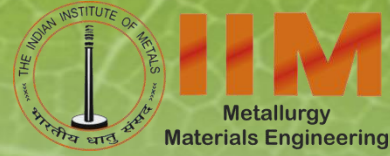


TATA STEEL

 WeAlsoMakeTomorrow



Presents

International Conference on

GREEN & SUSTAINABLE IRON MAKING

January 17 – 18, 2024



Biomass Gasification based Solution for Production of Biochar and Electricity/ Producer Gas

Devkumar Gupta

Program Manager: Gasification, P&ES

Thermax at a Glance



1\$

Billion Revenue

14

Manufacturing Plant

4\$

Billion Market Cap.

7K+

Employees

Solutions



Power



Heating



Cooling

Utilities



Water Treatment



Chemical

Raw Material



Waste



Desired Product



Hazardous Waste Treatment



Wastewater Treatment



Air Pollution Control



Waste to Energy Generation





A Solution for Biochar Production

- Process to produce Oil/liquid free Biochar
- Continuous fuel feeding and product removal system
- Integrated fuel drying system and heat management
- Clean co-products producer Gas/H₂/electricity
- Optimize biochar properties
- Better Plant economics

TATA STEEL

R&D

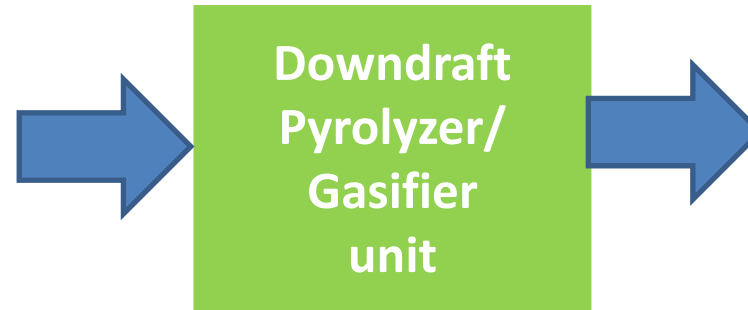
Assess Quality and
suitability of biochar for
Steel application

Biochar Production from Bamboo

Bamboo Feed

Sr. No.	Parameters	UoM	Value
1	FC	Wt%	23.2 (db)
2	VM	Wt%	74.4 (db)
3	Ash	Wt%	2.4 (db)
4	Moisture	Wt%	10.0 (ar)

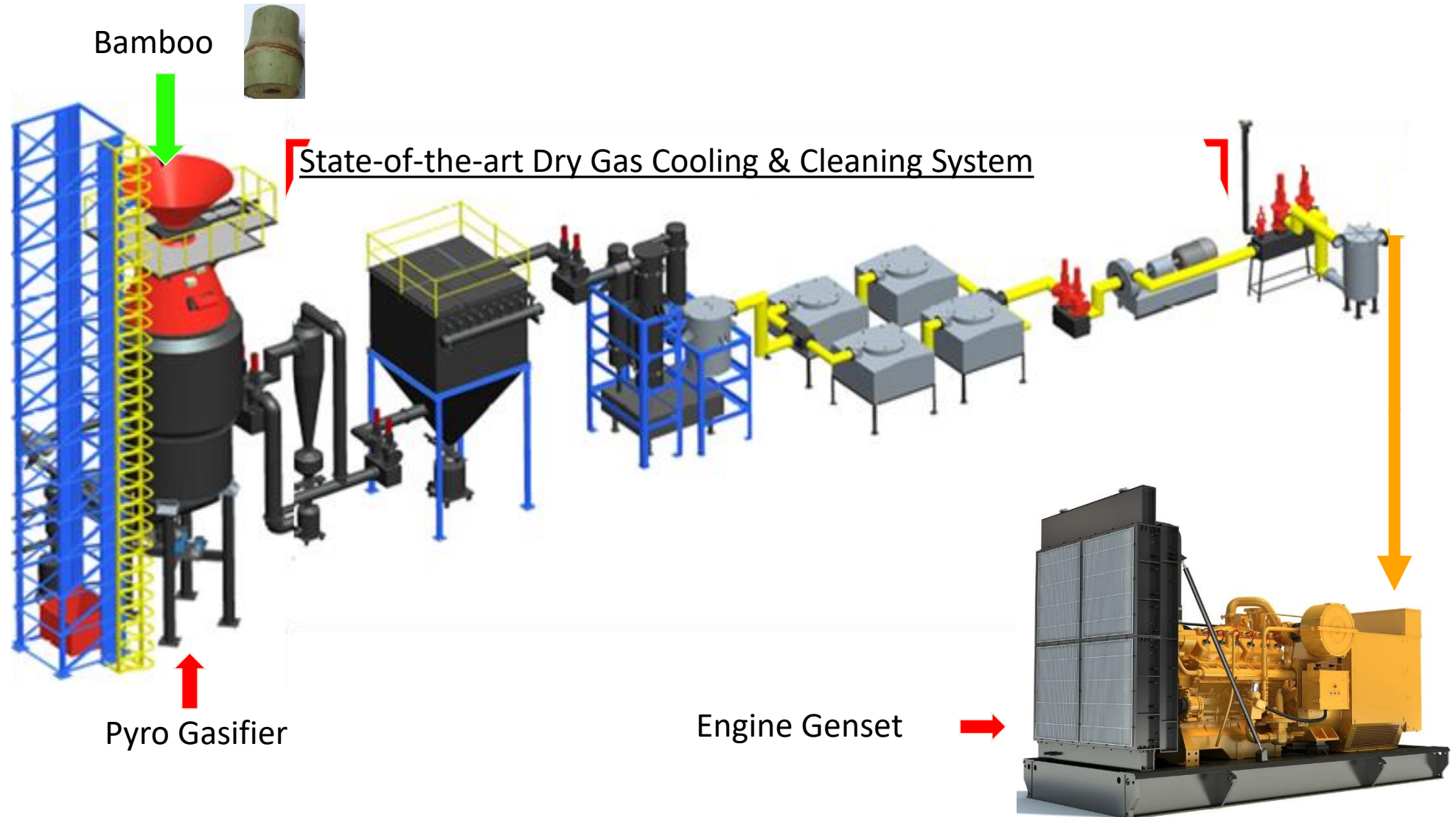
db: Dry basis, ar: As received basis



Biochar

- FC $\geq 70\%$
- Ash $< 8\%$
- VM 12-16%
- Moisture $< 2\%$
- Bulk density : 150 kg/m^3
- Size of biochar: 0-70mm
- GCV : 6000-6700 kcal/kg (dry basis)

Pyro Gasification plant for Biochar production



Source: Thermax Technology Partner

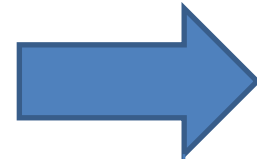
Biochar Yield



100 TPD Dry biomass

Bulk Density: >250 kg/M³
>3,600 kcal/kg

- Bamboo Block Size: Min-25 mm Dia. 50 mm L;
Max-75 mm Dia.100 mm L, Thickness-Min 25 mm.



22-25 TPD biochar

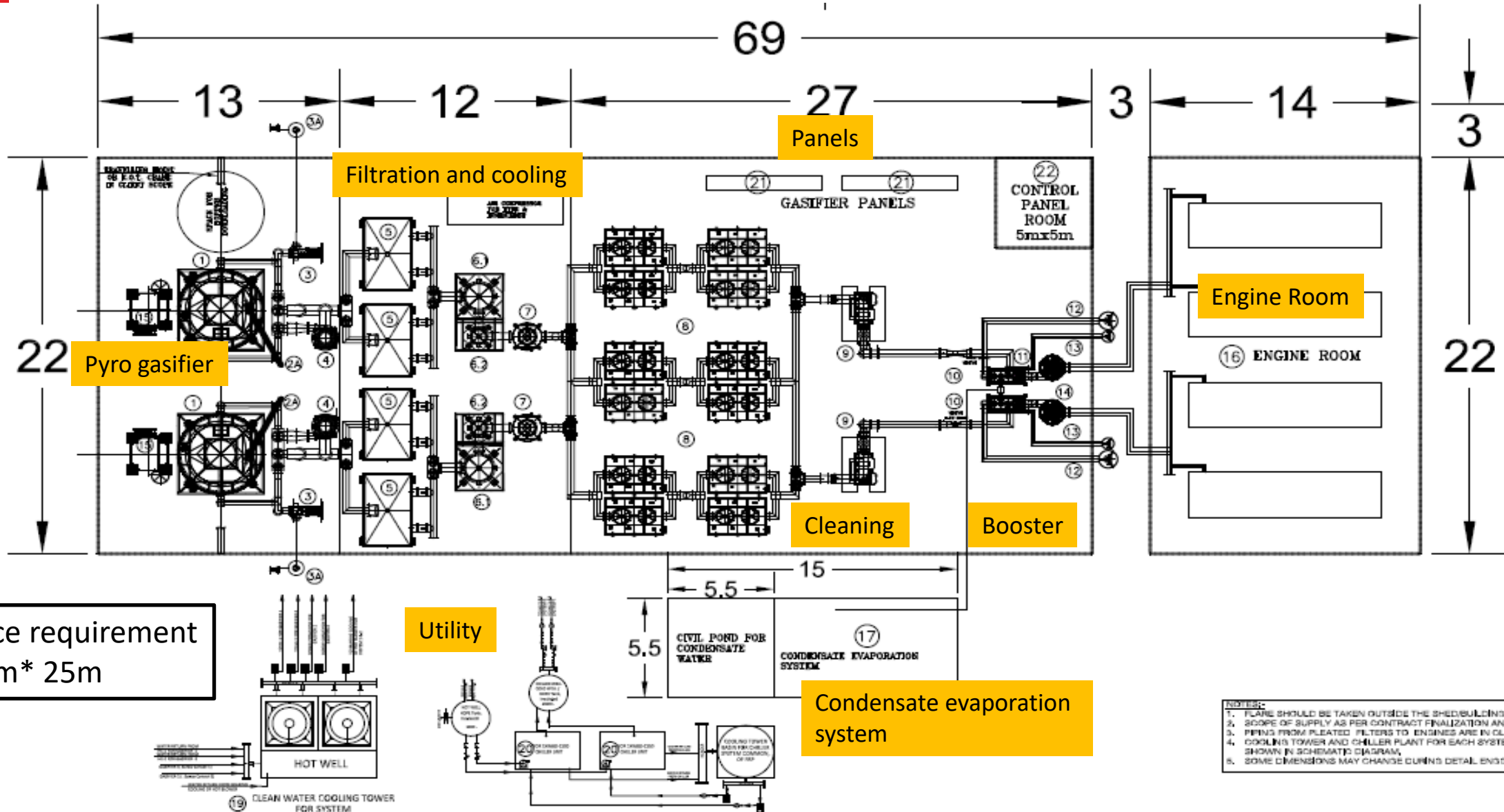
OR

Producer gas
4000 Nm³/hr

CO :14-17 v/v%
H₂ : 14-17
CH₄ : 4%
CO₂ : 10-12%
N₂ : Balance

1 MW_e Net power

Plan Layout :100 TPD biomass plant



Demonstration Facility 2.4 TPD Biomass



Testing of Bamboo from
Jharkhand region

Assessing biochar quality

Assessing Gas quality

Source: Thermax Technology
Partner

Thermax's Industrial scale Methanol Pilot Plant

- 6 TPD Fluidized Bed Gasification Plant
- Upto 6 bar fire side pressure
- **Location : Thermax Ltd., Chinchwad Pune**



**1 TPD
Methanol
production**

**4 TPD CO2
Separation Plant**



Project by DST & NITI Aayog

BioGenic CO₂ Capture and Utilization

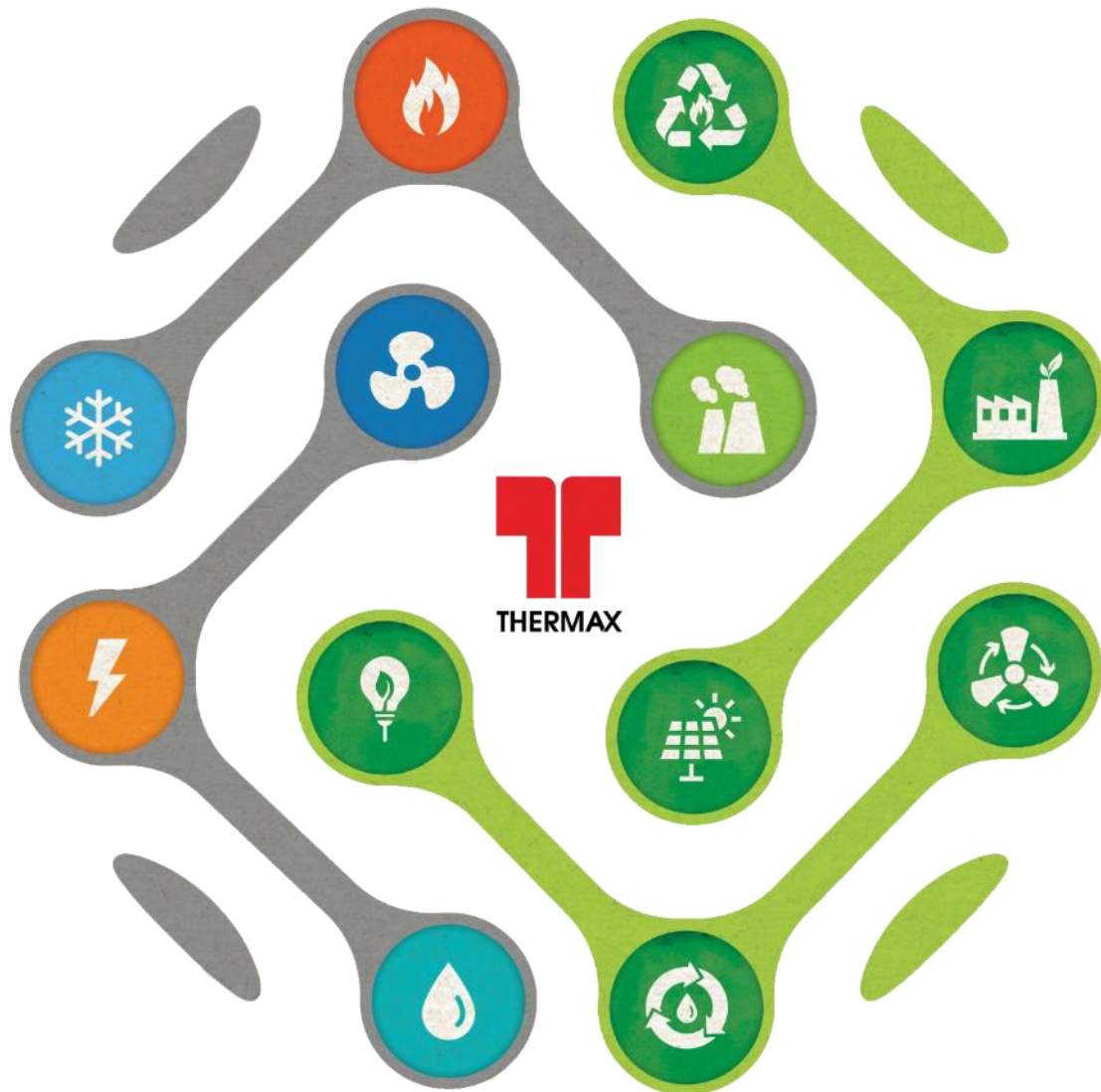
- Amine based CO₂ capture
- PSA based for B-CNG
- Thermax is working with Amine Licensors
 - BASF
 - Carbon Clean
 - UoP
- For Reducing Gas: Syngas/BCNG
- 4 TPD CO₂ Separation facility
- Thermax Pune
- Partner - IIT-Delhi

• Utilization

- CO₂ to Methanol
- CO₂ to Methane (BCNG)

Summary

- Downdraft Pyro-gasifier using bamboo as feed stock is optimized solution for biochar production
- It provides flexibility of biochar + power or clean producer gas
- BioGenic CO₂ capture from Producer gas and Utilization to Chemicals like CH₄ / Methanol using renewable H₂
- A comprehensive packaged solution from Thermax



Boundlessly bridging the gap
between energy availability
and sustainability

THANK YOU