

ORDNANCE EQUIPMENT FACTORY

Phoolbagh, Kanpur (Uttar Pradesh)

Unit Profile

Ordnance Equipment Factory, Kanpur (OEFK) an ISO 9001-2008 & ISO 14001-2004, EnMS ISO:- 50001,2011 certified unit of Ordnance Factory Board, Kolkata under Department of Defence Production, Ministry of Defence, Government of India . This is prime military equipment manufacturing factory, established in the year 1859. This unit was established for manufacturing of troop comfort equipments required for Defence Forces. The quality excellence of the organization has been recognised at various platforms such as:

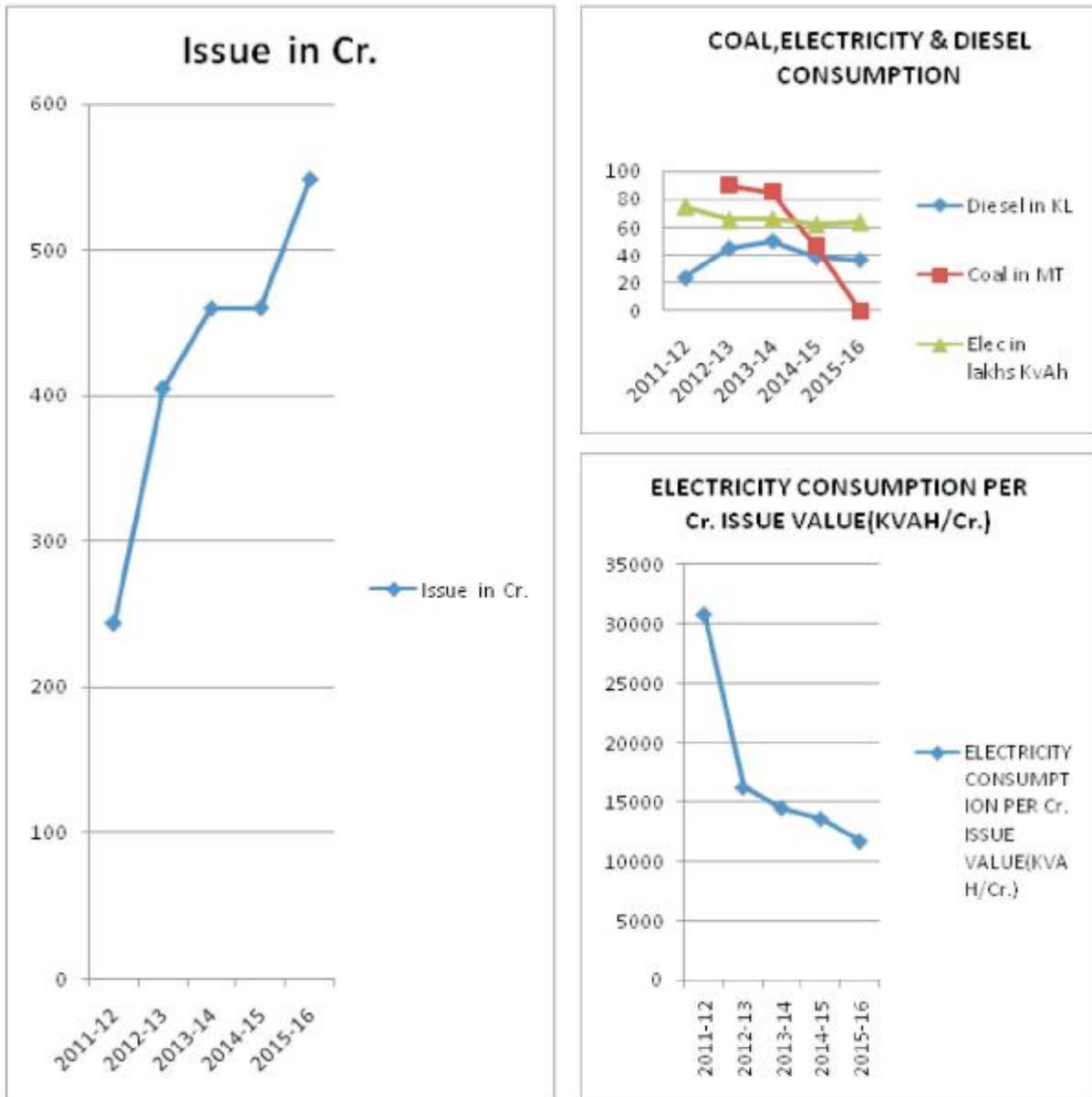
- Golden Peacock National Quality Award-1998.
- Raksha Mantri's Award for Excellence -2013-14.

Ordnance Equipment Factory, Kanpur (OEFK), has production facilities for three distinct technologies:- (a) Leather Technology (b) Clothing Technology and (c) Engg. Technology with turnover of about 550 Crores in 2015-16 and targetting 700 Crores in 2016-17.

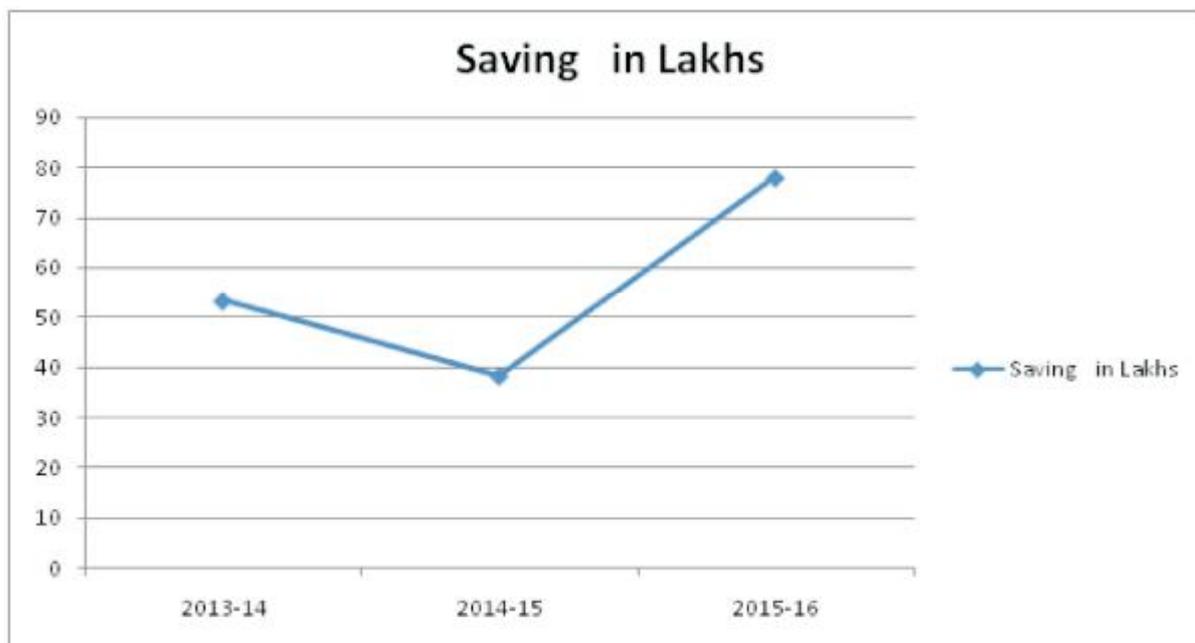


Energy consumption:

Production Issue (Cr.) Vs Rate of electricity consumption & Coal, electricity & diesel consumption representation.



Energy saving at OEFC



- 01 No-650KVAR & 2No. -100 KVAR Automatic Power factor Control Capacitor panels installed at main substation of OEFC in year 2015.**
(P.F improved up to 0.98 and saved energy consumption of factory).
- Old ceiling fan replaced by low energy consumption fans**
(old Fans of 160 watt. replaced by new fans of 60 watt. and saved the energy shown in units).

2014-15

Qty.	Watt.	Qty. (X) Watt.	Hrs	Watt. (X) Hours	Kwh (unit)	Saving/ Day (Units)	Saving/ Month (units)	Saving/ Year (units)
150	160	24000	10	240000	240		4500	54000
150	60	9000	10	90000	90	150		

2015-16

Qty.	Watt.	Qty. (X) Watt.	Hrs	Watt. (X) Hours	Kwh (unit)	Saving/ Day (Units)	Saving/ Month (units)	Saving/ Year (units)
360	160	57600	10	576000	576		10800	129600
360	60	21600	10	216000	216	360		

3. Old GLS bulbs replaced by low energy consumption CFLs.

2014-15

Qty.	Watt.	Qty. (X) Watt.	Hrs	Watt. (X) Hours	Kwh (unit)	Saving / Day (Units)	Saving / Month (units)	Saving / Year (units)
1000	100	100000	10	1000000	1000		25500	306000
1000	15	15000	10	150000	150	850		

2015-16

Qty.	Watt.	Qty. (X) Watt.	Hrs	Watt. (X) Hours	Kwh (unit)	Saving / Day (Units)	Saving / Month (units)	Saving / Year (units)
1500	100	150000	10	1500000	1500		38250	459000
1500	15	22500	10	225000	225	1275		

CFL TO LED

2015-16

Qty.	Watt.	Qty. (X) Watt.	Hrs	Watt. (X) Hours	Kwh (unit)	Saving / Day (Units)	Saving / Month (units)	Saving / Year (units)
200	15	3000	10	30000	30		360	4320
200	9	1800	10	18000	18	12		

4. Old FTL replaced by low energy consumption FTLs .

2014-15

Qty.	Watt.	Qty. (X) Watt.	Hrs	Watt. (X) Hours	Kwh (unit)	Saving / Day (Units)	Saving / Month (units)	Saving / Year (units)
2200	40	88000	10	880000	880		2640	31680
2200	36	79200	10	792000	792	88		

2015-16

Qty.	Watt.	Qty. (X) Watt.	Hrs	Watt. (X) Hours	Kwh (unit)	Saving / Day (Units)	Saving / Month (units)	Saving / Year (units)
7980	40	319200	10	3192000	3192		9576	114912
7980	36	287280	10	2872800	2872.8	319.2		

Qty.	Watt.	Qty. (X) Watt.	Hrs	Watt. (X) Hours	Kwh (unit)	Saving / Day (Units)	Saving / Month (units)	Saving / Year (units)
400	40	16000	10	160000	160		1440	17280
400	28	11200	10	112000	112	48		

5. More than 100 desert coolers replaced with centralized cooling plant. (**Saved the wastage of the running water with centralized arrangement**).
6. Energy saving awareness stickers pasted in production shops "**SWITCH OFF ELECTRICAL APPLIANCES AS LIGHT, FAN AND AC WHEN NOT IN USE**".
7. OEF has replaced old Furnaces with PLC/PID based energy efficient furnaces, Old Boilers with new PID/PLC controlled Thermo pack , Variable Frequency Drives for electrical motors of various capacity 0.75HP to 30 HP .
8. OEFC is maintaining power factor up to **0.98/0.99**.
9. Exhaust fans are replaced with Mechanical Turbo Ventilator.

ORDNANCE FACTORY DEHRADUN

(Uttarakhand)

Unit Profile

OFD Established on Sixteenth February One Thousand Nine Hundred Forty-Three (16-02-1943). During the year 1941, the Mathematical Instrument Office, 15, Wood Street, Calcutta was taken over the department of supply Munition Branch from the Supply Department and simultaneously the planning of this factory was started under project E.E. 20 with (Late) Mr. R.C. Malcolam, Superintendent, Mathematical Instrument office, as In-charge of planning. Originally, it was proposed that this new Instrument Factory be constructed at Tollygung at estimated cost of Rs. 31.22 Lakhs but owing to the capture of Burma by Japan and bombing of Calcutta, this proposal had to be abandoned and Dehradun was finally chosen as the site of factory. Government of India sanctioned as estimated amount of Rs. 68.90 lakhs under project T.P.B.

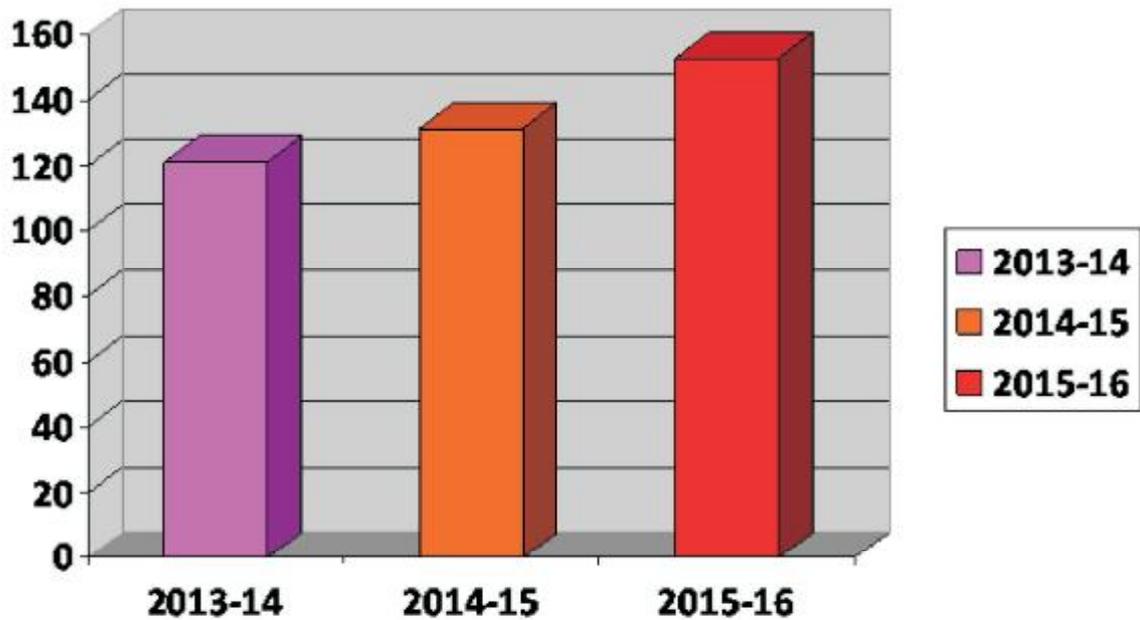
The construction of the factory commenced in December'1942 and was completed in 1943. The factory went into production in October, 1943.

Ordnance Factory Dehradun (OFD) has been the leading supplier of a wide variety of Optical, Opto-mechanical and Passive Night vision devices and weapon sights for infantry and artillery wings of Indian Armed Forces, Central Para Military Forces and State Police Organisations.



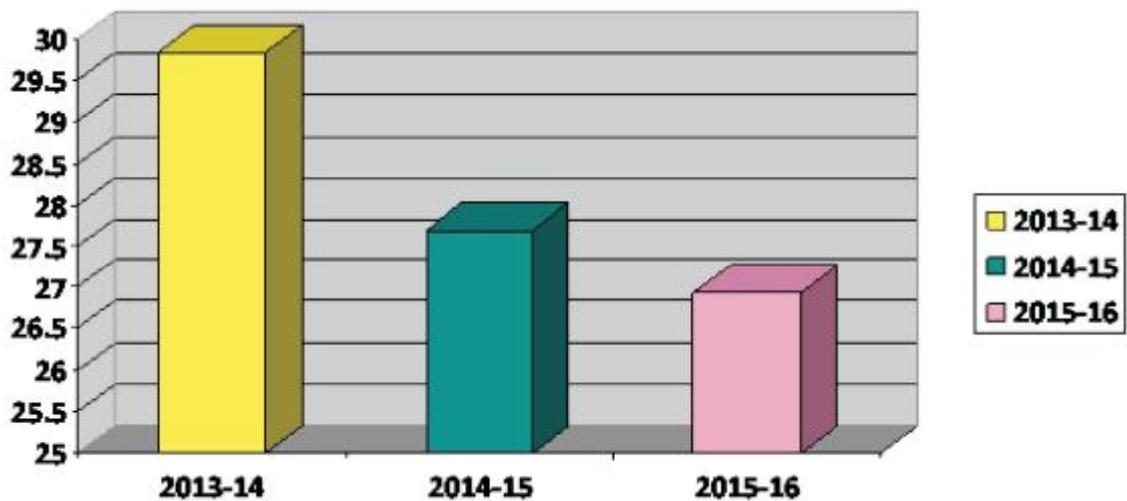
Value of Issue during Last Three Years (In Cr.):

Years	2013-14	2014-15	2015-16
Total (Rs in Crs.)	120.77	131.17	152.81



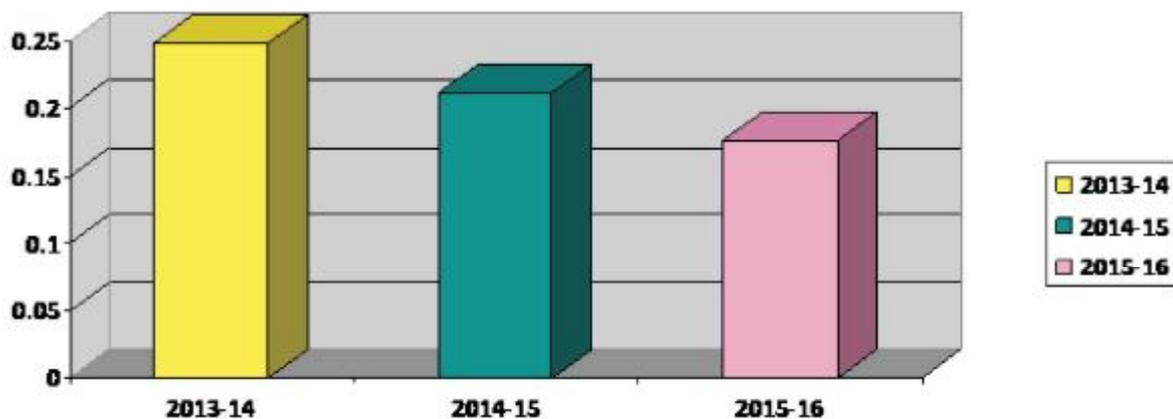
Electrical Energy Consumption of last Three Years (In Lac -Units):

Years	2013-14	2014-15	2015-16
Total Electrical Energy consumption	29.83	27.70	26.94



Specific Electrical Energy Consumption (Lac-Unit / VOI in Cr. Rs):

Years	2013-14	2014-15	2015-16
Total Electrical Energy consumption	0.248	0.212	0.176



Energy Policy:

ORDNANCE FACTORY DEHRADUN is committed to demonstrate excellence in Energy Performance in all our activities on a continual basis so as to make our operations environmentally sustainable for future.

We shall achieve this by:

- Monitoring and control of energy consumption through effective energy management system and periodic energy audit.
- Continuous up-gradation of process with energy efficient and eco friendly & economically viable technology to optimize energy consumption.
- Promote and propagation of energy awareness among all employee through external and in-house training program.
- Recognizing efforts of our employees in energy conservation initiatives.
- Benchmarking our performance with best and striving to beat the best.
- Commitment to ensure the availability of information and of necessary resources to achieve objective and targets.
- Commitment to comply with applicable legal requirements and other requirements and other requirements to which the organization subscribes related to its energy use, consumption and efficiency.

**MACHINE TOOL PROTOTYPE FACTORY
AMBARNATH (W)
Dist. Thane, (Maharashtra)**

Unit Profile

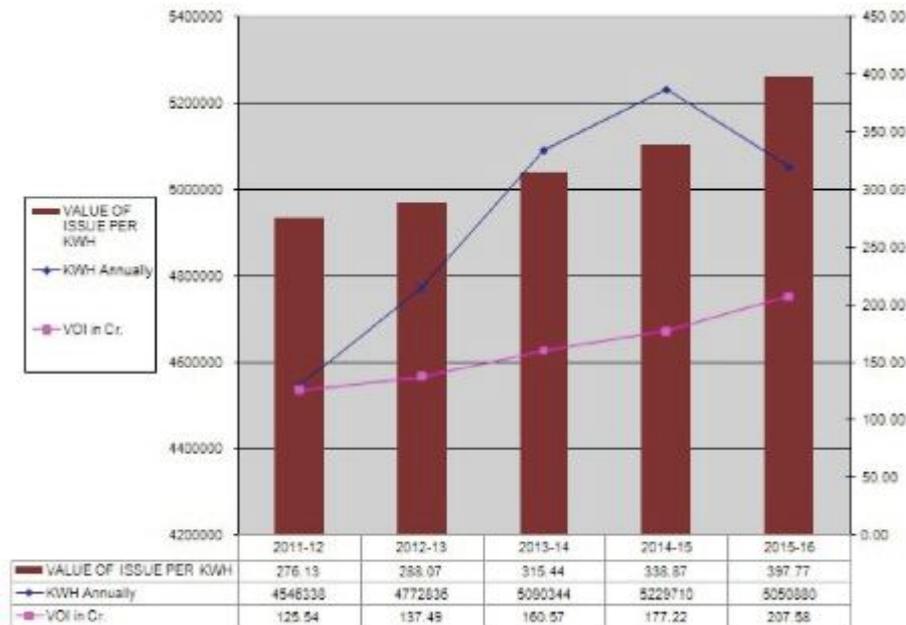
Machine Tool Prototype Factory (MPF) is situated at Ambarnath which is 65 Kms. from Mumbai. The factory was inaugurated on 13th January, 1953 by Late Pandit Jawaharlal Nehru, the First Prime Minister of India. The factory was installed in Collaboration with Ms Oerlikon Machine Tool Works, Switzerland.

The factory was installed with the primary objective of Design, Development and manufacture of prototypes of Machine Tools. The requirement of trained personnel for manning such a factory was conceived as an important input and accordingly, Artisan Training School (ATS) was set up in 1950 itself which is prior to the establishment of this factory. Consequently, this had provided the skilled manpower input and had proved to be the strength of the factory.



The Quality system of MPF is certified by IS/ISO-9001: 2008 & IS/ISO 14001:2004(For Environment Management System), MPF has a NABL Accredited Laboratory. MPF strives to keep the quality standards at optimum levels with a target of Zero Rejection.

Energy Consumption:



Comparison of Value of issue with Power consumption.

Electrical Energy Consumption

YEAR	ELECTRICAL CONSUMPTION KWH	VOI RUPEES	SP.ENERGY CONSUMPTION VOI/KWH
2014-15	5229710	177.22 Cr.	Rs. 338.87

YEAR	ELECTRICAL CONSUMPTION KWH	VOI RUPEES	SP.ENERGY CONSUMPTION VOI/KWH
2015-16	5050880	207.58 Cr	Rs. 397.77

DIESEL CONSUMPTION

YEAR	DIESEL CONSUMPTION LITRES	VOI RUPEES	SP.ENERGY CONSUMPTION VOI/LITRE
2014-15	14910 LITRES	177.22 Cr.	Rs. 118859.8

YEAR	DIESEL CONSUMPTION LITRES	VOI RUPEES	SP.ENERGY CONSUMPTION VOI/LITRE
2015-16	13467	207.58 Cr	Rs. 131595.8

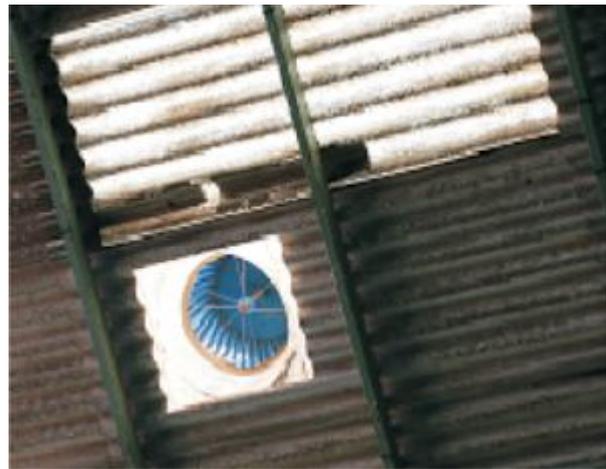
Projects Implemented towards Energy Conservation:

Project: 1 Production Planning in Energy Efficient SQF Furnace.

Total Hardening Load of 81mm Bomb Body has been Shifted from 90KW Fluidized Bed Furnace to 40KW Sealed Quench Furnace. Thereby a Total amount of 65% energy saving achieved. The lot size was 42 pc per lot and a cycle time of 2 Hours was required for the hardening process, in Sealed Quench Furnace the lot size was increased to 66 pc per lot and the cycle time reduced to 1 hour 45 minutes. Thereby a saving of 65 % energy achieved.

Project : 2

145 Nos. Wind Roof Ventilators installed in Main Work Shop and as a Result 8 Nos. of Conventional Exhaust Fans of 400 Watts each were Put off (taken out of service). 36 Nos. of Wind Roof Ventilators installed in Heat Treatment Shop and as a result 27 Nos. of Conventional Exhaust Fans of 400 Watts each were put off (taken out of service). Thereby saving Electrical Energy Completely.



Project: 3

Replacement of 110 Nos. 3 Phase 500 Watts Man Coolers with Energy Efficient 1 Phase Pedestal Fans was undertaken and successfully installed in Shop Floor, Thereby Saving Electrical Energy.



Energy Efficient Fans

PROJECT: 4

Replacement of all the Incandescent Machine Lamps of 60 Watts with 15 Watts CFL Lamps and thereby attained a saving of 75% Electrical Energy.



Project: 5

Replacement of old static Condensor banks with Automatic Power Factor Control Panels 8 Nos. has drastically improved power factor.



155 KVAR Static Condensor Bank with switch in OFF Condition

Project: 6

3 Nos. of 500 KVA Conventional Oil Cooled Transformers Replaced with Cast Resin Dry Type Transformers, thereby saving Mineral Insulating Oil.



Project: 7

The 80 Watts 5 Feet T/L Fitting Installed in Passage / Staircase/ Bathroom have been replaced with CFL of 20 Watts Lamps and thereby Saving to the Tune of 75% Electrical Energy is achieved. And also Action was initiated to Replace Conventional Copper Choke Fluorescent T/L Fittings with Electronic Chokes. And there by Saving Electrical Energy Loss in Chokes Completely. 150 Nos of 20watts CFL replaced with Energy efficient 7 Watts LED lamps.



Project: 8

Natural sunlight is used in Workshops by inserting Transparent Sheets in place of Asbestos Sheets, this resulted in power savings in lighting load.



MPF is committed to Energy Conservation and systematic management of available resources. MPF is in the process of obtaining ISO 50001: 2011 very shortly.

ORDNANCE FACTORY DUM DUM

Kolkata (West Bengal)

Unit Profile

Ordnance Factory Dum Dum is engaged in production of precision engineering components, polymer based components and fabrication based assemblies for Army, Air Force, Navy, Sister Factories and other Defence Departments.

OFDC has ISO 9000 -2008 and ISO 14001-2004 (EMS), ISO 50001- 2011 (EnMS) certification. The OFDC has also been awarded certificate for ISO 18001-2007 (OHEMS).

In November 1841 , the First Horse Artillery of British India Army under the command of General George Pollock made a heroic appearance at Jalalabad and Kabul in Afghanistan after a disastrous imperial campaign. The surviving forces of that fruitless campaign erected a memorial in the memory of their dead fellows . This monument stands at the East side of the Factory even today, known as the Afghan Monument. Following the defeat in Afgan war, the British East India Company decided to start an Ammunition Factory for the first time in India (1846). Ordnance Factory Dum Dum is that particular site which was set up as first Ammunition Factory in British India in 1846.

From the pioneering effort in the manufacture of ammunition items in India, Ordnance Factory Dum Dum, then known as Ammunition Factory soon started manufacturing cartridges . Subsequent campaigns of the British Army in Afghanistan led to the manufacture of bullets, known as DUM DUM Bullets. The name "DUM DUM " became famous world wide for those bullets. It was triggered of at our first war of Independence. As per need of the war, Dum Dum Factory manufactured "Dum Dum Bullets" which were used in Afgan War .The then British Queen honoured Bertie Clyde, the then superintendent with OBE (Order of the British Empire) for that innovation. The rumor regarding controversial manufacturing of cartridges (greased with fat of pig and cow) spread discontentment among Hindus and Muslims. Due to that increasing communal unrest, Mangal Pandey exhorted his fellow soldiers to rise in revolt against the British Rule on March 29, 1857.

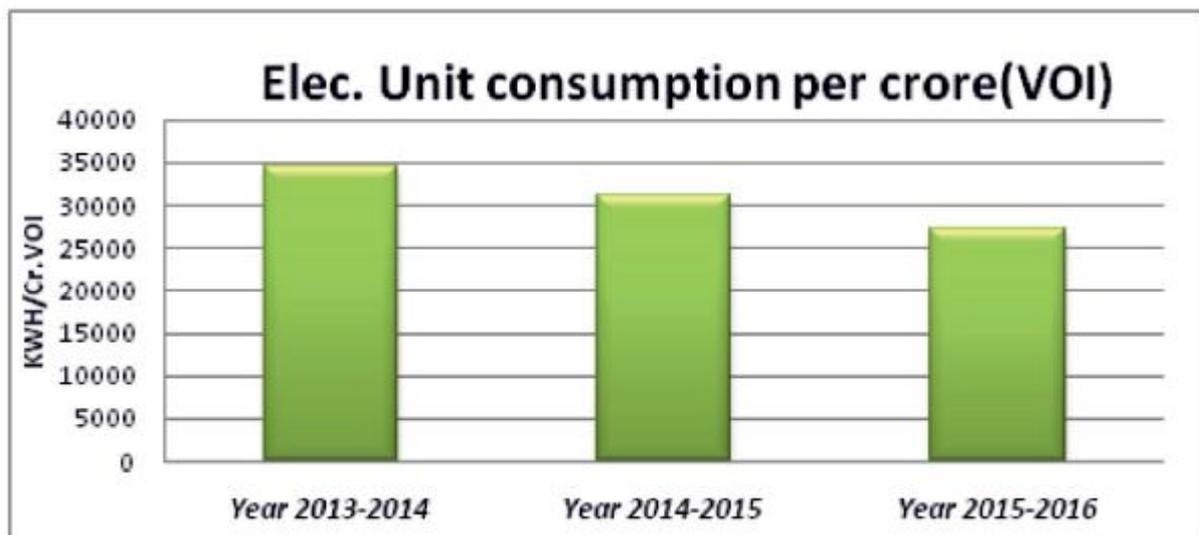
ENERGY PERFORMANCE INDICATOR

As OFDC is manufacturing variety of products, It was decided that KWh consumed per crore of VOI (Value of Issue) performance indicators will permit proper understanding at unit level.

Energy Consumption:

Contract Demand – 1700 KVA

YEAR	YEARLY CONSUMPTION (IN KWH)	VOI (IN CRORE)	Consumption / VOI (KWH / CRORE)
2013-2014	4123544	119.43	34526.8693
2014-2015	4071228	130.70	31149.411
2015-2016	4059144	149.53	27146.02



Energy Conservation Program at OFDC

Electrical energy is the major energy consumed at OFDC for Lighting, Ventilation, Heating, Producing Compressed Air and running machinery by motors. Energy conservation programme is centred on each of these consumption centres.

LIGHT PIPE - In the past ,OFDC has already installed 150 Nos. of Light pipes successfully at 7 location production buildings . Further , light pipe installation has been planned to cover all remaining shop floor by installing 68 light pipes . For this, action is in progress to procure and install the light pipes. By which reduction of 65000 KWHrs will be achieved. Directly expected saving of revenue will be Rs.4.20 Lakhs Per annum.



- 1. REDUCTION OF CONSUMPTION IN LIGHTING** :- OFDC has initiated action for replacement of 90 Watts Street lights 245 Nos by 45 watt LED street lights within plant and residential sites.
- 2. LED LIGHT** :- These are being installed in all machine lamps and offices where solar pipes installation is not feasible.
- 3. ENERGY EFFICIENT MOTORS** :- Most of the machines are of old vintage. Survey for replacement of old motors and practical issues are being tied up.
- 4. AIR TURBINE VENTILATORS** :- 48 Nos have been installed in production shops in replacement of exhaust fans.



6. **VARIABLE FREQUENCY DRIVES** :- are planned for installation on axial flow fans, pumps and compressors.
7. **MANUFACTURING PROCESS REENGINEERING** :- Old Phosphating plant system now has been dismantled and Automatic Phosphating Plant system has been installed successfully.
8. **LOAD END CAPACITATORS** :- Unit got very good benefits by installing load end capacitors in plant this scheme is being extended to estate and pump houses.



PARAMETERS :

1. **IMPROVING MAINTENANCE PRACTICES** :- Ultrasonic monitoring of airlines, infra red monitoring of panels and electrical installations and Vibration Monitoring of machines is carried out as standard practice. This has given very significant improvement.
2. **LOAD MANAGEMENT:** - OFDC is already touching its contract demand. Its location is in highly populated area. In order to manage growth and introduce

new technology additional power requirement is must. Increase in contract demand has been requested from utility, but for practical reasons it is going to take long time. So to manage growth OFDC is using better load management concepts and planned to introduce demand controllers and use diversified operation. **WORKERS AWARENESS** is a tool deployed for this purpose. Workers are also encouraged to take up high energy demanding work during lean hours. After making a constant dialogue and explaining them the necessity and advantages initial resistance to change evaporated and they readily agreed to change the timing for furnaces and major energy consuming operations.

3. DISTRIBUTED COMPRESSORS: - Central compressors are of very high capacity and these are required to be run in the night shifts and link shifts to permit operation. Distributed small compressors 8 Nos have been installed to provide support substantially conserving energy. Further 6 Nos of small stand alone units are under planning for future conservation of energy.

4. SOLAR ROOF TOP GRID CONNECTED POWER SYSTEM :-150 KW system is planned in first phase based on available roof space for installation .

5. BIO GASIFICATION :- OFDC is a full of plantation and is having 377 residential quarters and 45 acre land. Waste Management has been introduced in the estate, installation of Bio Gasification plant is planned by introducing energy harvesting concepts. Burning of dry leaves and waste has been stopped.

FUEL CONSERVATION

Boilers were completely shut down giving total relief to environment, steam generation was stopped and electrical direct heating was used for chemical tanks.

Energy Policy

We, at Ordnance Factory Dum Dum, engaged in manufacturing Defence Products, are committed to continual improvement in energy efficiency in all areas of our operation.

To achieve this we shall, in particular,

- 01) Have in place an Energy Management System.
- 02) Comply with applicable legal and other requirements related to energy usage.
- 03) Minimize wastages through efficient use of resources.
- 04) Imbibe best practices and technology.
- 05) Ensure involvement of employees by providing training and awareness.
- 06) Ensure availability of information and of all necessary resources to achieve energy objectives and targets.
- 07) Evaluate effectiveness of the Energy Management System through regular audits and management review.
- 08) Support the purchase of energy efficient products and services and design for energy performance improvements.

ENGINE FACTORY AVADI

Chennai (Tamil Nadu)

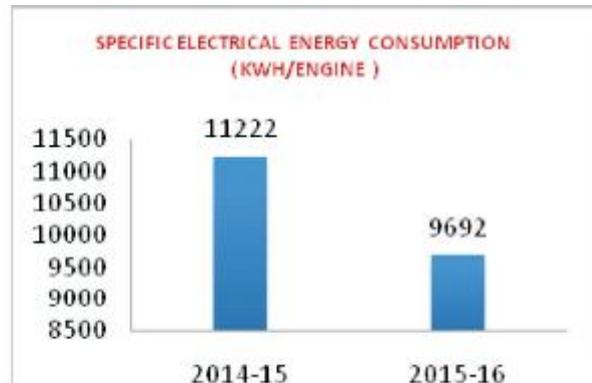
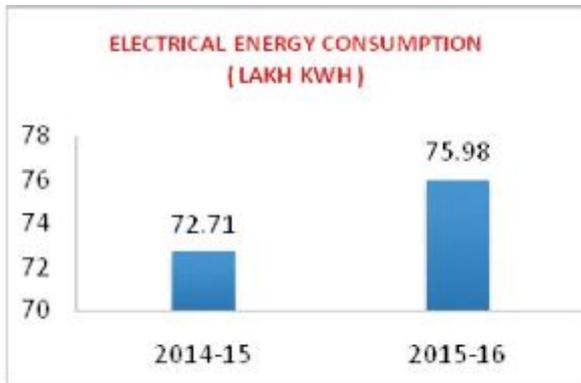
Unit Profile

Engine Factory Avadi (EFA) is one of the major defence production units under Ordnance Factory Board, Ministry of Defence. EFA was established in 1988 for the production of High Power Diesel Engines from 300 HP to 1000HP for Armoured Vehicle Fleet consisting of SARATH Tank (BMP-II), AJEYA Tank (T-72) and BHISHMA Tank (T-90S) for Mechanised Forces of Indian Army. These engines have a special feature of working on multi fuels - Petrol, Diesel and Aviation Turbine Kerosene. EFA is also engaged in the overhauling of these engines to meet the replacement requirements.

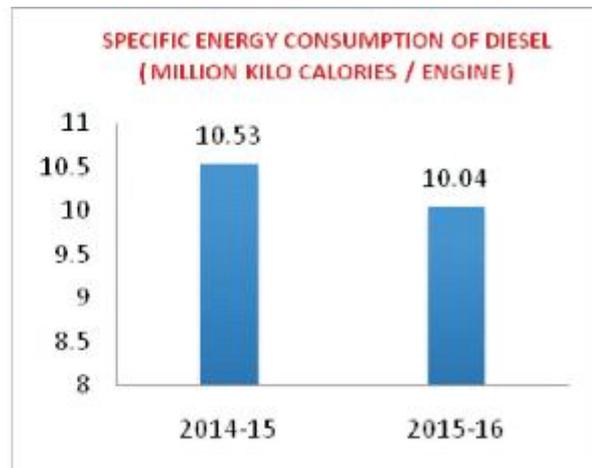
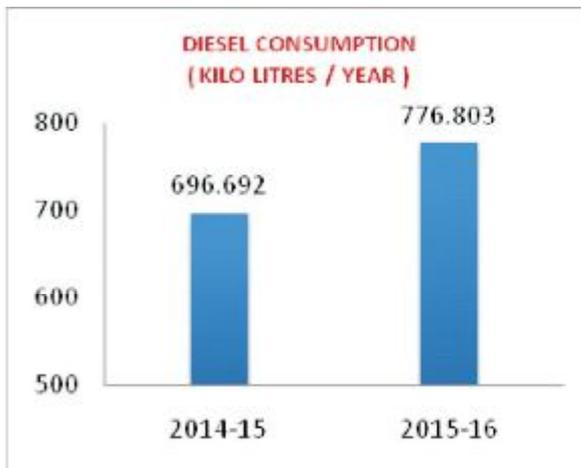
The factory is well equipped with state-of-the-art CNC machines, heat treatment facilities, sophisticated engine testing and laboratory. Manpower is well qualified and trained for manufacturing and overhauling of engines. The assembly and testing of Engines is carried out by trained technical personnel having expertise to meet the customer's requirements. Apart from regular production activities, EFA emphasizes on quality improvement, research & development, value engineering, total productive maintenance, energy conservation and automation through training, motivation, reward and recognition. Energy Conservation of traditional sources of energy - electricity, fuel, and more and more use of Solar Energy is the thrust area during last three years.



Energy Consumption



Diesel Consumption



Energy Conservative Measures taken for HTP:

1. Energy Saving Ceramic Fibre Modules:

- Energy Saving Ceramic Fibre Modules are being used in place of bricks for good insulation in all furnaces at EFA.

2. Switching on the furnaces:

- Furnaces are switched ON, when the load is ready and it is continuous.
- High temperature running furnaces ($> 800^{\circ}\text{C}$) are kept at 600°C , If there is a time delay for next charge.

3. Eliminating Heat Losses:

- Interlocks are provided in such a way that when furnace doors are closed, then only heaters get switched ON.
- Plugging of any opening in furnace.

4. Charge Weight of the Furnaces:

- For optimum utilization of energy, furnaces are being loaded with rated capacity.

5. Thyristor Based Controlling of Furnaces:

- On/off controllers will take full power in soaking period where as thyristor controllers will consume less power.
- Temperature band width is high i.e 20°C in on/off controlling and 4°C in case of thyristor controlling.
- Existing few ON/OFF controlling furnaces will be phased out by 2017-18.

6. Awareness Training:

- Employees of section are periodically trained on "Energy Savings".
- Section level "Discussions on Energy saving" is encouraged.
- Posters were displayed on energy conservation.

7. Procurement of Furnaces:

- Future requirement of all types of Furnaces and Equipment's are specified with Energy saving materials and instrumentation.

Energy Conservative Measures taken for Fms:

1. At FMS, 4 HMCs are switched on when the jobs are ready and positioned in parking stations. The 4 HMCs are monitored by a host computer. Whenever machining of the job is completed by any HMC, immediately it will be unloaded and another job from parking station gets loaded to that HMC. There by eliminating the waiting time for machining.
2. The next tool for machining purpose is placed in the ATC from the tool gantry so that HMC need not wait for the next tool and machining is continuous.

With the goal of making EFA a green factory, a number of measures have been implemented in the factory to reduce specific power consumption and to encourage more use of unconventional sources of energy like Solar Energy. The major projects are listed below:

Energy Conservative Projects Implemented

Project 1: Solar Power Plant

At EFA 100 KW Roof Top Solar Power plant grid system has been installed on the roof of Admin Block on 17th March 2016. It is generating 500 Units of electrical energy per day.

No of Solar Units of Electrical energy generation per day (Avg)	Solar Units of Electrical energy generation from 17/03/2016 to 31/03/2016	Savings (1 Unit = 7.5 ?) From 17/03/2016 to 31/03/2016
500 units	7000 Units	?52,500

**From April 2016 to October 2016: - 1, 05,000 units have been generated resulting in savings of ?7, 87,500.*



100 KW Roof Top Solar Power Plant

Project 2: Installation of LED Lights

LEDs are extremely energy efficient and consume up to 90% less power than incandescent bulbs. Since LEDs use only a fraction of the energy of an incandescent light bulb there is a dramatic decrease in power consumption. Also, money and energy is saved in maintenance and replacement costs due to long LED life span.

Challenges: At EFA, 930 number of mercury vapour lamps, 340 number of sodium vapour lamps was positioned across various shop floors and road side path ways. These bulbs which are positioned at height of 10 meters and above replaced with LED bulbs with the help of E.O.T crane, Battery operated JLC Hydraulic Boom and EFA skilled manpower by following due safety precautions. Apart from these, 3000 numbers of Office fluorescent tubes were also replaced with LED tubes.

Savings:

Light Description	Replaced with	Savings/Hour	Total Savings/Hour
Mercury vapour lamp Roof light - 440Watts	Led light - 100 Watts	340 Watts	930 Nos X 340 Watts = = 316.2 K Watts
Sodium vapour lamp Street Light - 170 Watts	Led street light - 65 Watts	105 Watts	340 Nos X 105 Watts = 35.7 K Watts
Tube Light - 28 Watts	Led Tube light - 18 Watts	10 Watts	3000Nos X 10 Watts = 30 K Watts



LED Lights Installation in EFA

Project 3: Optimisation of Compressor Running

Compressors in compressor house at EFA were running with full capacity irrespective of the load. Due to this, the compressors power consumption was very high. Even though auto cut off is available, 25% of the rated load power was consumed in auto mode. To avoid this wastage of power, compressors are switched on according to the load.

Challenges: During normal working hours of the factory at the end of the day, the buffer storage tanks (Air receivers) located at various shops were in empty condition. These buffer storage tanks along with the connected pipes to be filled with compressed air. For this purpose higher capacity compressor is switched on in the morning session. After complete filling of these buffer storage tanks and Air-lines, the compressor starts unloading and higher capacity compressor is switched off and lower capacity compressors are switched on and ensured that always compressor is running with loading. With this wastage of energy due to compressor running in unloading condition is saved.

Savings:

Energy Savings Before Optimisation	Energy savings after Optimisation	Savings	Total Savings in Rupees/Month
36,000 Units/Month	26,000 units/Month	10,000 units/Month	75,000/Month



Compressor room in EFA

Project 4: Three Separate Transformers for Lighting Purpose

At EFA, there are three substations. Earlier there was no separate lightening transformer and only a combined transformer for turning on the lights across EFA is available. Now each substation has been provided with one number of 250 KVA Transformer for lighting purpose. Because of introduction of separate transformer for lighting load, there is a reduction in voltage by 10 % which leads to 10% savings in power consumption for lights.

Savings:

Energy meter readings before 250 KVA Transformer	Energy meter readings after 250 KVA Transformer	Savings	Total Savings in Rupees / Month
88,606 Units / Month	83,504 units/ Month	5,102 units / Month	38,265/ month

Project 5: Renovation of Mechanical System in Test Bed

Challenges: Each engine is required to undergo various testing stages on the test bed. Because of rusting of old water pipe lines, exhaust system, obsolete tube type heat exchangers and pumps/motors, the test cells undergo frequent breakdowns. If this breakdown occurs when the engine testing is mid-way, the testing procedure of the engine is required to be carried out starting from beginning.

Thus frequent breakdowns of Test Cells results into frequent repetitions of engine testing and accordingly diesel consumption is increased.

Implementation: To prevent this breakdown, one Test Cell (No. 10), Mechanical system is renovated with energy efficient pumps and motors, tube type heat exchangers are replaced with plate type heat exchangers and all rusted pipe lines are replaced with stainless steel pipe lines.

Savings: With this renovation work test cell availability is increased. Accordingly past one year 74 engines were cleared in test cell number 10 which is 30% more as compared to other four similar test cells having 56 nos engine clearance per test cell.

Specific Energy Consumption in Million Kilo Calories / Engine Before Renovation	Specific Energy Consumption in Million Kilo Calories / Engine After Renovation	Savings in Million Kilo Calories / Engine
10.53	10.04	0.49

**Similarly E.F.A is in the process of replicating the above modernising the mechanical system in rest of the engine test cells.*

HIGH EXPLOSIVES FACTORY, KHADKI

Pune (Maharashtra)

Unit Profile

High Explosives Factory, Khadki, Pune is located on the river bank of the Mula. The factory was planned in pre-world war II for which foundation stone was laid on 11th January, 1940 by Shri G. S. BUTLER, the then Director of ORDNANCE FACTORIES and commenced production from 1942. Since then this factory has been consistently producing High Explosives such as TNT, DNT, TETRYL, HNS and Liquid Propellant required for strategic defence needs. This factory is one of the most important unit under A & E Division of Ordnance factory Board, Min. of Defence.

Energy Consumption Reduction

Replacement of 20/23 Watt CFL lamps with 12 Watt LED bulbs.(200 nos)

Efforts were made to replace existing 20/23 Watt CFL bulbs in production & other areas were replaced by 12 Watt LED bulbs. This has resulted in saving of 0.275 Lakh KWh electrical energy amounting to Rs. 0.261 Lakhs.

Replacement of 11/15 Watt CFL lamps with 7 Watt LED bulbs (77 nos).

Existing 11/15 Watt CFL lamps in production and other areas were replaced by 7 Watt LED bulbs. This has resulted in saving of 0.046 Lakh KWh electrical energy amounting to Rs. 0.043 Lakhs.

Replacement of conventional ceiling fans with 5 star rated ceiling fan (15 nos):-

Existing 65 Watt ceiling fan in production & other areas were replaced by 35 Watt 5 star rated ceiling fan. This has resulted in saving of 30 Watt per fan i.e. 0.011 Lakh KWh electrical energy amounting to Rs. 0.010 Lakhs.

Solar Water Heater System 500 LPD for bathing facilities for workers (6 nos)

Existing electrical geysers in rest rooms were replaced by solar water heater system. This has resulted in saving of 0.270 Lakh KWh electrical energy amounting to Rs.0.256 Lakhs.

Switching of transformer for optimum utilization as per load requirement.

Loading pattern of the transformers was optimized as per production requirement only 1 transformer out of 2 was operated.

Reduction in consumption of Furnace Fuel Oil (on-going project):- HEF has observed that about 25% of budget is expended towards purchase of Furnace Fuel Oil. On scrutiny of the A category items Furnace Fuel Oil stands at No.1. Furnace Fuel Oil is required for running Boilers to generate steam required for production activities. In view of the above, HEF has taken up this project to study and reduce consumption through optimizing consumption and following steps were taken as per actual requirement.

In CE manufacture the Nitration (Bldg. No.CE/48) was run with optimum capacity of 6 Nitration per day in day time of 12 hrs. This was resulted in monitoring steam supply and subsequently minimizing Furnace Fuel Oil consumption.

Survey of complete steam line and steam network was conducted and defective steam traps/lines were replaced. This has resulted in reducing steam loss thereby reduction in consumption of Furnace Fuel Oil.

The worn out/damaged lagging of steam line was replaced which resulted in reduction in steam loss and subsequently reduction in consumption of Furnace Fuel Oil.

Optimal use of steam - only the required number of Boilers (2 out of 5) were operated as per load requirement. This has resulted in reduction in consumption in Furnace Fuel Oil while maintaining continuity of production.

Training/awareness of Energy Conservation is given up to working level (i.e. to the staff and workers who are directly involved in the above jobs).

On successful implementation of above measures HEF has reduced Furnace Fuel Oil consumption from 1587.5 KL to 1550.5 KL i.e. saving resulting 37 KL during 2015-16.

Water Consumption:-

About 6 million liters per day of water is consumed by HEF for production and other services, out of which only 1.5 million liters is accountable. The water line network is of 1940, laid about 8 feet below the ground level. The following measures are being taken to reduce water consumption.

The water line network to various old plants not in operation has been disconnected.

The leakages in water line are located and repaired.

Water recirculation facility and Cooling Towers has been provided for some of the production units and refrigeration plants including air compressors.

In maintenance area close watch is kept in water consumption for cleaning purpose.

The above preventive measures has resulted into reduction of water consumption from 6 million ltrs per day to 4.5 million ltrs per day for the year 2013-14 to 2015-16.

Management Commitment and Involvement:

The primary objective of High Explosives Factory is to ensure optimal utilization of the energy through efforts of conservation by active participation of all employees to achieve sustained energy efficiency in all areas. The Top management of HEF is fully committed and is making endless efforts towards this goal.

Regular monitoring of Energy Consumption and Conservation Activities is undertaken by Top Management through monthly meetings and on-site visits.

Factory has applied for Energy Management System Certification to IS/ISO 50001: 2011 to BIS and is expected to be certified shortly.