



World leaders in the science of heating and cooling bulk solids.

TECHNICAL ARTICLE

**Installation and Operation of a Solex SIGMA Series Cooler
at the Sugar Plant of Brugelette in Belgium**

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INTRODUCTION

Solex Thermal Science, Inc. is a world leader in the indirect heating and cooling of powder and bulk solids in many industries world-wide (chemicals, polymers, fertilizers, detergents, minerals, oilseeds, grains, food products, sugar and biosolids). In the last few years, Solex has introduced this technology to the sugar industry with great success where it has been established as a proven and effective method for cooling sugar crystals before storage and packaging. The Solex SIGMA Series Cooler can be installed either as a primary cooler or a secondary cooler and is readily adaptable to plant retrofits.

EQUIPMENT DESCRIPTION

The Solex Heat Exchanger is a unique piece of equipment that consists of a bank of vertical, closely spaced, hollow, stainless steel plates. The sugar flows slowly, by gravity, between the plates in mass flow. Cooling water flows through the plates counter-current to product flow, for higher thermal efficiency.

The cooling occurs by heat transfer through the sugar particles and is exclusively based on conduction. Below the heat exchanger a vibrating discharge feeder creates mass flow and regulates the sugar throughput. The Solex Sugar Cooling Technology is covered by world-wide patents which are regularly maintained. Solex also benefits from a strong Research & Development department which has produced many patent pending applications for various bulk solid heat exchange designs currently introduced for various key applications.

INSTALLATION & OPERATION AT BRUGELETTE PLANT IN BELGIUM

To achieve optimum storage or packaging of white crystal sugar, several conditions must be fulfilled. Aspects linked to sugar quality that need to be tightly controlled include residual moisture, crystal size and uniformity of the sugar storage temperature. The local ambient conditions (Temperature, Relative Humidity) as well as the type of sugar storage silo (unventilated, unheated, ventilated, heated) must also be considered. In the horizontal storage silo of the sugar plant of Brugelette (RT Group), Brugelette, Belgium, the ideal sugar storage temperature for the local ambient conditions is approximately 30°C (86°F).

Before start up of the plant in 2005, Brugelette completed several modernization projects including replacing old centrifuges. A direct result of this change was a higher sugar temperature at the outlet. It soon became apparent that the existing drying and cooling system could not handle the increased temperature. This resulted in sending sugar out to storage at a much higher temperature than the required safe storage temperature of 30°C (86°F).

The sugar plant of Brugelette previously used a combined rotary drum dryer and cooler, with the first section being used as a counter current air dryer and the second section as an air cooler using ambient air, also in a counter-current configuration.

The existing dryer section could still meet the increased load, drying the sugar to below 0.04% moisture. However, the drum's cooling section could not cope with the resulting increase in temperature and was no longer able to provide the required sugar outlet temperature of 30°C (86°F).

According Ms. Laurence Philippart, project engineer at the sugar plant in Brugelette, the choice of the Solex Sugar Cooler was selected based on the following criteria:

- Compact design which was easily integrated into the existing structure
- Extremely low energy consumption of approximately 0.33 kW h/ton of product.
- No air consumption eliminated the need for large fans or ducts and large, costly auxiliary equipment such as air filters or cyclones.

The cooling water circuit needed for the exchanger was cleverly designed by the plant engineers by using a small portion of the beat washing water transported from the settling ponds to the wash plant. The water is filtered and sent through a small plate and frame exchanger, which cools the closed-loop water system for the Solex Exchanger, before rejoining the main water stream on its way to the wash plant. With this design, the Solex unit provides adequate cooling of the sugar even at the beginning of the campaign when the water in the settling ponds is relatively warm.

Since Solex does not use air to cool the product, the plant was able to realize important savings by avoiding the expensive task of installing additional air pollution equipment. Also, the fact that air is not used in the Solex Heat Exchanger provides an important increase in the quality of the final sugar product since the risk of external contamination with bad odors or microbiological contaminants is completely eliminated.

The operation of the cooler is completely automated, with the unit's Level and Temperature Control System integrated in the plant's Distributed Control System (DCS). In 2006, the Solex unit cooled 80 tons per hour of sugar from 48°C to 30°C (110°F to 86°F) using cooling water at 20°C (68°F).

The maintenance of the equipment consists of washing the interior of the exchanger at the end of the sugar campaign. This operation is extremely easy as large doors allow good access to the plate banks. Both the inlet hopper and the vibrating discharge feeder are also equipped with quick release inspection and maintenance openings.

ABOUT SOLEX THERMAL SCIENCE INC.

Solex Thermal Science Inc., formerly Bulkflow Technologies Inc. and Cominco Engineering, was formed in 1999. Solex has risen to become a world leader in indirect heating and cooling powder and bulk solids. Today there are more than 250 applications in more than 30 countries in a wide variety of industries.

With headquarters in Calgary, Solex Thermal Science Inc. has subsidiary operations in Germany, Belgium, The Netherlands and The United Kingdom to serve the European market. It serves the Asian Market through strategically located dealers in numerous countries.

For more information on how the Solex Heat Exchanger can be used to cool or heat sugar or other applications, contact Solex Thermal Science Inc. at 3122-114th Avenue S.E., Calgary, Alberta, Canada T2Z 3V6 or call +1 403-254-3500; Toll Free: +1 866-379-3500; Fax: +1 403-254-3501 or e-mail info@solexthermal.com Solex Thermal Science Inc. can also be found on the web at www.solexthermal.com.

Shown is the Solex Heat Exchanger for cooling sugar at the Brugelitte plant in Belgium.

Close up of the vibratory feeder at the Brugelette plant in Belgium.

Shows the inlet hopper for sugar at the Brugellette plant in Belgium.

Shows the water filter at the Brugelette plant in Belgium.

Shows the plate frame exchanger at the Brugelette plant in Belgium.