales	2026		750000						
Gross Profit	2026			550000					
Operating Expenses	2026				310000				
Operating Income	2026					240000			
Interest Expense	2026						18000		
Interest Income	2026							8000	
Net Income	2026								230000
Revenue	2027	1400000							
Cost of Sales	2027		800000						
Gross Profit	2027			600000					
Operating Expenses	2027				330000				
Operating Income	2027					270000			
Interest Expense	2027						20000		
Interest Income	2027							9000	
Net Income	2027								259000
Revenue	2028	1500000							
Cost of Sales	2028		850000						
Gross Profit	2028			650000					
Operating Expenses	2028				350000				
Operating Income	2028					300000			
Interest Expense	2028						22000		
Interest Income	2028							10000	
Net Income	2028								288000
Revenue	2029	1600000							
Cost of Sales	2029		900000						
Gross Profit	2029			700000					
Operating Expenses	2029				370000				
Operating Income	2029					330000			
Interest Expense	2029						25000		
Interest Income	2029							11000	
Net Income	2029								316000
Revenue	2030	1700000							
Cost of Sales	2030		950000						
Gross Profit	2030			750000					
Operating Expenses	2030				390000				
Operating Income	2030					360000			
Interest Expense	2030						28000		
Interest Income	2030							12000	
Net Income	2030								348000
Revenue	2031	1800000							
Cost of Sales	2031		1000000						
Gross Profit	2031			800000					
Operating Expenses	2031				410000				
Operating Income	2031					390000			
Interest Expense	2031						30000		
Interest Income	2031							13000	
Net Income	2031								380000
Revenue	2032	1900000							
Cost of Sales	2032		1050000						
Gross Profit	2032			850000					
Operating Expenses	2032				430000				
Operating Income	2032					420000			
Interest Expense	2032						32000		
Interest Income	2032							14000	
Net Income	2032								412000
Revenue	2033	2000000							
Cost of Sales	2033		1100000						
Gross Profit	2033			900000					
Operating Expenses	2033				450000				
Operating Income	2033					450000			
Interest Expense	2033						35000		
Interest Income	2033							15000	
Net Income	2033								445000
Revenue	2034	2100000							
Cost of Sales	2034		1150000						
Gross Profit	2034			950000					
Operating Expenses	2034				470000				
Operating Income	2034					480000			
Interest Expense	2034						38000		
Interest Income	2034							16000	
Net Income	2034								478000
Revenue	2035	2200000							
Cost of Sales	2035		1200000						
Gross Profit	2035			1000000					
Operating Expenses	2035				490000				
Operating Income	2035					510000			
Interest Expense	2035						40000		
Interest Income	2035							17000	
Net Income	2035								511000
Revenue	2036	2300000							
Cost of Sales	2036		1250000						
Gross Profit	2036			1050000					
Operating Expenses	2036				510000				
Operating Income	2036					540000			
Interest Expense	2036						42000		
Interest Income	2036							18000	
Net Income	2036								544000
Revenue	2037	2400000							
Cost of Sales	2037		1300000						
Gross Profit	2037			1100000					
Operating Expenses	2037				530000				
Operating Income	2037					570000			
Interest Expense	2037						45000		
Interest Income	2037							19000	
Net Income	2037								577000
Revenue	2038	2500000							
Cost of Sales	2038		1350000						
Gross Profit	2038			1150000					
Operating Expenses	2038				550000				
Operating Income	2038					600000			
Interest Expense	2038						48000		
Interest Income	2038							20000	
Net Income	2038								610000
Revenue	2039	2600000							
Cost of Sales	2039		1400000						
Gross Profit	2039			1200000					
Operating Expenses	2039				570000				
Operating Income	2039					630000			
Interest Expense	2039						50000		
Interest Income	2039							21000	
Net Income	2039								643000
Revenue	2040	2700000							
Cost of Sales	2040		1450000						
Gross Profit	2040			1250000					
Operating Expenses	2040				590000				
Operating Income	2040					660000			
Interest Expense	2040						52000		
Interest Income	2040							22000	
Net Income	2040								676000
Revenue	2041	2800000							
Cost of Sales	2041		1500000						
Gross Profit	2041			1300000					
Operating Expenses	2041				610000				
Operating Income	2041					690000			
Interest Expense	2041						55000		
Interest Income	2041							23000	
Net Income	2041								709000
Revenue	2042	2900000							
Cost of Sales	2042		1550000						
Gross Profit	2042			1350000					
Operating Expenses	2042				630000				
Operating Income	2042					720000			
Interest Expense	2042						58000		
Interest Income	2042							24000	
Net Income	2042								742000
Revenue	2043	3000000							
Cost of Sales	2043		1600000						
Gross Profit	2043			1400000					
Operating Expenses	2043				650000				
Operating Income	2043					750000			
Interest Expense	2043						60000		
Interest Income	2043							25000	
Net Income	2043								775000
Revenue	2044	3100000							
Cost of Sales	2044		1650000						
Gross Profit	2044			1450000					
Operating Expenses	2044				670000				
Operating Income	2044					780000			
Interest Expense	2044						62000		
Interest Income	2044							26000	
Net Income	2044								808000
Revenue	2045	3200000							
Cost of Sales	2045		1700000						
Gross Profit	2045			1500000					
Operating Expenses	2045				690000				
Operating Income	2045					810000			
Interest Expense	2045						65000		
Interest Income	2045							27000	
Net Income	2045								841000
Revenue	2046	3300000							
Cost of Sales	2046		1750000						
Gross Profit	2046			1550000					
Operating Expenses	2046				710000				
Operating Income	2046					840000			
Interest Expense	2046						68000		
Interest Income	2046							28000	
Net Income	2046								874000
Revenue	2047	3400000							
Cost of Sales	2047		1800000						
Gross Profit	2047			1600000					
Operating Expenses	2047				730000				
Operating Income	2047					870000			
Interest Expense	2047						70000		
Interest Income	2047							29000	
Net Income	2047								907000
Revenue	2048	3500000							
Cost of Sales	2048		1850000						
Gross Profit	2048			1650000					

Project Overview											
General Information				Financial Data				Operational Metrics			
ID	Name	Status	Priority	Revenue	Cost	Profit	Margin	Units	Hours	Efficiency	Quality
001	Project A	Active	High	12000	8000	4000	33.3%	1500	120	85%	92%
002	Project B	On Hold	Medium	8500	6000	2500	29.4%	1000	80	78%	88%
003	Project C	Completed	Low	5000	3500	1500	30.0%	500	40	90%	95%
004	Project D	Pending	High	3000	2000	1000	33.3%	300	20	80%	85%
005	Project E	Active	Medium	7000	4500	2500	35.7%	800	60	82%	90%
006	Project F	On Hold	Low	4000	3000	1000	25.0%	400	30	75%	80%
007	Project G	Completed	High	9000	6500	2500	27.8%	1100	90	88%	93%
008	Project H	Pending	Medium	6000	4000	2000	33.3%	700	50	80%	85%
009	Project I	Active	Low	2000	1500	500	25.0%	200	15	70%	75%
010	Project J	On Hold	High	15000	10000	5000	33.3%	1800	150	85%	90%
011	Project K	Completed	Medium	3500	2500	1000	28.6%	400	30	80%	85%
012	Project L	Pending	Low	1000	700	300	30.0%	100	10	75%	80%
013	Project M	Active	High	18000	12000	6000	33.3%	2200	180	85%	90%
014	Project N	On Hold	Medium	7500	5000	2500	33.3%	900	70	80%	85%
015	Project O	Completed	Low	4500	3000	1500	33.3%	550	40	85%	90%
016	Project P	Pending	High	2500	1800	700	28.0%	250	20	75%	80%
017	Project Q	Active	Medium	6500	4000	2500	38.5%	750	55	82%	88%
018	Project R	On Hold	Low	3000	2200	800	26.7%	350	25	70%	75%
019	Project S	Completed	High	11000	7500	3500	31.8%	1300	100	88%	93%
020	Project T	Pending	Medium	5500	3800	1700	30.9%	650	45	78%	83%
021	Project U	Active	Low	2200	1600	600	27.3%	220	18	72%	78%
022	Project V	On Hold	High	16000	11000	5000	31.3%	1900	160	85%	90%
023	Project W	Completed	Medium	4000	2800	1200	30.0%	450	35	80%	85%
024	Project X	Pending	Low	1200	900	300	25.0%	120	10	70%	75%
025	Project Y	Active	High	20000	13000	7000	35.0%	2500	200	85%	90%
026	Project Z	On Hold	Medium	8000	5500	2500	31.3%	950	75	80%	85%
027	Project AA	Completed	Low	3000	2000	1000	33.3%	350	25	80%	85%
028	Project AB	Pending	High	1800	1300	500	27.8%	180	15	70%	75%
029	Project AC	Active	Medium	7000	4500	2500	35.7%	850	65	82%	88%
030	Project AD	On Hold	Low	2500	1800	700	28.0%	250	20	75%	80%
031	Project AE	Completed	High	14000	9000	5000	35.7%	1700	140	85%	90%
032	Project AF	Pending	Medium	6000	4000	2000	33.3%	700	50	80%	85%
033	Project AG	Active	Low	3500	2500	1000	28.6%	400	30	80%	85%
034	Project AH	On Hold	High	19000	12500	6500	34.2%	2300	185	85%	90%
035	Project AI	Completed	Medium	5000	3500	1500	30.0%	550	40	85%	90%
036	Project AJ	Pending	Low	1500	1100	400	26.7%	150	12	70%	75%
037	Project AK	Active	High	25000	16000	9000	36.0%	3000	240	85%	90%
038	Project AL	On Hold	Medium	9000	6000	3000	33.3%	1100	90	80%	85%
039	Project AM	Completed	Low	4000	2800	1200	30.0%	450	35	80%	85%
040	Project AN	Pending	High	1700	1200	500	29.4%	170	14	70%	75%
041	Project AO	Active	Medium	7500	5000	2500	33.3%	900	70	80%	85%
042	Project AP	On Hold	Low	3000	2200	800	26.7%	350	25	70%	75%
043	Project AQ	Completed	High	16000	10500	5500	34.4%	1900	155	85%	90%
044	Project AR	Pending	Medium	5500	3800	1700	30.9%	650	45	78%	83%
045	Project AS	Active	Low	2800	2000	800	28.6%	280	22	72%	78%
046	Project AT	On Hold	High	22000	14500	7500	34.1%	2700	210	85%	90%
047	Project AU	Completed	Medium	6000	4000	2000	33.3%	700	50	80%	85%
048	Project AV	Pending	Low	1800	1300	500	27.8%	180	15	70%	75%
049	Project AW	Active	High	30000	19000	11000	36.7%	3600	280	85%	90%
050	Project AX	On Hold	Medium	10000	6500	3500	35.0%	1200	100	80%	85%
051	Project AY	Completed	Low	4500	3000	1500	33.3%	550	40	85%	90%
052	Project AZ	Pending	High	2000	1500	500	25.0%	200	15	70%	75%
053	Project BA	Active	Medium	8000	5500	2500	31.3%	950	75	80%	85%
054	Project BB	On Hold	Low	3500	2500	1000	28.6%	400	30	80%	85%
055	Project BC	Completed	High	18000	11500	6500	36.1%	2200	170	85%	90%
056	Project BD	Pending	Medium	6500	4500	2000	30.8%	750	55	80%	85%
057	Project BE	Active	Low	4000	2800	1200	30.0%	450	35	80%	85%
058	Project BF	On Hold	High	25000	16000	9000	36.0%	3000	240	85%	90%
059	Project BG	Completed	Medium	7000	5000	2000	28.6%	800	60	80%	85%
060	Project BH	Pending	Low	1600	1100	500	31.3%	160	12	70%	75%
061	Project BI	Active	High	35000	22000	13000	37.1%	4200	330	85%	90%
062	Project BJ	On Hold	Medium	11000	7500	3500	31.8%	1300	100	88%	93%
063	Project BK	Completed	Low	5000	3500	1500	30.0%	550	40	85%	90%
064	Project BL	Pending	High	2200	1600	600	27.3%	220	18	72%	78%
065	Project BM	Active	Medium	9000	6000	3000	33.3%	1100	90	80%	85%
066	Project BN	On Hold	Low	4000	3000	1000	25.0%	400	30	75%	80%
067	Project BO	Completed	High	19000	12000	7000	36.8%	2300	180	85%	90%
068	Project BP	Pending	Medium	7500	5000	2500	33.3%	900	70	80%	85%
069	Project BQ	Active	Low	5000	3500	1500	30.0%	550	40	85%	90%
070	Project BR	On Hold	High	28000	18000	10000	35.7%	3400	270	85%	90%
071	Project BS	Completed	Medium	8500	6000	2500	29.4%	1000	80	78%	88%
072	Project BT	Pending	Low	2000	1500	500	25.0%	200	15	70%	75%
073	Project BU	Active	High	40000	25000	15000	37.5%	4800	380	85%	90%
074	Project BV	On Hold	Medium	12000	8000	4000	33.3%	1400	110	80%	85%
075	Project BW	Completed	Low	6000	4000	2000	33.3%	700	50	80%	85%
076	Project BX	Pending	High	3000	2000	1000	33.3%	300	20	80%	85%
077	Project BY	Active	Medium	10000	7000	3000	30.0%	1200	100	80%	85%
078	Project BZ	On Hold	Low	4500	3000	1500	33.3%	550	40	85%	90%
079	Project CA	Completed	High	21000	13500	7500	35.7%	2500	200	85%	90%
080	Project CB	Pending	Medium	8000	5500	2500	31.3%	950	75	80%	85%
081	Project CC	Active	Low	5500	3800	1700	30.9%	650	45	78%	83%
082	Project CD	On Hold	High	32000	20000	12000	37.5%	3800	300	85%	90%
083	Project CE	Completed	Medium	9500	6500	3000	31.6%	1100	90	80%	85%
084	Project CF	Pending	Low	2500	1800	700	28.0%	250	20	75%	80%
085	Project CG	Active	High	45000	28000	17000	37.8%	5400	420	85%	90%
086	Project CH	On Hold	Medium	13000	8500	4500	34.6%	1500	120	80%	85%
087	Project CI	Completed	Low	7000	5000	2000	28.6%	800	60	80%	85%
088	Project CJ	Pending	High	3500	2500	1000	28.6%	400	30	80%	85%
089	Project CK	Active	Medium	11000	7500	3500	31.8%	1300	100	88%	93%
090	Project CL	On Hold	Low	5000	3500	1500	30.0%	550	40	85%	90%
091	Project CM	Completed	High	23000	14500	8500	36.9%	2700	210	85%	90%
092	Project CN	Pending	Medium	9000	6000	3000	33.3%	1100	90	80%	85%
093	Project CO	Active	Low	6000	4000	2000	33.3%	700	50	80%	85%
094	Project CP	On Hold	High	38000	23000	15000	39.5%	4500	350	85%	90%
095	Project CQ	Completed	Medium	10500	7000	3500	33.3%	1250	100	80%	85%
096	Project CR	Pending	Low	3000	2200	800	26.7%	350	25	70%	75%
097	Project CS	Active	High	50000	30000	20000	40.0%	6000	480	85%	90%
098	Project CT	On Hold	Medium	14000	9000	5000	35.7%	1700	140	85%	90%
099	Project CU	Completed	Low	8000	5500	2500	31.3%	950	75	80%	85%
100	Project CV	Pending	High	4000	3000	1000	25.0%	400	30	75%	80%

Project Overview											
General Information				Financial Data				Operational Metrics			
ID	Name	Status	Priority	Revenue	Cost	Profit	Margin	Units	Hours	Efficiency	Quality
001	Project A	Active	High	12000	8000	4000	33.3%	1500	120	85%	92%
002	Project B	On Hold	Medium	8500	6000	2500	29.4%	1000	80	78%	88%
003	Project C	Completed	Low	5000	3500	1500	30.0%	500	40	90%	95%
004	Project D	Pending	High	3000	2000	1000	33.3%	300	20	80%	85%
005	Project E	Active	Medium	7000	4500	2500	35.7%	800	60	82%	90%
006	Project F	On Hold	Low	4000	3000	1000	25.0%	400	30	75%	80%
007	Project G	Completed	High	9000	6500	2500	27.8%	1100	90	88%	93%
008	Project H	Pending	Medium	6000	4000	2000	33.3%	700	50	80%	85%
009	Project I	Active	Low	2000	1500	500	25.0%	200	15	70%	75%
010	Project J	On Hold	High	15000	10000	5000	33.3%	1800	150	85%	90%
011	Project K	Completed	Medium	3500	2500	1000	28.6%	400	30	80%	85%
012	Project L	Pending	Low	1000	700	300	30.0%	100	10	75%	80%
013	Project M	Active	High	18000	12000	6000	33.3%	2200	180	85%	90%
014	Project N	On Hold	Medium	7500	5000	2500	33.3%	900	70	80%	85%
015	Project O	Completed	Low	4500	3000	1500	33.3%	550	40	85%	90%
016	Project P	Pending	High	2500	1800	700	28.0%	250	20	75%	80%
017	Project Q	Active	Medium	6500	4000	2500	38.5%	750	55	82%	88%
018	Project R	On Hold	Low	3000	2200	800	26.7%	350	25	70%	75%
019	Project S	Completed	High	11000	7500	3500	31.8%	1300	100	88%	93%
020	Project T	Pending	Medium	5500	3800	1700	30.9%	650	45	78%	83%
021	Project U	Active	Low								

ภาคผนวก ข-8

เอกสารรับรองบุคลากรด้านสิ่งแวดล้อม

ที่ อก ๐๓๑๓/ ๑๖๘๓๖



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๘ ธันวาคม ๒๕๖๖

เรื่อง หนังสือรับแจ้งการมีบุคลากรด้านสิ่งแวดล้อมประจำโรงงาน

เรียน ผู้รับใบอนุญาตประกอบกิจการโรงงาน บริษัท กัลป์ เอ็นซี จำกัด

อ้างถึง คำขอเลขที่ ๑๕๕๔ ลงรับวันที่ ๖ ธันวาคม ๒๕๖๖

ตามคำขอที่อ้างถึง ท่านแจ้งการมีบุคลากรด้านสิ่งแวดล้อมประจำโรงงาน ของ โรงไฟฟ้านนทรี ทะเบียนโรงงานเลขที่ ๔๐๒๕๐๐๐๑๐๒๕๕๕๕ (๓-๘๘(๒)-๑๐/๕๕ ปจ) ประกอบกิจการผลิตพลังงานไฟฟ้าจาก เชื้อเพลิงก๊าซธรรมชาติ ขนาดกำลังการผลิต ๑๔๑ เมกะวัตต์ เพิ่มประเภทหรือชนิดของโรงงานลำดับที่ ๑๐๒ ประกอบกิจการเกี่ยวกับการผลิตและหรือจำหน่ายไอน้ำ ตั้งอยู่ ณ เลขที่ ๔๑๘ หมู่ที่ ๑ ตำบลนนทรี อำเภอบินทร์บุรี จังหวัดปทุมธานี โทรศัพท์ ๐ ๓๗๒๑ ๘๖๓๕ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว รับแจ้งการมีบุคลากรด้านสิ่งแวดล้อมประจำโรงงาน และให้ท่านยื่นคำขอแจ้งการมีบุคลากรด้านสิ่งแวดล้อมประจำโรงงานครั้งต่อไป ภายในวันที่ ๒๑ ธันวาคม ๒๕๖๙ โดยมีบุคลากรด้านสิ่งแวดล้อมประจำโรงงาน ดังนี้

ผู้จัดการสิ่งแวดล้อม			นายพนพล เงินโสม		
ลำดับ	ผู้ควบคุมระบบบำบัด	เลขทะเบียน	มลพิษน้ำ	มลพิษอากาศ	มลพิษกากอุตสาหกรรม
๑	นายวรุฒม์ นมะตร์	๐๒๐-๕๕-๐๐๑๓๕		✓	
ลำดับ	ผู้ปฏิบัติงานประจำระบบบำบัด		มลพิษน้ำ	มลพิษอากาศ	มลพิษกากอุตสาหกรรม
๑	นายประยูร สุดตา			✓	
๒	นายพนพฤทธิ์ พุกเพชร			✓	
๓	นายธีรพงษ์ สุกุลงาม			✓	

หมายเหตุ ๑. การแจ้งการมี/ยกเลิก/เพิ่มเติม/เปลี่ยนแปลง บุคลากรด้านสิ่งแวดล้อมประจำโรงงาน ต้องส่งหนังสือฉบับนี้ด้วย
๒. ยกเลิกหนังสือรับแจ้งการมีบุคลากรด้านสิ่งแวดล้อมประจำโรงงาน ที่ อก ๐๓๑๓/๑๓๕๕๑ ลงวันที่ ๓๐ ธันวาคม ๒๕๖๔

จึงเรียนมาเพื่อโปรดทราบ

บริษัท กัลป์ เอ็นซี จำกัด	
วันที่ 20/12/23	เวลา 15.10 น.
เลขที่เอกสาร GNC -I- P- 1223 - 102	
ผู้รับ	

ขอแสดงความนับถือ

(นางสาวปัทมวรรณ คุณประเสริฐ)
ผู้อำนวยการกองส่งเสริมเทคโนโลยีสิ่งแวดล้อมโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองส่งเสริมเทคโนโลยีสิ่งแวดล้อมโรงงาน

กลุ่มกำกับบุคลากรด้านสิ่งแวดล้อมประจำโรงงาน

โทรศัพท์ ๐ ๒๔๓๐ ๖๓๑๕ ต่อ ๒๔๐๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๕ ต่อ ๒๔๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



ภาคผนวก ข-9

กิจกรรมการมีส่วนร่วมกับชุมชนและกิจกรรมชุมชนสัมพันธ์

กิจกรรมปลูกต้นไม้ในชุมชนรอบโครงการสวนอุตสาหกรรมเครือสหพัฒน์ กบินทร์บุรี 16 สิงหาคม 2566



การเข้าเยี่ยมชมโครงการ ของ EIA Committing Meeting ครั้งที่ 3/2566 วันที่ 28 Aug 2023



การปฏิบัติงานด้านกิจกรรมเพื่อสังคม (CSR) ระหว่างเดือนตุลาคม-ธันวาคม 2566



วันที่ 2 พฤศจิกายน 2566 บริจาคน้ำดื่มให้กับ
วัด วัดโพธิทองหนองดุม



วันที่ 29 พฤศจิกายน 2566 บริจาคน้ำดื่มให้กับชุมชน
ในงานทำบุญวันวิสาขบูชาเกี่ยวข้าว



การปฏิบัติงานด้านกิจกรรมเพื่อสังคม (CSR) ระหว่างเดือนตุลาคม-ธันวาคม 2566



วันที่ 8 ธันวาคม 2566 ร่วมปล่อยพันธุ์ปลา ศูนย์การเรียนรู้ชุมชนบ้านหนองเอี่ยน - แควหนุมาน



การปฏิบัติงานด้านกิจกรรมเพื่อสังคม (CSR) ระหว่างเดือนตุลาคม-ธันวาคม 2566



วันที่ 8 ธันวาคม 2566 ร่วมปล่อยพันธุ์ปลา ศูนย์การเรียนรู้ชุมชนบ้านหนองเอี่ยน - แควหนุมาน



การปฏิบัติงานด้านกิจกรรมเพื่อสังคม (CSR) ระหว่างเดือนตุลาคม-ธันวาคม 2566



วันที่ 19-22 ธันวาคม 2566 มอบน้ำดื่มเพื่อบริการประชาชน ณ จุดบริการประชาชนช่วงเทศกาลปีใหม่ 2024

สถานีตำรวจกบินทร์บุรี



หมวดการทางกบินทร์บุรี



การปฏิบัติงานด้านกิจกรรมเพื่อสังคม (CSR) ระหว่างเดือนตุลาคม-ธันวาคม 2566



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Gulf MP Company Limited 12SPP Project

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Requisition No: FXGB001
EPJ-GNC-002-M-121-209 [A]
System description and control philosophy

FOR APPROVAL

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DESCRIPTION OF EQUIPMENT

When reading this chapter please refer to:

- Piping and Instrument Diagram **EPJ-GNC-002-M-121-211** (364.SC.001)
- Main layout drawings **EPJ-GNC-002-M-121-224** (364.OG.001)
- Mechanical interface list **EPJ-GNC-002-M-121-241** (364TS-4-05)
- Electrical interface list **EPJ-GNC-002-M-121-226** (364TS-4-06)
- Data sheet **EPJ-GNC-002-M-121-212** (364TS-4-12)

Main purpose of Gas Compressor Package (GCP) is to provide compressed gas to the consumers downstream of GCP keeping stable parameters of gas. In order to realize it GCP is equipped with all required and necessary systems accordingly contractual obligations and technical requirements for such kind of equipment and represents as a skid with mounted equipment GCP.

Model of functioning of GCP is following:

Inlet gas line

Through the external connection point on skid edge gas comes into GCP inlet gas line.

Before to get into compressor gas goes through the inlet hand valve HV 100, pneumatically actuate valve SV131-2, filling valve SV169-2, inlet gas filter FS175, check valve RV108, thermo compensator EJ109 and inlet filter strainer FS110. Inlet gas line is also equipped by the visual pressure gauge PI103, transmitting pressure PIT105 and temperature TIT107 transmitters in order to control conditions of the gas in the line.

Compressor

After inlet line, gas goes to the compressor K111 which is driven by the motor M112 and which are coupled by coupling C177. Coupling is covered in order not to hurt maintenance personal during the operation of GCP. Compressor is oil flooded screw compressor and it is equipped with following instruments:

- Slide position transmitter GI 168
- Vibration transmitter YIZ 111-13

Motor is equipped with the following instruments and auxiliaries:

- Temperature transmitters of winding TIA 112-5, TIA 112-6, TIA 112-7

Inside compressor gas is mixed with the oil, compresses and goes to outlet line.

Outlet gas-oil line

Mixture of compressed gas and oil leaves compressor and goes to oil separator B200 via thermo compensator EJ117. Line between compressor and oil separator is equipped by the visual (pressure gauge PI115), and transmitting (pressure transmitter PIT124, temperature transmitter TIT116 and pressure transmitter PIT113-I, II, III and temperature transmitters TIT114-I, II, III) instruments to control mixture conditions. Oil separator represents as vessel where under the action of gravity most of the oil is separating from the mixture and remain in separator which also functions as oil tank. On the top part of oil separator integrated coalescing filter cartridges FSE 120-A going through which gas is filtering from the oil in vapour phase. Oil separator is equipped by the following instruments and auxiliaries:

- Visual oil level meter LI 202 and oil level transmitter LIA 210-1
- Differential pressure transmitter for controlling of the dirtiness of the coalescent cartridges PDIA 120-1
- Pressure safety valve PSV 138 connected with the vent line tracked to the skid edge
- Drain and filling line with hand valve HV 220

Separated in coalescent cartridges oil through the orifices FO120-3, goes to the inlet line of the GCP under the action of different pressure between inlet and outlet lines.

Gas outlet line

Separated gas goes further to the gas cooler W119 which represented and shell-tube heat exchanger, where it is cooled by cooling water in order to keep required temperature of gas, measured by temperature transmitter TIT125. Then on the second stage of separation (gas filters FS 122 and FS121 which are represented as vertical vessel with integrated filter cartridges) remaining part of vaporized is separating from the gas and directing through the visual glasses FG 122-4 and FG 121-4 and check valves RV 122-5 and RV 121-5 to the inlet line of the GCP under the action of different pressure between inlet and outlet lines. In order to control conditions of filter cartridges, gas filter is equipped by differential pressure

transmitter PDIA 122-1 and PDIA 121-1. After filtration oil contamination is less than 0,5 ppm. After second stage of filtration gas goes through the check valve RV129, pneumatically actuated outlet valve SV130-2 and outlet hand valve HV 148 to the external connection point on the skid edge. In case of need to vent gas there is a branch pipe line with the hand valve HV 135-3 and pneumatically actuated vent valve SV135-2 which goes to the vent line from safety valve of the package. HV 135-3 is used for the maintenance purposes and normally closed in operations.

Oil line

Oil separated in oil separator B200 under the action of outlet pressure goes to the oil heat exchanger W203. Cooled oil goes to oil filter FS 206 represented as two vertical 100% flow vessels with filter cartridges FSE 206 connected with each other by three way valve in order to let GCP continue operation with one dirtied filter. Level of dirtiness of the filter cartridge is controlled by differential pressure transmitter PDIA 206-1 connected to the common lines of the oil filter

After the filtration, the oil line goes to the oil pump P 214-2. In order to keep required pressure difference between outlet pressure of gas and oil mixture and oil pressure, an hydraulically actuated pressure control valve PCV 226 is installed on the oil system. Valve is bypassing oil overflow to the from the outlet line of the pump to the inlet line. In order to prevent unstable operation of the pump during the start of oil pump, oil system is equipped by the line with check valve RV 214-4 installed in order to pass oil to the outlet line of the pump. Oil goes to slide control regulation valve and to the chambers of compressor that require high pressure of the oil to be injected (bearings, mechanical seal etc.). Line between the fine filters and compressor is equipped with the following instruments:

- Oil pressure transmitters PIT 205

Cooling line

In order to cool down oil in oil heat exchanger W 203 and gas in gas heat exchanger W119 there is a liquid cooling line implemented in the GCP. This is open loop line with the inlet and outlet external connections on the skid edge. Inlet cooling line is equipped by the hand shut off valve HV 418-2 and temperature gauge TI 401. Outlet cooling line after the oil heat exchanger W 203 is equipped by the temperature gauge TI 402

Outlet cooling line after the gas heat exchanger W 119 is equipped by the temperature gauge TI 403 and controlled by the control valve TCV440-2 that is regulating the flow of cooling water. After mixing of two cooling water outlet lines, the resulting line goes through hand valve HV418-1 to the skid edge. Cooling down the cooling media is in customer scope as well as cooling water pumping and control of cooling media temperature and/or pressure.

Capacity regulation system

Regulation concept of the project is to keep stable given outlet pressure set point. In order to follow it there are two sub-systems implemented:

- Slide control valve is a hydraulic valve inside the compressor driven by the high pressure oil. This valve changes internal volume of the compression chamber that allows regulating capacity in range between 10 and 100%. Slide is operated by the slide control system FCV 270-1 and FCV 270-2 that consist of solenoid valves that regulate the flow of the oil to move compressor to load or unload direction.
- Pressure control pneumatic valves PCV 123 is connected to outlet line of the GCP with inlet line and provides bypass of the gas from outlet to inlet and regulation in range between 0 and 10% during the operation. However, PCV 123 valve is calculated and designed to provide regulation in full range of capacity (0...100%).

Instrument air line

Most of the actuated valves of the GCP are instrument air actuated. Instrument air line connection point is situated on the skid edge. Further compressed instrument air goes through filter FS504 and pressure transmitters PIT501-I, II, III to the consumers. On each

line there are sets of solenoid valves (MV) that are actuated by the electricity and opening the air flow to the actuator of actuated technological valves.

Enclosure systems

GCP is equipped by the Gas detection system with three gas sensors DAZ 307-1, DAZ 307-2, DAZ 307-3. Gas detectors are set for two set points – 10% LEL and 20% LEL. In case if any detector will recognize 10% LEL, alarm signal will be generated on PLC. In case if any detector will recognize 20% LEL, GCP will be automatically shutted down.

Electrical connections and control panel

In order to organize normal operation of GCP, external electrical connections must be organized:

- Main motor power supply. Main motor must be connected with Medium Voltage Switch Gear (MVSG) by EPC Contractor's cable directly in motor junction box. Pass through the enclosure shall be made through the special Ex-proof cable rack foreseen in enclosure wall (in scope of Enerproject).
- 400 V auxiliary equipment power supply cables are connected by customer directly at the 400 volts terminals of each equipment's (Lube oil pump, Ventilation Fan, Motor heater) while the 400V MCC system is mounted in the PLC cubicle

Control cables are required for the connection of GCP with MVSG and supervision system:

- MVSG must be connected with control cubicle in order to let GCP PLC to interact with main motor and have possibility to proceed with stop sequence in correct way in case of emergency.
- Bus line between packages in order to provide auto start option for compressor un stand by in case of operating compressor will be shut down. Cable is in EPJ scope.
- Signals with supervision are required to have possibility for remote operation of GCP by hard-wire lines. Bus connections with supervision is also foreseen and made in order to let customer current information about working parameters, conditions and active alarm and emergency signals.

GCP is fully automatized and able to keep required operating conditions and follow foreseen operating sequences including start and stop without external intervention.

Measured values from field instruments could generate Alarm (AL) or Emergency (EM) signals on Programmable Logic Controller (PLC) of GCP in order to keep safety operation of the plant. Control cubicle is equipped with HMI for the local control of operation by the maintenance personnel.

Local panel is provided with followings devices:

- Start push button
- Stop push button
- Emergency stop push button
- Local / remote operation mode switch
- Emergency and alarm lights
- Buzzer

DETAILED DESCRIPTIONS OF EQUIPMENT SYSTEMS

Oil injected type screw compressor with slide control

Screw compressors K111 are oil injected dual rotor positive displacement machines with split casing. Rotors are dynamically balanced and standard foreseen from a balancing drum in order to reduce axial thrust. To prevent gas leakage stationary pressure-balanced mechanical seal are provided.

Main characteristic:

- High efficiency due to optimum rotor profile configuration
- High efficiency in a wide range thanks to a capacity control slide
- Long life and low maintenance requirements due to small number of rotating parts
- Low noise level and vibration free running thanks to low rotor speeds and oil injection

Main drive motor

Main drive motor M112 is a self-ventilated medium-voltage three-phase asynchronous drive with a cylindrical shaft end and feather key way. The shaft with the end shield on both ends or with the inner bearing cap forms a flameproof shaft gap. The motor is suitable for continuous operation in ex-proof execution.

Mechanical coupling

Power from main drive motor to compressor, will be transmitted by a mechanical coupling C177.

Oil system

The lube oil system of the compressor package is a closed loop system. The main oil injection port feeds the rotors directly with smaller lines feeding various points on the machine for seals and bearings. Once the oil is injected it will pass through the compressor K111 where it combines with the gas. The gas / oil mixture is then discharged out of the compressor. Injected oil is removed from the gas downstream of the compressor by means

of an oil separator FS120/B200. The oil separator also acts as a reservoir for the lube oil, the oil flows from the bottom of the separator, through an oil cooler W203 and oil filters FS206 and then back to the compressor. Part of the oil is after the oil filter directed to the oil pump P214-2 which ensures proper oil supply to the compressor at all times and is required for the hydraulic device of the capacity control.

Main components:

- oil tank with oil gas separator FS120/B200
- oil cooler W203
- Duplex oil filter (FS206-I, II)
- 100% oil pump screw type with magnetic coupling P214-2

Compressor gas line

The inlet gas line can be isolated by means of a hand ball valve HV100 from here the gas is fed through a standard installed strainer in order to remove large dirt particles.

Inlet line consists of:

- hand ball valve HV100
- actuated inlet valve SV131-2
- check valve RV108
- compressor inlet strainer FS110

The high pressure gas is fed through the oil separator and is then taken through a second stage coalescent filter and then taken off the skid for connection to the field piping.

Outlet consists of:

- oil/gas separator with integrated stages coalescent filter FS120/B200
- pressure relief valve PSV138
- 2nd stage coalescent filters FS121/FS122
- hand ball valve HV148

- check valve RV129
- actuated outlet valve SV130-2

Cooling system water

Demineralized water for cooling is provided by the customer up to the connections flanges of the package. The cooling system includes two shell and tube heat exchangers built for efficient heat transfer, one for the oil W203, other is for gas W119. The heat exchangers consist of a series of tubes. Water flows through the tubes and the medium runs over the tubes in order to be cooled.

Gas Detection

The gas detection system is designed to continuously monitor the explosive level of the atmosphere within the enclosure.

The operating personnel is warned of gas through acoustical and visual signals if the gas concentration in the enclosure increases above pre-selected levels, which are set as per lower explosive limit for warning and emergency shutdown.

Main components:

- 3 gas sensors DAZ307 installed inside the enclosure (2 above the compressor area, 1 around the ventilation outlet air flow area).
- Central analysis station with gas concentration display

Base Frame

The compressor system and its auxiliaries are installed on a self-supporting base frame. The base frame is composed by two parts. The main frame, fully welded, acts as a tight retention basin which, in case of failure of the oil or water systems, can hold the liquids leak within the enclosure. The secondary frame, mounted on the main frame by means of spring pads, holds the compressor and the driving motor and avoid any vibration transmission to the main frame and therefore to the foundation.

- welded base frame with oil collecting shell
- spring pad mounted compressor frame

- lifting eyes at each corner

Sound proof enclosure

The partial enclosure covering most noise-generating components is designed in order to allow easy maintenance on the main components and is built as a classified area.

Main characteristic:

- steel profile frame
- attenuated sound pressure level

Enclosure is provided with a removable roof located over the compressor, in order to permit an easy maintenance from the top.

Vibration monitoring device

The system by mean of accelerometer sensors, monitor the vibration behaviour of the screw compressor and motor.

Main components:

- 1 (YIZ111-13) vibration sensor accelerometer type with embedded electronics mounted on casing
- vibration monitor device is in customer scope and is external. Vibration sensor shall be connected with Bently Nevada MMS.

Control panel

GCP has included to the scope of supply control panel. Control panel control the operation of whole GCP and includes following functions:

- automatic and real-time (remote) control of the start-up, shutdown and ramping unit equipment up to the optimal operation mode and its maintenance;
- automatic control of the compressor capacity depending on the pressure in the outlet pipeline of the GCP
- remote start-up and stop;
- safety as technological and electrical components of the unit operation;

- issuing control commands to actuators and their execution for the transfer of the compression unit equipment in fault-free condition;
- continuous monitoring of main operating conditions and parameters;
- time synchronization between the system components;
- control and monitoring of the unit parameters from the local control panel and DCS;
- keep the liquid level in the filters, separators, oil separator within set-points;
- controlling the temperature, pressure and gas flow at the unit outlet;
- regulation of pressure, flow and temperature of the oil in the oil system;
- integration and output of information in the DCS by standard protocol
- indicating operating hours of main motor and lube oil pump motor
- indication of open/closed, running/stopped positions of equipment of compressor package.

OPERATING CASES

GCP start up and recirculation

Any GCP can be started individually at any time regardless the Turbine operation and related load condition. The unit simply remains in operation recirculating the Gas through the By-Pass line integrated on each skid.

GT Start-up and Operation

The GCP can be started by operator in local or remote mode. This applies to all units.

Stand-By Compressor

The remaining GCP, as long as it is selected to Remote mode switches automatically to Stand-by mode. Stand-by GCP will start automatically only in case of running compressor trips or any alarm will appear. Normal Start of the Stand-by unit is initiated by hardwire signals from DCS.

GT Trip, load variation

If GT trips (even at full load), then none of the gas compressors need to be tripped, as the compressed gas is immediately by-passed through the by-pass line. The opening of the by-pass valve is triggered by the pressure increase driven by the sudden decrease of the Gas flow.

If GT tripped, then GCP will switch automatically to by-pass mode and remain ready to take load as soon as required by the GT re-start. By-pass mode does not require any signal. In case if pressure on outlet is high Compressor package will automatically move slide to the minimal position, in case if this would not be enough (i.e. zero flow) bypass valve will open automatically and compressor will bypass all the gas through itself.

OPERATION MODES

The mode of operation can be selected by the operator as Remote/Local on the HMI panel for each Gas compressor.

Local mode

In local mode of operation, gas compressor can be started individually via Local Start command. Also each gas compressor can be individually stopped using local Stop command.

Remote mode

The remote mode of operation allows Remote start from DCS. Once the local selector is positioned to Remote, the gas compressor perform automatically a preparation sequence switching the unit to Stand-By mode where the compressor is pressurized at Gas inlet pressure and the lube oil Pump is set in operation if temperature is lower than set point or slide is not on minimum position. As soon as temperature will be heated to required set point or/and slide will reach minimum position, pump will be stopped automatically. In this mode, the operator can start or stop any gas compressor at any time.

CONTROL PHILOSOPHY

Concept

During operation the control is performed by the PLC of each compressor monitoring the Pressure at the outlet vs the specific pressure Set point set on GCP HMI.

Any turbine flow variation is followed by a corresponding pressure variation which is adjusted by the Slide Valve

Ready to Start

Fuel gas compressor is in normal condition with all start permissives met.

When all the start permissives are satisfied, the system is now ready to start. By pressing the Start button on the Local Control Panel, or by Remote signal (mode have to be selected using the selector switch on the HMI [Local/ Remote mode selection for each compressor]).

Start-up Sequence

Before the system can be started, a pre start sequence must comply with the first level check of start sequence. All conditions mentioned below must be achieved in order to start the fuel gas compressor

Main equipment's initial position

Gas Inlet isolation valve (SV131-2) is closed

Gas filling valve (SV169-2) is closed

Gas outlet isolation valve (SV130-2) is closed

Recycle control valve (PCV123) is opened

Compressor motor (M112) is off position

Compressor (K111) is off position with slide valve regulation at minimum load

Gas Filling

Gas Inlet isolation bypass valve (SV169-2) is opened and gas filling the GCP until inlet pressure set point will be reached
Gas outlet isolation valve (SV130-2) is opened
Filling valve is maintained open until PIT105 pressure measurement reaches its Set Point

System start up

Gas Inlet isolation valve (SV131-2) is opened
Gas Compressor motor (M112) is started
Gas Compressor (K111) is started
Gas Inlet isolation bypass valve (SV169-2) is closed
Motor M112 and Compressor K111 are started
As soon as M112 reaches the nominal speed, the compressor slide control (figure 1) increases the load while the recycle control valves PCV123 is maintained open.
The pressure set point is achieved and controlled by close loop pressure control of the slide.
The gas stream, recirculating through the recycle control valve PCV123 is ready to supply the fuel gas to the Gas Turbine.

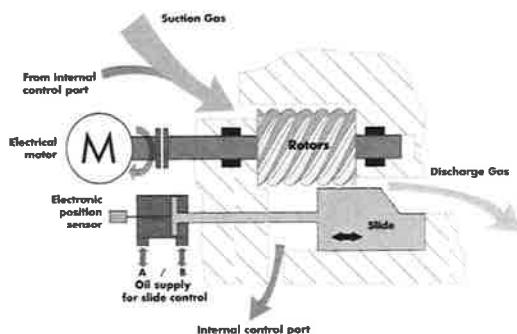


Figure 1

Gas Turbine light-off

At Gas Turbine light-off, the gas flow demand initially decrease the pressure inside the GCP line, the by-pass line PCV123 is closed while the compressor slide controller increase the load in order to maintain the pressure set point

Gas Turbine operation

During the gas turbine operation, compressor will be running and gas supply fuel gas to the Gas turbine the recycle control valve PCV123 will be in closed position. Any Gas Turbine flow demand variation affects the GCP pressure which is monitored by the PLC acting at the slide.

Gas Turbine-Stops

In case customer needs to stop the Gas Turbine temporarily, the presence of the by-pass line helps to avoid the immediate shut-down of the FGC that can remain ready to supply gas at any time. By-pass line is shown on P&ID and it is a line connecting outlet line and inlet line with pneumatically actuated valve PCV 123. This valve is needed when compressor operates at low capacity – 0...10% of nominal flow. When capacity is low, PLC automatically will open and regulate position of the by-pass valve. In this case part of the gas will be by-passed from outlet to inlet gas line that will reduce flow going to the customer even till 0% when needed. Gas outlet isolation valve SV130-2 remains open.

By-Pass mode

As long as sufficient water cooling is provided, the unit can be operated unlimited in By-Pass configuration.

During start-up sequence (waiting for Gas Turbine start-up) or after a Gas Turbine stop (waiting for GT re-start).

Gas Inlet isolation valve (SV131-2) is opened
Gas outlet isolation valve (SV130-2) is opened

Bypass automatic pressure control valve (PCV123) is opened

Compressor motor (M112) is on

Compressor (K111) is running with slide valve regulation at minimum load

During this mode gas flows through the by-pass valve PCV123 instead of going to the customer side. This allow compressor unit to operate with no-load and be ready for start working on load at any moment when turbine will be ready for gas consumption.

Compressor Shutdown (STOP) Sequence

The shutdown sequence is activated once “Stop” signal is sent by Local Control Panel or REMOTE STOP unlatched only.

There are two shutdown scenarios:

1. Compressor shutdown sequence for normal mode.
2. Compressor protective trip shutdown.

Compressor Shutdown Sequence for NORMAL Mode

When Stop –button is pushed, the following shutdown sequences are executed:

- Slide valve is forced to move to minimum position
- After slide reach minimum position or after 30 seconds after this command Main motor and pumps are stopped and vent valve and by-pass valve are opened.
- Enclosure fan will run till required temperature in enclosure is reached.

Compressor protective trip shutdown

When Emergency Stop –button is pushed or PLC generated emergency activated, the following shutdown sequences are executed:

- Main motor and pumps are stopped immediately and vent valve and by-pass valve are opened.

Status Indications & Compressor Alarms

All the analog and digital measurements of compressor package will be monitored in the HMI locating at the PLC panel. The GCP (Start up/shut down) and monitoring will executed from the HMI. The Signal that Trip the compressor are listed in the related Document “BIC2-TD-CK0402 - PLC communication address list”.

The different type of alarms such as low low, low, high , high high are configured in the PLC as per signal list Document. The alarms set points are indicated in the signal list. During the plant operation the alarms will appear in the HMI as per the priority of the alarm Usually the alarms are configured in two types, one is advisory alarms i.e low, high and second one is critical alarms these are distinct by different colour in HMI .Also the field signals such as transmitters are giving the alarm signals in HMI and the trip signals also initiated to start & stop the equipment’s as per the plant “operation flow chart”.

The alarms are initiated from field as described at below,

- 1) Alarm signal are generated by dry contact from field transmitter.
- 2) By comparing transmitter readings with given set point at the PLC. If reading is higher than the set point, and the system is checking for a high alarm, there will be a high alarm generated and vice versa for the low alarm. The set point will be keyed in by the operator at the HMI.

All the Gas compressor alarms will be shown in the HMI and the alarm summary page will be available in the HMI to see the history of the alarms .All the Gas compressor signals and alarms are sent to DCS through RS485 serial link Modbus communication for monitoring at control room. However each gas compressor remote start/ stop and status signals are connected to DCS by hard wired.

Mode of operation

Mode of operation	Command	Action
Local mode of GCP #1 selected in PLC HMI. (same action for local mode of GCP # 2)	Start GCP #1 from PLC HMI	Outlet gas valve open (SV 130-2) Filling valve open until filling pressure is reached (SV169-2). Inlet gas valve open (SV 131-2) Lube oil pump start (P 214-2) and lube oil pressure is checked. Main motor runs (M112). Compressor discharge pressure control is enabled.
	Stop GCP # 1 from PLC HMI	Main motor stops (M112). Gas discharge pressure control is disabled. Gas inlet (SV 131-2) and outlet (SV 130-2) valves close. Lube oil pump (P 214-2) stops after 10 seconds. Gas pressure is released via vent valve (SV 135-2) and the stop sequence ends after 5 minutes.
Remote mode of GCP # 1 selected in PLC HMI. (similar action for remote mode of GCP # 2)	Start GCP # 1 from DCS HMI	GCP # 1 is already in standby mode and filling sequence performed. Lube oil pump (P 214-2) start and lube oil pressure is checked. Main motor run (M112). Compressor discharge pressure control is enabled.
	Stop GCP # 1 from DCS HMI	Main motor stops (M112). Gas discharge pressure control is disabled. Gas inlet (SV 131-2) and outlet (SV 130-2) valves close. Lube oil pump (P 214-2) stops after 10 seconds. Gas pressure is released via vent valve (SV 135-2) and the stop sequence ends after 5 minutes.

Note : Failure of any of above will initiate an alarm in HMI

CONTROLS OF AUXILIARIES

Lube Oil system

As long as the compressor is in operation the lube oil Pump P214-2 is ON. This guarantee constant lube oil flow for following purposes:

- Compressor bare shaft BRG lubrication
- Compressor bare shaft rotor lubrication
- Gas cooling
- Hydraulic control of slide valve (positioning of the slide piston by means of a 4-20mA proportional valve)

Lube oil Pump (P214-2)

Oil injection into the high pressure sections of compressor is achieved monitoring a minimum pressure difference between the high Gas pressure side and the lube oil.

PCV226

is adjusted at commissioning at its final Set Point keeping set pressure difference between gas outlet pressure and oil pressure. The lube oil pressure is monitored by means of PIT205

Cooling water system

Demineralized water flowing through the cooling water lines supplies the following equipment:

Gas Cooler W119 shell and tube heat exchanger

Oil Cooler W203 shell and tube heat exchanger :-

Gas Detection System

Gas detectors :

Gas detectors will be installed and used to monitor the explosive level of the atmosphere within the sound enclosure. Once the sensors detect the Gas level, it will give the alarm signal to Gas alarm control panel at CCR for further action by control room operator.

Fire detection and fire fighting System

Compressor package is equipped with two fire detector sensors IS 318-2-I and IS318-2-II. In case if one detects fire compressor package alarm is activated (BUS signal, local light and horn HA318-3), in case of two detectors would detect fire, package would be shuttled down and fire fighting system with CO₂ would be activated.

START/STOP & LOAD CHANGE FUNCTIONS FOR MULTI UNIT OPERATION

Each GCP will be controlled automatically by respective local control panel to maintain the discharge gas pressure. Discharge gas pressure will be decided by the maximum required gas pressure among all running gas turbine corresponding to the gas turbine load demand.

One (1) gas compressor will be working for one (1) gas turbine. The stand-by compressor will start to operate if receive command from DCS except the case when running compressor trips or alarm is generated. In this case stand-by compressor will start operation.

ภาคผนวก ข-11

เอกสารการตรวจสอบ Silencer

Applicable Equipment List for Near Field Noise Measurement

Project: GNC

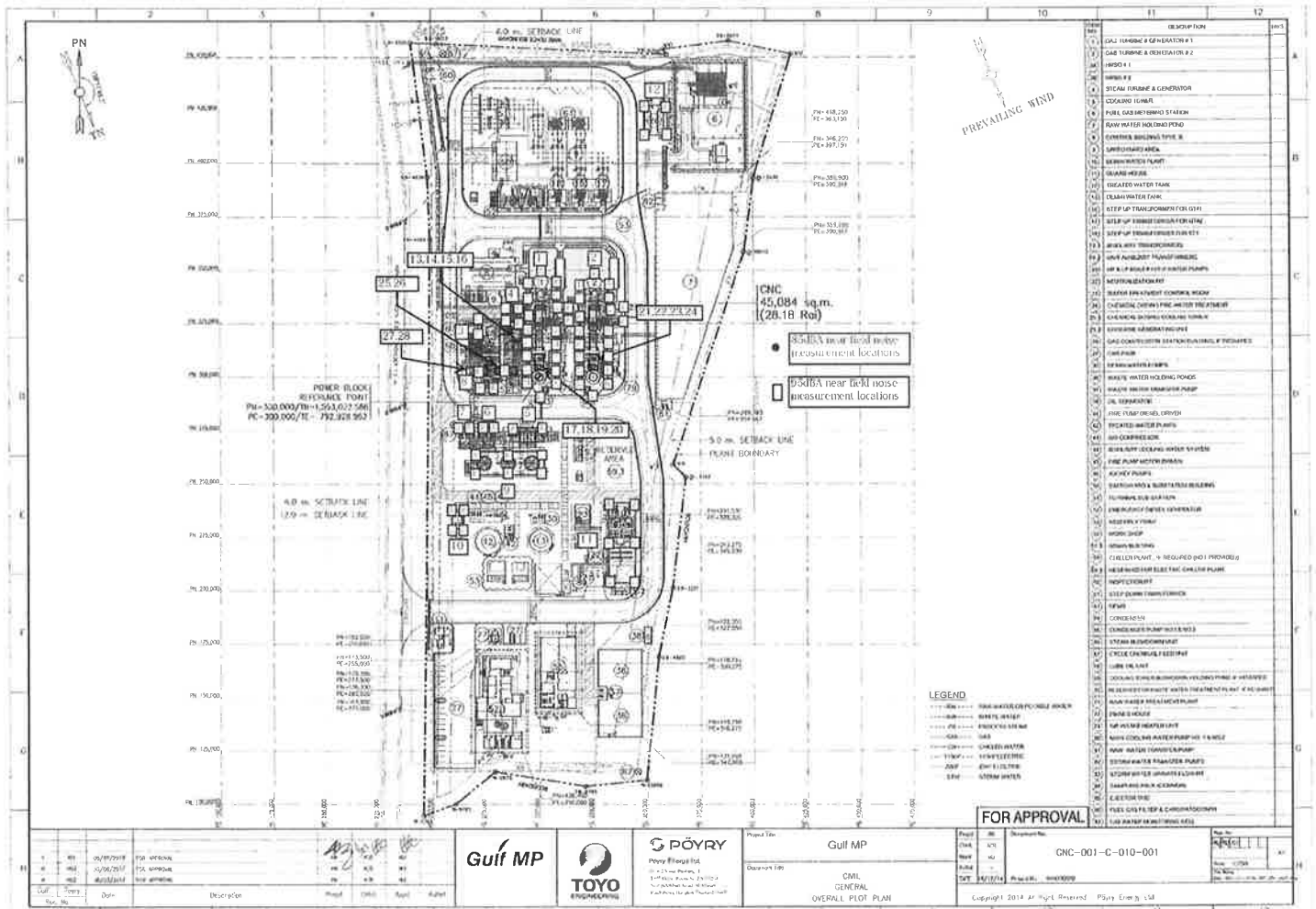
Rev. :

1

Date :

2018/1/28

Sr. #	KKS tag	Equipment	Type of test	Remarks
For 85 dBA near field noise				
1	11MB, 11HA	GTG11&HRSG11	85dBA	
2	12MB, 12HA	GTG12&HRSG12	85dBA	
3	10MA	STG	85dBA	
4	10LAC11AP001, 10LAC12AP001, 10LAC12AP001	BFW pumps	85dBA	
5	10PAC11AP001, 10PAC12AP001	MCW pumps	85dBA	
6	10PCC11AP001, 10PCC12AP001	ACW pumps	85dBA	
7	10PGC11AP001, 10PGC12AP001	CCW pumps	85dBA	
8	10LCB10AP001, 10LCB20AP001	Condensate pumps	85dBA	
9	10PAD91AN001, 10PAD92AN001, 10PAD93AN001	Cooling tower fans	85dBA	
10	10QEA	Air compressor package	85dBA	
11	10GC	Water treatment plant	85dBA	
12	10EKH	Fuel gas compressor package	85dBA	
For 95 dBA near field noise				
13	11LBH10BS001	HRSG11 HP start up vent silencer	95dBA	
14	11LBH65BS001	HRSG11 LP start up vent silencer	95dBA	
15	12LBH10BS001	HRSG12 HP start up vent silencer	95dBA	
16	12LBH65BS001	HRSG12 LP start up vent silencer	95dBA	
17	11LBA10BS201	HRSG11 HP superheater safety valve silencer	95dBA	
18	11LBA50BS201	HRSG11 LP superheater safety valve silencer	95dBA	
19	11HAD10BS201	HRSG11 HP drum safety valve silencer	95dBA	
20	11HAD50BS201	HRSG11 LP drum safety valve silencer	95dBA	
21	12LBA10BS201	HRSG12 HP superheater safety valve silencer	95dBA	
22	12LBA50BS201	HRSG12 LP superheater safety valve silencer	95dBA	
23	12HAD10BS201	HRSG12 HP drum safety valve silencer	95dBA	
24	12HAD50BS201	HRSG12 LP drum safety valve silencer	95dBA	
25	11MAN40AA001	HRSG 11 HP turbine bypass valve	95dBA	
26	11MAN10AA001	HRSG 11 LP turbine bypass valve	95dBA	
27	12MAN40AA001	HRSG 12 HP turbine bypass valve	95dBA	
28	12MAN10AA001	HRSG 12 LP turbine bypass valve	95dBA	



Near field noise (85dBA)
(To follow)

Near field noise (95dBA)
Start up vent silencers



Report No. : 2018-00090 / 001-6 (Page 1 of 6)

Issued date : February 8, 2018

CLIENT : TOYO ENGINEERING CORPORATION
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Rajchathewi, Bangkok 10400
Tel. 085-020-0134 Email : osamu.yamasaki@toyo-eng.com

Analysis Report

SAMPLE DESIGNATED AS : Noise Level MEASUREMENT DATE : February 7, 2018
MEASUREMENT LOCATION : HRS G11 HP&LP start up vent silencer, GNC MEASURED BY : Suriya Srithomee
CALIBRATION DATA : Calibrator Model CR-515, Cemus Research plc. Serial No. 81969
Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR-161B, Serial No. G080136

Noise Level [dB(A)] : February 7, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
7:58:19 - 7:58:29	81.5	8:03:19 - 8:03:29	70.8	8:08:19 - 8:08:29	74.0
7:58:29 - 7:58:39	70.3	8:03:29 - 8:03:39	74.3	8:08:29 - 8:08:39	73.8
7:58:39 - 7:58:49	70.1	8:03:39 - 8:03:49	74.2	8:08:39 - 8:08:49	73.0
7:58:49 - 7:58:59	70.1	8:03:49 - 8:03:59	72.4	8:08:49 - 8:08:59	72.8
7:58:59 - 7:59:09	70.0	8:03:59 - 8:04:09	72.9	8:08:59 - 8:09:09	73.6
7:59:09 - 7:59:19	70.0	8:04:09 - 8:04:19	75.1	8:09:09 - 8:09:19	73.7
7:59:19 - 7:59:29	70.8	8:04:19 - 8:04:29	72.9	8:09:19 - 8:09:29	73.0
7:59:29 - 7:59:39	70.2	8:04:29 - 8:04:39	73.4	8:09:29 - 8:09:39	72.8
7:59:39 - 7:59:49	71.5	8:04:39 - 8:04:49	73.3	8:09:39 - 8:09:49	74.0
7:59:49 - 7:59:59	70.2	8:04:49 - 8:04:59	74.2	8:09:49 - 8:09:59	73.5
7:59:59 - 8:00:09	70.0	8:04:59 - 8:05:09	73.7	8:09:59 - 8:10:09	74.1
8:00:09 - 8:00:19	69.9	8:05:09 - 8:05:19	73.6	8:10:09 - 8:10:19	73.8
8:00:19 - 8:00:29	69.8	8:05:19 - 8:05:29	73.4	8:10:19 - 8:10:29	73.8
8:00:29 - 8:00:39	69.8	8:05:29 - 8:05:39	73.4	8:10:29 - 8:10:39	74.2
8:00:39 - 8:00:49	70.2	8:05:39 - 8:05:49	73.0	8:10:39 - 8:10:49	74.1
8:00:49 - 8:00:59	71.3	8:05:49 - 8:05:59	72.5	8:10:49 - 8:10:59	74.3
8:00:59 - 8:01:09	70.6	8:05:59 - 8:06:09	72.8	8:10:59 - 8:11:09	75.0
8:01:09 - 8:01:19	72.6	8:06:09 - 8:06:19	73.3	8:11:09 - 8:11:19	74.3
8:01:19 - 8:01:29	70.6	8:06:19 - 8:06:29	73.7	8:11:19 - 8:11:29	74.9
8:01:29 - 8:01:39	70.6	8:06:29 - 8:06:39	73.7	8:11:29 - 8:11:39	72.5
8:01:39 - 8:01:49	70.7	8:06:39 - 8:06:49	74.4	8:11:39 - 8:11:49	72.9
8:01:49 - 8:01:59	71.3	8:06:49 - 8:06:59	73.9	8:11:49 - 8:11:59	73.6
8:01:59 - 8:02:09	70.4	8:06:59 - 8:07:09	73.0	8:11:59 - 8:12:09	73.2
8:02:09 - 8:02:19	70.4	8:07:09 - 8:07:19	73.5	8:12:09 - 8:12:19	76.2
8:02:19 - 8:02:29	70.3	8:07:19 - 8:07:29	73.7	8:12:19 - 8:12:29	77.3
8:02:29 - 8:02:39	70.4	8:07:29 - 8:07:39	74.3	8:12:29 - 8:12:39	77.2
8:02:39 - 8:02:49	70.6	8:07:39 - 8:07:49	73.3	8:12:39 - 8:12:49	77.3
8:02:49 - 8:02:59	70.6	8:07:49 - 8:07:59	73.2	8:12:49 - 8:12:59	77.3
8:02:59 - 8:03:09	70.6	8:07:59 - 8:08:09	72.7	8:12:59 - 8:13:09	77.5
8:03:09 - 8:03:19	70.5	8:08:09 - 8:08:19	73.1	8:13:09 - 8:13:19	77.4
Guaranteed Value* 95 dB(A)					



Report No. : 2018-00090 / 001-6 (Page 2 of 6)

Issued date : February 8, 2018

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Tel. 085-020-0134 Email : osamu.yamasaki@toyo-eng.com

Analysis Report

SAMPLE DESIGNATED AS : Noise Level MEASUREMENT DATE : February 7, 2018
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CALIBRATION DATA : Calibrator Model CR-515, Cemus Research plc. Serial No. 81969
Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR-161B, Serial No. G080136

Noise Level [dB(A)] : February 7, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
8:13:19 - 8:13:29	77.4	8:18:19 - 8:18:29	77.3	8:23:19 - 8:23:29	84.8
8:13:29 - 8:13:39	77.3	8:18:29 - 8:18:39	77.3	8:23:29 - 8:23:39	84.6
8:13:39 - 8:13:49	77.3	8:18:39 - 8:18:49	76.9	8:23:39 - 8:23:49	84.8
8:13:49 - 8:13:59	77.3	8:18:49 - 8:18:59	77.1	8:23:49 - 8:23:59	84.9
8:13:59 - 8:14:09	77.4	8:18:59 - 8:19:09	77.6	8:23:59 - 8:24:09	85.1
8:14:09 - 8:14:19	77.4	8:19:09 - 8:19:19	78.1	8:24:09 - 8:24:19	85.4
8:14:19 - 8:14:29	77.4	8:19:19 - 8:19:29	78.8	8:24:19 - 8:24:29	85.4
8:14:29 - 8:14:39	77.4	8:19:29 - 8:19:39	79.4	8:24:29 - 8:24:39	85.2
8:14:39 - 8:14:49	77.4	8:19:39 - 8:19:49	80.2	8:24:39 - 8:24:49	85.2
8:14:49 - 8:14:59	77.4	8:19:49 - 8:19:59	80.6	8:24:49 - 8:24:59	85.4
8:14:59 - 8:15:09	77.4	8:19:59 - 8:20:09	81.2	8:24:59 - 8:25:09	85.4
8:15:09 - 8:15:19	77.5	8:20:09 - 8:20:19	81.7	8:25:09 - 8:25:19	85.7
8:15:19 - 8:15:29	77.4	8:20:19 - 8:20:29	82.1	8:25:19 - 8:25:29	86.0
8:15:29 - 8:15:39	77.5	8:20:29 - 8:20:39	82.3	8:25:29 - 8:25:39	86.1
8:15:39 - 8:15:49	77.5	8:20:39 - 8:20:49	82.6	8:25:39 - 8:25:49	86.3
8:15:49 - 8:15:59	77.5	8:20:49 - 8:20:59	82.9	8:25:49 - 8:25:59	86.3
8:15:59 - 8:16:09	77.5	8:20:59 - 8:21:09	83.4	8:25:59 - 8:26:09	86.5
8:16:09 - 8:16:19	77.5	8:21:09 - 8:21:19	83.8	8:26:09 - 8:26:19	86.5
8:16:19 - 8:16:29	77.5	8:21:19 - 8:21:29	84.0	8:26:19 - 8:26:29	86.4
8:16:29 - 8:16:39	77.6	8:21:29 - 8:21:39	84.0	8:26:29 - 8:26:39	86.5
8:16:39 - 8:16:49	77.4	8:21:39 - 8:21:49	84.1	8:26:39 - 8:26:49	86.3
8:16:49 - 8:16:59	77.4	8:21:49 - 8:21:59	84.1	8:26:49 - 8:26:59	86.5
8:16:59 - 8:17:09	77.5	8:21:59 - 8:22:09	84.0	8:26:59 - 8:27:09	86.6
8:17:09 - 8:17:19	77.4	8:22:09 - 8:22:19	84.1	8:27:09 - 8:27:19	86.3
8:17:19 - 8:17:29	77.4	8:22:19 - 8:22:29	84.4	8:27:19 - 8:27:29	86.1
8:17:29 - 8:17:39	77.5	8:22:29 - 8:22:39	84.4	8:27:29 - 8:27:39	86.2
8:17:39 - 8:17:49	77.5	8:22:39 - 8:22:49	84.3	8:27:39 - 8:27:49	86.3
8:17:49 - 8:17:59	77.4	8:22:49 - 8:22:59	84.4	8:27:49 - 8:27:59	86.4
8:17:59 - 8:18:09	77.6	8:22:59 - 8:23:09	84.6	8:27:59 - 8:28:09	86.4
8:18:09 - 8:18:19	77.5	8:23:09 - 8:23:19	84.7	8:28:09 - 8:28:19	86.3
Guaranteed Value* 95 dB(A)					

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Report No. : 2018-00090 / 001-6 (Page 3 of 6)

Issued date : February 8, 2018

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Email : osamu.yamasaki@toyo-eng.com

Analysis Report

SAMPLE DESIGNATED AS : Noise Level MEASUREMENT DATE : February 7, 2018
MEASUREMENT LOCATION : HRSG11 HP&LP start up vent silencer, GNC MEASURED BY : Suriya Srithomee
CALIBRATION DATA : Calibrator Model CR:515, Cerus Research plc. Serial No. 81969
Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

Noise Level [dB(A)] : February 7, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
8:28:19 - 8:28:29	86.3	8:33:19 - 8:33:29	87.3	8:38:19 - 8:38:29	84.8
8:28:29 - 8:28:39	86.2	8:33:29 - 8:33:39	87.3	8:38:29 - 8:38:39	78.5
8:28:39 - 8:28:49	86.2	8:33:39 - 8:33:49	87.2	8:38:39 - 8:38:49	78.3
8:28:49 - 8:28:59	86.2	8:33:49 - 8:33:59	87.1	8:38:49 - 8:38:59	84.1
8:28:59 - 8:29:09	86.3	8:33:59 - 8:34:09	87.2	8:38:59 - 8:39:09	85.2
8:29:09 - 8:29:19	85.4	8:34:09 - 8:34:19	87.2	8:39:09 - 8:39:19	85.7
8:29:19 - 8:29:29	86.5	8:34:19 - 8:34:29	87.1	8:39:19 - 8:39:29	86.5
8:29:29 - 8:29:39	86.5	8:34:29 - 8:34:39	86.9	8:39:29 - 8:39:39	86.6
8:29:39 - 8:29:49	86.8	8:34:39 - 8:34:49	86.8	8:39:39 - 8:39:49	87.2
8:29:49 - 8:29:59	86.7	8:34:49 - 8:34:59	86.7	8:39:49 - 8:39:59	87.3
8:29:59 - 8:30:09	86.8	8:34:59 - 8:35:09	86.7	8:39:59 - 8:40:09	87.6
8:30:09 - 8:30:19	86.7	8:35:09 - 8:35:19	86.6	8:40:09 - 8:40:19	88.0
8:30:19 - 8:30:29	86.7	8:35:19 - 8:35:29	86.6	8:40:19 - 8:40:29	88.4
8:30:29 - 8:30:39	86.7	8:35:29 - 8:35:39	86.5	8:40:29 - 8:40:39	88.6
8:30:39 - 8:30:49	86.7	8:35:39 - 8:35:49	86.4	8:40:39 - 8:40:49	88.6
8:30:49 - 8:30:59	86.8	8:35:49 - 8:35:59	86.4	8:40:49 - 8:40:59	88.9
8:30:59 - 8:31:09	86.7	8:35:59 - 8:36:09	86.2	8:40:59 - 8:41:09	89.3
8:31:09 - 8:31:19	86.7	8:36:09 - 8:36:19	86.3	8:41:09 - 8:41:19	89.3
8:31:19 - 8:31:29	86.9	8:36:19 - 8:36:29	86.4	8:41:19 - 8:41:29	89.5
8:31:29 - 8:31:39	87.0	8:36:29 - 8:36:39	86.4	8:41:29 - 8:41:39	89.4
8:31:39 - 8:31:49	87.0	8:36:39 - 8:36:49	86.2	8:41:39 - 8:41:49	89.6
8:31:49 - 8:31:59	87.0	8:36:49 - 8:36:59	86.2	8:41:49 - 8:41:59	89.6
8:31:59 - 8:32:09	87.1	8:36:59 - 8:37:09	86.3	8:41:59 - 8:42:09	89.7
8:32:09 - 8:32:19	87.1	8:37:09 - 8:37:19	86.5	8:42:09 - 8:42:19	89.8
8:32:19 - 8:32:29	87.1	8:37:19 - 8:37:29	86.5	8:42:19 - 8:42:29	89.8
8:32:29 - 8:32:39	87.3	8:37:29 - 8:37:39	86.2	8:42:29 - 8:42:39	89.1
8:32:39 - 8:32:49	87.3	8:37:39 - 8:37:49	85.9	8:42:39 - 8:42:49	89.8
8:32:49 - 8:32:59	87.4	8:37:49 - 8:37:59	85.7	8:42:49 - 8:42:59	89.1
8:32:59 - 8:33:09	87.5	8:37:59 - 8:38:09	85.9	8:42:59 - 8:43:09	89.7
8:33:09 - 8:33:19	87.5	8:38:09 - 8:38:19	85.8	8:43:09 - 8:43:19	89.6
Guaranteed Value*		95	dB(A)		



Report No. : 2018-00090 / 001-6 (Page 4 of 6)

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SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

Noise Level [dB(A)] : February 7, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
8:43:19 - 8:43:29	90.1	8:48:19 - 8:48:29	90.8	8:53:19 - 8:53:29	90.9
8:43:29 - 8:43:39	90.4	8:48:29 - 8:48:39	90.7	8:53:29 - 8:53:39	90.7
8:43:39 - 8:43:49	90.8	8:48:39 - 8:48:49	90.8	8:53:39 - 8:53:49	91.0
8:43:49 - 8:43:59	91.0	8:48:49 - 8:48:59	90.7	8:53:49 - 8:53:59	90.6
8:43:59 - 8:44:09	91.1	8:48:59 - 8:49:09	90.7	8:53:59 - 8:54:09	90.8
8:44:09 - 8:44:19	91.1	8:49:09 - 8:49:19	90.8	8:54:09 - 8:54:19	90.9
8:44:19 - 8:44:29	91.1	8:49:19 - 8:49:29	90.9	8:54:19 - 8:54:29	90.6
8:44:29 - 8:44:39	91.0	8:49:29 - 8:49:39	90.7	8:54:29 - 8:54:39	91.0
8:44:39 - 8:44:49	91.3	8:49:39 - 8:49:49	90.9	8:54:39 - 8:54:49	90.8
8:44:49 - 8:44:59	91.0	8:49:49 - 8:49:59	90.7	8:54:49 - 8:54:59	90.7
8:44:59 - 8:45:09	91.1	8:49:59 - 8:50:09	90.8	8:54:59 - 8:55:09	91.1
8:45:09 - 8:45:19	91.2	8:50:09 - 8:50:19	90.9	8:55:09 - 8:55:19	90.7
8:45:19 - 8:45:29	91.1	8:50:19 - 8:50:29	90.6	8:55:19 - 8:55:29	90.9
8:45:29 - 8:45:39	91.3	8:50:29 - 8:50:39	90.9	8:55:29 - 8:55:39	91.1
8:45:39 - 8:45:49	91.1	8:50:39 - 8:50:49	90.7	8:55:39 - 8:55:49	90.7
8:45:49 - 8:45:59	91.4	8:50:49 - 8:50:59	90.9	8:55:49 - 8:55:59	91.0
8:45:59 - 8:46:09	91.1	8:50:59 - 8:51:09	90.7	8:55:59 - 8:56:09	90.7
8:46:09 - 8:46:19	91.0	8:51:09 - 8:51:19	91.1	8:56:09 - 8:56:19	91.0
8:46:19 - 8:46:29	91.1	8:51:19 - 8:51:29	90.9	8:56:19 - 8:56:29	90.9
8:46:29 - 8:46:39	91.1	8:51:29 - 8:51:39	91.1	8:56:29 - 8:56:39	90.7
8:46:39 - 8:46:49	91.1	8:51:39 - 8:51:49	90.9	8:56:39 - 8:56:49	91.0
8:46:49 - 8:46:59	91.0	8:51:49 - 8:51:59	91.0	8:56:49 - 8:56:59	90.6
8:46:59 - 8:47:09	90.9	8:51:59 - 8:52:09	90.8	8:56:59 - 8:57:09	90.8
8:47:09 - 8:47:19	91.2	8:52:09 - 8:52:19	91.0	8:57:09 - 8:57:19	90.9
8:47:19 - 8:47:29	90.9	8:52:19 - 8:52:29	90.7	8:57:19 - 8:57:29	90.5
8:47:29 - 8:47:39	91.1	8:52:29 - 8:52:39	90.9	8:57:29 - 8:57:39	91.0
8:47:39 - 8:47:49	90.8	8:52:39 - 8:52:49	90.8	8:57:39 - 8:57:49	90.9
8:47:49 - 8:47:59	90.9	8:52:49 - 8:52:59	90.9	8:57:49 - 8:57:59	90.8
8:47:59 - 8:48:09	90.7	8:52:59 - 8:53:09	90.7	8:57:59 - 8:58:09	91.2
8:48:09 - 8:48:19	90.8	8:53:09 - 8:53:19	90.9	8:58:09 - 8:58:19	90.8
Guaranteed Value*		95	dB(A)		

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Report No. : 2018-00090 / 001-6 (Page 5 of 6)

Issued date : February 8, 2018

CLIENT : TOYO ENGINEERING CORPORATION
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Rajchathewi, Bangkok 10400
Tel. 085-020-0134
Email : osamu.yamasaki@toyo-eng.com

Analysis Report

SAMPLE DESIGNATED AS : Noise Level MEASUREMENT DATE : February 7, 2018
MEASUREMENT LOCATION : HRS111 HP&LP start up vent silencer, GNC MEASURED BY : Suriya Srithomee
CALIBRATION DATA : Calibrator Model CR:515, Cernus Research plc. Serial No. 81969
Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

Noise Level [dB(A)] : February 7, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
8:58:19	91.0	9:03:19	91.0	9:08:19	89.4
8:58:29	91.2	9:03:29	90.7	9:08:29	89.5
8:58:39	90.9	9:03:39	90.8	9:08:39	89.1
8:58:49	91.2	9:03:49	90.9	9:08:49	88.7
8:58:59	90.9	9:03:59	90.8	9:08:59	88.7
8:59:09	90.7	9:04:09	88.5	9:09:09	88.0
8:59:19	91.0	9:04:19	88.5	9:09:19	88.2
8:59:29	90.8	9:04:29	87.6	9:09:29	88.0
8:59:39	90.9	9:04:39	86.9	9:09:39	87.4
8:59:49	91.0	9:04:49	86.5	9:09:49	88.0
8:59:59	90.6	9:04:59	86.1	9:09:59	87.0
9:00:09	90.9	9:05:09	85.6	9:10:09	86.8
9:00:19	90.8	9:05:19	85.2	9:10:19	87.2
9:00:29	90.7	9:05:29	82.2	9:10:29	85.9
9:00:39	91.0	9:05:39	85.0	9:10:39	86.3
9:00:49	90.7	9:05:49	86.1	9:10:49	86.3
9:00:59	90.9	9:05:59	86.0	9:10:59	84.9
9:01:09	91.0	9:06:09	86.6	9:11:09	85.9
9:01:19	90.7	9:06:19	87.2	9:11:19	83.8
9:01:29	91.0	9:06:29	87.6	9:11:29	83.9
9:01:39	90.8	9:06:39	87.6	9:11:39	83.8
9:01:49	90.7	9:06:49	87.7	9:11:49	83.8
9:01:59	91.0	9:06:59	87.7	9:11:59	83.9
9:02:09	90.6	9:07:09	87.0	9:12:09	83.8
9:02:19	90.7	9:07:19	88.4	9:12:19	83.9
9:02:29	90.9	9:07:29	89.4	9:12:29	83.9
9:02:39	90.6	9:07:39	90.2	9:12:39	80.7
9:02:49	90.9	9:07:49	89.7	9:12:49	83.7
9:02:59	90.7	9:07:59	90.3	9:12:59	82.5
9:03:09	90.7	9:08:09	90.1	9:13:09	78.8
9:03:19	90.7	9:08:19	90.1	9:13:19	78.8
Guaranteed Value* 95 dB(A)					



Report No. : 2018-00090 / 001-6 (Page 6 of 6)

Issued date : February 8, 2018

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Email : osamu.yamasaki@toyo-eng.com

Analysis Report

SAMPLE DESIGNATED AS : Noise Level MEASUREMENT DATE : February 7, 2018
MEASUREMENT LOCATION : HRS111 HP&LP start up vent silencer, GNC MEASURED BY : Suriya Srithomee
CALIBRATION DATA : Calibrator Model CR:515, Cernus Research plc. Serial No. 81969
Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

Noise Level [dB(A)] : February 7, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
9:13:19	78.8	9:15:09	78.8	9:16:59	80.1
9:13:29	78.9	9:15:19	78.8	9:17:09	80.0
9:13:39	79.0	9:15:29	78.8	9:17:19	79.8
9:13:49	82.0	9:15:39	79.0	9:17:29	79.6
9:13:59	78.3	9:15:49	78.9	9:17:39	79.6
9:14:09	79.0	9:15:59	84.3	9:17:49	79.6
9:14:19	78.9	9:16:09	81.8	9:17:59	79.6
9:14:29	79.0	9:16:19	80.4	9:18:09	79.8
9:14:39	79.0	9:16:29	79.2	9:18:19	79.6
9:14:49	79.0	9:16:39	79.2		
9:14:59	78.8	9:16:49	79.8		
Guaranteed Value* 95 dB(A)					

Source : * Guaranteed Value of GNC Power Plant.

Siriporn Imwilaiwan
(Siriporn Imwilaiwan)
Environmental Monitoring Manager

Thapson Yommana
(Thapson Yommana)
Technical Manager



TY/SS/AS/CJ

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Report No. : 2018-00090 / 001-7 (Page 1 of 5)

Issued date : February 8, 2018

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Analysis Report

SAMPLE DESIGNATED AS : Noise Level MEASUREMENT DATE : February 7, 2018
MEASUREMENT LOCATION : HRS12 HP&LP start up vent silencer, GNC MEASURED BY : Suriya Srithomee
CALIBRATION DATA : Calibrator Model CR:515, Cernus Research plc. Serial No. 81969
Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

Noise Level [dB(A)] : February 7, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
9:46:05 - 9:46:15	78.5	9:51:05 - 9:51:15	78.5	9:56:05 - 9:56:15	78.7
9:46:15 - 9:46:25	78.7	9:51:15 - 9:51:25	78.7	9:56:15 - 9:56:25	78.8
9:46:25 - 9:46:35	78.7	9:51:25 - 9:51:35	78.5	9:56:25 - 9:56:35	78.8
9:46:35 - 9:46:45	78.8	9:51:35 - 9:51:45	78.5	9:56:35 - 9:56:45	78.4
9:46:45 - 9:46:55	78.7	9:51:45 - 9:51:55	78.6	9:56:45 - 9:56:55	78.5
9:46:55 - 9:47:05	78.6	9:51:55 - 9:52:05	78.6	9:56:55 - 9:57:05	78.7
9:47:05 - 9:47:15	78.4	9:52:05 - 9:52:15	78.7	9:57:05 - 9:57:15	78.8
9:47:15 - 9:47:25	78.6	9:52:15 - 9:52:25	78.6	9:57:15 - 9:57:25	78.8
9:47:25 - 9:47:35	78.7	9:52:25 - 9:52:35	78.4	9:57:25 - 9:57:35	78.8
9:47:35 - 9:47:45	78.7	9:52:35 - 9:52:45	78.3	9:57:35 - 9:57:45	78.9
9:47:45 - 9:47:55	78.7	9:52:45 - 9:52:55	78.5	9:57:45 - 9:57:55	78.8
9:47:55 - 9:48:05	78.8	9:52:55 - 9:53:05	78.5	9:57:55 - 9:58:05	78.7
9:48:05 - 9:48:15	78.6	9:53:05 - 9:53:15	78.5	9:58:05 - 9:58:15	78.7
9:48:15 - 9:48:25	78.6	9:53:15 - 9:53:25	78.5	9:58:15 - 9:58:25	78.8
9:48:25 - 9:48:35	78.6	9:53:25 - 9:53:35	78.5	9:58:25 - 9:58:35	79.0
9:48:35 - 9:48:45	78.5	9:53:35 - 9:53:45	78.6	9:58:35 - 9:58:45	78.9
9:48:45 - 9:48:55	78.7	9:53:45 - 9:53:55	78.6	9:58:45 - 9:58:55	78.9
9:48:55 - 9:49:05	78.7	9:53:55 - 9:54:05	78.5	9:58:55 - 9:59:05	79.0
9:49:05 - 9:49:15	78.8	9:54:05 - 9:54:15	78.5	9:59:05 - 9:59:15	79.1
9:49:15 - 9:49:25	79.0	9:54:15 - 9:54:25	78.6	9:59:15 - 9:59:25	79.0
9:49:25 - 9:49:35	78.6	9:54:25 - 9:54:35	78.6	9:59:25 - 9:59:35	79.1
9:49:35 - 9:49:45	78.5	9:54:35 - 9:54:45	78.7	9:59:35 - 9:59:45	79.3
9:49:45 - 9:49:55	78.4	9:54:45 - 9:54:55	78.7	9:59:45 - 9:59:55	79.4
9:49:55 - 9:50:05	78.4	9:54:55 - 9:55:05	78.8	9:59:55 - 10:00:05	79.3
9:50:05 - 9:50:15	78.4	9:55:05 - 9:55:15	78.7	10:00:05 - 10:00:15	79.1
9:50:15 - 9:50:25	78.6	9:55:15 - 9:55:25	78.4	10:00:15 - 10:00:25	79.0
9:50:25 - 9:50:35	78.6	9:55:25 - 9:55:35	78.4	10:00:25 - 10:00:35	78.9
9:50:35 - 9:50:45	78.6	9:55:35 - 9:55:45	78.4	10:00:35 - 10:00:45	78.9
9:50:45 - 9:50:55	78.7	9:55:45 - 9:55:55	78.5	10:00:45 - 10:00:55	78.8
9:50:55 - 9:51:05	78.6	9:55:55 - 9:56:05	78.6	10:00:55 - 10:01:05	78.8
Guaranteed Value*		95	dB(A)		



Report No. : 2018-00090 / 001-7 (Page 2 of 5)

Issued date : February 8, 2018

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Analysis Report

SAMPLE DESIGNATED AS : Noise Level MEASUREMENT DATE : February 7, 2018
MEASUREMENT LOCATION : HRS12 HP&LP start up vent silencer, GNC MEASURED BY : Suriya Srithomee
CALIBRATION DATA : Calibrator Model CR:515, Cernus Research plc. Serial No. 81969
Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

Noise Level [dB(A)] : February 7, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
10:01:05 - 10:01:15	78.9	10:06:05 - 10:06:15	84.8	10:11:05 - 10:11:15	87.7
10:01:15 - 10:01:25	79.1	10:06:15 - 10:06:25	83.1	10:11:15 - 10:11:25	85.2
10:01:25 - 10:01:35	79.1	10:06:25 - 10:06:35	85.6	10:11:25 - 10:11:35	87.8
10:01:35 - 10:01:45	79.1	10:06:35 - 10:06:45	85.6	10:11:35 - 10:11:45	88.1
10:01:45 - 10:01:55	78.9	10:06:45 - 10:06:55	85.8	10:11:45 - 10:11:55	87.9
10:01:55 - 10:02:05	77.7	10:06:55 - 10:07:05	84.7	10:11:55 - 10:12:05	88.1
10:02:05 - 10:02:15	77.8	10:07:05 - 10:07:15	84.5	10:12:05 - 10:12:15	87.4
10:02:15 - 10:02:25	78.1	10:07:15 - 10:07:25	85.2	10:12:15 - 10:12:25	86.9
10:02:25 - 10:02:35	78.5	10:07:25 - 10:07:35	86.2	10:12:25 - 10:12:35	88.2
10:02:35 - 10:02:45	79.3	10:07:35 - 10:07:45	85.5	10:12:35 - 10:12:45	88.1
10:02:45 - 10:02:55	80.2	10:07:45 - 10:07:55	84.8	10:12:45 - 10:12:55	88.4
10:02:55 - 10:03:05	80.4	10:07:55 - 10:08:05	84.1	10:12:55 - 10:13:05	88.8
10:03:05 - 10:03:15	80.8	10:08:05 - 10:08:15	83.6	10:13:05 - 10:13:15	88.9
10:03:15 - 10:03:25	81.2	10:08:15 - 10:08:25	85.9	10:13:15 - 10:13:25	88.7
10:03:25 - 10:03:35	81.3	10:08:25 - 10:08:35	86.4	10:13:25 - 10:13:35	86.9
10:03:35 - 10:03:45	81.5	10:08:35 - 10:08:45	85.7	10:13:35 - 10:13:45	88.4
10:03:45 - 10:03:55	79.9	10:08:45 - 10:08:55	87.1	10:13:45 - 10:13:55	87.3
10:03:55 - 10:04:05	78.8	10:08:55 - 10:09:05	87.2	10:13:55 - 10:14:05	86.7
10:04:05 - 10:04:15	80.0	10:09:05 - 10:09:15	85.9	10:14:05 - 10:14:15	87.0
10:04:15 - 10:04:25	81.0	10:09:15 - 10:09:25	86.8	10:14:15 - 10:14:25	89.1
10:04:25 - 10:04:35	81.4	10:09:25 - 10:09:35	87.5	10:14:25 - 10:14:35	88.8
10:04:35 - 10:04:45	82.2	10:09:35 - 10:09:45	87.7	10:14:35 - 10:14:45	86.4
10:04:45 - 10:04:55	82.7	10:09:45 - 10:09:55	88.0	10:14:45 - 10:14:55	89.2
10:04:55 - 10:05:05	82.2	10:09:55 - 10:10:05	88.0	10:14:55 - 10:15:05	88.8
10:05:05 - 10:05:15	82.9	10:10:05 - 10:10:15	87.7	10:15:05 - 10:15:15	89.5
10:05:15 - 10:05:25	82.7	10:10:15 - 10:10:25	87.6	10:15:15 - 10:15:25	88.8
10:05:25 - 10:05:35	85.2	10:10:25 - 10:10:35	87.7	10:15:25 - 10:15:35	87.7
10:05:35 - 10:05:45	85.5	10:10:35 - 10:10:45	87.9	10:15:35 - 10:15:45	88.0
10:05:45 - 10:05:55	84.7	10:10:45 - 10:10:55	87.9	10:15:45 - 10:15:55	88.2
10:05:55 - 10:06:05	84.5	10:10:55 - 10:11:05	86.2	10:15:55 - 10:16:05	88.3
Guaranteed Value*		95	dB(A)		

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Shenzhen SGS Auto

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Shenzhen SGS Auto



Report No. : 2018-00090 / 001-7 (Page 3 of 5)

Issued date : February 8, 2018

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 Email : osamu.yamasaki@toyo-eng.com

Analysis Report

SAMPLE DESIGNATED AS : Noise Level
MEASUREMENT LOCATION : HRS12 HP&LP start up vent silencer, GNC
CALIBRATION DATA : Calibrator Model CR:515, Cerus Research plc. Serial No. 81969
 Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

Noise Level [dB(A)] : February 7, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
10:16:05 - 10:16:15	88.1	10:21:05 - 10:21:15	87.1	10:26:05 - 10:26:15	83.9
10:16:15 - 10:16:25	87.8	10:21:15 - 10:21:25	86.9	10:26:15 - 10:26:25	83.6
10:16:25 - 10:16:35	88.0	10:21:25 - 10:21:35	87.1	10:26:25 - 10:26:35	84.1
10:16:35 - 10:16:45	88.1	10:21:35 - 10:21:45	87.0	10:26:35 - 10:26:45	85.0
10:16:45 - 10:16:55	88.1	10:21:45 - 10:21:55	87.1	10:26:45 - 10:26:55	85.9
10:16:55 - 10:17:05	88.0	10:21:55 - 10:22:05	87.0	10:26:55 - 10:27:05	86.7
10:17:05 - 10:17:15	87.2	10:22:05 - 10:22:15	87.0	10:27:05 - 10:27:15	87.1
10:17:15 - 10:17:25	86.7	10:22:15 - 10:22:25	87.0	10:27:15 - 10:27:25	87.2
10:17:25 - 10:17:35	87.1	10:22:25 - 10:22:35	87.0	10:27:25 - 10:27:35	87.5
10:17:35 - 10:17:45	87.0	10:22:35 - 10:22:45	87.0	10:27:35 - 10:27:45	87.9
10:17:45 - 10:17:55	87.0	10:22:45 - 10:22:55	86.7	10:27:45 - 10:27:55	88.2
10:17:55 - 10:18:05	86.9	10:22:55 - 10:23:05	86.7	10:27:55 - 10:28:05	88.6
10:18:05 - 10:18:15	86.7	10:23:05 - 10:23:15	86.7	10:28:05 - 10:28:15	88.9
10:18:15 - 10:18:25	86.7	10:23:15 - 10:23:25	86.6	10:28:15 - 10:28:25	88.9
10:18:25 - 10:18:35	86.8	10:23:25 - 10:23:35	86.6	10:28:25 - 10:28:35	89.2
10:18:35 - 10:18:45	86.9	10:23:35 - 10:23:45	86.6	10:28:35 - 10:28:45	89.3
10:18:45 - 10:18:55	86.8	10:23:45 - 10:23:55	86.6	10:28:45 - 10:28:55	89.1
10:18:55 - 10:19:05	86.7	10:23:55 - 10:24:05	86.6	10:28:55 - 10:29:05	89.2
10:19:05 - 10:19:15	86.8	10:24:05 - 10:24:15	86.7	10:29:05 - 10:29:15	89.3
10:19:15 - 10:19:25	86.8	10:24:15 - 10:24:25	86.7	10:29:15 - 10:29:25	89.4
10:19:25 - 10:19:35	86.8	10:24:25 - 10:24:35	86.7	10:29:25 - 10:29:35	89.5
10:19:35 - 10:19:45	86.7	10:24:35 - 10:24:45	86.6	10:29:35 - 10:29:45	89.8
10:19:45 - 10:19:55	86.8	10:24:45 - 10:24:55	86.5	10:29:45 - 10:29:55	90.0
10:19:55 - 10:20:05	86.8	10:24:55 - 10:25:05	86.7	10:29:55 - 10:30:05	90.2
10:20:05 - 10:20:15	86.7	10:25:05 - 10:25:15	86.6	10:30:05 - 10:30:15	90.4
10:20:15 - 10:20:25	86.8	10:25:15 - 10:25:25	86.6	10:30:15 - 10:30:25	90.5
10:20:25 - 10:20:35	86.9	10:25:25 - 10:25:35	86.7	10:30:25 - 10:30:35	90.5
10:20:35 - 10:20:45	87.0	10:25:35 - 10:25:45	86.8	10:30:35 - 10:30:45	90.6
10:20:45 - 10:20:55	87.0	10:25:45 - 10:25:55	86.7	10:30:45 - 10:30:55	90.7
10:20:55 - 10:21:05	86.9	10:25:55 - 10:26:05	86.4	10:30:55 - 10:31:05	90.9
Guaranteed Value*		95	dB(A)		



Report No. : 2018-00090 / 001-7 (Page 4 of 5)

Issued date : February 8, 2018

CLIENT : TOYO ENGINEERING CORPORATION
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 Email : osamu.yamasaki@toyo-eng.com

Analysis Report

SAMPLE DESIGNATED AS : Noise Level
MEASUREMENT LOCATION : HRS12 HP&LP start up vent silencer, GNC
CALIBRATION DATA : Calibrator Model CR:515, Cerus Research plc. Serial No. 81969
 Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

Noise Level [dB(A)] : February 7, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
10:31:05 - 10:31:15	91.0	10:36:05 - 10:36:15	90.1	10:41:05 - 10:41:15	90.1
10:31:15 - 10:31:25	91.0	10:36:15 - 10:36:25	90.1	10:41:15 - 10:41:25	90.1
10:31:25 - 10:31:35	91.1	10:36:25 - 10:36:35	90.1	10:41:25 - 10:41:35	90.1
10:31:35 - 10:31:45	91.1	10:36:35 - 10:36:45	90.0	10:41:35 - 10:41:45	90.2
10:31:45 - 10:31:55	91.2	10:36:45 - 10:36:55	90.1	10:41:45 - 10:41:55	90.2
10:31:55 - 10:32:05	91.2	10:36:55 - 10:37:05	90.1	10:41:55 - 10:42:05	90.1
10:32:05 - 10:32:15	91.2	10:37:05 - 10:37:15	90.1	10:42:05 - 10:42:15	90.1
10:32:15 - 10:32:25	91.3	10:37:15 - 10:37:25	90.1	10:42:15 - 10:42:25	90.1
10:32:25 - 10:32:35	91.2	10:37:25 - 10:37:35	90.2	10:42:25 - 10:42:35	90.0
10:32:35 - 10:32:45	91.3	10:37:35 - 10:37:45	90.2	10:42:35 - 10:42:45	89.9
10:32:45 - 10:32:55	91.2	10:37:45 - 10:37:55	90.2	10:42:45 - 10:42:55	89.4
10:32:55 - 10:33:05	91.1	10:37:55 - 10:38:05	90.2	10:42:55 - 10:43:05	88.8
10:33:05 - 10:33:15	91.0	10:38:05 - 10:38:15	90.1	10:43:05 - 10:43:15	88.6
10:33:15 - 10:33:25	90.8	10:38:15 - 10:38:25	90.1	10:43:15 - 10:43:25	88.1
10:33:25 - 10:33:35	90.7	10:38:25 - 10:38:35	90.2	10:43:25 - 10:43:35	87.9
10:33:35 - 10:33:45	90.7	10:38:35 - 10:38:45	90.3	10:43:35 - 10:43:45	87.7
10:33:45 - 10:33:55	90.6	10:38:45 - 10:38:55	90.3	10:43:45 - 10:43:55	87.5
10:33:55 - 10:34:05	90.5	10:38:55 - 10:39:05	90.2	10:43:55 - 10:44:05	87.4
10:34:05 - 10:34:15	90.5	10:39:05 - 10:39:15	90.2	10:44:05 - 10:44:15	87.4
10:34:15 - 10:34:25	90.3	10:39:15 - 10:39:25	90.1	10:44:15 - 10:44:25	87.0
10:34:25 - 10:34:35	90.2	10:39:25 - 10:39:35	90.2	10:44:25 - 10:44:35	86.5
10:34:35 - 10:34:45	90.2	10:39:35 - 10:39:45	90.1	10:44:35 - 10:44:45	86.7
10:34:45 - 10:34:55	90.1	10:39:45 - 10:39:55	90.2	10:44:45 - 10:44:55	87.4
10:34:55 - 10:35:05	90.1	10:39:55 - 10:40:05	90.2	10:44:55 - 10:45:05	87.6
10:35:05 - 10:35:15	90.0	10:40:05 - 10:40:15	90.2	10:45:05 - 10:45:15	87.7
10:35:15 - 10:35:25	89.9	10:40:15 - 10:40:25	90.2	10:45:15 - 10:45:25	87.8
10:35:25 - 10:35:35	90.0	10:40:25 - 10:40:35	90.2	10:45:25 - 10:45:35	87.7
10:35:35 - 10:35:45	90.2	10:40:35 - 10:40:45	90.1	10:45:35 - 10:45:45	87.8
10:35:45 - 10:35:55	90.2	10:40:45 - 10:40:55	90.0	10:45:45 - 10:45:55	87.6
10:35:55 - 10:36:05	90.2	10:40:55 - 10:41:05	90.1	10:45:55 - 10:46:05	87.4
Guaranteed Value*		95	dB(A)		

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Report No. : 2018-00090 / 001-7 (Page 5 of 5)

Issued date : February 8, 2018

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Analysis Report

SAMPLE DESIGNATED AS : Noise Level **MEASUREMENT DATE :** February 7, 2018
MEASUREMENT LOCATION : HRSG12 HP&LP start up vent silencer, GNC **MEASURED BY :** Suriya Srithomee
CALIBRATION DATA : Calibrator Model CR:515, Cernus Research plc, Serial No. 81969
 Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

Noise Level [dB(A)] : February 7, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
10:46:05 - 10:46:15	87.3	10:50:35 - 10:50:45	79.8	10:55:05 - 10:55:15	79.4
10:46:15 - 10:46:25	87.1	10:50:45 - 10:50:55	81.5	10:55:15 - 10:55:25	79.4
10:46:25 - 10:46:35	86.9	10:50:55 - 10:51:05	82.9	10:55:25 - 10:55:35	79.6
10:46:35 - 10:46:45	86.9	10:51:05 - 10:51:15	80.0	10:55:35 - 10:55:45	80.2
10:46:45 - 10:46:55	86.5	10:51:15 - 10:51:25	83.3	10:55:45 - 10:55:55	78.7
10:46:55 - 10:47:05	86.9	10:51:25 - 10:51:35	80.4	10:55:55 - 10:56:05	77.9
10:47:05 - 10:47:15	86.8	10:51:35 - 10:51:45	80.7	10:56:05 - 10:56:15	78.0
10:47:15 - 10:47:25	86.9	10:51:45 - 10:51:55	82.0	10:56:15 - 10:56:25	77.9
10:47:25 - 10:47:35	86.7	10:51:55 - 10:52:05	79.9	10:56:25 - 10:56:35	77.9
10:47:35 - 10:47:45	86.6	10:52:05 - 10:52:15	79.9	10:56:35 - 10:56:45	78.0
10:47:45 - 10:47:55	86.5	10:52:15 - 10:52:25	79.8	10:56:45 - 10:56:55	78.2
10:47:55 - 10:48:05	86.4	10:52:25 - 10:52:35	78.7	10:56:55 - 10:57:05	78.2
10:48:05 - 10:48:15	86.2	10:52:35 - 10:52:45	79.7	10:57:05 - 10:57:15	78.5
10:48:15 - 10:48:25	86.0	10:52:45 - 10:52:55	79.6	10:57:15 - 10:57:25	78.4
10:48:25 - 10:48:35	85.9	10:52:55 - 10:53:05	79.7	10:57:25 - 10:57:35	78.3
10:48:35 - 10:48:45	85.8	10:53:05 - 10:53:15	79.7	10:57:35 - 10:57:45	78.4
10:48:45 - 10:48:55	85.5	10:53:15 - 10:53:25	79.7	10:57:45 - 10:57:55	78.3
10:48:55 - 10:49:05	85.2	10:53:25 - 10:53:35	79.6	10:57:55 - 10:58:05	78.1
10:49:05 - 10:49:15	85.0	10:53:35 - 10:53:45	79.7	10:58:05 - 10:58:15	78.7
10:49:15 - 10:49:25	84.5	10:53:45 - 10:53:55	79.8	10:58:15 - 10:58:25	78.4
10:49:25 - 10:49:35	84.1	10:53:55 - 10:54:05	79.8	10:58:25 - 10:58:35	78.3
10:49:35 - 10:49:45	83.8	10:54:05 - 10:54:15	79.7	10:58:35 - 10:58:45	78.2
10:49:45 - 10:49:55	83.7	10:54:15 - 10:54:25	79.7	10:58:45 - 10:58:55	78.5
10:49:55 - 10:50:05	83.6	10:54:25 - 10:54:35	79.8	10:58:55 - 10:59:05	78.4
10:50:05 - 10:50:15	83.6	10:54:35 - 10:54:45	79.8	10:59:05 - 10:59:15	78.4
10:50:15 - 10:50:25	80.8	10:54:45 - 10:54:55	79.7	10:59:15 - 10:59:25	78.5
10:50:25 - 10:50:35	79.8	10:54:55 - 10:55:05	79.5	10:59:25 - 10:59:35	78.6
Guaranteed Value*		95	dB(A)		

Source : * Guaranteed Value of GNC Power Plant.

Siriporn
 (Siriporn Imwilaiwan)
 Environmental Monitoring Manager



Thapson
 (Thapson Yommana)
 Technical Manager

TY/SS/AS/CJ

E 165737

Near field noise (95dBA)
 Turbine bypass valves



Report No. : 2018-00090 / 001-2 (Page 1 of 1)

Issued date : February 7, 2018

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Email : osamu.yamasaki@toyo-eng.com

Analysis Report

SAMPLE DESIGNATED AS : Noise Level
MEASUREMENT LOCATION : HRSG11 HP turbine bypass valve, GNC
CALIBRATION DATA : Calibrator Model CR:515, Cerrus Research plc. Serial No. 81969
Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

MEASUREMENT DATE : February 6, 2018
MEASURED BY : Suriya Srithomee

Noise Level [dB(A)] : February 6, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
14:28:05 - 14:28:15	92.5	14:32:05 - 14:32:15	91.7	14:36:05 - 14:36:15	91.9
14:28:15 - 14:28:25	92.1	14:32:15 - 14:32:25	91.8	14:36:15 - 14:36:25	91.8
14:28:25 - 14:28:35	91.8	14:32:25 - 14:32:35	91.8	14:36:25 - 14:36:35	92.0
14:28:35 - 14:28:45	92.0	14:32:35 - 14:32:45	92.0	14:36:35 - 14:36:45	91.7
14:28:45 - 14:28:55	91.8	14:32:45 - 14:32:55	91.9	14:36:45 - 14:36:55	91.9
14:28:55 - 14:29:05	91.9	14:32:55 - 14:33:05	91.9	14:36:55 - 14:37:05	91.8
14:29:05 - 14:29:15	91.9	14:33:05 - 14:33:15	91.6	14:37:05 - 14:37:15	91.7
14:29:15 - 14:29:25	91.8	14:33:15 - 14:33:25	91.8	14:37:15 - 14:37:25	91.6
14:29:25 - 14:29:35	91.8	14:33:25 - 14:33:35	91.8	14:37:25 - 14:37:35	91.6
14:29:35 - 14:29:45	91.7	14:33:35 - 14:33:45	91.8	14:37:35 - 14:37:45	91.6
14:29:45 - 14:29:55	91.9	14:33:45 - 14:33:55	91.7	14:37:45 - 14:37:55	91.5
14:29:55 - 14:30:05	91.8	14:33:55 - 14:34:05	91.7	14:37:55 - 14:38:05	91.5
14:30:05 - 14:30:15	91.8	14:34:05 - 14:34:15	91.9	14:38:05 - 14:38:15	91.6
14:30:15 - 14:30:25	91.7	14:34:15 - 14:34:25	91.9	14:38:15 - 14:38:25	91.7
14:30:25 - 14:30:35	91.8	14:34:25 - 14:34:35	91.9	14:38:25 - 14:38:35	91.6
14:30:35 - 14:30:45	91.7	14:34:35 - 14:34:45	91.7	14:38:35 - 14:38:45	91.9
14:30:45 - 14:30:55	91.5	14:34:45 - 14:34:55	91.9	14:38:45 - 14:38:55	91.8
14:30:55 - 14:31:05	91.6	14:34:55 - 14:35:05	91.8	14:38:55 - 14:39:05	92.2
14:31:05 - 14:31:15	91.6	14:35:05 - 14:35:15	91.8	14:39:05 - 14:39:15	92.2
14:31:15 - 14:31:25	91.6	14:35:15 - 14:35:25	91.7	14:39:15 - 14:39:25	92.3
14:31:25 - 14:31:35	91.6	14:35:25 - 14:35:35	91.7	14:39:25 - 14:39:35	92.2
14:31:35 - 14:31:45	91.6	14:35:35 - 14:35:45	91.7	14:39:35 - 14:39:45	92.2
14:31:45 - 14:31:55	91.6	14:35:45 - 14:35:55	91.8	14:39:45 - 14:39:55	92.3
14:31:55 - 14:32:05	91.6	14:35:55 - 14:36:05	91.7	14:39:55 - 14:40:05	92.2
Guaranteed Value*		95	dB(A)		

Source : * Guaranteed Value of GNC Power Plant.

Siriporn
(Siriporn Imwilaiwan)
Environmental Monitoring Manager



Thapson
(Thapson Yommana)
Technical Manager

TY/SS/AS/CJ



Report No. : 2018-00090 / 001-3 (Page 1 of 1)

Issued date : February 7, 2018

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Analysis Report

SAMPLE DESIGNATED AS : Noise Level
MEASUREMENT LOCATION : HRSG11 LP turbine bypass valve, GNC
CALIBRATION DATA : Calibrator Model CR:515, Cerrus Research plc. Serial No. 81969
Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

MEASUREMENT DATE : February 6, 2018
MEASURED BY : Suriya Srithomee

Noise Level [dB(A)] : February 6, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
14:40:05 - 14:40:15	92.1	14:41:15 - 14:41:25	92.2	14:42:25 - 14:42:35	92.0
14:40:15 - 14:40:25	92.2	14:41:25 - 14:41:35	92.1	14:42:35 - 14:42:45	92.1
14:40:25 - 14:40:35	92.1	14:41:35 - 14:41:45	91.9	14:42:45 - 14:42:55	92.0
14:40:35 - 14:40:45	92.2	14:41:45 - 14:41:55	91.9	14:42:55 - 14:43:05	92.0
14:40:45 - 14:40:55	92.1	14:41:55 - 14:42:05	91.8	14:43:05 - 14:43:15	91.9
14:40:55 - 14:41:05	92.2	14:42:05 - 14:42:15	92.0	14:43:15 - 14:43:25	91.9
14:41:05 - 14:41:15	92.1	14:42:15 - 14:42:25	92.0		
Guaranteed Value*		95	dB(A)		

Source : * Guaranteed Value of GNC Power Plant.

Siriporn
(Siriporn Imwilaiwan)
Environmental Monitoring Manager



Thapson
(Thapson Yommana)
Technical Manager

TY/SS/AS/CJ

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Report No. : 2018-00090 / 001-4 (Page 1 of 1)

Issued date : February 7, 2018

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Analysis Report

SAMPLE DESIGNATED AS : Noise Level
MEASUREMENT LOCATION : HRS12 HP turbine bypass valve, GNC
CALIBRATION DATA : Calibrator Model CR:515, Cemus Research plc. Serial No. 81969
 Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

MEASUREMENT DATE : February 6, 2018

MEASURED BY : Suriya Srithomee

Noise Level [dB(A)] : February 6, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
14:51:03 - 14:51:13	89.2	14:52:13 - 14:52:23	89.5	14:53:23 - 14:53:33	89.5
14:51:13 - 14:51:23	89.4	14:52:23 - 14:52:33	89.6	14:53:33 - 14:53:43	89.4
14:51:23 - 14:51:33	89.2	14:52:33 - 14:52:43	89.4	14:53:43 - 14:53:53	89.5
14:51:33 - 14:51:43	89.2	14:52:43 - 14:52:53	89.6	14:53:53 - 14:54:03	89.6
14:51:43 - 14:51:53	89.3	14:52:53 - 14:53:03	89.4	14:54:03 - 14:54:13	89.5
14:51:53 - 14:52:03	89.2	14:53:03 - 14:53:13	89.4	14:54:13 - 14:54:23	89.5
14:52:03 - 14:52:13	89.4	14:53:13 - 14:53:23	89.4	14:54:23 - 14:54:33	89.5
Guaranteed Value*		95		dB(A)	

Source : * Guaranteed Value of GNC Power Plant.

Siriporn Imwilaiwan
 (Siriporn Imwilaiwan)
 Environmental Monitoring Manager



Thapson Y.
 (Thapson Yommana)
 Technical Manager

TY/SS/AS/Cj



Report No. : 2018-00090 / 001-5 (Page 1 of 1)

Issued date : February 7, 2018

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 Tel. 085-020-0134 Email : osamu.yamasaki@toyo-eng.com

Analysis Report

SAMPLE DESIGNATED AS : Noise Level
MEASUREMENT LOCATION : HRS12 LP turbine bypass valve, GNC
CALIBRATION DATA : Calibrator Model CR:515, Cemus Research plc. Serial No. 81969
 Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.7 dB(A), Post Cal. : 93.7 dB(A)
SOUND LEVEL METER NO. : Model CR:161B, Serial No. G080136

MEASUREMENT DATE : February 6, 2018

MEASURED BY : Suriya Srithomee

Noise Level [dB(A)] : February 6, 2018					
Time	Leq 10 sec	Time	Leq 10 sec	Time	Leq 10 sec
14:55:03 - 14:55:13	89.4	14:56:33 - 14:56:43	89.4	14:58:03 - 14:58:13	89.3
14:55:13 - 14:55:23	89.2	14:56:43 - 14:56:53	89.3	14:58:13 - 14:58:23	89.2
14:55:23 - 14:55:33	89.1	14:56:53 - 14:57:03	89.2	14:58:23 - 14:58:33	89.3
14:55:33 - 14:55:43	89.4	14:57:03 - 14:57:13	89.3	14:58:33 - 14:58:43	89.3
14:55:43 - 14:55:53	89.3	14:57:13 - 14:57:23	89.2	14:58:43 - 14:58:53	89.4
14:55:53 - 14:56:03	89.3	14:57:23 - 14:57:33	89.3	14:58:53 - 14:59:03	89.3
14:56:03 - 14:56:13	89.4	14:57:33 - 14:57:43	89.4	14:59:03 - 14:59:13	89.3
14:56:13 - 14:56:23	89.2	14:57:43 - 14:57:53	89.3		
14:56:23 - 14:56:33	89.4	14:57:53 - 14:58:03	89.3		
Guaranteed Value*		95		dB(A)	

Source : * Guaranteed Value of GNC Power Plant.

Siriporn Imwilaiwan
 (Siriporn Imwilaiwan)
 Environmental Monitoring Manager



Thapson Y.
 (Thapson Yommana)
 Technical Manager

TY/SS/AS/Cj

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Shelter of 24-Hour Service

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Shelter of 24-Hour Service

Near field noise (95dBA)
HRSG safety valve silencers

Measured Noise Data by 3rd party, SGS



Report No. : 2018-00090 / 001-1 (Page 1 of 1)

Issued date : February 6, 2018

CLIENT : TOYO ENGINEERING CORPORATION
CONTACT : Mr. Osamu Yamasaki
ADDRESS : 1126/2 Vanit 2 Building 11th Floor, New Petchburi Road, Makkasan,
Rajchathewi, Bangkok 10400
Tel. 085-020-0134

Email : osamu.yamasaki@toyo-eng.com

Analysis Report

SAMPLE DESIGNATED AS : Noise Level
MEASUREMENT LOCATION : HRSG Safety Valve, GNC
CALIBRATION DATA : Calibrator Model CR:515, Cirrus Research plc. Serial No. 81969
Calibration Value Reference : 94.0 dB(A), Pre Cal. : 93.9 dB(A), Post Cal. : 94.0 dB(A)
SOUND LEVEL METER NO. : Model NL-21, Serial No. 00596472

MEASUREMENT DATE : February 6, 2018
MEASURED BY : Suriya Srithomee

Equipment	Steam Pressure	Date	Time	Noise Level [dB(A)]
				Leq 2 sec
HRSG11 HP superheater safety valve silencer	62.7 barG	06/02/2018	13:40	91.4
HRSG11 HP drum safety valve silencer	65.1 barG	06/02/2018	13:27	88.8
HRSG11 LP superheater safety valve silencer	6.6 barG	06/02/2018	13:46	84.6
HRSG11 LP drum safety valve silencer	6.97 barG	06/02/2018	13:47	86.1
HRSG12 HP superheater safety valve silencer	62.7 barG	06/02/2018	14:05	85.6
HRSG12 HP drum safety valve silencer	65.2 barG	06/02/2018	14:01	88.5
HRSG12 LP superheater safety valve silencer	6.7 barG	06/02/2018	14:07	87.9
HRSG12 LP drum safety valve silencer	7.0 barG	06/02/2018	14:10	85.5
Guaranteed Value*				95

Source : * Guaranteed Value of GNC Power Plant.


(Siriporn Imwailaiwan)
Environmental Monitoring Manager




(Thepsan Yommana)
Technical Manager

TY/SS/AS/CJ

Test Results Corrected by Toyo

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Model Form SGT 6/11/14

Test Results:
The below table summarize test results of HRS safety valve silencers noise. Noise were measured by 3rd party SGS at the indicated test pressure.
Measured noise reported by 3rd party SGS were corrected by applying correction factor in order to take into account influence of test pressure incorporating Owner's comment.

Correction method:

The attachment 3 shows the correction curves which were created based on the noise calculation sheets of PSVs (see Attachment 1) and PSV silencers (see Attachment 2) in order to estimate the noise at PSV noise test at lower operating pressure than SPV popping pressure. Basis of the correction curves are as below;

- (1) Power level of noise at PSV outlet (PWL) is function of set pressure (Ps) and is varied corresponding to variation of Ps. PWL can be calculated according to the equation 1) - 7) in the PSV noise calculation sheet and weighting correction using Table-A provided by Fukui as shown in the Attachment 1.
- (2) PWL at test condition can be estimated by entering operation pressure at test into Ps in the equations in the Attachment-1.
- (3) The PWL can be converted to sound pressure level (SPL) by the equation 9) in the Attachment-1.
- (4) This noise from PSV (= PWL) is reduced by the silencers as Attachment 2. The silencer is sized to achieve guarantee noise level of not exceeding 95dBA at 1m from silencer at design point (PSV popping at set pressure). The Attachment 2 also shows that silencer outlet noise is governed by the silencer inlet noise (= PSV outlet noise) and effect of flow noise is negligible. Therefore the sound pressure level (SPL) at 1 m from silencer outlet at test condition can be estimated by subtracting difference of PSV outlet noise between the one at PSV set pressure and test pressure from design noise level of 95 dBA at silencer outlet as shown in the Attachment 3
- (5) Correction curves are created by plotting estimated noise at various test pressure (x axis) and expected noise at each test pressure (y axis).

Based on the proposed correction curves, the noise test results will be judged as successful when measured noise [dBA] does not exceed expected noise [dBA] at test pressure.

	PSV set barg	Test date (See SGS Report) yyyy/mm/dd	Test Press barg	Noise		Noise correction curve equation
				Measured dBA	Corrected dBA	
HRS G11						
HP drum	70.67	2018/2/6	65.1	88.8	90.7	Pass
HP S/H	67.55	2018/2/6	62.7	91.4	92.8	Pass
LP drum	8.27	2018/2/6	6.97	86.1	87.4	Pass
LP S/H	7.4	2018/2/6	6.6	84.6	85.5	Pass
HRS G12						
HP drum	70.67	2018/2/6	65.2	88.5	90.4	Pass
HP S/H	67.55	2018/2/6	62.7	85.6	86.9	Pass
LP drum	8.27	2018/2/6	7.0	85.5	86.8	Pass
LP S/H	7.4	2018/2/6	6.7	87.9	88.7	Pass

Noise Calculation Sheet 騒音計算書 (ISO4216-9 Annex F)																																																																																											
PLANT		Gulf SPP3 B																																																																																									
P.O. No.		150200-010																																																																																									
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<p>*1: Power level generated from valve outlet to outlet pipe internal / 安全弁から二次側配管内に発生する音響出力</p> <p>*2: Calculation is outlet pipe Sch40 (Steel Pipe) basis / 二次側配管サイズはSch40(鋼管)とする。</p>																																																																																											
<table border="1"> <tr> <td>34</td> <td>(A)</td> <td colspan="10"></td> </tr> <tr> <td>35</td> <td>Octave band / オクターブバンド</td> <td>Hz</td> <td>63</td> <td>125</td> <td>250</td> <td>500</td> <td>1000</td> <td>2000</td> <td>4000</td> <td>8000</td> <td>OA</td> </tr> <tr> <td>36</td> <td>PWL₁</td> <td>dB</td> <td>134</td> <td>134</td> <td>135</td> <td>135</td> <td>136</td> <td>135</td> <td>134</td> <td>132</td> <td>144</td> </tr> <tr> <td>37</td> <td>A Weighting / A特性補正</td> <td>dB</td> <td>-26</td> <td>-16</td> <td>-9</td> <td>-3</td> <td>0</td> <td>1</td> <td>1</td> <td>-1</td> <td>-</td> </tr> <tr> <td>38</td> <td>Transmission Loss / 透過損失 TL(8)</td> <td>dB</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>-</td> </tr> <tr> <td>39</td> <td>PWL</td> <td>dBA</td> <td>108</td> <td>118</td> <td>126</td> <td>132</td> <td>136</td> <td>136</td> <td>135</td> <td>131</td> <td>142</td> </tr> </table>				34	(A)											35	Octave band / オクターブバンド	Hz	63	125	250	500	1000	2000	4000	8000	OA	36	PWL ₁	dB	134	134	135	135	136	135	134	132	144	37	A Weighting / A特性補正	dB	-26	-16	-9	-3	0	1	1	-1	-	38	Transmission Loss / 透過損失 TL(8)	dB	0	0	0	0	0	0	0	0	-	39	PWL	dBA	108	118	126	132	136	136	135	131	142																
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37	A Weighting / A特性補正	dB	-26	-16	-9	-3	0	1	1	-1	-																																																																																
38	Transmission Loss / 透過損失 TL(8)	dB	0	0	0	0	0	0	0	0	-																																																																																
39	PWL	dBA	108	118	126	132	136	136	135	131	142																																																																																

Noise Calculation Sheet				PLANT	Gulf SPP3 B							
騒音計算書 (ISO4216-9 Annex F)				P.O. No.	150200-010							
				JOB No.	150200							
GENERAL		1 Item No. アイテム番号										
2 Tag No. 弁番号		11/12LBA10AA401										
3 Fukui Use 1 福井 使用欄 1		15L-032A-C/0										
4 Fukui Use 2 福井 使用欄 2		20150 2251,2258,2265-1-2										
5 FUKUI Style 型式番号		SL651-C2-M2(T)										
6 Size サイズ		2*H*3										
7 Throat Diameter のど部の径		dt	26.6 mm									
8 Orifice Area 吹出し面積		A ₁	5.557 cm ²									
9 Outlet Diameter 出口の径		do	80 mm									
10 Outlet Area 出口面積		A ₂	50.265 cm ²									
11 Fluid 流体名		STEAM										
12 Mol. Wt. 分子量		M	18									
13 Specific Heat Ratio 比熱比		k	1.28									
14 Relieving Temp. 吹出温度		T	472 °C									
15			745 K									
16 Set Pressure 設定圧力		Ps	67.55 barG									
17			6.755 MPaG									
18 Allowable Over Press. 許容超過圧力		Ac	3 %									
19 Atmos. Press. 大気圧		Pa	0.101 MPaA									
20 Gas Constant ガス定数		R	8.314 J / (mol·K)									
21 Relieving Pressure from (2) 吹出し量決定圧力 (2)式より		P ₀	7.05865 MPaA									
22 Ratio Volume at Throat from (3) のど部の比容積 (3)式より		V ₁	0.04875 m ³ /kg									
23 Pressure at Outlet from (4) 出口圧力 (4)式より		P ₂	0.4287 MPaA									
24 Ratio Volume at Outlet from (5) 出口部比容積 (5)式より		V ₂	0.4349 m ³ /kg									
25 Speed at Throat from (6) のど部流体速度 (6)式より		U	664 m/s									
26 Power Level at Valve from (1) 音響出力*1 (1)式より		PWL ₁	145 dB									
27 Center Frequency from (7) 中心周波数 (7)式より		f	1660 Hz									
28 Surface Density 二次側配管材の面密度 *2		m	43.2 kg/m ²									
29 Power Level from Table (A) 音響出力 (A)表より		PWL	144 dBA									
30 Sound Pressure Level from (9) 音圧レベル (9)式より		SPL	137 dBA									
31		$PWL_1 = 20 \log \frac{dt}{1000} - 10 \log v_2 + 80 \log U - 53$ (1)										
32		$U = \sqrt{\frac{1000 \kappa R T}{M}}$ (6)										
33		$P_0 = P_s \left(1 + \frac{Ac}{100} \right) + P_a$ (2)										
34		$f = \frac{0.2U}{do} \times 1000$ (7)										
35		$v_1 = \frac{RT}{1000 \times MP_0}$ (3)										
36		$TL = 18 \log (m \times f) - 44$ (8)										
37		$P_2 = \left(\frac{2}{\kappa + 1} \right)^{\frac{\kappa}{\kappa - 1}} \frac{A_1}{A_2} P_0$ (4)										
38		$v_2 = \left(\frac{P_0}{P_2} \right)^{\frac{1}{\kappa}} v_1$ (5)										
39		$SPL = PWL - 10 \log (2 \pi r^2)$ (9)										
40		$r = 1m$ (from Outlet)										
41		*1: Power level generated from valve outlet to outlet pipe internal / 安全弁から二次側配管内に発生する音響出力										
42		*2: Calculation is outlet pipe Sch40 (Steel Pipe) basis / 二次側配管サイズはSch40(鋼管)とする。										
43		(A) Octave band / オクターブバンド										
44		Hz	63	125	250	500	1000	2000	4000	8000	OA	
45		PWL ₁	dB	134	135	135	136	136	137	136	135	145
46		A Weighting / A特性補正	dB	-26	-16	-9	-3	0	1	1	-1	-
47		Transmission Loss / 透過損失 TL(8)	dB	0	0	0	0	0	0	0	0	-
48		PWL	dBA	108	119	126	133	136	138	137	134	144
49												
50												
51												
52												
53												
54												
55												
56												
57												
58												
59												
60												

Noise Calculation Sheet				PLANT	Gulf SPP3 B							
騒音計算書 (ISO4216-9 Annex F)				P.O. No.	150200-010							
				JOB No.	150200							
GENERAL		1 Item No. アイテム番号										
2 Tag No. 弁番号		11/12HAD50AA401										
3 Fukui Use 1 福井 使用欄 1		15L-032A-C/0										
4 Fukui Use 2 福井 使用欄 2		20150 2253,2260,2267-1-2										
5 FUKUI Style 型式番号		SL231(T)										
6 Size サイズ		4*P*6										
7 Throat Diameter のど部の径		dt	75.7 mm									
8 Orifice Area 吹出し面積		A ₁	45.007 cm ²									
9 Outlet Diameter 出口の径		do	150 mm									
10 Outlet Area 出口面積		A ₂	176.714 cm ²									
11 Fluid 流体名		STEAM										
12 Mol. Wt. 分子量		M	18									
13 Specific Heat Ratio 比熱比		k	1.29									
14 Relieving Temp. 吹出温度		T	177.8 °C									
15			450.8 K									
16 Set Pressure 設定圧力		Ps	8.27 barG									
17			0.827 MPaG									
18 Allowable Over Press. 許容超過圧力		Ac	3 %									
19 Atmos. Press. 大気圧		Pa	0.101 MPaA									
20 Gas Constant ガス定数		R	8.314 J / (mol·K)									
21 Relieving Pressure from (2) 吹出し量決定圧力 (2)式より		P ₀	0.95281 MPaA									
22 Ratio Volume at Throat from (3) のど部の比容積 (3)式より		V ₁	0.21853 m ³ /kg									
23 Pressure at Outlet from (4) 出口圧力 (4)式より		P ₂	0.1329 MPaA									
24 Ratio Volume at Outlet from (5) 出口部比容積 (5)式より		V ₂	1.0062 m ³ /kg									
25 Speed at Throat from (6) のど部流体速度 (6)式より		U	518 m/s									
26 Power Level at Valve from (1) 音響出力*1 (1)式より		PWL ₁	142 dB									
27 Center Frequency from (7) 中心周波数 (7)式より		f	691 Hz									
28 Surface Density 二次側配管材の面密度 *2		m	55.7 kg/m ²									
29 Power Level from Table (A) 音響出力 (A)表より		PWL	140 dBA									
30 Sound Pressure Level from (9) 音圧レベル (9)式より		SPL	133 dBA									
31		$PWL_1 = 20 \log \frac{dt}{1000} - 10 \log v_2 + 80 \log U - 53$ (1)										
32		$U = \sqrt{\frac{1000 \kappa R T}{M}}$ (6)										
33		$P_0 = P_s \left(1 + \frac{Ac}{100} \right) + P_a$ (2)										
34		$f = \frac{0.2U}{do} \times 1000$ (7)										
35		$v_1 = \frac{RT}{1000 \times MP_0}$ (3)										
36		$TL = 18 \log (m \times f) - 44$ (8)										
37		$P_2 = \left(\frac{2}{\kappa + 1} \right)^{\frac{\kappa}{\kappa - 1}} \frac{A_1}{A_2} P_0$ (4)										
38		$v_2 = \left(\frac{P_0}{P_2} \right)^{\frac{1}{\kappa}} v_1$ (5)										
39		$SPL = PWL - 10 \log (2 \pi r^2)$ (9)										
40		$r = 1m$ (from Outlet)										
41		*1: Power level generated from valve outlet to outlet pipe internal / 安全弁から二次側配管内に発生する音響出力										
42		*2: Calculation is outlet pipe Sch40 (Steel Pipe) basis / 二次側配管サイズはSch40(鋼管)とする。										
43		(A) Octave band / オクターブバンド										
44		Hz	63	125	250	500	1000	2000	4000	8000	OA	
45		PWL ₁	dB	133	134	134	135	134	133	131	130	142
46		A Weighting / A特性補正	dB	-26	-16	-9	-3	0	1	1	-1	-
47		Transmission Loss / 透過損失 TL(8)	dB	0	0	0	0	0	0	0	0	-
48		PWL	dBA	107	118	125	132	134	134	132	129	140
49												
50												
51												
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54												
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56												
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58												
59												
60												

Noise Calculation Sheet
騒音計算書 (ISO4216-9 Annex F)

PLANT Gulf SPP3 B
P.O. No. 150200-010
JOB No. 150200

1	Item No.	アイテム番号	
2	Tag No.	弁番号	11/12LBA50AA401
3	Fukui Use 1	福井 使用欄 1	15L-032A-C/0
4	Fukui Use 2	福井 使用欄 2	2015O 2254,2261,2268-1-2
5	FUKUI Style	型式番号	SL231(T)
6	Size	サイズ	3*K*4
7	Throat Diameter	のど部の径	dt 40.6 mm
8	Orifice Area	吹出し面積	A ₁ 12.946 cm ²
9	Outlet Diameter	出口の径	do 100 mm
10	Outlet Area	出口面積	A ₂ 78.54 cm ²
11	Fluid	流体名	STEAM
12	Mol. Wt.	分子量	M 18
13	Specific Heat Ratio	比熱比	k 1.3
14	Relieving Temp.	吹出温度	T 253 °C 526 K
15	Set Pressure	設定圧力	Ps 7.4 barG 0.74 MPaG
16	Allowable Over Press.	許容超過圧力	Ac 3 %
17	Atmos. Press.	大気圧	Pa 0.101 MPaA
18	Gas Constant	ガス定数	R 8.314 J / (mol·K)
19	Relieving Pressure from (2)	吹出し量決定圧力 (2)式より	P ₀ 0.8632 MPaA
20	Ratio Volume at Throat from (3)	のど部の比容積 (3)式より	V ₁ 0.28146 m ³ /kg
21	Pressure at Outlet from (4)	出口圧力 (4)式より	P ₂ 0.0776 MPaA
22	Ratio Volume at Outlet from (5)	出口部比容積 (5)式より	V ₂ 1.7957 m ³ /kg
23	Speed at Throat from (6)	のど部流体速度 (6)式より	U 562 m/s
24	Power Level at Valve from (1)	音響出力*1 (1)式より	PWL ₁ 137 dB
25	Center Frequency from (7)	中心周波数 (7)式より	f 1124 Hz
26	Surface Density	二次側配管材の面密度 *2	m 47.1 kg/m ²
27	Power Level from Table (A)	音響出力 (A)表より	PWL 135 dBA
28	Sound Pressure Level from (9)	音圧レベル (9)式より	SPL 128 dBA

$$PWL_1 = 20 \log \frac{dt}{1000} - 10 \log v_1 + 80 \log U - 53 \quad (1)$$
$$P_0 = P_s \left(1 + \frac{Ac}{100} \right) + P_a \quad (2)$$
$$v_1 = \frac{RT}{1000 \times MP_0} \quad (3)$$
$$P_2 = \left(\frac{2}{\kappa + 1} \right)^{\frac{\kappa}{\kappa - 1}} \frac{A_1}{A_2} P_0 \quad (4)$$
$$v_2 = \left(\frac{P_0}{P_2} \right)^{\frac{1}{\kappa}} v_1 \quad (5)$$

$$U = \sqrt{\frac{1000 \kappa RT}{M}} \quad (6)$$
$$f = \frac{0.2U}{do} \times 1000 \quad (7)$$
$$TL = 18 \log (m \times f) - 44 \quad (8)$$
$$SPL = PWL - 10 \log (2\pi r^2) \quad (9)$$

$$r = 1m \text{ (from Outlet)}$$

*1: Power level generated from valve outlet to outlet pipe internal / 安全弁から二次側配管内に発生する音響出力
*2: Calculation is outlet pipe Sch40 (Steel Pipe) basis / 二次側配管サイズはSch40(鋼管)とする。

Octave band / オクターブバンド	Hz	63	125	250	500	1000	2000	4000	8000	OA
PWL ₁	dB	127	127	128	128	129	128	127	125	137
A Weighting / A特性補正	dB	-26	-16	-9	-3	0	1	1	-1	-
Transmission Loss / 透過損失 TL(8)	dB	0	0	0	0	0	0	0	0	-
PWL	dBA	101	111	119	125	129	129	128	124	135

REMARKS
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59
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2140 Eastman Ave. Suite 207
Ventura, CA 93003
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Page 1 of 1

Transmittal

ATA Project	P15419	Transmittal No.	011215_DS	Date	01Dec15
Prepared by	Mike Barrett			Distribution	Function
To	Nooter Eriksen	PO 150200-020	Gulf SPP3 B		
Attention	Rachel Holmes	Fax			
Address		Tel			
Zip code		City			

Document or drawing No.	Rev.	Description	Status code	format
P15419-65-1010	1	Data Sheets 11/12HAD10BS201	1	.pdf
P15419-65-1020	1	Data Sheets 11/12LBA10BS201	1	.pdf
P15419-65-1030	1	Data Sheets 10LAA30BS201	1	.pdf
P15419-65-1040	1	Data Sheets 11/12HAD50BS201	1	.pdf
P15419-65-1050	1	Data Sheets 11/12LBA50BS201	1	.pdf
P15419-65-1060	1	Data Sheets 11/12LCQ70BS201	1	.pdf
P15419-65-1070	1	Data Sheets 11/12LBH10BS001	1	.pdf
P15419-65-1080	1	Data Sheets 11/12LBH65BS001	1	.pdf

Status code

1 For approval	4 For information	7 final
2 For production	5 As requested	
3 For construction	6 revision	

Remarks

When receiving revised drawings, all previous versions of these drawings are expired. Please make sure that the previous versions of these drawings are marked obsolete or destroyed
Return a completed and signed copy of this transmittal to Aarding Thermal Acoustics USA by e-mail or fax

Received on.	Ref.	Signature
--------------	------	-----------

Attachment 2

NOISE CALCULATION STEAM VENT SILENCER

Date:	25/Nov/15
Project:	P15419 - Gulf SPP3 B - NE-PO: 150200-020
Item:	1 - 11 / 12HAD10BS201
Revision:	1

Freq.Hz	31	63	125	250	500	1000	2000	4000	8000	dBA
Lw core 1 inlet	117	120	124	129	136	141	145	147	147	152
Diffuser Element 1	0	8	16	21	28	34	37	33	30	
Lw core 1 silenced	117	112	108	108	108	107	108	114	117	119
	0	0	0	0	0	0	0	0	0	7
Lw core 2 silenced	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
Lw core 3 silenced	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
Total Silenced Cores	117	112	108	108	108	107	108	114	117	119 **
Casing (=Dir 90°)	2	2	3	5	6	8	9	10	11	
Splitter Package	0	0	0	0	0	0	0	0	0	
Total Lw no flow noise	115	110	105	103	102	99	99	104	106	109
Flow noise*	70	70	70	70	66	61	56	52	47	67
Lw ir	115	110	105	103	102	99	99	104	106	109
Lw - Lp @ 1 m	15	15	15	15	15	15	15	15	15	
Expected Lp @ 1 m / 90°	99	94	89	87	86	83	83	88	90	94

ø Casing	49.7 [Inch]	1,262 [mm]
Flow	107,855 [lb/hr]	48,922 [kg/hr]
Temp	549 [°F]	287 [°C]
Lw max*		151.7 [dB]
Lw core1		151.7 [dB]
		0.0 [dB]
		[dB]

**Core with the highest reduction

Velocity casing	68 [ft/s]	20.67 [m/s]
Open area casing	4.10 [ft²]	1.25 [m²]
Temp in casing	322 [°F]	147 [°C]
Flow Noise*		75 [dB]

*In case of combined Flows

Required Lp @ 1 m / 90° 95.0 dBA

"These acoustic calculations are based on actual venting noise of the silencer discharge with no inclusion of silencer upstream pipe radiated noise or any and all other noise sources within the measurement vicinity that may increase our acoustic prediction results due to measurement locations."



Attachment 2

NOISE CALCULATION STEAM VENT SILENCER

Date:	25/Nov/15
Project:	P15419 - Gulf SPP3 B - NE-PO: 150200-020
Item:	4 - 11 / 12HAD50BS201
Revision:	1

Freq.Hz	31	63	125	250	500	1000	2000	4000	8000	dBA
Lw core 1 Inlet	106	109	113	118	125	130	134	136	136	141
Diffuser Element 1	0	8	14	20	28	32	31	27	22	
Lw core 1 silenced	106	103	99	98	97	98	103	109	114	115
	0	0	0	0	0	0	0	0	0	7
Lw core 2 silenced	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
Lw core 3 silenced	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
Total Silenced Cores	106	103	99	98	97	98	103	109	114	115 **
Casing (=Dir 90°)	2	2	3	5	6	8	9	10	11	
Splitter Package	0	0	0	0	0	0	0	0	0	
Total Lw no flow noise	104	101	96	93	91	90	94	99	103	105
Flow noise*	61	61	61	60	55	51	46	41	37	57
Lw ir	104	101	96	93	91	90	94	99	103	105
Lw - Lp @ 1 m	14	14	14	14	14	14	14	14	14	
Expected Lp @ 1 m / 90°	90	87	82	79	77	76	80	85	89	90

ø Casing	38.2 [Inch]	970 [mm]
Flow	48,404 [lb/hr]	21,956 [kg/hr]
Temp	350 [°F]	177 [°C]
Lw max*		141.0 [dB]
Lw core1		141.0 [dB]
		0.0 [dB]
		[dB]

**Core with the highest reduction

Velocity casing	52 [ft/s]	15.78 [m/s]
Open area casing	2.42 [ft²]	0.74 [m²]
Temp in casing	326 [°F]	149 [°C]
Flow Noise*		66 [dB]

*In case of combined Flows

Required Lp @ 1 m / 90° 95.0 dBA

"These acoustic calculations are based on actual venting noise of the silencer discharge with no inclusion of silencer upstream pipe radiated noise or any and all other noise sources within the measurement vicinity that may increase our acoustic prediction results due to measurement locations."



Attachment 2

NOISE CALCULATION STEAM VENT SILENCER										

Date:	25/Nov/15									
Project:	P15419 - Gulf SPP3 B - NE-PO: 150200-020									
Item:	2 - 11 / 12LBA10BS201									
Revision:	1									
Freq.Hz	31	63	125	250	500	1000	2000	4000	8000	dBA

Lw core 1 Inlet	115	118	122	127	134	139	143	145	145	150
Diffuser Element 1	0	5	16	21	28	34	37	33	30	
Lw core 1 silenced	115	110	106	106	106	105	106	112	115	117
	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
Lw core 2 silenced	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
Lw core 3 silenced	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
Total Silenced Cores	115	110	106	106	106	105	106	112	115	117 **
Casing (=Dir 90°)	2	2	3	5	6	8	9	10	11	
Splitter Package	0	0	0	0	0	0	0	0	0	
Total Lw no flow noise	113	108	103	101	100	97	97	102	104	107
Flow noise*	51	51	51	47	42	38	33	28	24	44
Lw Ir	113	108	103	101	100	97	97	102	104	107
Lw - Lp @ 1 m	15	15	15	15	15	15	15	15	15	
Expected Lp @ 1 m / 90°	97	92	87	85	84	81	81	86	88	92
Required Lp @ 1 m / 90°										95.0 dBA

σ Casing	49.7 [Inch]	1,262 [mm]
Flow	35,617 [lb/hr]	16,156 [kg/hr]
Temp	882 [°F]	472 [°C]
Lw max*		149.7 [dB]
Lw core1		149.7 [dB]
		0.0 [dB]
		[dB]
**Core with the highest reduction		
Velocity casing	38 [ft/s]	11.54 [m/s]
Open area casing	4.10 [ft²]	1.25 [m²]
Temp in casing	835 [°F]	432 [°C]
Flow Noise*		56 [dB]

*In case of combined Flows

"These acoustic calculations are based on actual venting noise of the silencer discharge with no inclusion of silencer upstream pipe radiated noise or any and all other noise sources within the measurement vicinity that may increase our acoustic prediction results due to measurement locations."



Attachment 2

NOISE CALCULATION STEAM VENT SILENCER										

Date:	25/Nov/15									
Project:	P15419 - Gulf SPP3 B - NE-PO: 150200-020									
Item:	5 - 11 / 12LBA50BS201									
Revision:	1									
Freq.Hz	31	63	125	250	500	1000	2000	4000	8000	dBA

Lw core 1 Inlet	99	102	106	111	118	123	127	129	129	134
Diffuser Element 1	0	8	13	18	27	29	28	25	21	
Lw core 1 silenced	99	94	93	93	91	94	99	104	108	110
	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
Lw core 2 silenced	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
Lw core 3 silenced	0	0	0	0	0	0	0	0	0	7
	0	0	0	0	0	0	0	0	0	7
Total Silenced Cores	99	94	93	93	91	94	99	104	108	110 **
Casing (=Dir 90°)	2	2	3	5	6	8	9	10	11	
Splitter Package	0	0	0	0	0	0	0	0	0	
Total Lw no flow noise	97	92	90	88	85	86	90	94	97	100
Flow noise*	30	30	25	20	16	11	6	2	-3	18
Lw Ir	97	92	90	88	85	86	90	94	97	100
Lw - Lp @ 1 m	14	14	14	14	14	14	14	14	14	
Expected Lp @ 1 m / 90°	83	78	76	74	71	72	76	80	83	85
Required Lp @ 1 m / 90°										95.0 dBA

σ Casing	38.2 [Inch]	970 [mm]
Flow	11,947 [lb/hr]	5,419 [kg/hr]
Temp	487 [°F]	253 [°C]
Lw max*		134.1 [dB]
Lw core1		134.1 [dB]
		0.0 [dB]
		[dB]
**Core with the highest reduction		
Velocity casing	16 [ft/s]	4.76 [m/s]
Open area casing	2.42 [ft²]	0.74 [m²]
Temp in casing	490 [°F]	240 [°C]
Flow Noise*		35 [dB]

*In case of combined Flows

"These acoustic calculations are based on actual venting noise of the silencer discharge with no inclusion of silencer upstream pipe radiated noise or any and all other noise sources within the measurement vicinity that may increase our acoustic prediction results due to measurement locations."



HRSG PSV Silencer Noise Test for GNC, GNRV1 and GNRV2 (LM6000 sites)

		GNC				Noise		Noise correction curve equation
PSV sat	Test date	Test Pms	Measured		Corrected	Criteria <=95dB(A)		
			freq	mm/dd				
							freq	
HRS011								
HP-G11	70.67	60.0	90.9	y = 5.92583E +000(x) + 6.97769E+01				
HP-S14	67.95	60.0	90.9	y = 4.30871E +000(x) + 5.9143E+01				
HP-G12	7.0	90.0	90.9	y = 4.87762E +000(x) + 5.46535E+01				
LP-S14	7.4	90.0	90.7	y = 3.65035E +000(x) + 8.76384E+01				
HRS012								
HP-G12	70.67	60.0	90.9	y = 5.92583E +000(x) + 6.97769E+01				
HP-S14	67.95	60.0	90.9	y = 4.30871E +000(x) + 5.9143E+01				
LP-G12	7.0	90.0	90.9	y = 4.87762E +000(x) + 5.46535E+01				
LP-S14	7.4	90.0	90.7	y = 3.65035E +000(x) + 8.76384E+01				

By Fekral

Original message from Fukur (Japanese)

- ① 中心要素数及びAWRにより各周波数に対する補正値を求める。
 ② 800aの場合、中心要素数及びAWRの4乗の補正値を決定する。
 ③ $10 \log_{10} \{P_{WLC}(10^{-4}) + 10 \log_{10} P_{WLC}(10^{-4}) + 10 \log_{10} P_{WLC}(10^{-4}) + 10 \log_{10} P_{WLC}(10^{-4}) + 10 \log_{10} P_{WLC}(10^{-4}) + \dots\}$ (1式)
 ④ (1式)でPWLに代入した値より各周波数での中心要素を、IPWLで示した周波数でのPWL(参考値)
 ⑤ 800aの場合、中心は10000とある(10000より補正値)でのPWLを算出した値に140補正して141, 143, 142...と1づつ減らしていき
 ⑥ (1式)が最もPWLに近くなる値を決定する。IPWLの値はPWLで決まる。例(PWL=P5/F1)
 ⑦ PWL=1-A weighting-Transmission lossより各周波数でのPWLを求める。
 ⑧ (1式)のIPWLに各周波数でのPWLを代入することによってPWLが得られる。

English translation

- 1) Calculate center frequency per equation 17 on the PSV noise calculation sheet and obtain A weighting correction from the table B below
- 2) In case $F=80\text{dB}$, center frequency is 761 Hz. Therefore use A weighting correction for $710\text{Hz} < f < 1400\text{Hz}$ as per table B
- 3) $10 \log(10^4/P1/10) + 10^4(P3/10) + 10^4(P4/10) + 10^4(P5/10) + 10^4(P6/10) + 10^4(P7/10) + 10^4(P8/10) + \dots$ (Equation 1)
- 4) Determine all of P1 to be overall PWL1 per equation 1 above and overall PWL1 per PSV noise calculation sheet
- 5) In case $F=80\text{dB}$, center frequency is 1000Hz. Therefore A weighting correction at P5 is zero. The other P1 can be automatically calculated from the above table B.
- 6) Adjust figure of P5 manually in order for overall PWL1 per noise calculation sheet equals to overall PWL1 per equation 1.
- 6) Obtain $PWL = PWL1 + A \text{ weighting} + \text{Transmission loss}$
- 7) By entering PWL for each frequency in the above equation 1, Overall PWL (after corrections)

TABLE 9

Center Frequency	40	80	125	250	500	1000	2000	4000	8000
40 Hz	F	---	---	1.2	-1.2	-2.4	-3.8	-4.8	-7.2
80 Hz	F	---	---	-0.6	0	-1.2	-2.4	-3.8	-4.8
125 Hz	F	---	---	-1.2	-0.6	0	-1.2	-2.4	-3.8
250 Hz	F	---	---	-1.8	-1.2	-2.4	-3.8	-4.8	-7.2
500 Hz	F	---	---	-1.8	-1.8	-1.2	0	-1.2	-2.4
1000 Hz	F	---	---	-2.4	-2.4	-1.8	-1.2	-3.8	-4.8
2000 Hz	F	---	---	-3.8	-3.8	-2.4	-1.8	-7.2	-9.6
4000 Hz	F	---	---	-4.8	-4.8	-3.8	-2.4	-9.6	-12.0
8000 Hz	F	---	---	-7.2	-7.2	-4.8	-3.8	-12.0	-14.4
Octave band	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3
PWL, 1 dB	P1	P2	P3	P4	P5	P6	P7	P8	PWL, 1

HRSG PSV Silencer Noise Test

Name		HP drum PSV							
Tag		H1/2-DA/05DAAG01							
Description		Unit	Design	Case 1	Case 2	Case 3	Case 4	Case 5	
Throat diameter	dt	mm	40.6	40.6	40.6	40.6	40.6	40.6	
Orifice area	A1	cm ²	12.948	12.948	12.948	12.948	12.948	12.948	
Orifice diameter	A2	mm	150	150	150	150	150	150	
Orifice area	A2	cm ²	176.714	176.714	176.714	176.714	176.714	176.714	
Mol Wt	M		18	18	18	18	18	18	
Specific heat ratio	K		1.25	1.25	1.25	1.25	1.25	1.25	
Relieving temp	T	deg C	289.4	284.9	280.9	276.7	272.3	267.7	
Relieving temp	T	deg F	553.0	551.0	550.0	549.0	545.3	540.0	
Set pressure	Ps	barg	70.67	68	64	60	56	55	
Set pressure	Ps	MPa(g)	7.067	6.8	6.4	6.0	5.6	5.5	
Allowable over press	Ac	%	3	3	3	3	3	3	
Atmos. Press	Pa	MPa(a)	0.101	0.101	0.101	0.101	0.101	0.101	
Gas constant	R	J/(kg K)	8.314	8.314	8.314	8.314	8.314	8.314	
Relieving pressure from (2)	P0	MPa(a)	7.380070	7.105000	6.830000	6.520000	5.869000	5.457000	
Ratio volume at throat from (3)	V1	MPa(a)	0.035196	0.036267	0.036223	0.040223	0.042913	0.045768	
Pressure at outlet from (4)	P2	MPa(a)	0.00196	0.2868	0.7241	0.2552	0.2386	0.2214	
Ratio volume at outlet from (5)	V2	MPa(a)	0.4963	0.4701	0.4695	0.5240	0.5560	0.5803	
Speed at throat from (6)	V	m/sec	558	563	563	563	563	563	
Center frequency from (7)	f	Hz	70.67	75.4	75.7	75.4	75.1	74.8	
Power level at PSV from (1)	PWS1	dB	143.04	142.8	142.4	142.0	141.6	141.1	
Power level from table (A)	PWSA	dB(A)	141.0	140.8	140.4	140.0	139.6	139.2	
Sound pressure level from (9)	SL	dB(A)	133.0	132.8	132.4	132.0	131.6	131.1	
Design - Design - Case1	Δ SPL	dB(A)	0	-1.9	-2.59	-2.89	-1.39	-1.7	
At Silencer									
Design -95dB(A)	SFL	dB(A)	85	84.81	84.41	84.01	83.61	83.21	
Other case - 95dB(A) - Δ SPL									

Table A

Parameter	70.67 barg	125	250	500	1000	2000	4000	8000 ISO
Octave band	Hz	63	125	250	500	1000	2000	4000
PWL	dB	133	134	134	135	134	133	132
A-weighting	dB	-26	-18	-9	-3	0	1	-1
Transmission loss	dB	0	0	0	0	0	0	0
PWL	dBA	107	116	125	132	135	134	131

Parameter	Hz	63	125	250	500	1000	2000	4000	8000	ISO
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	ISO
PWL1	dB	132.8901	133.49013	134.09013	134.7	<u>135.29013</u>	134.09013	132.89013	131.69013	142.8
A weighting	dB	-26	-16	-8	-3	0	1	1	-1	
Transmission loss	dB			0	0	0	0	0	0	
PWL	dB	106.8901	117.49013	125.09013	131.69013	135.29013	135.09013	133.89013	130.6901	149.8

Pan		64 barg									
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	QA	
PWL	dB	132.490	133.090	133.690	134.290	134.890	135.690	132.490	131.290	142.4	
A weighting	dB	-26	-18	0	-3	0	1	1	-1		
Transmission loss	dB	0	0	0	0	0	0	0	0		
PWL	dBA	106.490	117.090	134.690	131.290	134.890	134.690	133.490	130.290	145.4	

Part	60 barg									
Octave band	Hz	(3)	125	250	500	1000	2000	4000	8000	10A
PWL1	(dB)	132.000	132.000	133	133.000	134.000	133.29013	132.000	130.800	142.0
A weighting	(dB)	-26	-18	-9	-3	0	1	1	-3	
Transmission loss	(dB)	0	0	0	0	0	0	0	0	
PWL	(dB)	106.000	118.000	124.29013	130.800	134.000	134.29013	133.000	129.800	140.0

Pwr	56 barg									
Octave band	fz	63	125	250	500	1000	2000	4000	8000	OA
PWS.1	dB	131.6901	132.29013	132.89013	133.49013	134.09013	132.89013	131.69013	130.4901	141.6
A weighting	dB	-26	-16	0	-3	0	0	1	-1	
Transmission loss	dB	0	0	0	0	0	0	0	0	
PWL	dBA	105.6901	116.29013	132.89013	130.49013	134.09013	133.89013	132.69013	129.4901	139.6

Pa	52 barg									
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	OA
PWL1	dB	131.2901	131.89013	132.49013	133.09013	133.69013	132.49013	131.29013	130.09013	141.2
A weighting	dB	-26	-16	-9	-3	0	1	1	-1	
Transmission loss	dB	0	0	0	0	0	0	0	0	
PWL	dB	105.2901	115.89013	123.49013	130.09013	133.69013	133.49013	132.29013	129.09013	139.2

Attachment 3

HRSG PSV Silencer Noise Test

Name	HP SH PSV									
Tag	1112LBA10AA01									
Description	Unit	Design	Case 1	Case 2	Case 3	Case 4	Case 5			
Throat diameter	in	26.6	26.6	26.6	26.6	26.6	26.6			
Orifice area	A1 cm ²	5.557	5.557	5.557	5.557	5.557	5.557			
Outlet diameter	in	80	80	80	80	80	80			
Outlet area	A2 cm ²	50.295	50.295	50.295	50.295	50.295	50.295			
Mol. Wt.	M	18	18	18	18	18	18			
Specific heat ratio	k	1.28	1.28	1.28	1.28	1.28	1.28			
Relieving temp.	1 deg C	472	472	472	472	472	472			
Relieving temp.	2 °F	745	745	745	745	745	745			
Set pressure	Ps barg	67.55	65	61	57	54	50			
Set pressure	Ps MPaG	6.755	6.5	6.1	5.7	5.4	5			
Allowable over press.	Ac %	3	3	3	3	3	3			
Atmos. Press.	Pa MPaA	0.101	0.101	0.101	0.101	0.101	0.101			
Gas constant	R J/mol K	8.314	8.314	8.314	8.314	8.314	8.314			
Relieving pressure from (2)	PO MPaA	7.058550	6.796000	6.384000	5.972000	5.560000	5.251000			
Ratio volume at throat from (3)	V1 m ³ /kg	0.048750	0.050634	0.053902	0.057620	0.060764	0.065532			
Pressure at outlet from (4)	P2 MPaA	0.4287	0.4128	0.3877	0.3627	0.3439	0.3185			
Ratio volume at outlet from (5)	V2 m ³ /kg	0.4348	0.4517	0.4809	0.5141	0.5421	0.5848			
Speed at throat from (6)	U m/s	663.7	663.7	663.7	663.7	663.7	663.7			
Center frequency from (7)	f Hz	1659	1659	1659	1659	1659	1659			
Power level at PSV from (1)	PWL1 dBA	144.9	144.7	144.4	144.1	143.9	143.6			
Power level from table (A)	PWL2 dBA	143.4	143.2	142.9	142.6	142.4	142.1			
Sound pressure level from (8)	SPL dBA	135.4	135.2	134.9	134.6	134.4	134.1			
Δ SPL (Design - Case)	dBA	0	-0.20	-0.50	-0.80	-1.00	-1.30			
At Silencer										
Design = 95dBA	PWL dBA	95	94.80	94.50	94.20	94.00	93.70			
Other case = 95dBA - Δ SPL										

Table A										
67.55 barg										
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	OA
PWL	dB	134.3406	134.9406	135.5406	136.1406	136.7406	137.3406	137.9406	138.5406	144.9
A weighting	dB	-26	-16	-9	-3	0	1	1	-1	-1
Transmission loss	dB	0	0	0	0	0	0	0	0	0
PWL	dBA	108.3406	118.8406	126.5406	133.1406	136.7406	138.3406	137.9406	137.5406	143.4

65 barg										
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	OA
PWL	dB	134.1406	134.7406	135.3406	135.9406	136.5406	137.1406	137.7406	138.3406	144.7
A weighting	dB	-26	-16	-9	-3	0	1	1	-1	-1
Transmission loss	dB	0	0	0	0	0	0	0	0	0
PWL	dBA	108.1406	118.6406	126.3406	132.9406	136.5406	138.1406	137.7406	137.3406	143.2

61 barg										
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	OA
PWL	dB	133.8406	134.4406	135.0406	135.6406	136.2406	136.8406	137.4406	138.0406	144.4
A weighting	dB	-26	-16	-9	-3	0	1	1	-1	-1
Transmission loss	dB	0	0	0	0	0	0	0	0	0
PWL	dBA	107.8406	118.4406	126.0406	132.6406	136.2406	137.8406	137.4406	137.0406	143.9

57 barg										
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	OA
PWL	dB	133.5406	134.1406	134.7406	135.3406	135.9406	136.5406	137.1406	137.7406	144.1
A weighting	dB	-26	-16	-9	-3	0	1	1	-1	-1
Transmission loss	dB	0	0	0	0	0	0	0	0	0
PWL	dBA	107.5406	118.1406	125.7406	132.3406	135.9406	137.5406	137.1406	136.7406	143.6

54 barg										
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	OA
PWL	dB	133.3406	133.9406	134.5406	135.1406	135.7406	136.3406	136.9406	137.5406	143.9
A weighting	dB	-26	-16	-9	-3	0	1	1	-1	-1
Transmission loss	dB	0	0	0	0	0	0	0	0	0
PWL	dBA	107.3406	117.9406	125.5406	132.1406	135.7406	137.3406	136.9406	136.5406	143.4

50 barg										
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	OA
PWL	dB	133.0406	133.6406	134.2406	134.8406	135.4406	136.0406	136.6406	137.2406	143.6
A weighting	dB	-26	-16	-9	-3	0	1	1	-1	-1
Transmission loss	dB	0	0	0	0	0	0	0	0	0
PWL	dBA	107.0406	117.6406	125.2406	131.8406	135.4406	137.0406	136.6406	136.2406	143.1

Attachment 3

HRSG PSV Silencer Noise Test

Name		LP drum PSV						
Tag	1112HAD00AA01							
Description	Unit	Design	Case 1	Case 2	Case 3	Case 4	Case 5	
Throat diameter	in	75.7	75.7	75.7	75.7	75.7	75.7	
Orifice area	cm ²	45.007	45.007	45.007	45.007	45.007	45.007	
Outlet diameter	in	150	150	150	150	150	150	
Outlet area	cm ²	176.714	176.714	176.714	176.714	176.714	176.714	
Mol. Wt.	M	18	18	18	18	18	18	
Specific heat ratio	k	1.29	1.29	1.29	1.29	1.29	1.29	
Relieving temp.	deg C	177.8	174.0	171.0	167.8	164.4	160.8	
Relieving temp.	°F	450.8	446.952	443.959	440.8262	437.449	433.6302	
Set pressure	Pa barg	8.277	7.7	7.1	6.5	5.9	5.3	
Set pressure	Pa MPaG	0.8277	0.77	0.71	0.65	0.59	0.53	
Allowable over press.	Pa %	3	3	3	3	3	3	
Atmos. Press.	Pa MPaA	0.101	0.101	0.101	0.101	0.101	0.101	
Gas constant	R J/mol K	8.314	8.314	8.314	8.314	8.314	8.314	
Relieving pressure from (2)	Pa MPaA	0.952610	0.894100	0.832300	0.770500	0.708700	0.646900	
Ratio volume at throat from (3)	Pa m ³ /kg	0.218532	0.230911	0.246398	0.264261	0.285103	0.309750	
Pressure at outlet from (4)	Pa MPaA	0.1229	0.1247	0.1181	0.1074	0.0983	0.0902	
Ratio volume at outlet from (5)	Pa m ³ /kg	1.0064	1.0634	1.1347	1.2169	1.3129	1.4254	
Speed at throat from (6)	U m/s	519.3	516.1	514.3	512.5	510.5	508.4	
Center Frequency from (7)	f Hz	691	688	686	683	681	678	
Power level at PSV from (1)	PWL dBA	141.7	141.3	140.9	140.5	140.0	139.5	
Power level from table (A)	PWL dBA	139.0	138.6	138.2	137.8	137.3	136.8	
Sound pressure level from (8)	SPL dBA	131.1	130.7	130.3	129.9	129.4	128.9	
Δ SPL (Design - Case)	dBA	0	-0.40	-0.90	-1.20	-1.70	-2.20	
At Silencer								
Design = 95dBA	PWL dBA	85	84.60	84.10	83.60	83.30	82.80	
Other case = 95dBA - Δ SPL								

Table A										
8.27 barg										
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	OA
PWL	dB	132.5826	133.1826	133.7826	134.3826	134.9826	135.5826	136.1826	136.7826	141.7
A weighting	dB	-26	-16	-9	-3	0	1	1	-1	-1
Transmission loss	dB	0	0	0	0	0	0	0	0	0
PWL	dBA	106.5826	117.1826	124.7826	131.3826	133.9826	135.5826	136.1826	136.7826	139.0

7.7 barg										
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	OA
PWL	dB	132.1826	132.7826	133.3826	133.9826	134.5826	135.1826	135.7826	136.3826	141.3
A weighting	dB	-26	-16	-9	-3	0	1	1	-1	-1
Transmission loss	dB	0	0	0	0	0	0	0	0	0
PWL	dBA	106.1826	116.7826	124.3826	130.9826	133.5826	135.1826	135.7826	136.3826	138.6

7.1 barg										
Octave band	Hz	63	125	250	500	1000	2000	4000	8000	OA
PWL1	dB	131.7826	132.3826	132.9826	133.5826	134.1826	134.7826	129.9826	128.7826	140.9
A weighting	dBA	-20	-16	-8	-3	0	1	1	-1	
Transmission loss	dB	0	0	0	0	0	0	0	0	
PWL	dBA	105.7826	116.3826	123.9826	130.5826	132	132.1826	130.9826	127.7826	136.2

Attachment 3

Name	LP S/H PSV

Name	LP S/H PSV

Table A

7.4 barg												
	PC	83	125	250	500	1000	2000	4000	8000 PA	16000 PA	32000 PA	64000 PA
Cover band	PC	126 8601	127 2500	127 8601	128 4300	128 8601	129 0000	129 0000	129 0000	129 0000	129 0000	129 0000
PWL	dB	-126	-127	-127	-128	-128	-129	-129	-129	-129	-129	-129
A weighting	dB	-126	-127	-127	-128	-128	-129	-129	-129	-129	-129	-129
Transmission loss	dB	0	0	0	0	0	0	0	0	0	0	0
PWL	dB	100 8601	111 2500	118 8601	128 4300	129 0000	129 0000	129 0000	129 0000	129 0000	129 0000	129 0000
A weighting	dB	100 8601	111 2500	118 8601	128 4300	129 0000	129 0000	129 0000	129 0000	129 0000	129 0000	129 0000

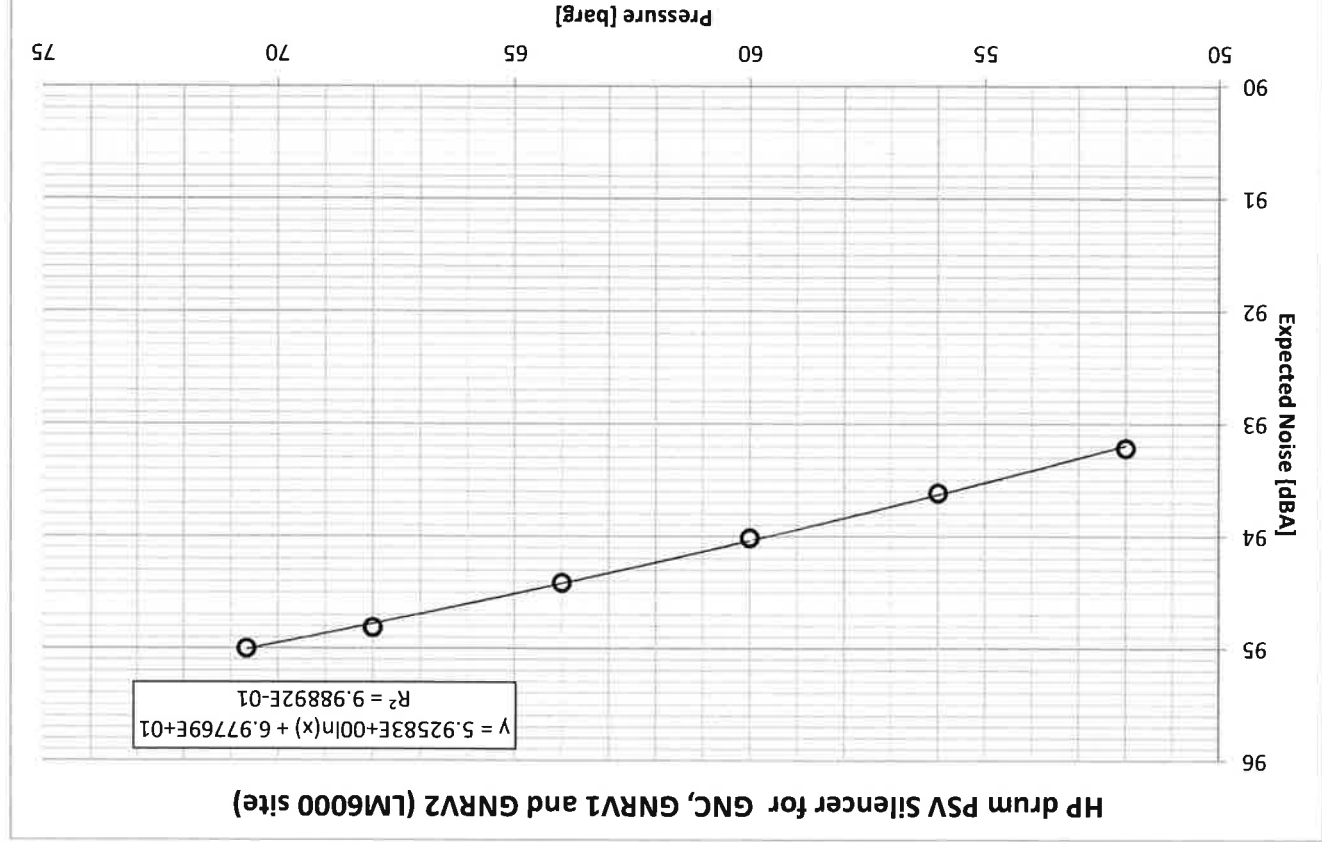
6.8 barg												
	PC	83	125	250	500	1000	2000	4000	8000 PA	16000 PA	32000 PA	64000 PA
Cover band	PC	126 3601	126 8601	127 5000	128 1000	128 3601	128 3601	128 3601	128 3601	128 3601	128 3601	128 3601
PWL	dB	-126	-126	-127	-127	-128	-128	-128	-128	-128	-128	-128
A weighting	dB	-126	-126	-127	-127	-128	-128	-128	-128	-128	-128	-128
Transmission loss	dB	0	0	0	0	0	0	0	0	0	0	0
PWL	dB	100 3601	110 8601	118 5000	128 1000	128 3601	128 3601	128 3601	128 3601	128 3601	128 3601	128 3601
A weighting	dB	100 3601	110 8601	118 5000	128 1000	128 3601	128 3601	128 3601	128 3601	128 3601	128 3601	128 3601

6.4 barg												
	PC	83	125	250	500	1000	2000	4000	8000 PA	16000 PA	32000 PA	64000 PA
Cover band	PC	125 8601	126 3601	127 0000	127 5000	127 8601	128 0000	128 0000	128 0000	128 0000	128 0000	128 0000
PWL	dB	-125	-126	-126	-127	-127	-128	-128	-128	-128	-128	-128
A weighting	dB	-125	-126	-126	-127	-127	-128	-128	-128	-128	-128	-128
Transmission loss	dB	0	0	0	0	0	0	0	0	0	0	0
PWL	dB	100 8601	110 7001	118 0000	127 5000	127 8601	128 0000	128 0000	128 0000	128 0000	128 0000	128 0000
A weighting	dB	100 8601	110 7001	118 0000	127 5000	127 8601	128 0000	128 0000	128 0000	128 0000	128 0000	128 0000

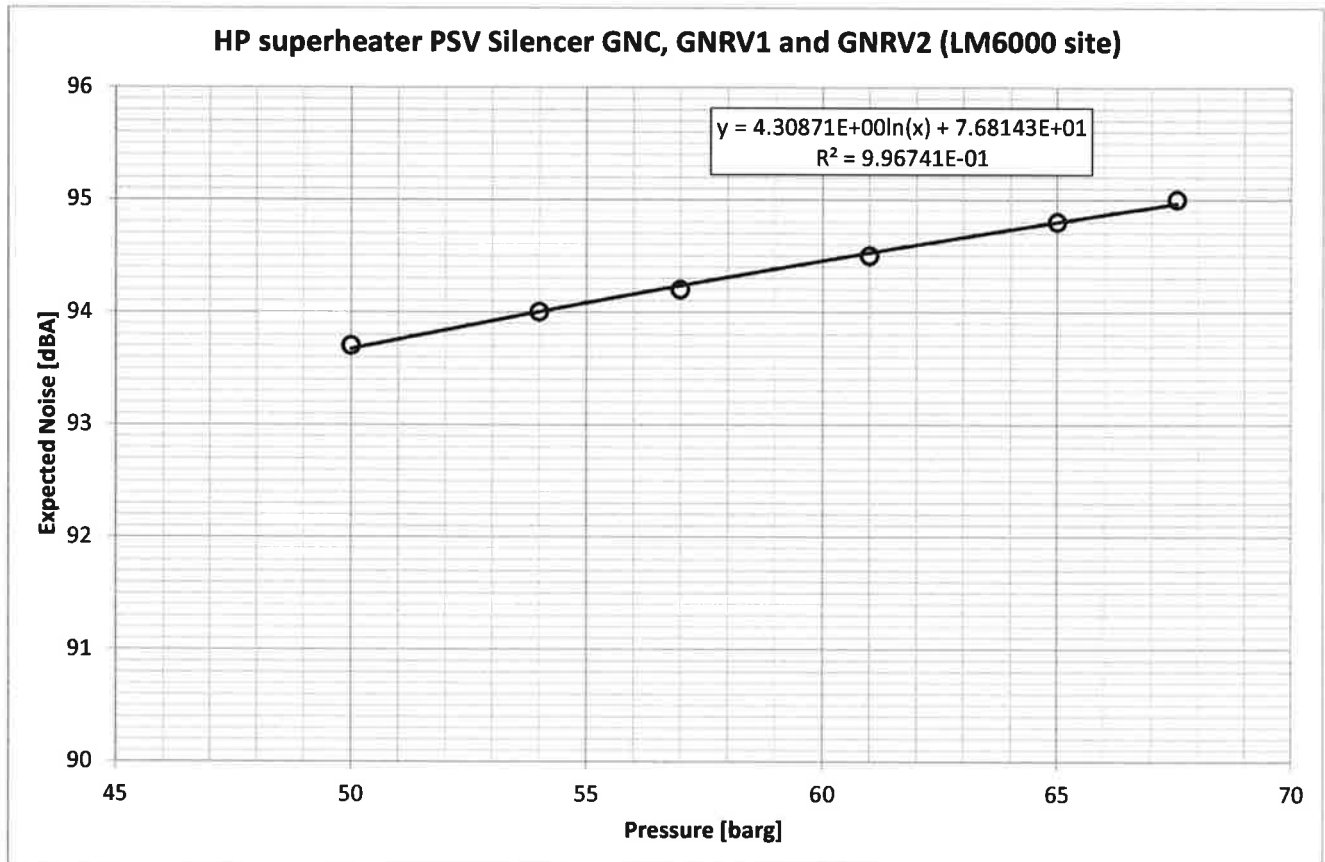
5.8 barg												
	PC	83	125	250	500	1000	2000	4000	8000 PA	16000 PA	32000 PA	64000 PA
Cover band	PC	125 8601	126 3601	127 0000	127 5000	127 8601	128 0000	128 0000	128 0000	128 0000	128 0000	128 0000
PWL	dB	-125	-126	-126	-127	-127	-128	-128	-128	-128	-128	-128
A weighting	dB	-125	-126	-126	-127	-127	-128	-128	-128	-128	-128	-128
Transmission loss	dB	0	0	0	0	0	0	0	0	0	0	0
PWL	dB	99 8601	110 4501	117 0000	126 5000	127 0000	127 8601	128 0000	128 0000	128 0000	128 0000	128 0000
A weighting	dB	99 8601	110 4501	117 0000	126 5000	127 0000	127 8601	128 0000	128 0000	128 0000	128 0000	128 0000

5.4 barg												
	PC	83	125	250	500	1000	2000	4000	8000 PA	16000 PA	32000 PA	64000 PA
Cover band	PC	125 3601	125 8601	126 3601	126 8601	127 0000	127 0000	127 0000	127 0000	127 0000	127 0000	127 0000
PWL	dB	-125	-126	-126	-127	-127	-128	-128	-128	-128	-128	-128
A weighting	dB	-125	-126	-126	-127	-127	-128	-128	-128	-128	-128	-128
Transmission loss	dB	0	0	0	0	0	0	0	0	0	0	0
PWL	dB	99 3601	110 0001	117 0000	126 5000	127 0000	127 8601	128 0000	128 0000	128 0000	128 0000	128 0000
A weighting	dB	99 3601	110 0001	117 0000	126 5000	127 0000	127 8601	128 0000	128 0000	128 0000	128 0000	128 0000

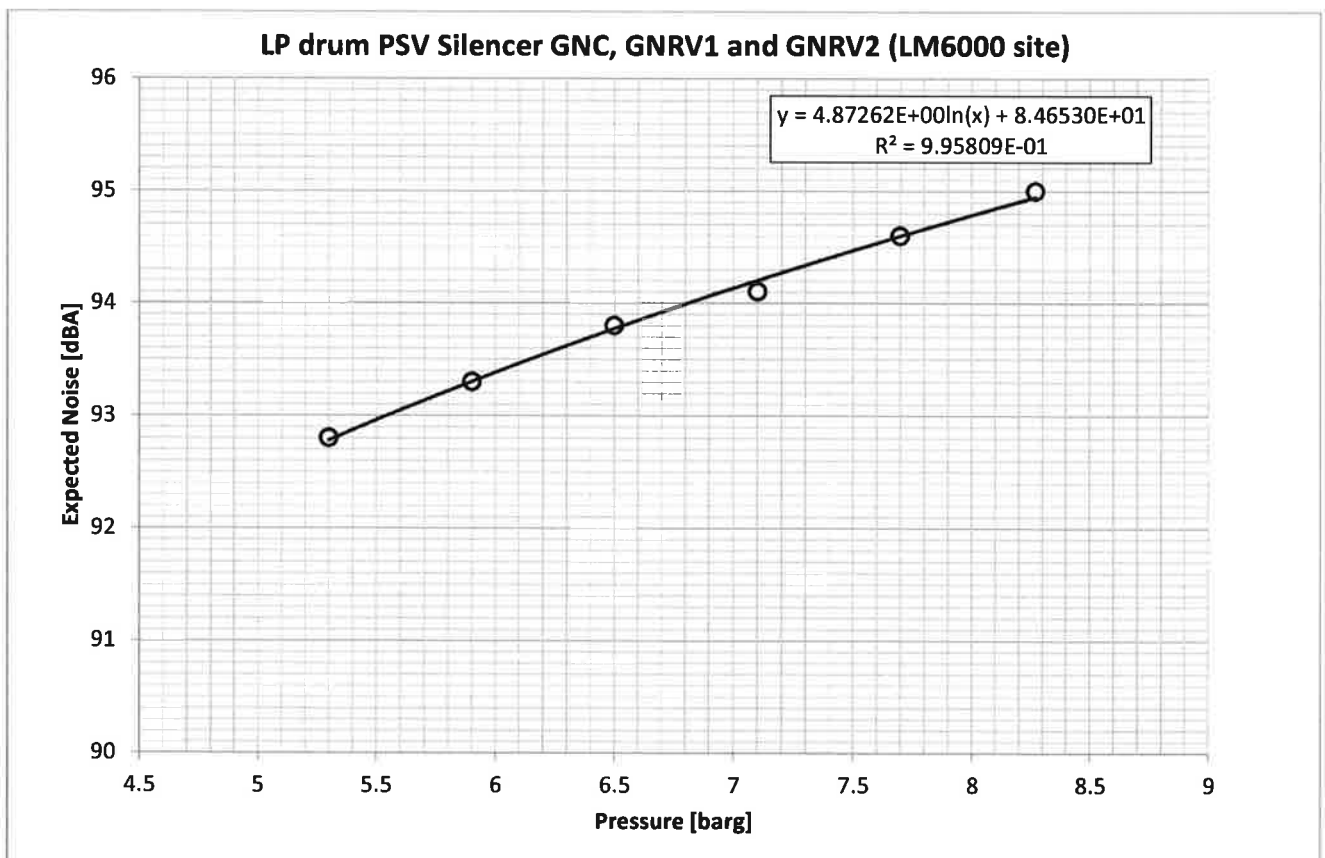
4.8 barg												
	PC	83	125	250	500	1000	2000	4000	8000 PA	16000 PA	32000 PA	64000 PA
Cover band	PC	125 0001	125 7601	126 3000	126 9000	127 0000	127 0000	127 0000	127 0000	127 0000	127 0000	127 0000
PWL	dB	-125	-126	-126	-127	-127	-128	-128	-128	-128	-128	-128
A weighting	dB	-125	-126	-126	-127	-127	-128	-128	-128	-128	-128	-128
Transmission loss	dB	0	0	0	0	0	0	0	0	0	0	0
PWL	dB	99 0001	109 7601	117 0000	126 5000	127 0000	127 8601	128 0000	128 0000	128 0000	128 0000	128 0000
A weighting	dB	99 0001	109 7601	117 0000	126 5000	127 0000	127 8601	128 0000	128 0000	128 0000	128 0000	128 0000

[illegible]

Attachment 3



Attachment 3



Attachment 3

