JINDAL STEEL AND POWER

GASIFICATION INDIA 2022

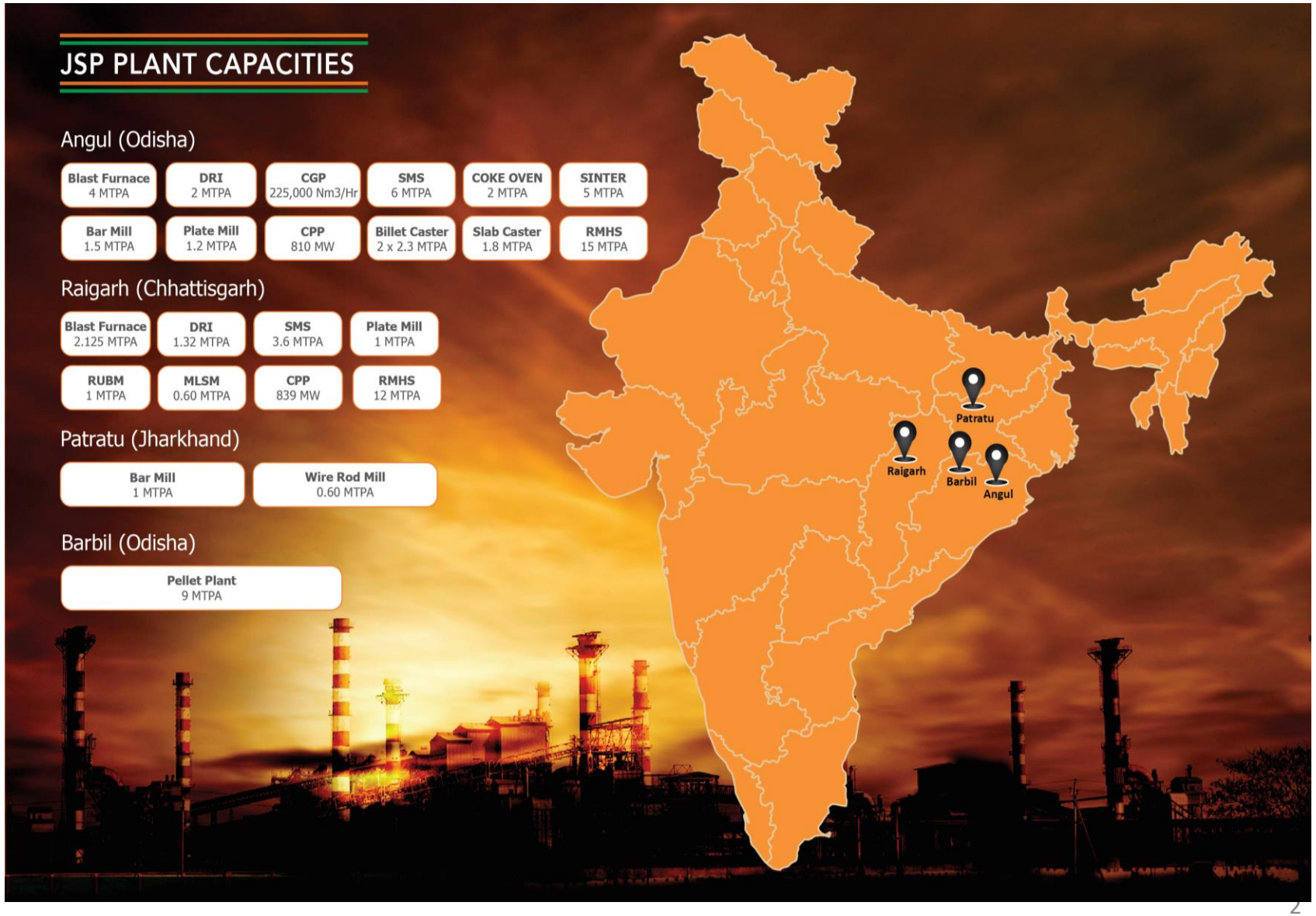
MISSION ENERGY FOUNDATION

JINDAL STEEL & POWER

Mission Energy FOUNDATION (A Not-for-Profit Organisation)

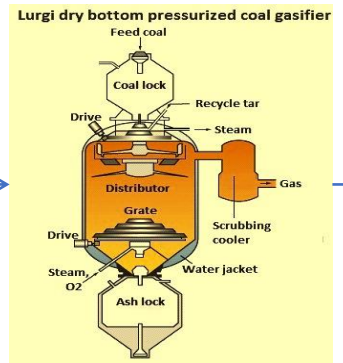
Jindal Steel & Power: Foot Prints in India

- Fully integrated steel plant /Downstream Units
- Thermal Power plant
- Beneficiation & Agglomeration Units
- Captive mines



What is Gasification

- Gasification converts any **Carbon** containing material into **Synthesis gas**, composed primarily of Carbon monoxide and Hydrogen
- Uses high pressure combined with **Oxygen** or air & steam to convert carbon based materials directly into **Syngas** by **partial oxidation**
- Gasification process breaks carbon based materials down to the **molecular level,** so impurities can be relatively easily and inexpensively removed



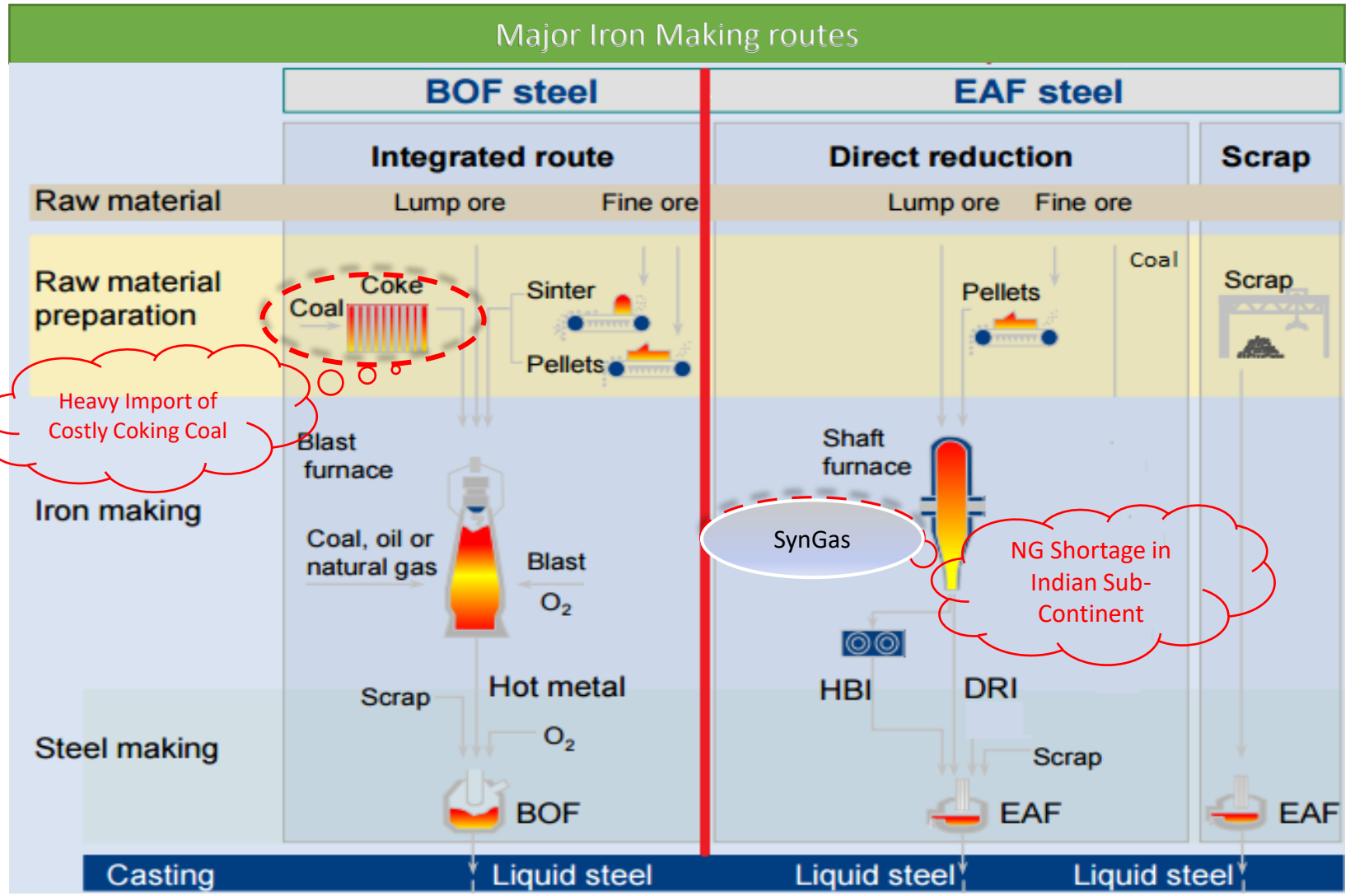
Benefits of Gasification

- Gasification plants produce significantly low quantities of air pollutants.
- Gasification can reduce the environmental impact of waste disposal because it can use waste products as feedstock - generating valuable products from these waste materials.
- Gasification's by-products are non-hazardous & are readily marketable.
- Gasification plants use significantly less water than traditional coal-based power generation, and can be designed so they fully recycle the process water, discharging none into the surrounding environment.
- Carbon dioxide (CO_2) is being captured from an industrial gasification plant using commercially proven technologies.
- Gasification offers the cleanest, very efficient means of producing chemicals & electricity from coal and the lowest cost option for capturing CO_2 .

Selection of Coal Gasification Technology

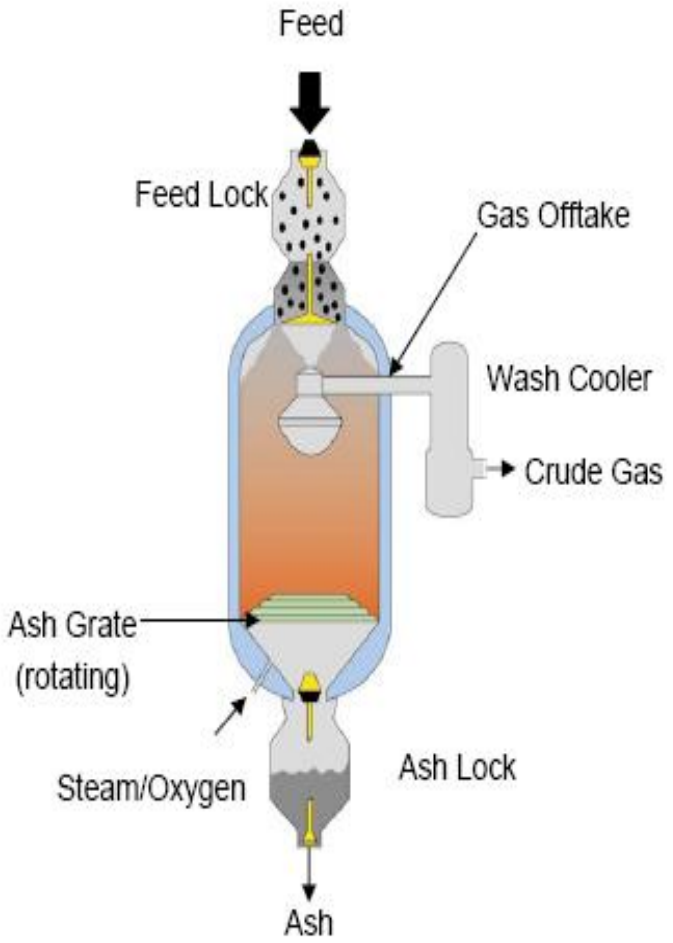
Selection of Coal Gasification Project

1. Both of the Current Clean Conventional Routes of Iron making are dependent on Imports.
2. However, JSP also being a supporter of “Make In India” Ideology, tried to use non-coking coal in Clean Steel making.
3. Same is abundantly available in India & can be used effectively.

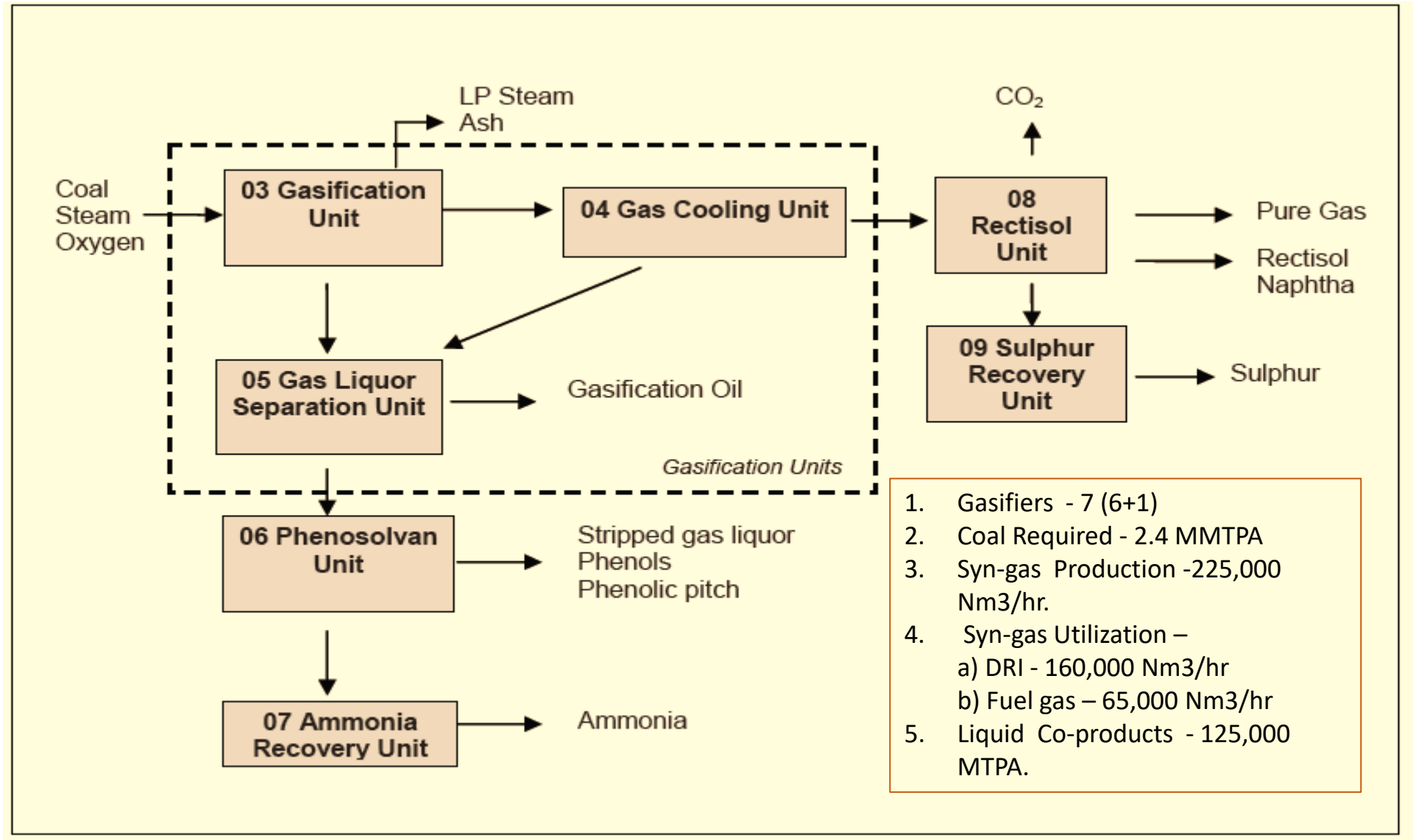


Selection of Fixed Bed Technology

- Well demonstrated, mature and Proven Technology with low risk. More than 100 Gasifiers in operation incl. China.
- Suitable for low Rank, high ash content Coal.
- High Carbon conversion efficiency (approx. 95%).
- High Cold Gas efficiency due to counter-current operation.
- Low Oxygen consumption.
- Gas Composition suitable for Steel / Fertilizer Industry.
- Ash fusion temperature of Indian Coal is high, therefore, dry bottom type is preferred.
- No Coal drying & grinding required, hence less energy consumption & not hazardous.
- Valuable By-Products like Tar, Oil, Phenol, Ammonia etc.



Coal Gasification Plant

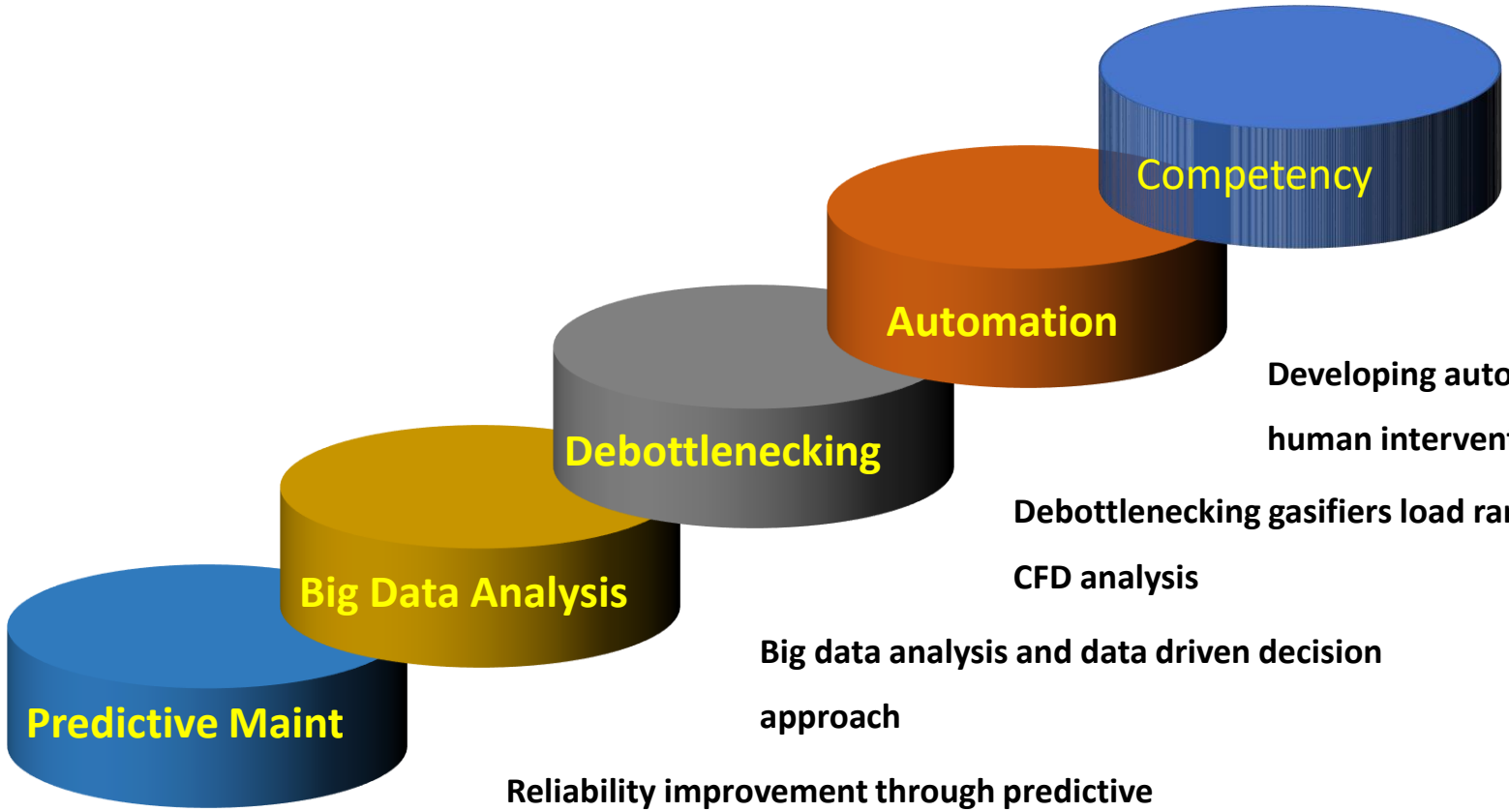


1. Gasifiers - 7 (6+1)
2. Coal Required - 2.4 MMTPA
3. Syn-gas Production -225,000 Nm3/hr.
4. Syn-gas Utilization –
   a) DRI - 160,000 Nm3/hr
   b) Fuel gas – 65,000 Nm3/hr
5. Liquid Co-products - 125,000 MTPA.

Steps taken for stable operation of Gasification Plant

- Establishing **Good Operating Zone** for efficient and stable operation
- Gained operational excellence while analyzing all the upsets.
- **Make in India initiative** by developing facilities at our Machinery Division at JSPL, Raipur for manufacturing Gasifier components, cost benefit
- **In house competency** developed at CGP Angul for repairing facility for Ash lock top cone, Ash lock bottom cone, Bosman skirt and Angular Valves
- **Major modification done and initiatives taken for automation of the plant**

Plan for sustainable operation of Gasification Plant



Competency

Reassurance Plan at all level

Developing automation scheme to avoid human intervention/error

Debottlenecking gasifiers load ramp-up through CFD analysis

Big data analysis and data driven decision approach

Reliability improvement through predictive maintenance plan

Why renewed interest in Coal Gasification

- Skyrocketing energy prices
- Availability of abundant non-coking coal in India
- Coal is more evenly distributed geographically, unlike oil
- Availability of now matured technology
- Coal gasification is widely used in SA & China and is a success story there

Way forward

1. **Expansion of existing unit**
    - Three additional fixed bed Gasifier will be installed for maximum utilization of existing Gasification complex as well as to meet the requirement of DRI 2 in line with mega expansion of the Steel complex
2. **New Gasification complex**
    - Coal fines can’t be used in our existing Gasifier. New Gasifiers of different technology which can handle fines will be installed.
    - Allotted mines will be operational in next 3 months in line with the aim of utilizing Indian coal to the maximum extent.
3. **Decarbonisation**

Decarbonisation Pillars for Steel Business

CO_2 Minimization

- Syngas based production
- Resource optimisation
- Pellet feed in blast furnaces
- Zero waste approach

CO_2 Avoidance

- Zero power furnace
- Heat recovery from off gases
- Heat recovery from slags
- Use of renewable power
- Maximizing hydrogen usage from existing 55-60%

Carbon Circularity

- CO_2 to CO
- CO_2 to syngas
- Dry reforming of CO_2

Carbon Capture & Utilization

- Fuels – bioethanol
- Chemicals – methanol
- Biological – Pigment and SiC

THANK You !