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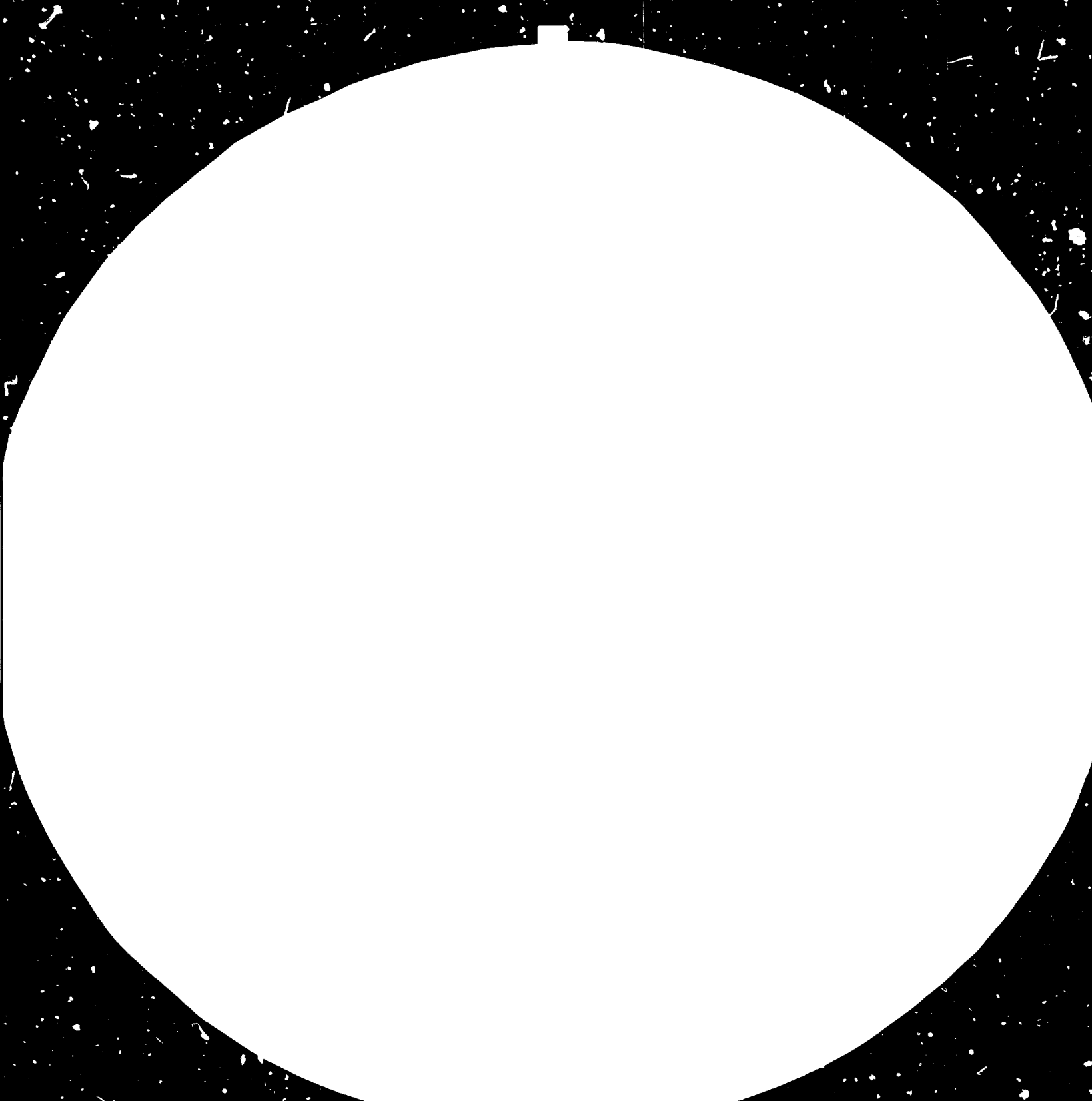

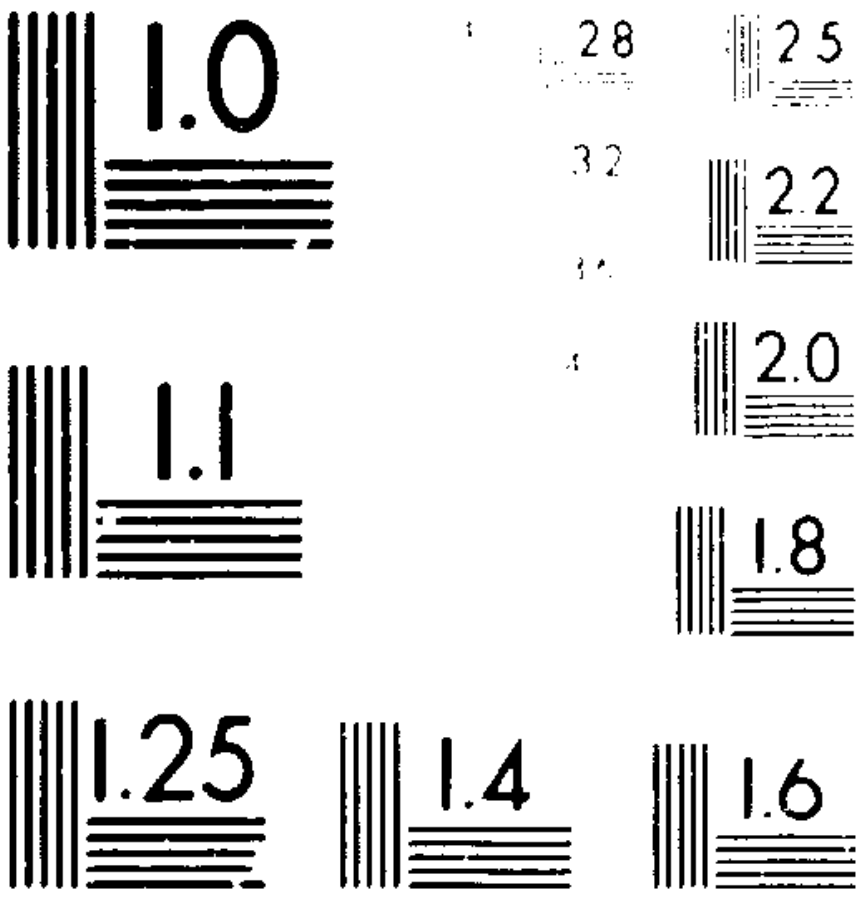

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SHIPYARD STRUCTURES FOR BUILDING AND REPAIR OF SHIPS AND BOATS; PRODUCTION TECHNOLOGY, REQUIRED EQUIPMENT AND LOCALLY AVAILABLE CONSTRUCTION MATERIALS

and

MODES AND WAYS OF CO-OPERATION AT REGIONAL LEVEL IN INFORMATION EXCHANGE, MARKETING AND PROMOTING JOINT VENTURES*

prepared by

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SHIPYARD STRUCTURES FOR BUILDING AND REPAIR OF SHIPS AND BOATS; PRODUCTION TECHNOLOGY, REQUIRED EQUIPMENT AND LOCALLY AVAILABLE CONSTRUCTION MATERIALS

I. INTRODUCTION

The production technology involved in ship construction is entirely different from that of shiprepair; just as in the construction of a new building, the work involved is patently different from the work involved in the repair of it. The infrastructural support that is required for shipbuilding is more capital intensive than that involved in that of ship-repair work. With this background, it has become necessary to treat ship construction as being different from shiprepair work. Hence the emphasis on this paper is more on the ship-yard structures, production technology, required equipment and locally available construction material for repair of ships, boats, etc., and not for their building. Thus it can be seen that it does not stand to reason that necessarily the ship construction and repair units need be located side by side. In fact, it has been our experience that being a primary revenue earning establishment, a shiprepair unit is more profit-oriented than a construction unit. This in itself creates a peculiar psychological environment in the minds of workers in the adjacent units. Repair unit being a highly profitable venture, since 'time' is considered as an essence of repairing work, the workers are highly motivated because not only the stakes are high but the returns are fast, by way of overtime, package bonuses and such incentives. This aspect necessarily vitiates the industrial atmosphere and poses a managerial problem to the managements in charge of both shiprepair and building units.

II. STRUCTURES FOR REPAIR OF SHIPS, BOATS, ETC.

The structures available for repair of ships and boats are basically reflected in the infrastructural capacity developed by a country, more the country is developed the better and sophisticated are the facilities available. In India, basically the following types of structures are provided in the shiprepair yards.

(i) Graving (Dry) Docks:

There are a couple of docks available both on the Eastern and Western coasts of the peninsular India. To give an idea, the Graving Dock of Hindustan Shipyard Ltd at Visakhapatnam in India, which has been in operation from the year 1971, has dimensions of 244 M length, 38 M width and 8.1 M depth and can take all vessels upto 57,000 DWT and some in the 70,000 DWT range. The dock is dewatered by 2 nos. 1,000 HP electrical dewatering pumps with independent controls. It is also equipped with rail mounted travelling sheaves for hauling of ships, operated by 10-T capstans on either side. The dock is served by travelling cranes on either side - one no. 10-T capacity on Southern and one no. 40-T capacity and one no. 20-T Level Luffing Crane on Northern side.

(ii) Wet Basins:

These structures are normally provided as active adjuncts to the Dry Docks and are situated immediately next to them, for undertaking above water (i.e. afloat) repairs. The Wet Basin at HSL has physical dimensions of about 225 M length and 74 M width and 10 M (below datum) and is serviced by a 20-T Travelling Crane on one side and a 10-T crane on the other side.

(iii) The aforesaid Dry Dock and Wet Basin together have workshop facilities as follows:

(a) Engineering Shop	- 18 M x 28 M
(b) Plumbing Shop	- 18 M x 37 M
(c) Steel Repair Base	- 18 M x 37 M .. 2 Nos.
(d) Rigging Repair Bay	- 18 M x 37 M

Required Equipment

The following equipment and machines are identified in various shops for the job of shiprepairs and renewals of Hull etc.

Engineering

Hydraulic torque spanners with power pack and hydraulic pull-push jacks of about 100-T capacity, Stern tubing equipment for preparing lignam vitae, pushing power hydraulic jacks for opening propeller, pneumatic chain blocks of about 30-T capacity, blowers for double bottom tanks and wing tanks, 10-T mobile crane, etc.

Hullshop

The following prime equipment is identified in the Hullshop, viz. 3 roll plate bending machine, profile cutting machine, 500-T hydraulic press.

Machine Shop

A small bed lathe of 1 M bed, 100 mm Swing, double ended grinding machine, pedestal drilling machines 50 mm capacity, small tools and precision tools, etc.

Plumbing Shop

Pressure testing equipment, Thread forming machine, pipe bending machine 75 mm dia, etc.

Electrical Shop

90 KVA, 6 operator welding transformer with connecting cables, switching panels and distribution boards etc. Necessary transformers and switch gear.

Ship-cleaning & Painting

High pressure water jet equipment for hull cleaning, grid blasting equipment, airless-spray painting equipment for chloro rubber and epoxy painting systems, equipment for measuring paint film thickness and surface roughness etc. Dock side arms/ travelling stages, light staging and platforms, hydraulic platform manipulators, etc.

Testing Equipment

Equipment for dynamic balancing of machines viz. Turbo-charger, high speed rotors and NDT equipment for testing of welds etc.

III. PRODUCTION TECHNOLOGY:

1. To meet production capacities, it would be necessary to evaluate and make a complete study of the condition of the existing shops and presently available machinery, their capacity, tolerances, performance, etc.

2. To organise all the shops, the reorientation of the various components need to be investigated with regard to optimal flow of work and materials.

3. The skill and capacity of existing work force should be subject to determination with regard to eventual special training programmes.

4. It would also be necessary to have new workshops for certain of the trades like Engine Repairs, Plumbing and Pressure Vessel Repairs, Structural Hull Repairs, Rigging, Electrical Equipment, Whitemetal Foundry, etc. There is thus a need to supply workshop lay-outs, definition of shop sizes, floor loads, etc.

5. To maximise production, it would also be necessary to analyse all material-handling equipment and make a thorough study of all materials being handled and/or transported in order to optimise the selection of the capacity of the cranage as well as flow transport means.

6. Energy requirement, specially that of electrical power, needs to be calculated elaborately so that ample electrical power is readily available, considering the additional equipment to be installed for modernisation and expansion.

7. Consumables required : Thorough study is also indicated on the supplies of sea water, fresh water, compressed air, gases, including a complete check of supply lines, fittings and fixtures, bearing in mind safety and fire hazards.

In a developing country which necessarily puts greater emphasis on the participation of human force i.e. labour for production, it would be necessary to use power, hand tools and special tools to improve the efficiency of operations, which need to be investigated and recommendations made in this regard.

Production is greatly dependent on secure methods of measuring, maintenance of tolerances and strict adherence to quality control, also on the implementation of fixtures and jigs. This should be reflected in any study for the purpose of achieving better productivity.

IV. Thus, in a nutshell, the maximisation of suitable production technology for a particular geographical location depends on :-

1. Analysis of the existing systems

1.1. Definition of the various production capacities.

1.2. The time schedules and sequence for producing various shiprepair types.

1.3. Possible changes in the production programme(s).

1.4. The share of repair work(s) to be aimed.

2. Layout:

The results of the productivity analysis govern the lay-out of the individual components of an industrial installation. Taking the example of a Shipyard, the main criteria is the material flow which sets in the rhythm of production. These criteria control the geometry of the workshops, drydocks, slipways, supply and energy systems, administrative buildings, welfare and recreation buildings their equipment, and associated infrastructure.

3. Engineering:

3.1. Development of a solution for particular technical tasks.

3.2. Compilation of technical solutions in relation to local conditions and requirements.

3.3. Design of production lines.

3.4. Development and Consultancy on the design of ancillary production facilities.

4. Organisation:

The organisational structures are worked out on the basis of Shipyard requirements. The indications of each position are detailed in job descriptions. Information systems are developed for the successful coordination of all departments.

5. Management:

Information planning, Company organisation, Training for management and specialists to meet the needs of the works and the administration is given priority.

6. Use of Computers:

It would be necessary to make an intensive use of computers so that in the information systems of works a large quantity of recording data are handled for a variety of needs to be processed and distributed in various forms to a number of regular recipients.

IV. LOCALLY AVAILABLE CONSTRUCTION MATERIAL

Generally in India, there is no dearth of natural stone in all its varieties and strengths. Normally,

construction material that is used is, Reinforcement Cement Concrete in the sub-structure and structural steel in super-structure for workshops while for buildings and offices, Reinforced Cement Concrete is used both for sub-structure and super-structures. The workshops are normally roofed with Asbestos Cement sheets. However, with the growing awareness of the possibility of contacting cancer due to deposition of asbestos fibres in the lungs as evidenced in a recent study in the U.S., sooner or later we might have to switch over to alternatives like Ferro-cement for roofing the workshops. All these materials are fortunately made within the country and are available in good quantity and quality.

V. RECOMMENDATIONS REGARDING ACHIEVING BETTER PRODUCTIVITY OF SHIPREPAIRING UNITS:

In Shiprepair business, 'time' is of utmost importance as a lot of revenue is lost by an anchored/drydocked ship. Thus it is essential to see that the vessel is repaired in the least possible time. This needs an excellent well-knit organisation which performs functions with precision, quality and in good time.

It is seen in some countries, for an identical job 100% more time is consumed while the cost of repairs more or less, remaining the same. In some cases, both the time and costs are double to the ones obtained in countries like Japan, S. Korea and Singapore.

This either means that the methods adopted are obsolete required more time, low labour wages, and/or poor labour productivity. This imbalance is to be set right; may be by exposure to better methods of repairs and better equipment and training of personnel in efficient and proven units by international cooperation. This is where UNIDO and ESCAP could play a leading role in promoting and coordinating these efforts.

It is the view of many a shiprepair undertaking that the problem of spares of foreign make of Engines, B & W, SULZER, MAN etc., are not easily available and ships go abroad for lack of spares causing a huge drain on the foreign exchange resources. In this context, the member nations in the region can think of some sort of "Spares Bank" in a geographical location which has got good land/air/sea transport connections. This will ensure that the member nations can draw from the "Spares Bank" the required spares at any time,

thereby obviating the burden of an uncertain inventory. This regional cooperation will foster good relations apart from direct benefits that accrue to its members from it.

On the same analogy, a "Data Bank" may also be thought of which will make available the labour, material and time inputs and their costing for repairs of specific items which may be termed as standard jobs. This will serve as a datum to measure the productivity and necessary corrective measures may be adopted to set right the imbalances, if any.

To give an indication of the situation obtaining at HSL, the manhours taken to do some of the standard jobs are roughly as under:

	For 10,000 GRT	For 15,000 GRT
1. Tail shaft survey	3200 hrs	4000 hrs
2. Renewal of Lignum Vitae bush including survey (Bottom & Top half).	2240 "	3000 "
3. Taking wear down readings of tail shaft including cutting out rope guards and fitting back.	90 "	90 "
4. Ranging the cables in Dry Dock.	184 "	200 "
5. Hull Anodes welding.	4 "	4 "
6. Unshipment of rudder for inspection and fix back.	2064 "	2064 "
7. Motors (AC) overhauling 20 KW	200 "	200 "
8. Mandays (average) required per tonne of steel renewal of various structures.	..	175 MDS

9. Max. capacity of steel renewals per year. .. 450 Tonnes

The profitability of shiprepair units is also to a large extent depending on the import and taxation policies of the respective Governments. The rules and procedures laid down in the Indian Customs Act in the matter of off-loading the works on ancillaries pose a stumbling block for a better profitability. Thus, apart from material and human resources, the policies pursued by the respective Governments also contribute either directly or indirectly to the profitability of an undertaking.

VI. It is hoped that the deliberations of this august body will be taken note by the respective Governments of the member Nations and derive benefit for the good and prosperity and improvement of the quality of life of their people.

MODES AND WAYS OF CO-OPERATION
AT REGIONAL LEVEL IN INFORMATION
EXCHANGE, MARKETING AND PROMOTING
JOINT VENTURES

1. Background Information:

1.1. At present, most of the developing countries in Asia and the Pacific undertake various policy measures to upgrade shiprepair and shipbuilding industry. Some developing countries have gained considerable experience in this field. However, majority of them still need assistance to improve and/or to develop existing facilities as well as to upgrade appropriate skills to meet essential requirements of national fleets both deep-sea and inland waterways. It also noted in the 38th Session of ESCAP held in March, 1982 that there is need for urgent action to assist the developing countries to improve and expand their shipbuilding and shiprepair capacities. At its 39th Session held at Bangkok in April, 1983 the Commission directed the Secretariat to carry out a survey of shipbuilding and shiprepair facilities and to convene an intergovernmental meeting in this field in 1984.

1.2. Objectives:

In the background information, the objective is stated as follows:

> "Assist in developing and strengthening capacities of shiprepair/maintenance and shipbuilding industries of Asian developing countries to carry out ship maintenance and repair works in national yards of the national fleet thus reducing considerable foreign exchange expenditure."

The project is expected to contribute to strengthening capacities of developing countries, in

solving technical and economic problems. With the above background data, an attempt has been made to describe the "Modes and Ways of Cooperation at Regional Level in Information Marketing, Promoting Joint Ventures, TCDC and ECDC, Introduction of New Technology, Ship Design, Production, Repair and Standardisation."

2. Information Marketing

At the national level, there should be a federation which should collect all informations in the country and inform to the regional levels consisting of developing countries. The types of information are as follows:

2.1. Shipbuilding Targets

Required target of shipbuilding expected to be achieved in the country depending on the national programme. Our VIth Five Year Plan has got a target -- 8.3 million GRT by the end of the Plan period and 10 million GRT by the end of 1990.

2.2. Capacities existing in the country for shipbuilding

The existing capacities of shipbuilding in the country in terms of GRT and projected target of VIth Plan are as follows:

GRT present : 0.23 million GRT per annum

GRT in the following years:
1985-1986 about : 0.30 million GRT per annum

2.2.1. Indigenous shipyards in India are capable of building fishing trawlers, supply vessels, dredgers, tugs, small cargo/passenger vessels, barges, defence vessels, ferry boats, bulk carriers upto 1 Lakh dwt, cargo vessels etc. Technology needs to be imported through technical collaborations to help shipyards to build specialised crafts with the assistance from developed or semi-industrialized or newly industrialized nations such as Offshore structures, drillships, jack up rigs, platforms, etc.

2.2.2. Number of ships owned by various shipowners (8,000 GRT and above) are given in Annexure-I. The Indian Shipowners' patronage to Indian Shipyards is essential. The international forums should evolve ways and means to accord production facilities as well as for development of indigenous shiprepairing industry in developing nations.

2.2.3. Indigenous Development

In shipbuilding, India has developed a number of marine equipments indigenously. The same can be marketed abroad. The items so far developed in the country are listed in Annexure-II.

A number of equipments are under development and the same are listed in Annexure-III.

3. Promoting Joint Ventures

3.1. Shipbuilding

The concept of shipbuilding is changing and the modern method of constructing the ships in the building docks on block system with advanced outfitting which reduces the construction time, resulting in saving mandays, need to be improved. Production Planning Methods also have improved very much and high degree of work coordination has been achieved by proper Planning Methods. The design of ships also have undergone considerable changes and the developing countries are going for improved design so that the hull resistance is reduced by developing improved hull forms and lower propeller speeds, adoption of self-polishing antifouling paints, etc. Routing system capable of selecting best navigation course based on predicting weather and sea conditions, etc. are also being developed. The development of sailing merchant ships with computer controlled sails to have auxiliary power is being taken up.

Joint venture in the above fields will be advantageous for the developing countries.

3.2. Offshore vessels for oil industry:

Offshore vessels like supply vessels, platforms, drilling rigs, etc. are now being constructed in the Indian Yards and further improvements are necessary.

4. Introduction of New Technology:

The technology in the marine field has to be modernised in developing countries and informations regarding development of new building equipments which could reduce the construction time, material handling time, proper layout of the shipbuilding yards and also for equipments in ship repair industries. As far as the new

technology in the Offshore Oil Industry is concerned, the developed countries are in a position to assist developing countries to a great extent.

5. Ship Design

5.1. The design is the major function in the shipbuilding organisation and through efficient design, the cost can be cut down through standardisation and adopting the design for production. Many ship designers today have become aware of the need to take production methods into account to design the ships. In our country, we have built ships to our design as well as to foreign designs. One of the problems faced by Indian Shipyards is the lack of adequate facilities for hydrodynamic testing ship models. The capabilities for designing vessels like chemical tankers, full container ships also need to be developed in the country.

5.2. To overcome the problem, the ship design activities are to be encouraged and it is suggested that the earlier proposal to set up CMDRO (Central Marine Design Research Organisation) need to be revived. This organisation could work in close coordination with other research organisations under Council of Scientific and Industrial Research to achieve optimum results.

5.3. The standardisation of ships also need to be established with the consent of shipowners and considering the requirements of the country, In this connection, a flexible design by HSL has already been developed and has been proved successful in the tests.

6. Production

Some of the problems faced in the production shops are —

- lack of improved shipbuilding facilities, such as efficient gas cutting machines, proper conveyor system for steel fabrication;

- longer delivery periods for indigenous materials which are just in the initial stage of development.

The production methods for shipbuilding need to be improved. Building Docks with larger block construction and advanced outfitting facilities is considered necessary as first step in this direction.

7. Repair Facilities

Depending on the number of vessels operating in the country and considering the drydock facilities available, it is found that the facilities for shiprepair are inadequate. The working facilities in drydocks are also to be improved in the country and joint ventures for manufacturing modern equipments in the country would benefit developing countries. The objective of this is to reduce the time for repairs/major overhauls in the drydock.

ANNEXURE-I

LIST OF NUMBER OF SHIPS OWNED BY VARIOUS SHIPOWNERS

	SHIPS					Total Number of ships
	Above 640 ft LOA		640 ft and below			
	Cargo bulker	Tanker	Cargo	Passengar	Tanker	
1. Chowgule Steam Ship Co. Ltd.	3	-	2	-	-	5
2. Damodar Bulk Carriers Ltd.	3	-	4	-	-	7
3. Essar Bulk Carriers Ltd.	-	-	-	-	9	9
4. Garware Shipping Corpn. Ltd.	-	-	4	-	-	4
5. The Great Eastern Shipping Co.	-	2	17	-	2	21
6. India Steamship Co. Ltd.	-	-	26	-	-	26
7. Dempo Steamship Co. Ltd.	1	-	7	-	-	8
8. Jaya Shree Shipping Co.	-	-	4	-	-	4
9. Mogul Line Ltd.	1	-	11	4	1	17
10. Pent-Ocean Steamship P.Ltd.	-	-	3	-	-	3
11. The Scindia Steam Nav.Co. Ltd.	4	-	36	-	-	40
12. Seven Seas Transportation Ltd.	1	-	3	-	-	4
13. Shipping Corpn. of India Ltd.	14	12	105	6	10	147
14. Tolani Shipping Co. Ltd.	-	-	5	-	-	5
15. Takur Shipping Co. Ltd.	-	-	4	-	-	4
16. Surendra Overseas Ltd.	-	-	4	-	-	4
Total number of ships	27	14	235	10	22	308

ANNEXURE-II

SHIP RELATED EQUIPMENT DEVELOPED INDIGENOUSLY

S.No.	Item
1.	Oil/Sea water filters
2.	Valves, valve chests
3.	Air receivers
4.	Cargo winches
5.	Life Boats
6.	Anchors
7.	CO_2 System
8.	Al. Windows
9.	Paints
10.	Emergency Compressor
11.	Evaporators - FW Generators
12.	Preheaters
13.	Pumps
14.	Side Lights
15.	Panama Canal Chocks
16.	Tail shaft & Intermediate shaft
17.	Stern Castings
18.	Electric Cables
19.	Mast Head Lights, Flood Lights
20.	Switch Boards, Control Panels
21.	Bridge Console
22.	Refrigeration
23.	Air-conditioners
24.	Cargo Blocks
25.	Deck Cranes
26.	Hatch Covers
27.	Windlass & Mooring Winch
28.	Main Engines
29.	Electrodes

ANNEXURE-III

SHIP RELATED EQUIPMENT UNDER DEVELOPMENT INDIGENOUSLY

A. DEVELOPMENT FOR THE FIRST TIME

1. Marine Pumps

   i) Centrifugal
   ii) Screw/Gear

2. F.W. Generators
3. Marine Boilers
4. Oil Bilge water separators
5. Sewage plant & incinerator
6. Hydraulically remote operated valves for bilge and ballast system
7. Wireless, VHF & DF Equipment
8. Radars, Satellite Navigator, Gyro Compass, Doppler Speed Log, Echo Sounder, Communal Antenna Systems, Broadcast receivers, T.V. Sets, Weather fascimile equipments.
9. Fire Alarm System
10. Portable Life Boat wireless set
11. Engine order telegraph and rudder angle indicators.
12. Bridge console
13. Capacitence type level controller
14. Pyrotechnics
15. 'B' Class Marinite Board
16. Anchor and chain cables