



Reliability through Experience

Sugar Cane Diffusion



The advantages of diffusion



The advantages of diffusion over conventional milling have been confirmed by the performances of DE SMET diffusers in industrial operation.

De Smet diffusers have processed several million tons of cane in different countries and proved their :

- √ Simplicity
- √ Efficiency
- √ Low maintenance costs
- √ Low operation costs
- √ Mechanical reliability
- √ Adaptation to changes in capacity.



Types of De Smet diffusers

De Smet supplies two types of diffusers:

- √ The BAGASSE (TS) DIFFUSER to process first mill bagasse,
- √ and the CANE (TN) DIFFUSER, to process shredded cane.



De Smet can therefore give you unbiased advice on the type of diffuser best suited to your conditions.

Both types of diffusers are mechanically similar and the TS type can be converted into a TN diffuser.



Auxiliary equipment



DE SMET does not manufacture cane preparation and bagasse dewatering equipment but has thoroughly studied these problems and keeps in close touch with new developments in these fields.

This enables DE SMET to advise on how to make maximum use of existing equipment and to assume responsibility for the performance of the whole extraction plant when supplied through DE SMET.



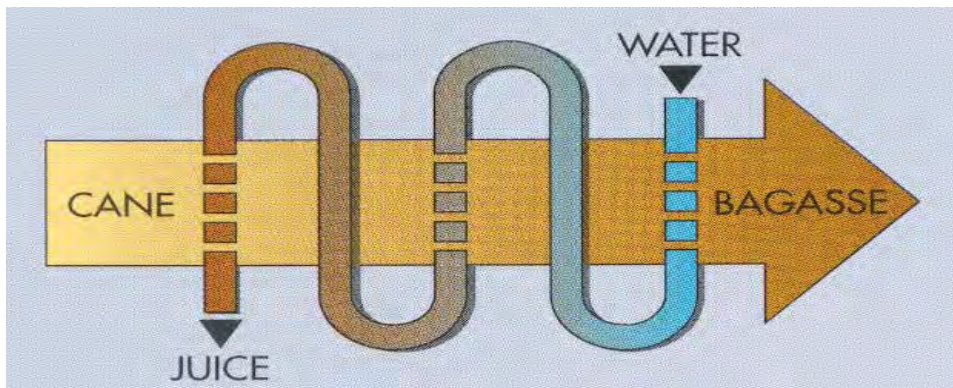
Principles of operation



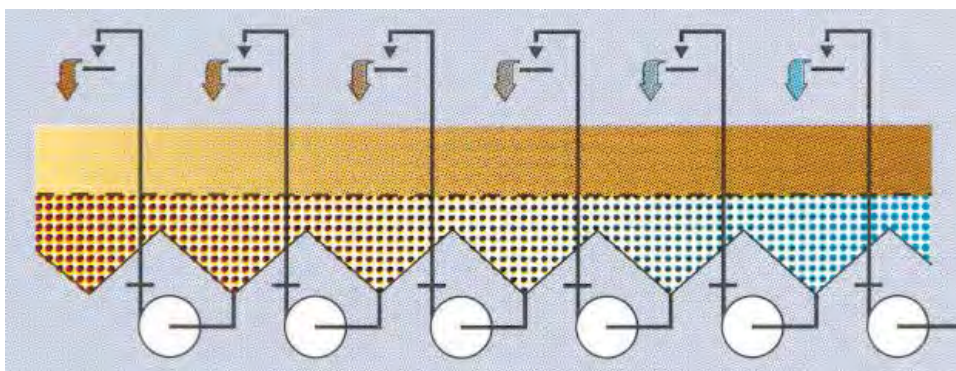
Operation of the diffuser is based on systematic counter current washing of the cane or bagasse by means of imbibition water.

In practice, this is achieved by forming a bed of shredded cane or first mill bagasse on a conveyor.

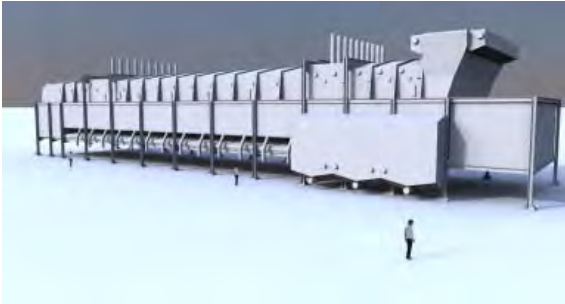
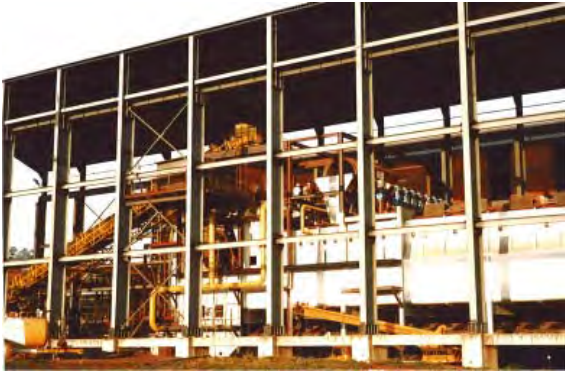
Water is added at the discharge end of the conveyor and percolates through the bed of bagasse and the perforated slats of the conveyor. The water dissolves the sugar in the bagasse and the thin juice thus formed is collected in a hopper.



This juice is moved forward one stage by pumping and the process is repeated until the juice reaches maximum concentration at the feed end of the diffuser. The diffuser may be conditioned either for single-flow or for parallel-flows juice circulation.



Description of the diffuser

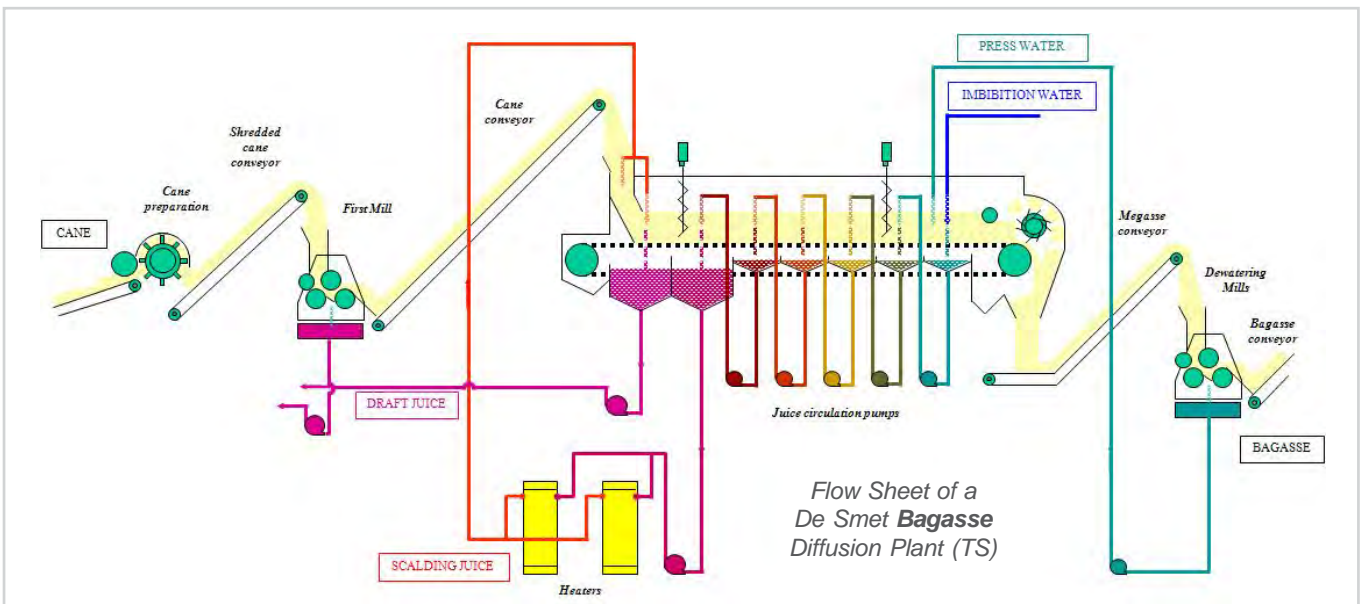
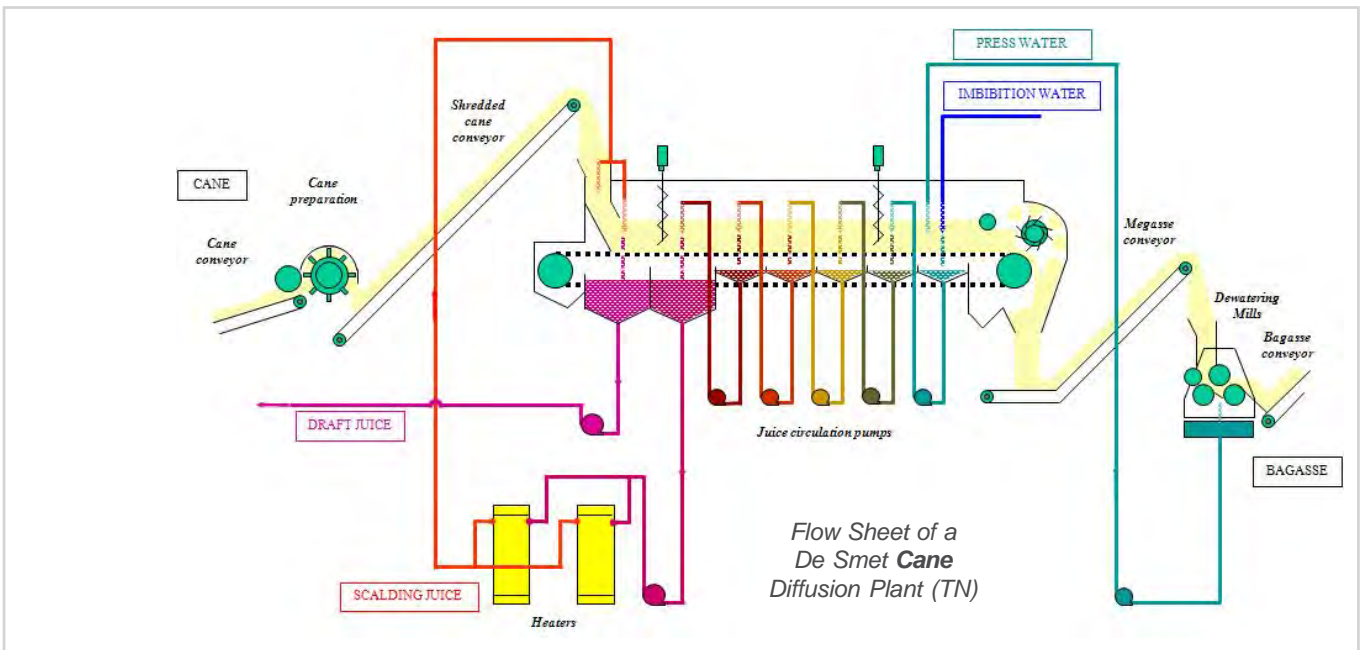


The housing of the DE SMET diffuser is of welded steel construction.

It is from 35 meters (110 ft) to 52 meters (170 ft) long; the cross section is rectangular and diffusers of different capacities are made in different widths.

The conveyor grids and screens are supported by two outboard type roller chains with a pitch of about 3 feet. These chains are supported at the extreme ends by sprockets.

At the driven end, the sprockets are coupled through a gearwheel and pinion to a variable speed hydraulic drive or electric gearmotor drive.





The conveyor itself is made of articulated frames to which the screens are fixed.

The screens and frames are rigidly attached to corresponding links of the two chains.

These chains are fitted with self-lubricating bushings. The rollers ride on parallel rails. The return rails are completely exposed underneath the housing, giving full visibility and accessibility to the screens.



Feed conveyor



View of cane diffuser inlet



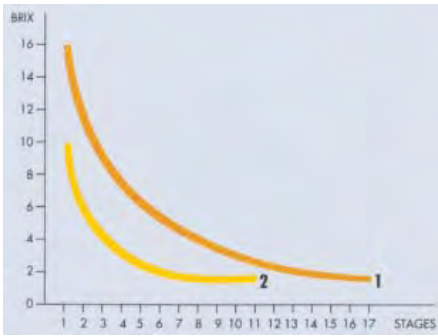
The thickness of the bed varies from 1.5 meters (5 ft) to 2 metres (6 ft). The space between the two conveyor spans is occupied by a large tank with a sloping bottom split into individual hoppers by means of vertical plates. These vertical plates have horizontal slots, at specified levels, through which the juice overflows to the next hopper.

At the end of the conveyor, there is a revolving scraper to even out the flow of bagasse which falls in an outlet hopper. This hopper is provided with a conveyor for removing the bagasse.

The diffuser is equipped with lifting screws in the presswater feedback area.



Juice distributors and pumps



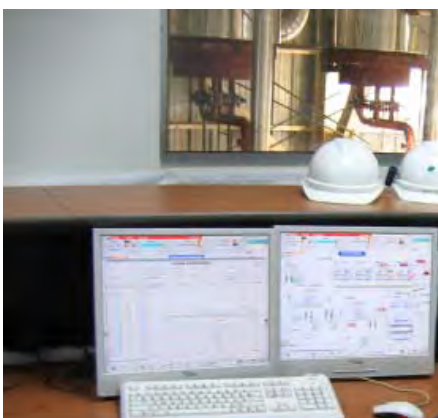
BRIX curves (1) TNC diffuser -
(2) TSC diffuser



Lateral view with juice distributors
feeding pipes



Control panel



During the whole duration of its passage through the diffuser, the bed of cane is submitted to intensive sprays of juice of progressively decreasing concentration.

The juice is evenly sprayed above the bed by a series of overflowing troughs extending on the whole width of the housing.

One of these troughs is fitted above each juice-collecting hopper and designed so as to distribute uniformly the juice across the bed, with an accuracy of 2%.

The curve showing the decreasing concentration of the juice in the successive hoppers is very steady.

The last trough is fed with pure water.

All the juice hoppers have the same width.

They collect the juice percolating from each juice distributor through the bed of cane.

Each hopper is piped to an individual high capacity centrifugal pump.

Each pump is piped to take juice from one hopper and to spray it above the preceding hopper (in opposite direction to the movement of the bed).

A last single pump feeds the richest juice to the rich juice tank.

Another pump of great capacity continuously circulates rich juice on the fresh prepared canes.

The intensive flow of cane or first mill bagasse is fed into the diffuser by a drag type cross conveyor so designed as to spread the feed evenly on the diffuser conveyor.

Juice from the rich juice tank is pumped to the factory.

The diffuser is operated and controlled from a central panel on which all instruments are grouped.

A mimic flow diagram and very complete instrumentation facilitate control of the process.

In very large installations (8,000 tons/day and above) TV cameras could be fitted in the diffuser as an option and feeding operations and general flow pattern of raw material and juices watched from a screen fitted to the control panel.

Advantages of the DE SMET cane diffusion process

Operating walkway



High extraction achieved in combination with existing milling equipment or in completely new extraction plants.

Low initial cost of the overall extraction plant because DE SMET diffusers are designed to work with conventional cane preparation and milling equipment.

The capital cost is lower than that of a milling tandem capable of equivalent extraction.

DE SMET diffusers can be installed outdoors.

Low maintenance costs because of massive design and extremely slow movement of the main conveyor.

Low operational costs

DE SMET diffusers are completely automated and can be operated by one man per shift.

DE SMET will also engineer automation of pre and post diffusion equipment to enable the diffuser operator to control the whole extraction plant.

Lubrication costs are negligible.

Low power requirements

Live steam is not needed.

Vapour of low-pressure steam is used for juice heating in the diffuser.

All moving parts are driven by electric motors (estimates of steam and power requirements are given in the tables hereafter).

Very wide capacity range

DE SMET diffusers can operate without modifications and without loss of efficiency from 30 % under to 10 % over nominal capacity.

By varying the bed height and conveyor speed, the capacity range may be extended even more.

The design of the diffuser is such that unforeseen increases in capacity may, to a certain extent, be met by the addition of washing stages to existing diffusers.

Conversion from bagasse to cane diffuser

DE SMET diffusers for a given capacity are designed from standard sections so that a bagasse diffuser can be lengthened into a cane diffuser when the pre-extraction mill has to be scrapped.

Mechanical reliability

Mechanically DE SMET cane diffusers are similar to the beet diffusers.

They therefore benefit from well over thirty years of experience under arduous conditions in the beet sugar industry.

Absence of fermentation

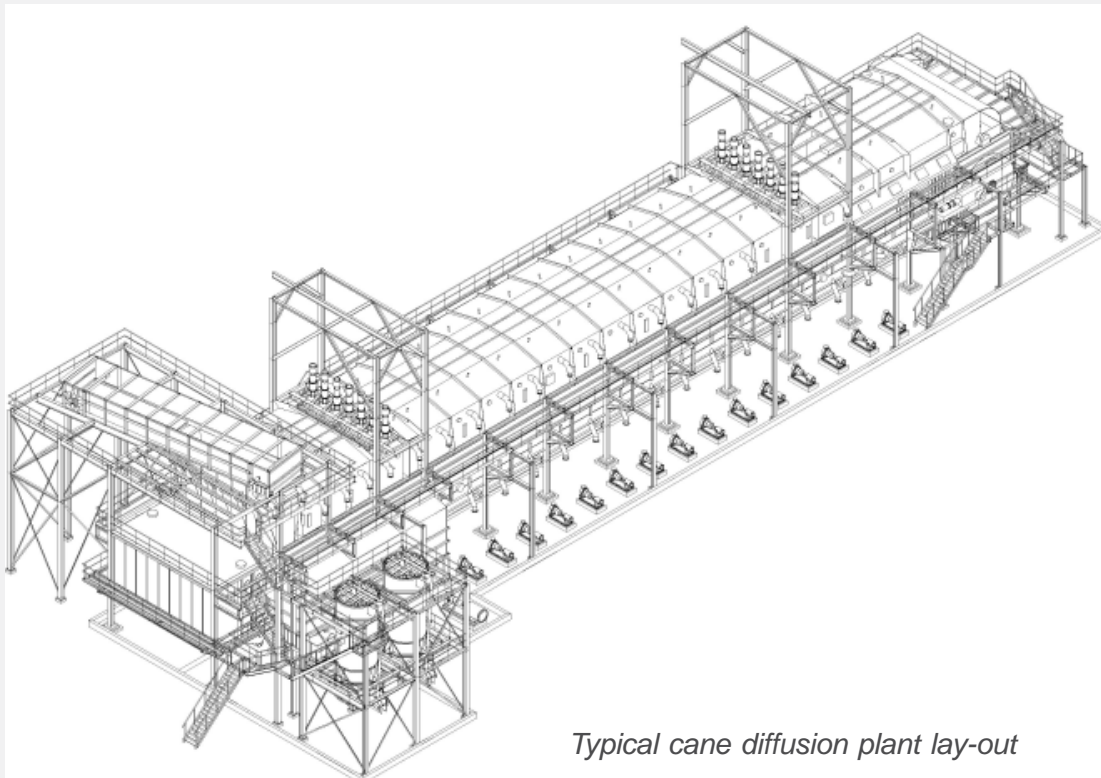
The diffusers have been designed to eliminate all static zones where fermentation could develop. The return span of the diffuser conveyor is washed at every cycle to prevent contamination of the feed by pieces of bagasse sticking to the screen.

The diffuser is fitted for pH control and for operation at optimum temperature.

In case of long stops or for unforeseen contaminations, equipment is provided for the addition of anti-septics.

Bagasse discharge is by gravity at the tail end of the diffuser. A special scraper is provided to even out the flow of bagasse and provide a continuous feed to the dewatering mills. The diffuser can be completely discharged for long stops and does not have to be cleaned manually.

Juice quality is better than with conventional milling. Systematic clarification of last mill juice enables removal of impurities early in the process and contributes towards the production of juices which are easy to clarify and which present no problems in the boiling house.



Typical cane diffusion plant lay-out

DE SMET – BAGASSE DIFFUSERS																			
TYPE	TS	20C	25C	30C	35C	40C	45C	50C	55C	60C	65C	70C	75C	80C	85C	90C	95C	100C	115C
NOMINAL CAPACITY	METRIC TONS/DAY	FROM 2,000 TO 20,000																	
PRINCIPAL OVERALL DIMENSIONS	WIDTH M	2.8	3.3	4.2	4.7	5.2	5.7	6.2	6.7	7.2	7.7	8.2	8.7	9.2	9.7	10.9	11.4	11.9	13.4
	WIDTH FT	9.2	10.7	13.8	15.4	17.0	18.7	19.6	22.0	23.6	25.3	26.9	28.6	30.2	31.8	35.7	37.4	39.0	44.0
	LENGTH	FROM 35.8 M – 118 FT TO 51 M - 168 FT																	
	HEIGHT	ABOUT 8 M – 25 FT																	
INSTALLED POWER	AT FULL CAPACITY	APPROX. 100 HP/1,000 TONS/DAY							APPROX. 90 HP/1,000 TONS/DAY										
STEAM CONSUMPTION	KG/TON OF CANE	80 - 85																	

Heat economy

Every precaution has been taken to reduce to a minimum the calorific requirements of the process.

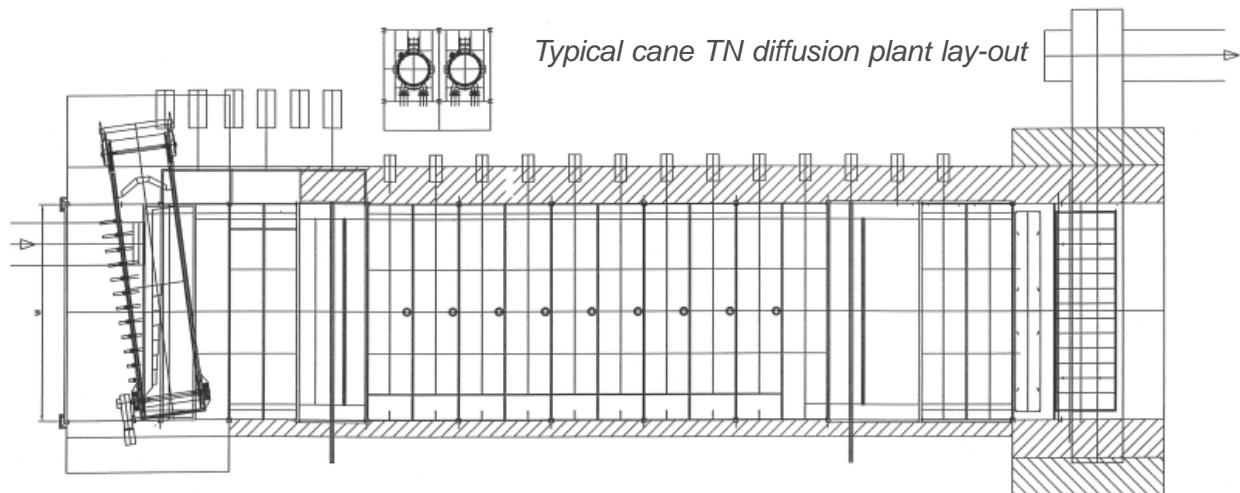
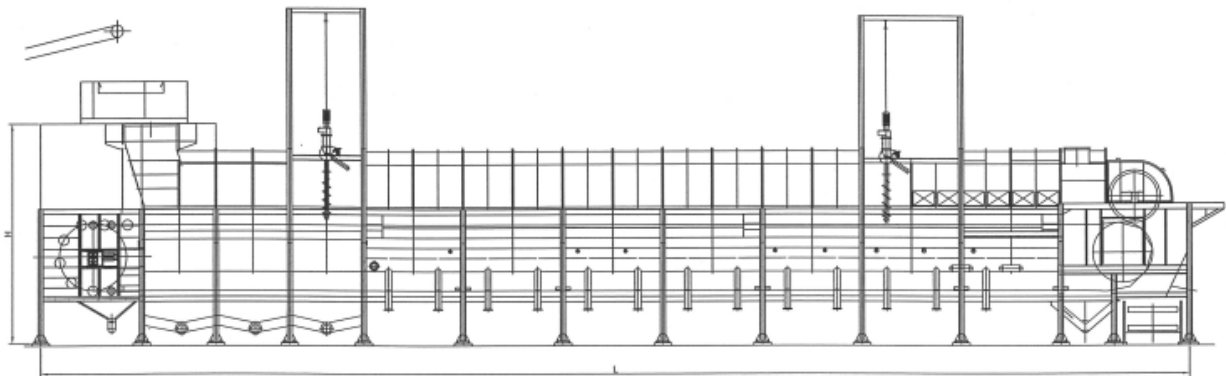
All heaters are of the type used for mixed juice heating in sugar factories.

The diffuser is completely enclosed and insulated.

Experience

Acquired in more than 15 different countries, experience which has included the diffusion of: frozen cane, mechanically harvested cane, dirty cane, low fibre cane, burnt cane and even clean cane!

Experience also in processing diffusion juices by defecation, sulphitation, carbonation and sugar factories which refine their own raw sugar.



DE SMET – CANE DIFFUSERS

TYPE	TN	20C	25C	30C	35C	40C	45C	50C	55C	60C	65C	70C	75C	80C	85C	90C	95C	100C	115C
NOMINAL CAPACITY	METRIC TONS/DAY	FROM 2,000 TO 15,000																	
PRINCIPAL OVERALL DIMENSIONS	WIDTH M	2.8	3.3	4.2	4.7	5.2	5.7	6.2	6.7	7.2	7.7	8.2	8.7	9.2	9.7	10.9	11.4	11.9	13.4
	WIDTH FT	9.2	10.7	13.8	15.4	17.0	18.7	19.6	22.0	23.6	25.3	26.9	28.6	30.2	31.8	35.7	37.4	39.0	44.0
	LENGTH	FROM 48.3 M – 158 FT TO 61 M - 200 FT																	
	HEIGHT	ABOUT 8 M – 25 FT																	
INSTALLED POWER	AT FULL CAPACITY	APPROX. 110 HP/1,000 TONS/DAY									APPROX. 100 HP/1,000 TONS/DAY								
STEAM CONSUMPTION	KG/TON OF CANE	80 - 85																	

**SOME OF THE DE SMET SUGAR CANE DIFFUSERS
WHICH HAVE BEEN SUPPLIED TO SUGAR FACTORIES
ON MANY CONTINENTS ARE:**

<i>Year</i>	<i>Project</i>	<i>Country</i>	<i>Diffuser processing capacity</i>
2016	Khon Kaen Sugar Industry PLC (KSL Group)	Thailand	20,000 tcd
2015	Ethiopian Sugar Corporation	Ethiopia	2 x 12,000 tcd
2011	Lam Son Sugar JSC	Vietnam	8,400 tcd
2010	<u>Tendaho</u> Sugar Factory	Ethiopia	13,000 tcd
2007	Zambia Sugar Co. Ltd Nakambala Factory	Zambia	8,400 tcd
2005	<u>AlMoiz</u> Industries - Lahore	Pakistan	4,000 tbd 8,000 tcd
2003	<u>Azucar</u> Guarani S.A. – Usina Cruz Alta	<u>Brazil</u>	12,000 tcd
1996	Sucrierie Bourbon-Tay Ninh Ltée	Vietnam	8,800 tcd
1995	The Andhra Sugar Ltd (3rd Plant), <u>Tanaku</u>	India	4,200 tcd
1991	Sugar Corporation of Malawi	Malawi	7,200 tcd
1990	Fiji Sugar Corporation Ltd. Lautoka	Fiji	6,800 tcd
1990	Industrielle Sucrière de Bourbon, Bois Rouge	<u>Reunion</u>	7,800 tcd
1989	<u>Umfolozi</u> Coop. <u>Sugar Planters</u> Ltd	<u>South Africa</u>	7,200 tcd
1983	<u>Ubombo</u> Ranches Ltd. Big Bend	Swaziland	4,800 tcd
1979	<u>Dwangwa</u> Sugar Corporation, Limbe	Malawi	3,600 tcd
1971	Corp. Boliviana de Fomento, Guabira	Bolivia	4,000 tcd
1970	Nicaragua Sugar Estates Ltd., San Antonio	Nicaragua	8,000 tcd



Zambia Sugar Co. Ltd
Nakambala Factory
Zambia



AIMoiz Industries
Lahore
Pakistan



Açucar Guarani
Cruz Alta Sugar Plant
Brazil



KSL Group
Wang Saphung
Sugar Factory
Thailand



Bourbon-Tay Nihn
Sugar plant
Vietnam



Lam Son Sugar
Sugar Plant, Vietnam



Andhra Sugar Ltd
India



Tendaho Sugar Factory
Tendaho, Ethiopia

Fiji Sugar Corp. Ltd
Lautoka, Fiji





DE SMET ENGINEERS & CONTRACTORS is a privately held limited liability company incorporated in Belgium in 1989. It has an established reputation as a general contractor, specializing in the agro-industrial field where it is a fully-integrated world class provider of engineering, procurement and construction services.

It brings a compelling business offering that combines excellence in execution, safety, cost containment, experience and reliability with particular care towards energy saving and sustainability.

Sugar as well as **Oils & Fats** have been the core of **DE SMET ENGINEERS & CONTRACTORS's** fields of activity. A major diversification towards the **Biofuels, Biochemicals** and **Agrochemical** industries has now taken place, based on its specific competence in agro-industrial engineering and project management acquired over the years.

DE SMET ENGINEERS & CONTRACTORS provides the industry with general contracting services from project management (**EPCM - Engineering, Procurement and Construction Management** or "*For and on Behalf*" operations) to full turnkey construction (**EPC - Engineering, Procurement and Construction**) allowing industrial operators to concentrate on their production commitments.

From conceptual study to vocational training, **DE SMET ENGINEERS & CONTRACTORS** has the ability and skill to **successfully complete large turnkey projects on brown- or greenfields**, all within the pre-established budget and delivery time, in a variety of geographical environment.



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