



South Asia

## Baseline Audit Report

### Premier Sea Foods Exim Pvt. Ltd

EP X/289, Eramalloor 688537, Alleppy, Kerala



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 Baseline audit 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 **Premier Seafoods Exim Pvt. Ltd.** 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	Premier Seafoods Exim Pvt. Ltd.
Address	EP X/289, Eramalloor 688537, Alleppy, India
Contact Person	Mr. Mohan Phone:9447548840, 0478-2875436 / 2874356
Products	Sea Food processing
Production	
DIC Number	
Bank Details	
TIN / PAN No.	TIN: PAN:
Contract demand	300 KVA

### 2. Existing Major Energy Consuming Technology

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.

### 3. Proposed Energy Saving Technologies with Cost Economics

#### Identified technology up gradation proposals

- Replacement of reciprocating compressor with Screw compressor with VFD
- Replacement of water cooled condenser with Evaporative condenser
- Replacement of existing V-Belt drive with synthetic Energy Efficient flat belt/S.P.C saver belt drive in the compressor motor
- 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	249962	1609757	2536400	1.58
2	Replacement of water cooled condenser with Evaporative condensers	131400	827820	1000000	1.21
3	Replacement of existing V-Belt drive with synthetic Energy Efficient flat belt /S.P.C saver belt drive in the compressor motor	83110.5	523596	180000	0.34
4	Installation of THERMOSHIPON SYSTEM (GAS COOLING) for Compressor.	33376	214939	400000	1.86
5	Automation of refrigeration plant by using PLC controller	83439	537347	800000	1.49
	Total	581287	3713459	4916400	1.32

#### Identified Energy Saving Proposals:

- Correction of automatic power factor controller
- Proper insulation of identified insulation damaged areas.

Cost Economic Analysis :

S No	Recommendation	Annual Savings in kWh	Savings in INR	Investment in INR	Payback in Years
1	Correction of automatic power factor controller	15KVA	54054	105000	1.94
2	Proper maintenance of condenser coil	3-5% savings			
	Total		54054	105000	1.94

## 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

**Premier Seafoods Exim Pvt. Ltd.** A company with international reputation who export frozen seafoods. Premier, is one of the first few companies in the country which pioneered into the exports of seafoods. Being highly perishable Seafood calls for extreme care in its handling and preservation for international markets. processing time is always under stringent mechanism, which makes it mandatory that all our products are processed according to HACCP guidelines. Size grading and packing are done as required by the customers. Products are exported in fresh and frozen conditions.

Located at the major fishing port in Cochin, the production facilities are centrally placed in relation to the fishing fleet and fishing grounds. Based at the largest marine resource of the world. India offers extensive resources of shrimp. Easy access to rich sea food in the Middle East makes the group strategically located

## 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 types of condensers are being used in the plant:

- 1.Evaporative Condenser
- 2.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.

#### Evaporative condenser:

The evaporative condenser is one of the energy efficient models compared to other type of condenser used in the processing unit. The vapor to be condensed is circulated through the condensing coil, which is continually wetted on the outside by a recirculating water system. Air is pulled over the coil, causing a small portion of the recirculating water to evaporate. The evaporation removes the heat from the vapor in the coil, causing it to condense.





## 2. Water Cooled Condenser:

Primary task of Cooling tower is to reject heat into atmosphere, they used to remove low grade heat from cooling tower, the make up water source is used to replenish water lost to evaporation. hot water from heat exchanger is sent to the cooling tower . the water exit the cooling tower and is sent back to the exchanger .

## 3. Freezers

It is noticed at the time Baseline audit that the following type of freezers are being used in the Premier Sea foods 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, ice making unit and chilled water base cooling systems are also being used in the plant for processing area cooling purpose.

## 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

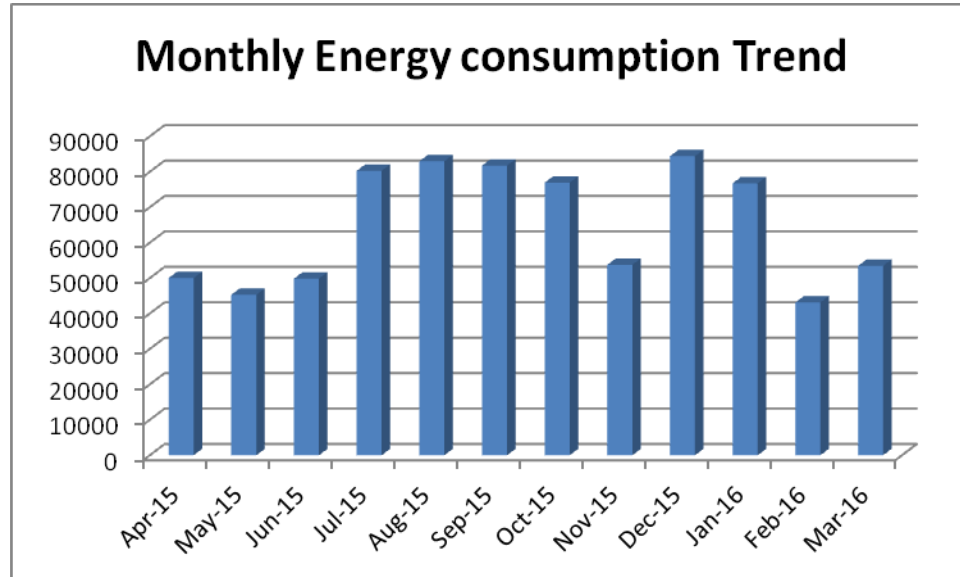
### Energy consumption of the plant

The primary source of energy is electricity and that is imported from the KSEB and diesel generators are being used as an back system during power failure. Month wise electricity consumption of the total 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	300	225	50004	54200	0.92	340139	-1343	6.80
2	May-15	300	225	45292	48788	0.93	313819	-1818	6.93
3	Jun-15	300	225	49840	52512	0.95	288417	-3299	5.79
4	Jul-15	300	246	80280	81520	0.98	497544	-8443	6.20
5	Aug-15	300	245	82964	84648	0.98	512398	-8745	6.18
6	Sep-15	300	238	81756	83264	0.98	498691	-8511	6.10
7	Oct-15	300	245	76944	80328	0.96	484370	-6110	6.30
8	Nov-15	300	225	53756	59604	0.90	356938	0	6.64
9	Dec-15	300	266	84412	90764	0.93	529382	-3317	6.27
10	Jan-16	300	250	76776	83780	0.92	481231	-1993	6.27
11	Feb-16	300	225	43124	48552	0.89	307025	2318	7.12
12	Mar-16	300	225	53432	59600	0.90	358666	0	6.71
	Total			<b>778580</b>	<b>827560</b>		<b>4968620</b>	-41261	
	Avg			<b>64881</b>	<b>68963</b>	<b>0.93</b>	<b>414052</b>		<b>6.44</b>

The electricity consumption of the plant is varying from 0.43 lakh kWh/month to 0.84 Lakh kWh/month and average electrical energy cost for the plant is 6.44 Per Unit (kWh)

## Monthly Variation of Electricity Consumption during the year 2015-16



### Diesel Generators :

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:

S.No	Month & Year	Diesel(Ltrs)	KWh	cost(Rs)
1	Apr-15	616	1848	36960
2	May-15	447	1341	26820
3	Jun-15	2003	6009	120180
4	Jul-15	947	2841	56820
5	Aug-15	612	1836	36720
6	Sep-15	895	2685	53700
7	Oct-15	1775	5325	106500
8	Nov-15	446	1338	26760
9	Dec-15	657	1971	39420
10	Jan-16	865	2595	51900
11	Feb-16	283	849	16980
12	Mar-16	304	912	18240
		<b>9850</b>	<b>29550</b>	<b>591000</b>

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

**Production scenario :**

The following table shows the monthly wise production details of **Premier Sea foods Exim Pvt. Ltd.** for FY-2015-16.

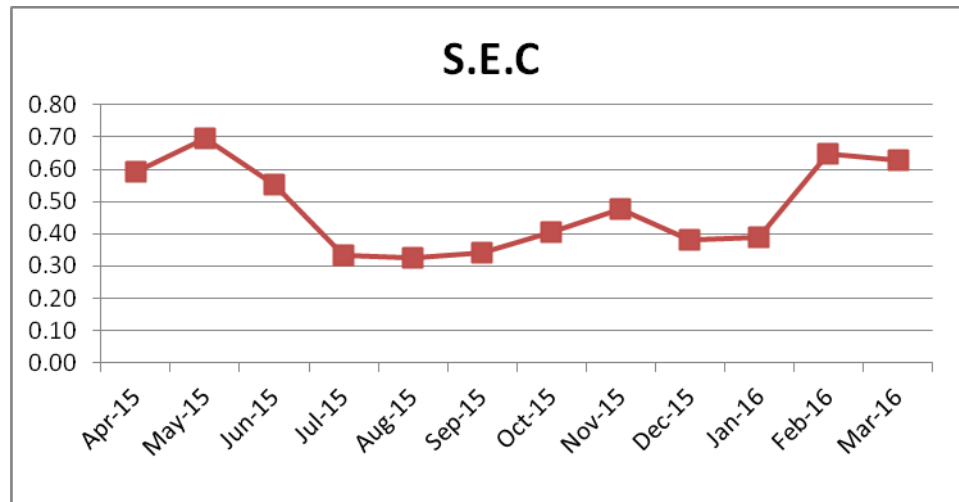
S.No	Month & Year	Production(KG)
1	Apr-15	87874
2	May-15	67140
3	Jun-15	100820
4	Jul-15	248260
5	Aug-15	261323
6	Sep-15	247576
7	Oct-15	202660
8	Nov-15	115409
9	Dec-15	226416
10	Jan-16	204894
11	Feb-16	67860
12	Mar-16	86488
		<b>1916720</b>

**Specific Energy Consumption:**

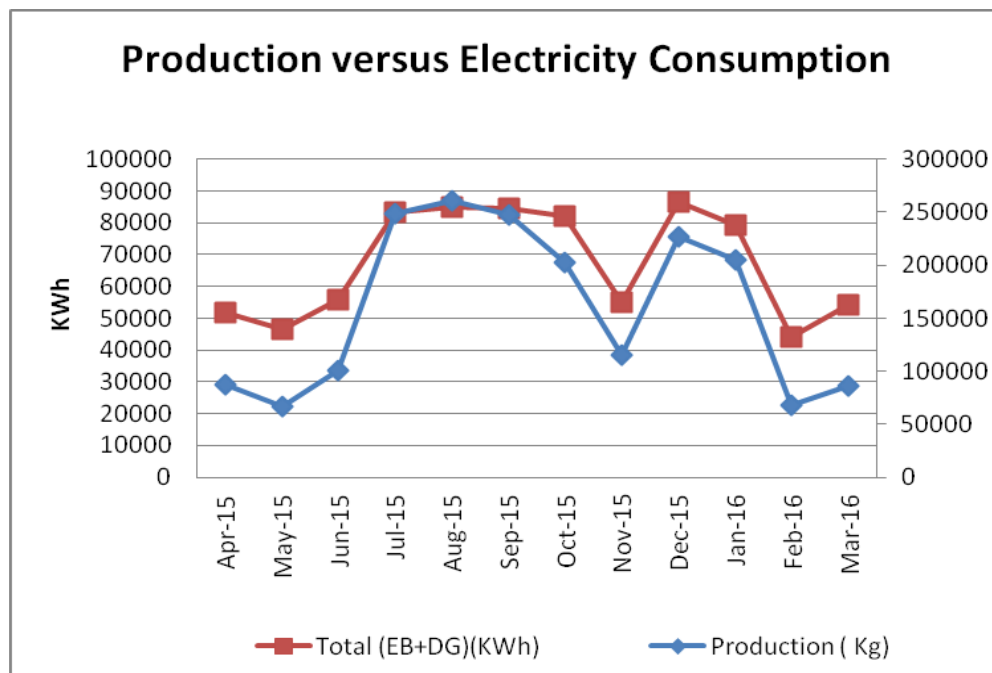
The specific energy consumption unit range from 0.32 kWh/kg of the product to 0.69 kWh/kg of the product.

S.No	Month & Year	Production ( Kg)	Total (EB+DG)(KWh)	S.E.C(KWh/Kg)
1	Apr-15	87874	51852	0.59
2	May-15	67140	46633	0.69
3	Jun-15	100820	55849	0.55
4	Jul-15	248260	83121	0.33
5	Aug-15	261323	84800	0.32
6	Sep-15	247576	84441	0.34
7	Oct-15	202660	82269	0.41
8	Nov-15	115409	55094	0.48
9	Dec-15	226416	86383	0.38
10	Jan-16	204894	79371	0.39
11	Feb-16	67860	43973	0.65
12	Mar-16	86488	54344	0.63
		<b>1916720</b>	<b>808130</b>	<b>0.48</b>

### Monthly Specific Energy consumption Variation for the year 2015-16

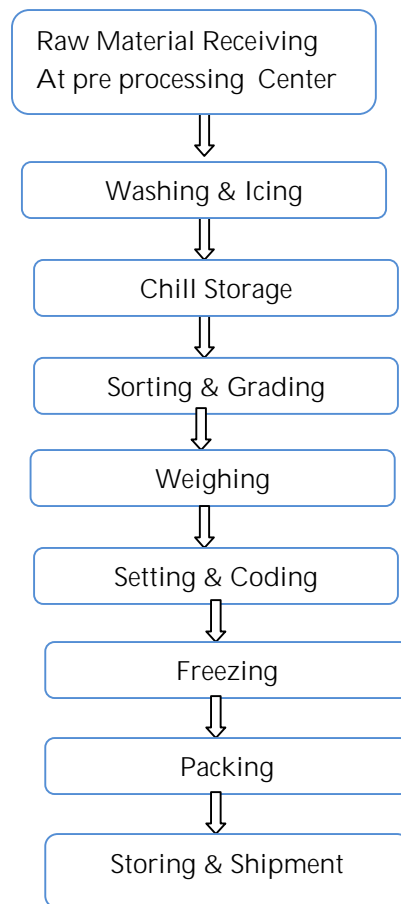


### Monthly Variation in Production versus Electricity Consumption for the year 2015-16



## 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.

Premier 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 4 compressors installed in Premier Sea foods to meet the cooling load requirements.

S.No	Description	Design	Measured				
		Rating(HP)	V	A	KW	P.F	KVA
1	Compressor-1	125	428	132	95	.98	98
2	Compressor-2	40	430	50.4	26.8	0.71	38
3	Compressor-3	75	Not working				
4	Compressor-4	100	Not working				

By the time of audit only one blast and one plate freezers are 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**

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

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

There are 1 Evapco condenser and one water cooled condensers are installed Premier. Out of which 125 HP+75HP compressor are connected with EVAPCO system and 100HP+40HP compressors connected with water cooled condenser, based on heat load units will come in to active mode automatically.

Performance evaluation EVAPCO condenser System

	Unit-1
Mass flow Rate of cooling water M3/h	35240
inlet air temp deg C	32.8
Outlet air temp deg C	35.2
Inlet air Humidity %	65
Out let air Humidity %	89
Inlet air enthalpy KJ/KG	86
Outlet air temp KJ/KG	117
Specific heat of air kg/m3 deg C	1.23
Condenser-Heat Rejected (TR)-Measured	106
Compressor (KW)-measured	95
Evaporator (TR)-Measured	79

100HP+40HP compressors connected with water cooled condenser , by the time of audit only 40 HP compressor running. Water Cooled condenser performance evaluation

Mass flow Rate of cooling water kg/h	26460
Cooling water inlet temp deg C	36.5
Cooling water outlet temp deg C	34
Specific heat of water Kcal/kg deg C	1
Condenser-Heat Rejected (TR)-Measured	22
Compressor (KW)-measured	26.8
Evaporator (TR)-Measured	14

**Cold storage :**

After packing frozen material product will keep in cold storages at -18deg C temperature . Premier Sea foods is having one cold storages to keep products in required temperatures Premier sea foods not using any separate systems for cold storages and they are using same refrigerator compressors for cold storage also.

Power Measurement details of ante rooms are given below:

S.No	Cold store	Unit no's	Power Measurement details				
			V	A	KW	P.F	KVA
1	Ante room	unit-1	417	10.5	7.6	0.88	8.6
2	Ante room	Unit-2	415	10	7.2	0.93	7.7



Performance evolution of ante room FCU's are given below:

S.No.	DESCRIPTION	Ante room	
		Unit-1	Unit-2
1	Air density(Kg/m3)	1.29	1.29
2	Air flow(m3/h)	5579	5619
3	Supply air temp deg C	15	16
4	Return air temp deg C	18	18
5	TR	5.24	6.23
6	KW	7.57	7.18
7	KW/TR	1.45	1.15
8	COP	2.43	3.05

From the above table we can observe that Net refrigeration capacity of the AC system varies from 5.24 and 6.23 TR. Also the range in kW/ TR is 1.45 & 1.15 .

## 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 4 compressors with different ratings details are given below:

S.No	Description	Rating(HP)
1	Compressor-1	75
2	Compressor-2	40
3	Compressor-3	100
4	Compressor-4	125

#### Observation

- The specific energy consumption of reciprocating compressor is varying from 1.5 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 25 Lakhs.

**Payback:**

Payback period will be in between 1.5 to 2 years.

In general 2 compressors are running to meet cooling requirement , 100HP compressor is having VFD it is suggested to replace all reciprocating compressor with screw compressors and install VFD's for remaining all compressors , calculation has been mentioned below:

S. No.	Particulars	Units	Value	Value	Value	Value
1	Capacity of the reciprocating compressor	kW	30	56	75	93
2	Number of compressors	no's	1	1	1	1
3	Actual power consumption of 4 compressors	kW	254			
4	Expected power consumption by screw compressor with VFD(@15% saving)	KW	216			
5	Savings in kW	kW	38			
6	Operating hours	hours	18			
7	Savings in kWh per annum	kWh/Annum	249962			
8	Savings in Rs	Rs	1609757			
9	Investment	Rs	2536400			
10	Payback	Years	1.58			

## 2. Replacement of water cooled condenser with Evaporative condensers

### Present status:

At the time of audit, it is observed that unit is using water cooled condenser.

### 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 10 Lakhs.

### Payback:

Payback period will be in between 1 to 2 years.

The energy saving calculation for condensers has been mentioned below :

S. No.	Particulars	Units	Value
1	Capacity of the water cooled condenser	Ton	100
2	Present S.E.C kW/TR with water cooled condenser(avg)	KW/TR	1.5
3	Expected Savings in S.E.C kW/TR with Evapco system	KW/TR	0.2
4	Energy savings	KW	20
5	Savings in kWh/Annum	kWh/Annum	131400
6	Saving in Rs/Annum	Rs	827820
7	Investment	Rs	1000000
8	Payback	Years	1.21

### 3.Replacement of existing V-Belt drive with synthetic Energy Efficient S.P.C saver belt in the compressor motor

#### Present status:

compressor motors are connected with compressor through V Belt drive. Compressors are most energy consumer of sea food processing unit and the operating time of the compressors are varying from 15 to 18 hours per day.

#### Observation:

- Use of V belt causes some energy losses. There are power transmission losses of about 5-7%.
- The latest trend in the industry is to replace the V Belt drive with S.P.C saver belt and these belts have the following advantages:
  - i. Non-hygroscopic - prevents elongation due to moisture absorption
  - ii. Ensures better grip on the pulley

#### Recommendation:

- It is recommended to replace the V belts with flat belt in order to reduce power transmission losses and this will result in considerable amount of energy savings.
- The energy saving calculation for 4 number of compressors which is operating with V belt drive has been mentioned below as a sample calculation:

S. No.	Particulars	Units	Value
1	Total Capacity of the motors	kW	253
	Actual power consumption with V belt	kW	190
3	Projected consumption with flat belt	kWh	171
	Savings in kWh	kWh	19
5	Total No. of compressors	Nos	4
	Operating hours	hours	12
7	Savings in kWh per annum	kWh/Annum	83110.5
	Savings in Rs	Rs	523596
9	Investment	Rs	180000
	Payback	Years	0.34

#### 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 3 Lakhs.

##### Payback:

Payback period will be in around 1.5 year.

S. No.	Particulars	Units	Value
1	Capacity of the Present reciprocating compressors	kW	242
2	Number of compressors	no's	3
3	Expected power consumption by installation of Thermoshipon system (@2% saving)	KW	4.84
4	Operating hours	hours	18
5	Savings in kWh per annum	kWh/Annum	31798.8
6	Savings in Rs	Rs	200332
7	Investment	Rs	300000
8	Payback	Years	1.50

## 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 6 Lakhs.

### Payback:

Payback period will be in around 1.5 year.

S. No.	Particulars	Units	Value
1	Capacity of the Present reciprocating compressors	kW	242
2	Number of compressors	no's	3
3	Expected power consumption by installation of PLC based automatic system (@5% saving)	KW	12.1
4	Operating hours	hours	18
5	Savings in kWh per annum	kWh/Annum	79497
6	Savings in Rs	Rs	500831
7	Investment	Rs	600000
8	Payback	Years	1.20



## Identified Energy Saving Proposals:

### 1. Correction of automatic power factor controller

#### Observation:

It is observed that the power factor of the plant is varying from 0.89 to 0.98 . Automatic power factor controller installed to maintain the power factor close to unity. but in APFC panel is not working effectively as installed capacitors may be De-rated an programming need to change.

Working of Automatic power factor controller:

Automatic power factor controller has microcontroller based programmable controller which switches the capacitor bank of suitable capacity automatically in multiple stages by directly reading the reactive load of the plant.

#### Recommendation:

It is recommended to correct the installed automatic power factor controller (replacement of faulty capacitors an need to correct the controller ) in the plant in order to improve the power factor close to unity that will result in considerable amount of energy savings. Kerala State Electricity board power factor improvement policy is given below:

Power Factor Range	Incentives
0.90 to 1.00	0.15 % of energy charges for each 0.01 unit increase in power factor from 0.9 p.f

Power Factor Range	Penalty
For power factor below 0.90	1% energy charge for every 0.01 fall from 0.90 p.f

The quantification of energy saving by sample calculation method has been tabulated as below:

S. No.	Particulars	Units	Value
1	Average Monthly energy charges	Rs	64882
2	Avg power factor of the plant	PF	0.936
3	Desired power factor of the plant	PF	0.999
4	Required KVAR	kVAR	175
5	Actual Apparent power of the plant	kVA	237
6	Apparent power after improvement of power factor	kVA	222
7	Savings in kVA	kVA	15

S. No.	Particulars	Units	Value
8	Savings in Rs/Month	Rs	4444
9	Savings in Rs/ Annum	Rs	53324
10	Savings in Amount as a power factor Incentives Rs/Month	Rs	61
11	Savings in Rs/ Annum	Rs	730
12	Total cost Savings	Rs	54054
13	Investment	Rs	105000
14	Payback	Years	1.94

## 2. Proper insulation of identified insulation damaged areas.

### Present status:

- Most of the units have poor insulation for the ammonia lines leading to large exposed areas and ice accumulation.
- Exposed ammonia lines absorb significant amount of thermal energy thereby reducing the evaporative capacity within the freezer.

### Observation:

- The average surface temperature were 4-5 °C higher than the insulated area of the ammonia lines

### Recommendation:

- By providing complete and proper insulation, thermal energy transgression across exposed surface can be cut off.
- Need to Survey entire refrigeration line frequently for identification of any exposed areas or Insulation damage areas

### Savings percentage:

Approximately 1-2% of energy can be achieved.

### Investment:

Nominal amount

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

1. Replacement of reciprocating compressor with screw compressor with VFD
2. Replacement of water cooled condenser with Evaporative condensers
3. Replacement of existing V-Belt drive with synthetic Energy Efficient S.P.C saver belt/flat belt in the compressor motor
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 Lac from BEE

The summary of the savings plans are are below:

S.No	Recommendation	Investment in Rs	Eligible Subsidiary amount in Rs
1	Replacement of reciprocating compressor with Screw compressor with VFD	2536400	1000000
2	Replacement of water cooled condenser with Evaporative condensers	1000000	
3	Replacement of existing V-Belt drive with synthetic Energy Efficient S.P.C saver belt/ flat belt drive in the compressor motor	180000	
4	Installation of THERMOSHIPON SYSTEM (GAS COOLING) for Compressor.	400000	
5	Automation of refrigeration plant by using PLC controller	800000	

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

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

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



South Asia

Kochi 5 Ph: +91 (484) 2231844	Friends' Park Society, Senapati Bapat Road ,Pune – 411016 India
<b>ACS Refrigeration</b> 272/5, Sangam Apartments, Belly Area, Anna Nagar west., Chennai – 600040. Tamil Nadu, India. Mob No:- 09840818637, Tele Fax:: 044-42026477 Email : <a href="mailto:sales@acsref.com">sales@acsref.com</a>	

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.