



RAJ PROCESS
EQUIPMENTS AND SYSTEMS PVT. LTD.

PATENTED RAJ ZERO LIQUID DISCHARGE TECHNOLOGY



Cost effective
practical solution



BioCNG - the
fuel of future



Potash rich
fertilizer



Waste to
Wealth

World-Class Equipment With Best -In-Class Technology

RAJ Process Equipment & System Pvt. Ltd., established in 2003, is a rapidly growing engineering company specializing in process equipment & systems. We offer design, engineering, manufacturing, & export services, including turnkey projects. Our expertise includes Distillery, Dehydration Technology, Evaporators, Condensate Polishing Units, Spray Dryers, Rotary Dryers, Granulation Plants, Powder Handling Systems, & more. We have a reputation for delivering optimal solutions to various industries across Asia and beyond. Our focus on Technology, Service, and Customer Satisfaction drives our Success.

Sugarcane Toxic Waste A Boon For Farmer

In India, sugarcane molasses-based distilleries have long been known to consume significant amounts of water and produce a hazardous residue known as spent wash or vinasse. This thick, dark brown, and pungent liquid poses a severe threat to the environment, as untreated discharge can cause extensive damage to soil, groundwater, and rivers. Shockingly, experts estimate that for each liter of ethanol produced, approximately 8-15 liters of toxic spent wash are generated.

Recognizing the grave environmental impact caused by this toxic waste, Raj Process Equipment has taken a ground-breaking step by introducing an innovative technology. They have successfully developed a method to transform the spent wash from distilleries into a valuable resource for potash fertilizer, while also recovering residual organic materials. The process involves concentrating the spent wash in a Multiple Effect Evaporator until it reaches 55% brix. Instead of incinerating the spent wash in the traditional manner, it can now be converted into a dry powder with just 4% moisture through a tailor-made Spray Dryer for Spent Wash Drying.

This innovative approach not only helps mitigate the environmental hazards posed by toxic waste but also turns it into a potential resource, benefiting both the distilleries and the agriculture sector.

Features



Zero shut down & zero maintenance



Simplicity in operation



Low operation and maintenance cost



90% Steam condensate recovery



Save 8 Rs/lit of alcohol in operation cost



Process Flow Diagram



It's a testament to the synergy between renewable energy production and efficient waste management, underscoring its holistic contribution to society and the environment.

Bio digester

Treatment Strategy:

CSTR' process being offered by RAJ is based on the concept of conversion of organic matter into biogas. The process of conversion of organic matter into biogas occurs through a group of bacteria. In 'CSTR' process, which is a high rate process, anaerobic digestion takes place in the mesophilic range of temperature, i.e. 36–40°C. The pH inside the reactor is usually kept around 7.2 while the proper ratio of volatile acid and alkalinity is maintained.



The following three stages are involved in the process of anaerobic digestion.

Hydrolysis:

In the process of hydrolysis the complex molecular compounds i.e. polymers are converted into the simple molecular form i.e. monomers.

Acidogenesis:

The monomers so formed at the end of hydrolysis process are converted into volatile fatty acids. Acetic acid forms the major portion of volatile fatty acids. The process of conversion of monomers into acids is carried out by a group of anaerobic bacteria known as acid formers.

Methanogenesis:

Acids produced at the end of Acidogenesis process are converted into carbon dioxide and methane gases. The process of conversion of acid into gases is carried out by a group of anaerobic bacteria known as methane formers. In CSTR process the bacteria responsible for digestion process are kept in suspension with the help of lateral as well as central mixers.

Compressed Bio-Gas (CBG)

Biogas cleaning process

The process begins with raw biogas from digesters treating distillery waste and press mud. An innovative biochemical method, including an aerobic reactor, absorber, and sulphur recovery unit, converts H₂S-containing gases to elemental sulphur.

The resulting biogas, with reduced H₂S at 200 ppm, undergoes further refining through a low-pressure compressor unit. Real-time monitoring is facilitated by online H₂S analyzers, enhancing control, and accuracy.

CO₂ Removal Process

CO₂ removal from biogas employs a packed column with soft water as solvent under 7.5 kg/cm² pressure, reducing CO₂ to <4%. A closed-loop system regenerates soft water, minimizing chilling costs. Moisture removal follows via a Dryer Unit. Dry methane, free of H₂S and CO₂, is achieved through a two-vessel molecular sieve dryer. Biogas then enters a 6-7 kg/cm² buffer vessel with pressure control and PRV for closed-loop gas recycling, before advancing to the high-pressure compressor.

Process



Features of CBG



Competitive pricing



Renewable energy source



Alternative to fossil fuels



Waste to wealth



Evaporator

The Evaporators are used for concentration of Biomethanated Spent Wash coming from the Degasser. Evaporators are used to increase the solid contents of the liquid product prior to drying. This is a cost effective method of removal of moisture. Depending on the number of effects used in an evaporator, the quantity of water evaporated per kilogram of steam increases. In case of multiple effect evaporators, steam jet ejectors or thermocompressors are used to increase the thermal efficiency. An evaporator consists of shell and tube type heat exchanger. The liquid feed is passes through the heat exchanger and indirectly heated with the help of steam. This operation is either done at atmospheric pressure or under vacuum. Evaporation under vacuum is most energy efficient and also ensures that the product does not get over heated.

The condensate is further treated in ammonia stripper before sending it to condensate polishing unit



CPU

Highlights of CPU Process

- Steam Based Double Stripper Column to treatment of BMSW process Condensate
- Integrate to minimize Steam Consumption
- No add on cost for Chemical dosing as Acid or caustic as for conventional scheme
- COD & BOD to be reduce up to 200 to 400 ppm
- Treated water is recycle to use in Cooling tower makeup & Fermenter dilution etc
- Low Capex compare to Conventional MBBR CPU
- Low Opex compare to Conventional MBBR CPU Robust and Proven technology
- Steam Condensate Recovery system



Patented Spray Drying Technology



The Concentrated Bio-Methanated Spent wash with 30-40% Solid from the Multiple Effect Evaporator is fed into the Spray Dryer by feed Pump. In the Spray Dryer, the liquid is atomized by high speed Atomizer at the top of the Chamber. The Hot Air is generated by using the Biogas Based Direct Fired Hot Air Generator and further diluting it with the Boiler Flue Gas, High efficient Air Distributor is used to feed Hot Air in Spray Chamber. In Spray Chamber atomized feed is mixed with flue gas as the atomized spent wash comes in contact with the Hot Air, immediately the water Evaporates & free flowing dry powder with less than 5% moisture is discharged from bottom of Chamber, The process air carries fine particles which is further arrested in high efficient cyclone. Very fine particles cannot be arrested in cyclone.



Features



Low fuel
consumption



Less
manpower



Low maintenance
cost



Continuous
operation



Granulation

Crusher

Our new high-efficiency organic fertilizer crusher is a reversible type crusher with strong adaptability to materials' moisture content. It works well with matured waste, sludge after fermentation, and other materials with moisture content up to 30%. The granulation success rate is between 20% to 30%, meeting the requirements of common fertilizer production.

Ribbon Blender

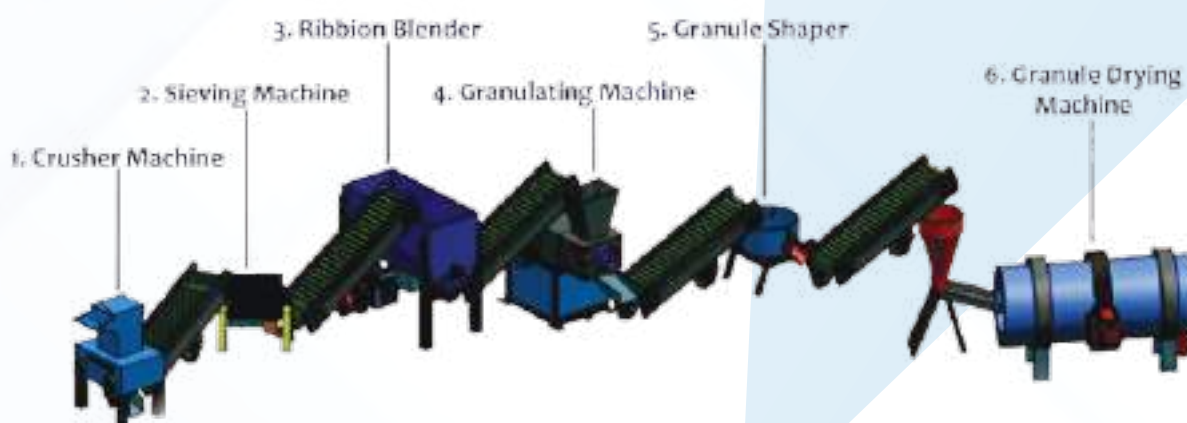
The horizontal fertilizer mixer ensures high mixing uniformity, minimal material residual. Ideal for blending formula feed, additives, organic and compound fertilizer materials.

Granulator

Biomethanated Spent Wash powder is added from the top, degassed, compressed, and transported between two rolls with reversed rotation. Materials condense in the disc, separating naturally aided by gravity and surface tension.


Rotary Drum Dryer

The granular fertilizer from the granulator has high moisture content and needs drying. The rotary drum dryer is used for this purpose, reducing moisture to 2%-5% from 20%-30% for compound fertilizer and 40% to 10% for organic fertilizer. After drying, a cooling machine is used to lower the temperature for proper storage.



Laboratory Report

Analysis of Biomethanated spent wash Granules



Since 1948

Italab Private Limited
INDUSTRIAL TESTING & ANALYTICAL LABORATORIES
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E-mail: inquiry@italab.in • Web: www.italab.in
AN ISO 9001:2015 CERTIFIED ORGANISATION

CIN:U75100MH1948PTC005404

CERTIFICATE OF ANALYSIS

Sample Not Drawn By ITALAB

Certificate No. : ITA/2022-23/067630

1. Particulars of Sample Submitted

Customer Name : Raj Process Equipments And Systems Pvt Ltd.
Jai Ganesh Vision,
'B'- Wing, 3rd Floor, Akardj, Pune
411035
Mst IN


Sample Name # : Bio-Methanated Spent Wash (Powder)
Letter Ref. No. # : PO No: 4000016448, PO Date : 07.12.2022
Sample Receive Date: 8/12/2022
Marks # : --

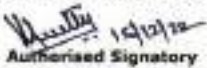
Certificate Date : 15/12/2022
Customer Master No: C014472
Quantity Received # : 60gms
Packing : Plastic Bag

2. Result of Analysis :

Parameter Name	Result	Unit	Method
pH (5% Solution)	8.32	-	
Electrical conductivity (5% Solution)	30.4	mS/cm	
Nitrogen as N	1.81	%	
Carbon (on dry basis)	25.95	%	
Organic matter (on dry basis)	44.75	%	
Phosphorous as P	0.28	%	
Phosphorous as P2O5	0.65	%	
Potassium as K	21.3	%	
Moisture	3.27	%	
Total solid (5% Solution)	963.4	g/l	
Total Dissolved Solid (5% Solution)	17.3	g/l	
Fibre	3.60	%	
Total Suspended Solids (5% Solution)	946.1	g/l	IS:3025 Part17:1984 Reaffirmed:1997
Density	0.847	g/cc	
Gross Calorific Value	1980	Cal/gm	IS:1350 (Part II)
	3564	BTU/lb	IS:1350 (Part II)
Sucrose	Not Detected	%	


----- END OF REPORT -----

Test Carried Out By :

Mrs. Kavita

For Italab Private Limited

Authorised Signatory
Page 1 of 1

Mtg. Hq. : 294, 2nd Floor, Sahyog Bldg., S.V. Road, Bandivli (West), Mumbai - 400 067.
Chennai : Lotus Court, 3rd Floor, New 238, Old 305, Thambu Chetty Street, Chennai - 600 001. | Kolkata : Mercantile Building, 30, Lal Bazar Street, Kolkata - 700 001.

Collection Centres : Ahmedabad, Bangalore, New Delhi, Jaipur.

 A Subsidiary of 3A Capital Services Ltd.

Sr.No.: M 096070

Our Other Offerings

Turn- key Plants

- Distillery Plant – Molasses & Grain Based
 - Zero Liquid Discharge Plant
 - CBG Plant
 - Guar Gum
 - Starch and Glucose
 - Detergent Powder Plant
 - MCCP
 - Nutraceutical Powder Plant
 - Milk Powder Plant
 - Herbal Extraction Plant
 - Thermal Desorption Unit
 - Fruit and Vegetable Processing
-

Dryers

- Spray Dryer
 - Rotary Dryer
 - Spin Flash Dryer
 - Flash Dryer
 - Rotary Vacuum Dryer
 - Paddle Dryer
 - Continuous Fluid Bed Dryer
 - Steam Tube Bundle Dryer
 - Cone Screw Dryer
 - ATFD
-

Evaporators

- Falling Film Evaporator
- Forced Circulation Evaporator
- Integrated and Hybrid Evaporator
- Standalone Evaporator
- MVR Based Evaporator
- Solvent Stripper
- ATFE

Boilers

- Multi Fuel Package Boiler with External Furnace
 - Multi Fuel Package Boiler with Integral Furnace
 - Oil Fired Boilers/ Waste Heat Recovery Boilers
 - Captive Plant High Capacity Boilers
 - Turnkey Co-Generation Power Plant
 - Thermic Fluid Heater And Hot Water Boiler
-

Mixers

- Cone Screw Mixer (Nauta Mixer)
 - Ribbon Blender
 - Paddle Mixer
 - Continuous High Speed Mixer
 - Double Cone Blender
 - Plough Shear Mixer
 - Conical Blender
 - Conche Mixer
-

Process Equipments

- Heat Exchanger
- Reactors
- Fermenter
- Dust Collection System
- Wet Scrubber
- Bag Filter
- Screw Conveyor
- Pressure Vessel
- Silos
- Crystallizers
- Blowers

Infrastructure That We Have

We are one of the leading process equipment manufacturer from India. We have supplied our products and Services in India as well as in abroad. Our company is Certified with ISO 9001-2015, ISO14001:2015, BS OHSAS18001:2007, ASME 'U' Stamp, 'S' Stamp, National Board 'R' Stamp.



Corporate Office

Sadanand Business Center, Sr.No. 140/1, 14th Floor,
Baner, Pune – 411 045 Maharashtra, India



Unit I

Plot No. 166 & 167, Sector No.7. PCNTDA Bhosari,
Pune – 411 026 (India)



Unit II

Sr. No. 373, Village Kharabwadi, Chakan,
Tal – Khed, Dist – Pune (India)



Unit III

Plot No. -14, SEZ, Village – Nimgaon, Tal – Khed,
Dist – Pune – 410505 (India)



Unit IV

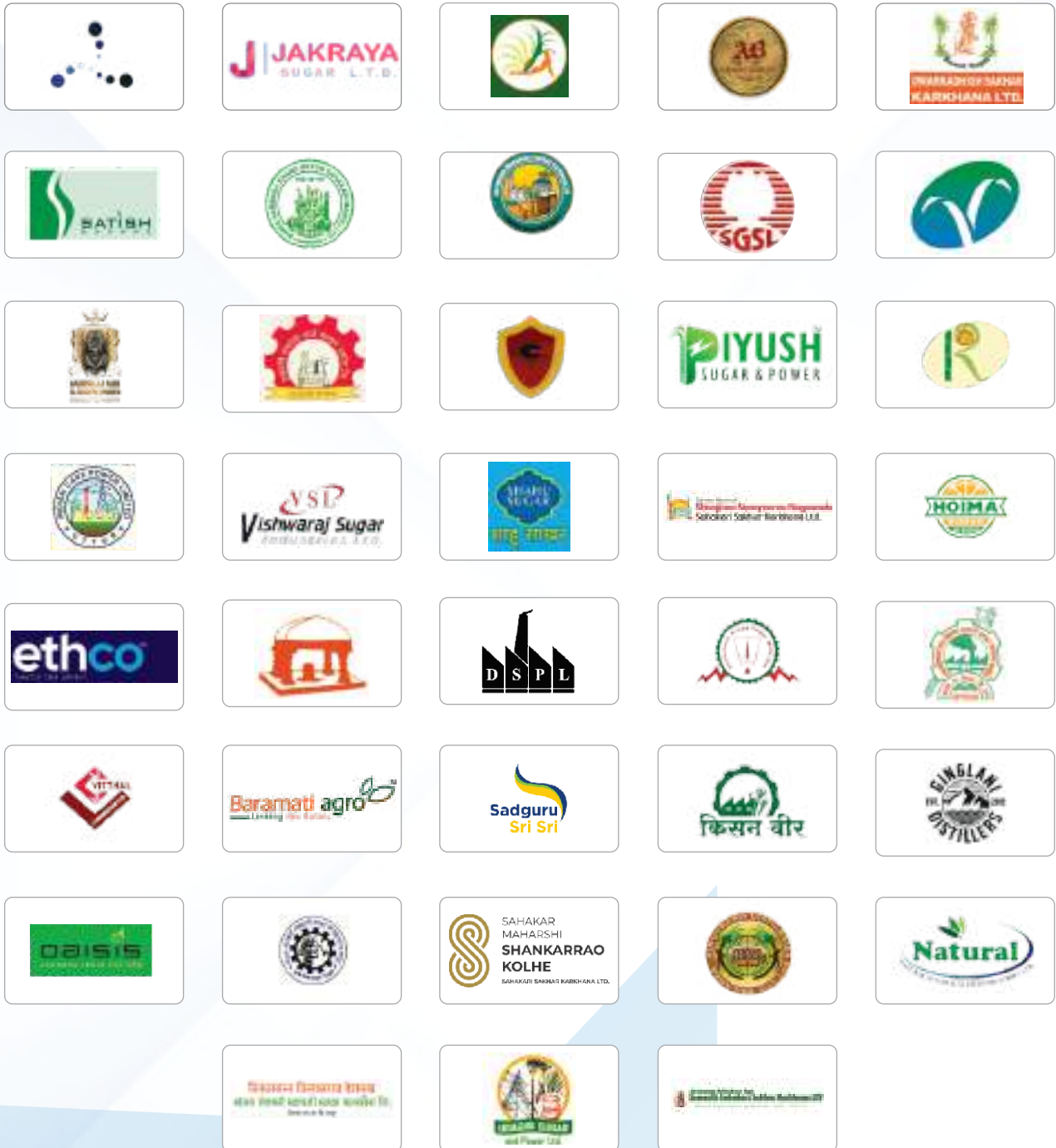
Gat No. 530, Alp Ahire, Tal – Khandala,
Dist – Satara – 412802 (India)



Unit V

Gat No. 118/2, R, A/P- Wasuli, Tal – Khed,
Dist – Pune – 410501 (India)

Customers We Served



RAJ PROCESS
EQUIPMENTS AND SYSTEMS PVT. LTD.

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