

-XXIII Dr. Tamhankar Memorial Lecture-

‘Steel for Future Defence and Strategic Application’



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Outline of presentation

Steel Scenario

Defence Sector Scenario

Steel requirement for the Defence application

Steel requirement for other strategic sector

Future Outlook

Global and Domestic Scenario



World Steel Scenario

Top steel producing countries

Top 10 Steel Production Countries				
Rank	Country	2015 (MT)	2014 (MT)	% Change
1	China	803.8	822.8	-2.3
2	Japan	105.2	110.7	-5.0
3	India	89.4	87.3	2.6
4	United States	78.9	88.2	-10.5
5	Russia	71.1	71.5	-0.5
6	South Korea	69.7	71.5	-2.6
7	Germany	42.7	42.9	-0.6
8	Brazil	33.2	33.9	-1.9
9	Turkey	31.5	34	-7.4
10	Ukraine	22.9	27.2	-15.6

Source: WSA

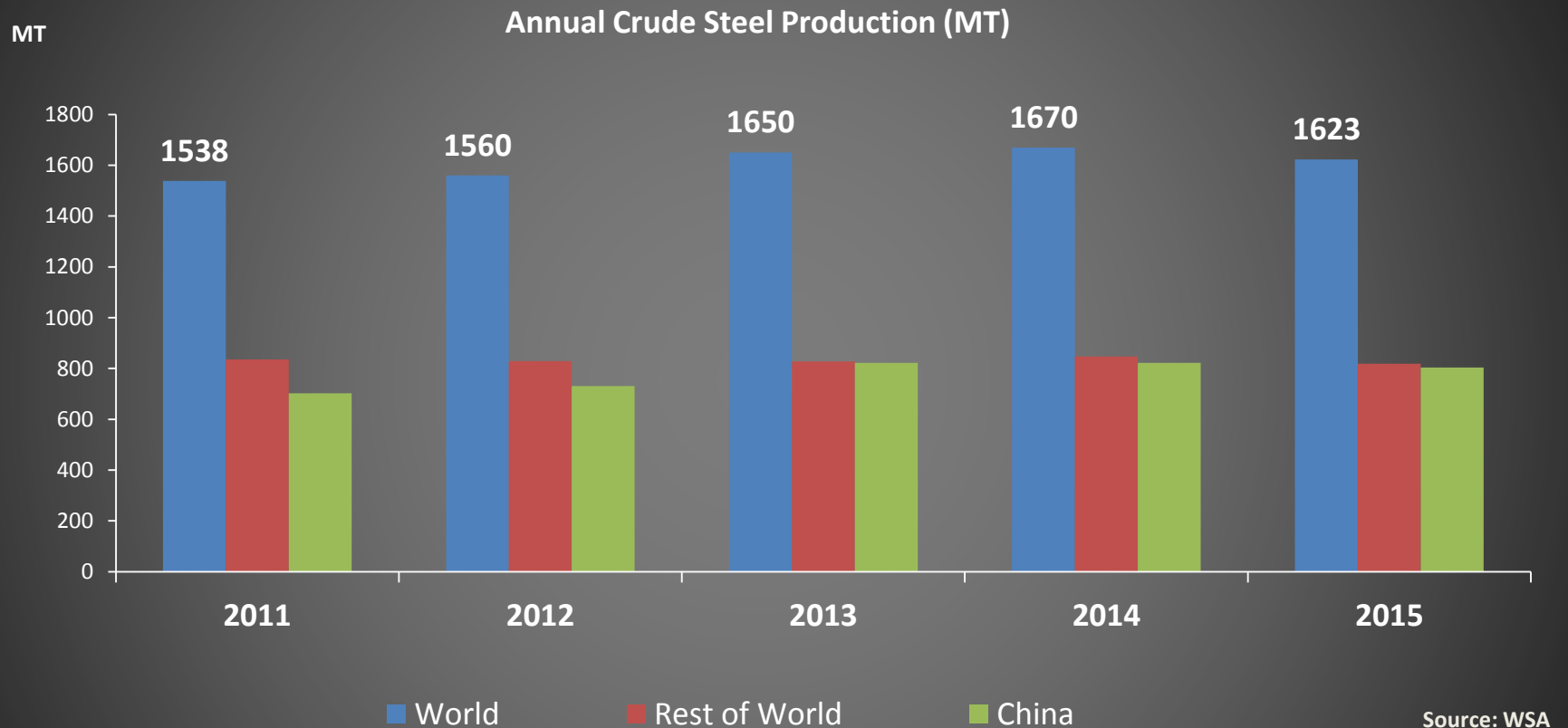
India overtook USA to emerge as the world's **3rd largest** producer of crude steel in 2015

Top 5 countries with highest per capita steel consumption

Rank	Country	Unit: kg
1.	South Korea	1118.8
2.	Taiwan (China)	837.1
3.	Czech Republic	582.4
4.	Japan	531.7
5.	China	510
	India	59.4
	World Average	216.6

World Steel Scenario

World Steel Production



India's share in World Steel Production in 2015 is **5.5%**

Global Crude Steel Production Trend

Million Ton

Country	2012	2013	2014	2015	% change In 2015	
					Over 2014	Over 2012
EU 28	168.6	166.3	169.3	166.2	-1.8%	-1.4%
CIS	111.0	108.3	105.9	101.3	-4.3%	-8.7%
US	88.7	86.9	88.2	78.9	-10.5%	-11.0%
Asia of which:	1026	1116	1140	1114	-2.3%	8.6%
China	731.0	822.0	822.8	803.8	-2.3%	9.9%
Japan	107.2	110.6	110.7	105.2	-5.0%	-1.9%
India	77.3	81.3	87.3	89.6	2.6%	15.9%
World	1559.5	1649.0	1670.2	1622.8	-2.8%	4.1%

- Between 2012 and 2015, except China and India, production fell in all major steel producing countries.
- India was the only major steel producing country with production growth in 2015.

Domestic Finished Steel Consumption- 2015-16

(Qty. in million ton)

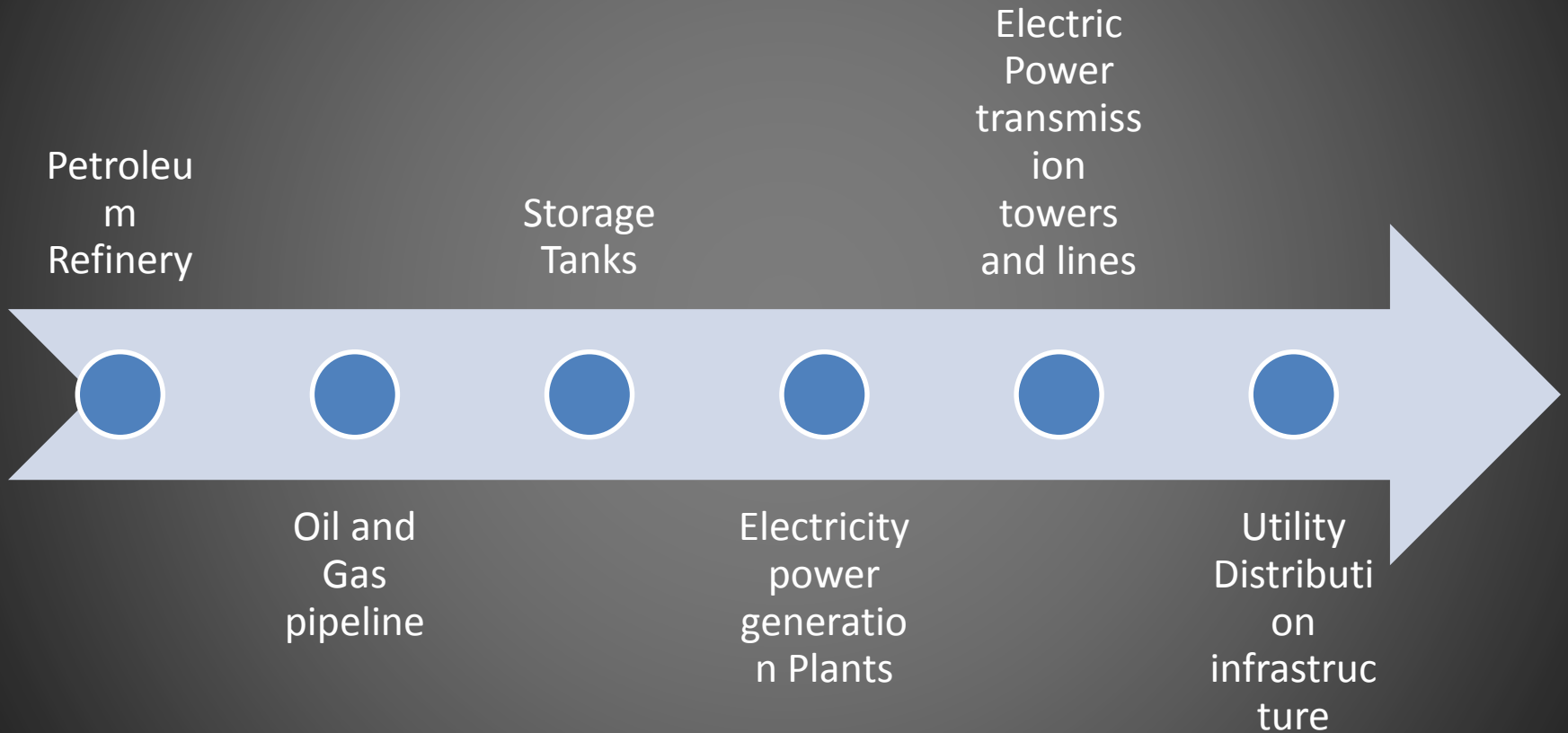
Period	Production for sale	Import	Export	Consumption
2015-16	90.4	11.7	4.1	80.5
2014-15	92.2	9.3	5.6	77.0
% Growth	-1.9%	25.7%	-27.1%	4.5%

Source: JPC

- With 2.4 MT higher imports and 1.5 MT lower exports in FY16 over FY15, there was increased availability of 3.9 MT in the domestic market.
- Against this, domestic consumption was higher by only 3.5 MT.
- Domestic producers were accordingly forced to curtail production.

- Steel is vital for
 - Infrastructure
 - Homeland Security and Economic Security
- All segments are highly Steel Intensive

Steel for Energy Infrastructure



Steel for Transportation Security Infrastructure

- Highway
- Bridges
- Rail/ Roads
- Mass transit systems
- Airports
- Seaports
- Navigation System



Steel For Health & Public Security Infrastructure

- Dams and Reservoirs
- Waste and Sewerage treatment plants
- Public water supply system
- Residential Construction



Steel for Comml. Infrastructure & Indl. Complex

- Manufacturing plants
- Chemical Processing Plants
- Schools Colleges and Commercial buildings
- Hospital, retail stores and hotels
- Houses of Worship, Government Buildings

Growth potential- Indian Steel

- Resources
 - Strong managerial skills in Iron and Steel Making
 - Large pool of skilled manpower
 - Established steel players with strong skills in steel making
 - Abundant resources (ex. Iron ore and coal reserve)
- Opportunities
 - High economic growth driven increasingly by Industry
 - Faster urbanisation
 - Increased fixed asset building
 - Automobiles and component industry growth

Defence Scenario

- Countrywise budget
 - USA- \$ 581 Billion
 - China- \$ 186 Billion
 - Saudi Arabia- \$ 57 Billion
 - UK- \$ 55 Billion
 - Russia- \$ 47 Billion
 - Japan- \$ 40.3 Billion
 - India- \$ 40 Billion
 - Germany- \$ 36.3 Billion



Defence Infrastructure

- Man Power
- Land System
- Air Power
- Naval Power
- Resources (oil)
- Logistics (Port, Rails and Roads)
- Geographic (Land, Coast, Borders Waterways coverage)

Indian Military Power –requirement of Steel

- Land systems
- Tanks (MBT, BT tanks and Tank destroyers)
- Armored Fighting Vehicle (APCs and IFVs)
- Self Propelled guns (SPGs)
- Toward Artillery
- Multiple launch rocket systems (MLRs)



AIR Power

- Total Air craft (Fixed wing and Rotary wing)
- Fighters and Interceptors
- Fixed wing attack aircraft
- Transport aircraft
- Helicopters -646
- Attack Helicopters- 19



Naval Power

- Total Naval Strength – 295
- Aircraft Carrier (including Helicopter) – 2
- Frigates – 14
- Destroyer – 10
- Corvettes – 26
- Submarines – 14
- Coastal Defence craft – 135
- Mine warfare - 6



Resources (Petroleum)

- Oil Production -767,600 bbl/day
- Oil Consumption – 3,510,000 bbl/ day
- Proven oil resources – 5,675,000,000 bbl / day

Logistics

- Labor force – 492,400,000
- Merchant Marine strength – 340
- Major Ports and Terminals - 7
- Roadways coverage – 3,320,410
- Railways coverage – 63,974
- Serviceable air tracks – 346

Geography

- Square land area – 3,287,263 km
- Coast Line – 7000 km
- Shared Border – 13,888 km
- Waterways – 14,500 km

Journey towards self excellence

- Achievements (Source: Ministry of Defence, Govt. of India publication)
- FDI in Defence sector increased from 26% to 49%
- Licensing requirement relaxed
- Defence Exports – Policy liberalised
- Rs. 65,000 crores value of equipment and platforms to be acquired through 'Make in India' or Make and Buy route (including 12 Drone surveillances aircrafts, 6 submarines, 384 Helicopters)

Capability Enhancements

- India's largest aircraft carrier 'INS – Vikramaditya' dedicated to the nation by the Prime Minister
- INS-Kolkatta, the biggest warship ever built in India, was commissioned by the Prime Minister
- INS- Kamorta (Anti submarine warfare) and INS-Sumitra (Offshore Petro vessel)

Capability Enhancement & Modernization

- LCA- Tejas was introduced into the Air force
- SBTF Ski jump facility created
- Indian Air Force modernisation continued C-130-J, C 17 s included
- MI-17 – V5 Helicopter fleet included
- Fast Petrol vessel ICGS- Abhiraj commissioned.

Technological Advancement

- Special allocation of Rs. 5000 crore made in the current union budget for speeding up modernisation.
- Rs. 160 crore allocated to setup a Technology Development fund to encourage Research and Development of new defence systems that enhance cutting edge technology capability in the country
- Rs. 1000 crore allocated for accelerating the development of the railway sector in border area.

Technological Advancement

- Successful test of Akash Missile
- ASTRA- BVR from Su- 30 MKI
- LRSAM Surface to air Missile was successfully tested
- BRAHMOS successfully conducted the test flight from INS Kolkotta
- Dhanush, Prithvi-II and varunastra

Largest defence companies in the world

Sl. No.	Company	Country	Business
1	Lockheed Martin	US	Research design, development, manufacturing, integration of advanced technological system
2	Northrop Grumman	US	Entire defence spectrum- under outer space and cyber space
3	Boeing	US	Military products and related systems
4	BAE Systems	UK	Systems, Services Electric and IT system
5	General Dynamics	US	Products and Services to Military
6	Eurofighter Typhoon	EU	Fighter jets

- Finmeccanica, Raytheon, Thales, LB communications are some of the satellite service providers in the area.

Defence Production in India

Defence PSUs

1. HAL – Design, development, Manufacturing repair and overhaul of aircraft, helicopter, engines and accessories
2. BEL – Electronics Equipment company for defence services
3. BEML – Multi products, Heavy Vehicles
4. MDL – submarines, Missile boots, destroyers etc.
5. GRSE- Missiles, Torpedo Counter Mechanism etc.
6. MIDHANI- Armaments, Space Armaments, Atomic Energy, Navy products, Ti and SS Tubes and Alloys
7. GSL – Builds different types of Special purpose ships

Indian Defence- private Sectors

- TAS (Tata Advanced systems)- Composite compounds and other applications
- L&T – Naval/ Missile system
- Kirloskar Brothers – Infrastructure projects
- Mahindra Defence Systems – Solutions for light Combat vehicles
- Ashok Leyland - Special vehicles for Air Force
- Bharat Forge- Defence related various auxilliary products

Steel Requirement

Defence Equipment- **major Steel Requirement**

- Army : Battle tanks/ Armored vehicles / armored weapons – **Armored Plates**
- Navy : Submarines/ Aircraft Carrier – **high strength and low temperature toughness plates.**
- Airforce : Aircrafts- **Titanium superalloys and composites**
- Others : Gun Carriage – **High strength special steel plates**

Application and requirement of defence grades

Application	Grades
Ordnance Factory (OF) and Heavy Vehicles Factory (HVF)	Spade – MBT (T-72, T-90, Arjun), Bullet/ Mine proof vehicles Jackal – MBT-II, Bullet proof, Jacket, water towers and security posts SAIL Kavach- Bullet Proof Vehicles and Jackets SAIL Abhed- Bullet proof Rail wagons SAIL Rath- Carriage for Bofors Guns
Mine protected Vehicle by Ordnance Factory	OF manufactures MPVs which are required by homebound security agencies like CISF, BSF etc. Each vehicle requires 5-7 tonnes of armored plates in the thickness range of 4-8mm
NAVY- Warships/ Aircraft carriers Submarines	DMR 249A: Warship hull/ Body DMR-249B: Landing and takeoff Platforms DMR-249AZ: Support for Landing and takeoff Platforms DMR-249A7 -22 mm plates are required in Q&T Condition below 22 mm can be used as rolled 292 A & AB-3

Product Indigenization (Chronology)

Year	Product Application	Customer
2005-07	DMR-249 a plates for warships and Aircraft carriers	CSL Couchin
2008-09	SAIL Abhed for Bullet proof wagons	DRDO Pune
2008-09	130 mm thick plates for T-90 tanks	HVF
2009-10	SAIL Rath for Bofors Gun carriage	GCF, Jabalpur
2009-10	DMR 249B water quenched plate for NAVY	CSL Couchin
2009-10	DMR 249A (Z) water quenched plate for NAVY	CSL Couchin
2010-12	DMR 249B oil quenched plate for NAVY	CSL Couchin
2013-15	DMR 249A grade plate for submarine applications	DMRL, Hyderabad

Other specialty Steel developed by Essar Steel

Sl no.	Grades	Application
1	Armored plate CDA-99 EN10025-6-S690QL	Heavy armored Vehicle
2	Bullet proof Grades Speed – 760m /sec BBHN- 500	Armored application
3	DMR-1700 (1500 Mpa With DMRL)	Armored application

New products in Defence Basket

Sl no.	Grades	Application
1	DMR 249 GRBK plates	Requirement of Indian Navy Requirement Anti flaking treatment
2	AB-3 plates- high toughness at low temp	Deep Water submarines
3	SAILARM –new grade Q&T plate	Bullet proof application with OF Khammam and L&T

Annual requirement for specialized steel

Grade	Annual Requirement (T)
DMR 249 A/ 249B	750-1000
DMR 292	200
DMR 1700	100
AB-3 (TOT)	200
SPADE	4000
Jackal	4000-6000

Future Approach – Revolutionary Outlook

- What combination of material
- Build things faster and better
- Meet quality and safety norms
- Research labs focusing tomorrow
- Advanced Material

- Next generation Steel
- Next generation Manufacturing
- Next generation equipment

Demand for future capability

Today's Inventory

Size

Force

Power

Impact

Future Arsenal

Stealth

Agility

Information

Precision

- Develop a road range of technological capability

- Building and Industrial requires the presence and orchestration of all industry enablers
 - Development of Technology
 - Culture of R&D across Industry
 - Development of Talent
 - Robust facility and Infrastructure
 - Academia, Industry and Research Institute Interactions
 - Institutions such as SRTMI



Thank You !!!