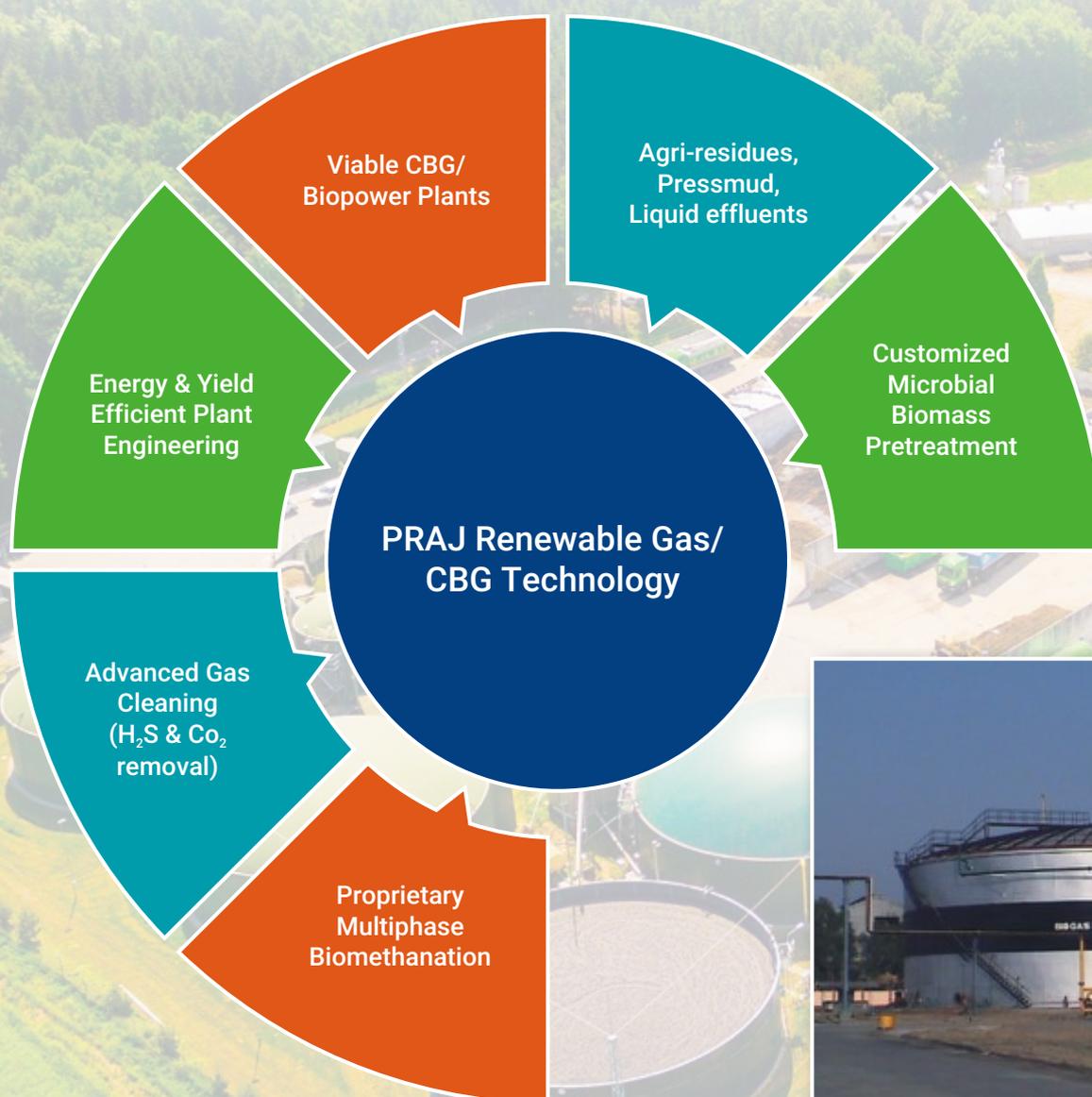


PRAJ RenGas Technology

*Partnering for Better Tomorrow with Compressed Biogas (CBG)
The Next Generation Biofuel*



RNG: Biomethane produced by anaerobic digestion of Agri-residues/organic wastes



Reduces GHG & Carbon Emissions



Lower costs than Fossil fuels



Agro-based- Improves internal economies

PRAJ – Leading the way in Renewable Gas:

As global leader in Biofuels Technology & Plants, PRAJ has a strong track record in Renewable Gas Plants. Over 40 Industrial Installations with capacities up to 1500 M³/Hr

PRAJ **RenGas** technology results from extensive research & development on

Compositional data of Agro-residues & Sugar / Grain Plants Co-products

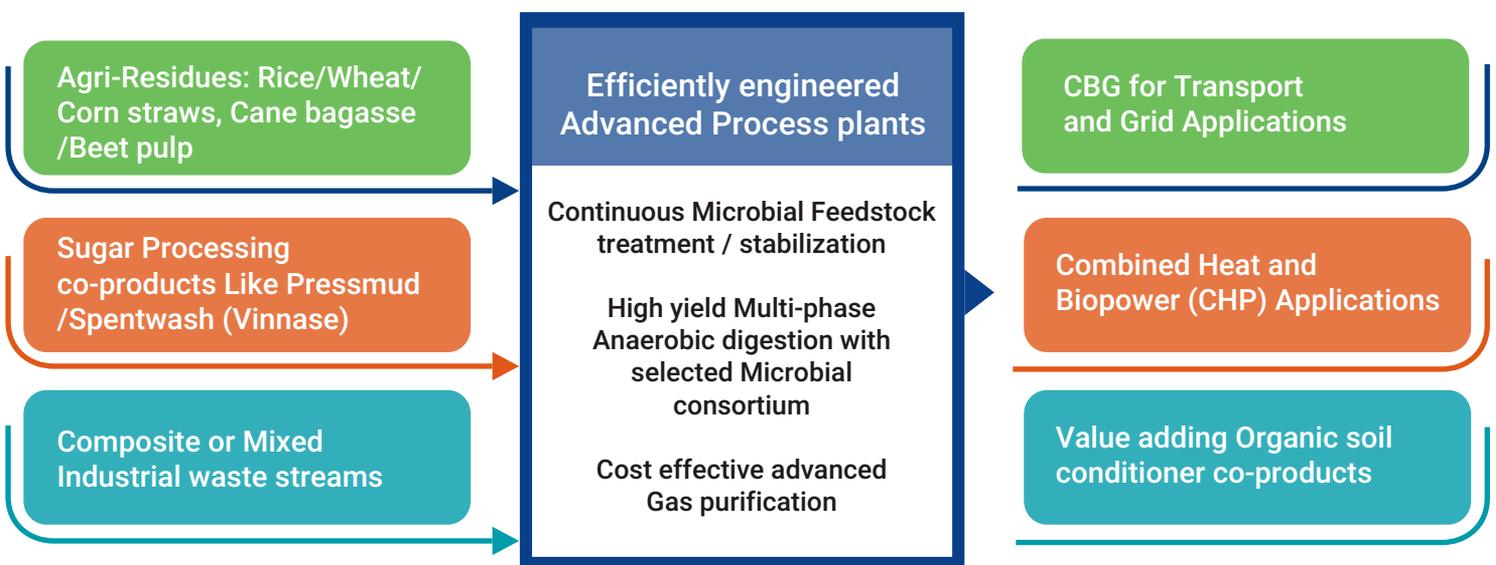
Unique Microbial Consortia for Feedstock Pretreatment & Anaerobic digestion

Industrial Biomethane Fermentation Process Development

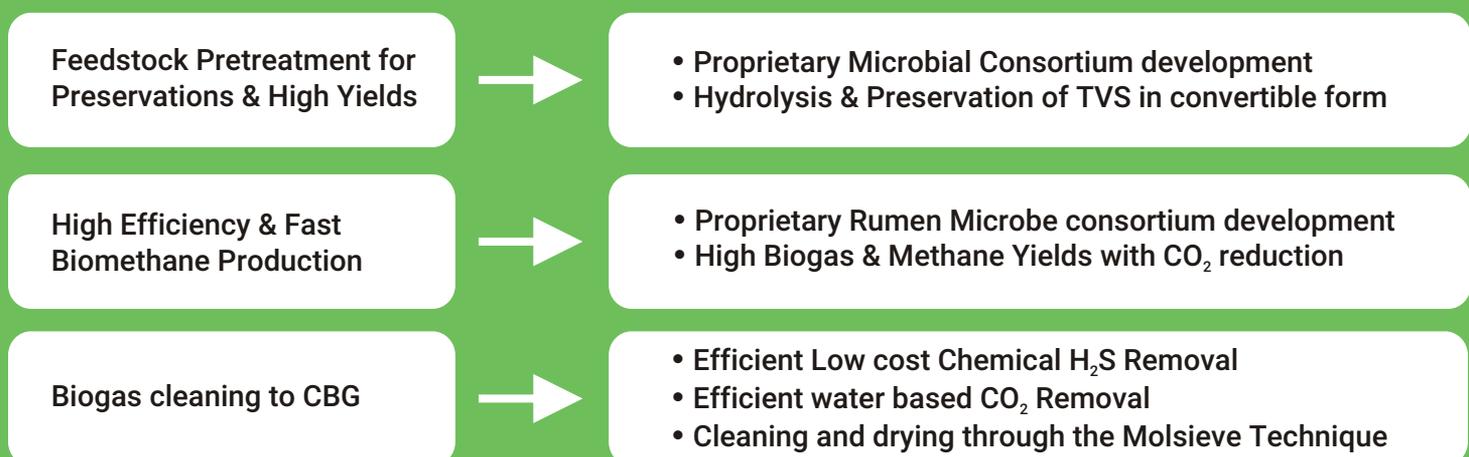
Digestate processing into Value added Soil Conditioner co-products

Advanced cost effective biogas cleaning techniques to give Pure Methane

PRAJ Multi-feed Multi-products **RenGas** Plants



PRAJ has developed "3 Key unique Technologies" for high gas yields & purity in Renewable Gas plants







The PRAJ Edge...

Flexible Rengas Technology:

- 1) Rice straw & other Agri-residues
- 2) Pressmud & Distillery Spent wash
- 3) High yield of CBG & Bio-fertilizer
- 4) Combined Heat and Power option

Benefits of CBG Plant:

- 1) Round the Year Operation
- 2) Low cost of CBG Production
- 3) High Co-product credit from Organic soil conditioner
- 4) Customized Multi-application designs:
CBG / Biopower / Industrial gas

Advanced Plant Engineering:

- 1) Based on innovative reaction engineering
- 2) Efficient & low energy Reactor designs
- 3) Skid mounted systems Culture Propagation, S-L separation & Gas cleaning
- 4) Advantage of quick execution

Partnership:

- 1) Pre-feasibility studies & licensing assistance
- 2) Operation training and commissioning
- 3) After sales support services

Under one Roof:

Technology
License

EPC / Turn Key
Plant supply

Basic &
Detailed Engg.

Equipment &
Systems supply

Piping / E&I &
Automation

Civil &
Structural

Across 5 continents | More than 75 countries | Over 750 References

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Innovate • Integrate • Deliver

PRAJ RenGas Press Mud to BioCNG/Biopower Technology

Press Mud To CBG Plant

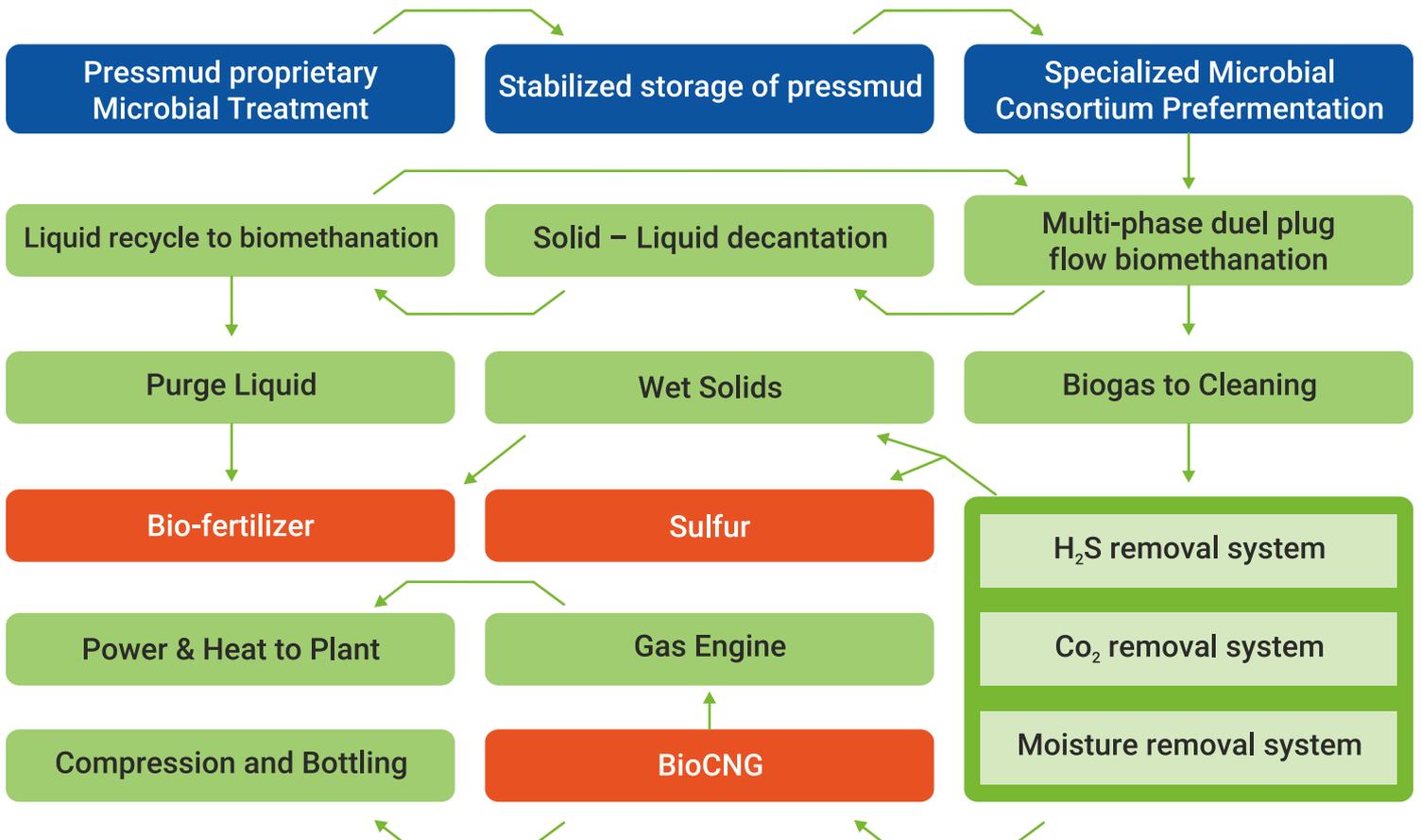
Press Mud:

- Solid residue coproduct from cane juice clarification.
- Rich in Convertible Total Volatile Solids (TCVS) that give Biogas by AD process.
- Biogas plant from press mud generates multiproduct revenue streams viz BioCNG, solid & liquid fertilizer.

Press Mud to BioCNG Technology: Opportunities from PRAJ

- The pressmud can be converted to high value BioCNG / biopower and premium co-products like solid / liquid biofertilizer.
- Complete green operation helping reduce GHG.
- 3 to 4 times value enhancement from Pressmud.

Pressmud to BioCNG Plant Schematic



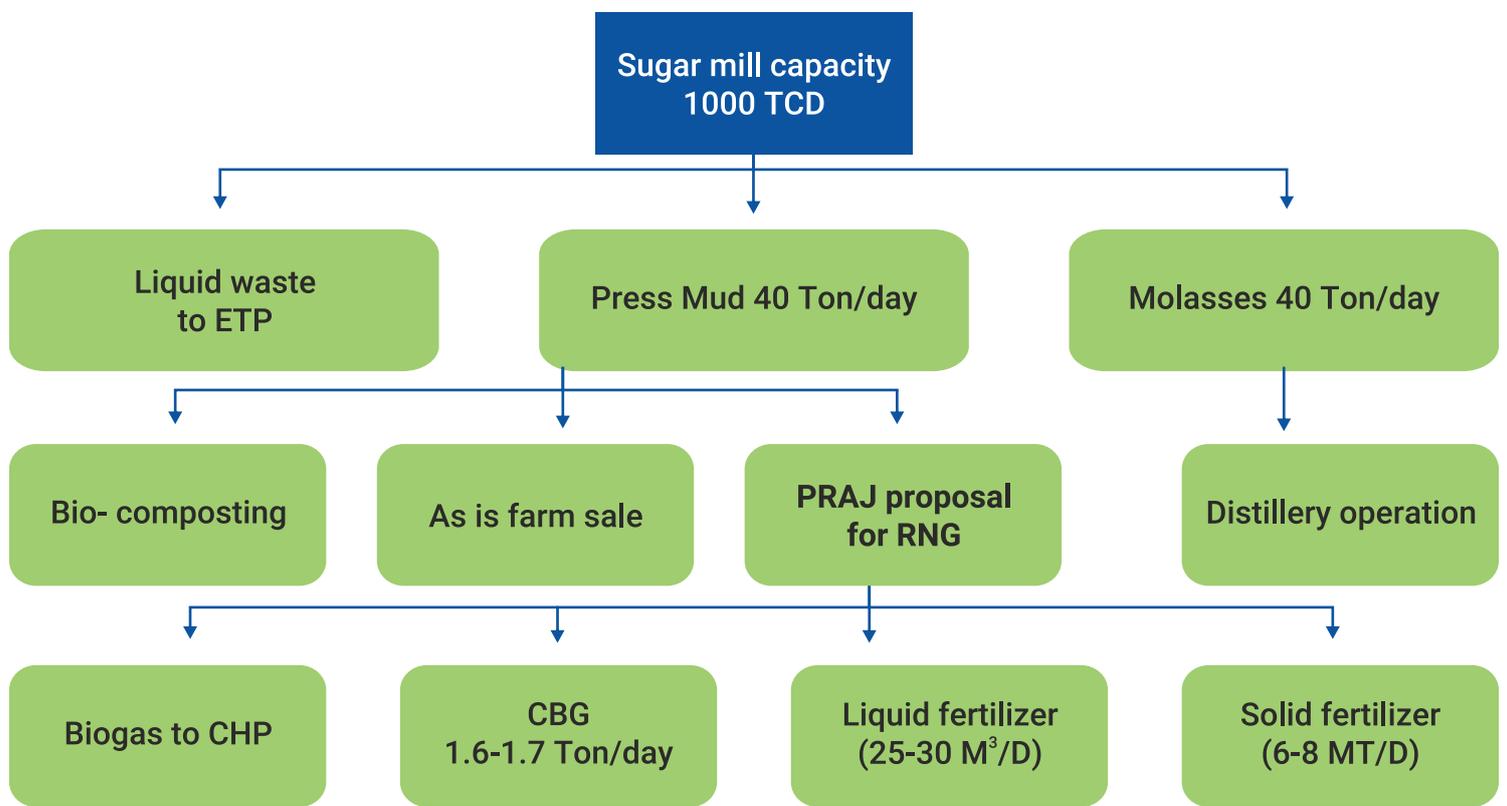


Press Mud Processing



Biofertilizer

ORGANIC INPUTS OF PRAJ BIO CNG UNIT



PRAJ USPs:

- Unique PM stab pressmud pre-treatment: Allows preservation up to 6 M, enabling RTY BioCNG operations.
- Unique Rumen culture AD process: Runs AD process stably for annual operations with high gas and methane yields.
- Economical & robust gas cleaning for high quality BioCNG.
- High quality solid & liquid ferti-irrigation co-products.
- Process know how especially for digester startup and stabilization.

PRAJ Offerings:

- Customized plant designs from 100 to 400 TPD.
- Industry's highest biogas yields from press mud (Depending on the TCVS range of 18.5 to 23.0 % w/w)
- Premium grade organic manure with NOCA Organic certification.
- Commercially sound projects with high IRR and low payback periods.
- Complete turnkey / EPC Plant & technology supply with O&M options.
- Partnership for complete project development.

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Gas Cleaning System

PRAJ RenGas EcoClean™ gas cleaning system for BioCNG/ Biopower production



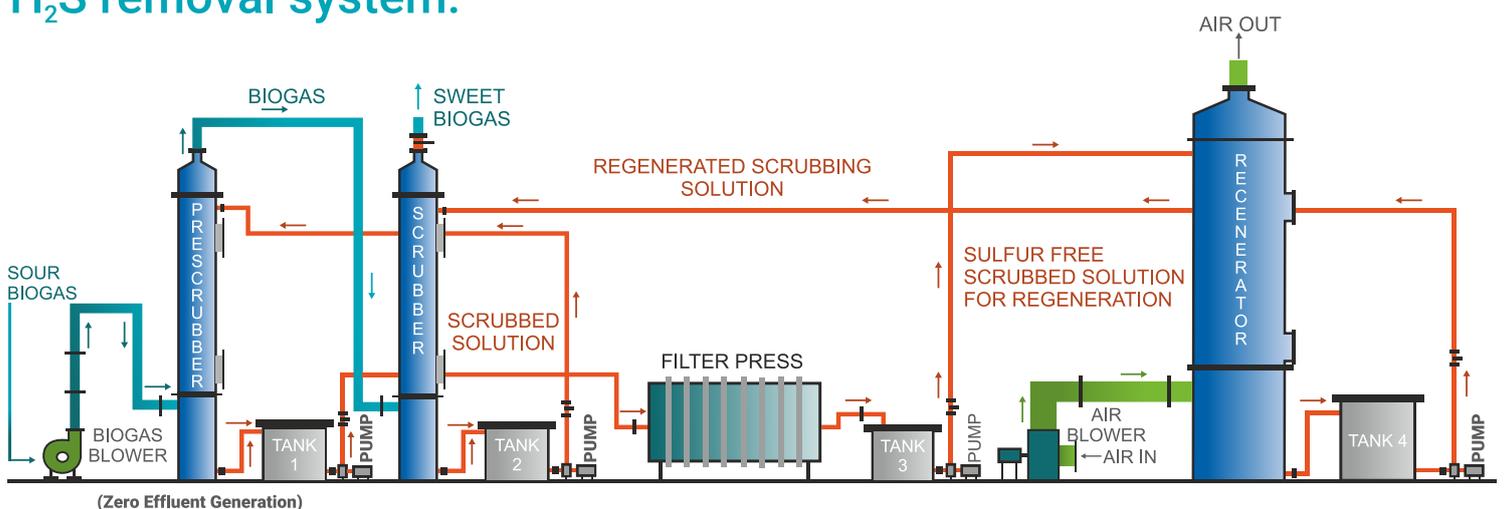
GCS Controls

The Biogas produced from different feedstocks contain 55 to 62 % methane, 35 to 39% CO₂, H₂S between 0.01 to 3 % and other impurities like NH₄, CO₂ and moisture. Various applications of Biogas demand different purity of methane and tolerable extent of impurity levels. For instance,

- BioCNG needs 96% Methane, 3% maximum CO₂, H₂S < 20 PPM and moisture < 100 PPM.
- Biogas used for engines can tolerate CO₂ but H₂S needs to be lower than 50 PPM.
- Some industrial applications of Biogas demand H₂S content below 200 PPM.

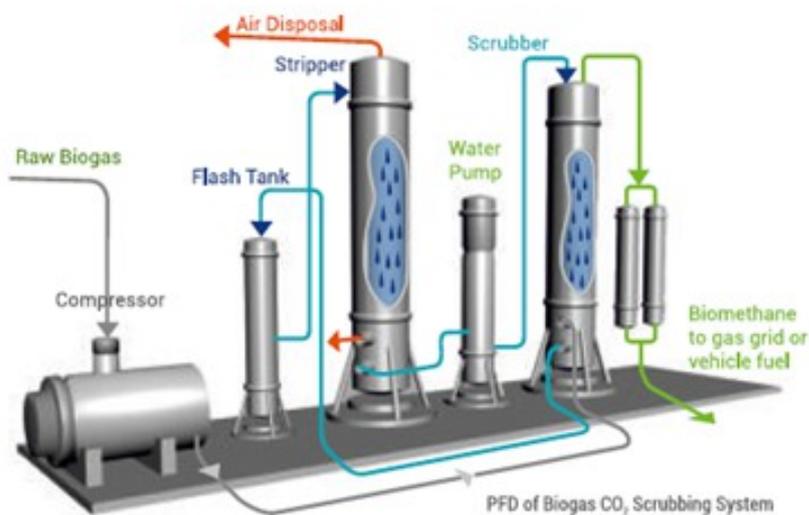
Keeping quality requirements in view, PRAJ has developed commercial Biogas cleaning / upgradation systems to remove impurities that are based on simple principles, are robust and cost effective.

H₂S removal system:





CO₂ removal system:



Removal of Hydrogen Sulfide: The system uses polyvalent metal ions chelates of iron in aqueous medium to react with the sulfur of H₂S from biogas. The hydrogen sulfide is precipitated as elemental sulfur- a co-product for fertilizer application. The catalyst is continuously regenerated and recycled.

Carbon dioxide removal: The system uses differential solubility of CO₂, CH₄ and H₂S in water. This is enhanced by the use of pressurized chilled water which removes CO₂ and trace impurities by dissolution.

Final conditioning: The purified methane is then subjected to molecular sieve drying and sent to compression and cylinder filling.

PRAJ USPs:

- Robust & Economical Gas cleaning.
- Low maintenance costs.
- Highly efficient removal of H₂S, CO₂ and other impurities for different grades.
- Generates valuable sulfur co-products.

PRAJ Offerings:

- Customized Plant Designs 100– 2000 M³/Hr biogas flow.
- Standalone supply for existing Biogas plants.
- System engineering as per the end-use grade specification (BioCNG/Biopower).
- Skid mounted (Prefab) designs available for short installation time and quick start-up.
- Can remove 0.01–3% H₂S & up to 40% CO₂.

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PRAJ RenGas Biomass to BioCNG/Biopower Technology

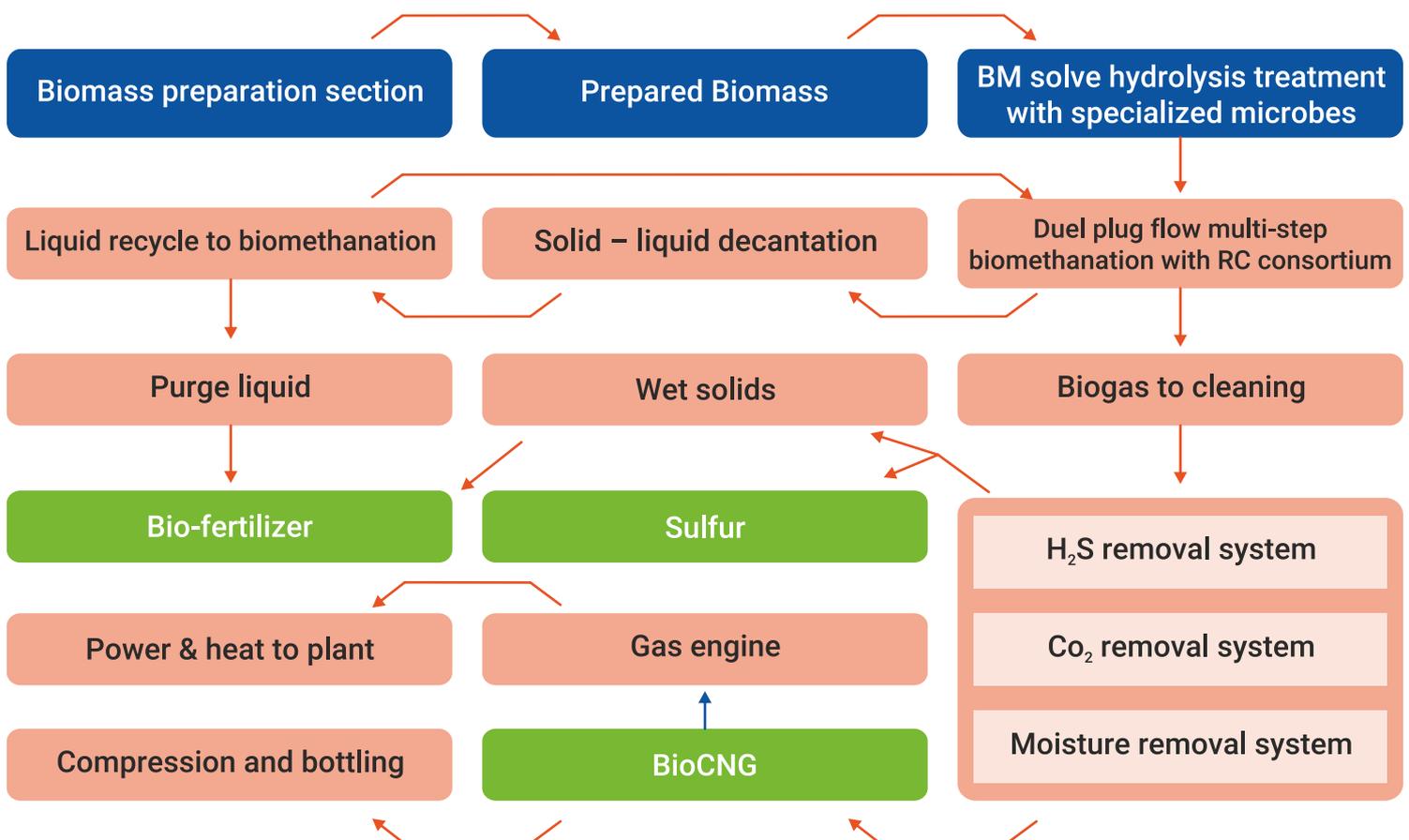
Biomass- Agri-residue:

- Agri-residue such as straw and stover are abundantly available in the annual farming systems.
- Cellulose, Hemicellulose and other organic matter in these can be converted to convertible total volatile solids through microbial pre-treatment.
- The TCVS can further be processed through AD process.

Praj's Biomass to BioCNG Technology

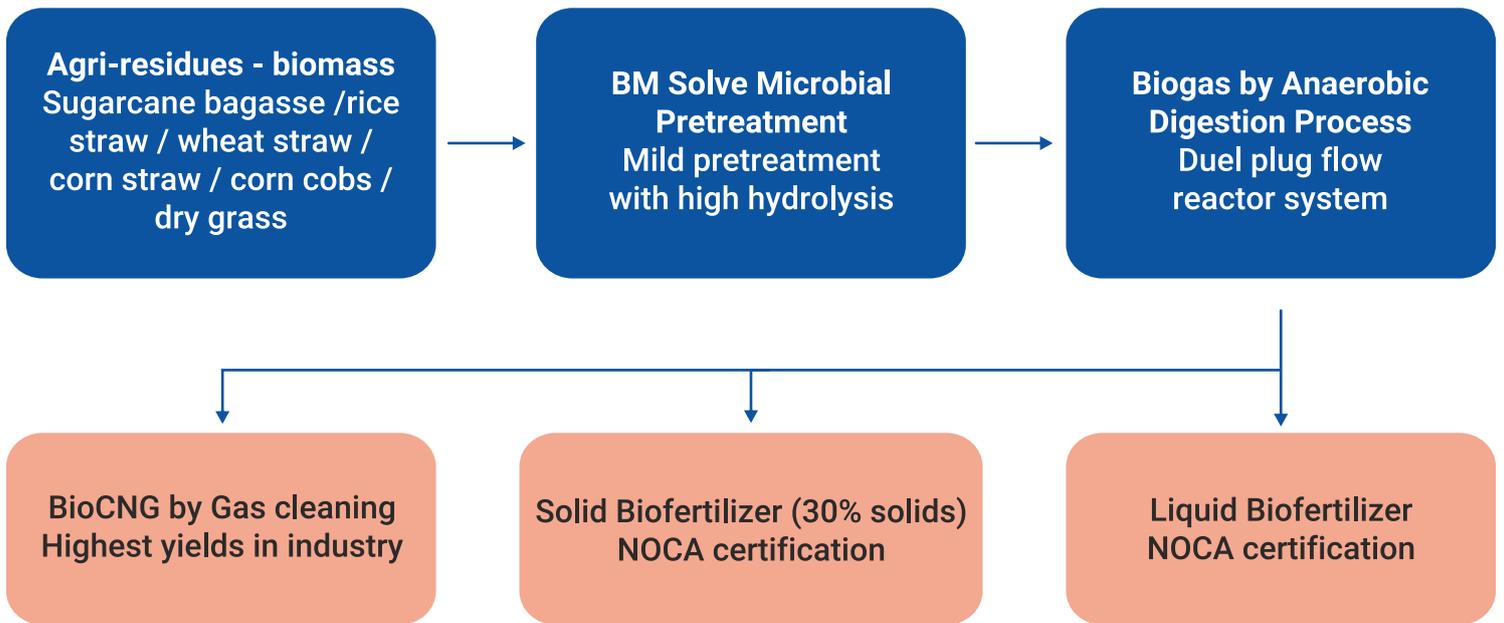
- The biomass can be converted to high value BioCNG / Biopower and premium co-products like solid / liquid biofertilizer.
- Complete green operation helps reduce GHG emissions.
- Biogas and BioCNG adds substantial value.
- Round-the year operation of Biogas / BioCNG plants.

Biomass to BioCNG plant schematic with proprietary microbial prehydrolysis





Biomass Milling Section



PRAJ USPs:

- Unique microbial biomass pretreatment to convert cellulosic polymers into TCVS.
- Mild environment-friendly pretreatment not involving extreme conditions.
- Specially adapted rumen consortia for fiber digestion and high biogas yields through AD process.
- Economical and robust gas cleaning for high quality BioCNG.
- High quality solid and liquid ferti-irrigation co-products.

PRAJ Offerings:

- Customized plant designs from 75 to 250 TPD.
- Industry's highest biogas yields from biomass (Depending on the TCVS range 65 to 80 % w/w).
- Premium grade soil amendment with NOCA organic certification.
- Commercially sound projects with high IRR and low payback periods.
- Complete turnkey / EPC Plant & technology supply with O&M options.
- Partnership for complete project development.

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