Fluid bed technology with gas clean up:
High Ash Coal Gasification

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Dr. R. R. Sonde
CTO and Executive Vice President, Thermax Ltd. Pune
(formerly with Atomic Energy Commission & NTPC Ltd.)
&
Chairman Coal to Methanol, Niti Aayog
Coal will continue to be the back bone of Energy in India

- India consumes Total 212.7 Mtoe oil and 45.1 Mtoe Natural gas. Majority (88%) of this is import.
- India’s dependence on Oil and Gas import is hurting our economy and there is all round effort to reduce its dependence by alternate fuels, which can supplement Oil and Gas.
- Government of India has come up with two major approaches
  - Bio fuels (Bio diesel / Bio ethanol)
  - Coal to oil and gas (Coal Gasification)
India’s shale oil moment lies in Coal energy maximization:

303 billion tones of coal vs 0.621 billion tons of crude says it all. We need about 520 MTOE in total energy and only coal can meet this demand for more than 100 years. Crude internal resource can meet for 4 years and gas for six years (for an extended capacity).
Coal to Gas for Oil and Gas

- Coal conversion to gas (and then gas to CNG/Oil/direct usage) is the most suited option.

By Gasification process coal can be converted to syngas, syngas is a starting molecule for fuel energy, CNG, Methanol & other liquid fuels.
Technology Needs for Gasification for Coal and Low grade solid fuels (MSW)

There is no commercial demonstrated technology for India’s high ash coal gasification

The work carried out in India since late nineties and last five years has given a confidence that Fluid Bed Gasification is the best option for HAIC.
Plant Installations:

Indirect / Twin bed design

4.5 MWth Biomass gasification plant at Washim, MH

MNRE

RSIL
250 kW coal Gasification facility Thermax Pune

Plant has completed ~500 hours of operation
500 kW coal Gasification facility EIL Gurgaon

1 MW coal Gasification facility Thermax Pune

IITM, EU, ECN, TKI, HU, CNRS

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R&D Testing Facilities...

Gas sampling system for Syngas and tar

Gas chromatograph (GC)

X-ray diffractometer (XRD)

Thermo gravimetric analyser (TGA)

Scanning Electron Microscope (SEM)

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TAR Analysis

Tar sample analysis

Hydrocarbons Peaks

Syngas/ producer gas analysis
LEARNINGS FROM THE INDUSTRIAL PILOT SCALE PLANTS

1. Fluid bed design for India’s coal is operable with few critical parameters. Continuous sustainability is possible but with lowering the pressure of operation 4-10 bar and then use the booster compressor to meet the end utility requirements.

2. MSW needs to be converted to RDF in pellet form and this can then be gasified in the twin reactor design.

3. Fluid bed CFBC will enable to get the char free ash and enhance the overall efficiency.

4. Gas clean up system needs to take care of particulate matter, light HCs, AGR, metal impurities respectively to meet the final gas specifications.
Fluidized bed Gasifier with fly ash char combustor is best suitable technology for high ash coal
Coal Gasifier for Thermal/Power Applications

- Coal Feeding System
- Fluidized Bed Gasifier
- Syngas Cooler
- Effective Heat Recovery for Enhancing Efficiency
- Dust Separation
- Only small light Tar Generation
- Handles Wide Variety of Coal (Type and Size)

syngas to burners for heating applications
Coal to Methanol Project

Indian coal

Gasification island

Ash

Indian coal

Air separation unit

Gas clean-up R&D

Gas clean-up island

Gas cooling

Particulate Separation

Acid gas / trace metal removal

MeOH Reactor Island

Hydrodynamics & Reactor Engineering R&D

DST, IITD and Thermax

Catalysis R&D
- Performance evaluation & optimization
- Effect of operating parameters, kinetics
Thank You