Project code: 2015IE03
Cluster: Belgaum (Foundry)
Report ID: Belgaum/06/EAR

Energy audit report of M/s Vinsavi Indotechs, Belgaum

Prepared for

Bureau of Energy Efficiency

Suggested format for citation

T E R I. 2015
Energy Audit Report
M/s Vinsavi Indotechs, Belgaum
New Delhi: The Energy and Resources Institute. 37pp.
[Project Report No. 2015IE03]

For more information

Project Monitoring Cell
T E R I
Darbari Seth Block
IHC Complex, Lodhi Road
New Delhi – 110 003
India

Tel. 2468 2100 or 2468 2111
E-mail pmc@teri.res.in
Fax 2468 2144 or 2468 2145
Web www.teriin.org
India +91 • Delhi (0)11

Contents

Acknowledgement

The Energy and Resources Institute (TERI) places on record its sincere thanks to GEF and UNIDO for its role in guiding and steering this prestigious assignment for "Promoting energy efficiency and renewable energy in selected MSME clusters in India".

TERI is grateful to Bureau of Energy Efficiency (BEE) for vesting its confidence in TERI for carrying out this prominent assignment for the Belgaum (Foundry) cluster and for their full-fledged coordination and support throughout the study. TERI is grateful to Mr Abhishek Nath, National Project Manager, GEF-UNIDO-BEE and Mr Sadanand Humbarwadi, Cluster Leader – Belgaum under the project for their support

The study team is indebted to Mr Sunil Kangralkar, Owner for showing keen interest in the study and also thankful to the progressive management of M/s Vinsavi Indotechs for their wholehearted support and cooperation for the preparation of Energy Audit Report (EAR), without which the study would not have steered to its successful completion.

It is well worthy to mention that the efforts being taken and the enthusiasm shown by all the plant personnel towards energy conservation and sustainable growth was really admirable. We found all the personnel keen to implement the possible energy conservation aspects.

Last but not least, the interactions and deliberations with cluster coordinating agencies, industry associations, technology providers and who were directly or indirectly involved throughout the study were exemplary and the whole exercise was thoroughly a rewarding experience for TERI.

The Energy and Resources Institute (TERI)
New Delhi

Executive summary

A detailed energy audit at M/s Vinsavi Indotechs was conducted to identify the potential of energy savings. This report provides details of energy audit such as areas covered under the study, performance assessment of different equipment, potential areas for energy saving and estimated energy and cost savings along with investment required and payback periods. It provides insights to the plant for proper planning of investments on energy conservation recommendations.

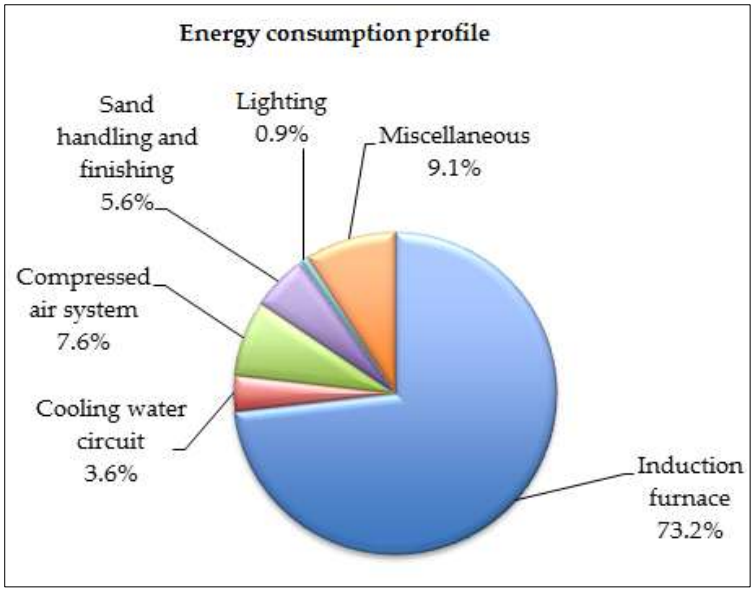
Brief Introduction of the foundry unit

Name of the Unit	M/s Vinsavi Indotechs
No. of years in operation	07
Factory address	R.S. No. 08, M-30, Udyambag Industrial Estate, Belgaum – 590 008
Type of industry	Steel castings
Hours of operation per day	12
Number of days of operation per year	300
Energy used	Electricity

A detailed performance study was undertaken in the identified areas with the use of the sophisticated handheld instruments. Energy consumption pattern and production data were collected to estimate the specific energy consumption of the unit. The unit level baseline of the unit was also estimated using the historical data. The total energy consumption of the unit during last 12 months (August 2014 to July 2015) was 59.5 toe (~0.7 million kWh) which is equivalent to 51.6 lakh rupees. The total CO_2 emission during this period is estimated to be 678 tonnes. Electricity was considered for CO_2 emission estimation.

The main source of the energy consumption in the plant is electricity used in induction melting furnace and to drive the process equipment and other auxiliaries, various utilities.

The unit manufactures ductile iron and graded CI castings which include gears and machine tools and supplies to various industries. The unit uses green sand and silicate sand moulding process. The total liquid melting production of the unit during last 12 months (August 2014 to July 2015) was 632 tonnes and dispatched production was 465 tonnes. The plant has an installed capacity of 150 tonnes per month. With respect to production in financial year 2014 – 15 the capacity



utilization factor for the unit is 35%. The net yield of unit is around 67%.

The energy consumption in the plant is mainly for following: induction furnace, cooling water circuit, compressed air system, sand handling, finishing, lighting and miscellaneous. A pie chart depicting share of each area/section is given in figure.

Summary of energy conservation measures identified in unit

Key recommendations made in this energy audit report are summarised below.

S. No	Energy conservation measures	Annual energy savings	Investment	Savings	Simple payback
		Electricity (kWh)	(Rs lakh)	Rs lakh/ year	year
1	Power factor improvement	1,708	0.93	1.05	0.9
2	Lid mechanism for induction furnace	11,623	2.00	0.74	2.7
3	Arresting leakages and reducing pressure in compressed air system	3,194	-	0.20	-
4	Replacement of raw water pump with energy efficient pump	10,433	0.55	0.66	0.8
5	Replacement of existing lighting system with energy efficient lighting system	1,070	0.21	0.07	3.1
	Overall	**28,027**	**3.7**	**2.7**	**1.4**

Total five energy conservation measures are identified. Implementing then would attract a one-time investment of Rs 3.7 lakh; it would lead to annual savings of Rs 2.7 lakh. This would result in reduction in energy consumption by 4.1%. The specific energy consumption of entire foundry would improve from 1,488 kWh per tonne to 1,428 kWh per tonne.

1.0 Production and energy consumption

1.1 Introduction

M/s Vinsavi Indotechs foundry unit was set up in 2008. The unit manufactures steel castings and supplies to various industries. The unit has an installed capacity of 150 tonnes per month. Brief summary of unit is given in table 1.1.

Table 1.1: Brief description of unit

Name of the Unit	M/s Vinsavi Indotechs
No. of years in operation	07
Factory address	R.S. No. 08, M-30, Udyambag Industrial Estate, Belgaum – 590 008
Type of industry	Steel castings
Hours of operation per day	12
Number of days of operation per year	300
Energy used	Electricity

1.2 Process flow diagram

The major steps of process are mould sand preparation, charge preparation followed by melting, pouring, knockout and finishing. The unit uses green sand moulding process. The process flow diagram is shows in figure 1.2.

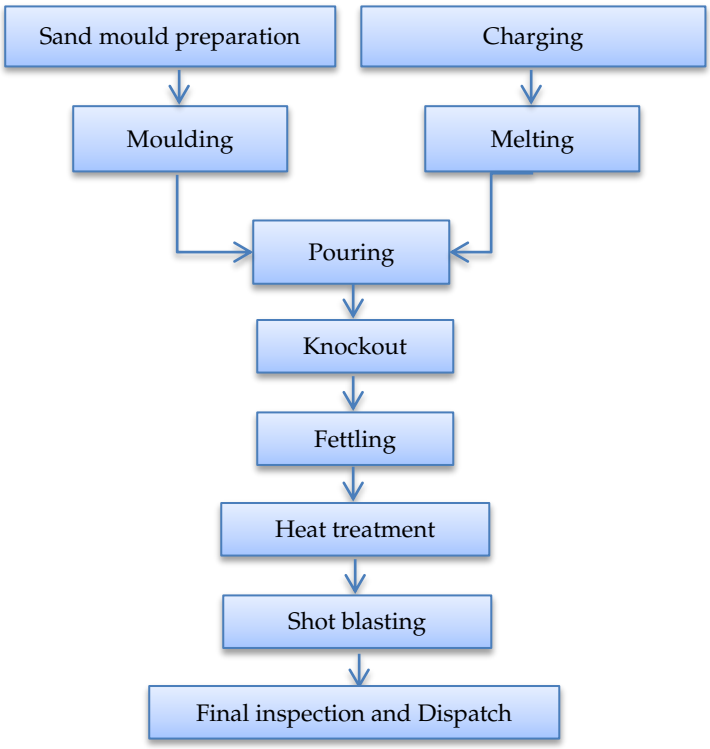


Figure 1.2: Process flow chart

1.3 Production and energy cost

The energy and production data for available period was taken from the unit for the analysis. The total liquid melting production of the unit during last 12 months (August 2014 to July 2015) was 632 tonnes and dispatched production was 465 tonnes. The overall energy cost incurred for this production was 51.6 lakh rupees. Figure 1.3 refers the monthly production and energy cost profile of the unit.

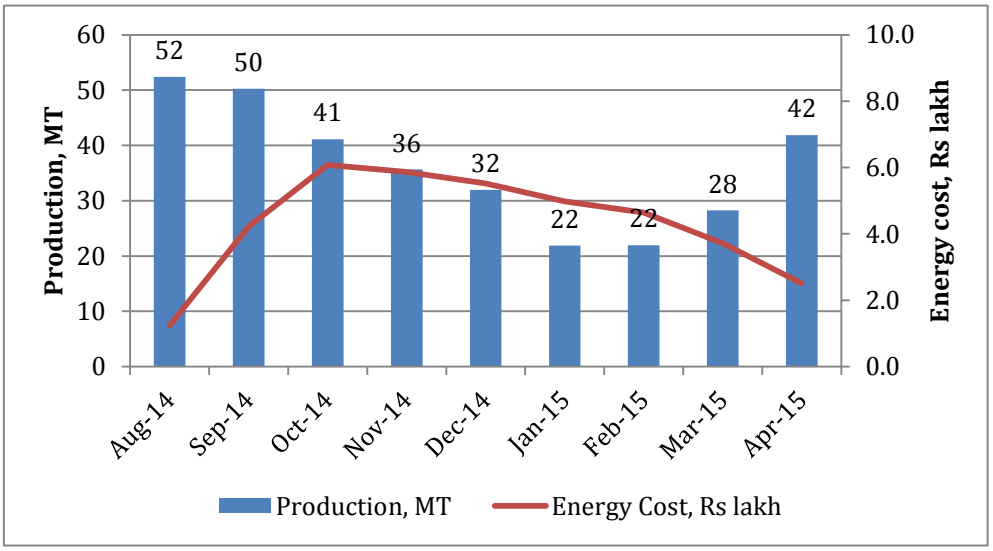


Figure 1.3: Production and energy cost profile

1.4 Energy sources availability and tariff details

Availability of listed energy types as above and their respective tariffs are given in table 1.4.

Table 1.4: Energy sources, availability and tariffs

S No	Energy source	Availability	Tariff details
1	Electricity	Supplied by HESCOM	Tariff category: HT-2(a) Voltage of supply: 11 kV Demand charges: Rs 170/kVA Energy charges: Rs 5.7/kWh (up-to 100,000 units) Rs 6.0/kWh (beyond 100,000 units) Time of day charges: 2200-0600: Rs -1.25/kWh 0600-1800: Rs 0.00/kWh 1800-2200: Rs +1.00/kWh PF penalty charges: For every 0.01 drop below 0.90, penalty Rs 0.03/kWh

1.5 Energy consumption

The total energy consumption of the unit during last 12 months (August 2014 to July 2015) was 59.5 toe (~0.7 million kWh) which is equivalent to 51.6 lakh rupees. The total CO_2 emission during this period is estimated to be 678 tonnes. Electricity was considered for CO_2 emission estimation.

1.6 Performance indicators

1.6.1 Capacity utilization

The unit has an installed capacity of 150 MT per month. The actual monthly average melting is 52.7 MT. Thus, the capacity utilization (CU) of plant is 35%. The CU varies between 20 – 53%. The CU is low due to lack of orders, thus the plant operates 10 – 12 hours per day only.

1.6.2 Net yield

The raw material consumption of foundry is around 54 tonnes per month and net casting sold is 38.7 tonnes per month. The net yield of foundry is 67%. The net yield depends on melting loss with spillage, runner and risers, rejection and net yield of foundry.

1.6.3 Specific energy consumption

The average specific energy consumption (SEC) of the plant for the year FY 2014 – 15 was estimated based on the monthly consumption of electricity and monthly production. The overall SEC is estimated to be 1,488 kWh per metric tonne of production. The SEC for induction furnace for melting is estimated to be 747 kWh per tonne of melting.

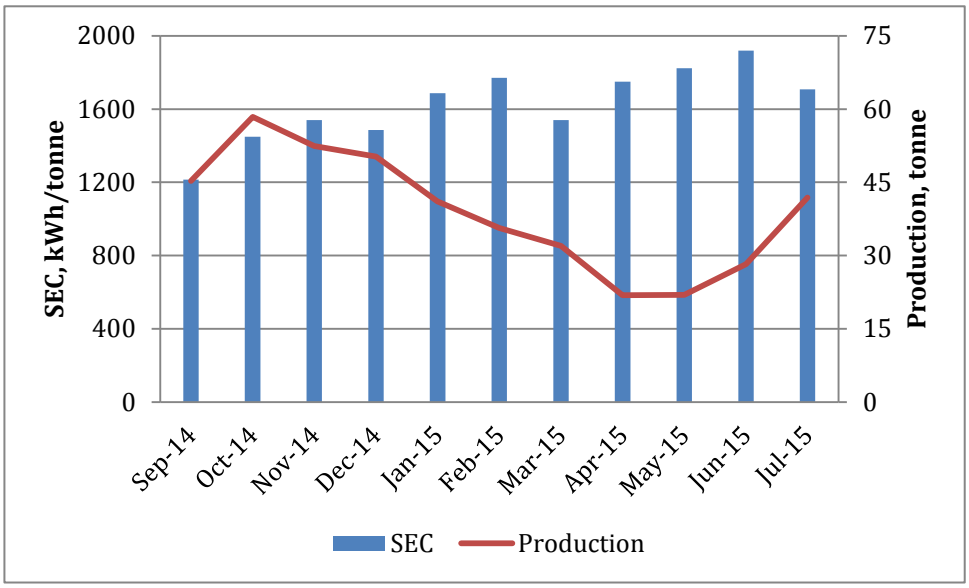


Figure 1.6.3: SEC and production profile

2.0 Electrical systems

2.1 Facility description

2.1.1 General

The main source of electricity for M/s Vinsavi Indotechs is from Hubli Electricity Supply Company Ltd (HESCOM) at 11 kV grid supply. The 11 kV Main Receiving Station (MRS) is located within the plant premises. The power supplied at 11 kV is step down to 433 V using a transformer and is fed to the respective power distribution board (PDB) and light distribution board (LDB) at 415 V through the LT switchgear located at main substation.

The rate of power failure in Belgaum, Karnataka is insignificant. To maintain the power factor near to unity, plant has provided the power factor correction system at main incomer at power control centre (PCC) level.

2.1.2 Electricity consumption data

The power supply to the facility is from HESCOM grid under the tariff category HT-2(a), with 610 kVA contract demand. The minimum billing demand is 458 kVA (75% of the contract demand). The detail of electricity consumption is given in the table 2.1.2.

Table 2.1.2: Monthly electricity consumption details

Month & Year	Electricity consumption (kWh)	Contact demand (kVA)	Power factor	Billed demand (kVA)	Demand charges (Rs)	Energy charges (Rs)	P.F. penalty (Rs)	Monthly electricity bill (Rs)
Sep-14	55052	400	0.904	462	89080	313,796	-	422,288
Oct-14	84680	400	0.903	484	96560	482,676	-	608,197
Nov-14	80668	400	0.899	493	99620	459,808	-	587,016
Dec-14	74688	400	0.900	496	100640	425,722	-	551,905
Jan-15	69348	400	0.896	425	76500	395,284	2,080	497,581
Feb-15	63100	400	0.879	426	76840	359,670	5,679	463,769
Mar-15	49240	400	0.883	409	71060	280,668	2,954	371,522
Apr-15	38268	610	0.918	458	77860	218,128	-	250,882
May-15	40008	610	0.984	475	80750	228,046	-	327,139
Jun-15	54234	610	0.855	489	83130	309,134	8,135	427,570
Jul-15	71514	610	0.910	495	84150	407,630	-	528,549
Average	**57648**	**470**	**0.903**	**451**	**82266**	**326,048**	**2,174**	**430092**
Total	**691776**				**987190**	**3912574**	**26,092**	**5,161,101**

Important parameters only are presented in above table, details such as time of day tariff, electricity duty and others are not presented. Figure 2.1.2 presents the contract demand, billed demand and the energy consumed for the last 12 months (August 2014-July 2015).

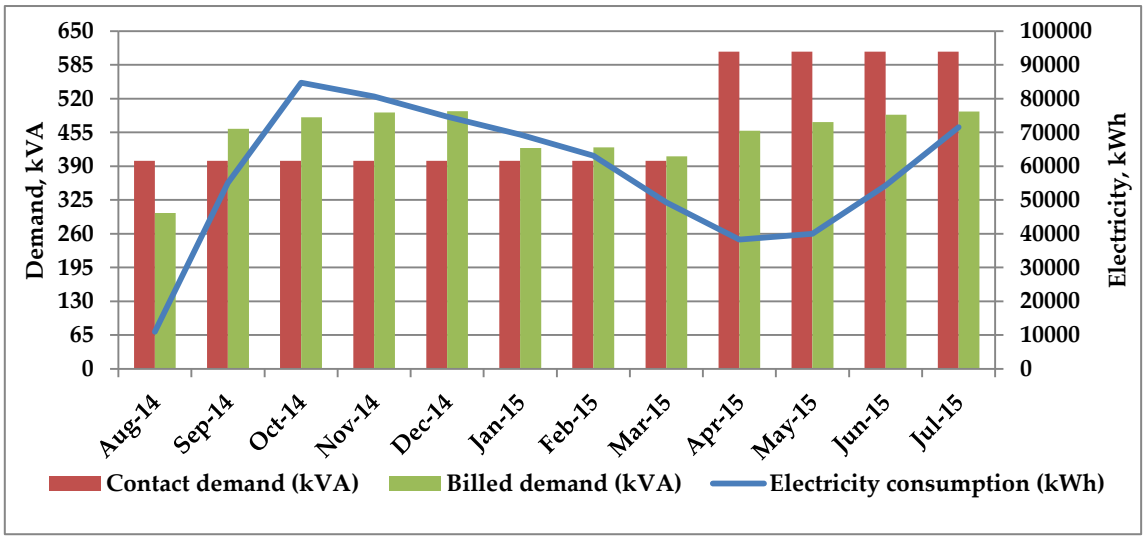


Figure 2.1.2: Demand and energy consumption pattern

As observed from above figure, plant has registered a maximum recorded demand of 496 kVA in the month of December 2014 whereas the minimum recorded demand of 300 kVA in the month of August 2014. The average recorded demand for the period was 451 kVA and it is 96% of the contract demand. The average electricity consumption of the plant from HESCOM grid was about 57,648 kWh per month.

2.2 Observation and analysis

2.2.1 Electrical power measurement

Electrical power data logging was carried out on the main power incomer at LT feeder panel using three-phase power quality analyser extensively. All electrical parameters have been recorded for identification and analysis of demand and power factor management of the plant. The operating power parameters of distribution transformer at LT side were measured evaluate the operational efficiency pattern. Some necessary data has been taken from the plant services department logbook for historical pattern better analysis.

2.2.2 Main system parameters

The electrical and power parameters of transformer are summarises in table 2.2.2.

Table 2.2.2: Summary of electrical and power parameters at main incomer

Parameters	Minimum	Average	Maximum
Voltage, Volt	388	402	421
Current, Amp	25	448	539
Active Power (kW)	10.0	270.8	371.8
Apparent Power (kVA)	16.8	312.0	393.1
Power Factor, pf	0.595	0.868	0.946
% THD (Voltage)	0	8.4	11.3
% THD (Current)	0	26.1	55.0

Observation:

- The load at transformer is variable and it follows the power curve of induction furnace.
- The average demand is found to be about 312 kVA for transformer during the measurement period however; the demand is fluctuating due to instantaneous loads of the utility system. The maximum demand was 393 kVA
- The total harmonic distortion in voltage and current is exceeding the permissible limit and this could be avoided by installation of harmonic filters.

2.2.3 Power factor management

Plant has provided the power factor correction system at main incomer BUS at LT side as well as at PCC. The power factor pattern at main incomer and its variation with demand was analysed to understand the effect of the capacitor bank during the load changeability conditions. Power factor studied from past 12 months electricity bills and the measured power factor at transformer is given in figure 2.2.3.

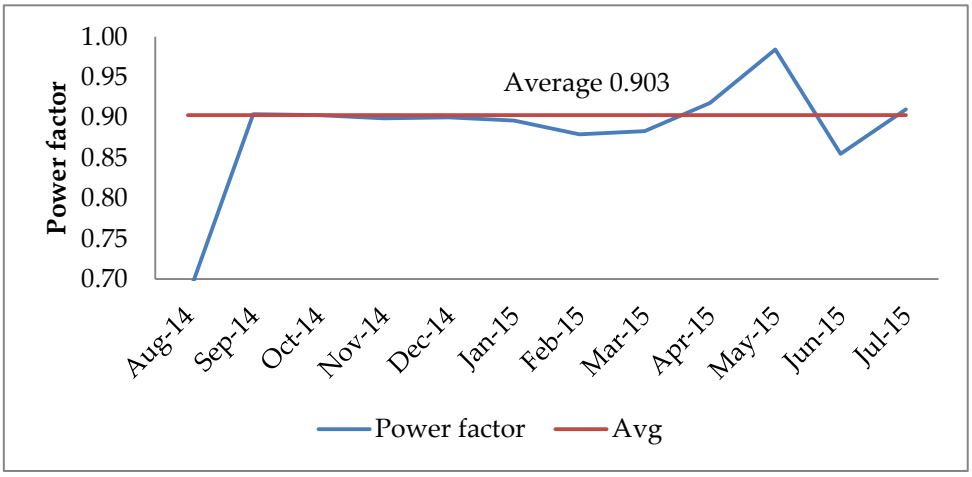


Figure 2.2.3: Power factor variation during last 12 months

It has been observed that the average power factor of the plant at main incomer is around 0.868 during measurement and average for past one year is 0.903. It also has been observed that the power factor correction system required capacity augmentation to maintain the power factor unity.

2.2.4 Load factor of plant

The average monthly electricity consumption of plant is 57,648 kWh. The plant operates for 16 hours daily. The peak demand of plant is 451 kVA at power factor of 0.903 lag. This corresponds to a load factor of 57%. The load factor is good due to continuous running of induction furnace during operation period. It can still be improved by maintaining furnace at full power, when in operation.

2.3 Energy conservation measures

2.3.1 Improving power factor and demand reduction

The average power factor recorded in foundry was 0.903. The average billed demand is 479 kVA and average maximum load is 433 kW. The power can be still improved near to unity by connecting capacitor bank. The power factor is quite low at the unit is at verge of paying penalty. It was recommended to install capacitor bank of 185 kVAr capacity. Poor power factor does not only increase the penalty in billing but also increases demand charges and distribution losses. This will also reduce the demand by 46 kVA. The estimated annual energy savings by improving power factor is 1,708 kWh equivalents to a monetary saving of Rs 1.05 lakh. The investment requirement is Rs 0.93 lakh with a simple payback period of 0.9 year. A detailed cost benefit analysis is been given in Table 2.3.1.

Table 2.3.1: Cost benefit analysis

Actual Parameters	Unit	Value
Contract demand	kVA	610
Minimum billing demand (@75%)	kVA	458
Average billed demand	kVA	479
Existing power factor	pf	0.903
Proposed power factor	pf	0.999
Existing real load	kW	433
New demand	kVA	433
Reduction in demand	kVA	46
Capacitor bank requirement	kVAr	187
Savings Estimation	**Unit**	**Value**
Annual energy saving	kWh	1,708
Demand cost saving	Rs lakh/year	0.94
Monetary saving	Rs lakh/year	1.05
Investment cost for capacitor bank	Rs lakh	0.93
Simple payback period	years	0.9
CO_2 emission avoided	tCO_2/year	1.7

2.4 General recommendations

It was observed that current and voltage harmonics are crossing limits. In Karnataka as of now there is no penalty on harmonics but other states do have penalty. In future Karnataka may also introduce penalty on harmonics. The plant may consider installing harmonics filters. Table 2.4 gives details of harmonics.

Table 2.4: Details of harmonics

Parameters	Permissible limit	Measure value
% THD Voltage	5.0%	8.4%
% THD Current	8.0%	26.1%

3.0 Furnace

3.1 Facility description

The plant is equipped with one induction melting furnace of rating 350 kW and it has crucible of capacity 500 kg. The design parameters of the induction melting furnace are presented in Table 3.1.

Table 3.1: Induction melting furnace design parameters

Parameters/equipment ID	Furnace
Equipment	Induction furnace
Type	SCR
Make	Electrotherm
Voltage/Frequency, V/Hz	415/500
Rating, kW	350
Crucible capacity, kg	500
Operating Temperature (°C)	1610
Mode of operation (batch/continuous)	Batch
Batch duration (minute)	79

3.2 Observation and analysis

The study was conducted on 500 kg crucible and entire days (6 sample heats (batches)) were studied to arrive at specific energy consumption of induction furnace. The details of observation are given in table 3.2. The power curves for the batches studied are shown in figure 3.2. Detailed furnace logging is given in annexure 3.2.

Table 3.2: Observation and measurement of induction furnace

Particular	Unit	Total	Average
Raw material charge	kg	2,003	500.75
Units consumed	kWh	1,496	374
Cycle time (melting + pouring)	min	315	79
Specific Energy Consumption	kWh/MT	747	747
Tapping temperature	C	1,610	1,610

- There was no lid cover on furnace crucible, thus leading to radiation and convection losses, around 6% of input energy
- Currently the furnace is operating in one shift (8-12 hours depending on demand) and is left for natural cooling at end of day, leading to bigger crakes in refractory lining and reducing lining life
- It was recommended to use a fan for forced cooling of crucible, this not only increase lining life but also reduce the hours of coil cooling requirement after furnace is switched off
- The harmonics level is too high due to furnace operation. Current distortion is near 26.1% and voltage distortion is near 8.4%

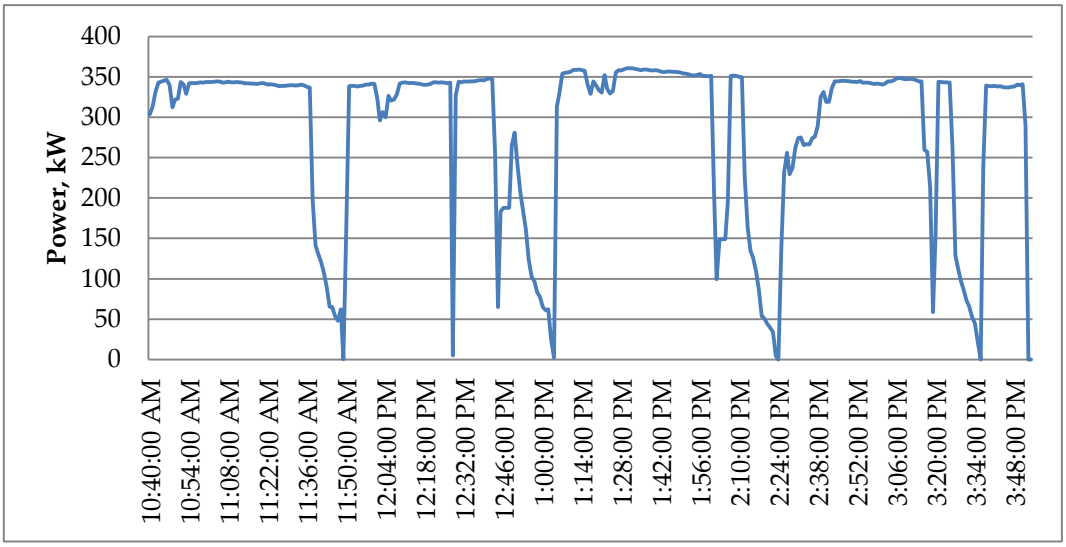


Figure 3.2: Power curve of induction furnace on 23rd July 2015

3.3 Energy conservation measures

Based on the above analysis, identified energy efficiency measures in furnace are discussed in the following paragraphs.

3.3.1 Installation of lid mechanism for induction furnace

The operational parameters of the induction furnace including the electricity consumption and material charged were measured during the detailed energy audit and analysis of the past one year data. The specific energy consumption of the induction furnace was calculated to be 747 kWh per metric tonne of melting. It was found that the opening of induction furnace is circular with 355 mm diameter. The opening heat losses for one batch (heat) were calculated to be 23 kWh per heat. The heat loss is due to radiation and convection loss.

It is recommended to install a hydraulically operated lid mechanism for both crucible of induction furnace to avoid opening losses. It was estimated that around five units per heat can be saved.

Table 3.3.1: Installation of Lid mechanism for induction furnace

Particulars	Unit	Value
Heats per day	heats	7.0
Saving potential per heat	kWh/heat	5.53
Operational days per year	days	300
Annual saving potential	kWh/year	11,623
Energy cost per unit	Rs/kWh	6.35
Monetary saving	Rs lakh/year	0.74
Investment	Rs lakh	2.00
Simple payback period	years	2.7
CO_2 emission avoided	tCO_2/year	11.4

The estimated annual energy savings by using lid mechanism is 11,623 kWh equivalents to a monetary savings of Rs 0.74 lakh. The investment requirement is Rs 2.0 lakh with a simple payback period of 2.7 year. The annual reduction in CO_2 emission is estimated to be 11.4 tCO_2.

4.0 Compressed air system

4.1 Facility description

The plant has installed one screw type (air cooled) air compressor for meeting the compressed air requirement of instrumentation and service in the plant. The design parameters of the air compressor are presented in Table 4.1.

Table 4.1: Air compressor design parameters

Particulars	Unit	AC01
Make		ELGI
Type		Screw
Model		E22-7.5
Rated Capacity	m^3/min	3.85
	cfm	136
Pressure	bar	7.0
Power rating	kW	22.0

4.2 Observation and analysis

The air compressors AC01 runs continuously in load and unload mode. The compressors will be unloaded while reaching to the set pressure. When compressors in unload mode, the motor continues to operate however at much reduced load and no compressed air is delivered to the system. The compressed air pressure required at the end use point was observed to be about 6.1 kg/cm^2.

4.2.1 Performance assessment of air compressor

The details of FAD test conducted on the air compressor are given in table 4.2.1. The power curves for loading unloading of air compressor studied are shown in figure 4.2.1.

Table 4.2.1: Performance assessment of air compressor

Particulars	Unit	AC01
Operating Pressure	bar	7.2
Initial Pressure	bar	0.2
Capacity of Receiver	m^3	0.5
Additional holdup of volume	m^3	0.05
Pump up time	seconds	60
Inlet air temperature	^oC	32.0
FAD	m^3/min	3.8
	cfm	133
Isothermal power	kW	12.3
Motor power	kW	25.5
Motor efficiency	%	89.0%
Shaft power	kW	22.70
Isothermal efficiency	**%**	**54.0%**
Volumetric efficiency	**%**	**97.5%**
Specific power consumption	**kW/cfm**	**0.192**

- The FAD of air compressors was estimated to be 133 cfm and the specific power consumption of air compressor was 0.192 kW per cfm
- The volumetric and isothermal efficiency of air compressor was estimated to be 97.5% and 54.0% respectively

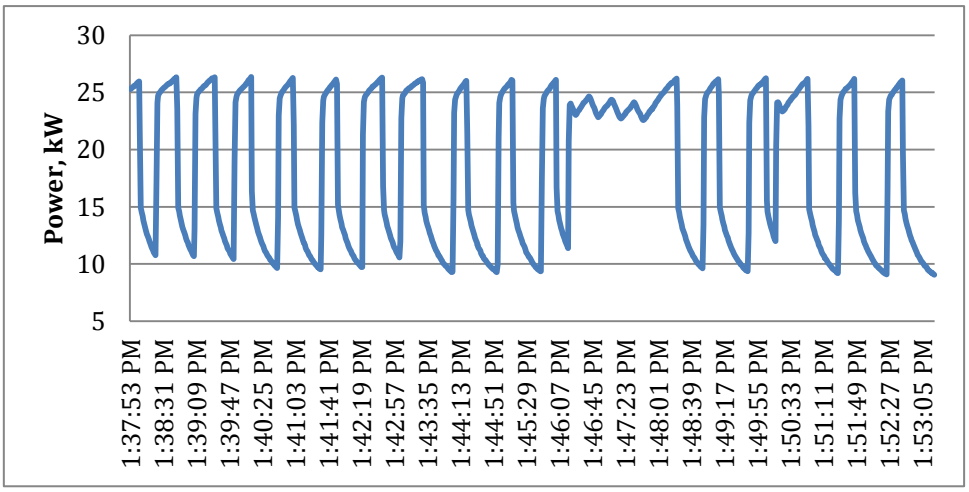


Figure 4.2.1: Power curve during normal operation

4.2.2 Leakage test

The leakage test of the compressed air distribution system was conducted on AC01 during the field study. Under this test, all supply valves at utilization end were closed manually and compressor was operated for a period of 30 minutes. The loading and unloading time of the operating compressor during the leakage test is noted. The loading period is the generation of the compressed air, which is due to leakages in the distribution system.

The estimated leakage in the compressed air distribution system is shown in table 4.2.2. Figure 4.2.2 shows load-unload cycle during leakage test. In an ideal system once pressure attained, the compressor should never come ON-load again during leakage test.

Table 4.2.2: Leakage assessment

Leakage Test	Unit	Value
Actual FAD	m^3/min	3.75
	cfm	133
ON time	sec	19
OFF time	sec	123
Leakage in plant	%	13%
Leakage in plant	cfm	17.73

Leaks are a significant source of wasted energy in a compressed air system of plant, often wasting a portion of the compressor's output. Compressed air leaks can also contribute to problems with system operations, including:

- Fluctuating system pressure, which can cause air tool and other air-operated equipment to function less efficiently, which possibly affects the production.
- Excess compressor capacity, resulting in higher than necessary costs

- Decreased service life and increased maintenance of supply equipment (including the compressor package) due to unnecessary cycling and increased run time.

By installing suitable application specific nozzles, taking the necessary maintenance practices and periodic inspection of distribution network, it would be possible to reduce the air leakages significantly. Although leaks can occur in any part of the system, the most common problem areas are: couplings, hoses, tubes, fittings, pipe joints, quick disconnects, FRLs (filter, regulator, and lubricator), condensate traps, valves, thread sealants, and point of use devices. Leakage rates are a function of the supply pressure in an uncontrolled system and increase with higher system pressures.

The total leakage quantity in the system in plant is estimated to 13% of the supplied air (from one compressor) which is equivalent to 18 cfm, which is significant. The permissible line losses in the industrial scenario are less than 5%.

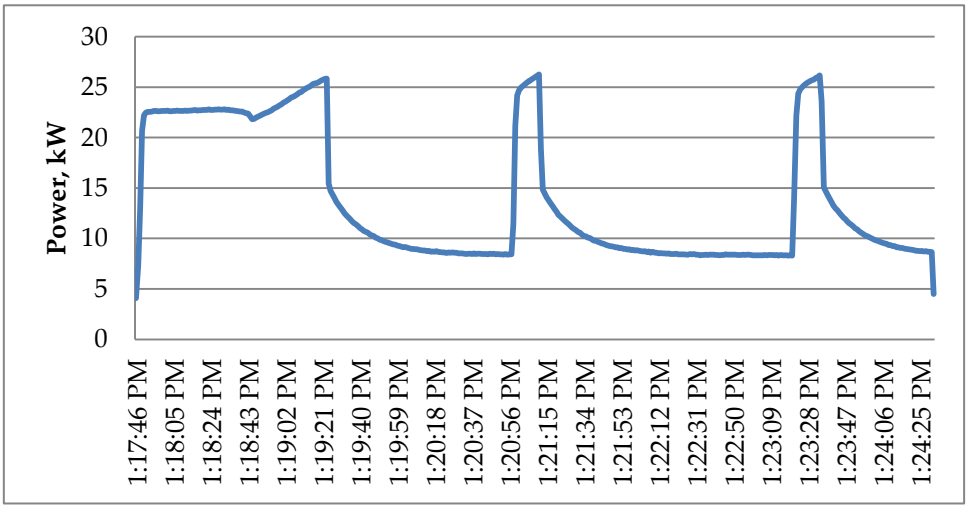


Figure 4.2.2: Power curve during leakage test

4.3 Energy conservation measures

Based on the above analysis, identified energy efficiency measures in air compressor are discussed in the following paragraphs.

4.3.1 Arresting leakages and reducing pressure in compressed air system

From preliminary assessment it was found that leakage in line is very high in both the pipe lines. Leakage test was performed during break time to estimate the amount of leakage. The on time and off time were measured for two air compressors. The leakage in existing compressed air piping system was measured and found to be 13%, which is high.

It is recommended to reduce leakages in the compressed air piping system by periodically checking for air leaks and arresting them, and bring it down to about a nominal level of 5%. It is recommended to have common ring main system for compressed air network and set screw compressor at 6.2 to 7.2 bar pressure and set reciprocating compressor at 6.2 to 6.8 bar. After reduction of leakage single screw compressor should be able to meet the demand.

Also, it is recommended to join pipes with proper sized pipes to form ring main system, thus to minimize pressure drop in system.

Table 4.3.1: Cost benefit analysis

Particulars	Unit	Value
Leakage arresting		
Leakage in plant	%	13%
Energy loss	kW/hour	0.7
Acceptable losses	%	5%
Energy Saving	kW	0.4
Operating hours	hour	3,600
Recommended pressure		
Load pressure	bar	6.2
Unload pressure	bar	6.8
Energy Saving	%	3%
Annual energy saving	kWh/ year	3,194
	toe/year	0.27
Monetary saving	Rs lakh/year	0.2
Investment	Rs lakh	-
Simple payback period	years	-
CO_2 emission avoided	tCO_2/year	3.1

The estimated annual energy savings by arresting air leakage and reducing pressure setting is 3,194 kWh equivalents to a monetary savings of Rs 0.2 lakh. There is no investment required for this recommendation. The annual reduction in CO_2 emission is estimated to be 3.1 tCO_2.

5.0 Pumping system and cooling towers

5.1 Facility description

Pumping systems and cooling towers were installed in the plant, mainly for supplying cooling water to induction furnace. The furnace panel has one DM water pump for its cooling. Soft water is circulated for coil cooling using another pump. The soft water and DM water is cooling using heat exchanger, where raw water flows in secondary circuit. The rated parameters of the pumps have been given in table 5.1a.

Table 5.1a: Rated parameters of the pumps taken up for study

Design Parameters	Unit	Coil cooling pump	Raw water pump
Make		Kirloskar	Kirloskar
Type		Mono-Block	Mono-Block
Flow rate	m^3/hour	11.9	7.2
Head	m	30.0	51.0
Motor Power	kW	2.2	3.7
Overall Efficiency	%	40%	34%

The plant is equipped with one cooling tower (CT) to cater to the cooling water requirements of the induction furnace. The rated parameters of the cooling towers have been given in table 5.1b.

Table 5.1b: Rated parameters of the cooling tower taken up for study

Parameters	CT
Type	Forced draft
Make/year	NA
Purpose	Coil water cooling in induction melting furnace
Capacity (lpm)	150
Pump power (kW)	3.7
Fan power (kW)	2.2
Operating hours per day	12
Other Location	Roof mounted

5.2 Observation and analysis

5.2.1 Pumps

The operating parameters, such as flow and head, were measured for all operating water pumps. Suction & discharge head of the pumps was measured by using standard pressure gauge from the plant. The flow rate of water delivered by the pumps was measured by using non-intrusive type flow meter. Simultaneously, operating electrical parameters of pump mainly voltage, current, power factor and kW were measured by using portable power analyser. The operating parameters and efficiency estimation is given in table 5.2.1.

Table 5.2.1: Estimation of efficiency of pump associated with induction furnace

Actual Parameters	Unit	Coil cooling pump	Raw water pump
Flow rate	m^3/hour	9.0	6.5
Suction Pressure	kg/cm^2		
Discharge Pressure	kg/cm^2	3.1	3.5
Differential Head	m	31	35
Power	kW	2.60	4.84
Overall efficiency	**%**	**29.2%**	**12.8%**

5.2.2 Cooling towers in the plant

Operating parameters of cooling towers such as cooling water temperature at inlet and outlet, water flow rates, air flow rates and power consumption of fan motor were monitored by using digital thermometer, non-intrusive type flow meter, anemometer and power analyser respectively. The operating parameters and the performance of the cooling tower are shown in table 5.2.2.

Table 5.2.2: Estimation of operating parameters and performance of cooling towers

Measured Parameters	Unit	Value
Water flow rate	m^3/hour	6.5
Ambient temperature	°C	29.5
RH	%	49.9
T inlet	°C	35.6
T outlet	°C	29.9
Calculations	**Unit**	
DBT	°C	29.5
WBT	°C	21.6
Approach	°C	8.3
Range	°C	5.7
Heat removed to atmosphere	kCal/hour	37,050
	TR	12.25
Effectiveness	%	41%

5.3 Energy conservation measures

There is a scope of considerable energy savings in the pumps and cooling tower area, as this is clear from the performance assessment that some of the pumps installed are of poor efficiency.

5.3.1 Replacement of existing raw water pump with energy efficient pump

The power consumption of raw water pump was measured to be 4.84 kW. The water flow rate was measured to be 6.5 m^3/hr, which is lower than the design flow of 7.2 m^3/hr. The overall efficiency of the pump is calculated to be 12.8% which is lower than design efficiency (34%).

The performance of an induction furnace is directly linked with the performance of its cooling water circuit. Therefore, it is recommended to replace the existing raw water pump for panel cooling PHE with an energy efficient grundfos pump

Table 5.3.2: Replacement of existing raw water pump with energy efficient pumps

Recommended Pump Specification	Units	Raw water pump
Flow rate	m^3/hour	9.0
Differential Head	m	35.0
Efficiency	%	44.2%
Power	kW	1.94
Energy saving	kW	2.90
Operating period	hour	3,600
Annual Energy saving	kWh/year	10,433
	toe/year	0.90
Cost saving		
Energy cost per unit	Rs / kWh	6.35
Annual Monetary Saving	Rs lakh / year	0.66
Investment	Rs lakh	0.55
Simple Payback Period	years	0.8
CO_2 emission avoided	tCO_2/year	10.2

The estimated annual energy savings in raw water pump is 10,433 kWh equivalents to a monetary saving of Rs 0.66 lakh. The investment requirement is Rs 0.55 lakh with a simple payback period of 0.8 years. The annual reduction in CO_2 emission is estimated to be 10.2 tCO_2.

.

6.0 Lighting system

6.1 Facility description

The total connected lighting load of the plant, as per the inventory collected during the detailed assessment study, was estimated to be 1.1 kW (including ballast losses). The different types of lamps operating in the plant are tube light (FTL-T12), Mercury vapour (HPMV), Compact Fluorescent Lamp (CFL) and induction lamp. Table 6.1 gives the type of lamps used in different areas of the plant.

Table 6.1: Details of the lighting system

S. No	Location in the plant	Type of lamps & ballast	No. of lamps	Rated wattage, watt (including ballast)	Connected load, kW	Average operating hours
1	Office	T12	17	52	0.9	8
2	Plant	HPMV	1	265	0.3	5
3	Plant	Induction	1	150	0.2	5
4	Plant	CFL	5	27	0.1	5

The overall energy consumption in lighting is about 1% of total energy consumption in foundry.

6.2 Energy conservation measures

6.2.1 Replacement of existing lighting system with efficient lighting system in phase manner

The foundry is using mixed lighting, including FTL T12 and HPMV. Fluorescent tube lights of 40W FTLs with conventional copper ballasts consume more energy. About 17 T12 and four T8 were found in different locations of the unit. It is proposed to replace all 40W copper ballast FTLs with 28W FTLs having electronic ballasts. Electronic ballasts help in instantaneous starting of lamps and have improved regulation for varying input voltage. Major benefits of T5 fixtures over conventional T12 FTL are as follows:

- Uniform light output for wide range of supply voltages.
- Instant start and flicker free operation.
- Improves the power factor almost close to unity.
- Less heat generation, hence load on ACs reduces.
- Increased lamp life around 15000 hrs.
- Higher lumen output per watt (around 105 lumens per watt)

Also, it is observed that foundry uses one mercury vapour lamp for lighting in shop floor. The lumens per watt of MV lamp are low and also the life is short. It is recommended to replace it with induction lamp.

Table 6.2.1: Cost benefit analysis

Particulars	Unit	Existing	Proposed	Existing	Proposed
Type of lamp	-	T-12	T-5	HPMV	Induction lamp
Wattage of lamps	W	40	28	250	150
Design Lumen (Approx.)	Lumen	3200	2900	15000	22500
Watt loss per ballast	W	12	2	15	0
No. of lamps to be replaced	No.	17	17	1	1
Average Operating Hours per day	Hours/Days	8	8	5	5
Operating day /year	No.	300	300	300	300
Energy consumption	kWh/year	2121.6	1224	397.5	225
Energy savings	kWh/year		898		173
Energy Cost	Rs/kWh		6.35		6.35
Energy cost savings	Rs/ year		5,700		1,095
Initial retrofitting cost / lamps	Rs		585		11,000
Initial investment cost	Rs		9,945		11,000
Payback period	Years		1.74		10.04
CO_2 avoided	t CO_2/year		0.88		0.17

The estimated annual energy savings efficient lighting is 1,070 kWh equivalents to a monetary saving of Rs 0.07 lakh. The investment requirement is Rs 0.21 lakh with a simple payback period of 3.1 years. The annual reduction in CO_2 emission is estimated to be 1.05 tCO_2.

7.0 Summary of potential savings

7.1 Summary of recommendations

The proposed energy conservation measures (ECMs) for various facilities of Vinsavi Indotechs is categorized as no investment, short term investment and medium term investment based recommendations as per the following criteria:

- The energy savings measures, which are having immediate returns, are considered to be no investment recommendations.
- The energy saving measures, which are having a simple payback period of less than a year, are considered to be short term measures.
- The energy saving measures, which are having a simple payback period of 1 to 2 year, are considered to be medium term measures.
- The energy saving measures, which are having a simple payback period greater than 2 years, are considered to be long term measures.

The number of ECMs under the above categories as given table 7.1

Table 7.1: Categorization of energy conservation measures

Sr. No.	Type of recommendation	No. of ECM	Energy cost saving potential (Rs lakh)	Investment required (Rs lakh)	Simple payback (years)
1	No investment based	1	0.20	-	-
2	Short term return based (< 1 year)	2	1.71	1.48	0.9
3	Medium term return based (1-2 year)	0	-	-	-
4	Long term return based (> 2 year)	2	0.81	2.21	2.7
	Total	**5**	**2.72**	**3.69**	**1.4**

7.2 Recommended energy conservation measures

The recommended measures considered for energy audit report after discussion with unit representative is given in table 7.2

Table 7.2: Recommended energy conservation measures for implementation

S. No	Energy conservation measures	Annual energy savings	Investment	Savings	Simple payback
		Electricity (kWh)	(Rs lakh)	Rs lakh/ year	year
1	Power factor improvement	1,708	0.93	1.05	0.9
2	Lid mechanism for induction furnace	11,623	2.00	0.74	2.7
3	Arresting leakages and reducing pressure in compressed air system	3,194	-	0.20	-
4	Replacement of raw water pump with energy efficient pump	10,433	0.55	0.66	0.8
5	Replacement of existing lighting system with energy efficient lighting system	1,070	0.21	0.07	3.1
	Overall	**28,027**	**3.7**	**2.7**	**1.4**

Total five energy conservation measures are identified. Implementing then would attract a one-time investment of Rs 3.7 lakh; it would lead to annual savings of Rs 2.7 lakh. This would result in reduction in energy consumption by 4.1%. The specific energy consumption of entire foundry would improve from 1,488 kWh per tonne to 1,428 kWh per tonne.

7.3 Lifetime energy and CO_2 savings

Implementation of the energy conservation measures in the unit may result in reduction in CO_2 emissions due to reduction in overall energy consumption. The estimated reduction in GHG emission by implementation of the recommended energy conservation measures is 27.5 tonne of CO_2 per year. The life time CO_2 emission reduction in estimated to be 412 tonne. The lifetime energy and CO_2 saving are given in table 7.3

Table 7.3: Lifetime CO_2 savings

S. No	Energy Conservation Measures	Life time energy saving (toe)	Life time CO_2 reduction (tonne)
1	Power factor improvement	2.2	25.1
2	Lid mechanism for induction furnace	15.0	170.9
3	Arresting leakages and reducing pressure in compressed air system	4.1	47.0
4	Replacement of raw water pump with energy efficient pump	13.5	153.4
5	Replacement of existing lighting system with energy efficient lighting system	1.4	15.7
		36.2	**412.0**

7.4 Renewable energy recommendation

The potential of utilization of renewable energy in foundry unit exists at two levels. One is to meet thermal energy needs and other is to use solar photovoltaic panel for lighting load. Process such as sand drying and core baking uses LPG, diesel or natural gas as fuel, this can be replaced by a biomass gasifier. But the usage of sand drier is only for 2-3 months in a year and given the small size of unit, this recommendation is not financially attractive. In case of roof-top SPV, the area available is very less and the payback on investment is more than four years.

Annexures

Annexure: 3.2 Logging of induction furnace

Date	Time	Voltage (Line)			%VTHD			Current (Line)			% ATHD			kW	kWh	kVAr	kVA	PF Line1			Hz
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	Sum		Sum	Sum	L1	L2	L3	
7/23/2015	10:40:00 AM	401.5	400.9	399.2	8.6	8.3	8.3	463	465	461	26.8	26.7	27.2	303.5	5.1	105.5	321.3	0.94	0.95	0.94	50.01
7/23/2015	10:41:00 AM	401.1	400.5	399.2	8.7	8.4	8.4	478	480	476	26.7	26.6	27.1	312.9	10.3	109.0	331.4	0.94	0.95	0.94	50.03
7/23/2015	10:42:00 AM	401.9	401.4	399.9	8.7	8.4	8.3	505	507	503	26.4	26.3	26.8	331.3	15.8	115.5	350.8	0.94	0.95	0.94	50.04
7/23/2015	10:43:00 AM	401.2	400.8	399.5	8.5	8.2	8.2	523	525	521	26.5	26.4	26.8	343.0	21.5	119.0	363.0	0.94	0.95	0.94	50.01
7/23/2015	10:44:00 AM	400.9	400.4	399.2	8.8	8.5	8.5	526	527	523	26.4	26.3	26.7	343.9	27.2	119.7	364.1	0.94	0.95	0.94	50.00
7/23/2015	10:45:00 AM	401.1	400.7	399.6	8.6	8.3	8.3	527	529	524	26.6	26.5	26.9	345.2	33.0	119.6	365.4	0.94	0.95	0.94	50.00
7/23/2015	10:46:00 AM	401.1	400.7	399.3	8.6	8.3	8.2	529	531	526	26.4	26.4	26.8	346.3	38.8	120.3	366.6	0.94	0.95	0.94	49.99
7/23/2015	10:47:00 AM	399.9	399.4	398.1	9.5	9.1	9.1	532	535	530	26.9	26.8	27.3	340.0	44.4	137.8	368.1	0.92	0.93	0.92	49.98
7/23/2015	10:48:00 AM	398.8	398.2	397.1	11.3	10.6	10.9	535	539	532	28.6	28.3	28.9	312.2	49.6	195.5	369.0	0.85	0.85	0.84	49.96
7/23/2015	10:49:00 AM	398.5	398.0	396.8	10.8	10.2	10.4	535	538	531	28.4	28.1	28.8	322.0	55.0	178.7	368.5	0.87	0.88	0.87	49.96
7/23/2015	10:50:00 AM	397.9	397.4	396.3	10.7	10.1	10.3	534	538	531	28.2	27.9	28.5	322.9	60.4	173.4	367.7	0.88	0.88	0.88	49.98
7/23/2015	10:51:00 AM	399.5	399.2	398.0	9.6	9.2	9.2	532	534	529	26.7	26.7	27.1	343.8	66.1	129.9	367.6	0.93	0.94	0.93	49.99
7/23/2015	10:52:00 AM	396.4	396.1	394.8	9.6	9.3	9.3	533	536	530	27.0	26.8	27.3	340.4	71.8	132.4	365.4	0.93	0.93	0.93	50.00
7/23/2015	10:53:00 AM	394.3	394.1	392.8	10.4	9.8	10.0	534	537	531	28.0	27.7	28.3	328.9	77.3	156.1	364.3	0.90	0.91	0.90	49.99
7/23/2015	10:54:00 AM	395.8	395.4	394.3	9.5	9.2	9.1	531	533	528	26.4	26.3	26.7	342.1	83.0	121.7	363.2	0.94	0.94	0.94	49.97
7/23/2015	10:55:00 AM	395.8	395.5	394.2	9.5	9.2	9.1	530	532	528	26.2	26.1	26.6	342.6	88.7	119.7	362.9	0.94	0.95	0.94	49.97
7/23/2015	10:56:00 AM	395.7	395.4	394.2	9.3	9.0	9.0	530	532	527	26.1	26.1	26.5	342.2	94.4	119.5	362.4	0.94	0.95	0.94	49.98
7/23/2015	10:57:00 AM	396.5	396.2	395.1	9.3	9.0	9.0	529	531	527	26.1	26.1	26.5	342.6	100.1	119.7	363.0	0.94	0.95	0.94	49.99
7/23/2015	10:58:00 AM	397.4	397.1	396.1	9.4	9.1	9.1	529	531	527	26.0	25.9	26.3	343.2	105.8	120.3	363.6	0.94	0.95	0.94	50.00
7/23/2015	10:59:00 AM	397.2	397.0	395.9	9.5	9.2	9.2	529	531	527	25.9	25.9	26.3	342.9	111.5	120.4	363.4	0.94	0.95	0.94	50.00
7/23/2015	11:00:00 AM	397.8	397.7	396.5	9.4	9.1	9.1	529	531	527	26.0	25.9	26.3	343.6	117.3	120.7	364.2	0.94	0.95	0.94	50.01
7/23/2015	11:01:00 AM	397.3	397.2	396.0	9.4	9.1	9.1	530	532	528	25.9	25.8	26.2	343.6	123.0	120.7	364.2	0.94	0.95	0.94	50.00
7/23/2015	11:02:00 AM	397.4	397.2	396.2	9.5	9.2	9.2	530	532	528	25.9	25.8	26.3	343.8	128.7	120.7	364.3	0.94	0.95	0.94	49.98
7/23/2015	11:03:00 AM	397.7	397.5	396.4	9.6	9.3	9.3	530	532	528	25.9	25.8	26.2	343.9	134.4	121.2	364.6	0.94	0.95	0.94	49.98
7/23/2015	11:04:00 AM	398.2	398.1	396.8	9.6	9.3	9.3	530	532	528	25.9	25.8	26.2	344.3	140.2	121.2	365.0	0.94	0.95	0.94	50.00
7/23/2015	11:05:00 AM	397.8	397.6	396.2	9.6	9.3	9.3	530	532	528	25.9	25.8	26.2	343.9	145.9	121.1	364.6	0.94	0.95	0.94	50.02
7/23/2015	11:06:00 AM	396.7	396.5	395.2	9.5	9.2	9.2	530	532	527	25.8	25.7	26.2	342.8	151.6	120.8	363.5	0.94	0.95	0.94	50.05

Date	Time	Voltage (Line)			%VTHD			Current (Line)			% ATHD			kW	kWh	kVAr	kVA	PF Line1			Hz
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	Sum		Sum	Sum	L1	L2	L3	
7/23/2015	11:07:00 AM	397.1	397.0	395.7	9.6	9.3	9.3	530	532	527	25.8	25.7	26.1	343.1	157.3	121.2	363.9	0.94	0.94	0.94	50.06
7/23/2015	11:08:00 AM	398.6	398.5	397.0	10.0	9.6	9.7	529	532	527	25.7	25.7	26.1	344.1	163.1	121.7	365.0	0.94	0.94	0.94	50.06
7/23/2015	11:09:00 AM	397.4	397.4	395.8	9.8	9.5	9.4	530	532	527	25.8	25.7	26.1	343.4	168.8	121.5	364.3	0.94	0.94	0.94	50.04
7/23/2015	11:10:00 AM	397.0	397.0	395.6	9.6	9.3	9.3	530	532	528	25.8	25.7	26.1	343.2	174.5	121.2	364.0	0.94	0.94	0.94	50.05
7/23/2015	11:11:00 AM	397.3	397.2	395.9	9.5	9.2	9.2	530	532	528	25.8	25.7	26.1	343.6	180.3	121.3	364.4	0.94	0.94	0.94	50.00
7/23/2015	11:12:00 AM	397.4	397.1	395.9	10.0	9.7	9.7	530	532	528	25.8	25.8	26.2	343.4	186.0	121.4	364.3	0.94	0.94	0.94	49.99
7/23/2015	11:13:00 AM	396.7	396.4	395.2	10.1	9.8	9.8	530	532	527	25.7	25.7	26.2	342.7	191.7	121.2	363.5	0.94	0.94	0.94	49.95
7/23/2015	11:14:00 AM	396.0	395.9	394.6	10.2	9.8	9.8	530	532	527	25.9	25.8	26.2	342.2	197.4	120.9	363.0	0.94	0.94	0.94	49.92
7/23/2015	11:15:00 AM	396.0	395.8	394.4	10.2	9.8	9.9	530	532	527	25.8	25.7	26.1	342.0	203.1	120.9	362.8	0.94	0.94	0.94	49.91
7/23/2015	11:16:00 AM	395.5	395.4	393.8	10.1	9.7	9.7	530	532	527	25.8	25.7	26.2	341.6	208.8	120.8	362.4	0.94	0.94	0.94	49.93
7/23/2015	11:17:00 AM	395.5	395.2	393.8	10.1	9.7	9.7	530	532	527	25.7	25.7	26.1	341.5	214.5	120.8	362.3	0.94	0.94	0.94	49.94
7/23/2015	11:18:00 AM	395.3	395.0	393.7	10.3	9.9	9.9	530	532	527	25.7	25.7	26.1	341.3	220.2	120.7	362.0	0.94	0.94	0.94	49.95
7/23/2015	11:19:00 AM	395.3	394.9	393.7	10.1	9.7	9.8	530	532	527	25.8	25.8	26.2	341.6	225.9	120.6	362.3	0.94	0.94	0.94	49.97
7/23/2015	11:20:00 AM	396.3	396.0	394.7	9.8	9.5	9.5	530	532	527	25.6	25.6	26.1	342.5	231.6	121.1	363.3	0.94	0.94	0.94	49.97
7/23/2015	11:21:00 AM	395.3	395.1	393.7	9.9	9.5	9.5	530	532	527	25.6	25.6	26.0	341.6	237.3	120.9	362.4	0.94	0.94	0.94	49.98
7/23/2015	11:22:00 AM	394.4	394.1	392.6	9.8	9.5	9.5	530	532	527	25.5	25.5	25.9	340.5	242.9	120.8	361.3	0.94	0.94	0.94	49.96
7/23/2015	11:23:00 AM	394.2	393.9	392.6	9.6	9.3	9.3	530	532	527	25.6	25.5	26.0	340.7	248.6	120.4	361.4	0.94	0.94	0.94	49.96
7/23/2015	11:24:00 AM	393.8	393.5	392.2	9.7	9.3	9.3	530	533	528	25.7	25.6	26.1	340.5	254.3	120.3	361.1	0.94	0.94	0.94	49.98
7/23/2015	11:25:00 AM	392.7	392.3	391.0	9.6	9.2	9.2	530	533	528	25.7	25.6	26.1	339.5	259.9	119.9	360.1	0.94	0.94	0.94	49.97
7/23/2015	11:26:00 AM	391.7	391.5	390.1	9.8	9.4	9.4	530	533	528	25.6	25.5	26.0	338.6	265.6	119.8	359.2	0.94	0.94	0.94	49.95
7/23/2015	11:27:00 AM	392.2	392.1	390.6	9.8	9.5	9.5	530	533	527	25.6	25.5	26.0	339.0	271.2	120.1	359.6	0.94	0.94	0.94	49.96
7/23/2015	11:28:00 AM	392.3	392.3	390.6	9.9	9.5	9.5	530	533	527	25.6	25.5	26.0	339.0	276.9	120.2	359.7	0.94	0.94	0.94	49.95
7/23/2015	11:29:00 AM	392.7	392.5	390.9	9.8	9.5	9.5	530	532	527	25.6	25.5	25.9	339.3	282.5	120.1	359.9	0.94	0.94	0.94	49.97
7/23/2015	11:30:00 AM	392.6	392.4	390.9	9.2	8.9	8.9	530	533	528	25.8	25.7	26.2	339.8	288.2	119.4	360.1	0.94	0.95	0.94	49.99
7/23/2015	11:31:00 AM	392.6	392.5	390.9	9.2	8.9	8.9	530	533	528	25.8	25.7	26.2	339.8	293.9	119.5	360.2	0.94	0.95	0.94	49.96
7/23/2015	11:32:00 AM	392.3	392.1	390.6	9.6	9.1	9.1	531	533	528	25.7	25.7	26.1	339.4	299.5	119.6	359.8	0.94	0.95	0.94	49.95
7/23/2015	11:33:00 AM	392.5	392.2	391.0	9.6	9.2	9.2	531	533	528	25.8	25.7	26.1	339.6	305.2	119.8	360.1	0.94	0.95	0.94	49.95
7/23/2015	11:34:00 AM	393.2	393.0	391.9	9.8	9.3	9.3	531	533	528	25.8	25.8	26.2	340.3	310.9	120.3	360.9	0.94	0.94	0.94	49.94
7/23/2015	11:35:00 AM	392.2	392.1	390.7	9.9	9.4	9.5	531	533	528	25.7	25.7	26.1	339.2	316.5	120.1	359.9	0.94	0.94	0.94	49.95
7/23/2015	11:36:00 AM	390.9	390.8	389.2	10.1	9.7	9.7	530	532	527	25.6	25.5	26.0	337.7	322.1	119.9	358.3	0.94	0.94	0.94	49.99

Date	Time	Voltage (Line)			%VTHD			Current (Line)			% ATHD			kW	kWh	kVAr	kVA	PF Line1			Hz
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	Sum		Sum	Sum	L1	L2	L3	
7/23/2015	11:37:00 AM	390.5	390.3	388.6	10.2	9.8	9.8	530	532	527	25.6	25.5	26.0	337.0	327.8	119.6	357.6	0.94	0.94	0.94	50.01
7/23/2015	11:38:00 AM	392.8	392.5	390.9	7.8	7.3	7.4	353	355	350	28.4	27.9	28.7	197.4	331.0	128.1	239.2	0.80	0.81	0.80	50.02
7/23/2015	11:39:00 AM	394.4	394.1	392.5	6.6	6.1	6.2	274	276	272	29.5	28.9	29.8	141.4	333.4	122.0	186.8	0.76	0.76	0.75	50.05
7/23/2015	11:40:00 AM	394.9	394.5	392.8	6.1	5.6	5.8	253	255	251	29.5	28.9	29.8	131.3	335.6	112.3	172.8	0.76	0.76	0.76	50.06
7/23/2015	11:41:00 AM	397.3	397.1	395.2	5.5	5.1	5.3	232	234	231	29.5	29.0	29.9	121.1	337.6	103.9	159.6	0.76	0.76	0.75	50.05
7/23/2015	11:42:00 AM	398.6	398.3	396.1	4.8	4.5	4.6	206	207	204	29.6	29.0	30.0	107.7	339.4	92.0	141.7	0.76	0.76	0.76	50.05
7/23/2015	11:43:00 AM	399.1	398.8	396.8	4.5	4.3	4.2	179	180	177	29.7	29.1	30.0	89.6	340.9	84.3	123.3	0.73	0.73	0.72	50.04
7/23/2015	11:44:00 AM	400.1	399.7	397.9	3.9	3.9	3.5	139	141	138	30.0	29.2	30.2	65.1	342.0	71.0	96.4	0.68	0.68	0.67	50.01
7/23/2015	11:45:00 AM	400.1	399.7	397.9	4.0	4.0	3.6	138	140	138	29.9	29.2	30.1	64.8	343.1	70.7	95.9	0.68	0.68	0.67	50.00
7/23/2015	11:46:00 AM	399.8	399.5	397.5	3.3	3.4	3.2	115	116	114	30.0	29.3	30.3	53.8	344.0	58.3	79.3	0.69	0.68	0.67	50.01
7/23/2015	11:47:00 AM	400.4	400.1	398.1	3.1	3.3	2.9	101	103	101	30.1	29.4	30.4	47.7	344.8	51.7	70.4	0.69	0.68	0.67	50.02
7/23/2015	11:48:00 AM	400.9	400.8	398.5	3.6	3.6	3.4	103	103	104	24.9	25.1	36.1	62.1	345.8	30.4	71.6	0.68	0.68	0.68	50.02
7/23/2015	11:49:00 AM	403.0	403.0	400.5	1.8	2.1	1.9	2	2	9	8.4	8.3	34.6	0.3	345.8	0.0	3.3	0.02	0.01	0.01	50.03
7/23/2015	11:50:00 AM	397.9	397.8	395.7	5.4	5.3	5.2	256	257	259	14.0	13.9	32.5	161.3	348.5	58.7	174.0	0.46	0.46	0.46	50.03
7/23/2015	11:51:00 AM	390.2	389.9	388.4	9.4	9.1	9.0	532	534	529	25.9	25.8	26.4	338.4	354.1	119.4	358.9	0.94	0.95	0.94	50.04
7/23/2015	11:52:00 AM	391.0	390.8	389.3	9.4	9.0	9.0	532	534	529	25.9	25.9	26.3	339.0	359.8	119.5	359.5	0.94	0.95	0.94	50.03
7/23/2015	11:53:00 AM	391.2	391.2	389.7	9.4	8.9	8.9	531	533	529	25.9	25.8	26.3	338.9	365.4	119.2	359.3	0.94	0.95	0.94	50.01
7/23/2015	11:54:00 AM	391.0	390.9	389.5	9.6	9.2	9.2	530	532	528	25.8	25.8	26.2	338.2	371.1	119.1	358.6	0.94	0.95	0.94	49.99
7/23/2015	11:55:00 AM	391.9	391.7	390.3	9.5	9.1	9.1	530	532	528	25.8	25.8	26.2	338.8	376.7	119.3	359.2	0.94	0.95	0.94	49.99
7/23/2015	11:56:00 AM	393.1	392.9	391.6	9.6	9.2	9.2	529	531	527	25.8	25.8	26.3	339.3	382.4	119.6	359.7	0.94	0.95	0.94	49.98
7/23/2015	11:57:00 AM	395.1	394.7	393.3	9.4	9.0	9.0	529	530	526	25.8	25.8	26.2	340.5	388.0	119.7	360.9	0.94	0.95	0.94	49.98
7/23/2015	11:58:00 AM	395.6	395.3	394.0	9.7	9.3	9.2	528	530	525	25.6	25.6	26.1	340.5	393.7	120.1	361.0	0.94	0.94	0.94	50.01
7/23/2015	11:59:00 AM	396.7	396.5	395.1	10.0	9.6	9.5	528	530	525	25.8	25.8	26.2	341.5	399.4	120.4	362.2	0.94	0.95	0.94	50.03
7/23/2015	12:00:00 PM	396.7	396.6	395.3	9.9	9.5	9.5	527	529	525	25.5	25.5	26.0	341.1	405.1	120.6	361.8	0.94	0.94	0.94	50.06
7/23/2015	12:01:00 PM	397.8	397.9	396.5	9.5	9.2	9.1	498	499	495	25.6	25.6	26.0	322.9	410.5	114.1	342.5	0.94	0.94	0.94	50.06
7/23/2015	12:02:00 PM	397.7	397.3	396.1	9.0	8.6	8.6	457	458	454	26.0	26.0	26.4	296.0	415.4	104.1	313.8	0.94	0.95	0.94	50.08
7/23/2015	12:03:00 PM	396.6	396.4	395.0	9.3	8.9	8.9	474	475	471	26.1	26.1	26.5	306.4	420.5	107.6	324.7	0.94	0.95	0.94	50.08
7/23/2015	12:04:00 PM	397.8	397.6	396.1	8.6	8.3	8.2	462	464	460	26.3	26.2	26.7	300.1	425.5	104.9	317.9	0.94	0.95	0.94	50.07
7/23/2015	12:05:00 PM	397.6	397.4	395.9	9.0	8.6	8.6	503	505	501	26.1	26.1	26.5	326.4	431.0	114.4	345.9	0.94	0.95	0.94	50.06
7/23/2015	12:06:00 PM	398.0	397.6	396.3	9.1	8.7	8.7	494	495	492	26.1	26.1	26.6	320.6	436.3	112.4	339.7	0.94	0.95	0.94	50.08

Date	Time	Voltage (Line)			%VTHD			Current (Line)			% ATHD			kW	kWh	kVAr	kVA	PF Line1			Hz
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	Sum		Sum	Sum	L1	L2	L3	
7/23/2015	12:07:00 PM	397.9	397.4	396.1	9.9	9.4	9.4	496	497	494	26.0	26.1	26.5	321.7	441.7	113.4	341.1	0.94	0.95	0.94	50.08
7/23/2015	12:08:00 PM	398.8	398.3	396.9	9.8	9.3	9.4	505	506	502	26.0	26.0	26.4	328.0	447.1	115.8	347.9	0.94	0.94	0.94	50.08
7/23/2015	12:09:00 PM	398.4	398.0	396.7	9.7	9.2	9.2	527	528	524	25.6	25.6	26.1	341.7	452.8	120.8	362.5	0.94	0.94	0.94	50.06
7/23/2015	12:10:00 PM	398.8	398.4	396.9	9.7	9.2	9.3	528	529	525	25.7	25.7	26.2	342.9	458.5	120.9	363.6	0.94	0.94	0.94	50.06
7/23/2015	12:11:00 PM	398.9	398.5	396.9	10.0	9.5	9.6	528	530	525	25.7	25.6	26.0	343.2	464.3	121.2	364.0	0.94	0.94	0.94	50.00
7/23/2015	12:12:00 PM	398.2	397.9	396.4	9.7	9.4	9.4	528	529	525	25.6	25.6	26.0	342.4	470.0	120.9	363.1	0.94	0.94	0.94	49.96
7/23/2015	12:13:00 PM	398.4	397.9	396.5	9.7	9.3	9.4	528	529	525	25.5	25.5	26.0	342.5	475.7	120.9	363.2	0.94	0.94	0.94	49.93
7/23/2015	12:14:00 PM	398.1	397.7	396.2	9.7	9.3	9.3	528	529	525	25.6	25.6	26.0	342.4	481.4	120.8	363.0	0.94	0.94	0.94	49.87
7/23/2015	12:15:00 PM	397.6	397.3	395.7	10.2	9.7	9.8	527	529	525	25.6	25.5	26.0	341.7	487.1	120.8	362.4	0.94	0.94	0.94	49.80
7/23/2015	12:16:00 PM	397.4	396.9	395.4	9.8	9.4	9.4	528	529	525	25.6	25.6	26.0	341.6	492.8	120.6	362.3	0.94	0.94	0.94	49.80
7/23/2015	12:17:00 PM	396.5	396.0	394.5	9.8	9.5	9.5	527	529	525	25.4	25.3	25.8	340.6	498.4	120.5	361.3	0.94	0.94	0.94	49.82
7/23/2015	12:18:00 PM	395.8	395.3	393.9	10.1	9.8	9.8	528	529	525	25.5	25.6	25.9	340.1	504.1	120.3	360.8	0.94	0.94	0.94	49.83
7/23/2015	12:19:00 PM	396.2	395.6	394.2	9.9	9.5	9.6	527	530	525	25.4	25.4	25.8	340.3	509.8	120.6	361.1	0.94	0.94	0.94	49.87
7/23/2015	12:20:00 PM	397.0	396.4	395.0	10.0	9.6	9.7	528	530	525	25.3	25.3	25.8	341.1	515.5	121.0	361.9	0.94	0.94	0.94	49.92
7/23/2015	12:21:00 PM	399.3	398.9	397.5	10.2	9.7	9.8	528	530	525	25.5	25.5	25.9	343.4	521.2	121.7	364.4	0.94	0.94	0.94	49.98
7/23/2015	12:22:00 PM	399.1	398.7	397.3	10.3	9.9	9.9	528	530	525	25.4	25.4	25.9	343.1	526.9	121.8	364.1	0.94	0.94	0.94	50.01
7/23/2015	12:23:00 PM	398.5	398.2	396.7	10.1	9.7	9.7	528	530	525	25.4	25.3	25.8	342.8	532.6	121.7	363.8	0.94	0.94	0.94	50.02
7/23/2015	12:24:00 PM	398.7	398.3	397.0	10.1	9.6	9.7	528	530	526	25.5	25.5	25.9	343.3	538.3	121.6	364.2	0.94	0.94	0.94	50.03
7/23/2015	12:25:00 PM	398.1	397.9	396.6	10.3	9.9	9.9	529	531	526	25.5	25.5	25.9	343.0	544.1	121.7	364.0	0.94	0.94	0.94	50.01
7/23/2015	12:26:00 PM	396.5	396.2	394.8	10.0	9.7	9.7	529	531	527	25.5	25.5	25.9	341.9	549.8	121.2	362.8	0.94	0.94	0.94	50.02
7/23/2015	12:27:00 PM	397.4	397.0	395.4	9.8	9.3	9.4	530	532	527	25.6	25.5	26.0	343.0	555.5	121.2	363.7	0.94	0.94	0.94	50.05
7/23/2015	12:28:00 PM	409.9	409.4	407.2	2.2	2.3	2.2	11	11	18	3.2	3.1	4.5	5.2	555.6	3.1	9.4	0.02	0.02	0.02	50.05
7/23/2015	12:29:00 PM	398.1	397.6	396.2	9.9	9.5	9.6	509	511	506	27.7	27.5	28.0	327.0	561.0	119.9	349.6	0.91	0.91	0.91	50.06
7/23/2015	12:30:00 PM	398.6	398.0	396.5	10.0	9.6	9.7	530	532	527	25.5	25.5	25.9	344.1	566.7	121.8	365.0	0.94	0.94	0.94	50.05
7/23/2015	12:31:00 PM	397.4	396.9	395.4	9.8	9.4	9.4	530	532	527	25.5	25.5	25.9	343.1	572.5	121.4	364.0	0.94	0.94	0.94	50.02
7/23/2015	12:32:00 PM	398.7	398.1	396.7	9.8	9.4	9.4	530	532	527	25.5	25.5	25.9	344.3	578.2	121.7	365.2	0.94	0.94	0.94	50.01
7/23/2015	12:33:00 PM	398.5	397.9	396.5	10.0	9.6	9.6	530	532	527	25.5	25.5	25.9	344.0	583.9	121.8	364.9	0.94	0.94	0.94	50.01
7/23/2015	12:34:00 PM	398.8	398.3	396.9	10.1	9.6	9.7	530	532	527	25.5	25.5	25.9	344.4	589.7	121.8	365.3	0.94	0.94	0.94	50.01
7/23/2015	12:35:00 PM	398.8	398.3	396.7	9.8	9.4	9.4	530	532	528	25.5	25.5	26.0	344.5	595.4	121.7	365.4	0.94	0.94	0.94	50.00
7/23/2015	12:36:00 PM	399.1	398.7	397.2	9.6	9.3	9.2	531	532	528	25.6	25.6	26.1	345.0	601.2	121.8	365.9	0.94	0.94	0.94	50.01

Date	Time	Voltage (Line)			%VTHD			Current (Line)			% ATHD			kW	kWh	kVAr	kVA	PF Line1			Hz
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	Sum		Sum	Sum	L1	L2	L3	
7/23/2015	12:37:00 PM	399.9	399.5	397.9	9.8	9.3	9.3	530	532	528	25.6	25.6	26.0	345.6	606.9	122.1	366.5	0.94	0.94	0.94	50.00
7/23/2015	12:38:00 PM	400.4	400.0	398.5	10.1	9.6	9.7	530	532	528	25.7	25.7	26.1	346.1	612.7	122.3	367.1	0.94	0.94	0.94	49.98
7/23/2015	12:39:00 PM	399.7	399.3	397.9	10.1	9.7	9.7	530	533	528	25.7	25.7	26.1	345.6	618.5	122.1	366.5	0.94	0.95	0.94	50.00
7/23/2015	12:40:00 PM	401.7	401.4	399.8	10.1	9.6	9.7	530	533	528	25.7	25.7	26.1	347.3	624.2	122.7	368.4	0.94	0.94	0.94	49.99
7/23/2015	12:41:00 PM	402.5	402.1	400.6	10.0	9.6	9.6	531	533	528	25.8	25.8	26.2	348.2	630.1	122.7	369.1	0.94	0.94	0.94	49.98
7/23/2015	12:42:00 PM	402.0	401.6	400.1	10.0	9.6	9.6	530	533	528	25.7	25.6	26.1	347.5	635.8	122.8	368.6	0.94	0.94	0.94	50.00
7/23/2015	12:43:00 PM	404.5	404.2	402.6	8.8	8.3	8.3	424	426	422	27.0	26.8	27.4	254.7	640.1	126.6	296.0	0.78	0.78	0.78	50.02
7/23/2015	12:44:00 PM	408.0	407.8	406.0	5.9	5.5	5.6	208	210	206	29.9	29.2	30.0	65.1	641.2	131.7	146.9	0.45	0.44	0.44	50.02
7/23/2015	12:45:00 PM	402.7	402.2	400.5	7.8	7.3	7.6	341	345	339	29.4	28.9	29.7	183.0	644.2	150.8	237.6	0.77	0.77	0.76	50.04
7/23/2015	12:46:00 PM	402.8	402.3	400.7	8.0	7.4	7.6	346	350	344	29.4	28.9	29.7	187.9	647.4	151.5	241.4	0.78	0.78	0.77	50.03
7/23/2015	12:47:00 PM	402.0	401.6	399.9	8.1	7.4	7.6	346	350	344	29.4	28.9	29.7	187.9	650.5	150.6	240.8	0.78	0.78	0.78	50.01
7/23/2015	12:48:00 PM	401.4	400.9	399.4	7.9	7.3	7.5	346	350	344	29.4	28.9	29.7	187.9	653.6	150.2	240.5	0.78	0.78	0.78	50.01
7/23/2015	12:49:00 PM	401.0	400.5	399.0	9.0	8.5	8.6	435	437	432	27.6	27.3	27.9	264.8	658.0	135.3	301.3	0.86	0.87	0.86	50.00
7/23/2015	12:50:00 PM	402.3	401.7	400.2	9.5	9.1	9.2	441	443	439	27.6	27.4	28.0	281.0	662.7	121.5	306.6	0.91	0.92	0.91	49.99
7/23/2015	12:51:00 PM	402.6	402.0	400.6	8.9	8.5	8.5	383	386	382	28.7	28.4	29.0	240.7	666.7	115.6	267.0	0.90	0.90	0.90	49.97
7/23/2015	12:52:00 PM	403.3	402.6	401.2	8.1	7.5	7.6	346	349	344	29.1	28.7	29.4	206.6	670.2	123.3	241.4	0.85	0.86	0.85	49.96
7/23/2015	12:53:00 PM	404.8	404.0	402.6	7.2	6.6	6.8	325	327	322	29.4	28.9	29.7	185.0	673.2	132.0	227.3	0.81	0.82	0.81	49.98
7/23/2015	12:54:00 PM	406.7	406.0	404.3	6.1	5.6	5.8	284	286	282	29.4	28.9	29.8	161.4	675.9	116.9	199.4	0.81	0.81	0.80	49.98
7/23/2015	12:55:00 PM	406.8	406.3	404.3	6.0	5.8	6.0	253	256	252	29.6	28.9	29.9	123.5	678.0	128.7	178.4	0.70	0.69	0.69	49.96
7/23/2015	12:56:00 PM	408.0	407.3	405.5	5.1	4.9	4.9	209	211	207	29.7	29.0	30.0	102.8	679.7	105.7	147.4	0.70	0.70	0.69	49.95
7/23/2015	12:57:00 PM	408.9	408.1	406.3	4.8	4.7	4.5	196	198	194	29.8	29.1	30.0	96.5	681.3	99.1	138.3	0.70	0.70	0.69	49.94
7/23/2015	12:58:00 PM	411.4	410.8	408.8	4.3	4.3	4.1	168	170	167	29.9	29.1	30.1	83.5	682.7	86.0	119.8	0.70	0.70	0.69	49.96
7/23/2015	12:59:00 PM	412.1	411.6	409.4	4.2	4.2	4.0	156	158	156	29.9	29.1	30.1	77.8	684.0	80.0	111.6	0.70	0.70	0.69	50.00
7/23/2015	1:00:00 PM	413.8	413.4	411.0	3.6	3.6	3.5	130	132	130	30.0	29.2	30.2	65.0	685.1	67.0	93.4	0.70	0.70	0.69	50.04
7/23/2015	1:01:00 PM	414.5	414.2	411.8	3.4	3.5	3.2	122	124	121	30.0	29.2	30.2	60.9	686.1	63.0	87.6	0.70	0.70	0.69	50.03
7/23/2015	1:02:00 PM	415.8	415.6	413.2	3.1	3.1	3.0	114	116	114	30.0	29.3	30.2	62.3	687.1	53.3	82.4	0.76	0.75	0.75	50.06
7/23/2015	1:03:00 PM	419.1	419.0	416.4	2.7	2.7	2.6	42	42	47	14.1	12.5	43.3	24.6	687.6	16.7	31.6	0.34	0.34	0.33	50.07
7/23/2015	1:04:00 PM	421.2	421.0	418.3	2.7	2.8	2.6	5	5	13	0.4	0.4	55.0	2.3	687.6	0.3	5.4	0.02	0.02	0.02	50.08
7/23/2015	1:05:00 PM	410.6	410.5	408.2	9.3	9.0	8.9	468	470	466	26.1	26.0	26.5	313.1	692.8	110.7	332.1	0.94	0.94	0.94	50.11
7/23/2015	1:06:00 PM	412.1	412.0	409.8	9.4	9.0	9.0	491	493	489	26.1	25.9	26.5	330.0	698.3	116.0	349.8	0.94	0.95	0.94	50.13

Date	Time	Voltage (Line)			%VTHD			Current (Line)			% ATHD			kW	kWh	kVAr	kVA	PF Line1			Hz
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	Sum		Sum	Sum	L1	L2	L3	
7/23/2015	1:07:00 PM	413.2	413.0	411.0	9.6	9.3	9.3	525	527	522	26.0	25.9	26.4	353.8	704.2	124.3	375.0	0.94	0.95	0.94	50.14
7/23/2015	1:08:00 PM	412.9	412.6	410.7	9.7	9.4	9.3	527	529	525	26.0	26.0	26.5	355.1	710.1	124.6	376.3	0.94	0.95	0.94	50.16
7/23/2015	1:09:00 PM	412.7	412.5	410.5	9.6	9.2	9.2	528	530	526	26.0	25.9	26.4	355.6	716.1	124.7	376.9	0.94	0.95	0.94	50.15
7/23/2015	1:10:00 PM	413.3	413.2	411.2	9.6	9.2	9.2	529	531	527	26.0	25.9	26.4	356.7	722.0	125.0	378.0	0.94	0.95	0.94	50.14
7/23/2015	1:11:00 PM	414.4	414.5	412.4	9.3	8.9	8.9	530	532	528	26.1	26.1	26.5	358.7	728.0	125.2	379.9	0.94	0.95	0.94	50.13
7/23/2015	1:12:00 PM	415.0	414.9	412.9	9.3	9.0	9.0	529	532	527	26.0	25.9	26.4	358.7	734.0	125.5	380.0	0.94	0.95	0.94	50.15
7/23/2015	1:13:00 PM	416.1	416.0	414.0	9.4	9.1	9.1	529	531	527	25.8	25.7	26.1	359.2	739.9	126.1	380.7	0.94	0.95	0.94	50.15
7/23/2015	1:14:00 PM	416.0	415.8	413.9	9.8	9.6	9.6	528	531	526	25.5	25.4	25.9	358.3	745.9	126.6	380.0	0.94	0.94	0.94	50.15
7/23/2015	1:15:00 PM	416.4	416.2	414.1	10.0	9.7	9.7	527	529	524	25.4	25.2	25.8	357.5	751.9	126.7	379.3	0.94	0.94	0.94	50.14
7/23/2015	1:16:00 PM	416.5	416.3	414.3	9.8	9.5	9.5	501	503	499	25.7	25.6	26.1	340.3	757.5	120.0	360.9	0.94	0.94	0.94	50.11
7/23/2015	1:17:00 PM	416.4	416.1	414.0	9.6	9.3	9.3	485	487	482	25.9	25.8	26.4	329.2	763.0	115.8	348.9	0.94	0.95	0.94	50.11
7/23/2015	1:18:00 PM	416.6	416.4	414.2	9.3	9.0	9.0	507	509	504	26.1	26.0	26.5	344.4	768.8	120.6	364.9	0.94	0.95	0.94	50.10
7/23/2015	1:19:00 PM	416.4	416.4	414.0	9.9	9.6	9.6	500	502	498	25.9	25.8	26.3	339.5	774.4	119.5	359.9	0.94	0.95	0.94	50.10
7/23/2015	1:20:00 PM	417.4	417.4	415.0	9.4	9.2	9.2	491	492	488	25.8	25.7	26.3	333.8	780.0	117.4	353.8	0.94	0.95	0.94	50.10
7/23/2015	1:21:00 PM	417.0	417.0	414.7	9.2	9.0	8.9	486	488	484	25.9	25.8	26.3	330.6	785.5	116.1	350.4	0.94	0.95	0.94	50.10
7/23/2015	1:22:00 PM	416.4	416.4	414.2	9.3	9.0	9.0	519	521	516	25.9	25.8	26.3	352.4	791.4	123.3	373.4	0.94	0.95	0.94	50.11
7/23/2015	1:23:00 PM	418.0	418.0	415.7	8.9	8.6	8.6	492	493	489	26.4	26.3	26.8	335.5	797.0	116.5	355.1	0.94	0.95	0.94	50.08
7/23/2015	1:24:00 PM	416.7	416.6	414.4	9.1	8.8	8.8	484	486	482	26.3	26.2	26.7	329.2	802.5	114.7	348.6	0.94	0.95	0.94	50.08
7/23/2015	1:25:00 PM	415.1	414.9	412.7	9.4	9.1	9.1	491	493	489	25.9	25.9	26.3	332.5	808.0	116.4	352.3	0.94	0.95	0.94	50.07
7/23/2015	1:26:00 PM	414.1	414.0	411.8	9.4	9.1	9.1	526	528	523	25.7	25.7	26.1	355.4	813.9	124.5	376.6	0.94	0.95	0.94	50.04
7/23/2015	1:27:00 PM	414.6	414.4	412.2	9.2	8.8	8.9	530	532	527	25.9	25.8	26.3	358.3	819.9	124.9	379.5	0.94	0.95	0.94	50.03
7/23/2015	1:28:00 PM	414.7	414.6	412.4	9.5	9.2	9.2	529	532	527	25.9	25.8	26.3	358.1	825.9	125.2	379.4	0.94	0.95	0.94	50.02
7/23/2015	1:29:00 PM	416.2	416.1	413.9	9.3	9.0	9.0	529	531	526	25.8	25.7	26.2	359.4	831.8	125.7	380.7	0.94	0.95	0.94	50.03
7/23/2015	1:30:00 PM	417.3	417.2	415.0	9.6	9.2	9.2	530	532	527	25.8	25.8	26.2	360.7	837.9	126.3	382.2	0.94	0.95	0.94	50.01
7/23/2015	1:31:00 PM	417.4	417.4	415.2	9.7	9.3	9.4	530	532	527	25.8	25.7	26.2	360.9	843.9	126.4	382.4	0.94	0.95	0.94	50.03
7/23/2015	1:32:00 PM	417.1	417.1	414.9	9.4	9.1	9.1	530	532	527	25.7	25.6	26.1	360.6	849.9	126.5	382.2	0.94	0.95	0.94	50.02
7/23/2015	1:33:00 PM	416.5	416.5	414.2	9.4	9.1	9.1	530	532	527	25.7	25.6	26.1	360.1	855.9	126.3	381.6	0.94	0.95	0.94	50.01
7/23/2015	1:34:00 PM	415.5	415.6	413.2	9.6	9.3	9.2	530	532	527	25.6	25.4	26.0	359.0	861.9	126.3	380.6	0.94	0.95	0.94	50.02
7/23/2015	1:35:00 PM	415.1	415.1	412.7	9.8	9.5	9.6	530	532	527	25.4	25.3	25.8	358.3	867.8	126.6	380.0	0.94	0.94	0.94	50.03
7/23/2015	1:36:00 PM	416.3	416.3	413.8	10.4	10.1	10.2	530	532	527	25.3	25.2	25.8	359.2	873.8	127.6	381.2	0.94	0.94	0.94	50.01

Date	Time	Voltage (Line)			%VTHD			Current (Line)			% ATHD			kW	kWh	kVAr	kVA	PF Line1			Hz
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	Sum		Sum	Sum	L1	L2	L3	
7/23/2015	1:37:00 PM	416.2	416.2	413.6	10.3	10.0	10.0	530	533	527	25.4	25.2	25.8	359.2	879.8	127.5	381.1	0.94	0.94	0.94	49.99
7/23/2015	1:38:00 PM	415.2	415.4	412.8	10.1	9.9	9.9	530	533	527	25.3	25.1	25.7	358.4	885.8	127.2	380.3	0.94	0.94	0.94	49.97
7/23/2015	1:39:00 PM	414.7	414.8	412.3	10.1	9.9	9.9	530	533	527	25.2	25.1	25.6	357.8	891.7	127.2	379.7	0.94	0.94	0.94	49.98
7/23/2015	1:40:00 PM	415.1	415.2	412.8	10.1	9.9	9.9	530	533	527	25.2	25.1	25.6	358.3	897.7	127.4	380.3	0.94	0.94	0.94	49.98
7/23/2015	1:41:00 PM	414.8	414.9	412.5	10.1	9.9	9.9	530	533	527	25.2	25.1	25.6	358.0	903.7	127.4	380.0	0.94	0.94	0.94	50.00
7/23/2015	1:42:00 PM	413.2	413.3	410.9	10.1	9.8	9.8	530	533	527	25.3	25.1	25.6	356.7	909.6	126.9	378.6	0.94	0.94	0.94	49.98
7/23/2015	1:43:00 PM	412.3	412.4	410.0	10.0	9.7	9.7	530	533	527	25.3	25.2	25.7	356.0	915.6	126.5	377.8	0.94	0.94	0.94	49.97
7/23/2015	1:44:00 PM	412.9	412.9	410.6	9.9	9.6	9.6	530	533	527	25.3	25.3	25.7	356.5	921.5	126.6	378.3	0.94	0.94	0.94	49.99
7/23/2015	1:45:00 PM	413.0	412.9	410.8	9.9	9.6	9.6	530	533	527	25.3	25.2	25.7	356.7	927.5	126.5	378.4	0.94	0.94	0.94	49.98
7/23/2015	1:46:00 PM	412.5	412.5	410.5	10.0	9.7	9.7	530	533	527	25.4	25.3	25.8	356.3	933.4	126.5	378.1	0.94	0.94	0.94	49.97
7/23/2015	1:47:00 PM	412.7	412.5	410.6	10.3	10.0	10.0	530	532	527	25.4	25.3	25.8	356.3	939.3	126.6	378.1	0.94	0.94	0.94	49.97
7/23/2015	1:48:00 PM	412.4	412.3	410.5	10.2	9.9	9.9	530	532	527	25.2	25.2	25.7	356.0	945.3	126.7	377.8	0.94	0.94	0.94	49.96
7/23/2015	1:49:00 PM	411.8	411.7	409.9	10.0	9.7	9.7	530	532	527	25.3	25.3	25.7	355.6	951.2	126.3	377.4	0.94	0.94	0.94	49.95
7/23/2015	1:50:00 PM	410.2	410.1	408.3	10.0	9.7	9.7	530	532	527	25.3	25.2	25.7	354.2	957.1	125.8	375.9	0.94	0.94	0.94	49.94
7/23/2015	1:51:00 PM	409.8	409.8	407.8	10.0	9.7	9.7	530	532	527	25.3	25.2	25.7	353.9	963.0	125.7	375.6	0.94	0.94	0.94	49.95
7/23/2015	1:52:00 PM	409.1	409.1	407.2	9.9	9.6	9.7	530	532	527	25.3	25.2	25.7	353.4	968.9	125.5	375.0	0.94	0.94	0.94	49.96
7/23/2015	1:53:00 PM	407.3	407.3	405.3	9.9	9.6	9.6	530	533	528	25.4	25.3	25.8	351.9	974.7	124.8	373.4	0.94	0.94	0.94	49.96
7/23/2015	1:54:00 PM	406.8	406.8	404.9	9.9	9.6	9.6	530	533	528	25.3	25.3	25.8	351.4	980.6	124.8	372.9	0.94	0.94	0.94	49.96
7/23/2015	1:55:00 PM	408.2	408.3	406.2	10.0	9.7	9.7	530	532	527	25.3	25.2	25.7	352.5	986.5	125.3	374.1	0.94	0.94	0.94	49.94
7/23/2015	1:56:00 PM	409.3	409.3	407.2	9.9	9.6	9.6	530	533	527	25.3	25.2	25.7	353.5	992.4	125.5	375.1	0.94	0.94	0.94	49.93
7/23/2015	1:57:00 PM	406.5	406.4	404.5	9.9	9.6	9.6	530	533	527	25.3	25.2	25.7	351.1	998.2	124.6	372.5	0.94	0.94	0.94	49.93
7/23/2015	1:58:00 PM	406.5	406.5	404.6	10.0	9.7	9.7	530	532	527	25.3	25.2	25.6	351.0	1,004.1	124.8	372.5	0.94	0.94	0.94	49.92
7/23/2015	1:59:00 PM	406.3	406.3	404.4	10.1	9.7	9.7	530	532	527	25.3	25.2	25.7	350.9	1,009.9	124.8	372.4	0.94	0.94	0.94	49.92
7/23/2015	2:00:00 PM	406.5	406.5	404.7	10.1	9.7	9.8	530	532	527	25.3	25.2	25.6	351.0	1,015.8	124.9	372.6	0.94	0.94	0.94	49.94
7/23/2015	2:01:00 PM	409.6	409.8	407.5	7.7	7.4	7.5	370	373	368	27.7	27.3	28.0	206.3	1,019.2	135.9	262.0	0.70	0.70	0.70	49.98
7/23/2015	2:02:00 PM	410.9	411.0	408.6	6.2	5.9	6.1	255	257	253	29.7	29.1	30.0	99.5	1,020.9	150.0	181.1	0.54	0.54	0.53	49.99
7/23/2015	2:03:00 PM	409.5	409.5	407.4	7.1	6.8	7.0	312	315	310	29.6	28.9	29.9	148.8	1,023.3	163.7	221.2	0.68	0.68	0.67	49.99
7/23/2015	2:04:00 PM	410.0	410.0	407.9	7.1	6.7	7.0	312	316	310	29.6	28.9	29.9	148.8	1,025.8	164.2	221.6	0.68	0.67	0.67	50.00
7/23/2015	2:05:00 PM	409.5	409.5	407.3	7.1	6.8	7.0	312	316	310	29.6	28.9	29.8	148.8	1,028.3	163.8	221.3	0.68	0.67	0.67	50.03
7/23/2015	2:06:00 PM	408.2	408.3	406.1	7.7	7.4	7.6	362	365	360	28.7	28.1	29.0	195.2	1,031.6	154.4	255.5	0.74	0.74	0.73	50.04

Date	Time	Voltage (Line)			%VTHD			Current (Line)			% ATHD			kW	kWh	kVAr	kVA	PF Line1			Hz
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	Sum		Sum	Sum	L1	L2	L3	
7/23/2015	2:07:00 PM	406.1	406.2	404.4	9.9	9.6	9.6	531	533	528	25.4	25.4	25.8	351.2	1,037.4	124.8	372.7	0.94	0.94	0.94	50.09
7/23/2015	2:08:00 PM	406.6	406.7	405.1	9.9	9.6	9.6	530	533	528	25.4	25.3	25.7	351.6	1,043.3	124.9	373.1	0.94	0.94	0.94	50.08
7/23/2015	2:09:00 PM	406.1	406.2	404.6	9.9	9.5	9.6	530	532	528	25.4	25.4	25.8	351.1	1,049.1	124.6	372.6	0.94	0.94	0.94	50.07
7/23/2015	2:10:00 PM	404.7	404.8	403.1	9.8	9.4	9.5	531	533	528	25.5	25.5	25.9	350.2	1,055.0	123.9	371.4	0.94	0.94	0.94	50.06
7/23/2015	2:11:00 PM	404.2	404.3	402.6	9.9	9.5	9.6	530	533	528	25.5	25.5	25.9	349.6	1,060.8	123.8	370.8	0.94	0.94	0.94	50.02
7/23/2015	2:12:00 PM	406.3	406.2	404.4	8.5	7.8	8.0	378	381	376	29.0	28.6	29.3	223.8	1,064.5	142.1	265.6	0.84	0.84	0.84	50.04
7/23/2015	2:13:00 PM	407.1	407.1	405.2	7.0	6.7	7.0	311	314	309	29.4	28.9	29.7	163.3	1,067.2	144.7	219.3	0.74	0.74	0.73	50.00
7/23/2015	2:14:00 PM	408.5	408.2	406.4	6.2	6.0	6.2	270	273	269	29.6	29.0	29.9	134.4	1,069.5	136.1	191.3	0.71	0.71	0.70	49.95
7/23/2015	2:15:00 PM	408.4	408.0	406.3	5.7	5.6	5.8	253	256	251	29.6	29.0	29.9	126.2	1,071.6	126.8	178.9	0.71	0.71	0.70	49.91
7/23/2015	2:16:00 PM	409.3	409.2	407.2	5.3	5.2	5.3	218	220	217	29.7	29.1	29.9	109.7	1,073.4	108.9	154.6	0.71	0.71	0.70	49.87
7/23/2015	2:17:00 PM	411.6	411.4	409.4	5.7	5.7	5.6	184	186	183	29.9	29.1	30.0	86.4	1,074.8	97.9	131.1	0.66	0.65	0.65	49.86
7/23/2015	2:18:00 PM	411.8	411.5	409.5	4.3	4.3	4.2	132	134	131	30.1	29.3	30.3	53.4	1,075.7	77.5	94.1	0.58	0.57	0.56	49.86
7/23/2015	2:19:00 PM	410.4	410.1	408.2	4.4	4.3	4.0	126	127	125	30.2	29.4	30.4	50.9	1,076.6	73.3	89.3	0.58	0.57	0.56	49.84
7/23/2015	2:20:00 PM	411.0	410.7	408.6	3.9	3.9	3.7	109	111	109	30.2	29.4	30.5	44.4	1,077.3	63.9	77.8	0.58	0.57	0.56	49.83
7/23/2015	2:21:00 PM	410.8	410.3	408.3	3.2	3.4	3.3	97	98	96	30.4	29.6	30.7	39.4	1,078.0	56.6	68.9	0.58	0.57	0.56	49.82
7/23/2015	2:22:00 PM	409.9	409.5	407.4	3.2	3.3	3.2	84	85	83	30.7	29.8	31.0	34.1	1,078.6	48.8	59.6	0.58	0.57	0.56	49.81
7/23/2015	2:23:00 PM	412.8	412.4	410.2	2.2	2.3	2.3	11	11	18	5.7	4.2	33.8	4.2	1,078.6	4.5	9.2	0.07	0.07	0.07	49.82
7/23/2015	2:24:00 PM	412.8	412.5	410.2	2.0	2.2	2.1	-	-	9	-	-	8.5	-0.0	1,078.6	-2.1	2.1	-	-	-	49.84
7/23/2015	2:25:00 PM	407.6	407.2	405.4	5.5	5.4	5.4	208	208	210	16.9	16.9	17.1	136.2	1,080.9	47.9	145.7	0.58	0.58	0.58	49.86
7/23/2015	2:26:00 PM	405.3	405.1	403.3	7.9	7.6	7.6	350	351	349	27.3	27.3	27.7	231.8	1,084.8	80.4	245.3	0.94	0.95	0.94	49.88
7/23/2015	2:27:00 PM	402.6	402.2	400.6	8.3	8.0	8.0	390	391	388	26.7	26.6	27.0	255.9	1,089.0	89.5	271.1	0.94	0.95	0.94	49.88
7/23/2015	2:28:00 PM	402.9	402.6	400.9	7.8	7.5	7.5	349	350	347	27.0	27.0	27.4	229.3	1,092.8	80.1	242.9	0.94	0.95	0.94	49.90
7/23/2015	2:29:00 PM	402.4	402.0	400.4	7.6	7.4	7.4	361	362	359	27.3	27.3	27.6	237.2	1,096.8	82.1	251.0	0.94	0.95	0.94	49.91
7/23/2015	2:30:00 PM	402.5	402.1	400.6	7.8	7.5	7.5	399	400	397	27.0	27.0	27.3	262.2	1,101.2	90.6	277.4	0.94	0.95	0.94	49.90
7/23/2015	2:31:00 PM	402.4	402.0	400.5	8.3	7.9	8.0	418	419	416	26.7	26.7	27.1	274.4	1,105.7	95.4	290.5	0.94	0.95	0.94	49.88
7/23/2015	2:32:00 PM	403.0	402.6	401.0	8.3	8.0	8.0	418	419	416	26.7	26.7	27.0	275.0	1,110.3	95.7	291.2	0.94	0.95	0.94	49.88
7/23/2015	2:33:00 PM	403.3	403.0	401.3	8.0	7.6	7.7	403	404	402	26.7	26.7	27.0	265.5	1,114.7	92.3	281.1	0.94	0.95	0.94	49.87
7/23/2015	2:34:00 PM	403.4	403.1	401.5	7.7	7.4	7.4	405	406	403	26.8	26.8	27.1	266.6	1,119.2	92.4	282.1	0.94	0.95	0.94	49.88
7/23/2015	2:35:00 PM	402.8	402.4	400.8	7.6	7.3	7.3	405	406	403	26.9	26.8	27.2	266.2	1,123.6	92.2	281.7	0.94	0.95	0.94	49.90
7/23/2015	2:36:00 PM	403.1	402.8	401.1	7.7	7.4	7.4	417	418	415	26.8	26.7	27.1	274.3	1,128.2	95.1	290.4	0.94	0.95	0.94	49.97

Date	Time	Voltage (Line)			%VTHD			Current (Line)			% ATHD			kW	kWh	kVAr	kVA	PF Line1			Hz
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	Sum		Sum	Sum	L1	L2	L3	
7/23/2015	2:37:00 PM	403.8	403.4	401.6	7.9	7.5	7.6	419	420	417	26.7	26.7	27.0	275.9	1,132.8	95.9	292.1	0.94	0.95	0.94	49.97
7/23/2015	2:38:00 PM	402.7	402.3	400.5	8.1	7.8	7.9	440	441	438	26.5	26.5	26.9	289.2	1,137.6	100.7	306.2	0.94	0.95	0.94	49.96
7/23/2015	2:39:00 PM	400.2	399.8	398.1	8.7	8.5	8.5	498	499	495	26.2	26.1	26.5	324.8	1,143.0	113.6	344.1	0.94	0.95	0.94	49.92
7/23/2015	2:40:00 PM	399.2	399.0	397.3	9.3	8.9	9.0	509	510	507	26.1	26.1	26.5	331.4	1,148.6	116.1	351.2	0.94	0.95	0.94	49.91
7/23/2015	2:41:00 PM	400.1	399.7	398.0	8.6	8.4	8.4	489	490	487	26.2	26.2	26.5	319.2	1,153.9	111.6	338.2	0.94	0.95	0.94	49.91
7/23/2015	2:42:00 PM	400.8	400.5	398.8	8.8	8.5	8.5	488	489	486	26.0	26.0	26.4	318.9	1,159.2	111.7	337.9	0.94	0.95	0.94	49.87
7/23/2015	2:43:00 PM	400.3	399.9	398.3	9.2	8.8	8.9	515	517	513	25.8	25.8	26.2	336.1	1,164.8	118.3	356.3	0.94	0.95	0.94	49.86
7/23/2015	2:44:00 PM	400.6	400.2	398.6	9.1	8.7	8.8	527	529	525	25.7	25.7	26.1	344.5	1,170.5	120.9	365.1	0.94	0.95	0.94	49.90
7/23/2015	2:45:00 PM	399.9	399.6	397.9	9.1	8.7	8.8	528	530	525	25.7	25.7	26.2	344.3	1,176.3	120.8	364.8	0.94	0.95	0.94	49.91
7/23/2015	2:46:00 PM	400.2	399.9	398.3	9.1	8.7	8.8	528	530	526	25.8	25.8	26.2	344.9	1,182.0	121.0	365.5	0.94	0.95	0.94	49.95
7/23/2015	2:47:00 PM	400.5	400.2	398.5	9.3	8.9	9.0	528	530	526	25.8	25.8	26.2	345.1	1,187.8	121.1	365.8	0.94	0.95	0.94	50.00
7/23/2015	2:48:00 PM	399.6	399.5	397.8	9.3	8.9	8.9	529	531	526	26.0	26.0	26.4	344.8	1,193.5	120.5	365.3	0.94	0.95	0.94	50.00
7/23/2015	2:49:00 PM	399.7	399.6	398.0	8.7	8.4	8.4	529	531	526	26.0	25.9	26.3	345.0	1,199.3	120.3	365.4	0.94	0.95	0.94	50.00
7/23/2015	2:50:00 PM	398.9	398.8	397.2	9.0	8.6	8.6	529	531	526	25.8	25.8	26.2	344.2	1,205.0	120.4	364.6	0.94	0.95	0.94	50.02
7/23/2015	2:51:00 PM	398.6	398.5	396.9	9.3	8.9	8.9	529	531	526	25.7	25.6	26.0	343.9	1,210.7	120.9	364.6	0.94	0.95	0.94	50.01
7/23/2015	2:52:00 PM	398.2	398.1	396.4	9.2	8.9	8.9	529	531	526	25.7	25.6	26.1	343.6	1,216.5	120.8	364.2	0.94	0.95	0.94	50.03
7/23/2015	2:53:00 PM	399.3	399.2	397.5	9.3	8.8	8.9	529	531	527	25.9	25.8	26.3	344.9	1,222.2	120.9	365.5	0.94	0.95	0.94	50.01
7/23/2015	2:54:00 PM	396.6	396.4	394.7	9.3	8.8	8.9	530	532	527	25.9	25.9	26.3	342.8	1,227.9	120.3	363.3	0.94	0.95	0.94	50.00
7/23/2015	2:55:00 PM	396.5	396.3	394.7	9.0	8.5	8.6	530	532	527	25.9	25.9	26.3	342.8	1,233.6	120.0	363.2	0.94	0.95	0.94	50.01
7/23/2015	2:56:00 PM	396.9	396.8	395.1	9.1	8.7	8.7	530	532	527	25.8	25.7	26.2	343.0	1,239.4	120.3	363.5	0.94	0.95	0.94	50.04
7/23/2015	2:57:00 PM	396.2	396.1	394.5	9.8	9.4	9.5	529	531	527	25.6	25.6	26.0	342.0	1,245.1	120.5	362.6	0.94	0.95	0.94	50.04
7/23/2015	2:58:00 PM	395.3	395.2	393.7	9.6	9.2	9.3	530	531	527	25.7	25.7	26.0	341.4	1,250.7	120.2	362.0	0.94	0.95	0.94	50.03
7/23/2015	2:59:00 PM	395.4	395.3	393.8	9.6	9.2	9.3	530	532	527	25.9	25.8	26.2	341.8	1,256.4	119.8	362.2	0.94	0.95	0.94	50.00
7/23/2015	3:00:00 PM	395.1	394.8	393.3	9.6	9.1	9.2	530	532	527	25.7	25.7	26.1	341.4	1,262.1	119.9	361.9	0.94	0.95	0.94	49.97
7/23/2015	3:01:00 PM	393.6	393.4	392.0	9.5	9.1	9.1	530	532	528	25.7	25.7	26.0	340.3	1,267.8	119.7	360.7	0.94	0.95	0.94	49.94
7/23/2015	3:02:00 PM	395.2	394.8	393.4	9.5	9.2	9.2	530	532	528	25.6	25.6	26.0	341.5	1,273.5	120.4	362.1	0.94	0.95	0.94	49.94
7/23/2015	3:03:00 PM	397.8	397.5	396.2	9.8	9.4	9.4	531	532	528	25.9	25.9	26.2	344.3	1,279.2	120.8	364.8	0.94	0.95	0.94	49.94
7/23/2015	3:04:00 PM	398.0	397.7	396.3	9.7	9.3	9.4	531	532	528	25.9	25.9	26.3	344.5	1,285.0	120.8	365.0	0.94	0.95	0.94	49.93
7/23/2015	3:05:00 PM	399.5	399.2	397.8	9.7	9.3	9.4	531	532	528	25.9	25.9	26.3	345.7	1,290.7	121.4	366.4	0.94	0.95	0.94	49.95
7/23/2015	3:06:00 PM	402.4	402.0	400.6	9.8	9.4	9.4	530	532	528	25.8	25.8	26.2	348.0	1,296.5	122.2	368.8	0.94	0.95	0.94	50.00

Date	Time	Voltage (Line)			%VTHD			Current (Line)			% ATHD			kW	kWh	kVAr	kVA	PF Line1			Hz
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	Sum		Sum	Sum	L1	L2	L3	
7/23/2015	3:07:00 PM	402.7	402.4	401.0	9.6	9.2	9.3	531	533	528	25.8	25.8	26.1	348.7	1,302.3	122.6	369.6	0.94	0.95	0.94	50.05
7/23/2015	3:08:00 PM	402.1	401.8	400.4	9.6	9.2	9.3	531	533	528	25.8	25.7	26.1	348.0	1,308.1	122.4	369.0	0.94	0.95	0.94	50.05
7/23/2015	3:09:00 PM	401.1	400.9	399.4	9.7	9.3	9.3	531	533	528	25.8	25.7	26.1	347.1	1,313.9	122.2	368.0	0.94	0.95	0.94	50.05
7/23/2015	3:10:00 PM	401.2	401.0	399.4	9.7	9.3	9.4	531	533	528	25.8	25.7	26.1	347.2	1,319.7	122.3	368.1	0.94	0.95	0.94	50.06
7/23/2015	3:11:00 PM	401.6	401.5	399.9	9.6	9.2	9.2	531	533	529	25.8	25.7	26.2	347.7	1,325.5	122.3	368.6	0.94	0.95	0.94	50.07
7/23/2015	3:12:00 PM	400.9	400.8	399.2	9.5	9.1	9.2	531	533	529	26.0	25.9	26.3	347.3	1,331.3	121.8	368.0	0.94	0.95	0.94	50.07
7/23/2015	3:13:00 PM	399.7	399.6	398.0	9.9	9.5	9.6	531	533	529	25.9	25.8	26.2	346.1	1,337.1	121.7	366.9	0.94	0.95	0.94	50.07
7/23/2015	3:14:00 PM	398.2	398.2	396.5	10.3	9.9	10.0	530	533	528	25.8	25.7	26.1	344.6	1,342.8	121.6	365.4	0.94	0.95	0.94	50.07
7/23/2015	3:15:00 PM	398.1	398.0	396.6	10.3	9.8	9.9	531	533	528	25.7	25.7	26.1	344.5	1,348.6	121.6	365.3	0.94	0.94	0.94	50.06
7/23/2015	3:16:00 PM	401.5	401.3	399.8	9.3	8.7	8.8	409	411	407	28.2	28.0	28.5	259.8	1,352.9	114.8	284.1	0.91	0.92	0.91	50.04
7/23/2015	3:17:00 PM	401.5	401.4	399.8	9.3	8.6	8.8	406	408	404	28.4	28.1	28.7	257.4	1,357.2	115.6	282.2	0.91	0.92	0.91	50.00
7/23/2015	3:18:00 PM	402.0	402.0	400.1	8.5	8.0	8.1	360	362	358	29.3	28.7	29.5	214.2	1,360.7	115.9	250.0	0.80	0.81	0.80	49.99
7/23/2015	3:19:00 PM	405.3	405.5	403.3	5.5	5.3	5.7	199	201	197	30.1	29.2	30.0	58.6	1,361.7	126.7	139.6	0.42	0.42	0.42	49.98
7/23/2015	3:20:00 PM	402.7	402.7	401.0	7.4	7.1	7.2	311	313	309	28.6	28.0	28.7	155.0	1,364.3	125.6	215.8	0.60	0.60	0.60	50.01
7/23/2015	3:21:00 PM	397.4	397.3	395.8	9.9	9.5	9.6	531	533	529	25.5	25.4	25.8	344.0	1,370.0	121.8	364.9	0.94	0.94	0.94	50.04
7/23/2015	3:22:00 PM	397.2	397.2	395.6	9.9	9.5	9.6	531	533	529	25.5	25.4	25.8	343.7	1,375.8	121.8	364.7	0.94	0.94	0.94	50.02
7/23/2015	3:23:00 PM	396.8	396.8	395.3	10.1	9.7	9.7	530	532	528	25.5	25.5	25.9	343.2	1,381.5	121.5	364.0	0.94	0.94	0.94	49.99
7/23/2015	3:24:00 PM	396.7	396.7	395.1	9.7	9.3	9.4	530	532	528	25.7	25.6	26.0	343.2	1,387.2	121.0	363.9	0.94	0.95	0.94	49.97
7/23/2015	3:25:00 PM	396.5	396.4	395.0	9.8	9.4	9.5	530	532	528	25.7	25.7	26.0	342.7	1,392.9	120.9	363.4	0.94	0.95	0.94	49.97
7/23/2015	3:26:00 PM	398.4	398.3	396.8	8.4	8.0	8.1	423	425	422	27.2	27.0	27.5	260.7	1,397.3	121.0	291.4	0.87	0.87	0.87	49.97
7/23/2015	3:27:00 PM	401.9	401.8	399.9	5.8	5.6	5.7	244	246	243	29.6	29.0	29.8	128.8	1,399.4	110.7	169.9	0.76	0.76	0.75	49.95
7/23/2015	3:28:00 PM	402.4	402.2	400.4	4.9	4.7	4.7	213	215	212	29.6	29.1	29.9	113.2	1,401.3	95.9	148.4	0.77	0.77	0.76	49.93
7/23/2015	3:29:00 PM	403.8	403.8	401.8	4.2	3.9	3.9	183	184	182	29.7	29.2	29.9	97.6	1,402.9	82.4	127.7	0.77	0.77	0.76	49.93
7/23/2015	3:30:00 PM	404.3	404.3	402.4	3.9	3.6	3.5	160	162	159	29.8	29.2	30.0	85.9	1,404.4	72.1	112.2	0.77	0.77	0.76	49.93
7/23/2015	3:31:00 PM	405.4	405.5	403.6	3.4	3.2	3.1	135	137	135	29.9	29.3	30.0	72.8	1,405.6	61.1	95.1	0.77	0.77	0.76	49.95
7/23/2015	3:32:00 PM	405.9	405.9	404.3	3.2	2.9	2.9	122	123	122	29.8	29.3	30.0	65.8	1,406.7	55.2	85.9	0.77	0.77	0.76	49.97
7/23/2015	3:33:00 PM	406.8	406.8	405.0	2.8	2.7	2.6	98	99	98	30.0	29.5	30.2	52.8	1,407.5	44.4	69.0	0.77	0.77	0.76	50.02
7/23/2015	3:34:00 PM	407.8	408.0	406.2	2.6	2.5	2.4	83	83	82	30.1	29.7	30.4	44.5	1,408.3	37.8	58.4	0.77	0.76	0.76	50.03
7/23/2015	3:35:00 PM	408.0	408.3	406.0	2.1	2.2	2.1	40	40	43	19.8	19.5	27.8	21.5	1,408.6	17.7	28.9	0.50	0.49	0.49	50.04
7/23/2015	3:36:00 PM	409.0	409.2	406.9	2.2	2.2	2.1	-	-	8	-	-	37.0	-0.0	1,408.6	-2.0	2.0	-	-	-	50.02

Date	Time	Voltage (Line)			%VTHD			Current (Line)			% ATHD			kW	kWh	kVAr	kVA	PF Line1			Hz
		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	Sum		Sum	Sum	L1	L2	L3	
7/23/2015	3:37:00 PM	399.3	399.4	397.7	7.7	7.4	7.4	371	373	372	19.3	18.9	30.4	238.8	1,412.6	85.4	254.6	0.67	0.67	0.67	50.03
7/23/2015	3:38:00 PM	394.9	394.9	393.5	10.0	9.6	9.7	527	529	525	25.5	25.4	25.8	339.3	1,418.3	120.3	360.0	0.94	0.94	0.94	50.02
7/23/2015	3:39:00 PM	394.6	394.5	393.3	10.2	9.7	9.8	526	528	524	25.6	25.6	26.0	338.7	1,423.9	120.0	359.3	0.94	0.94	0.94	49.99
7/23/2015	3:40:00 PM	394.7	394.7	393.4	10.1	9.6	9.7	526	528	524	25.7	25.6	26.0	338.7	1,429.6	119.9	359.3	0.94	0.95	0.94	49.98
7/23/2015	3:41:00 PM	394.5	394.5	393.1	9.9	9.6	9.6	526	528	524	25.5	25.5	25.9	338.7	1,435.2	119.9	359.4	0.94	0.94	0.94	49.95
7/23/2015	3:42:00 PM	392.8	392.9	391.6	10.0	9.6	9.7	528	530	526	25.6	25.6	25.9	338.2	1,440.9	119.7	358.8	0.94	0.94	0.94	49.93
7/23/2015	3:43:00 PM	392.8	392.8	391.5	10.1	9.7	9.8	528	530	526	25.6	25.5	25.9	338.4	1,446.5	119.8	359.0	0.94	0.94	0.94	49.93
7/23/2015	3:44:00 PM	392.2	392.2	390.8	10.1	9.6	9.7	528	530	526	25.5	25.5	25.9	337.5	1,452.1	119.6	358.1	0.94	0.94	0.94	49.96
7/23/2015	3:45:00 PM	392.6	392.7	391.3	10.3	9.8	9.9	526	528	524	25.5	25.4	25.8	337.0	1,457.7	119.6	357.6	0.94	0.94	0.94	50.00
7/23/2015	3:46:00 PM	391.5	391.7	390.2	10.3	9.8	9.9	528	530	526	25.5	25.5	25.9	337.1	1,463.4	119.7	357.7	0.94	0.94	0.94	50.01
7/23/2015	3:47:00 PM	391.1	391.3	389.8	10.0	9.6	9.6	529	531	527	25.6	25.6	25.9	337.7	1,469.0	119.3	358.2	0.94	0.94	0.94	50.02
7/23/2015	3:48:00 PM	391.1	391.2	389.7	10.1	9.6	9.7	530	532	528	25.6	25.6	26.0	337.9	1,474.6	119.5	358.4	0.94	0.94	0.94	49.99
7/23/2015	3:49:00 PM	393.1	393.1	391.7	9.7	9.3	9.3	531	533	529	25.7	25.6	26.1	340.3	1,480.3	120.4	361.0	0.94	0.94	0.94	49.97
7/23/2015	3:50:00 PM	392.5	392.5	391.2	10.1	9.6	9.7	531	533	529	25.7	25.7	26.0	339.9	1,486.0	120.6	360.6	0.94	0.94	0.94	49.95
7/23/2015	3:51:00 PM	393.3	393.2	391.9	9.8	9.3	9.4	532	534	530	25.8	25.8	26.1	340.8	1,491.6	121.0	361.7	0.94	0.94	0.94	49.93
7/23/2015	3:52:00 PM	394.5	394.5	393.1	8.8	8.4	8.4	455	457	455	22.3	22.3	23.8	290.1	1,496.5	104.6	309.6	0.81	0.81	0.81	49.95
7/23/2015	3:53:00 PM	9.7	9.8	9.7	-	-	-	-	-	7	-	-	-	-0.0	1,496.5	-0.1	0.1	-	-	-	1.66
7/23/2015	3:54:00 PM	-	-	-	-	-	-	1	2	7	-	-	-	-	1,496.5	-	-	-	-	-	- - -