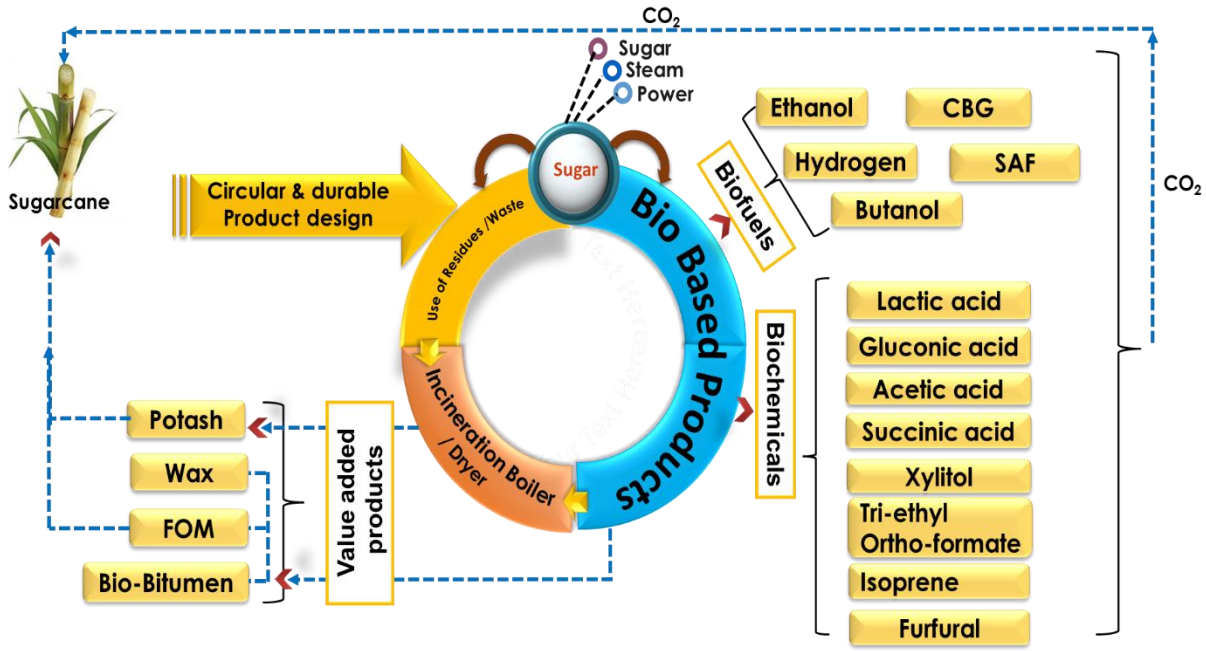
Research and Development Facilities

- 1st and 2nd generation ethanol production
- Improvement in overall fermentation & distillation efficiency
- Developing processes for alcohol based beverages.
- Diversification of the product portfolio of sugarcane bio-refineries through production of biofuels (Ethanol, Butanol, CBG, H_2), bio-chemicals (Lactic acid, Gluconic acid, Acetic acid) and other value added products (Wax & Potash)
- Treatability studies on effluents and solid wastes
- Monitoring of indoor and outdoor air quality
- Environmental Damage Assessment
- Institute work around biocircular economy in different direction as per the mentioned below figure.



Major Facilities

Sr. No.	Equipment	Applications
1	Laminar air flow	For microbial strain handling and fermentation material handling
2	Autoclaves	Required for microbial media & fermenters sterilization purpose
3	BOD incubator and refrigerators	Microbial cell culture growth/storage, maintenance and pollution load estimation
4	Incubator shaker	Required for microbial culture growth, strain screening and media optimization work
5	Hot air oven	Glassware handling or fermentation sample Dry Cell weight estimation.
6	Electronic Balance	Routine requirement for multiple microbial or analytical lab work
7	Raman Spectrophotometer	Raman spectroscopy can be used to study solid, liquid and gaseous samples

8	GC with FID and TCD	Required for analysis of volatile compounds present in fermentation products.
9	GC-MS (Agilent)	Required for analysis of volatile compounds which are below detection limit of GC and identification of unknown compounds
10	Spectrophotometer-UV visible	Enzymatic assays and absorbance measurement
11	FT-NIR	Analysis of wax, sugars, inhibitors and intermediate compound identification.
12	Densitometer with alcoholyzer (Anton par)	Estimation of alcohol sample without sample preparation or estimation of density of various samples
13	COD digester with auto-titrator	Estimating pollution load of effluents generated after biomethanation or fermentation or distillation/ product recovery
14	CHEM-CAD-process simulation software	Will be useful for simulation and design purpose of product recovery (such as ethanol or acetic acid)
15	Ion Chromatography (Metrohm 883 Basic IC plus)	To estimate the cations & anions present in feedstock/fermentation products/ effluent samples
16	HPLC (Agilent Infinity 1200)	Use for analysis of sugars, alcohol and bio-acetic acid (Engaged completely for Departmental activities)
17	Anaerobic digesters (20 L and 200 L)	Biogas production from sugar by-products such as spent wash, PMC, bagasse
18	NBS fermenters (2 and 10 L)	Fermentation and enzyme hydrolysis
19	Planetary Ball mill	Used for fast and reproducible grinding of material to analytical fineness
20	Refrigerated centrifuge (Hermle)	Temperature sensitive material can be centrifuged
21	Bomb Calorimeter	The bomb calorimeter is a laboratory instrument used to measure the amount of a sample's combustion heat or heat power when excess oxygen combustion occurs. The purpose of this research is to determine the effect of using the bomb calorimeter on the ability of physics students to process science.
22	Laminar Air Flow	laminar airflow, also known as laminar air flow (LAF), is a device, designed to prevent the equipment and working environment from particles. Laminar airflow units create particle-free working environments by sucking air through a filtration system and exhausting it across a work surface in a laminar air stream.
23	Flame Photometer	Flame photometer is an analytical instrument used in clinical laboratories for determining of sodium, potassium, lithium and calcium ions in body fluids.
24	COD Digester	COD Digestion Apparatus are used for determining Chemical Oxygen Demand in effluents like waste water, industrial water, sewage water which are discarded after processing. This help in understanding the real time presence of chemicals/gas in natural water bodies.

25	UV/VIS spectrophotometer	UV-Vis spectrophotometers provide fast and efficient analysis, allowing researchers to obtain results within a few seconds. It is used to quantify nucleic acid and protein content in biological samples and for quality control in drugs and food industries.
26	ICP-OES Analyzer	Inductively Coupled Plasma Optical Emission spectroscopy (ICP-OES) is an analytical technique used to determine how much of certain elements are in a sample. The ICP-OES principle uses the fact that atoms and ions can absorb energy to move electrons from the ground state to an excited state.
27	Kjeldahl Distillation Apparatus Vapodest System	nitrogen analysis according to Kjeldahl or steam distillation of volatile acids, Sulphur dioxide, TVB-N, ammonium, formaldehyde, phenol, alcohol, vicinal dike tones or hydrogen cyanide.
28	Centrifuge	A centrifuge is a laboratory device that is used for the separation of fluids, gas or liquid, based on density. Separation is achieved by spinning a vessel containing material at high speed; the centrifugal force pushes heavier materials to the outside of the vessel.
29	Water Bath	A water bath is a device used in the laboratories to incubate samples in water maintained at a constant temperature. Temperature may be controlled digitally or by a dial and once set, the water bath cycles on and off to ensure constancy of the temperature.
30	Cooling BOD Incubator	cooled incubators (ST) is a thermostatic device designed to store samples at a specific temperature. Cooled incubators (ST) have a heating system and a cooling system, so samples can be stored/incubated above or below ambient temperature.
31	Hot Air Oven	Hot air ovens use extremely high temperatures over several hours to destroy microorganisms and bacterial spores. The ovens use conduction to sterilize items by heating the outside surfaces of the item, which then absorbs the heat and moves it towards the center of the item.
32	Dual Channel Fine Dust Sampler	Instrumental methods used to measure the concentration of chemical impurities in the air and assess the atmosphere of a space before entering it, such as using multi-gas detectors to detect the presence of chemical compounds.
33	Portable Air Dust Sampler	uses special instruments to detect contaminants such as gases, vapors, dusts and fibers in the air. The significance of air sampling is that these substances can cause respiratory impairments if inhaled.
34	Noise Meter	A decibel meter is a measuring instrument used to assess noise or sound levels by measuring sound pressure. Often referred to as a sound pressure level (SPL) meter, decibel (dB) meter, noise meter or noise dosimeter, a sound level meter uses a microphone to capture sound.
35	Melting & Boiling point determination	For Melting & Boiling point determination
36	Alcolyzer & Densitometer	It can measure alcohol strength of any solution
37	Potash recovery pilot plant	

Pilot winery & Nano-brewery facility

Sensory testing laboratory facility

Pilot winery fermentation facility

Fermenters for brewery facility lab

Fermenter facilities in the fermentation laboratory

Analytical sophisticated instrument laboratory facility

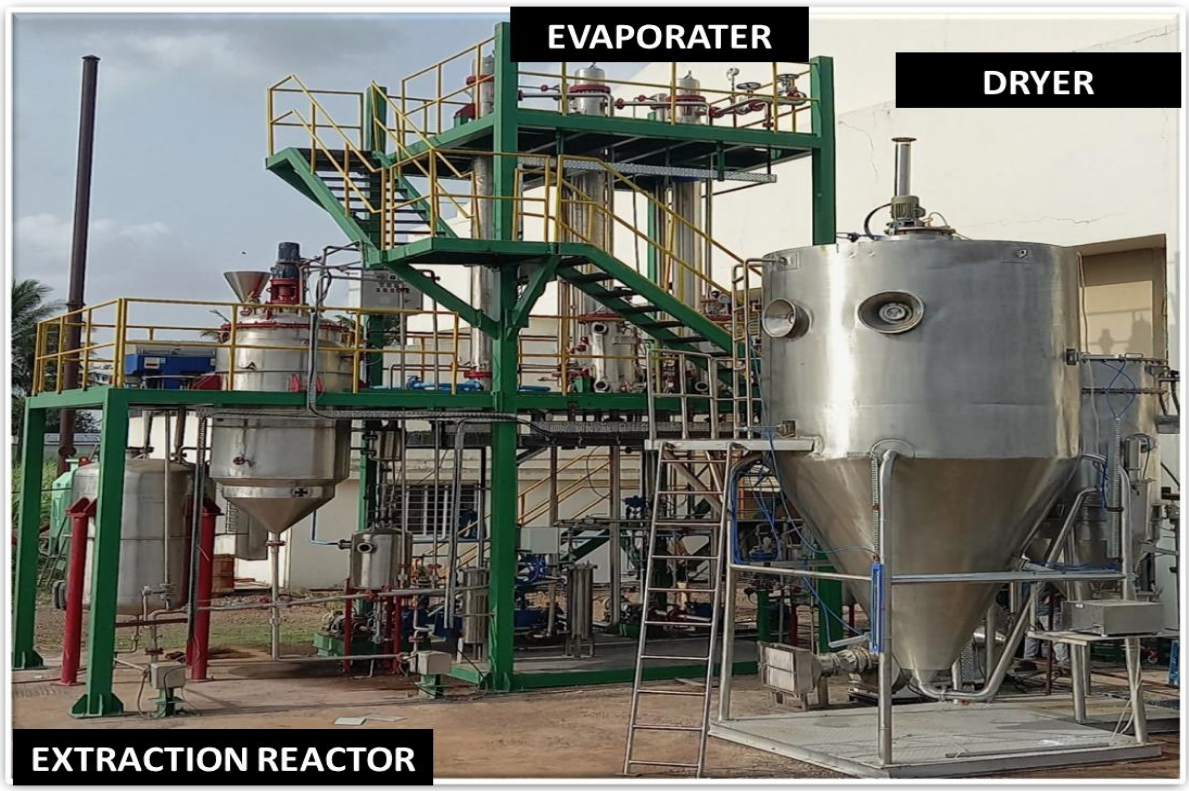
Liquor maturation house

Biogas facility laboratory (20 L scale)

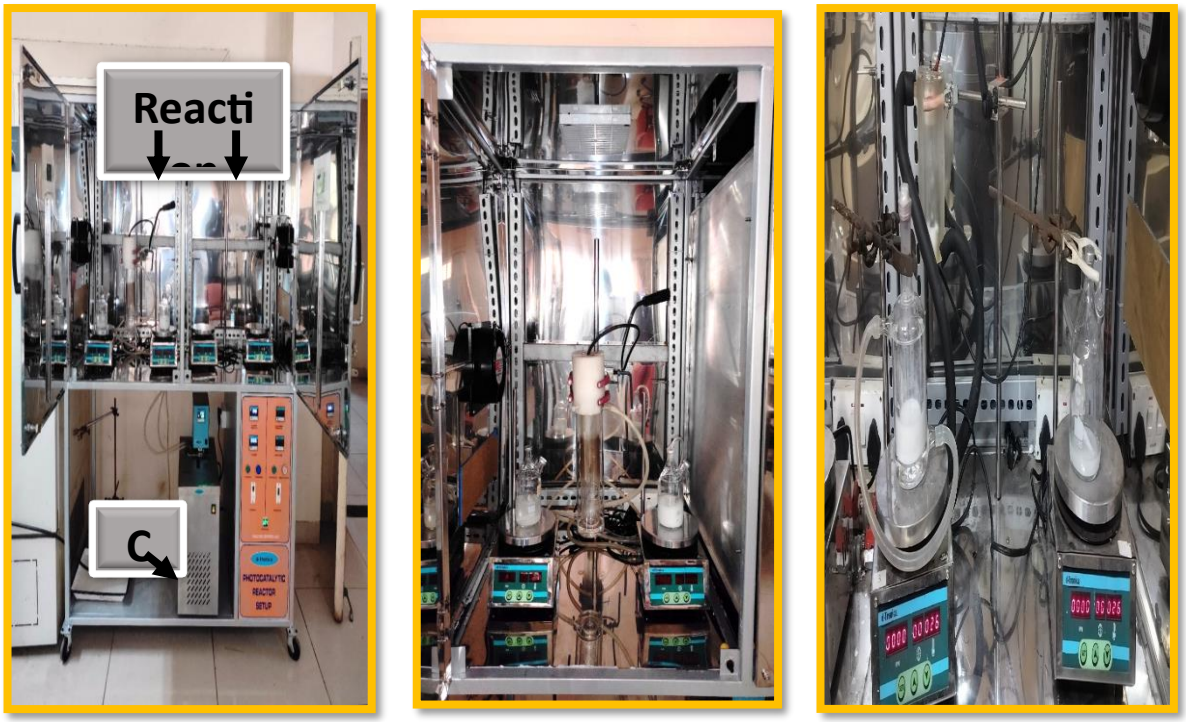
Biogas facility laboratory (200 L scale)

Facility for heavy metal analysis (ICP-OES) & spectrophotometer

Open type bioreactor for industrial effluent treatment



Potash recovery pilot plant installed at VSI



PHOTOCATALYTIC REACTOR