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MAKE IN INDIA – OPPORTUNITY FOR MANUFACTURING INDUSTRY IN NAVAL SHIPBUILDING

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ABSTRACT

The Make in India initiative has generated a lot of enthusiasm in areas of manufacturing in Indian Defence sector. The Ministry of Defence (MoD) has promulgated new Defence Procurement Policy (DPP) early this year. The DPP has effected a number of policy changes, aiming to provide a level playing field to the Indian Private Sector. The authors are undertaking a detailed research study on the impact of 'Make in India' in areas of Naval Warshipbuilding. The aim of the study is to suggest a roadmap for indigenous manufacturing of critical technology equipment that are presently being imported. The research study will be primarily be based upon secondary research data as the information is very sensitive in nature. The authors have explained how Indian Navy moved from 'Buyers' Navy to 'Builders' Navy a long time ago. The frontline warships built in Indian Defence Shipyards in 1990s have earned accolades in International Maritime Exhibitions, participated by global Navies. The Indigenously built ships are reckoned at par with those built by shipyards of advanced countries. However, a large number of warship equipment and systems are still imported. There is a need to manufacture this equipment in India for self-reliance. The authors have touched upon a decade long journey of a business unit of L&T that has been involved in indigenisation of equipment for Indian Navy. The authors have suggested pilot projects in areas promulgated by Indian Navy as target systems for indigenisation. The authors have briefly described the steps required for adaptation of an equipment for naval applications. The authors intend to undertake detailed research study and come up with a concrete roadmap for creating Life Cycle Support capacity within the country for critical technology areas in naval shipbuilding.

KEYWORDS

warshipbuilding, defence procurement policy, naval indigenisation plan, technology transfer.

INTRODUCTION

Indian Naval shipbuilding is poised at an ambitious and aggressive phase to counter the strategic threat posed globally. Buoyed by the success of indigenous naval shipbuilding in past 3 to 4 decades and the catalytic effect of 'Make in India (MII)' initiative of the Government of India (GoI), Indian Navy has chalked out a plan to grow into a strong 200 plus blue water fleet by year 2027. Therefore, at the outset, it is prudent to dwell upon some relevant aspects of MII initiative and their significance in Naval Shipbuilding.

The 'Make in India' (MII) drive of the Hon'ble Prime Minister Mr. Narendra Modi offers a way of improving the country's self-reliance in defence production. However, for the MII to succeed in the defence manufacturing sector, the government needs to address some legacy issues. These are related to 'Establishing a Defence Minister's Council on Production (DCMP) to prepare a long term roadmap', 'converting the Long Term Integrated Perspective Plan (LTIPP) of the Indian armed forces into a defence manufacturing and R&D plan', 'promoting a certain degree of defence research and development outside the Defence Research and Development Organisation (DRDO)', among other issues. However, the most important legacy issue to address is to 'treat the private sector as an equal partner and expedite big-ticket contracts to be awarded to them under the 'Make' and 'Buy and Make (Indian)' procurement categories'.

In pursuance of the MII drive, the Defence Ministry (MoD) has tried to bring about some policy changes in the defence procurement procedures. The MoD announced the new 'Defence Procurement Policy (DPP) – 2016 on 28th March 2016. This DPP was formally released in June 2016. In the preamble of the DPP-2016, the Hon'ble Raksha Mantri has brought out the focus on the MII in a straight forward manner. The DPP-2016 lays down significant emphasis on establishing balance between competing requirements such as expeditious procurement, high quality standards and appropriate costs while maintaining highest standards of probity and public accountability. It acknowledges the immense potential to leverage the manpower and engineering capability within the country for attaining self-reliance in design, development and manufacturing in defence sector. The DPP focuses on institutionalising, streamlining and simplifying defence procurement procedure to give a boost to 'Make in India' initiative of the Government of India, by promoting design, development and manufacturing of defence equipment, platforms, systems and sub-systems. The essence of spirit of the DPP can be summarized as follows: -

"It is, therefore, of utmost importance that the concept of 'Make in India' remains the focal point of defence acquisition policy/ procedure."¹

The DPP-2016 has generated significant enthusiasm in the Indian Industry involved in manufacturing in defence sector. Such an environment has been sought by major industry players and institutions like FICI, CII, L&T (Larsen & Toubro) etc. for a very long time. The DPP-2016, is yet to percolate to the ground level where the Indian Industry starts contributing in a big way towards defence manufacturing. However, the stage is set for manufacturing houses to commence restructuring of the internal processes and getting collaborations/ joint ventures with global technology leaders in place so as to be ready for fulfilling the trust and confidence posed by the MII initiative in them.

BACKGROUND

India is not new to shipbuilding. The history has documented ships being built in the country as early as 3000 BC to 1500 BC. This is evident by unearthing of a dry dock during excavation of Lothal, a major port city of erstwhile Harrappan civilization of India. This dry dock was used for ship repairs as well as ship building. Down the years, HMS Trincomalee was built in Bombay in early 19th century for British Navy. The acknowledgement of India's shipbuilding capability worldwide finds ample mention in recorded history. Various naval powers had been sourcing their requirement of ships from shipyards in India. Indian shipbuilding saw a dark age during British rule. While laying the foundation stone of Scindia Shipyard (now Hindustan Shipyard) in Visakhapatnam on 21 Jun 1941, Dr Rajendra Prasad summarized thus:

"Indian shipbuilding was thus able to hold on its own till about 1840. But India had to go to wall, in the interest of British shipping."²

However, post-independence, Indian Navy put its act together and commenced indigenous warshipbuilding in Defence shipyards viz. Mazagon Dock Shipbuilders Ltd. (MDL), Mumbai, Garden Reach Shipbuilders and Engineers (GRSE), Kolkata early on. The upgraded Leander Class ships, were built by MDL under 'License Production'. The Nilgiri-class frigates, an updated versions of the Leander class ships, were designed and built for the Indian Navy by Mazagon Dock Limited in Mumbai. Six ships were built between 1972 and 1981. Vessels of this class formed the 14th Frigate Squadron. The lead ship INS Nilgiri was the first major warship to be built in India in collaboration with Yarrow Shipbuilders of the United Kingdom. However, Indian Navy did not have in-house design capability at this stage and was dependent upon foreign Navies and shipyards for the design documentation. Navy was quick to set up a correcting mechanism for that and the capability was gradually developed in the design directorate of the Indian Navy.

The Indian Naval Shipbuilding came of age in 1990s with the production of Delhi Class Guided Missile Destroyers at MDL. Three ships viz. INS Delhi, INS Mysore and INS Mumbai were built and commissioned in the Indian Navy through 1997 to 2002. These ships were designed indigenously and Indian Navy is proud to the fact that these ships evoked awe and inspiration in the world naval powers during International Maritime Exhibitions. The first exhibition was held at Langkawi Malaysia in year 1997 where INS Delhi showcased the capability of India in warshipbuilding. INS Mumbai took part in International exhibition at Abu Dhabi in year 2003. The author is proud to be an integral part of the shipbuilding endeavor of Delhi Class Destroyers for more than a decade in various capacities; designer, overseer and crew. Indigenous Naval Shipbuilding has not looked back and every year a ship or two are launched or commissioned for Indian Navy in Indian Shipyards.

Having achieved indigenous capability in ship design, Indian Navy focused on the equipment that go inside a ship. It was realized that much was to be achieved for it to be truly a warshipbuilders' nation. The self-reliance is established as far as the design and construction of the ship 'Hull' is concerned. But a ship is not Hull alone. The hull has to house a plethora of equipment, machinery and systems that make the 'Hull' a 'Mean Fighting Machine'. This is an area where much is left to be desired for achieving the 'Make in India' aspect in naval shipbuilding in 'Letter and Spirit';

At this stage, it is important to take stock of what goes into a warship and, more importantly, how much of it is indigenous. A Naval ship has equipment that can be broadly classified in three categories; Float, Move and Flight. The Float category pertains to equipment and machinery that help ship float in water. The steel hull of the ship constitutes a major portion of this category. The Move category pertains to equipment and machinery helping the ship move in water. The fight category includes radars, weapons, guns, missile systems, torpedo launch systems etc. Further, some special ships like Aircraft Carriers and submarines have specialized equipment.

A majority of 'Float' material, equipment and systems are indigenous. About 50% of the 'Move' equipment & systems are indigenous. However, a majority of the 'Fight' equipment and specialized equipment for Aircraft Carrier & Submarine are imported. Indian Navy has all along been aware of this fact and has been laying emphasis on indigenisation. However, Indian Navy took a while to come out with a comprehensive Indigenisation Plan in year 2015.

INDIAN NAVY'S INDIGENISATION PLAN

As brought out earlier, Indian Navy has moved from 'Buyer's' to 'Builder's' Navy a long time ago. Indigenous shipbuilding has been reckoned a successful venture with the induction of Delhi Class Guided Missile Destroyers in late 1990s. These ships were built with total in-house design capability of Indian Navy and Mazagon Dock & Shipbuilders (MDL). Though these ships were designed and constructed indigenously, almost all the specialized systems and equipment were imported. It was then realized that Indian Navy must explore domestic industry to substitute these imports with indigenous equipment.

PROBLEMS WITH IMPORTS

An imported equipment comes with its share of problems. It is generally observed that the foreign supplier delivers the equipment and makes it operational onboard ship. Proper technology transfer and training of the Indian crew are invariably deficient. Therefore, the Navy is not able to exploit and maintain the imported equipment optimally, necessitating deputation of foreign supplier's technicians or engineers. This is a costly proposition involving expenditure to the tune of thousands of Dollars per day. Further, there is a fear of support denial in scenario of conflicts. It is observed that, more often than not, the equipment becomes 'Unsupportable' after the expiry of warranty period. There have been instances where Navy had to resort to 'Cannibalisation' of spares from a ship under refit, to keep the fleet operational. The upgrades are not available making the equipment 'Obsolete' in a short time. This situation has been experienced by Navy for equipment imported from Western world or even from Russia who is a staunch supporter of India in defence equipment supplies.

Indian Navy had realized the perils of importing equipment all along. There were indigenization drives undertaken at various formation and levels in Navy, however, a holistic approach had been long desired. The Make in India initiative gave the necessary impetus to Navy's Think Tank prompting a comprehensive document on this aspect.

Indian Navy came out with an Indigenisation plan and commenced exploring Indian industry for sourcing this equipment. Some of the relevant areas are listed below: -

- Electric Propulsion Motor operating at of 6.6 KV with a capacity of 3 MW and above (AC motors as well as and DC motors)
- Active Front End Drive
- Power management systems associated with motors and drives mentioned above
- Diesel generators of 1 MW capacity and above
- Diesel generator control systems
- Gas turbines and Gas turbine Generators
- Gas Turbine Control Systems
- Submarine Motion control systems and submarine equipment
- Navigation radars and Inertial navigation systems
- Global positioning systems
- Weapon radars and missile systems

Indian Navy has listed equipment and systems for indigenisation in its Indigenisation Plan.³

ROLE OF INDIAN INDUSTRY IN NAVAL SHIPBUILDING

It is pertinent to mention here that the Indian industry has been active in naval shipbuilding for quite some time now. A majority of warship equipment in Float category is sourced indigenously. A significant portion of the Move category is also sourced indigenously. Actually, the Indian industry has always been technologically at par with many of the equipment and systems onboard a warship. But these 'Industrial' equipment are not readily suitable for shipborne applications. Some of the typical hazards onboard a warships are shock, vibration, corrosion, humidity and electromagnetic interference. An equipment has to be ruggedized and tested for immunity for the above hazards prior to its induction into Navy. The situation is valid even today. Therefore, an easy way to gain successful entry into naval shipbuilding is by mapping industrial products for functional suitability and getting them 'ruggedized'. Then there are some areas which are not applicable to Indian industry and, hence, these technologies have to be 'Imported'. Examples are engines, generators & associated control systems, magnetic stealth of the ship, navigation equipment, missile systems etc. Indian firms viz. L&T, Tata Group of Companies, Mahendra Defence, Kirloskar Group, Kalyani Group, Bharat Forge, Walchandnagar Group and many other firms have established indigenous manufacturing facilities and are supporting Indian Navy in achieving desired levels of Indigenisation.

L&T identified global technology leaders and set about developing indigenous capability by adopting 'Knowledge Acquisition' model. A business model was developed to ensure the financial interests of the technology provides as well as L&T and also satisfying indigenisation needs of the Indian Navy. The journey of this nascent group of L&T is given below in brief.

ROLE OF L&T – ELECTRICAL AND AUTOMATION IC

The Electrical & Automation Marine Business of L&T came into existence a decade ago. In this short time, the group has demonstrated knowledge acquisition model with global partnership approach and indigenised the complete range of electrical and automation equipment of a warship. Today, this group has a unique distinction of being the only group in eastern globe with capability to cover the electrical and automation range of a warship in a 'Turnkey' model. The business group has delivered several 'Single Window Solution' projects for warships of Indian Navy. The global footprints have also commenced with sizable supplies to Royal Malaysian Navy, Sri Lankan Navy and Mauritius Navy. Some of the global partners and the technology areas are listed below: -

- (a) Magnetic stealth of a warship with technology tie-up with Thales, France, Ultra, UK and STL, Germany.

- (b) Platform Management Systems with Servowatch, UK. (L&T acquired Servowatch in year 2012).
 (c) Medium Voltage Switchgear with TAMCO, Malaysia. (L&T acquired TAMCO in year 2008).
 (d) Gas Turbine monitoring and control with Zorya Mashproekt, Ukraine.

ROLE OF OTHER FIRMS

In addition to L&T, a number of firms are active in defence manufacturing sector. Notably among them are Tata Advance Systems, Tata Power, Mahendra Defence, Bharat Forge, Kalyani Group. These firms have been supporting the indigenisation drive of Indian Navy for the past three decades or so. However, before the launch of MII drive and promulgation of DPP-2016, there was a strong bias on imports as the taxation and commercial regulations favoured imports. A level playing field was not available to Indian Industry. The DPP-2016 is expected to remove this bias and promote local manufacturing.

RELEVANCE OF THE STUDY

There is a huge opportunity for the Indian Manufacturing sector to implement the 'Make in India' dream true by producing the equipment within the country. This paper aims to bring about the indigenisation plans of the Indian Navy in the coming decade or so and the opportunity it provides for the manufacturing industry in areas of electrical, power electronics, control systems and power generation. The paper will suggest a broad roadmap for indigenous manufacturing of these equipment as pilot projects, keeping in mind profitability and business viability for the private industry. As brought out earlier, a large number of warships and submarine equipment are predominantly imported even today and the business potential for import substitution is significant. At a rough estimate, Indian Navy will be spending sums to the tune of hundreds to thousands of Crores on import of equipment over the period till year 2030. The annual return for the industry depends upon building of capability and capacity within the country with collaboration between Indian Industry as well as with global technology leaders. The scope of paper is restricted to the technological and technical aspects of the process that can benefit Indian Industry and Indian Navy and do justice to the confidence posed by the MII on Indian Industry. However, a flavor of the potential is essential to evoke enthusiastic response from firms.

"It is envisaged that the Indian Navy will be placing orders for more than 90 vessels by year 2027. Further, a total of about 60 vessels are currently on order on Defence and private shipyards. This ambitious plan entails a capital expenditure on about INR 847000 Crore by year 2027".⁴ At a very conservative estimate, a potential of Rs, 17,500 Cr (roughly 2%) exists for equipment and systems mentioned above. On an average, the potential works out to be about Rs. 1200 Cr per year. In the first few years, the potential may be less as Indian Industry may not be able to substitute the imports, but with methodical capability building, the potential in the subsequent years will increase.

SCOPE OF THE STUDY

As mentioned earlier, the scope of this paper precludes estimation of accurate potential at this stage, the mapping of potential will be undertaken as part of a detailed research study subsequently. The scope of the paper is limited to drawing up a roadmap for pilot projects for the technologies listed earlier in this paper. The paper explores the opportunities and challenges thrown up by MII in Indian Naval Shipbuilding context. The paper restricts its scope to induction of new technology in the 'Electrical and Automation' areas of naval warship building. The paper keeps a sharp focus on the underlying spirit of MII, i.e. capability and capacity building within the country to be able to attain 'Self Reliance' in providing 'Life Cycle Support' to strategic technology areas in Defence Sector.

OBJECTIVES OF THE RESEARCH PAPER

1. Understand the significance of Make in India initiative on indigenous warshipbuilding
2. Understand the new Defence Procurement Policy
3. Build up a case for indigenous manufacturing of equipment and systems for the Indian Navy by initiating pilot projects in suggested area
4. Study the steps involved in induction of equipment in Indian Navy

RESEARCH METHODOLOGY

The research methodology will mainly cover secondary research as the information is very sensitive in nature and confidential.

ROADMAP FOR PILOT PROJECTS

The technology for induction into the Indian Navy is not 'Unmanageable'. A number of companies in India are dealing with similar equipment and also equipment of higher technology. Therefore, a manageable paradigm shift in the operations of the industry can be the game changer. This paradigm shift primarily pertains to the following two areas

- Adaptation of the equipment for naval environment, i.e. taking into aspects of shock, vibration, electromagnetic interference etc. at the design stage.
- Understanding the procurement procedure of Indian Navy and following the steps for indigenisation of an equipment.

It is suggested that the industry take up manufacture of following equipment locally:

- Alternators of 1 MW capacity
- Static Frequency Converters of 300 KW capacity
- Uninterruptible Power Supplies of 300 KW capacity
- Battery Monitoring system for submarines
- DC Motors of various capacities for submarines
- Power supplies for Avionics on Aircraft Carrier
- Lift Control System on Aircraft Carrier

It is suggested to undertake pilot projects to establish the process and capability of getting these successfully inducted into Navy. All the above equipment can be straightaway adapted from industrial systems to naval systems. According to the researchers, no technology transfer from a global player is involved for these equipment as they are in abundant use in civil industry. There are many similar areas and once a headway is made, further avenues will automatically unfold.

Larsen & Toubro offers to undertake the coordinating role in facilitating the interested industry player in entry into Indian Navy. In some areas, it may necessitate formation of a consortium with a DRDO Laboratory.

ROADMAP FOR THE INDIAN INDUSTRY – DISCUSSION POINTS

The detailed mapping the financial potential in terms of revenue and profits will be undertaken as part of a detailed research study by the authors. Further the requirement of capital investment involved in setting up manufacturing units for some of the equipment will also be undertaken in the detailed research study. Some areas need no capital investment and the existing manufacturing set-up can be fine-tuned into a dedicated assembly line to adapt the products for naval use.

The typical steps involved in induction of a new technology are listed below: -

WITH INDIGENOUS CAPABILITY

- **Identification of the technology area in line with the expertise of the business group and requirement of naval ships:** This step may take upto three months and involves discussions with naval authorities and visits onboard naval ships.
- **Preparing a project plan in consultation with Navy:** This plan can be prepared parallelly while interacting with Navy and can be concurrently ready on conclusion of identification of the equipment. This plan would typically have following steps.

- **Design adaptation of equipment:** This is a very crucial stage and a thorough involvement of competent design engineers with naval specialists is required. The success of the induction is heavily dependent upon the thoroughness of the design adaptation of the equipment. This process may take between 3 to 6 months. Parallely, the trials schedule can be drawn and approved by Navy.
- **Manufacturing Cycle:** A prototype equipment is manufactured and subjected to the functional trials. This step may also take upto 3 months.
- **Environmental Testing:** The prototype equipment is subjected to various trials in naval test facilities and laboratories. This process needs very meticulous project management as this process involves movement of the equipment across the country, testing into environmental chambers and correction in the event of failures. This process will take minimum three months. The success of the testing is dependent upon robust design, good manufacturing and thorough testing by internal Quality Assurance team.
- **Trials onboard a Warship:** On successful functional and environmental trials of the equipment, Navy nominates one of the warships where the equipment can be installed for trials in real environment. The duration of the trials may be between 3 to 6 months. This step also involves meticulous project management as the ship availability is crucial for this stage.
- **Empanelment of the Supplier:** After all the steps listed above, Indian Navy empanels the supplier for the subject equipment and a notification to this effect is issued to all shipyards. Then the regular procurement process begins.

GLOBAL TECHNOLOGY TRANSFER

Some of the technologies are not available within the country. Therefore, it is imperative to tie-up with a global technology leader. The new DPP has helped Indian industry in this area significantly by giving incentives for indigenous manufacturing by technology transfer.

The steps involved are similar as above. In addition, the technology leader becomes a part of the induction process. There are complex financial considerations for settlement before the technology transfer can take place. Further, knowledge acquisition and making Indian team capable of providing service support is imperative. One cannot resort to seeking intervention of the foreign engineers for support as the costs are prohibitive. Some of technologies may need substantial capital investment. Some of the technologies for induction within a time frame of 5-10 years are listed below: -

- Propulsion Motors of 6.6 KV with 5 MW capacity
- Active Front End Drives and associated power management systems
- Rugged Transformers 6.6KV/ 415 V of 3 MW rating
- DC Motors for submarine propulsion
- Electromagnetic Aircraft Launch Systems (EMALS) and equivalent Advanced Arrester Gears (AAG)
- Gas Turbine Generators
- Gas Turbine Control system

CONCLUSION AND RECOMMENDATIONS

The Defence Procurement Policy – 2016 issued in consonance with the Make in India initiative of Shri Narendra Modi has thrown open avenues for Indian Manufacturing sector for making a grand entry into Naval shipbuilding areas. Indian Navy has an ambitious plan of induction of a number of warships in next 10 to 15 years. Indian Navy has also promulgated a list of equipment that are being imported. The DPP favours indigenous capability building and the time is ripe for the industry for setting up manufacturing base for these equipment. This can be done with full indigenous capability, either by a single player, or by formation of a consortium. In some cases, the consortium may involve a DRDO establishment and Academia. Some technologies that are not available locally can be inducted by forming suitable alliances with global technology leaders. The EAIC Marine Business of Larsen & Toubro has a proven track record of more than a decade of Indigenisation of Naval equipment. L&T today enjoys a partnership status with Indian Navy in establishing indigenous Life Cycle capability in the country for supporting Naval warships. L&T offers to take a coordinating role in facilitating manufacturing industry to approach Indian Navy with their offerings in the listed areas. There is an opportunity in exports of these warship equipment to foreign navies also. Therefore, it is time for the Indian manufacturing industry to take the big leap in making the dream of Make in India a reality.

Naval shipbuilding at the private shipyard is in its nascent stage and therefore is facing considerable challenges. Proactive measures therefore need to be adopted to plug the existing loop holes in warship contracts and improve warship acquisition through competitive bidding. The shipbuilding industrial base in the long run will bring about economic benefits along with quality and efficiency in construction and repair of warships. Naval and Coastguard expansion and the promotion of indigenous manufacture in keeping with the "Make in India" campaign can offer unprecedented opportunities to all the stake holders. The private shipbuilding industry needs to rise to the occasion with enhanced competitiveness and graduate towards a reliable and resilient pillar in nation building.

Investment in modern defence equipment involves heavy initial expenditure with long gestation period before income starts flowing in. In India, the government has the capability of investing large amounts for developing a product, and the private industry has the ability to speedily absorb and produce a product. So co-operation between the original equipment manufacturer, the government agencies and the private sector will pave the way for high degree of indigenization for such critical systems.

Advanced Navies are already making rapid strides in various associated areas towards enhancing their capabilities. The Indian Navy also needs to be the prime mover for indigenous development & early realization of such capabilities. This assumes urgency keeping in view of the large gestation period of these and resultant ship building efforts.

LIMITATIONS

The proposed research study by the authors aims to suggest optimum methodology for induction of cutting-edge technology in the Indian Navy. However, no such research has been undertaken prior to this proposed study. Also, a large amount of information is in the restricted domain and needs sensitive handling. Therefore, the research methodology and research design for the proposed study is largely based upon secondary data collection by means of structured interviews of personnel from Indian Navy, defence shipyards, Ministry of Defence, FICCI, CII and prominent Indian industry players like L&T, Tata Group, Kalyani Group etc. The research study will map the potential for tapping by the Indian industry in the next 15 years and the steps required to be taken to be able to convert the potential into business. The present paper is merely a prelude to the details research study.

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