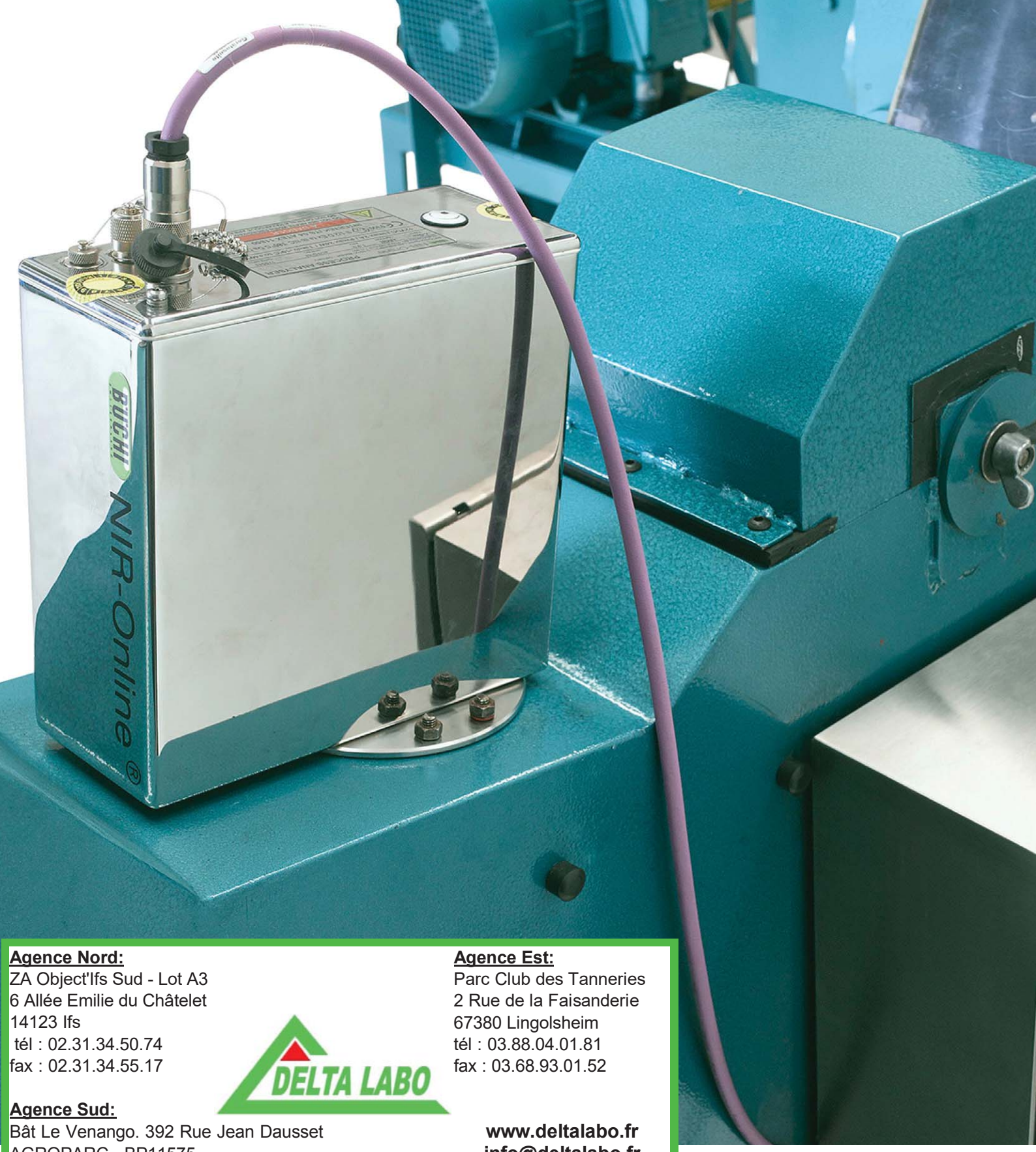

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DELTA LABO

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info@deltalabo.fr

BUCHI SWITZERLAND

NIR-Online®

Sugarcane, Sugar & Bioethanol Solutions

Real-time Process Control for the Sugarcane Industry

BUCHI NIR-Online® Sugarcane, Sugar & Bioethanol Solutions enable enhanced productivity and higher quality for utmost gross profit margins. We support you with fast and accurate analysis at all stages of production - from incoming raw material, downstream process steps to releasing finished products.

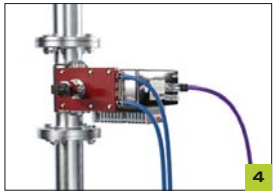
Process Optimization for the Sugarcane Industry
Maximize your quality and profit

BUCHI NIR-Online® offers the most advanced and versatile analytical solutions for the sugarcane processing industry available on the market. Our process analyzer provides accurate measurements within seconds to guarantee enhanced production efficiency. With real-time trending conveniently displayed in the control room, your operators can immediately correct for process deviations. We span your entire process value chain starting from cane intake, intermediate products and by-products to raw dried sugar and bioethanol.

Cane receival
Determine the average quality of each truckload in terms of total sugar recovery to guarantee correct payment to suppliers.

Cane shredding
On-line analysis of shredded sugarcane composition to optimize the subsequent milling step and ensure maximum sucrose extraction.

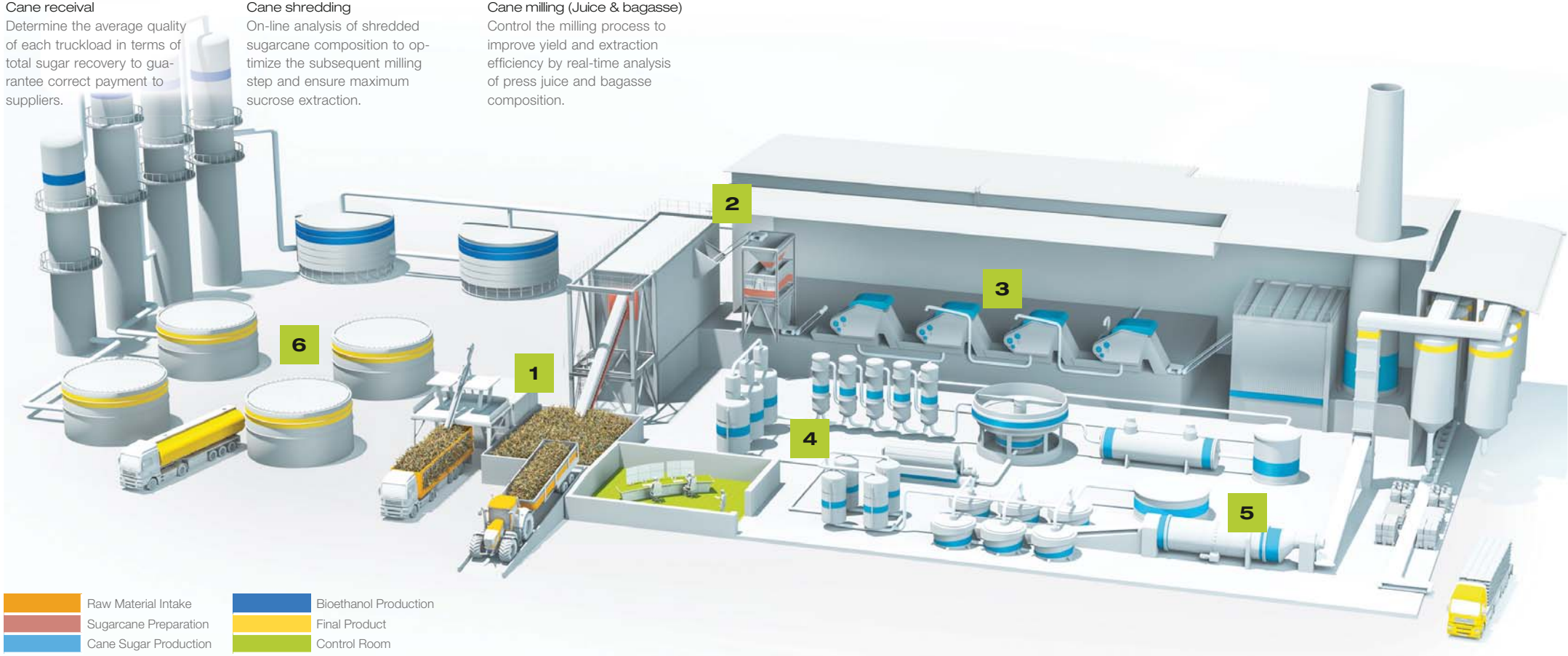
Cane milling (Juice & bagasse)
Control the milling process to improve yield and extraction efficiency by real-time analysis of press juice and bagasse composition.



Evaporation, Crystallization & Separation
Minimize the sucrose loss and degradation, and color formation by real-time control of juice concentration and sugar crystallization. Ensure correct addition of water for optimal separation of sugar crystals and molasses.

Raw Sugar Drying & Storage
Analyze the color (ICUMSA) and moisture content during the drying step. Ensure that final product quality meets the specification.

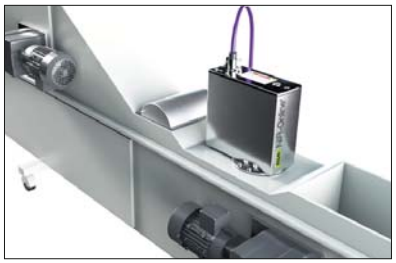
Bioethanol production
Control the fermentation step by monitoring key parameters like Brix, sugars, and ethanol. Optimize the distillation, rectification and dehydration for high ethanol yield. Document the final product quality before storage and delivery.



Sugarcane, Sugar & Bioethanol Solutions
Enhancing production and quality

1 Cane receival: raw material inspection directly at reception

Cane analysis for payment and quality control is performed directly in the truck unloading area with BUCHI NIR-Online® Process Analyzer. Sample material is taken from the truck by a core sampler, shredded and directly forwarded to the process analyzer for measurement of Brix, POL and fiber to determine total sugar recovery. High-speed diode array technology allows representative sampling volume and thus true average values of these quality parameters are displayed in real-time. With these information, decision upon unloading or rejection of the incoming cane is rapidly taken and supplier´s payment is correctly ensured.



Benefits

- Accurate pre-check, increase of the amount of controlled trucks & average quality documentation
- Fast decision upon unloading or rejection of the incoming cane
- Correct payment to suppliers

2 Cane Shredding: cane preparation for maximum sucrose extraction

Installation of BUCHI NIR-Online® Process Analyzer just after the shredder provides accurate measurements of main quality attributes of the cane, such as fiber, Brix and sucrose. This information can be automatically transferred to a process control room to enable process adjustments in real-time. The shredder operation can be optimized in terms of energy efficiency, sucrose extraction, and minimum wear.

Benefits

- Better sucrose extraction by adjustment of the shredder operation
- Optimization of the subsequent milling step for constant high yield
- Cost reduction by controlling the energy consumption

3 Cane milling: control the milling step for an efficient extraction

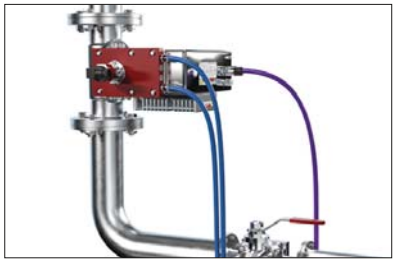
Characterization of the raw juice extracted from milling unit 1 and 2, mainly in terms of sucrose and Brix, and the bagasse after the last mill as regards to sucrose and moisture is monitored by BUCHI NIR-Online® Process Analyzer. These continuous measurements provide instant information for a feedback loop control of the cane preparation step as well as the milling settings such as imbibition rate, shredded cane rate entering to the mill, mill speed. Feed forward control loop can be used to adjust the flocculants addition in the clarifier.

Benefits

- Real-time adjustment of the mill for efficient extraction and constant high sucrose content in the juice
- Correct dosing of flocculants for the subsequent clarification step
- Decrease of the sucrose loss in the bagasse
- Suitable moisture content in the bagasse for efficient boiler performance
- Optimization of energy consumption

4 Evaporation, Crystallization & Separation: ensure optimal performance

Real-time control of the evaporation and crystallization steps by placing the analyzer at the outlet of the evaporator and/or crystallizer helps to minimize the sucrose loss and degradation and color formation as well as to ensure fine regulation of the operation variables.
The massecuite produced during crystallization undergoes further a centrifugation step to separate the sugar crystals from the molasses. Continuous measurements of sucrose content and color by BUCHI NIR-Online® Process Analyzer helps to adjust the level of water addition to avoid sucrose loss.



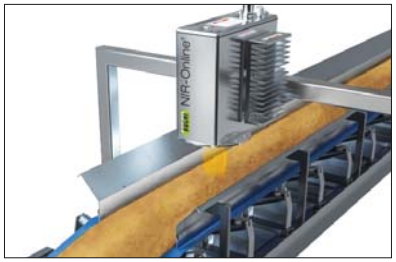
Benefits

- Read-out all relevant parameters in juice, syrup and massecuite for continuous process control
- Effective evaporation & crystallization steps
- Improvement of sugar crystals quality
- Better use of heating energy and reduction of production cost

Sugarcane, Sugar & Bioethanol Solutions
Enhancing production and quality

5 Raw sugar Drying & Storage: control of final product

Measure the moisture content and color (ICUMSA) during the drying step in real-time to produce a consistent quality product free of lumps and discoloration during storage. Document final product composition for Pol, moisture and color.



Benefits

- Avoid rework time and cost
- Ensure final product composition meets specifications
- Quality standardization

6 Bioethanol: control of production steps

Sugarcane bioethanol is a fuel produced by the fermentation of cane juice and/or molasses, followed by a distillation, rectification and dehydration step. Continuous knowledge of feedstock composition is essential for an efficient fermentation and is related to final ethanol yield. BUCHI NIR-Online® Process Analyzers continuously control the whole process by measuring accurately the relevant parameters like Brix, individual sugars, and ethanol during fermentation and ethanol content during distillation step. Necessary process adjustments are possible in real-time and final ethanol yield is maximized. The process analyzer measures and documents the final product quality before delivery.

Benefits

- Control of the feedstock composition for the fermentation
- 100 % control of the fermentation, distillation and dehydration step for optimal ethanol conversion rate and quality
- Full traceability and documentation

Typical Products and Parameters
for the sugarcane industry

Sugarcane

1 2

- Brix
- Pol/Sucrose
- Moisture
- Fiber
- Ash

Sugarcane Juice

3

- Brix
- Pol/Sucrose
- Moisture
- Fiber
- Ash
- Reducing sugars
- Color

Bagasse

3

- Brix
- Pol/Sucrose
- Moisture
- Fiber
- Ash
- Reducing sugars

Massecuite

4

- Brix
- Pol/Sucrose
- Moisture
- Ash
- Color
- Reducing sugars
- Dry solids

Raw Cane Sugar

5

- Brix
- Pol/Sucrose
- Moisture
- Ash
- Color

Bioethanol

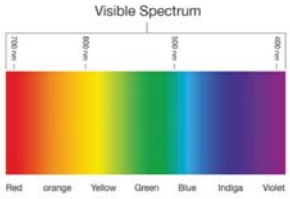
6

- Moisture
- Ethanol
- Density
- Flash point
- Cloud point

Features and Benefits
Certified safety and ease of use

Visible detector: color measurement for process control

The combination of NIR with a visible (VIS) detector provides an additional tool to check the consistency along the production steps and your final product. The VIS detector in our process analyzer enables you to measure the color of your product as an important quality parameter. Real-time color measurement supports the fast adjustment of the process variables for an efficient evaporation, crystallization and drying step.



Certified safety for hazardous environments

BUCHI NIR-Online® Sugarcane, Sugar & Bioethanol Solutions ensure safe operations in potentially explosive environments according to ATEX directive. The NIR-Online process analyzer is designed and certified to be used in zones 0 and 1 together with an additional enclosure and for zone 2 in direct contact with a product. Benefit from full installation flexibility.

FOR STATIC DISCHARGE

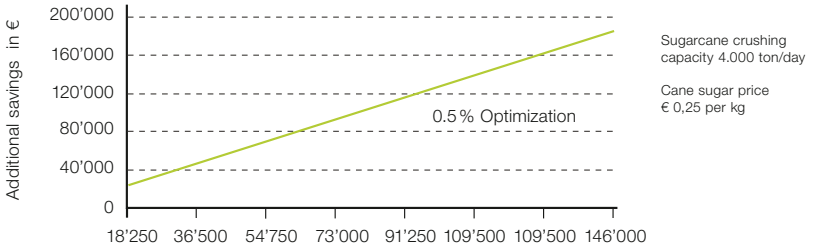
Fig.1.: BUCHI NIR-Online® Process Analyzer mounted on a conveyor machine for continuous measurements of Brix, POL, moisture and fiber in disintegrated sugarcane at the receival station.

Fast Payback in less than one Year
Optimize your gross profit margins

Save up to € 183'000 per year: optimize the extraction process

Cane sugar production is 146.000 tons per year considering that 1 ton of sugarcane produce 100 kg sugar and a daily crushing capacity of 4.000 tons. An increased yield by only 0.5 % based on continuous monitoring of shredded cane, bagasse and juice composition results in additional annual yield of 730 tons which corresponds to € 182.500.

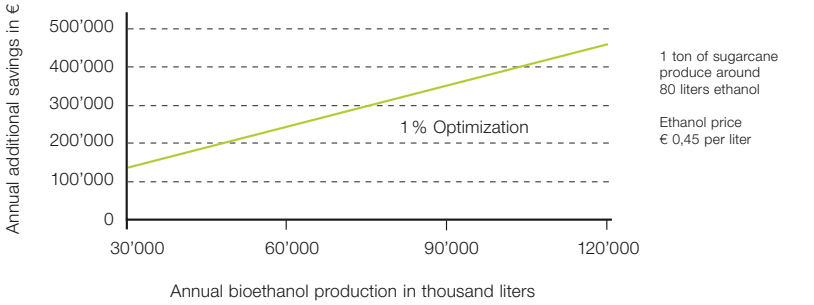
Example: Extraction process optimization



Save up to € 470'000 per year: control bioethanol production

Considering 4.000 tons sugarcane are processed daily for bioethanol production and output equals around 320.000 liters per day. 1 % increase in ethanol yield by real-time control of the production steps main parameters results in 3.200 additional liters of bioethanol per day which corresponds to annual revenue of € 467.200.

Example: Control bioethanol production



After Sales & Service
Competent and fast support

Our service and application specialists support you in all matters related to our solutions. Whether you have questions about our hardware and software specific to your application or your production process, our colleagues and partners on site support you competently and promptly. If required, the local colleagues are supported by an international team of experts from Germany and Switzerland. Send us your request, we look forward to assisting you.

We provide the following services for you as valued customers:

Technical Support in the Planning Phase
· On-site support for installation planning and process integration
· Acceptance of technical installation and commissioning on-site worldwide

Technical Support for Hardware and Software
· by mail (local BUCHI affiliates or service.nir-online@buchi.com)
· by telephone (local BUCHI affiliates or +49 6227 732660)
· via remote connection (service.nir-online@buchi.com)

Application Support
· by mail (local BUCHI affiliates or application.nir-online@buchi.com)
· by telephone (local BUCHI affiliates or +49 6227 732660)
· via remote connection (application.nir-online@buchi.com)

Software Training
· Standard operator training
· Individual training tailored to your needs

More information & contact at application.nir-online@buchi.com

Technical Data
NIR-Online Process Analyzer

Specifications

Dimensions (W x D x H)	220 x 220 x 135 mm
Weight	7 kg
Max. operating pressure	30 bar at flange
Realtive humidity	<90 % non condensing
Ambient temperature	-10°C – 40°C
Product / flange temperature	-10°C – 70°C (130°C with Water Chiller)
Vibrations	0.2 G at 0.1 – 150 Hz
Electric power supply	110 or 220 VAC ± 20%, 50/60 Hz, 30 W
ATEX / IP Class	II 2D Ex tb [op is Da] IIIC T80°C / T100°C Db II 2G Ex px IIC T4 Gb
Spectal range	Visible range 350 – 920 nm, NIR range 900 – 1700 nm or 1100 – 2200 nm depending on model and configuration
Detector type	Diode array (InGaAs)
Measuring time	20 spectra/s (V3S 200 spectra/s)
Illumination spot diameter	30 – 40 mm, depending on accessory and optical setup
Imaging	High resolution CCD Camera, 40 µm particle size
Light source	Tungsten halogen dual lamp / 18000 h (2 x 9000 h)
Housing materials	Stainless steel, aluminum cooler (nickel coated), FFKM (standard sealing material; custom sealing upon request)
Interfaces to process control system	TCP/IP, Profibus, Modbus, OPC, SQL, XML/CSV, Analog

Accessories for process integration

Weld-In mounting plate

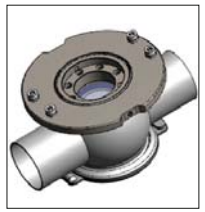
Article No.11060753

X-Cell

11063019

Weld-in Flange

11060754



Varinline® DN50 - DIN 32676

11061674

Complete your Portfolio
Complementary products

Process Analyzer with X-Rot Module

For laboratory and at-line analysis of pre-delivery samples and back-up laboratory system that may easily be integrated online. Designed for measuring sample surfaces from top.

Process Analyzer Up-view Module

For laboratory and at-line analysis of pre-delivery samples and back-up laboratory system that may easily be integrated online. Designed for measuring sample surfaces from bottom.

Proximate™ NIR

Designed for at-line sample analysis in a glass free environment. With touch-screen user interface, it is suitable to measure inhomogeneous sample surfaces in dual view, from bottom and from top.

Quality in your hands

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