



Use of Different Metals in Shipbuilding

- T. S. Mukherjee

On 5th Sep 2006, GRSE got the Status of Mini Ratna - Category I.

Garden Reach Shipbuilders & Engineers Ltd (GRSE), is the premier Warship building Company in India, under the administrative control of Ministry of Defense. GRSE was founded in 1884 as a small workshop on the banks of river Hoogly, West Bengal for repairing of river crafts. The company was taken over by Government of India in April 1960 and placed under the ministry of Defense. Being a pioneer in indigenous warship building the shipyard delivered the first indigenously built warship of the country INS Ajay in 1961. The shipyard changed to present name Garden Reach Shipbuilders & Engineers Limited on 1st January 1977.

Since 1960, the shipyard has successfully built and delivered 92 warships to Indian Navy and Indian Coast Guard for various roles, starting from state-of-the-art Frigates & Corvettes to Fast Patrol Boats. GRSE has played a very important role in the defense preparedness of the country and has always risen to the occasion in the national mission of design and construction of warship indigenously. In addition to warships, GRSE has also built & supplied close to 800 vessels to carry men and materials as well as for surveillance of the Coast Line by the Police Forces. Apart from ship building and ship repair, GRSE is one of the few versatile shipyards having its own Engineering and Engine Division. At present 17 warships are concurrently undergoing various stages of construction in the yard.

The second phase of shipyard modernization project was completed and the new facility was inaugurated in June 2013. The objective of the modernization is to create new shipbuilding infrastructure that would enable integrated construction of large ships. The modernized infrastructure enables the shipyard to undertake construction of large ships using latest modular construction technology. The modernized facility comprises one covered dry dock of 10,000 Tons capacity, one covered inclined berth of 4,500 Tons capacity, a module hall with telescopic sliding roof movement to facilitate integration of pre outfitting of mega hull blocks weighing up to 200 Tons with a goliath crane of 250 Tons capacity.

GRSE is the first Shipyard in the country and the first DPSU to get accreditation on Integrated Management System harmonizing ISO 14001:2004 (Environment Management System), BS OHSAS 18001:2007 (Occupational Health & Safety) and EN ISO 50001:2011 (Energy Management System). The Engine and Engineering division as also plate preparation facility shop of the organization are already ISO 9001/2008 certified.

GRSE has been receiving "Excellent" rating in MoU for five consecutive years. GRSE achieved the best MoU rating among DPSUs in the year 2010-11 and 2012-13.

The Company continues its efforts in the field of development of design of warships as also development of its engineering products. The core strength of the Company lies in its own in-house design capability. Recently the Company has given an impetus to R&D activities in indigenous shipbuilding by successfully inducting Water Jet Fast Attack Crafts in the service of the Indian Navy. In the area of Ship Design, the Company has made major contribution to the design of ASW Corvettes being built for the Indian Navy.

GRSE in its modernisation drive has fully made operational the state-of-the-art Information and Communication System in the company. The hardware and software are in place and GRSE is already deriving rich benefit out of this drive. As part of ERP-IT improvement, the Company has taken initiative to establish a DR System through 'Co-located Managed Solution' to avoid unforeseen natural or manmade disaster in the Main Data Centre. In January 2013 "employee portal"

MOU RATINGS				
2009-10	2010-11	2011-12	2012-13	2013-14
1.35 Excellent	1.07 Excellent	1.176 Excellent	1.17 Excellent	1.43 Excellent

was launched to facilitate employees to get information directly from system. The Company has an effective internal control system supported by Enterprise Resource Planning (ERP) platform i.e. SAP for its main business processes.

Some of the significant achievements of the Company over the years, is mentioned below:

First Export Order

GRSE has successfully executed the 1st Export Order received by any DPSU in the country. An Offshore Patrol Vessel of 74.10 mts length, 1.40 Mtrs width, with a speed of 20 Knots constructed in the yard for the Republic of Government of Mauritius has been delivered in December 2014.

First Fleet Tanker

The first of its kind Fleet Tanker, "INS ADITYA" was built in India by GRSE and commissioned in April 2000.

First of its kind Marine Acoustic Research Vessel: "INS SAGARDHWANI", the first of its kind marine acoustic research vessel, built indigenously by GRSE was commissioned in 1994.

Largest Naval Vessels ever built in India : Landing Ship Tank "INS MAGAR" and "INS GHARIAL", 2nd of the two largest Naval Vessel ever built in India, were commissioned in 1987 and 1997 respectively.

First Fisheries Research Vessel

"SKIP JACK", the first Fisheries Research Vessel, was built by GRSE in 1982.

Asia's Biggest Twin Screw Trailing Suction Hopper Dredger

"MAHAGANGA", built by GRSE in 1978 was Asia's biggest Twin Screw Trailing Suction Hopper Dredger.

First of its Kind Oceanographic Research Ship

"GAVESANI", the first of its kind Oceanographic Research Ship was built by GRSE in 1975.

First Indigenous Warship of India

It is worthwhile to mention that the first Indigenous Warship of India, "INS AJAY" was built by GRSE in 1961, just within a year of becoming a Public Sector Unit (PSU).

"GRSE built" warships have proved their worth & capability during war, in addition to various disaster & peace keeping missions, till date.

Highest Modular Steel Bridge in the World: GRSE finds its mention in the Guinness Book of World Records for having built the highest modular steel bridge in the world at Ladakh, in 1990. GRSE has supplied thousands of Bailey Bridges to Indian Army, Central & State Public Works Departments, for fast accessibility in difficult terrain and during natural calamities.

Besides designing and building warships and portable bridges, a diverse range of deck machinery products including Halo Traversing System, Boat Davits, Anchor Capstans, Winches, Helo Hangers, Marine Pumps etc are manufactured by the Engineering Division of GRSE.

The excellent performance of GRSE over the last few years has been recognized and appreciated and following awards bestowed on GRSE speak for themselves:-

- GRSE received the "Award of

Excellence for Best Performing Defence Shipyard" four years in a row (FY 10-11 & 13-14), from the Hon'ble Raksha Mantri.

- GRSE Chairman Rear Admiral AK Verma, VSM, IN (Retd.) has been bestowed with the "Honor of Excellence" Award by the Hon'ble President of India, Shri Pranab Mukherjee, in 2014.

- GRSE received the "Indira Gandhi Rajbhasha Puroskar" for Official Language Implementation from the Honorable President of India, Shri Pranab Mukherjee, for two consecutive years (FY11-12 & 12-13).

- GRSE has been conferred the Governance Now Awards 2014 in the Category of Strategic Turnaround.

- GRSE has ranked 2nd, nationally among Miniratna Companies, in the Category of CSR & Sustainability, by a survey conducted by the India Today Group.

- GRSE won the e Gov Awards 2014 in the Category of Technology - Modernisation initiative in PSUs.

- GRSE was conferred the IIIE Performance Excellence Award in the Golden Category (Financial & Operational Strength), for the year 2012-13.

- For effective implementation of Quality Concept in the organization, the CMD of GRSE has been awarded "QCFI Award for Best CEO of the Year 2013."

- GRSE Director (Finance) Shri K. K. Rai won the BT "Star PSU Director (Finance) For Outstanding Performance" in the Category of Non Maharatna & Navratna PSUs.

- GRSE received a Certificate of Appreciation for being a Model Total Quality Management Company by CII for 2013.

- GRSE was conferred the DPE ICC's PSE Excellence Award 2013 for CSR & Sustainability, in the Miniratna Category.

- GRSE was conferred with 'Caring Company Award -2013' at the World CSR Congress

The company continues to accord utmost importance to Quality Assurance activities, reflecting its strong commitment for Product quality and customer satisfaction. The Yard has an established Quality Assurance



Department with well experienced QC Inspection team, who are continuously trained in adopting updated inspection methodologies and best practices. The team undertakes inspection checks at every stage of the construction as per detailed Quality Assurance plans (QAP) so as to ensure that right from the initial receipt inspection of raw materials, all fabrication processes up to the final Ship acceptance trails are monitored both by internal and external Inspection agencies. In addition to defect identification, the yard has focused on defect avoidance, through awareness training, along with on the job monitoring. The yard personnel are constantly encouraged to carryout self-inspection and root cause analysis in order to identify appropriate corrective and preventive measures for achieving continual improvement in quality of products.

Corporate Social Responsibility (CSR) is an integral part of the Company's corporate philosophy, integrating business processes with social processes. The Company is committed towards CSR and has a CSR Policy in place to guide its CSR activities.

GRSE is making persistent efforts to set itself firmly on a growth trajectory. Firm foundation being laid today is aimed at enabling GRSE to further consolidate on its strengths and emerge as a leading shipyard with multi-dimensional engineering capabilities, in the years to come.

Gun Metal/Cupro-Nickel and Other Products Used in Shipbuilding

Gun Metal, Brass, Cupro-Nickel [Cu-Ni] products are used in plumbing work pertaining to various systems in ship construction. Fully annealed copper pipes conforming to BS 2871 of assorted sizes [6 mm – 150 mm] NB are used in various systems in the ship. Cu-Ni pipes of material 90/10 as per NES 779, Part 3, Issue 1 and 70/30 Cu-Ni pipes as per NES 780, Part 3, Issue 1 of assorted sizes are extensively used depending upon the requirement of various systems. The present requirement is approximately 15 Km per annum and the same would likely be 30-40 Km in near future.

The pipe sizes for various systems are ascertained based on flow requirements, permissible fluid speeds, and available head and in particular, operational conditions and PIPENET Analysis, as applicable, duly approved by IHQ MoD (Navy) / Indian Coast Guard.

Sea water system pipes onboard are used of Cu-Ni 90/10 material, having inherent anti-corrosive and anti-fouling characteristics. To achieve optimum strength/ service life for the

sea water systems, quality of Cu-Ni pipes with regard to properties are used as printer nationally accepted standard [Cu-Ni Pipes will be as per NES 779 Part 3]. Addition of ferrous sulphate or approved type additive (as per NES 781) is used to enhance the protective film formation.

Few examples of pipe materials used in various systems in ship building:

SYSTEM NAME	MATERIAL
Fire main System & Sprinkler Arrangement	90/10 Cu-Ni NES-779
Domestic Fresh Water System	Solid drawn Cu pipe to BS2871 or COPPER TO BS2871 or equivalent
Sea Water System in Main & Aux.Engine	90/10 Cu-Ni
Domestic Sea Water System	90/10 Cu-Ni
Domestic Hot Water System	Solid drawn Cu pipe to BS2871 or COPPER TO BS2871 or equivalent
Steering Gear System SG SGF	70/30 Cu Ni to NES 780/BS 2871 or equivalent as per OEM recommendation
A/c and Refrigeration System	Cu
RO Plant System Drawing	S.W 90/10 Cu-Ni, output side copper pipe.
Condenser Cooling Water System for A/c & Ref. Plants	S.W: 90/10 Cu-Ni

The varieties of fittings like forged Tee Pieces, Elbow sets made of 90/10 Cu-Ni of assorted sizes are extensively required for ship building. Approximate value of the said items being used by the shipyard is Rs 3 Crores per annum.

Material for valves are normally of Gun Metal to BS1400 LG4C. However Nickel Aluminium Bronze [NAB] valves conforming NES 833 are used for various valves generally for sea water system. The requirement of valves vary from 300-400 no per annum.

The flanges are required to be used extensively for various pipe jointing purpose; the material for flanges for nonferrous pipes are Gun Metal to BS1400 LG4C specification. The average consumption of such flanges are approximately 3000 pcs per annum.

Similarly the fasteners are also used in the ship building process of Aluminium Bronze material BS2874 Grade CA104 of sizes M12 to M20, 50 – 80 mm long. The average consumption of such flanges are approximately 1000 pcs per annum.

Observation

It is observed that the shipyard need to

import Cu-Ni pipes detailed above as also varieties of fittings like forged Tee Pieces made of 90/10 Cu-Ni of assorted sizes etc due to unavailability of indigenous sources.

Meanwhile the Ministry of Defence is rigorously pursuing the need to upgrade DPSUs from present level of indigenization to the higher level. In pursuit to attain this MoD has stressed that the items like above which are

of generic types and less technology intensive but imported will be termed as import substitution items. Indigenous development of such items will reduce the import content, will likely be cost effective, reduce build period and in due course of time, Indian Industry will attain process capability in manufacturing of such items.

In these fields the shipyard is earnestly looking for the support from the Indian business partners to contribute extensively to take the "Make in India" concept of the Government of India further forward.

(T. S. Mukherjee passed out from National Institute of Technology, Durgapur, West Bengal in 1978 in Electrical Engineering Stream; he attained Post Graduate Diploma in Business Management in 1983. After serving Calcutta Port Trust and Bengal Paper Mill briefly, Sri Mukherjee started his carrier with Garden Reach Shipbuilders & Engineers Limited as a maintenance engineer and is continuing to serve the shipyard till date in various capacities.)