



Unit Profile. Naval Dockyard, Mumbai is a premier Naval Establishment whose principal function is the refit and repair of Indian Naval Ships and Submarines. The comprehensive functions of the yard are listed below: -

- (a) Scheduled refit of ships & submarines
- (b) Repair support to operational ships and submarines.
- (c) Mid life modernization of ships and submarines
- (d) Repair to rotatable inventory
- (e) Berthing and movement of ships
- (f) Fuel, water and other stores at anchorage
- (g) Trans-harbour ferry services
- (h) Upkeep of plant machinery and other assets
- (j) Repair support to ships in harbour / anchorage
- (k) Maintenance of yard services and crafts



Bird's Eye View



Maintenance of Ships



Dry Dock

Historical Background

The Naval Dockyard, Mumbai has a rich and vibrant maritime heritage and has played a key role in shaping domestic and international history. The Yard was established in 1735 by Lowji Nasserwanji Wadia. Over the years the Yard has built over 170 ships for the East India Company, 34 warships for the Royal Navy and 87 Merchant Ships. One notable creation of Naval Dockyard is HMS Trincomalee. Built at Naval Dockyard, Mumbai in 1817, it is presently berthed at Hartlepool (U.K) and is the second oldest warship afloat. The HMS Minden, on which, Francis Scott Key wrote the 'Star Spangled Banner', which is now the National Anthem of United States was also built at Naval Dockyard, Mumbai.



Lowji Nasserwanji Wadia



HMS Trincomalee



HMS Minden

Present Day Naval Dockyard

21. Over the years the yard has organically grown and modernized to keep pace with the constant changing evolution of Naval Ships as they metamorphosed with changing maritime and naval doctrine. To carryout the functions of a modern repair yard catering to modern naval warships, the Yard has a array of technologies and a myriad of specialized equipment which range from Steam Boilers to reversible GT's, from Electromagnetically Operated Systems to Software Embedded Systems, from Valves to VLSI, PLA's & FPGA and from Manual controls to Fully Automated Controls.



Lion Gate

22. The various facilities of the yard are listed below :-

(a) **Hull Facilities.**

- (i) Steel & Sheet Metal Fabrication.
- (ii) Forging and Black Smithy.
- (iii) Outfitting of Ships.
- (iv) Woodwork.
- (v) Boat Repair.



Hull Facilities

(vi) Hull Preservation & Painting.

(b) **Engineering Facilities.**

(i) Gas Turbine Overhaul & Repair.

(ii) Diesel Engine Overhaul & Repair.

(iii) Steam Turbine & Boiler overhaul & Repair.

(iv) Repair & Maintenance of ships system & Auxiliaries Shafting.



Engineering Facilities

(c) **Electrical Facilities.**

(i) Repair & Overhaul of generators.

(ii) Repair & Overhaul of Motors & Switch gears.

(iii) Repair & Overhaul of electrical Auxiliaries.

(iv) Submarine Battery commissioning & Maintenance.

(v) Electroplating.



Electrical Facilities

(d) **Weapons Facilities.**

(i) Gun Mountings.

(ii) Missile & Rocket Launchers.

(iii) Torpedo Tubes & Systems.

(iv) Radar & ESM System.

(v) Sonar & Under water Systems.

(vi) Communication System.

(vii) Navigational Aids.



Weapon Facilities

23. Naval Dockyard has a 10,000 strong workforce manning 101 production centres. It is spread over 124 acres of land in south Mumbai and comprises 04 kms of jetties and wharves with associated services, 05 dry docks and one 150 T slipway and 53 Yard Crafts. To supplement the primary activity of refit and repair to Indian and at times foreign warships the Yard also provides the following technical services:

- (a) Shore Supply to ships and Submarines.
- (b) Jetty, Mobile & Floating Cranes.
- (c) LP & HP Air Compressors.
- (d) Fresh & Feed Water.
- (e) Shore Air Conditioning to Submarines.
- (f) Shore Charging of Submarine Batteries.
- (g) Berthing & Dry Dock Facilities



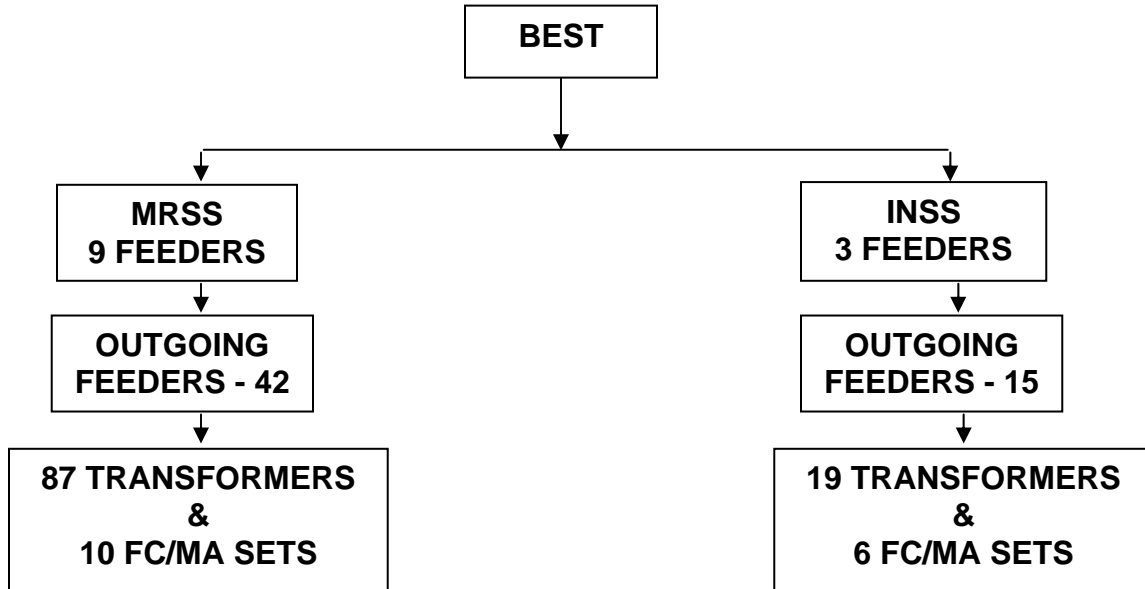
Shore Facilities

The entire Naval Dockyard, Mumbai is ISO: 9001:2000 certified, (**Annexure 2**) with 14 centres being ISO: 14001 certified (**Annexure 3**). The Yard has 106 functioning quality circles and has won numerous awards at National and International conventions since 1998.

Details of Energy Conservation Achievements

24. **Existing System Of Electricity Supply.** Power Supply for Naval Dock yard, Mumbai is received from M/s. BEST at 6.6 kV through 12 incoming feeders. The same is distributed to various workshops, offices, jetties through 57 HT outgoing feeders branching out with 11 kms of HT cabling. The LT supply is further distributed through 106 transformers of ranging between 150 to 1500 kVA.

DISTRIBUTION – SCHEMATIC DIAGRAM

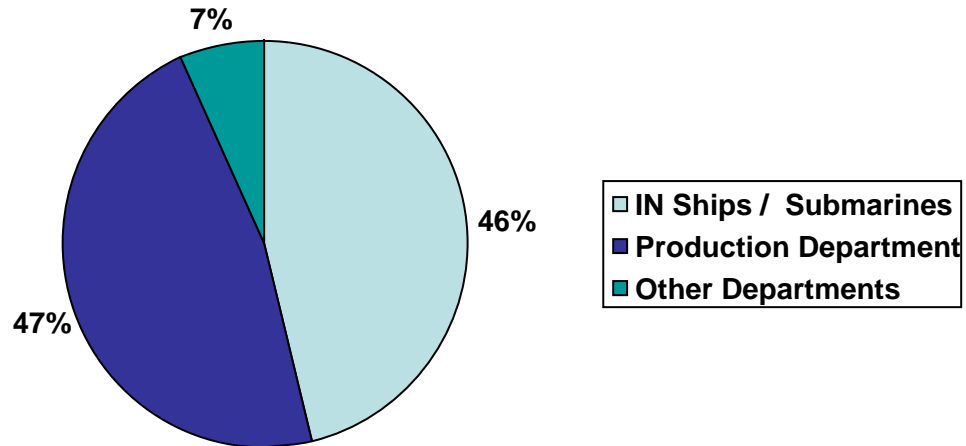


Note: Frequency converter sets are necessitated due to the singular requirement of providing 60Hz supply to Indian Naval warships. 6.6kV 50Hz is therefore converted to 7.2 kV 60 Hz prior to stepping down to 450v, 60HZ required for ships.

25. **Power Distribution Details.** The total electrical power consumed by Naval Dockyard, Mumbai is further distributed as follows:-

<u>Sl</u>	<u>User</u>	<u>Consumption Lakh (kWH)</u>	<u>Remarks</u>
-----------	-------------	-----------------------------------	----------------

(a)	IN Ships / Submarines	25.15	Shore power Supply & Battery Charging
(b)	Production Centres	25.71	Production & Services
(c)	Technical Services	3.68	Non-Production & Offices.



Electrical Power Distribution – Break Up

Energy Conservation Strategy

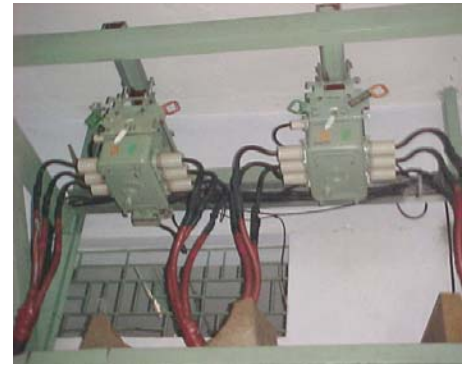
26. Naval Dockyard, Mumbai has successfully implemented a multi-pronged strategy towards energy conservation. The salient features are explained below :-

(a) **Power Factor Management.** With an aim to reduce reactive power consumed and maintain optimum power factor the yard has installed automatic power factor correcting HT Capacitor banks at the Main Receiving Sub-Station. An automatic power factor correcting relay operates 06 Nos SF6 Gas Switches and HT capacitor banks if the Power Factor transgresses a preset threshold. LT Capacitor banks have also been installed at all LT Transformers. (106 Nos.). It is further ensured that major equipments like Frequency Converter sets are run at power factor close to unity by adjusting excitation levels to optimum. With dedicated & untiring efforts of the Energy Audit Board under the guidance of MYAS, the staff of the Yard have committed themselves to reduce the reactive power factor and as a result there have been a steady improvement in power factor from 0.88 in May 1997 to an all time high of 0.9944 in October 02. M/s. BEST have adjudged Naval Dockyard, Mumbai as a Model Consumer for consistently maintaining power factor for the years 1997-98, 2001-02, 2002-03 & 2003-04. The certificates of merits are placed at **Annexures 4 to 7**. This has further resulted in M/s. BEST waving reactive power unit (RKVAH) charges for those organisations whose power factor is 0.97 or more. The improvement of power factor has resulted in considerable savings electricity bills besides additional advantages like.

- (i) Reduction in heating and transmission losses in transformers and distribution equipment.
- (ii) Longer plant life
- (iii) Stabilized voltages.



HT Capacitor Banks



SF 6 Gas Switches

27. **Other Measures Implemented.**

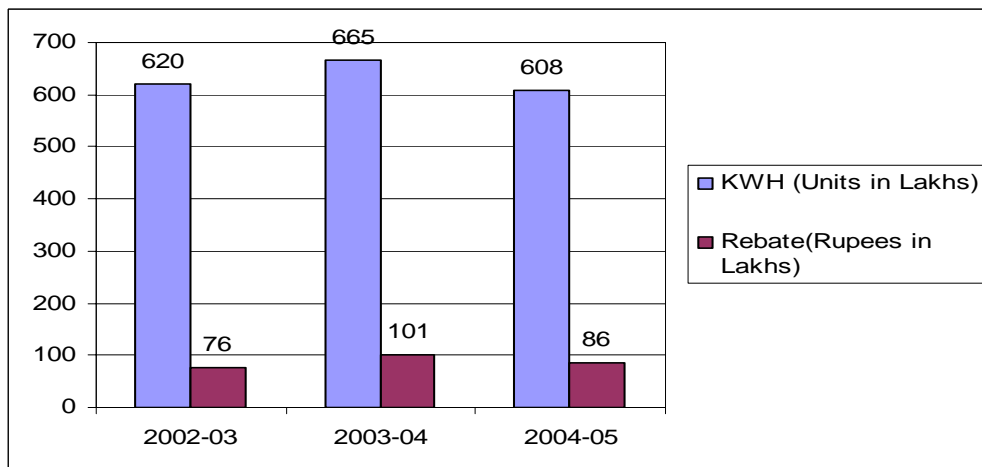
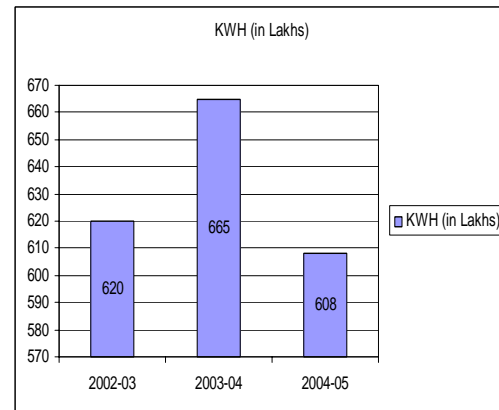
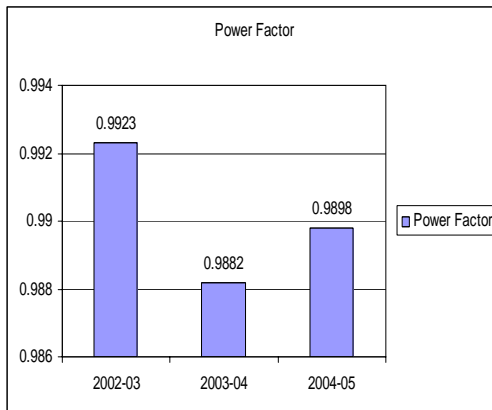
- (a) Photo Electric cells with timer relays for street lights, to switch 'ON' lights automatically so as to save man-hours.
- (b) Electronic chokes in place of conventional chokes of tube lights.
- (c) CFL's in place of Incandescent Lamps.
- (d) Switching 'ON' alternate street lights after every 06 hrs. (automatically) to save man-hours & Energy.
- (e) 50 Nos Energy Meters installed to monitor and audit energy consumption.



Photo Electric Cell

DETAILS OF ELECTRICITY ENERGY CONSERVATION

Heads	2002-03	2003-04	2004-05
Average P.F	0.9923	0.9882	0.9898
Total Electricity bill (Rs.)	259138085	255734767	202228244
Rebate (Rs.)	7679484	10096056	8637228
Rebate as % of total bill	2.96%	3.95%	4.27%



(b) **Spreading Awareness.** Dedicated Energy Audit Teams under the stewardship of the energy audit board have made sustained effort at auditing energy consumption and educating workers on the need for energy conservation. The teams systematically visit the 101 work centres and carry out energy audits. Observations are then made as Energy Conservation Slips corrective action as required is then implemented.

(c) **Load Managers.** 12 Load Managers have been installed on 12 HT Feeders. These are basically micro process based Energy Meters installed on each HT Feeder. These provide statistical data regarding consumption pattern of a required consumer.