ESSAR STEEL

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Ministry of Steel
Government of India

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CONFERENCE ON MODERN LOGISTICS FOR INDIAN METALS & MINERALS

5th February 2019 | Shangri-la, New Delhi

Powered by एनएमडीसी NMDC

METALOGIC

SLURRY PIPE LINE

"A CONVENIENT WAY OF HANDLING IRON ORE CONCENTRATE "

MVB MURALI

SLURRY PIPE LINE ROLE IN IRON ORE LOGISTICS

- NEED AND HISTORY OF SLURRY PIPE LINE
- KEY DESIGN AND OPERATING PARAMETERS
- ADVANTAGES, LIMITATIONS AND SUPPORT NEEDED

INDIAN IRON ORE INDUSTRY SCENARIO

- India has over 20billion of **Iron ore reserves.** However, more than 95% of iron ore in India is produced from Odisha, Chhattisgarh, Jharkhand, Goa and Karnataka. All these mine heads, except Goa, are minimum 300 Km away from the nearest port areas. The central and North India is connected to these mine heads through road or rail which add up to the logistics.

- Highest iron ore mining ever achieved in India was 218 Million in 2009. Out of this only 60% of the ore mined was above + 62% Fe. Hence there is a definite need to beneficiate the ores.

- The lumpy ores are being used directly in iron making and fines which are more than half of the country's reserve do not find utilization owing to its grade and high rail & road freights

INDIAN IRON ORE INDUSTRY-WAY FORWARD

- As per National Steel Policy 2017, the projected crude steel capacity is 300 million tones (MT), production of 255 MT and per capita steel consumption of 160 Kg from existing level of around 61 Kg by 2030.

- Logistics & infrastructure development like rail and roadways is the main concern for handling these additional capacities. Without this infrastructure, it is impractical to achieve the envisaged steel production rate.

- **Considering the higher investment & time required for building Rail and Road ways, Slurry pipeline is the alternative which is 5 times cheaper & faster to construct. It is an ideal solution to meet the additional logistics requirement of iron ore transportation.**

- The hydro transportation of these fines in the form of slurry through pipelines not only makes the project cost effective but also environment friendly compared to rail or road transportation.

ORIGIN AND HISTORY OF SLURRY PIPE LINE

- The 85 km Savage River Slurry pipeline in Tasmania, Australia, was the world's first slurry pipeline to transport iron ore which was built in 1967.

- In India, Hydro transportation of tailings was first introduced in Kolar Gold Mines and at Jaduguda Uranium mines.

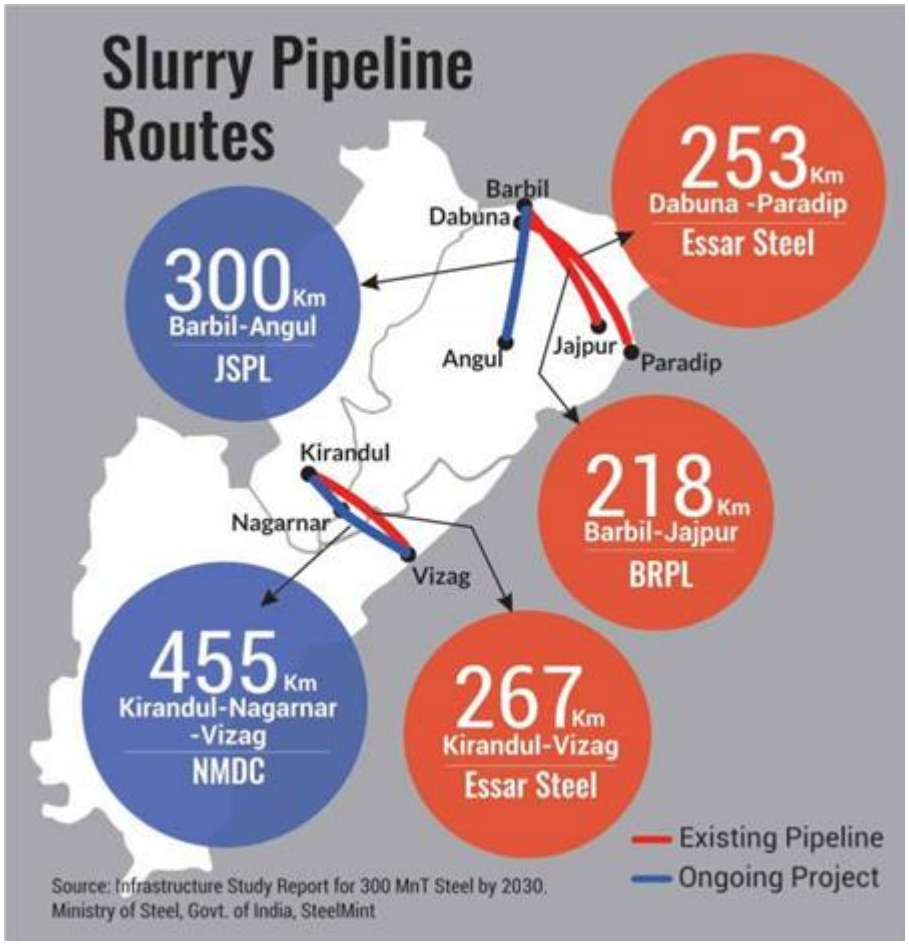
- Kudremukh is an example which was once rejected for lack of transportation facilities and low Fe content in the ore. With the developments in slurry transportation and beneficiation of ores, this huge deposit became economically viable. KIOCL slurry pipe line of 67km is the first slurry pipe line in India to transport iron ore concentrate.

- India’s largest iron ore slurry pipeline of 267 km owned and operated by Essar Steel India Ltd was Commissioned in 2005.

IRON ORE SLURRY PIPE LINES – across the world

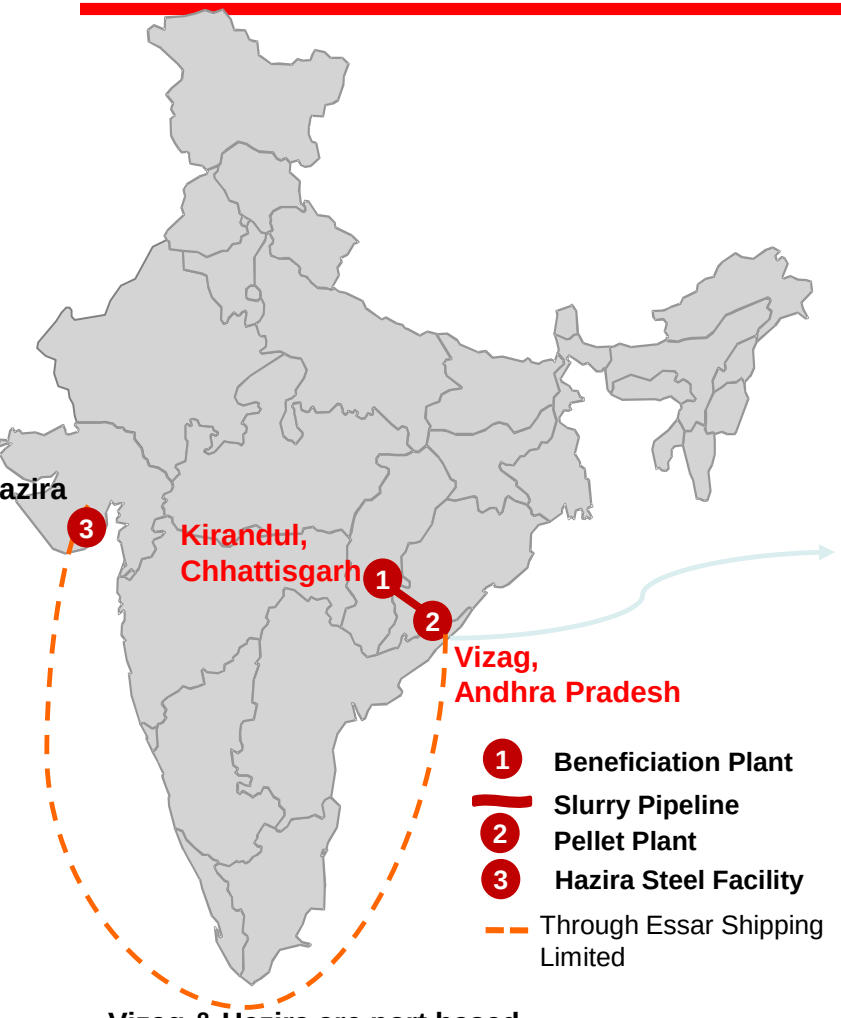
Project	Country	Length (km)	Diameter (inch)	Capacity (Mtpa)	Year
Samarco 3rd Pipeline	Brazil	401	22/24	20.0	2017
Minas Rio	Brazil	528	24/26	24.5	2014
Essar 2nd Pipeline	India	253	20	12.0	2013
CP Mining	Australia	30	32	33.6	2013
BRPL Tanto-Jajpur	India	217	13	4.0	2012
Da Hong Shan Expansion	China	171	9	3.5	2010
BaoTou West Mine	China	145	14	5.5	2010
Samarco 2nd Pipeline	Brazil	398	16/14	8.3	2008
Da Hong Shan	China	171	9	2.3	2006
Essar 1st Pipeline	India	267	14/16	7.2	2005
Jian Shan	China	105	9	2.0	1997
Kudramukh	India	67	16	7.5	1980
Samarco 1st Pipeline	Brazil	398	20/18	16.0	1977
Savage Water	Australia	85 KMs		2.5	1967

IRON ORE SLURRY PIPE LINES IN INDIA



- At present Essar Steel itself is operating two pipelines of lengths 267 km and 253 km.
- BRPL is operating 218 km length pipeline.
- There is an envisaged plan of laying a 455 KM pipeline, a joint venture of NMDC & RINL.
- Another 300 km pipeline from Barbil to Angul was under planning by JSPL.

ESSAR STEEL, VIZAG SPL PROFILE



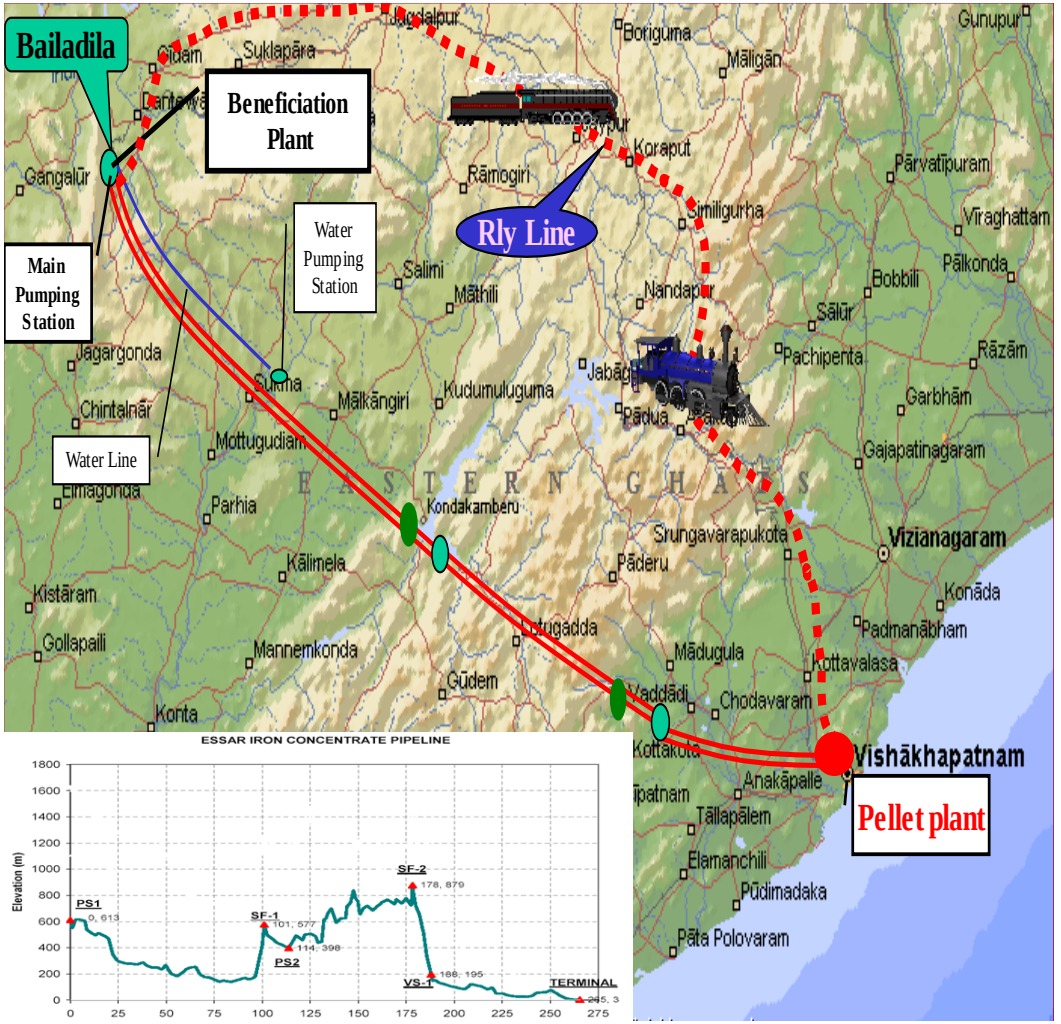
1 **Beneficiation Plant**

Slurry Pipeline

2 **Pellet Plant**

3 **Hazira Steel Facility**

Through Essar Shipping Limited



- **Vizag & Hazira are port based.**
- **End to end connectivity from mine to steel making**

SLURRY PIPE LINE KEY DESIGN PARAMETERS

The Slurry Pipelines have the following design requirement which are the decisive factors for adoption of hydro-transportation of iron ore:

1. Rheological properties of the material to identify the Line pressure & wear pattern of the slurry pipeline.

2. The hydraulic design requires that the grind of the slurry be limited within certain range.

3. Determining the minimum settling velocities of the slurry and transition velocity.

4. Topography for pipeline profile/route selection.

SLURRY PIPE LINE KEY OPERATING PARAMETERS

Slurry Preparation	• Particle Size • Slurry Density • Slurry PH • Dissolved Oxygen for Water Batches.
Slurry Pumping	• Slurry velocity • Pipeline Pressure • Pump Parameters • Slack Flow Monitoring
Pipeline Protection	• Cathodic Protection • Oxygen Scavenging system • Safety Interlocks • Pressure monitoring stations • Leak detection

SLURRY PIPE LINE ADVANTAGES

Low cost of transportation, which is almost one-fifth of that by rail transport.
It is a **zero waste** mode of transportation and echo friendly
Low maintenance costs and higher availability almost throughout the year.
Low capital cost as compared to rail or road transport. The power requirement is very low.
Highly automated slurry pipeline operations require relatively less operating and maintenance personnel.
The land requirement is very much less. Most of the pipeline is underground and the land can be used for agriculture.
Slurry pipelines offer more economical benefit with higher capacity handling within the same area requirements.
It supports disposal of mine waste at the source and thereby increases the operational efficiency at steel level.

LIMITATIONS AND SUPPORT NEEDED

Limitations :

1. Security & external factors

2. Slurry pipe lines are available only for concentrate and associated with Beneficiation and Pellet plant. However with depletion in ore quality, iron ore beneficiation is a must in future course.

Support from Government:

1. Encouragement of slurry pipeline projects through funding & incentive schemes.

2. Recommendation of SPL Operations for Carbon credits.

3. Safeguard initiatives for the Operating & upcoming Pipelines.

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THANK YOU