

Innovative bulk solids heat exchanger saves energy, reduces odor and improves performance

How Cargill's oilseed processing plant in Germany reduced pollution and odor, with the help of a special rapeseed preheater.

New Bulk Solids Heat Exchanger Technology

The seed entering the Cargill rape seed processing plant in Mainz, Germany is of the same high quality as always. Inside the plant, however, new technology is improving process efficiency and processed seed quality, while reducing the operation's environmental footprint thanks to bulk solids heat exchanger technology developed by Solex.

The story began when Cargill, always mindful of the environmental impact of its operations, started looking for ways to improve its process. Three objectives were established for this project. First, the company wanted to recover energy waste from the dryers that are used to heat rapeseed before processing. Second, it wanted to reduce odors associated with this system. Cargill's third objective was to improve overall process efficiency by preheating the rapeseed before flaking.

Sponsored by the EU project LIFE04 ev/d/00051, Cargill took this challenge to Solex Thermal Science, a company with extensive experience in the bulk solids heat exchange. Working closely together, Cargill and Solex developed an innovative process.

"Our bulk solids heat exchange technologies are used for materials as diverse as sugar, fertilizer, chemicals, plastics, biosolids and minerals," says Solex Vice President Claudio Forniciov. "Our mandate with Cargill in Mainz was to develop an approach geared to rape seed, consistent with the company's objectives for the project."

Using the Bulk Solids Heat Exchanger to Recover Energy

The production process that turns rape seed into oil uses a significant amount of energy, especially in the form of steam. One way to conserve energy is to reduce the quantity of steam needed for the process.

While drying and conditioning the rape seed, vapors with a temperature of approximately 95°C (203°F) are generated. Cargill and Solex combined their expertise to design an energy recovery system in which the hot vapors leaving the dryer are condensed in a closed-loop water stream, thereby capturing this waste heat. The heated water is then used to pre-heat the rape seed entering the process through the use of a special Rape Seed Pre-Heater developed by Solex. Through this process, overall energy consumption is reduced.

This closed-loop system not only recovers energy, it also captures odors leaving the stack of the pre-heater. The reduction in odor is achieved by water-scrubbing the hot vapors.

Innovative Bulk Solids Heat Exchanger Reduces Odor and Pollution

The results show that the system envisioned by Cargill and designed and built by Solex has met or exceeded its objectives. Air pollution and odors were reduced without the use of any chemical additives. Pre-heating the seed has improved processing quality compared to the previous system. Perhaps most significantly, Cargill now uses about 20% less energy than before, resulting in significant cost savings and the environmental benefit of a reduction in greenhouse gas emissions.

Since the system’s installation in 2004, based on using less steam in the process, Cargill is producing oil for less cost and with a smaller environmental footprint than before.

Energy Savings

“By our calculations, Cargill has realized energy savings of 2 mt of steam per hour,” says Thomas Rau, Production Supervisor at Cargill Mainz. “Our goal is to increase heat recovery in the stack in order to decrease the temperature of the vapors and thus gain an odor reduction and to preheat the seed to an even higher temperature. This is possible due to the modular design of the Solex Preheater, allowing us to easily add another heat exchange module.”

Claudio Forniciov describes the project as another example of Solex’s innovation in the bulk solids heat exchange: “This is thermal science in the service of improved process performance, increased thermal efficiency and smaller environmental footprint.”

