About

- India's **National Coal Gasification Mission** aims to achieve **100 million tonnes (MT)** of coal gasification capacity by **2030** to start with, transforming domestic coal into clean energy, fuels, and chemical feedstocks. Coal gasification plays a pivotal role in **reducing import dependence**, enhancing **energy security**, and enabling a **low-carbon industrial transition** through syngas-based production of methanol, ammonia, urea, DME, acetic acid and other critical chemicals. This mission focuses towards India becoming self reliant and self sufficient (Atma-Nirbhar Bharat) in low carbon hydrogen production with an aim towards –
    - Minimizing Natural Gas Import
    - Export of energy in the form of hydrogen-based molecules
    - Minimizing subsidies on account of food security

- Amid this national push, our **Hydrogen Enriched Catalytic Coal Gasification (HCC)** technology - a **US-patented pioneering process** - delivers a next-generation pathway for clean coal utilization. Operating at **moderate temperatures and pressures**, HCC uses a **proprietary catalyst** to **enhance hydrogen yield by ~15%**, minimize tar formation, and improve overall carbon conversion efficiency. This breakthrough makes **coal-to-chemicals and coal-to-hydrogen** projects more efficient, modular, and environmentally sustainable - supporting India's **100 MT by 2030** gasification vision with **indigenous, high-performance technology**.

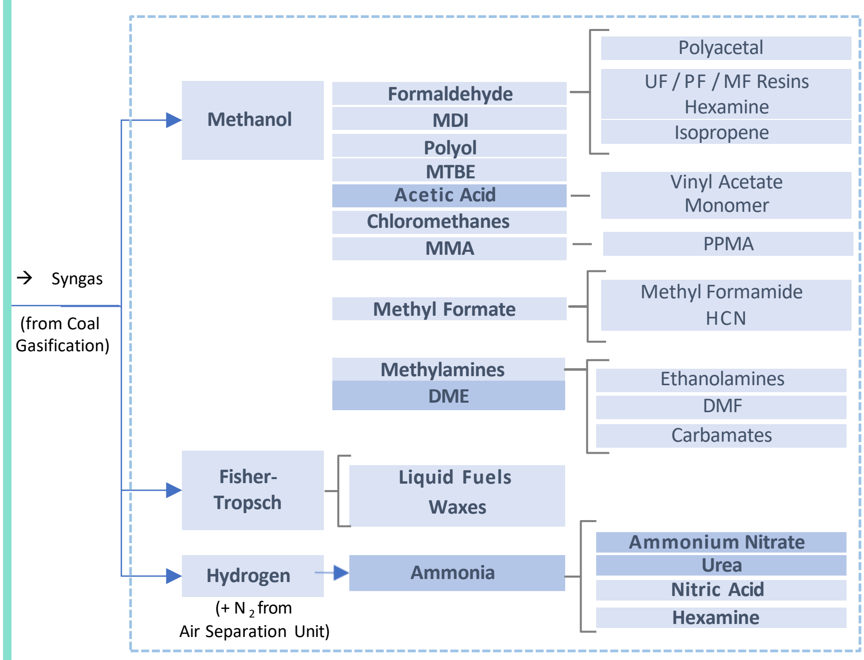
Salient Features of the Catalyst

- **Catalyst Function:** A proprietary catalyst enhances hydrogen yield by ~15% in the fixed-bed coal gasification process.
- **Syngas Composition Impact:** H_2 content rises from 40–45 vol% to ~46–52 vol%, improving the H_2/CO ratio (typically at1.7–2.0 at temperature of 1050-1100 deg C) ideal for downstream synthesis.
- **Reaction Enhancement:** Promotes water–gas shift and steam reforming, reducing CO, tar, and char, thus improving syngas quality and plant uptime
- **Operational Benefits:** Enables lower steam-to-oxygen ratio, better thermal balance, and potentially lower operating temperature/pressure**.**
- **Economic Outcome:** Higher H_2 yield boosts methanol and derivative output per ton of coal; marginal catalyst cost is offset by higher efficiency and reduced downtime
- **Overall Result:** Delivers cleaner, hydrogen-rich syngas with better process sustainability and energy integration suited to Indian high-ash coal.

Chemical Reactions

Section	Reaction / Description	Equation
1. Fixed Bed Gasifier Reactions	Partial Oxidation	$C + 1/2\ O_2 \rightarrow CO$
	Complete Combustion (minor, for heat)	$C + O_2 \rightarrow CO_2$
	Boudouard Reaction	$C + CO_2 \rightarrow 2CO$
	Water-Gas Reaction	$C + H_2O \rightarrow CO + H_2$
	Methanation	$C + 2H_2 \rightarrow CH_4$
	Water-Gas Shift (in gas phase, equilibrium influenced)	$CO + H_2O \leftrightarrow CO_2 + H_2$
2. Catalyst Column (WGS + Hydrogen Boost)	Water Gas Shift (main reaction)	$CO + H_2O \rightarrow CO_2 + H_2$
3. Methanol Synthesis Reactor	Primary Reaction	$CO + 2H_2 \rightarrow CH_3OH$
	Secondary Reaction	$CO_2 + 3H_2 \rightarrow CH_3OH + H_2O$
4. DMEA Synthesis Reactor	Methanol carbonylation (simplified)	$2CH_3OH + CO \rightarrow CH_3OCH_2OCH_3 + H_2O_2$
	Alternate Route	(via methylamine)
5. Acetic Acid Plant	Methanol carbonylation	$CH_3OH + CO \rightarrow CH_3COOH$
6. Urea Plant	Urea synthesis	$2NH_3 + CO_2 \rightarrow NH_2CONH_2 + H_2O_2$

Output Streams



Update – Setting up a 120 TPD Plant in Odisha to produce DMEA, Acetic Acid, Urea

Parameter	Details
Location	Odisha, India (Mahanadi Coalfields / Talcher region)
Feedstock	High-ash Indian thermal coal (≈ 42 % ash, 10.7 % moisture)
Products	Methanol (74 TPD) · DMEA (10 TPD) · Urea (34 TPD) · Acetic Acid (13 TPD)

- In conclusion, incorporating a proprietary catalyst boosting hydrogen yield by 15% into the fixed bed gasifier operating at 10 bar and 900–1100 °C positively shifts syngas composition toward higher hydrogen content (~50 vol% H_2). This improves downstream synthesis efficiency, reduces operational issues from tar, and may allow optimized steam usage, leading to better overall process economics and sustainability under Indian coal conditions.
- The integrated plant's revenue increases annually, driven by 10–20% market price escalation, with methanol (~42%) and DMEA (~34%) dominating contributions; enhanced pricing of urea and acetic acid further strengthens cash flow and project viability.

A technology leader in green chemicals and circular waste solutions, ideal for ESG and impact investors.