UNI-SYSTEMS

Unrivaled efficiency in
sucrose extraction

HOW IT WORKS

In a cane diffuser, sugar extraction occurs by washing shredded cane with hot imbibition water, in a multi-stage virtual countercurrent pattern. Shredded cane is loaded at the diffuser feeding point and moves towards the opposite end, where it is discharged as exhausted bagasse; hot imbibition water is moving in the opposite direction becomes more and more rich in sucrose, at every stage, until it is finally pumped to the process.

The separation occurs in a totally enclosed steel housing with rectangular cross section where the shredded cane, forming a mat of 0.8-1.8 m height is dragged over a stationary bed, provided with perforated plates. The extraction of the sucrose takes place by mass transfer between two liquid phases at different sucrose concentrations, under the action of the imbibition fluid.

The bed dragging mechanism consists of a main shaft, a shaft-mounted gearbox and a variable speed drive. The bagasse is moved by steel slats mounted on several strands of chains.

The bagasse mat washing is accomplished by means of several juice gutters properly installed at regular intervals above the mat, while several batteries of lifting screws, installed on the diffuser roof, maintain a good percolation rate. A complex juice recirculation system interconnect the juice trays with the imbibition gutters.

A special floating roll provides the hydraulic seal inside the diffuser, thus preventing the juice outflow and keeping a bagasse moisture leaving the diffuser to less than 80%. A revolving kicker installed behind the floating roll breaks apart the mat and transfers the bagasse into the discharge conveyer.

The diffuser bed is made of perforated plates with holes of special profile to promote high percolation rates even with high dirt content. The juice flowing out the holes is collected into juice trays mounted under the plates.

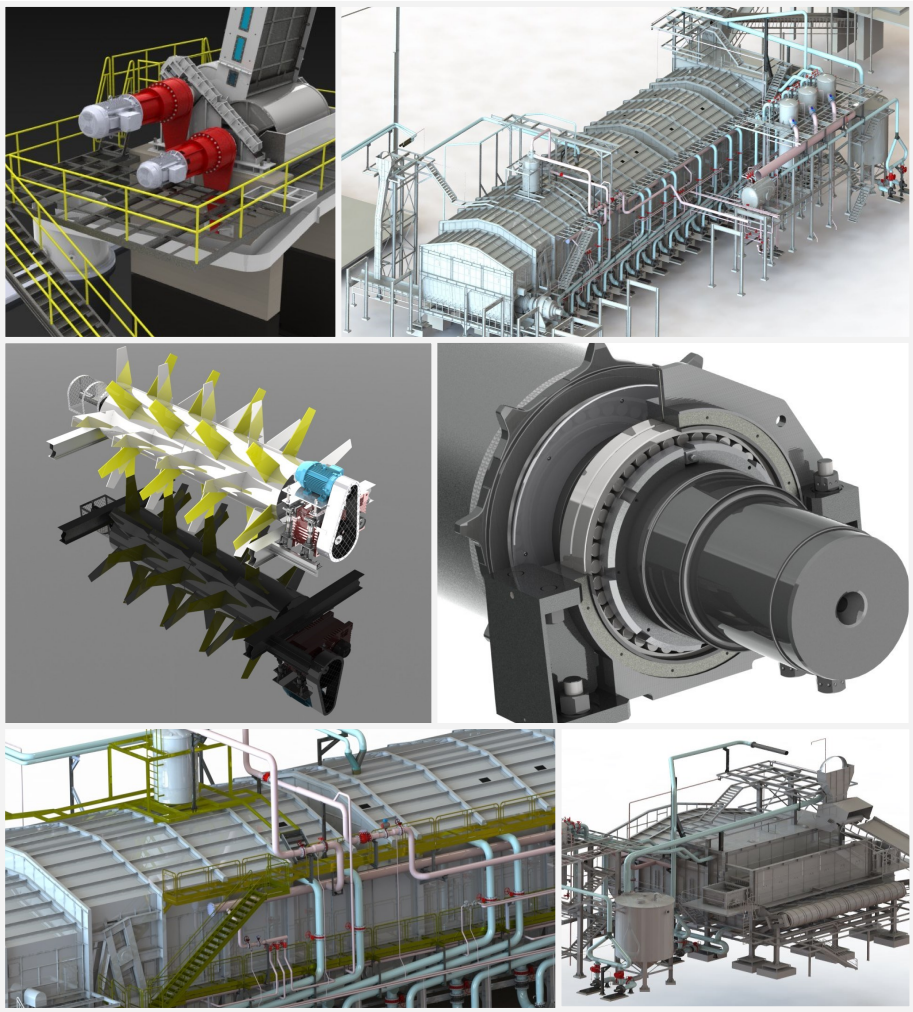
Because a minimum open cell index of 90% is required to guarantee a high extraction, the preparation system shall always include a heavy duty shredder. The type and quantity of additional cane preparation equipment are contingent upon the type of harvesting, the cane washing, and the characteristics of the sugar cane.

The bagasse leaving the diffuser with 78-80% moisture is dried up to a moisture not exceeding 50-51%. The drying system includes dewatering devices which are suitably selected for each specific application and finally a heavy duty, high pressure drying mill designed to guarantee the final bagasse moisture.

Our diffuser can be configured as conventional cane diffuser or as a bagasse diffuser, in which case a mill is installed before the diffuser and performs the extraction of the first juice.

TECHNOLOGY AT WORK FOR YOU

Uni-systems' approach to engineering is always meant to deliver cost-effective solutions, to improve competitiveness and assure long-term business success. In diffusion, our engineering capabilities are based on proven processes and more than 40 years of experience and practice in cane preparation and juice extraction. Moreover, we avail ourselves of an extensive and sophisticated array of computer aided engineering tools and proprietary calculation programs.



MAIN ADVANTAGES

- Higher Sucrose Extraction
- Lower Energy Consumption
- Reduced O&M Costs
- Higher Operation Flexibility
- Higher Operational Reliability
- More Consistent Performance
- Lower Investment Costs
- Reduced Installation costs
- Cleaner and safer operation
- Lower risk of infection

UNRIVALED SOLUTION FOR

- New greenfield sugar projects
- New biofuel and co-generation projects using sugar cane and sweet sorghum as feedstock
- Sugar mill rehabilitation or capacity expansion projects requiring extensive mill retrofitting or upgrading of mills or transmissions
- Capacity expansion projects requiring upgrading of mills and transmissions.

FLEXIBLE APPLICATIONS

- Cane diffuser with one or two drying mills
- Bagasse diffuser with first upfront mill and one or two drying mills
- Cane diffuser convertible to bagasse diffuser for capacity expansion

1. Higher Sucrose Extraction

Practical results show that the Pol% in bagasse resulting from a correctly operated diffuser is as low as 0.6% and, in most cases, lower than 1%. Typical values attainable with a six four-roll mill tandem working under same conditions, could be as low as 1.8-2.0%, normally 2.5-3.5%. The difference is remarkable. Every 1% drop of the Pol% bagasse represents an increase of gross profits of about 1.1 US$ per ton of processed cane per season. Ex.: a 2,000,000 Ton processing facility generates 3.3 million US$ additional gross profits when the Pol% in bagasse drops 1.5%. (Values based on a typical boiling house efficiency of 90% and a sugar price of US$ 400 per ton).

2. Lower Energy Consumption

The diffuser consumes a small portion of the mechanical power typically required in a conventional mill tandem. The total power requirement including main drive, conveyers, kicker, pumps, lifting screws, and screens is comparable to the power consumption of only one mill. Therefore a system comprising one diffuser and two mills consumes only 35% of the power required by a six 4-roll mill tandem, including mill drives, conveyers, imbibition pumps, screens etc. Example: a 2,000,000 Ton processing facility operating with a diffuser can sell to the grid an additional quantity if 14,000 MW per season equivalent to 1.4 million US$ (Value based on a fiber % in cane of 13.5% and a sale price for energy of US$ 100/MW).

3. Reduced O&M Costs

Diffuser components do not endure the severe wear as mill parts do. Only a few elements (chain pins and bushes, pump impellers, conveyer moving parts) require periodic maintenance. Practical experience shows that maintenance costs in a diffuser installation with two drying mills is about 50% of the maintenance costs of a six 4-roll mill tandem. Example: The reduction in maintenance costs for a 2,000,000 Ton processing facility operating with a diffuser will be about 700,000 US$/season . Labor costs are reduced to 60%. Lubrication, electrodes and welding costs are narrowed down to 35%. The costs for chemicals used in clarification and filtration are also cut by half and similar reduction is expected in the disposal costs of the filter cake.

4. Higher Operational Flexibility

The diffuser maintains a constant performance in a wide range of capacity (from 50 to 130%), even with uneven cane supply or variable fiber content. In general, the diffuser always outperforms a mill tandem in terms of extraction, even when heavily overloaded. Existing installations show extraction rates above 96.5 % with diffusers running at 180% their design capacity.

5. Higher Operational Reliability

The few moving parts of the diffuser are subjected to low mechanical stresses, thus reducing chances of mechanical failures. Critical elements, such as chains, are designed for a 15-year lifespan.

The performance is not affected by the gradual increasing wear of moving parts during the season as it is the case of a mill suffering wear of shells, scrapers, turnplates, pinions etc. Higher production rates and lower down-time for maintenance are typical with the diffuser.

Record high operational continuity, with overall downtimes less than 2% per season is common with Uni-systems diffusers.

6. Consistent Performances

Performance parameters such as capacity, extraction, and bagasse moisture are more steady in a diffuser even with fluctuating feeding rate, cane characteristics, imbibition flow rate, temperature, and steam supply. The equipment is fully automated thus minimizing human errors.

7. Lower Investment Costs

The total Capex for a diffuser installation is estimated in 75-80% of what needed for a complete six 4-roll mill tandem. In addition, being suitable for outdoor operation, the diffuser does not require a building nor a service overhead crane. Scalding juice heaters are part of the diffuser package so that the cost of complementary heaters is reduced by 40%. As the juice is filtered while passing through the diffuser screens, the clarification and filtration stations capacity is normally reduced to 50%.

8. Reduced Installation Costs

The diffuser does not require the massive concrete foundations typical of a mill tandem and heavy mechanical gearing. Additional savings are consequence of smaller heating/clarification/filtration modules. Almost all electrical drives are low power, resulting in savings with transformers, starters, MCC's, cables and other bulk materials and related installation costs

9. Cleaner and safer operation

The totally enclosed configuration and the absence of moving parts makes the diffuser installation a low noise, cleaner and safer environment, more suited to food processing or renewable energy plants.

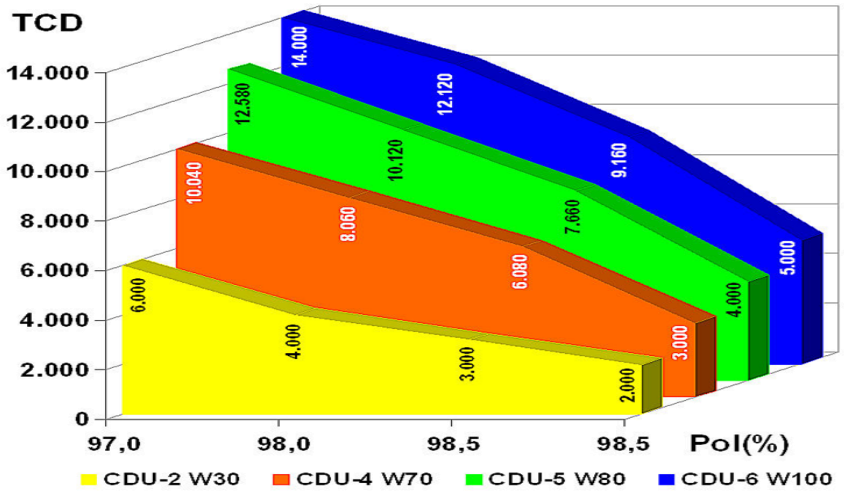
10. Lower risk of infections

The extraction process occurs at high temperature and in aseptic environment reducing considerably the risk of contamination and inversion.

MAIN FEATURES

- Horizontal type, fully-enclosed, fixed bed, with motorized chain type bagasse conveying system. The bagasse moves over the bed in a smooth and continuous fashion, constantly cleaning the screen for an optimum percolation efficiency, while avoiding flooding.
- Automatic transversal feed conveyor with unique duplex motorized lifting device to adjust the bagasse mat by desired level. Special distribution device, to evenly spread the bagasse across the diffuser width and maintain an even level over the bed thus avoiding differentiate percolation rates across the mat, in detriment of extraction.
- Multiple sets of vertical motorized lifting screws to avoid bagasse mat compactation, thus preventing flooding.
- Multi-strand chain concept arranged to eliminate downtime in case of chain failure. Chain can be repaired while the diffuser is in operation
- Automatic chemicals dosing system to correct the juice pH at suitable levels
- Scalding juice heaters of special design to increase thermal efficiency. Extra heating surface is provided to maintain the diffuser at nominal throughput even during CIP.
- Special sealing system to avoid losses of juice and steam/vapor.
- Imbibition system suitably positioned above the mat, with calibrated trays to assure a perfectly even distribution of the juice. Vortex type pumps for water feeding and juice circulation are provided.
- Optional bagasse dewatering system of special design to minimize power consumption and maintenance costs. It presents an excellent option when a lower capital investment is a priority
- Main shaft and drive concept to assure total reliability and operational flexibility.
- Automatic feed control to adjust the diffuser linear speed to in order to maintain a constant bagasse mat level in the diffuser. Feedstock flow rate is automatically adjusted by measuring the mat level.
- Juice screens in stainless steel and of special design to increase the open area in benefit of a better percolation.

CANE DIFFUSER SELECTION CHART

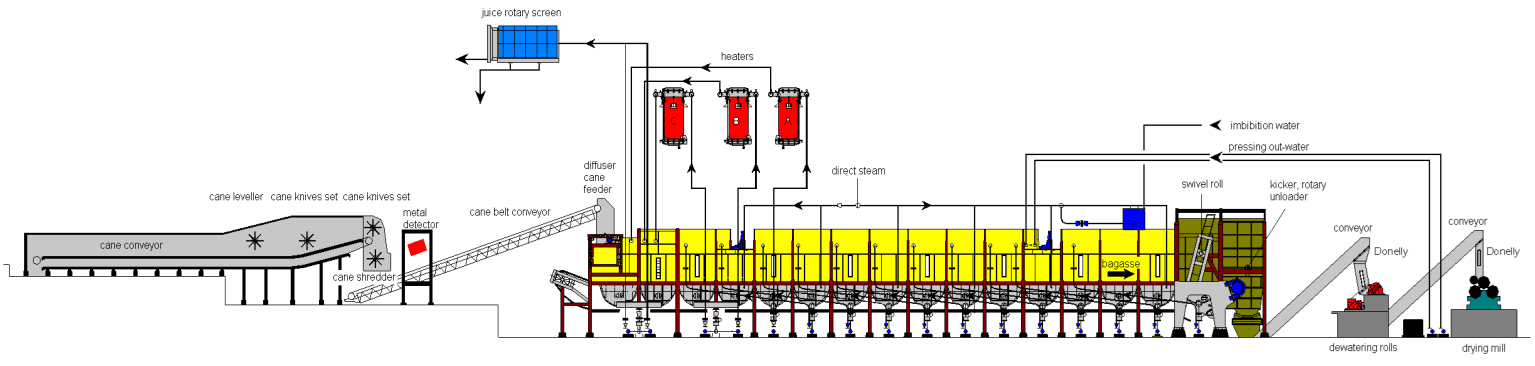


DIFFUSER TECHNICAL DATA

DATA	UNIT	VALUE
Capacity	TFH	Up to 100
Shafts centerline (Cane/Bagasse)	M	61.5 / 48.3
Width ([1])	M	3 -15
Retention time	MIN	50 - 80
Bagasse mat height	M	0.8 - 1.8
Linear speed	M/MIN	0.4 - 1.1
Energy Consumption ([2])	HP/TFH	16.5
Imbibition (% on fiber)	%	200 - 300
Operational temperature	°C	70 - 95
Scalding juice vapor consumption	Kg/TCH	60 - 80
Pol extraction	%	Up to 98.6
Bagasse final moisture ([3])	%	50 -51
Required open cell index	%	90-92

([1]) According to capacity and fiber content
([2]) Excluding power consumption of drying equipment
([3]) Requires dewatering and drying equipment

DIFFUSER SCHEMATIC FLOW DIAGRAM



REFERENCE LIST

No.	Year	Customer	Group	Country	Capacity, TCD	Width, mm
1	1985	Galo Bravo		Brazil	4,000	3300
2	1986	Usina Cruz Alta de Olimpia	Tereos	Brazil	8,000	8250
3	1996	Cia. Az. Vale do Rosário	Biosev	Brazil	10,000	9990
4	1998	Ingenio la Providencia	Arcor	Argentina	10,000	9990
5	1999	Cevasa I	Cargill - Canagrill	Brazil	4,000	3300
6	2001	Vale do Paranaíba	Joao Lyra	Brazil	6,000	6600
7	2002	Vertente	Tereos - Humus	Brazil	8,000	8250
8	2004	Dracena		Brazil	4,000	3300
9	2004	Louisiana Agrifuel—Lacassine		USA	12,000	9990
10	2005	Usina São Francisco I	SCJ Bioenergia	Brazil	12,000	9990
11	2006	Ouroeste	Bunge	Brazil	8,000	9990
12	2006	Frutal	Bunge	Brazil	10,000	9990
13	2006	Guariroba	Bunge	Brazil	8,000	8260
14	2006	Usina São Francisco II		Brazil	12,000	9990
15	2007	USJ - Cachoeira Dourada		Brazil	12,000	9990
16	2007	Pantaleon - Vale do Paraná		Brazil	10,000	9990
17	2007	British Petroleum - Tropical I		Brazil	10,000	9990
18	2007	Bevap - Paracatu		Brazil	15,000	11560
19	2007	British Petroleum - Itumbiara		Brazil	10,000	9990
20	2007	British Petroleum - Ituiutaba		Brazil	10,000	9990
21	2008	Cosan - Gasa		Brazil	15,000	11560
22	2008	Cachoeira Dourada		Brazil	12,000	9990
23	2008	Cargill/Canagrill - Cevasa II		Brazil	8,500	6600
24	2008	Bioenergetica Aroeira		Brazil	5,000	4100
25	2008	Romero - Agrícola Del Chira		Peru	4,000	4100
26	2010	Bunge - Pedro Afonso	Bunge	Brazil	12,000	9890
27	2010	Cia Azucarera Valdez		Ecuador	12,000	9890
28	2011	Maple Ethanol		Peru	5,000	4100
29	2014	British Petroleum - Tropical 2		Brazil	12,000	12160

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