Report No: AI/WIPRO/19-001

Date: 2nd February, 2018

ENERGY SAVING REPORT WITH MAXR100 – WIPRO LTD, HYDERABAD

Total – 07 Pages

1. Client : **WIPRO LIMITED**,

   Nanakram Guda SEZ, Hyderabad

2. Equipment Details : Carrier Midea 2 TR Cassette AC unit X 2 No's

   Model No. MCAC24WY2C1

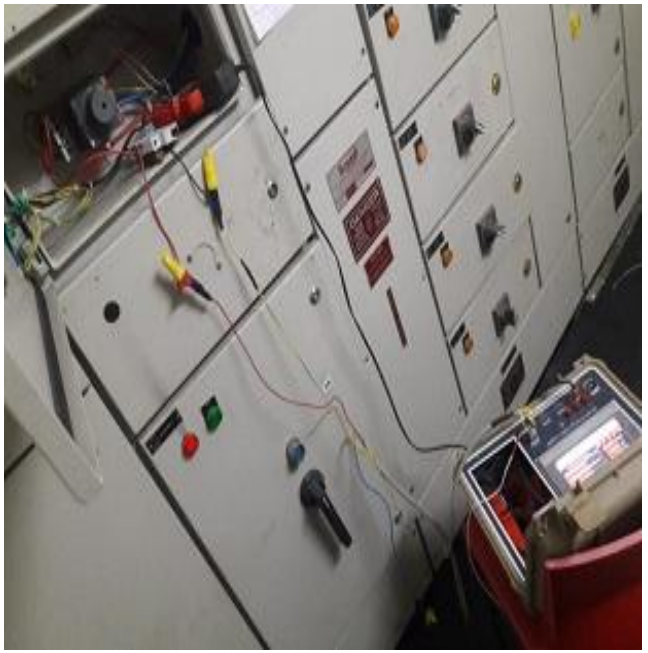
3. Refrigerant : R- 22

4. Data Logging Details

a) Pre Data Logging : 3rd December, 2018 to 22nd December, 2018
b) MAXR100 installed on : 6th January, 2019
c) Post Data Logging : 24th January 2019 to 1st February 2019
d)

CARRIER MIDEA 2.0 TR CASSETTE TYPE AC UNITS X 2 NOS, MODEL: MCAC24WY2C1

AC UNIT OUT DOOOR UNIT NAME PLATE DETAILS



SMART ENERGY DATA LOGGER

A) DAY WISE DATA SUMMARY – PRE INSTALLATION DATA

SR.NO	DATE	Total Running Hours	Total KWH	VOLTAGE	AMPS	KW	PF	Temp. In Deg C		RH %
								AMB	SET POINT	
1	04-12-2018	23.75	34.5	231	6.37	1.428	0.846	25.48	24.0	49.24
2	05-12-2018	23.75	43.2	232	7.27	1.63	0.854	26.00	24.0	50.65
3	06-12-2018	23.75	36.8	231	7.34	1.657	0.858	26.40	24.0	50.96
4	07-12-2018	23.75	38.5	237	6.81	1.569	0.861	26.92	24.0	52.53
5	08-12-2018	23.75	44.0	234	8.127	1.876	0.879	27.00	24.0	52.61
6	09-12-2018	23.75	39.1	236	7.36	1.7	0.881	27.00	24.0	50.62
7	10-12-2018	23.75	40.5	233	7.38	1.678	0.863	27.00	24.0	54.78
8	11-12-2018	23.75	35.8	232	6.96	1.556	0.850	27.00	24.0	50.34
9	12-12-2018	23.75	32.9	231.6	5.7	1.255	0.784	27.88	24.0	52.23
10	13-12-2018	23.50	36.2	232.6	7.03	1.588	0.870	28.00	24.0	55.71
11	14-12-2018	23.75	30.6	231	5.44	1.2	0.813	27.58	24.0	81.13
12	15-12-2018	23.75	33.8	235.3	5.84	1.32	0.826	26.48	24.0	53.84
13	16-12-2018	23.75	25.4	237	4.8	1.06	0.777	26.00	24.0	40.49
14	17-12-2018	23.00	26.2	234	4.7	1.05	0.791	25.26	24.0	59.28
15	18-12-2018	23.75	24.7	234.7	5.44	1.22	0.852	24.13	24.0	74.37
16	19-12-2018	23.75	26.7	233	4.96	1.08	0.768	23.99	24.0	56.00
17	20-12-2018	23.75	25.0	234.2	4.99	1.08	0.809	24.00	24.0	55.63
18	21-12-2018	23.75	33.7	234	5.78	1.297	0.794	24.38	24.0	51.31
19	22-12-2018	23.50	26.5	236	4.88	1.08	0.766	25.39	24.0	49.33
Total		**450.0**	**634.1**							
Average			**1.409**	**233.7**	**6.167**	**1.385**	**0.828**	**26.1**	**24**	**54.79**

B) DAY WISE DATA- POST MAXR100 INSTALLATION & POST CALEAN UP PERIOD

Sr. No	Date	Total		Voltage	Amps	KW	PF	Temp in Deg C		RH%
		Running Hours	KWH					AMB	SP	
1	24-01-2019	9.00	16.4	231	8.86	1.932	0.882	25.00	24	97.84
2	25-01-2019	23.75	27.5	231	4.91	1.081	0.799	24.80	24	84.64
3	26-01-2019	23.75	31.3	237	5.93	1.360	0.816	25.00	24	53.29
4	27-01-2019	23.75	19.2	238	3.19	0.690	0.721	23.65	24	37.73
5	28-01-2019	23.83	23.3	235	4.81	1.070	0.829	22.55	24	51.82
6	29-01-2019	23.75	19.6	235	3.69	0.822	0.756	21.90	24	61.2
7	30-01-2019	23.75	21.0	233	3.54	0.764	0.729	21.70	24	50.5
8	31-01-2019	23.75	20.2	233	3.72	0.807	0.718	21.57	24	62.71
9	01-02-2019	14.50	15.1	235	4.14	0.912	0.791	22.01	24	62.85
Total		**189.83**	**193.6**							
Average			**1.020**	**234**	**4.75**	**1.049**	**0.782**	**23.13**	**24**	**62.5**

C) SUMMARY OF PRE & POST DATA FOR COMPARISION:

SR.NO	PARAMETERS	Pre	Post
1	Total Running hours	450	189.8
2	Total Energy Consumption in KWH	634.1	193.6
3	**Average Energy Consumption in KWH/ Hour**	**1.409**	**1.02**
4	**Average Load in KW/ Hour**	**1.385**	**1.049**
5	**Average Energy Consumption per KW in KWH**	**1.017409**	**0.972**
6	Average Voltage in Volts	233.7	234
7	Average Current in AMPS	6.167	4.75
8	Average PF	0.828	0.782
9	Average Ambient Temperature in Deg C	26.1	23.13
10	Average Set Point Temperature in Deg C	24	24
11	Average RH %	54.79	62.5

D) CONCLUSION:

Average Energy Consumption in KWH/ Hour (Pre)	:	1.409 KWH
Average Energy Consumption in KWH/ Hour (Post)	:	1.20 KWH
Difference	:	1.409 – 1.02 = 0389 KWH/ Hour
% of improvement with MAXR100	**:**	**(0.389/1.409) X 100 = 27.6 %**

Energy Savings with MAXR 100 IN %

Improvement in average Power consumption /Hour in KWH	.0389 KWH/ Hour
Improvement in average Power consumption /Hour in KWH (%)	**27.6 %**

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 2.97 Deg C. Any decrease 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 2.97 Deg C decrease in the ambient Temperatures for the post MAXR 100 installation period the energy consumption has decreased by 5.94% during the period.

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

- Total Energy consumption in KWH : 193.6 Kwh
- Decrease in Energy consumption due to drop in ambient temperature in % : 5.94 %
- Actual Energy Consumption in KWH : (193.6 x 5.94)/100 = 11.499 KWH

193.6 + 11.499 = 205.099 kWh

F. Pre Bench Mark VS Post Data after considering the affect of drop in Ambient Temperatures during Post Data Duration:

SR.NO	PARAMETERS	Pre Bench Mark	Post (After considering the affect of drop in Amb temp during post data durration)
1	Total Running hours	450	189.8
2	Total Energy Consumption in KWH	634.1	205.099
3	**Average Energy Consumption in KWH/ Hour**	**1.409**	**1.08**
4	**Average Load in KW/ Hour**	**1.385**	**1.049**
6	Average Voltage in Volts	233.7	234
7	Average Current in AMPS	6.167	4.75
8	Average PF	0.828	0.782
9	Average Ambient Temperature in Deg C	26.1	23.13
10	Average Set Point Temperature in Deg C	24.0	24.0
11	Average RH %	54.79	62.5

G) Final Conclusion

- Actual average Energy Consumption / Hour on kWh : 205.099/ 189.83 = 1.080 kWh/Hour
- **Actual % of Energy Savings with MAXR100 in % : (1.409 – 1.080) = 0.329 Kwh/ Hour**

(0.329/1.409) x 100 = 23.34 %

H) Bench Mark Vs Post Data – Graph