Performance Report

Client Details

Bayer Bioscience Pvt Ltd

Hyderabad, India

Equipment Details

FRASCOLD make

Model No. D3-18.1Y

R-407 Cold Room

Result Summary

Energy Saving with MaxR100 - KWH/Hour

13.14% Energy Saving

Next Steps

Deployment to the rest of their refrigeration and AC systems onsite.

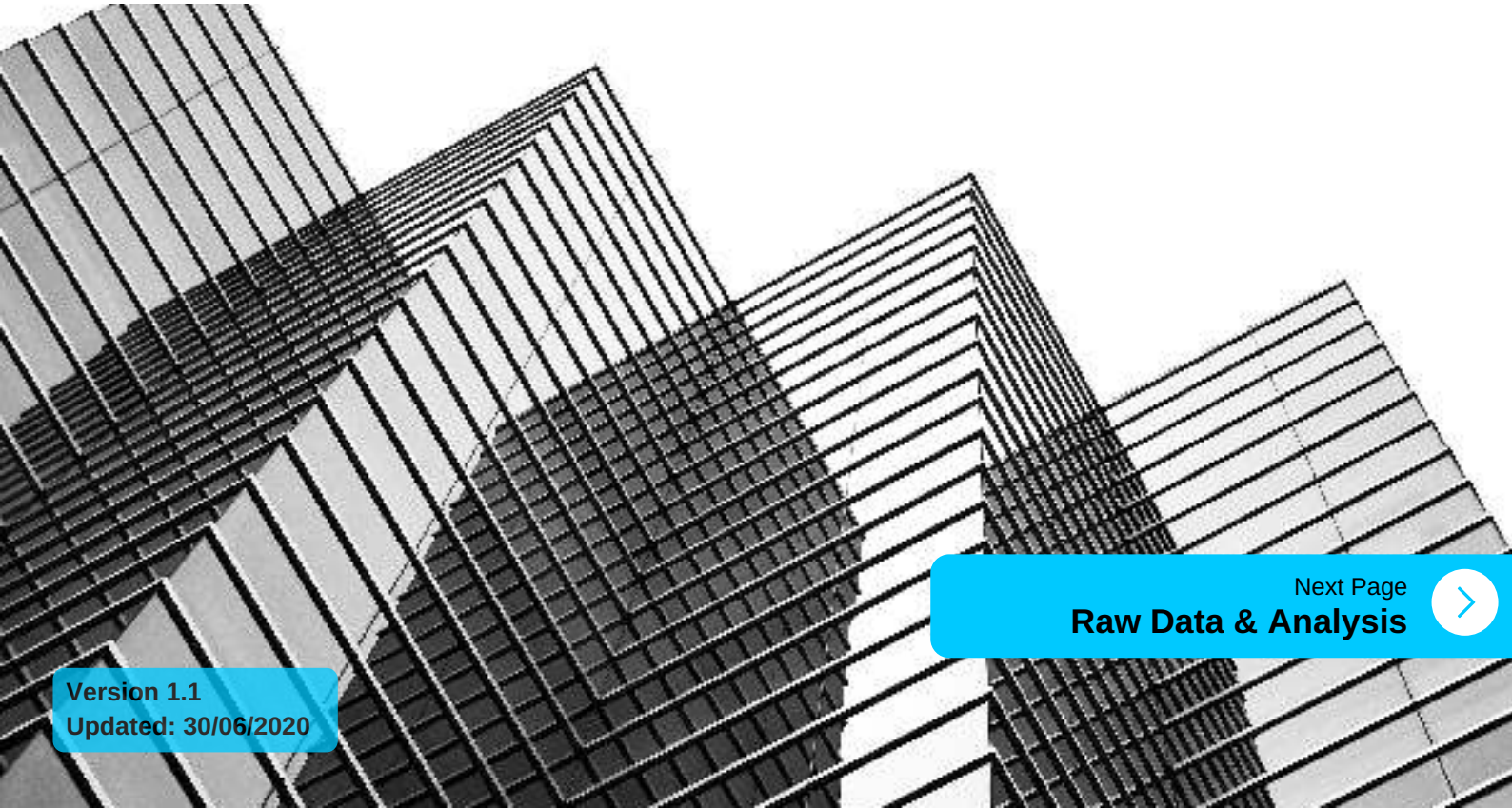
100 TR Units x2 | 4 TR units x 19 | 17 TR units x 4

Measurement Method

Data Logger connected to the AC unit.

Pre Installation logging: 23/12/2019 to 03/01/2020

Post Installation Logging: 02/03/2020 to 14/03/2020



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Raw Data & Analysis

Version 1.1
Updated: 30/06/2020

FRASCOLD 4.0 TR

Compressor Details

Frascold Make

Condensing Unit

Model: MD3-18.1Y

Location

Cold Storage

Capacity

4.0 TR

Required MaxR100

118.3 ml PoE

As per installation guide, any unit under 25TR will require 1 oz per TR of MaxR100

Data Logger

Data Logger installed at the power board, measuring the energy consumption of the unit.

For detailed Logging requirement, please refer to the testing protocol for MaxR100.

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PRE Installation Benchmark

PRE Installation Benchmark

Total Running Hours
251.4 Hours

Total Energy Consumption
1700.6 kWh

Note

For daily data, please refer to the appendix A.

Average Energy Consumption / Hour
6.76 kWh

Average Load
6.76 kW/Hour

Average Line-to-Line Voltage
417.1 Volts

Average Line-to-Neutral Voltage
239.4 Volts

Average Current
10.49 Amps

Average PF
0.865

Average RH in %
64.36%

Average Set Point
-4 Degrees Celsius

Ambient Temperature
23.09 Degrees Celsius

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POST Installation Benchmark

POST Installation Benchmark

Total Running Hours
282.39 Hours

Total Energy Consumption
1855.5 kWh

Note
For daily data, please refer to the appendix B.

Average Energy Consumption / Hour
6.57 kWh

Average Load
6.59 kW/Hour

Average Line-to-Line Voltage
418.8 Volts

Average Line-to-Neutral Voltage
240.3 Volts

Average Current
9.67 Amps

Average PF
0.900

Average RH in %
46.1%

Average Set Point
-4 Degrees Celsius

Ambient Temperature
28.41 Degrees Celsius

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Observations & Conclusion

Comparison & Observations

Comparison - PRE Benchmark VS POST Installation

SR.NO	PARAMETERS	Bench Mark- Pre Data	Post Data
1	Total Running Hours	251.4	282.39
2	Total Energy Consumption in KWH	1700.6	1855.5
3	Average Energy Consumption / Hour in KWH	6.76	6.57
4	Average Load in KW/ Hour	6.76	6.59
5	Average Line to Line Voltage (VLL) in Volts	417.1	418.8
6	Average Line to Neutral Voltage (VLN) in Volts	239.4	240.3
7	Average Current in Amps	10.49	9.67
8	Average PF	0.865	0.900
9	Average RH in %	64.36	46.1
10	Average Set Point IN Deg C	-4.0	-4.0
11	Ambient Temperatures in Deg C	23.09	28.41

Observations

After comparing data collected from PRE and POST installation, we have the following observations :

Average Energy Consumption / Hour in KWH

0.19 kWh / Hour

Ambient Temperature

5.32 Degrees Celsius

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POST Installation Standardisation

Actual Energy Savings (with change in average Ambient Temperatures)

Before calculating actual savings, changes in ambient temperature between PRE and POST data period are required. Any increase in ambient temperature will affect the energy consumption of the AC unit, hence, adjustment to the POST data is required.

Coeff. Of Performance *- the ratio of heat removed from a system to the energy required to remove the heat. The theoretical maximum is equal to the Kelvins. Even the perfect system decreases efficiency with increased outside temperatures, dropping around 2% per degrees celsius.*

Considering the 5.32 Degree Celsius increase in ambient temperatures during POST installation logging period, the energy consumption should be standardised by increasing 10.64% during the period.

With consideration of the above, we have calculated the actual energy consumption during **POST MaxR100 Installation period** :

Total Energy Consumption

1855.5 kWh

Decrease in Energy Consumption due to increase in ambient temperature in %

10.64%

Actual Energy Consumption (POST)

(1855.5 x 10.64) / 100 = 197.4252 kWh

Actual Average Energy Consumption (POST)

1558.07/282.39 = 5.87 kWh / hour

SR.NO	PARAMETERS	Bench Mark- Pre Data	Post Data (After adjustment due to increase in Ambient Temperature)
1	Total Running Hours	251.4	282.39
2	Total Energy Consumption in KWH	1700.6	1658.07
3	Average Energy Consumption / Hour in KWH	6.76	5.87
4	Average Load in KW/ Hour	6.76	6.59
5	Average Line to Line Voltage (VLL) in Volts	417.1	418.8
6	Average Line to Neutral Voltage (VLN) in Volts	239.4	240.3
7	Average Current in Amps	10.49	9.67
8	Average PF	0.865	0.900
9	Average RH in %	64.36	46.1
10	Average Set Point IN Deg C	-4.0	-4.0
11	Ambient Temperatures in Deg C	23.09	28.41

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Conclusion

Conclusion

Energy Saving with MaxR100

After adjustment to the POST data due to changes in ambient temperature during POST installation logging period, we can now calculate the energy saving for MaxR100 by comparing PRE and POST data logged.

Actual Average Energy Consumption (PRE)

6.76 kWh / Hour

Actual Average Energy Consumption (POST)

5.87 kWh / Hour

Energy Saving with MaxR100 (%)

[(6.76-5.87) / 6.76] x 100 = 13.14%

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Appendix

Appendix A

PRE Installation

Summary of Daily data

Sr.No	DATE	Total		Day wise averages					Temp. In Deg C	
		TRH	KWH	VLL	VLN	AMPS	KW	PF	RH %	SET POINT	AMB
1	23-12-2019	10.00	69.3	418.0	240.0	10.71	6.90	0.875	59.01	-4.0	24.60
2		11.75	79.1	417.0	240.0	10.49	6.77	0.877	74.53	-4.0	18.88
	24-12-2019	8.68	59.4	418.0	240.0	10.80	6.95	0.877	61.47	-4.0	22.53
3		11.75	80.2	415.0	239.0	10.61	6.81	0.88	70.51	-4.0	20.92
	25 12 2019	8.75	56.6	419.0	240.0	10.30	6.65	0.831	55.30	4.0	24.35
4	26 12 2019	23.75	160.9	417.0	239.0	10.47	6.67	0.855	60.44	4.0	24.86
5	27-12-2019	23.75	157.5	418.0	240.0	10.15	6.55	0.835	62.97	-4.0	24.99
6	28-12-2019	23.75	161.4	417.0	239.0	10.49	6.78	0.855	57.04	-4.0	23.55
7		12.75	88.2	417.0	239.0	10.70	6.91	0.881	68.13	-4.0	18.69
	29-12-2019	8.75	55.9	417.0	239.0	9.85	6.35	0.808	59.36	-4.0	22.01
8	30-12-2019	23.75	158.1	417.0	239.0	10.24	6.61	0.836	63.32	-4.0	22.82
9	31-12-2019	23.75	162.8	417.0	239.0	10.54	6.80	0.862	70.65	-4.0	23.26
10	01-01-2020	23.75	161.3	417.0	239.0	10.46	6.74	0.862	67.01	-4.0	24.71
11	02-01-2020	23.75	163.9	417.0	240.0	10.63	6.88	0.857	68.15	-4.0	24.81
12	03-01-2020	12.75	86.0	416.0	239.0	10.86	7.02	0.995	67.50	-4.0	25.39
	Total	**251.43**	**1700.6**								
	Average	**6.764**	**417.1**	**239.4**	**10.49**	**6.76**	**0.865**	**64.36**	**-4.0**	**23.09**

Appendix B

POST Installation

Summary of Daily data

Sr. No	Date	Total		Average Values						Temperatures In D. C	
		Running Hours	Energy Consumption in KWH	VLL	VLN	AMPS	KW	PF	RH%	Set Point	AMB
1	02.03.2020	9.39	62.6	419.0	240.0	10.04	6.84	0.928	38.25	-4.0	29.50
2	03-03-2020	23.75	160.3	418.0	240.0	9.93	6.77	0.917	46.53	-4.0	27.75
3	04-03-2020	23.75	161.6	419.0	241.0	9.99	6.82	0.917	37.18	-4.0	28.46
4	05-03-2020	23.75	158.6	417.0	240.0	9.94	6.78	0.976	33.97	-4.0	27.43
5	06-03-2020	23.75	157.6	420.0	241.0	9.50	6.57	0.888	46.68	-4.0	27.44
6	07-03-2020	23.75	156.6	418.0	240.0	9.63	6.55	0.889	47.45	-4.0	27.85
7	08-03-2020	23.75	156.1	420.0	241.0	9.53	6.54	0.884	35.72	-4.0	28.68
8	09-03-2020	23.75	157.4	420.0	241.0	9.67	6.60	0.897	56.00	-4.0	27.99
9	10-03-2020	23.75	154.2	419.0	240.0	9.61	6.55	0.897	48.85	-4.0	29.22
10	11-03-2020	23.75	153.4	418.0	240.0	9.53	6.46	0.887	49.60	-4.0	29.25
11	12-03-2020	23.75	152.6	419.0	240.0	9.30	6.33	0.876	56.87	-4.0	28.57
12	13-03-2020	23.75	154.6	418.0	240.0	9.59	6.48	0.894	44.80	-4.0	30.17
13	14.03.2020	11.75	74.9	419.0	240.0	9.49	6.43	0.903	57.60	-4.0	27.08
Total		**282.39**	**1855.50**								
Averages			**6.5707**	**418.8**	**240.3**	**9.67**	**6.59**	**0.900**	**46.10**	**-4.0**	**28.41**