DE SMET
ENGINEERS & CONTRACTORS

SUGAR & DERIVATIVES

Serving the World Sugar Industry

Reliability through Experience

DE SMET ENGINEERS & CONTRACTORS PROFILE

De Smet Engineers & Contractors (DSEC) is a privately held limited liability company incorporated in Belgium since 1989. It has established an international reputation as a general contractor and technology provider, ISO 9001-2015 Certified, specialising in the agro-industrial field in which it is a fully integrated world class provider of engineering, procurement and construction services. It brings a comprehensive business solution that combines excellence in execution, safety (HSSE), cost containment, experience and reliability with particular care towards energy saving and sustainability.

From conceptual study to plant commissioning, DSEC 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 environments.

FOCUSING ON THE SUGAR INDUSTRY

De Smet Engineers & Contractors' longstanding experience in the diffusion of sugar from beet and cane has been successfully transferred to all the Sugar and Oligofructose sectors where our expertise now ranges from feedstock handling and processing up to final product refining and conditioning. DSEC's autonomy from equipment suppliers allows us to select the best possible technological and operational solutions with the aim of optimizing performances, energy recovery and construction costs for the benefit of the investor.

In addition to state-of-the-art projects, our engineering skills combined with our agro process general know-how have been selected by major players in developing large scale industrial units from laboratory research and pilot plants in the Speciality Sugars and Inulin production sectors.

Relying on such solid experience and knowledge, DSEC successfully complements its portfolio with Bioethanol and Biochemicals projects.

Biomass is one of the most promising Renewable Energy sources with a usage often limited by logistical issues, and DSEC is therefore concentrating its efforts on offering comprehensive solutions for those biomasses whether they are for the production of Green Electricity or Fermentable Sugars.

Building your Plant as per your Requirements

SUGAR PLANTS TURNKEY CONSTRUCTION

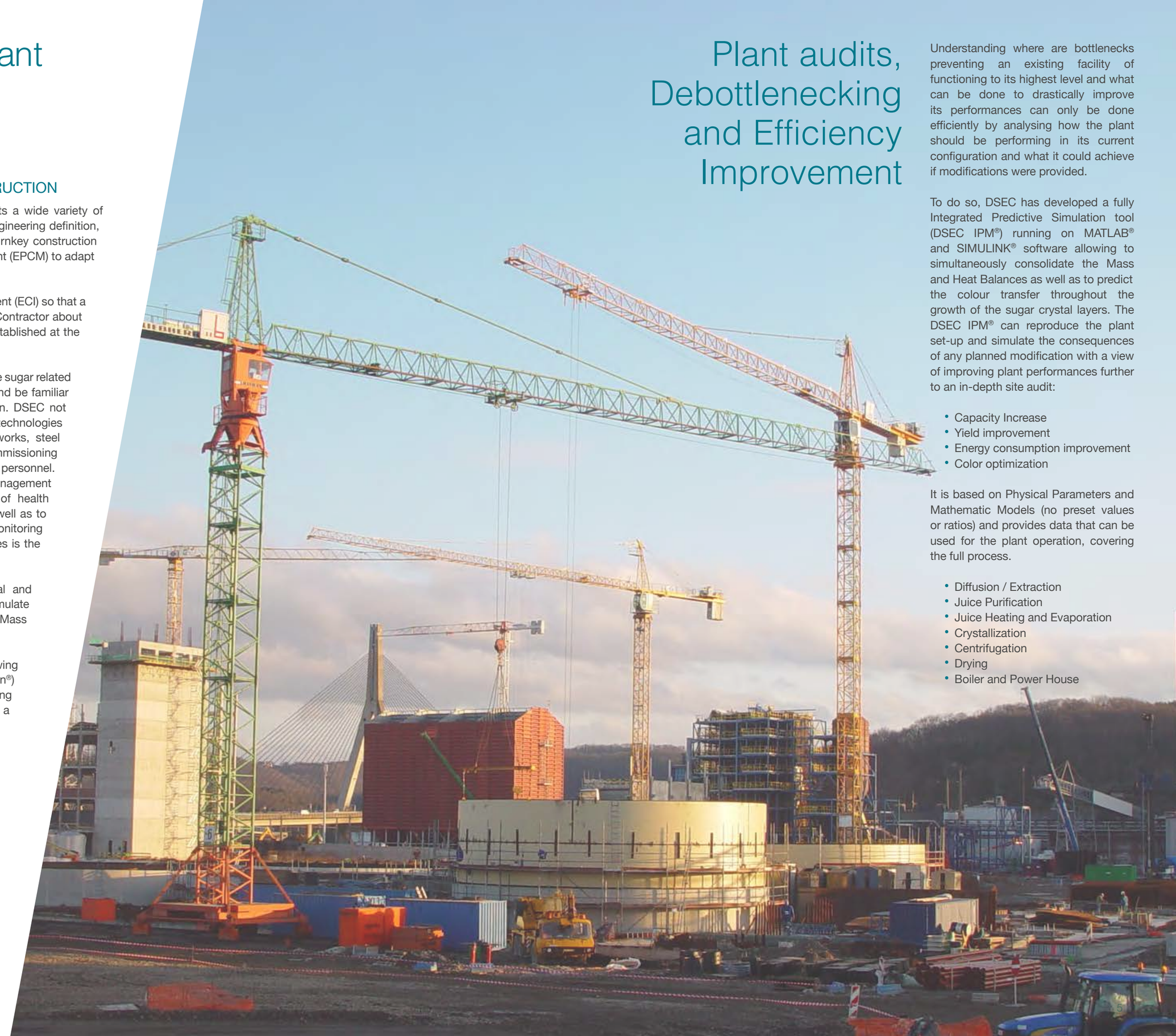
DSEC´s Contracting Services offer to its clients a wide variety of contractual setups ranging from Conceptual Engineering definition, Front End Engineering Design (FEED) to Full Turnkey construction (EPC) or possibly “For & On-behalf” management (EPCM) to adapt to every situation requirements.

DSEC also promotes Early Contractor Involvement (ECI) so that a common understanding between Investor and Contractor about project definition and risks mitigation can be established at the earliest stages of the operation.

As for its other activities, DSEC is able to execute sugar related projects under the form of full EPC contracts and be familiar with all aspects of the project’s implementation. DSEC not only masters specific sugar techniques and technologies but also all related process auxiliaries, civil works, steel structures, installation works, start-up and commissioning activities, including training of the client’s personnel. DSEC’s project design and construction management gives paramount importance to the respect of health and safety and environment norms (HSSE) as well as to technical efficiency and ease of operation. The monitoring of project cost, time schedule and performances is the essence of any EPC or EPCM commitment.

DSEC has developed proprietary technological and thermodynamic programs that very accurately simulate the operation of plants, from overall Heat & Mass Balances down to unitary process operations.

In terms of design, DSEC uses a powerful 3D drawing and construction management tool (SmartPlan®) that dramatically improves material purchasing reliability and site installation efficiency through a high level of prefabrication work.



Plant audits, Debottlenecking and Efficiency Improvement

Understanding where are bottlenecks preventing an existing facility of functioning to its highest level and what can be done to drastically improve its performances can only be done efficiently by analysing how the plant should be performing in its current configuration and what it could achieve if modifications were provided.

To do so, DSEC has developed a fully Integrated Predictive Simulation tool (DSEC IPM®) running on MATLAB® and SIMULINK® software allowing to simultaneously consolidate the Mass and Heat Balances as well as to predict the colour transfer throughout the growth of the sugar crystal layers. The DSEC IPM® can reproduce the plant set-up and simulate the consequences of any planned modification with a view of improving plant performances further to an in-depth site audit:

- Capacity Increase
- Yield improvement
- Energy consumption improvement
- Color optimization

It is based on Physical Parameters and Mathematic Models (no preset values or ratios) and provides data that can be used for the plant operation, covering the full process.

- Diffusion / Extraction
- Juice Purification
- Juice Heating and Evaporation
- Crystallization
- Centrifugation
- Drying
- Boiler and Power House

Contributing
to the Sugar Industry Development

BEET SUGAR FACTORY

De Smet Engineers & Contractors' expertise in beet sugar starts at the beets reception yard, including feedstock analysis, storage, handling, washing and slicing before Sugar extraction of the juice by diffusion. DSEC pays particular attention to agronomic specificities, climatic and local environmental aspects so as to optimize the installation performances.

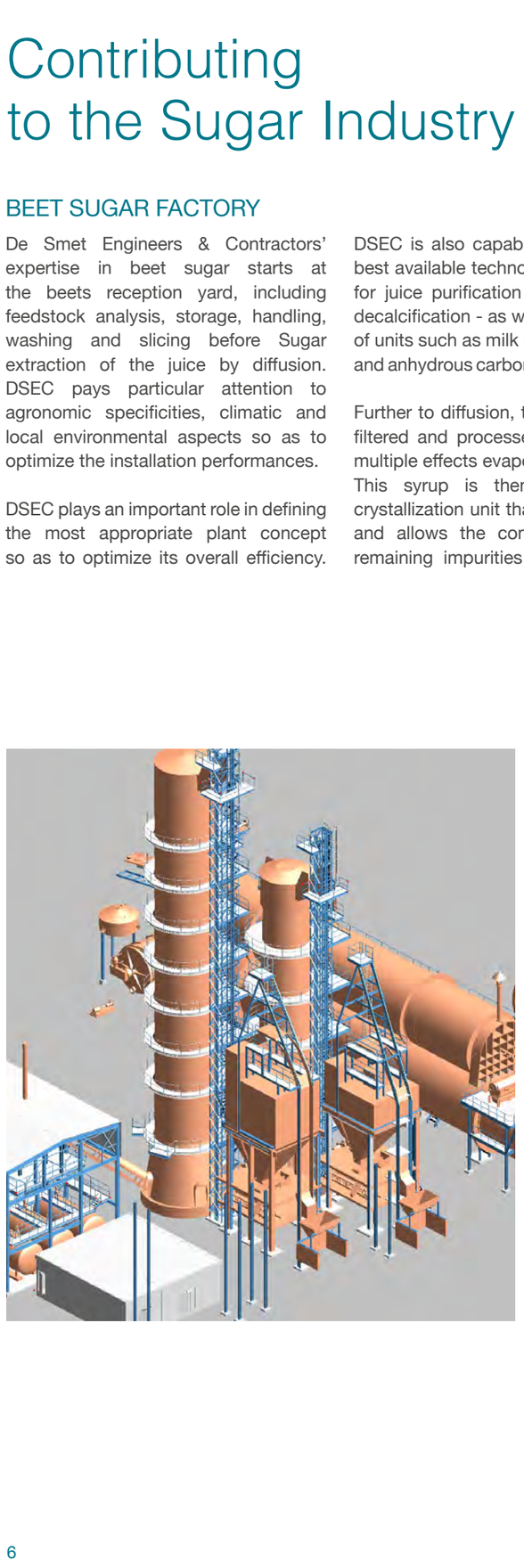
DSEC plays an important role in defining the most appropriate plant concept so as to optimize its overall efficiency.

DSEC is also capable of selecting the best available technology to be applied for juice purification - with or without decalcification - as well as the selection of units such as milk of lime preparation and anhydrous carbonic gas production.

Further to diffusion, the juice has to be filtered and processed into syrup in a multiple effects evaporation installation. This syrup is then treated in the crystallization unit that generates sugar and allows the concentration of the remaining impurities in the molasses.

DSEC's simulation program is of paramount importance at this stage so as to define the most efficient energy set-up as well as to precisely size any single equipment of the line.

DSEC dedicates particular care to sugar drying, cooling, maturation and storage operations that are critical for subsequent packing and commercialization of finished products.



SUGAR REFINERY

DSEC has dedicated special attention to the design of sugar refinery with particular emphasis on energetic efficiency and white sugar quality.

A considerable portion of the sugar market is located in areas where neither beet nor cane can be cultivated. Such markets can be fed by large bulk ships with raw cane sugar that needs to be further refined before being commercialized.

As the quality of the raw sugar available on the international market varies considerably depending on its origin, DSEC has developed alternative concepts to adapt the refinery design to the feedstock that is processed.

The selected alternative for a refined sugar production will be defined after analyzing the necessity of a raw sugar affination (washing) step before the mandatory re-melting operation. Different purification or possibly decolouration technologies will also be analyzed by DSEC so as to optimize capital and operating expenditures (CAPEX and OPEX) in function of feedstock and finished products as well as of the local environment.

DSEC will also define and design the sugar drying and packaging facilities as well as all ancillary units as in any industrial facility. Particular attention will be given to energy and water savings and environment protection in general.

CANE SUGAR FACTORY

Cane sugar is produced by means of technologies rather similar to those used in a beet sugar plant.

However, the sugar cane plant first process sections are totally different: whereas sugar beet is sowed and can be harvested after ± 6 months, cane takes longer to develop but grows back after it has been cut and can therefore be harvested several consecutive years before being replanted. Cane harvesting takes place during a much longer period that beets with direct consequences on the mill sizing as well as on its reliability.

DSEC will select the most appropriate methodology for extracting the juice from the cane after its first shredding. The extraction operation will be performed using mill tandem or cane diffusion. Bagasse will be used as fuel for the plant combined heat and power generation (CHP) that will generally export electricity on the public grid. The choice between mill tandem and diffuser will be highly dependent on plant capacity, cane characteristics, expected extraction... DSEC has a perfect knowledge of these operations as well as of subsequent technologies for cane sugar production, i.e. purification, evaporation, crystallization, etc.

The design of all auxiliary equipment and facilities that are inherent to any industrial facility is fully mastered by DSEC.

As naturally produced sugar in a cane mill still contains some impurities and has a particular coloration, it needs to be refined. The refining operation can be designed by DSEC: either for a single mill that will produce refined sugar or as a stand-alone refinery fed with imported raw sugar and located closer to the consumer market.

SUGAR DERIVATIVES

DSEC has considerable experience in the production of specialty sugars such as **Pearl Sugar** as well as in the processing of Chicory into **Inulin** and **Oligofructose** where its know-how in the sugar industry has been a major asset for helping investors to develop new products and define the adequate industrial facility for their efficient and reliable production.

Supplying Highly Efficient Equipment

SUGAR DIFFUSION WITH DE SMET DIFFUSER

The De Smet Diffuser is, up until now, the diffuser having by far the largest number of references.

The De Smet Diffuser has also proved to be capable of processing alternatively both beet and cane in areas where tropical beet can be grown so as to extend the plant operation after the cane campaign. It can also operate on bagasse from a first mill so as to allow segregation between mill and diffuser juices while reaching capacities of 20,000 TCPD.

When compared to mills tandem, sugar diffusion with De Smet Diffuser presents many advantages amongst which:

- Better extraction yield (usually 1% higher than mills)
- Performances kept throughout the campaign (no mechanical wear and tear influencing the extraction yield)
- Improved juice quality with consequent reduction of losses at filtration stage
- Slow motion equipment
- Perfect counter-current operation
- Reduced energy consumption
- Reduced maintenance cost
- Ease of operation and maintenance

Except for some key components, the De Smet Diffuser is generally manufactured locally so that transport costs and import duties can be considerably reduced while providing activity for local workshops.

DSEC PROPRIETARY EQUIPMENT FOR SUGAR PRODUCTION

Thanks to its broad and established experience in the sugar industry, De Smet Engineers & Contractors has been naturally led to question and rethink important aspects of the crystallisation process. This results in providing today's market with significant performance improvement of the whole refining process as well as with a large range of optimized, robust and proven process components.

In addition to enhanced process design, DSEC is now able to propose to its customers several equipments that can be combined so as to improve the overall operation of their plants. The current range of equipment includes mainly:

- Seeding systems
- Vacuum Pans
- Crystallizers
- Masse-Cuite Distributors
- Melters

Energy consumption, ease of maintenance, cleaning practicality, extended lifetime,... have been carefully taken into account besides pure performance criteria in order achieve perfect integration of these items into new or existing refineries. Retrofit and improvement of existing process vessels can also be contemplated by DSEC.

DSEC Key References

TAFRAOUI SUGAR REFINERY - ALGERIA

- Contract: Engineering, equipment supply, site supervision, commissioning and overall management
- Customer: Grande Raffinerie Oranaise de Sucre - Berrahal Group
- Capacity: 1,000 TPD white sugar expandable to 2,000 TPD

BIOWANZE - BELGIUM

- Contract: Turn-key construction of a greenfield bioethanol production plant
- Customer: Biowanze s.a. - CropEnergies - Südzucker
- Capacity: 300,000 m³ per year of bioethanol

N'GAOUS SUGAR REFINERY - ALGERIA

- Contract: Engineering, equipment supply, site supervision, commissioning and overall project management
- Customer: N´Gaous Sugar Spa - Groupe Mazouz
- Capacity: 2,000 TPD raw sugar

DINTELOORD BEET PLANT – NL

- Contract: EPCM supply of a complete beet washing plant
- Customer: Suiker Unie - Cosun
- Capacity: 28,000 TPD beet

HODEIDAH SUGAR REFINERY - YEMEN

- Contract: Engineering, equipment supply, site supervision and commissioning
- Customer: Yemen Company for Sugar Refining - Hayel Saeed Anam Group
- Capacity: 2,000 TPD white sugar

MAKENI PLANT - SIERRA LEONE

- Contract: EPCM supply of a complete cane processing line for the production of ethanol
- Customer: Addax Bioenergy
- Capacity: 80,000 m³ per year of bioethanol

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