



Development of Environment Friendly
GASIFICATION TECHNOLOGY
Newly developed **Balanced Draft (BDGT)**

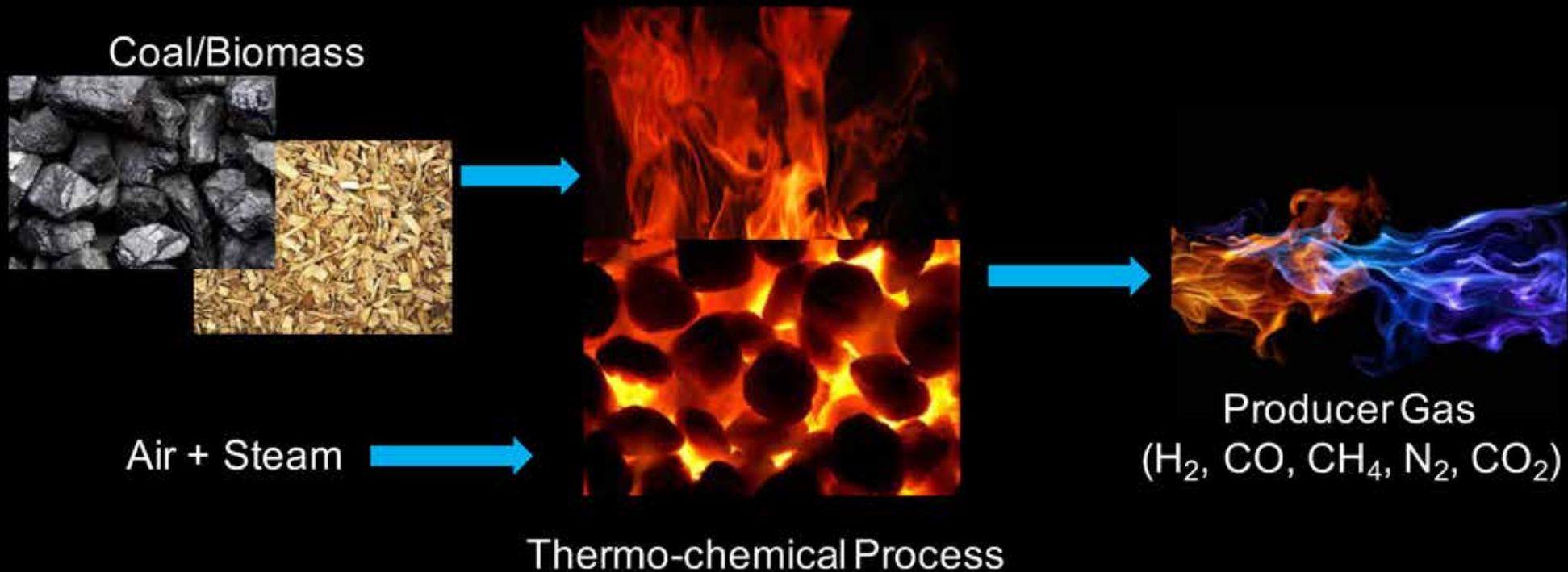


By
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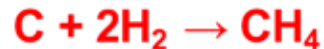
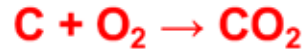
What is Gasification ?

Gasification is a thermo- chemical process, which converts solid carbonaceous material/Fuel, waste material in to combustible gases called producer gas.



What is Gasification ?

Gasification Reaction:



(Combustion) (+393800 kJ/kg mole)

(water gas) (-131400 kJ/kg mole)

(Boudouard Reaction) (-172600 kJ/kg mole)

(water shift Reaction) (+41200 kJ/kg mole)

(Methane Reaction) (+75000 kJ/kg mole)

producer gas compositions:

Carbon Monoxide (CO) : 20 ± 2%

Methane (CH₄) : 03 ± 1%

Hydrogen (H₂) : 12 ± 2%

Carbon Dioxide (CO₂) : 03 ± 2%

Nitrogen (N₂) : 50 ± 5%

CV of Producer Gas : 1200-1350 Kcal/Nm³

Producer gas specifications:

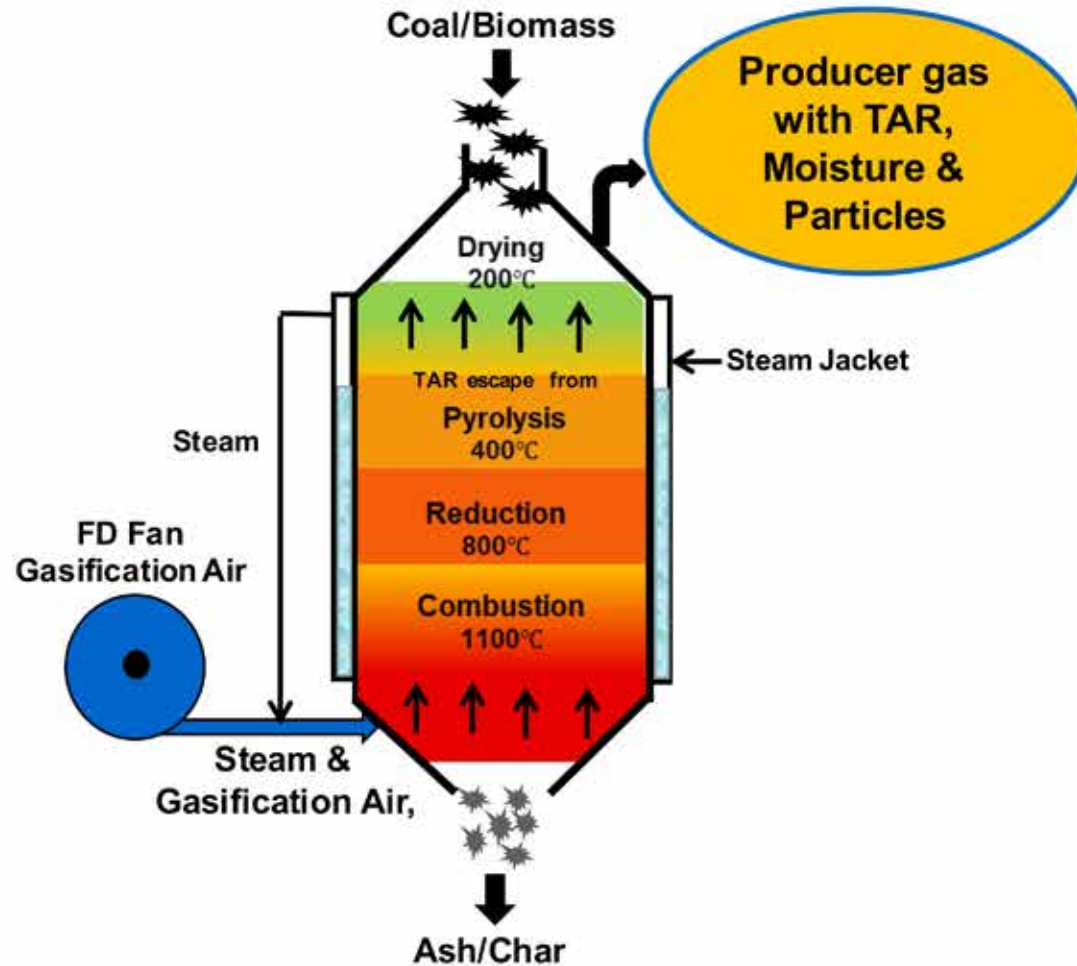
Carbon Particulate : 34 mg/NM³

TAR : 50 mg/Nm³

H₂S : 4.99 ppm

SO_x : 3.13 ppm

Gasification Process (updraft)



Most Common GASIFICATION Technology available World Wide

1. UP-DRAFT

2. DOWN DRAFT

3. CROSS DRAFT

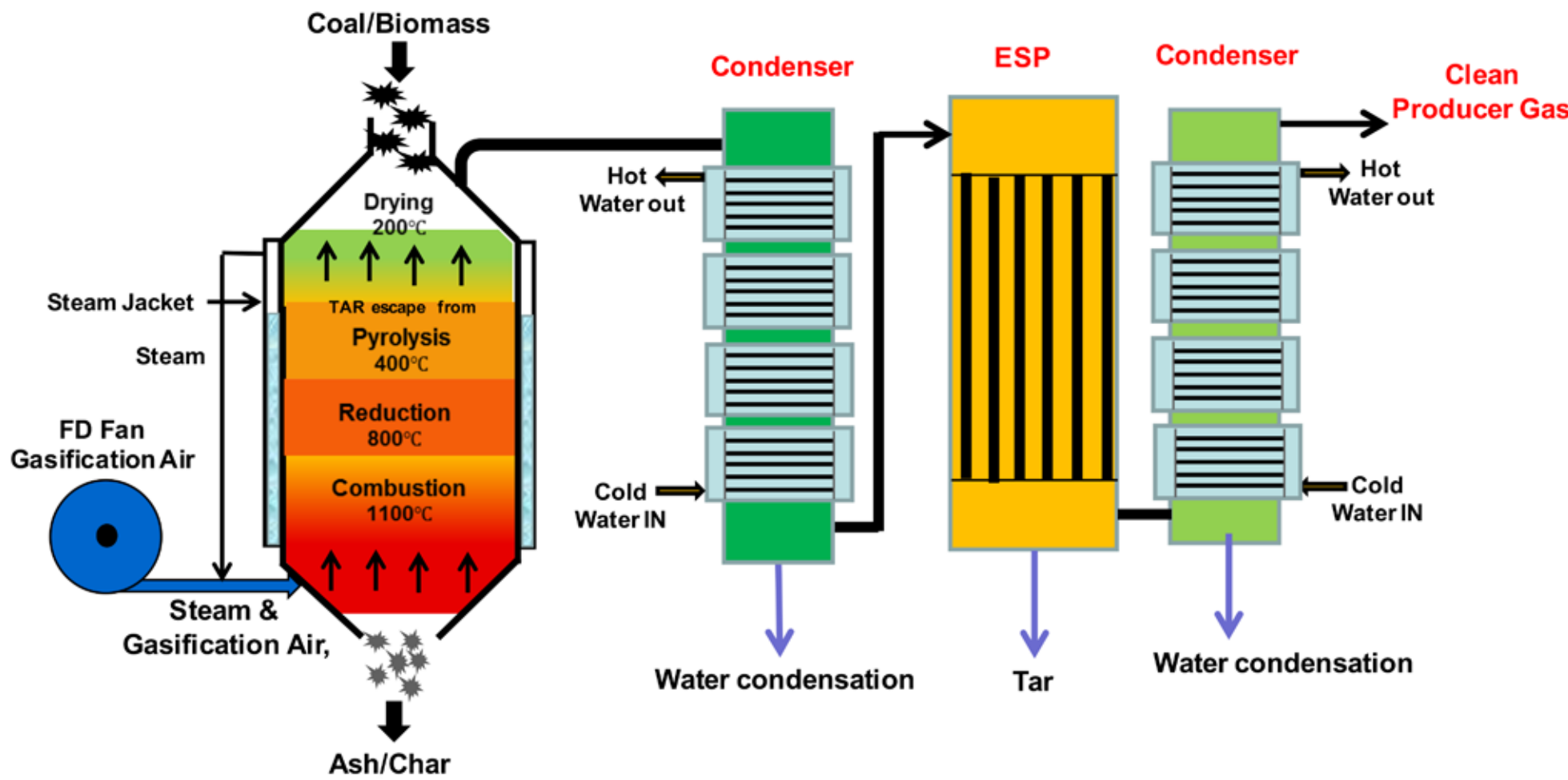
4. ENTRAIN FLOW

5. FLUIDIZED BED

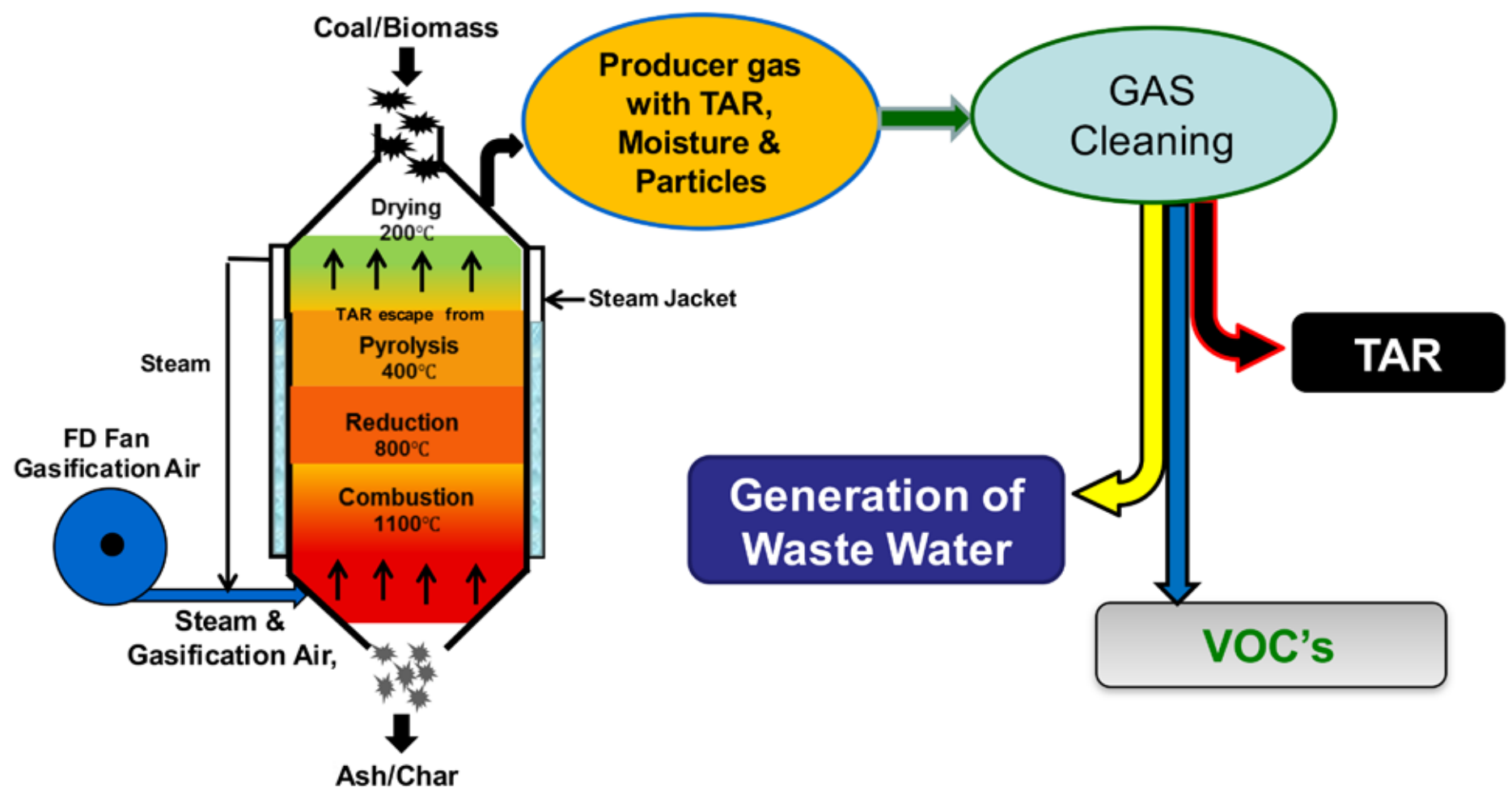
6. Newly Developed BALANCED DRAFT



Schematic Diagram: Advanced Gasification Process



Environmental issues related to Gasifier



Environmental issues related to Gasifier

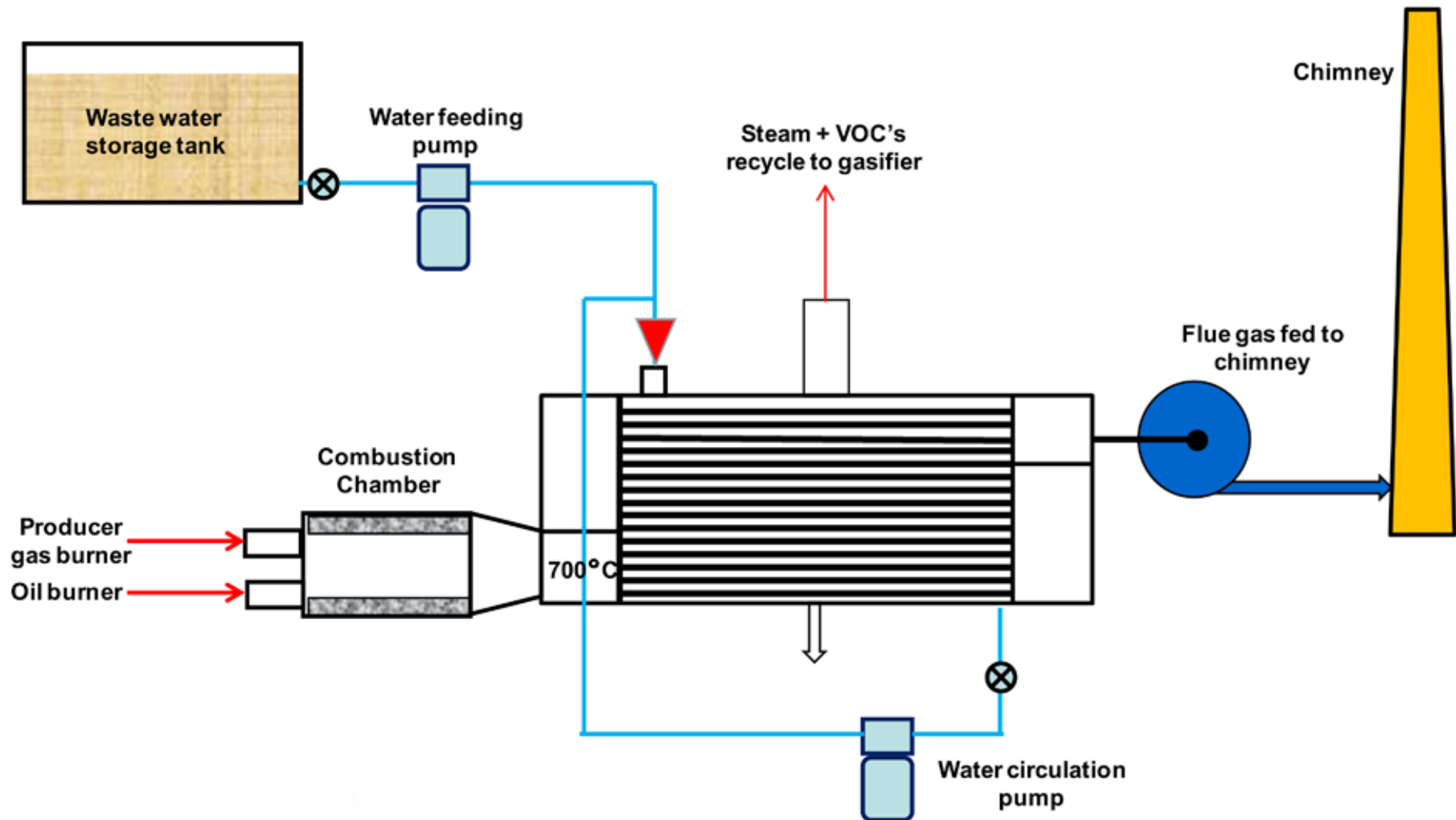
Waste Water Generation

- Waste water generated during cleaning and quenching of producer gas.
- More than Half of the waste water generation quantity reduced by indirect cooling system.

Waste Water Disposal

- Waste water collected in storage tank.
- Waste water evaporated and feed to the gasifier in form of steam
- Steam utilized as a gasifying agent.

Process Diagram Waste Water Evaporator



Installation of Waste Water Evaporator



producer gas/Tar fired
evaporator



Environmental issues related to Gasifier

VOC's emission

- Producer gas quenching tank,
 - Waste water tank
 - Tar tank.
-
- All the **Storage** tanks are **covered** and provided negative suction.
 - All the VOC's are Feed in to the Gasifier and it will convert to energy.

VOC emission and its control

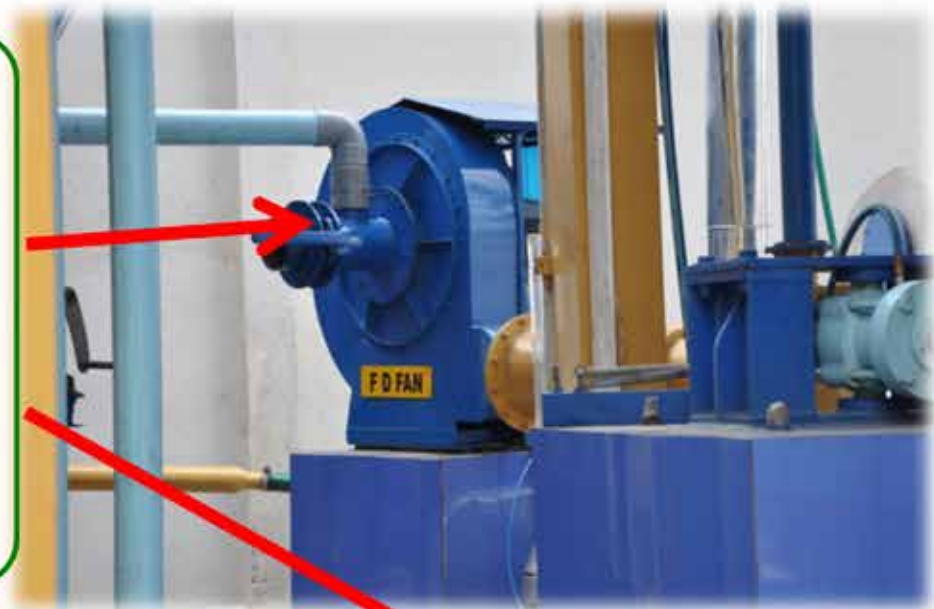
Closed wastewater tank with VOC exhaust pipes to blower/gasifier



VOC emission and its control



VOC
emission
collection
and
recycle
back to
gasifier



Tar
storage
Tank
with
VOC
control

Under ground Waste water storage PVC
Tank

TAR Cracking/Thermal De-Polymerization Technology

(Patent Pending (2689/MUM/2013))

Process:

- TAR cracking/Thermal de-polymerization technology developed for disposal of TAR in-built in updraft Gasifier.
- TAR is heated up to 80-90°C to attain fluidity by homogenous stirring, which could be injected to gasifier high temperature combustion zone (1100-1200°C) without air with fully automatic self cleaning nozzle mechanism.
- Tar injected in high temperature zone will be CRAKED from heavy hydrocarbon in to low molecular hydrocarbons and finally in to producer gas (H_2 , CO , CH_4).



About TAR

- TAR is not a waste product but it is a valuable by product (fuel).
- The Gasification tar is not a petrochemical tar its only condensation of VM of gasification fuel (biomass/coal)
- Very low sulfur content 0.3- 0.5% compare to furnace oil 3-4% and Calorific Value around 7500-8000 Kcal/kg.
- Combustion of TAR is very simple & efficient than furnace oil.



Tar Combustion In HAG



Tar Fired HAG for Spray Dryer

Tar Combustion In Evaporator

Double burner
evaporator (Tar
& Producer Gas
as fuel)



TAR Cracking/Thermal De-Polymerization Technology

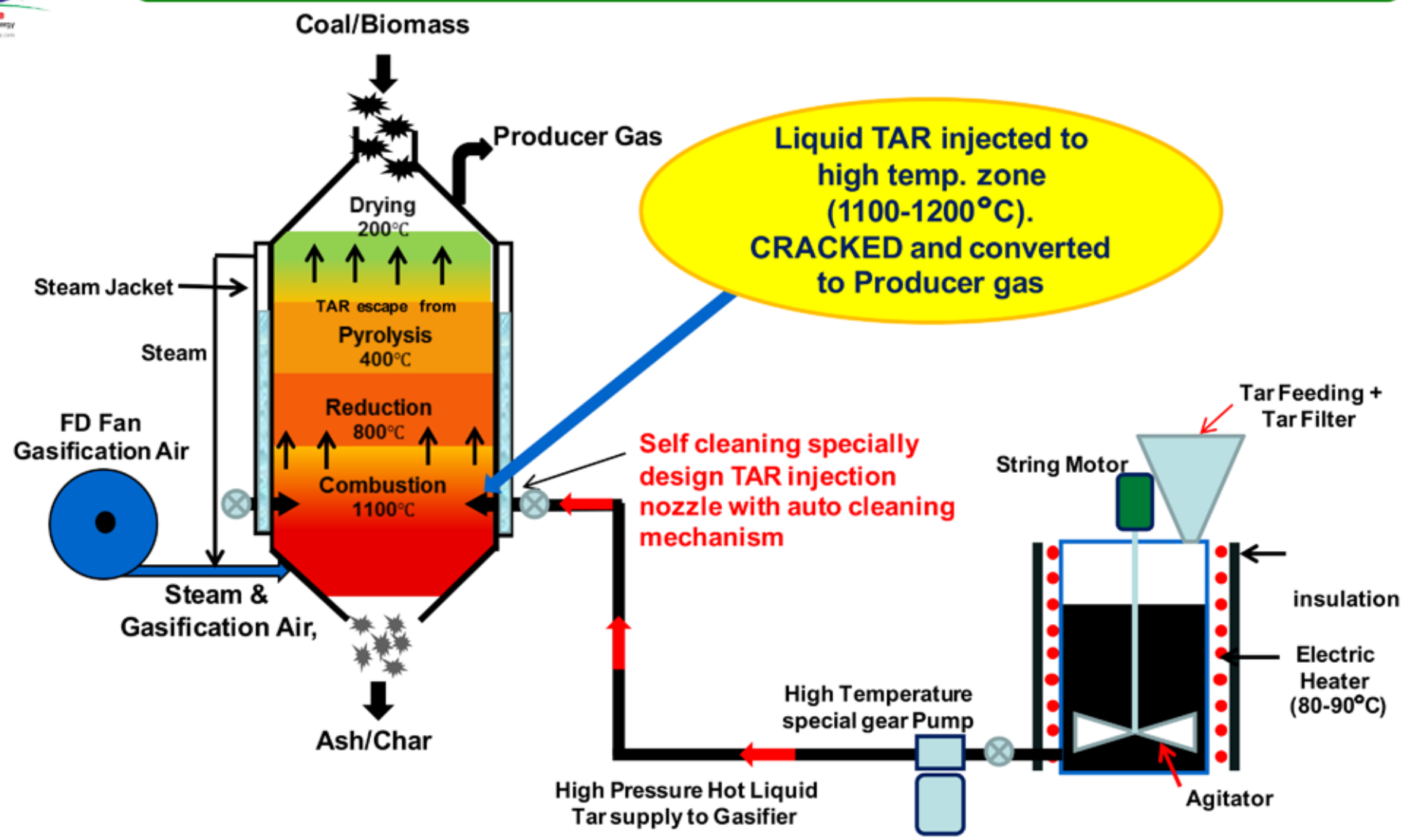
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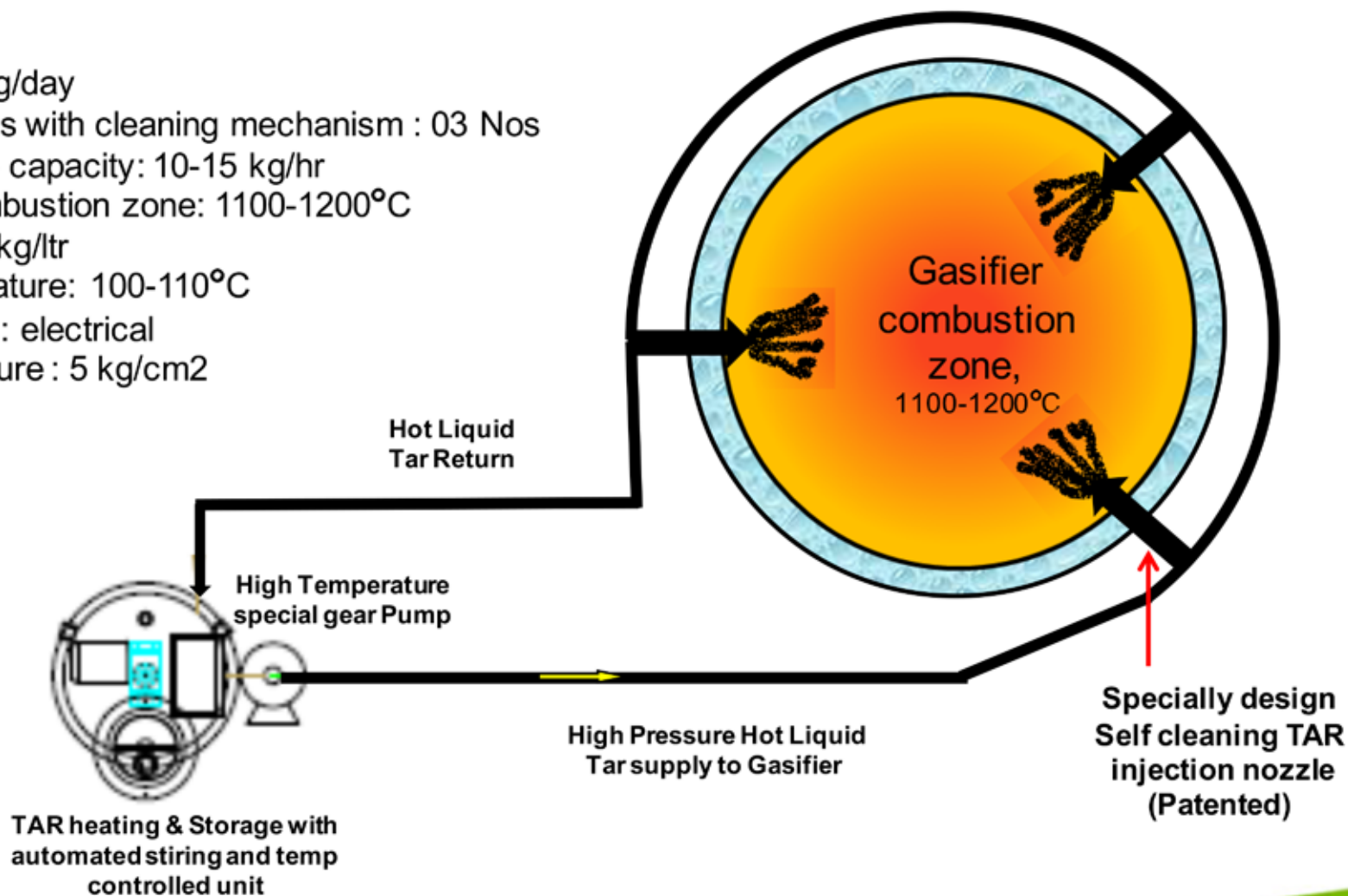
Process Diagram of TAR Cracking/Thermal De-Polymerization technology



Schematic Diagram of TAR Cracking/Thermal De-Polymerization Technology

Features:

- ✓ Tar Disposal: 600 kg/day
- ✓ Tar injection Nozzles with cleaning mechanism : 03 Nos
- ✓ Tar Injection Nozzle capacity: 10-15 kg/hr
- ✓ Temperature in combustion zone: 1100-1200°C
- ✓ Density of Tar: 0.9 kg/ltr
- ✓ Supply Tar Temperature: 100-110°C
- ✓ Tar heating method: electrical
- ✓ Pump: 3 hp, Pressure : 5 kg/cm²



Merits and Comparisons of TAR Cracking technology

Sr. No.	Features	Radhe TAR Cracking Technology	Others TAR cracking Technology
1.	Additional Energy Require	×	✓
2.	Risk of Explosion	×	✓
3.	Residue generation (Sludge, Coal Tar Pitch, ash)	×	✓
4.	Need to Disposal of Residue	×	✓
5.	Flue gas generation	×	✓
6.	Require complex additional equipment	×	✓
7.	Skill manpower for operation	×	✓
8.	Tar Cracking Temperature	1100-1200°C	500°C
9.	Energy Efficiency	High	low
10.	Equipment. Maintenance and operation cost	Very Low	High
11.	Environment Friendly, complete Zero Discharge	✓	×
			No but need precise attention for Residue disposal

TAR Cracking/Thermal De-Polymerization Technology

Automated self
cleaning TAR
injection system
for TAR cracking



TAR Cracking/Thermal De-Polymerization Technology

Automated self
cleaning TAR
injection system
for TAR cracking



TAR heating &
Storage with
automated stirring
and temp controlled
unit

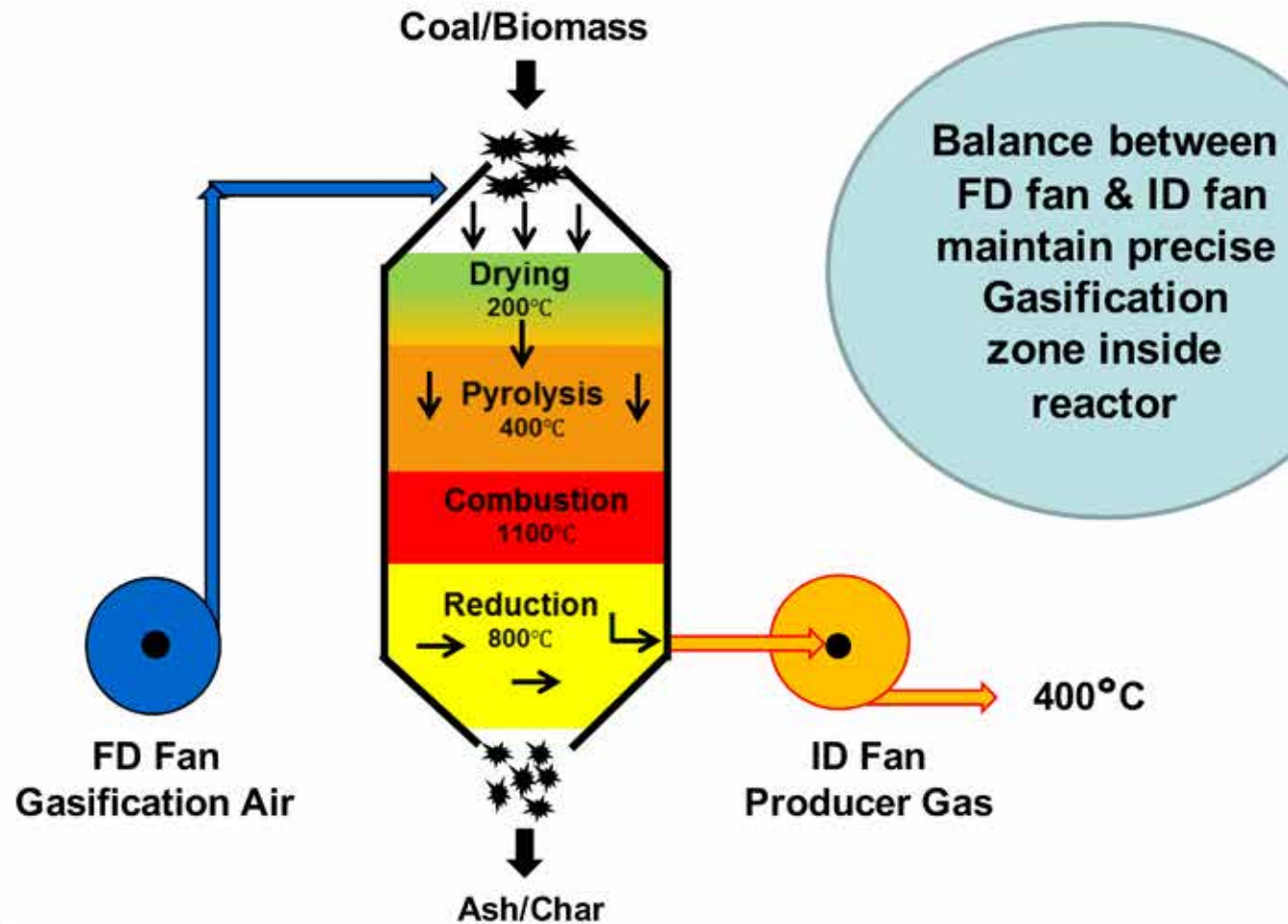


Advantages of TAR Cracking/Thermal De-Polymerization Technology

- 100% TAR is disposed and converted to produce gas
- Increase the gasifier Efficiency
- No by-product generation and no residue left out (Zero Discharge)
- Operational friendly with low investment & low maintenance
- No Flue gas generation, completely ENVIRONMENTALLY friendly
- Fully Automatic with PLC control, No extra man power require
- In-house TAR disposal



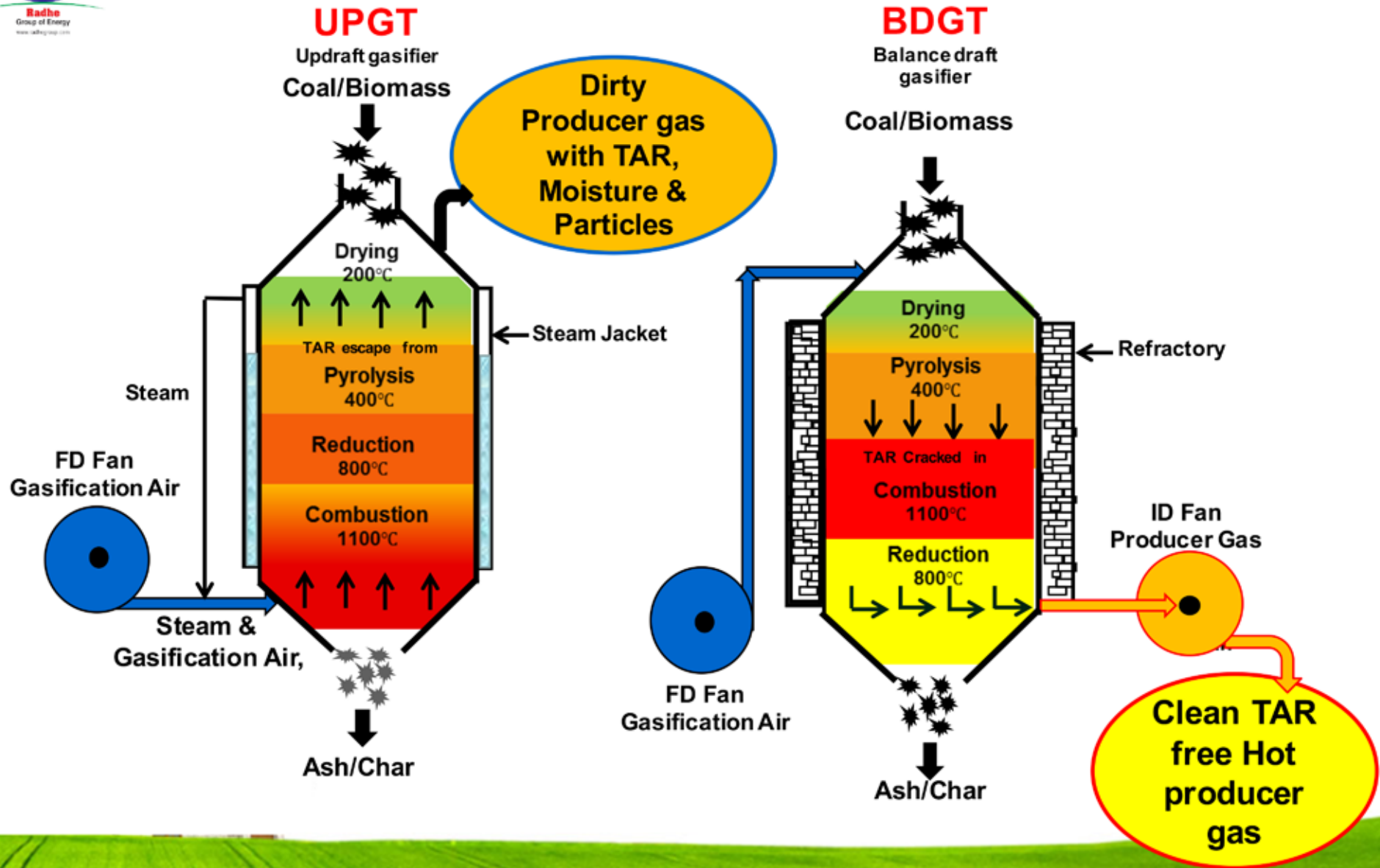
Balanced Draft Gasification Technology (BDGT)



Brief Process Description of BDGT

- Generates Tar free producer gas compare to other types of conventional Gasification.
- VM (Tar) in feed stock Cracked in combustion zone at High temperature (1100°C) & produces combustible gases like H_2 , CH_4 and CO .
- Heavy Hydrocarbon Chain is broken in to lower HC Chain and further converted to combustible gases.
- Balance between FD fan & ID fan maintain precise Gasification zone Temp. & Pressure inside reactor
- Tar free Clean Hot gas with HOT filtration (cyclone/Ceramic candle) can be utilized as per the process demand

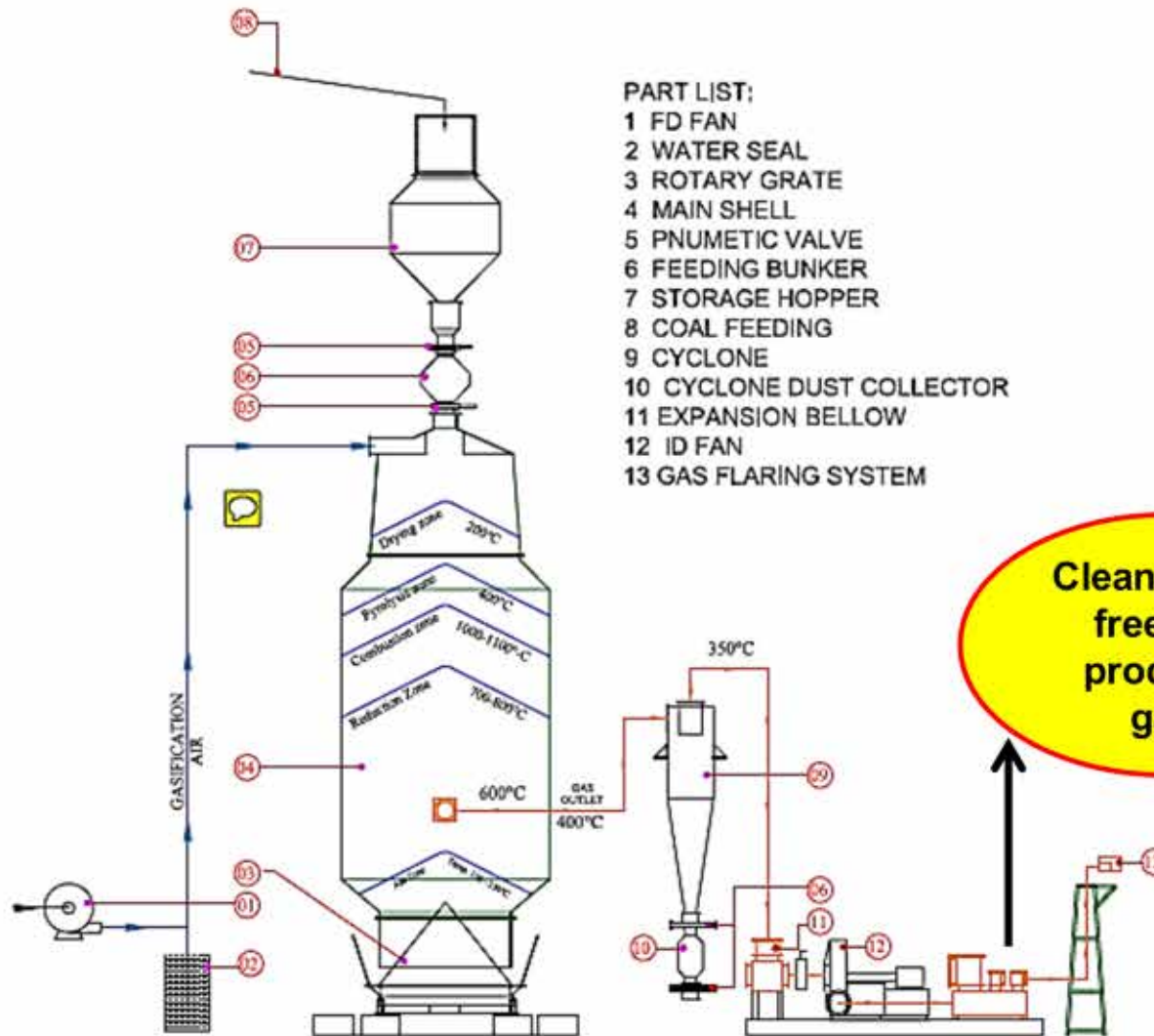
Process Comparison of UPGT and BDGT



Merits and Comparisons of Existing UPGT and New BDGT

Sr. No.	Features	Updraft Gasification (UDGT)	Balance Draft Gasification, (BDGT)
1.	Generation of TAR	✓	✗
2.	Generation of waste water	✓	✗
3.	Steam requirement for gasification	✓	✗
4.	Disposal of waste water and TAR	✓	✗
5.	Require additional energy for waste disposal	✓	✗
6.	Require Additional equipment for gas cleaning (Condenser, ESP, Cooling Tower)	✓	✗
7.	Efficiency of technology	Low (Due to Energy loss in TAR and Gas cooling)	High (No TAR, No Cooling, No thermal losses)
8.	Maintenance and operation cost	High	Very low
9.	Environment Friendly	Yes but need precise attention for waste disposal	Complete environment friendly without any attention

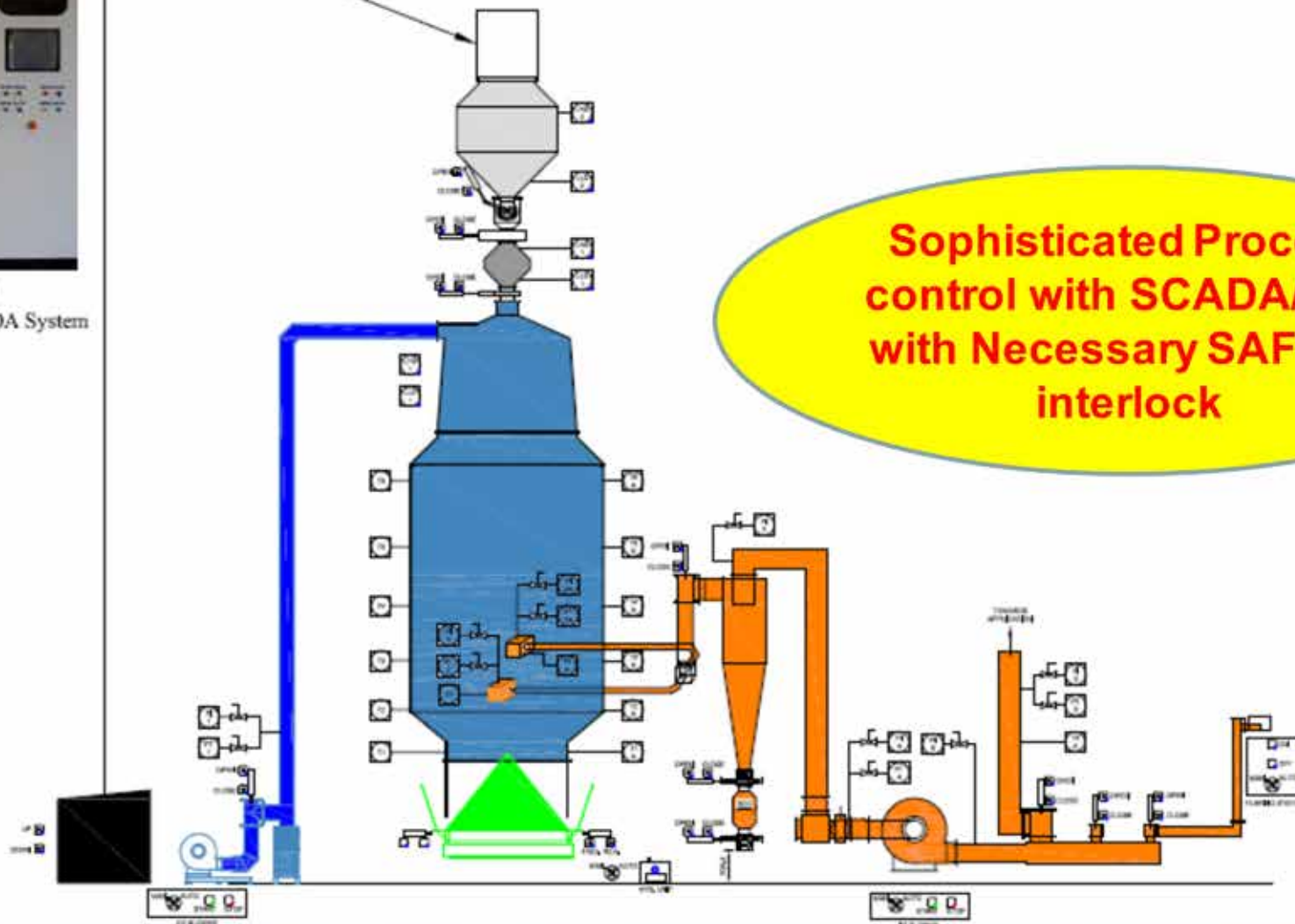
Schematic Diagram of BDGT



Process Controls of BDGT



Control Panel
Equipped with SCADA System



**Sophisticated Process
control with SCADA/PLC
with Necessary SAFETY
interlock**

BDGT Installed at Kalyan Glaze Tiles factory, Morbi (India)



Advantages of BDGT

1. TAR free producer gas available for process
2. No Gas scrubbing finally No waste water generation
3. BDGT gives better and precised process control.
4. Total environment friendly no generation of tar and contaminated (Waste) water.
5. Better conversion of various solid fuels to gaseous fuel
6. Steam is not require for gasification as inbuilt moisture in fuel produces steam upon heating up which full fill the requirement of process.
7. Continuous operation and operation friendly
8. Fully Automatic with SCADA/PLC



Thank You

Looking Forward to the Sustainable growth

we

Live Green
Love Green
Leave Green

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