



Date: 2<sup>nd</sup> April 2018

**ENERGY SAVINGS REPORT**  
(Total 06 Pages)

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|---|---|--|
| <b>1. Client</b>  | : | <b>SGS INDIA PRIVATE LIMITED<br/>BNT Connections Buildings, Opp. SBI<br/>28 B/1(SP), 28 B/2 (SP), Second Main Road,<br/>Ambattur Industrial Estate, Chennai 600 058.</b> |
| <b>2. Location of Equipment</b>                                   | : | <b>Chennai 600058</b>  |
| <b>3. Equipment Details</b>                                       | : | <b>DUNHAM – BUSH make 240 TR Air Cooled Chiller<br/>Model: AFN X 240 – 5H RHR<br/>SERIAL No: 2B12000080</b>  |
| <b>4. Refrigerant</b>   | : | <b>R134A</b>   |
| <b>5. Data Loggers Installed on &amp; Recording starting time</b> | : | <b>Unit -1 @ 11.45 Hrs on 31/1/18</b>  |
| <b>6. Data Loggers Recording Ending time</b>                      | : | <b>Unit -1 @ 18.31 Hrs on 14/02/18</b>   |
| <b>7. MAXR100 installed on</b>                                    | : | <b>15<sup>th</sup> February 2018</b>   |
| <b>8. Post MAXR100 installation data recorded</b>                 | : | <b>08.10 AM on 14/3/18 to 27/3/18 till 23.45 Hours</b>   |

**A) Pre installation Data of 240 TR Air Cooled Chiller Sr.No. 2B12000080 ( Unit 1)**

Sr.No	Date	TRH	Average Values					Total KWH	Temperatures in Deg C			
			VLL	VLN	AMPS	KW	PF		AMB	Set Point	Inlet	Out Let
1	31-01-2018	8.25	411.3	237.5	244.6	146.2	0.824	1211.0	29.50	6.0	11.26	7.90
2	01-02-2018	11.75	413.7	238.8	266.4	161.3	0.846	1882.0	29.62	6.0	13.16	7.92
3	02-02-2018	12.00	412.6	238.2	259.0	155.2	0.839	1871.0	30.70	6.0	10.59	6.61
4	03-02-2018	2.25	405.5	234.1	128.9	74.4	0.812	165.7	29.65	6.0	9.25	6.80
5	05-02-2018	12.50	402.0	232.1	232.5	137.2	0.849	1732.0	28.90	6.0	10.98	7.09
6	06-02-2018	11.25	406.0	234.4	250.0	150.4	0.857	1709.3	28.50	6.0	11.65	7.21
7	08-02-2018	11.50	396.3	228.8	296.7	177.2	0.871	2039.0	31.73	6.0	12.56	7.00
8	09-02-2018	9.75	399.0	230.4	271.6	158.3	0.843	1570.0	32.06	6.0	11.40	6.62
9	10-01-2018	7.00	398.0	229.8	287.0	170.6	0.862	1190.0				
10	12-12-2018	2.00	382.4	220.8	293.2	168.4	0.864	353.1	32.8	6.0	10.90	6.53
11	13-02-2018	10.00	399.5	230.6	283.6	168.4	0.857	1702.0	30.2	6.0	11.14	6.71
12	14-02-2018	9.75	402.8	232.6	292.6	175.2	0.858	1713.0	31.07	6.0	10.98	6.55
<b>Total</b>		<b>108.00</b>						<b>17138.1</b>				
<b>Average</b>			<b>402.4</b>	<b>232.3</b>	<b>258.8</b>	<b>153.6</b>	<b>0.848</b>	<b>158.69</b>	<b>30.37</b>	<b>6.0</b>	<b>11.26</b>	<b>6.99</b>

## **B) POST MAXR 100 INSTALLATION DATA**

SR.NO	DATE	TRH	Average Values				TOTAL KWH	Temp in Deg C		Chiller Temp in D.C	
			VLL	AMPS	KW	PF		AMB	SP	INLET	OUTLET
1	14-03-2018	4.00	394.4	362.7	207.8	0.807	207.80	32.60	6.0	14.30	7.22
2	15-03-2018	9.50	388.6	360.5	212.8	0.854	2035.80	34.18	6.0	14.50	8.23
3	16-03-2018	11.91	390.7	199.3	118.4	0.877	1313.50	33.64	6.0	16.50	12.53
4	17-03-2018	9.50	395.0	174.6	105.0	0.878	996.60	30.61	6.0	13.98	10.10
5	19-03-2018	12.00	398.5	267.0	160.1	0.843	1937.00	34.50	6.0	13.81	8.60
6	20-03-2018	7.75	400.0	276.7	165.5	0.862	1300.70	35.20	6.0	11.60	7.40
7	21-03-2018	9.75	400.5	322.5	192.7	0.860	1888.10	36.80	6.0	11.90	6.89
8	22-03-2018	10.00	394.7	316.7	186.8	0.862	1902.00	36.06	6.0	13.10	8.30
9	23-03-2018	10.00	387.5	321.7	188.8	0.875	1923.00	38.10	6.0	13.10	7.80
10	24-03-2018	10.25	382.3	350.6	204.2	0.881	2136.00	36.20	6.0	15.90	10.01
11	26-03-2018	10.25	398.1	334.6	200.8	0.867	2092.00	36.55	6.0	12.36	6.75
12	27-03-2018	9.50	399.6	347.9	210.0	0.856	2025.30	37.67	6.0	13.36	7.34
<b>Total</b>		<b>114.41</b>					<b>19757.80</b>				
<b>Average</b>			<b>394.2</b>	<b>302.9</b>	<b>179.4</b>	<b>0.860</b>	<b>172.693</b>	<b>34.95</b>	<b>6.0</b>	<b>13.7</b>	<b>8.43</b>

### C) Comparison of PRE & POST data :

So.No	PARAMETERS	Pre Data	Post Data
1	Total Running Hours	108	114.41
2	Total Energy Consumption in KWH	17138.1	19757.9
3	Average Energy Consumption per hour in KWH	158.686	172.6938
4	Average Load in KW per Hour	153.6	179.4
5	Average KWH/ KW	1.0331127	0.962619
6	Average Voltage Line to Line (VLL) in Volts	402.4	393.7
7	Average Current in Amps	258.8	298.8
8	Average PF	0.848	0.860
9	Average Ambient Temperature in Deg C	30.37	34.95
10	Average Set Point in Deg. C	6.0	6.0
11	Average chiller in let temperature in Deg C	11.26	13.73
12	Average chiller Out let temperature in Deg C	6.99	8.53

### D) Observations:

A. Post Max R100 the load increased from 153.6 KW/Hour to 179.4 KW/Hour by **25.8%**

B. Post MAXR100 the ambient temperature increased from 30.37 Deg C to 34.95 Deg C i.e. by **4.58 Deg C**

**E) Actual Energy Savings Considering the change in average Ambient Temperatures post MAXR100 installation period.**

- For calculating the actual savings we need to consider the change in ambient temperatures of pre data period with the post data period, which is 4.58 Deg C. Any increase in the ambient temperature will affect the energy consumption of the AC unit. Hence for calculating the actual savings we need to consider COP- Coefficient of Performance principle which is most commonly used method.
- COP- is the ratio of heat removed from a system to the energy required to remove the heat. The theoretical maximum is equal to the coldest temperatures of the refrigerant divided by the difference between its coldest and hottest temperatures are expressed in Kelvins. Even the perfect system decreases efficiency with increased outside temperatures, dropping about 2% per Deg C.
- Considering 4.58 Deg C increase in the ambient Temperatures for the post MAXR 100 installation period the energy consumption has increased by 9.16 % during the period.

Considering the above we have calculated the actual energy consumption during the post MAXR100 installation period.

➤ Total Energy consumption in KWH	:	19759.9 Kwh
➤ Increase in Energy consumption due to rise in ambient temperature in %	:	9.16 %
➤ Actual Energy Consumption in KWH	:	$(19759.9 \times 9.16)/100 = 1809.82 \text{ KWH}$
		$19759.9 - 1809.82 = 17948.076 \text{ kWh}$
➤ Actual average Energy Consumption / Hour on kWh	:	$17948.076/114.91 = 156.875 \text{ kWh/Hour}$
➤ Average Energy Consumption/ Kw Pre	:	1.03311 KWH/KW
➤ Average Energy Consumption/ KW Post	:	0.87444 KWH/KW
➤ <b>Improvement with MAXR100</b>	:	<b><math>1.03311 - 0.87444 = 0.1586697 \text{ KWH/KW}</math></b>
➤ <b>% of improvement</b>	:	<b><math>(0.1586697/1.03311) \times 100 = 15.35841588\%</math></b>

**F) Pre & Post Average Energy Consumption per KW ( KWH/KW )**

