Praj is a global process solutions company driven by innovative and integration capabilities which offers solutions to add significant value to bio-ethanol facilities, brewery plants, water & waste water treatment systems, critical process equipment & systems, high purity solutions and myriad bio-products. With over 750 references in 75 countries across 5 continents, Praj is amongst the top three technology providers. Solutions offered by Praj are backed by its state-of-the-art R&D centre called Matrix.

Quick scale up & commercialization with over 3 decades of rich experience in process design, engineering and project execution, Praj is uniquely positioned to:

- Validate & build proof of concept
- Conceptualize various process schemes & ideas
- Evaluate freezing of process schemes & ideas
- Process scale-up
- Process optimization & integration engineering

First Choice amongst major global Oil & Sugar producers

- 1200 KLPD UK’s largest wheat based ethanol complex built for Vivergo fuels
- 750 KLPD wheat based ethanol plant for Bio-Wanza Belgium
- 600 KLPD corn to ethanol complex for AEMETIS USA
- 480 KLPD sugarcane juice to ethanol complex for Colombian oil major – EcoPetrol
- 380 KLPD sugarcane juice to ethanol complex for Swiss Oil major – ADDAX Petroleum

Praj - One Stop Shop for ethanol Technology

EPC/Lumpsum turnkey solution
From 1st generation to 2nd generation ethanol technology, we thrive on challenges. We have over 750 references in 75 countries across the globe. Each of these plants carry our signature of technology innovation and integration, delivering lowest water & energy footprint. This knowledge base helped us in developing second generation ethanol technology ‘enfinity’. Praj’s state-of-the-art second generation ethanol pilot facility is operational since 2009. This facility has tested more than 450 MT of biomass such as corn residues, sugarcane residues, rice straw, wheat straw, cotton stalk and EmptyFruit Bunches (EFB) Praj has finger printed more than 600 samples of biomass globally. Rigorous testing and 800,000 manhours of technology development efforts enabled us to scale up enfinity to 500 MTPD.

**Praj’s Enfinity based Smart Bio-refinery**

- Praj is executing integrated 2nd Gen ‘Smart Bio-refinery. Pre-commercial project, which is expected to go on stream by Dec 2016.
- The Smart Bio refinery will process multiple agricultural residues and will produce multiple products like bio ethanol, bio chemicals, power for grid, BioCNG, CO2, etc.

**Key Technology Highlights**

- Multiple feedstock processing capability including Rice Straw, Cane bagasse, Corn Cobs, Corn Stover, Wheat Straw etc.
- Multi-feed, Multi-product “Smart Bio refinery”
- Zero Process Liquid Discharge
- Integration to achieve low energy & water footprint
- Complete end to end offering
- Low operating & capital cost

**EcoClean™ BioCNG technology**

Biogas (one of the key byproduct of enfinity) has been recognized as a green energy source (also referred as BioCNG). BioCNG can be produced through various organic waste such as:

- Distillery effluent and sugar plant press mud
- Animal manure - cattle dung, poultry droppings
- Kitchen and canteen waste
- Agricultural residues (all kind of lignocellulosic matter)

**The BioCNG can be used as**

- Domestic / industrial heating and cooking applications
- For generating electric power using gas generators
- Fuel for transport

Praj offers end to end solution for producing BioCNG from all kinds of lignocellulosic waste.
EcoClean™
BioCNG Energy from waste

Praj has collaborated with Indian Institute of Science for H$_2$S removal and with Indian Institute of Delhi for CO$_2$ removal Technology.

**Hydrogen Sulfide Removal**

In aqueous medium, polyvalent metal ions chelates of iron, is used for scrubbing hydrogen sulfide from the biogas. The sulfur present in Hydrogen sulfide is precipitated as elemental sulfur.

**Carbon dioxide Removal**

Hydro scrubbing process is based on the difference in solubility of CH$_4$, H$_2$S and CO$_2$ in water. The process is intensified by further improving the solubility of CO$_2$ by pressurizing the absorption system using chilled water. This ensures removal of impurities and absorption of traces of hydrogen sulfide and carbon dioxide. The moisture in the exit methane enriched biogas is removed in Methane Gas Dryer. Methane enriched gas is compressed under pressure to fill up in cylinder as Compressed Biogas (CBG) or BioCNG.

Distilleries as well as industrial effluent treatment plant based on biomethanation produces biogas as a co-product. Typically, it is a mixture of Methane (CH$_4$, 55- 65 %), Carbon dioxide (CO$_2$, 30-40%) and Hydrogen Sulfide H$_2$S (0 – 4%) depending on the type of waste and the temperature of the digester used.

Apart from conventional energy rich feedstocks like bagasse or coal, biogas is used as alternate fuel source for steam, power generation to improve operation cost.

If biogas is cleaned by removing hydrogen sulfide and Carbon di oxide, it can be converted to BioCNG which is renewable fuel for various applications including operating automotive as well as for industries like foundries and restaurants enabling sustainability of the prospects.
**Need fulfilment**
Most of the distilleries and industries are using biogas for steam generation. In case of power generation using gas engine, industries are using chemical Scrubbing technology to reduce hydrogen sulfide.
In case of compressing biogas further, Carbon dioxide is reduced by high pressure Hydro-Scrubbing.

**Applications**
- EcoClean™ technology is suitable for cleaning of biogas for distilleries as well as for other industrial application for
  - Power generation
  - BioCNG/CBG/Biomethane production

**Features**
- Purely chemical Scrubber
- Biogas cleaning technology to scrub H₂S and CO₂ in feed biogas
- H₂S converted into Elemental Sulphur with highpurity having good commercial value
- Capable of handling variation in H₂S concentration (upto 20% w/w) in the feed biogas
- Zero Liquid Discharge System
- Minimum Loss of methane in treatment system

**Advantages**
- Methane enriched gas (Methane content upto 95%)
- Elemental sulfur as co-product
- less downtime
- High pressure gas from EcoClean™ technology ensures
- CAPEX and OPEX reduction in case of BioCNG application

**Benefits**
- Additional revenue generation from Co-product Selling
- Consistent production ensures consistent output to supply chain

**References**
- GMMCO LIMITED
- Green Future Innovation.
- Loknete Industries
- Simbhaoli Sugars
- Sahyadri Starch
- Vijaynagar Industries
- Biosynergy
- Mahindra Research Valley
- Rajasthan Go Seva Sangh
- Madhav Go Vigyan Anusanadhan Kendra
- Kanhaiya Goshala
- Shri Krishna Goshala
- Miraj Goshala

Note: Includes references of technology partners namely Indian Institute of Science (Bangalore) and Indian Institute of Technology (New Delhi)

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**Praj Worldwide**
India | South Africa
Thailand | UAE | USA