Emerging Trends in Defence Materials

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Emerging Trends in Defence Materials

- Next Gen Defence Materials is likely to revolutionize the Defence industry with a focus on superior strength ,light weight properties and adaptability to various conditions.
- Advanced materials –Advanced ceramics and alloys to carbon fibre composites. Nano,Meta materials, Al matrix composites etc
- Advanced materials to give superior strength to weight ratios, resist corrosion,easy fabrication, long lasting,wear resistance & provides specialised features.
- Until 2001 private sector was barred from defence production.
- Government has issued 606 licenses to 369 companies.
- As of Jan’2023 ,14000 MSME’s & 329 start ups engaged in defence production in India.
- India has been the largest importer in 2019-23 period with a 9.8% share in total arms imports.

FDI allowed for Defence Procurement

Prioritised Category	Indigenous Content (IC) Requirement	Maximum FDI allowed under automatic route
Buy (Indian IDDM)	Indigenous Design & IC of ≥ 50%	49%
Buy (Indian)	50% IC if Indigenous Design :Otherwise ,IC of≥60%	74%
Buy and Make (Indian)	≥50% IC in Make Portion	74%
Buy (Global Manufacture in India)	IC of ≥50%	74%
Buy (Global)	Foreign Vendor-Nil Indian Vendor ≥30% IC	NA (Foreign):74% (Indian)

Source: Compiled from Ministry of Defence ,Defence Acquisition Procedure 2020

India’s Defence Exports

Year	Total Exports in (INR Crores)
2016-17	1,522
2021-22	12,815
2022-23	15,918
2023-24	21,105

Source: Department of Defence Production

Defence Production

- Advanced Metal Used in Defence are
  - ❑ Nickel –Aluminium Bronze
  - ❑ Beryllium Copper
  - ❑ Copper Nickel
  - ❑ Titanium-For rockets,explosives,missile guided equipments
- Titanium is light in weight and stronger than other metals.
- Production Values surged by 16.8% to 1,26,887 crores in 23-24 vis a vis 2022-23 (1,08,684 crores)
- India's defence mkt size is est. at USD17.4 billion to reachUSD 23.05by 2029 CAGR 5.79 (24-29)
- Indai has the 4th highest military spending in 2023.
- Govt aim to make India a leading Global Defence mfrg hub.
- 79.2% prodn by DPSU and 20.8% by pvt sector.

Defence Production Contd

- Budget allocation for Defence in India

Year	Amount in crores in INR
2014-15	2,29,000
2023-24	5,93,537
2024-25	6,21,541

Initial developments for Defence

- In early years after independence most of defence requirements were imported. Small part was met from indigenous production.
- SAIL since its inception has developed products to meet the requirements of Defence. It took lead to create products for import substitution.
- Working in tandem with DMRL/DRDO, SAIL developed –

Armour grade Steels for Main Battle Tank.

SSB 26, SSB 27, 45X1, 48X3, B14, 9260 & B24 for **Shells**

655M13, 8235M15, 817M40, JSS 9510 for **Barrel & Breech block.**

- DMR 249A for warship body/hull, DMR 249B for landing decks/platforms of air craft carrier and DMR 249A/BK bulb bars replacing D40S considering excellent high strength – low temperature toughness combination over D40S steel.

High Strength Steels For Indian Army

STEEL GRADE	PRODUCT	APPLICATION
Jackal & Spade	Plates	MBT (T-72, T-90, Arjun), Bullet/ Mine Proof Vehicles, BMP-II, Bullet Proof Vehicles & Jackets
Armour Steel replacing 50 Pi	Plates	Tanks & Mine Proof Vehicles
15Cr3	Plates	Bottom Parts of Armoured Vehicles
Jackal (Special)	Plates	BMP (*Boyevaya Mashina Pyekhoty - R)* II Vehicle (Infantry Combat Vehicle – English)
2 Pi	Plates	Turrets (on Hull) of BMP II Vehicles
BPi25	Sheets	Wheel Covers for BMP Vehicles
SAIL KAVACH	Sheets	Bullet Proof Vehicles and Jackets
Def Stan 10-13/ 2H95 & W3-2539	Forgings	120 mm Arjun Tank Barrels & 155 mm Dhanush Barrels

High Strength Steels For Indian Navy

Steel Grade	Product	Application
DMR 249 B	Plates (< 30 mm)	Flight Carrier Deck & Platform (INS Vikrant)
DMR 249 BK	Plates (71 -100 mm	Flight Carrier Deck & Platform
DMR 249 A	Plates	Hulls for Submarines (can withstand impact of 78 Joules even at -60^{o} C)
AB 3K	Plates (41 - 70 mm)	Hulls for Submarines
AB 3KM	Plates (71 - 100 mm)	Hulls for Submarines
DMR 249A	Billets	Bulb Bars for surface & underwater vessels
DMR 249 BK	Billets	Bulb Bars for surface & underwater vessels
DMR 292A	Billets	Bulb Bars for surface & underwater vessels
AB 3/ DMR 301	Billets & Plates (< 40 mm)	Bulb Bars for surface & underwater vessels

Special Steels For Defence

Steel Grade	Product	Application
SAILRATH	Plates	Bofors Gun Carriage components
Special Carbon Steel	Forgings	Pinaka Multi Barrel Rocket Launcher components
JSS 9510-D120	Ingots	Soltam Gun Barrels
30XKhaga	Plates	Muzzle Brakes in Gun Barrels
60SiCr8	Billets	Shell manufacture
En 2E Special	Billets	Guard of Strocket Wheels of Tanks
C60E	Billets	Shell manufacture

Special Steels For Defence

Steel Grade	Product	Application
15CDV6 Special	Plates	Agni Missile Outer Motor Casings & Brahmos Missile Jackets
DMRL 1750	Plates	ERA Containers
SAILARM	Ingots	Ammunition Testing
Fe 410 (Special)	Sheets	Aerial Bombs Parts
35Mn6Mo3	Billets	105 mm Field Gun

Future Requirements in Defence

- Opening of the defence to private sector participation is a welcome step as it will help country get more capacity to augment the defence requirements.
- Defence systems/materials development have long lead items besides having high development costs.
- Collaboration will help build resilience in supply chains, create new technologies and pursue interoperable standards.
- Along with newer technologies, advanced materials (AdMs) - Aluminum alloys, Composite materials, Nano materials, Meta materials, Advanced ceramics, Aluminum matrix composites - find great utility for their - high strength to weight ratio, high corrosion resistance, easy fabrication, long lasting, resistance to extreme temperatures & pressures besides excellent wear resistance and thermal stability.

SAIL steel W3-2539 Grade used in Barrel of Dhanush



SAIL SPADE steel strengthening Main Battle Tanks



Shells used in Indo-Pak war of 1971





Shells Now in Use



❑ **Shell 155MM HE ERFB BT**

Rapid & Accurate firing at long ranges to attack the ground targets by 155mm Artillery Gun



❑ **Shell 155MM Illuminating ERBF**

Designed to support night warfare. Illumination provided by this ammunition is sufficient for identification and engagement of

All types of moving and non-moving objects

Shells Now in Use



Shell 155MM Screening Smoke ERBF

This shells are normally used to mask the movement or redployment of own forces from enemy observation, thereby neutralizing direct enemy fire.



Shell 105MM ILLG

The ammunition provides intense illumination for identification and engagement of all types of stationary and moving objects.

SAIL is supplying defence grade steel to Field Gun Factory for Building Rocket Launchers



India's First Indigenous Aircraft Carrier
INS Vikrant
(built at Cochin Shipyard)
Commissioned on 2nd September 2022.



P17A Frigate INS NILGIRI (built at MDL) launched on 28th September 2019



P17A Frigate INS HIMGIRI (built at GRSE) launched on 14th December 2020



P17A Frigate INS UDAYGIRI (built at MDL) launched on 17th May,2022



P17A Frigate INS DUNAGIRI (built at GRSE) launched on 15th July 2022



P17A Frigate INS TARAGIRI (built at MDL) launched on 11th September 2022



P17A Frigate INS VINDYAGIRI (built at GRSE) launched on 17th August,2023



P17A Frigate INS MAHENDRAGIRI (built at MDL) launched on 1st September 2023




सेल SAIL
Thank You