



South Asia

Baseline Audit Report

L G Sea Foods

CC 18/343, Palluruthy Nada, Cochin-682006, Kerala, India



BEE's National Program on Energy Efficiency in
SMEs Kochi (Sea Food) cluster in XII plan

TÜV SÜD South Asia Pvt. Ltd.

May, 2016



Acknowledgement

TUV SUD South Asia Pvt. Ltd. is thankful to **Bureau of Energy Efficiency (BEE), Ministry Of Power** for providing us an opportunity to conduct Baselineaudit in five units of Kochi Seafood Processing Cluster under the BEE SME Programme. We express our sincere Gratitude to the following officials of BEE

Shri Dr. Ajay Mathur –Director General

Shri Sanjay Seth– Secretary

Shri Milind Deore – Energy Economist

Shri Tarun Dixit – Project Engineer

We are extremely grateful to the officials of the **Seafood Exporters Association of India (SEAI)** for their support and cooperation. We extend

Our special thanks to **Mr. S. Ramakrishnan, Secretary of the SEAI** and **Mr. Alex Ninan, Vice President of the SEAI.**

We thank the **L G Seafoods** owner and their staffs for their support and cooperation during the baseline audit study.



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EXECUTIVE SUMMARY

1. Unit Details

Unit Name	L G Seafoods
Address	CC 18/343, Palluruthy Nada, Cochin-682006, Kerala, India
Contact Person	K K Lirar Phone:09847034444, 09387324181
Products	Sea Food processing
Contract demand	125 KVA

2. Existing Major Energy Consuming Technology

The major equipments in a typical seafood processing unit are compressors, condensers, cooling towers, freezers and the motors connected to these equipment. Compressors are the major energy consuming equipment in these seafood processing units.

Cold Storage:

After packing frozen material product will keep in cold storages at -18deg C temperature. L G Sea foods is having total 2 cold storages to keep products in required temperatures they installed 4 FCU's . R22 which is the commonly used as coolant in the FCU's.

3. Proposed Energy Saving Technologies with Cost Economics

a) Identified technology up gradation proposals

- Replacement of reciprocating compressor with Screw compressor with VFD
- Replacement of water cooled condenser with Evaporative condenser
- Installation of variable frequency drive for condenser water pumps
- Installation of THERMOSHIPON SYSTEM (GAS COOLING) for Compressor.
- Automation of refrigeration plant by using PLC controller

Cost Economic Analysis:

S No	Recommendation	Annual Savings in kWh	Savings in INR	Investment in INR	Payback in Years
1	Replacement of reciprocating compressor with Screw compressor with VFD	80811	503453	820000	1.63
2	Replacement of water cooled condenser with Evaporative condenser	49012	340145	500000	1.47
3	Installation of variable frequency drive for condenser water pumps	9461	65658	130000	1.98
4	Installation of THERMOSHIPON SYSTEM (GAS COOLING) for Compressor.	10775	74777	200000	2.67
5	Automation of refrigeration plant by using PLC controller	26937	186943	400000	2.14
	Total	176996	1170975	2050000	1.8

b) Identified Energy Saving Proposals:

- Revision of contract demand and reduction of kVA charges payable to electricity board

Cost Economic analysis

S No	Recommendation	Annual savings in INR	Investment in INR	Payback in Years
1	Revision of contract demand and reduction of kVA charges payable to electricity board	66600	0	0



OBJECTIVE OF BEE SME PROGRAM

The BEE SME Program aims to improve Energy Efficiency (EE) in SME sector by technological interventions in the various industrial clusters in India. The EE in SMEs is intended to be enhanced by helping the industries in the 25 energy intensive SME clusters by:

- Technology interventions
- Implementation of EE measures and projects in clusters, and
- Capacity building for improved financial planning for SME entrepreneurs

The program also aims at creating a platform for dissemination of the appropriate practices and the appropriate technologies available in the market for energy efficiency and conservation, to create awareness in the clusters, and to demonstrate the new technology interventions/ projects to stimulate adoption of similar technology/projects in the clusters. The BEE SME program has been designed in such a way that it addresses the specific needs of the industries in the SME sector for EE improvement and to overcome the common barriers in the implementation of EE technologies in cluster through knowledge sharing, capacity building, and development of innovative financing mechanisms.

The major activities for which we need to give support to BEE's National Program on Energy Efficiency in SMEs Kochi (Sea Food) cluster in XII plan are:

- Conducting pre-activity cluster workshop.
- Conducting initial Baseline audits to get an overview of the technology presently existing in the Seafood processing units in Kochi.
- Identify areas of energy saving, both without & with investment and propose to BEE two energy efficient process technologies.
- Identify at least 5 Local technology/ service providers for the above technologies in the cluster
- Identify 20 SME units willing to implement and demonstrate the above two technologies
- Assist BEE to enter into a contract with each of the 20 shortlisted SME units
- Conduct comprehensive Baseline Energy Audits in 20 SME units
- Development of technology specific case studies for each technology
- Preparing Best Operating Practices(BOP) document for the top 5 energy using equipment/ process
- Carry out post implementation energy audit in each of the above 20 units
- Verify and submit to BEE all the relevant documents of each participating unit
- Assist BEE in conducting five post energy audit training workshops



BRIEF ABOUT UNIT

LG Sea foods:

A company with international reputation who export live Mud crab and frozen seafoods (Cuttle Fish, Squid, Shrimps, Ribbon Fish, etc.) Established in 1988, L G Sea Foods, is one of the first few companies in the country which pioneered into the exports of live seafoods. Mr. Lirar's innovative products perception and quick response to the changes in the live seafood market, have catapulted the firm to the top rung of live seafood exporters.

LG Seafood was awarded the best Live Seafood Exporter for the year 1996-97 by The Marine Products Export Development Authority (MPEDA), Government of India.

Located at the major fishing port in Cochin, the production facilities are centrally placed in relation to the fishing fleet and fishing grounds. For fast and secure procurement of raw materials and quick and easy shipment of finished products.

Technology overview of typical sea food processing unit

1. Compressors :

It is noticed that reciprocating compressors are being used in the chilling unit. Reciprocating compressors consists of a piston moving back and forth in cylinder, with suction and discharge valves to achieve suction and compression of the refrigerant vapor. The suction side of the compressor is connected to the exit of the evaporator, while discharge side of the compressor is connected to condenser inlet. The performance evaluation of the compressors (KW/TR) should be done regularly in order to monitor the performance of the same.



2. Condenser :

It is observed at the time of audit the following type of condenser is being used in the plant:

1. Water Cooled Condenser

The above mentioned condenser is being used in the HVAC system to the cool ammonia which is the commonly used coolant in the plant for freezers. The detailed analysis and performance evaluation of condenser will be discussed in refrigeration system chapter.



3. Freezers

It is noticed at the time Baseline audit that the following type of freezers are being used in the L G Seafoods food processing unit

- i) Plate freezer
- ii) Blast freezer

Plate freezer:

Plate freezer are commonly used for freezing brick shaped packaged products. In plate freezers, the refrigerant is allowed to circulate inside the thin channels within the plates. The packaged products are firmly pressed between the plates. High rates of heat transfer can be obtained between the packed product and the refrigerant plates

Blast Freezer:

Blast freezer is commonly used freezer in sea food processing unit in which blower is being used to supply the cold air over the product in order freeze the product. The temperature range will be in the range of -40 deg C and the air speed over the product will be high, to get good heat transfer.

4. Other equipments:

In addition to the above processing equipment are also being used in the plant for Processing.



Energy & Production Situation in the Unit

Energy scenario:

It is noticed during the course of audit that two type of energy is being used in the plant, which are electrical energy and thermal energy. The electricity is drawn from the Kerala state electricity board (KSEB) and Diesel generators are being used in the plant as a back system to meet the demand in case of grid supply failure or scheduled power cut from the grid

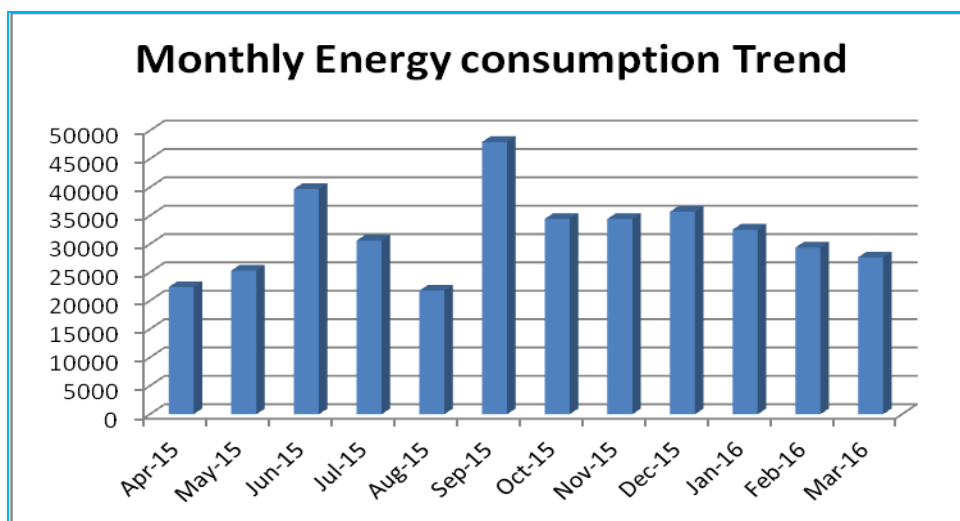
Energy consumption of the plant

The primary source of energy is electricity and that is imported from the KSEB and diesel generators are being used as back system during power failure. Month wise electricity consumption of the plant details are as follows:

S. No	Month & Year	CMD (KVA)	RMD (KVA)	KWh	KVAh	P.F	Total Bill(Rs)	P.F incentives/ penalty	Unit cost (Rs/KWh)
1	Apr-15	125	119	22416	22446	0.99	151590	-2899	6.76
2	May-15	125	155	25330	25392	0.99	177889	-3172	7.02
3	Jun-15	125	162	39718	40078	0.99	257016	-4589	6.47
4	Jul-15	125	167	30628	30930	0.99	190191	-3708	6.21
5	Aug-15	125	115	21782	21998	0.99	151253	-2624	6.94
6	Sep-15	125	170	47994	48562	0.98	313385	-5744	6.53
7	Oct-15	125	179	34428	34898	0.98	247994	-4186	7.20
8	Nov-15	125	179	34428	34898	0.98	247994	-4186	7.20
9	Dec-15	125	173	35704	36120	0.98	250389	-4300	7.01
10	Jan-16	125	176	32546	33010	0.98	231566	-3845	7.12
11	Feb-16	125	182	29394	29660	0.99	217423	-3500	7.40
12	Mar-16	125	174	27648	27960	0.98	204745	-3276	7.41
	Total			382016	385952		2641435	-46029	
	Avg			31834	32162	0.99	220120		6.94

The electricity consumption of the plant is varying from 0.22 lakh kWh/month to 0.47 Lakh kWh/month and average electrical energy cost for the plant is 6.94 Rs/kWh

Monthly Variation of Electricity Consumption during the year 2015-16



Diesel Generator:

Diesel generators are being used in the plant as a back system to meet the demand in case of grid supply failure or scheduled power cut from the grid. Month wise consumption and generation details of the plant are as follows:

Month & Year	Diesel(Ltrs)	KWh	Cost (INR)
Apr-15	100	300	6000
May-15	50	150	3000
Jun-15	200	600	12000
Jul-15	0	0	0
Aug-15	0	0	0
Sep-15	200	600	12000
Oct-15	50	150	3000
Nov-15	100	300	6000
Dec-15	100	300	6000
Jan-16	0	0	0
Feb-16	0	0	0
Mar-16	50	150	3000
	850	2550	51000

It seems to be diesel consumption of plant is nominal only.



Production scenario:

The following table shows the monthly wise production details of L G Seafoods for FY-2015-16.

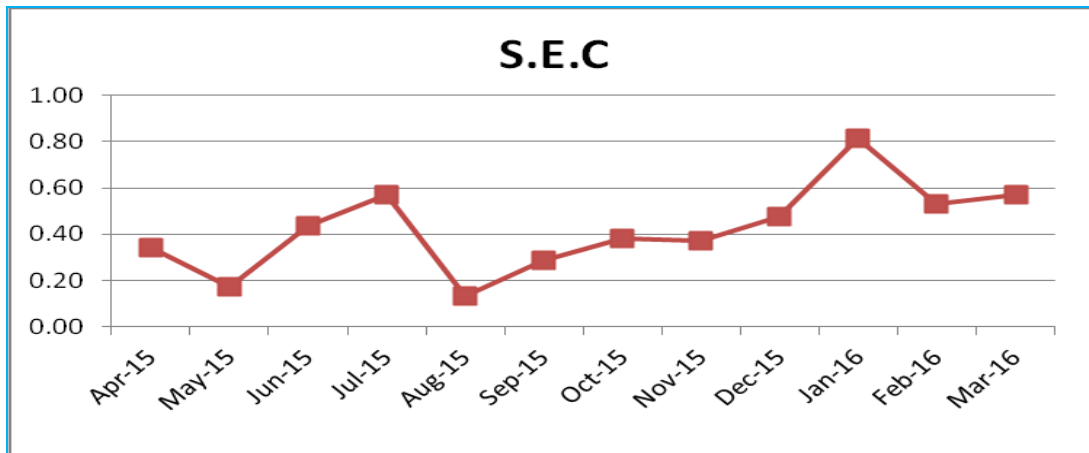
Month & Year	Production (kg)
Apr-15	66409
May-15	146600
Jun-15	92023
Jul-15	53706
Aug-15	162783
Sep-15	168110
Oct-15	90115
Nov-15	92881
Dec-15	75758
Jan-16	39916
Feb-16	55129
Mar-16	48648
	1092078

Specific Energy Consumption:

The specific energy consumption unit average 0.42 kWh/kg of the product

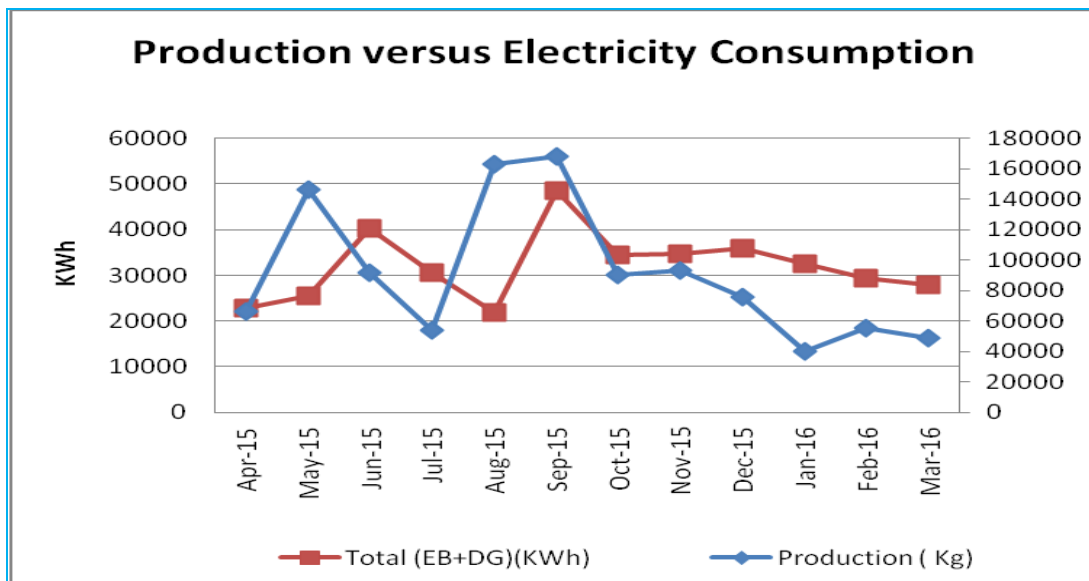
S. No	Month & Year	Production (Kg)	Total (EB+DG)(KWh)	S.E.C(KWh/Kg)
1	Apr-15	66409	22716	0.34
2	May-15	146600	25480	0.17
3	Jun-15	92023	40318	0.44
4	Jul-15	53706	30628	0.57
5	Aug-15	162783	21782	0.13
6	Sep-15	168110	48594	0.29
7	Oct-15	90115	34578	0.38
8	Nov-15	92881	34728	0.37
9	Dec-15	75758	36004	0.48
10	Jan-16	39916	32546	0.82
11	Feb-16	55129	29394	0.53
12	Mar-16	48648	27798	0.57
		1092078	384566	0.42

Monthly Specific Energy consumption Variation for the year 2015-16



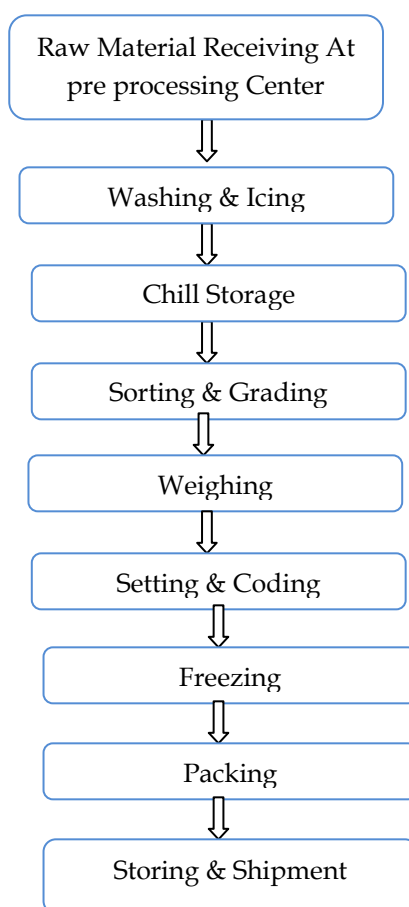
It seems to be January 2016 month accounts for highest Specific energy consumption 0.82 KWh /Kg followed by July-15 and March-16 month.

Monthly Variation in Production versus Electricity Consumption for the year 2015-16



Process flow diagram

The typical process followed in the seafood processing industry is shown in the flowchart below. For all of the units surveyed, the preprocessing of fish was done outside the units and the operations in the units started with the cleaning of preprocessed/ cleaned fish. While most of the units follow the general process of cutting, cleaning, grading, weighing, freezing, packing, and storing; the difference arise in the way fish is frozen and the freezers used for the purpose.



From the flowchart, it can be inferred that the energy intensive steps in the process are the freezing and the storage. Freezing alone accounts for nearly 75% of all the electricity consumed in the unit.



Condenser Analysis

The major equipments in a typical seafood processing unit are compressors, condensers, cooling towers, freezers, ice making units, and the motors connected to these equipment. Compressors are the major energy consuming equipment in these seafood processing units.

L G Sea foods have installed direct contact water cooled condenser in their HVAC system to cool the ammonia which is the commonly used coolant in the unit.

As a part of audit we conducted performance evolution of refrigeration system, there are 2 compressors installed in L G Sea foods to meet the cooling load requirements.

S.No	Description	Design	Measured				
		Rating(KW)	V	A	KW	P.F	KVA
1	Compressor-1	37	401	73	45	0.92	49
2	Compressor-2	45	399	88	54	0.89	61

By the time of audit only one plate freezer is working, to estimate cooling load of freezer can be calculated using the formula given below:

Heat rejected at condenser = Cooling load + Work done by compressor

$$\text{Heat Rejected (TR)} = (\text{Evaporator TR}) + \frac{\text{kW}}{3.516}$$

$$\text{Heat rejected (TR)} = \frac{Mc \times C_p \times (t_{wo} - t_{wi})}{3024}$$

Performance comparison of HVAC System

Parameter	60HP unit	50HP Unit
Mass flow Rate of cooling water kg/h	48960	27000
Cooling water inlet temp deg C	36	33
Cooling water outlet temp deg C	33	30
Specific heat of water Kcal/kg deg C	1	1
Condenser-Heat Rejected (TR)-Measured	49	27
Compressor (KW)-measured	54	45
Evaporator (TR)-Measured	33	14

Condenser water pumps:

S.No	Description	Design	Measured				
		Rating(KW)	V	A	KW	P.F	KVA
1	Condenser pump-1	3.7	400	6.7	4.1	0.87	4.71
2	Condenser pump-2	3.7	399	6.5	3.99	0.85	4.69
3	Condenser pump-3	2.2	400	3.86	2.39	0.89	2.69

Cold Storage:

After packing frozen material product will keep in cold storages at -18deg C temperature. L G Sea foods is having total 2 cold storages to keep products in required temperatures they installed 4 FCU's . R22 which is the commonly used as coolant in the FCU's.



Detailed analyses of units are given below:

S.No	Description	Measured				
		V	A	KW	P.F	KVA
1	Cold storage-1 Unit-1	422	19.1	13	0.93	14.0
2	Cold storage-1 Unit-2	420	18.3	12.5	0.94	13.3
3	Cold storage-2 Unit-1	422	23.7	16	0.93	17.2
4	Cold storage-2 Unit-2	421	19.6	13.2	0.93	14.2

Performance Evaluation details are as follows:

S.No.	DESCRIPTION	Cold storage-1		Cold storage-2	
		Unit-1	Unit-2	Unit-1	Unit-2
1	Air density(Kg/m3)	1.29	1.29	1.29	1.29
2	Air flow(m3/h)	2676	1672	3010	2742
3	Supply air temp deg C	-13	-17	-14	-15
4	Return air temp deg C	-7	-6	-8	-10
5	TR	7.42	7.85	7.06	5.85
6	KW	13.00	12.50	16.00	13.20
7	KW/TR	1.75	1.59	2.27	2.26
8	COP	2.00	2.20	1.55	1.56

From the above table we can observe that net refrigeration capacity of the HVAC system varies from 5.85 TR to 7.85 TR and 1.68 TR for ante room. Also the range in kW/ TR is observed to be little bit high. But the CoP varies from 1.55 to 2.20.

Identified technology up gradation proposals

1. Replacement of reciprocating compressor with screw compressor with VFD

Present status:

Ammonia based reciprocating compressor is being used in plant for cooling purpose. Compressors are coupled with motor through V belt drive. There are total 2 compressors with different ratings details are given below:

1.60HP*1
2.50 HP*1

Observation

- The specific energy consumption of reciprocating compressor is varying from 1.5 kW/TR to 2 kW/TR
- The specific energy consumption of screw compressor will vary from 0.85 kW/TR to 1 kW/TR
- Compressors are not operated to their full capacity due to less capacity utilization of the plant.

Recommendation:

It is recommended to replace the reciprocating compressor with screw compressor in order to reduce the specific energy consumption to certain level and that will result in considerable amount of energy savings.





Saving percentage:

Saving percentage will be 10-20%

Investment:

Investment amount will be in the range of 10 Lakhs.

Payback:

Payback period will be in between 1.5 to 2 years.

In general 2 compressors are running to meet cooling requirement, it is suggested to replace 2 reciprocating compressor with screw compressors, calculation has been mentioned below:

S. No.	Particulars	Units	Value
1	Capacity of the reciprocating compressor(50HP,60HP)	kW	82
2	Number of compressors	no's	2
3	Actual power consumption of 2 compressors	kW	82
4	Expected power consumption by screw compressor with VFD(@15% saving)	KW	69.7
5	Savings in kW	kW	12.3
6	Operating hours	hours	18
7	Savings in kWh per annum	kWh/Annum	80811
8	Savings in Rs	Rs	503453
9	Investment	Rs	820000
10	Payback	Years	1.63

2. Replacement of water cooled condensor with Evaporative condensers

Present status:

At the time of audit, it is observed that unit is using water cooled condenser. Cooling water is spraying on condenser tubes to cool down hot gas .

Observation:

- Cooling towers are filled with algae formation and that will affect the effectiveness of the cooling towers.
- Evaporative condenser is a single unit which reject the heat more efficiency when compared to other condensers

Recommendation:

It is recommended to replace the old & inefficient water cooled condenser with energy efficient evaporative condenser in order to save substantial amount of energy savings.



Saving

Saving percentage will be at least 10%.

Investment:

Investment amount will be in the range of 5 Lakhs.

Payback:

Payback period will be in between 1 to 2 years.

The energy saving calculation for condensers has been mentioned below:

S. No.	Parameter	Units	Value
1	Capacity of the open coil atmospheric condenser	Ton	50
2	Condenser Pumps (2*5HP+1*3HP)	kW	9.698
3	Evaporative condenser Fan motor	kW	1.1
4	Evaporative condenser spray pump	kW	1.1
5	Savings in kW	kW	7.46
6	Savings in kWh/Annum	kWh/Annum	49012.2
7	Saving in Rs/Annum	Rs	340145
8	Investment	Rs	500000
9	Payback	Years	1.47



3. Installation of Variable frequency drive (VFD) for condenser water Pumps

Present status:

It is noticed that the condenser pumps are being used in the plant to supply the cooling water to condenser for cooling application

Observation:

At the time of audit, it was observed that pumps are running continuously irrespective on the load in the secondary side and throttle valves are being used in the pipe lines to control the flow of pump. This will only reduce the flow and would not reduce the energy consumption of the pump.

Recommendation:

Variable frequency drive can installed in the pump and which will vary the speed of the motor with respect to loading on secondary side and this will result in substantial energy savings. It is recommend installing variable frequency drive in the pumps in order to save substantial amount of energy savings and sample calculation for the same has been tabulated as below:

S.No	Particulars	Units	Value	Value
1	Rated capacity of the pump	HP	5	3
2	Actual power consumption of the pump	kW	3.7	2.2
3	No. of pumps	No	2	1
4	Total power consumption	kW	9.6	
5	Savings with VFD %	%	15	
6	Projected Energy Consumption	kW	8.16	
7	Savings in kW	kW	1.44	
8	Savings in kWh/Day	kWh/day	25.92	
9	Savings in kWh/Annum	kWh/Annum	9460.8	
10	Savings in Rs	Rs/Annum	65658	
11	Investment	Rs	130000	
12	Payback	Years	1.98	



4. Installation of THERMOSHIPON SYSTEM (GAS COOLING) for Compressor.

Present status:

At the time of audit, it is observed that unit is using water cooled Cooling system for compressor. Cooling water is circulating on compressor head to cool down compressor temperature . Separate Pump installed and running continuously for circulating cooling water for compressor cooling.

Observation:

- Cooling towers are filled with algae formation and that will affect the effectiveness of the cooling towers.
- thermoshipon system is a new technology developed for compressor cooling. It will improve the work done compressor and efficiency.

Recommendation:

It is recommended to install Thermoshipon system for compressor cooling in order to save substantial amount of energy savings.

Percentage Saving:

Saving percentage will be at least 1-2 %.

Investment:

Investment amount will be in the range of 2 Lakhs.

Payback:

Payback period will be in around 2.5 to 3 year.

S. No.	Particulars	Units	Value
1	Capacity of the Present reciprocating compressors	kW	82
2	Number of compressors	no's	2
3	Expected power consumption by installation of Thermoshipon system (@2% saving)	KW	1.64
4	Operating hours	Hours	18
5	Savings in kWh per annum	kWh/Annum	10775
6	Savings in Rs	Rs	74777
7	Investment	Rs	200000
8	Payback	Years	2.67



5. *AUTOMATION of refrigeration plant by using PLC controller:*

Present status:

At Present Refrigeration system is controlling in manual mode only. Based on temperature requirements refrigerate flow controlling with the help of opening and closing valves manually by operators.

Observation:

- While operating manually error may occur, it will cause power loss.
- We can program, when to start and when to stop in Automatic system.
- PLC will control Loading and unloading of compressors automatically.

Recommendation:

It is recommended to install PLC based automatic system to save substantial amount of energy.

Percentage Saving:

Saving percentage will be at least 5 %.

Investment:

Investment amount will be in the range of 4 Lakhs.

Payback:

Payback period will be in around 2.5 year.

S. No.	Particulars	Units	Value
1	Capacity of the Present reciprocating compressors	kW	82
2	Number of compressors	no's	2
3	Expected power consumption by installation of PLC controlled Automation system (@5% saving)	KW	4.1
4	Operating hours	hours	18
5	Savings in kWh per annum	kWh/Annum	26937
6	Savings in Rs	Rs	186943
7	Investment	Rs	400000
8	Payback	Years	2.14



Identified Energy Saving Proposals:

1. Revision of contract demand and reduction of kVA charges payable to electricity board

Present Status:

LG Sea foods is having CMD 125KVA, the average contract demand of the unit is ranges between 150 to 180 kVA. Above 125 KVA excess demand charges needs to pay for local electricity board.

Observation

It was observed LG Sea foods is paying additional demand charges on every month. Hence CMD needs to revise to avoid additional demand charges.

Recommendation:

Hence, it is recommended to revise contract demand to get financial benefit from electricity bill.

Energy saving calculation for a contract demand

CMD	KVA	125
Avg Recorded M.D	KVA	162
Additional Demand Charges	Rs/KVA	150
Recorded Excess Demand	KVA	37
Expected cost savings with CMD revision/yr.	Rs.	66600
Investment	Rs.	0
Payback	Years	Immediate

Conclusion

Based on our audit in the L G Seafoods processing unit and above given energy saving opportunities in detail we are recommending the below given energy efficient technology up gradation in the L G Seafoods

1. Replacement of reciprocating compressor with screw compressor with VFD
2. Replacement of water cooled condenser with Evaporative condensers
3. Installation of Variable frequency drive (VFD) for condenser water Pumps
4. Installation of THERMOSHIPON SYSTEM (GAS COOLING) for Compressor.
5. Automation of refrigeration plant by using PLC controller

The total investment cost is 20 Lacs, after successful implementation of any project; the plant will get the subsidiary amount of Rs. 10 Lacs from BEE

The summary of the savings plans are given below:

S. No	Recommendation	Investment in INR	Eligible Subsidiary amount in Rs
1	Replacement of reciprocating compressor with Screw compressor with VFD	820000	1000000
2	Replacement of water cooled condenser with Evaporative condenser	500000	
3	Installation of variable frequency drive for condenser water pumps	130000	
4	Installation of THERMOSHIPON SYSTEM (GAS COOLING) for Compressor.	200000	
5	Automation of refrigeration plant by using PLC controller	400000	

The BEE will provide subsidiary amount of Rs.10 Lacs per plant and will not provide more than ceiling amount of Rs.10 Lac



Equipments Suppliers Contact Details

Compressors & Condensers	
Kirloskar Pneumatic Co Ltd. 1st Floor, Elcanso Building, 10, Casa Major Road, Egmore, Chennai-600 008 Phone: 044-28193066, 2890436, 2892092 Fax: 044-28194397 E-mail: kpclchnacd@kpcl.net	Elgi Equipment Limited #39/3973, Pallimukku, M.G.Road, Kochi – 682016. Tel (0484) 2360155 Fax (0484) 2351904 E-mail : enquiry@elgi.com
Frick India Limited 41/3273-D, Golden Castle Bldg. Old Railway Rd., Cochin - 682018. Phone: 0484-2394173 E-mail: cochin@frick.co.in	Johnson Controls (India) Pvt. Ltd. C/ o. York India Limited, Delphina Building 2nd floor CMH Road, Indiranagar Stage 1 Bangalore, Karnataka 560 038 India Ph: +91 (80) 3057 5730 Fax: +91 (80) 3057 5729
Evapco Condensor ACS Consultancy Pvt . Ltd 276/ 5, Sangam Apartments Belly Area, Anna Nagar West Chennai-40, India Ph: (91) 9840818637 / 9444048480 Fax: (91) 44-42026477 Email: evapco-india@airtelmail.in	Lloyd Insulations (India) Limited, 38/ 449, Panampilly Nagar Manorama Junction, Ernakulam, Kerala 680036 Ph: +91 (484) 2324472
Bombay Ammonia Sales Corporation B-17, Rishabh Shri House, Ranjeet Nagar Commercial Complex, New Delhi – 110 008	Vision Engineering Madras Pvt. Ltd. No 6/1, Shanthi Nagar Main Road, Ramapuram, Chennai - 600089, Opposite Dlf & Moonlight Phone: +(91)-44-22492800, 22490801, Mobile: +(91)-9444040948, 9444040946, 9444040950
Baltimore Aircoil Condensor Densol Engineering Pvt . Ltd. #43/ C, 9th Main, R P C Layout Vijayanagar 2nd Stage Bangalore 560040	
Belts Beblec (India) Private Limited Plot No. 126, Sipcot Industrial Complex Hosur - 635 126	Belts Anjanaa Belting 3857, TNHB, Ayapakkam, Chennai – 600077



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Tamil Nadu, India		Ph: +91-44 – 64991300/ 9840186799	
Sagar Electric Power Services #70, K. Kamaraj Road, Bangalore, India—560042 Ph: +91 9060133874; 9448073258		Vijay Energy Products Pvt.Ltd. SP – 75, Ambattur Indl. Estate Chennai – 600 058 044 – 625 4326	
<u>Pumps</u> BI Marketing & Services Pvt Ltd Dealer: Grundfos Pumps No.50, 3 rd street, East Abhiramapuram, Chennai – 60004 Ph: +91-44-24671267		<u>VFD's</u> Enpro Industrial Automation Pvt Ltd. Dealer: Danfoss VFD F18 Ambattur Industrial estate, Ambattur Chennai – 600058 Ph: +91-44-26244583; 26244865;26359850 email: projects@enproautomation.com	
<u>Motors</u> Project & Supply A – 605, Sunswept Lokhandawala Complex Swami Samarth Nagar,4, Bungalow, Andheri (West) Mumbai 400 050,Ph: 022 – 626 6584		<u>Motors</u> Kirloskar Electric Co. Ltd 294 – 295, Lloyd's Road, Royapettah. Chennai –14. Ph: 044 – 28133176	
<u>Motors</u> Siemens Ltd 3rd Floor, Jyoti Mahal, No. 49, St . Marks Road, Bangalore 560 001 +91 80 5119 1500 Ph: +91-4344-276358 / 278658 / 400688 /400687		<u>Capacitors</u> Momaya Capacitors 401, Madhav Apartments Jawahar Road, Opp.Rly.Stn. Ghatkopar (East) Mumbai – 400 077,Ph: 022 – 516 2899 / 1005 / 0745	
<u>Insulation</u>			
India Insulations NH Bypass, Vytilla, Kochi – 682 019, Kerala Ph: +91 (484) 2304465		Thermax Limited, RNG Pallazzo, No. 1, 1st Floor South End Street Kumarapark East Bangalore 560 001 Ph: +91 (80) 22371721,Fax: +91 (80) 22371726	
<u>For Ice Storage System:</u>			
Balamurugan Refrigeration Engineers, Liveiro building, Thoppumpady Kochi 5		GEA Refrigeration India Pvt. Ltd. Branch Office- 5th Floor, Lohia Jain Business Centre, Friends' Park Society, Senapati Bapat Road ,Pune –	



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Ph: +91 (484) 2231844	411016 India
ACS Refrigeration 272/5, Sangam Apartments, Belly Area, Anna Nagar west, Chennai – 600040. Tamil Nadu, India. Mob No:- 09840818637, Tele Fax:: 044-42026477 Email : sales@acsref.com	

The service providers were selected considering the technology recommended and their ability to service the sea food processing units located in Kochi. Since not all service providers have dealership network in Kochi, hence dealers have been selected from Chennai & Bangalore.