The Solex fertilizer cooling unit guarantees highly efficient thermal performance and ongoing, reliable operation.

Each cooler is custom designed taking into account:
- Type of fertilizer
- Required thermal performance
- Local ambient conditions
- Selection of optimum water temperatures
- Selection of optimum purge air flow rate and dewpoint to prevent condensation

Optimized Fertilizer Cooling
- Solex has over 100 fertilizer reference plants in all types of fertilizer, including urea, ammonium nitrate, MAP/DAP, NPK and specialty fertilizers
- The Solex fertilizer cooling unit reduces energy costs by up to 90% compared to traditional fluid bed coolers
- Solex units have been installed in a range of different climates, from the temperate mid-west United States to tropical India and Malaysia
- Solex fertilizer cooling units do not require regular cleaning resulting in long run times and low maintenance costs
Solex Fertilizer Cooling System

The Science Behind Cooling Fertilizers

Fertilizers are Hygroscopic

Fertilizers are hygroscopic. When moisture transfers from the product to the air in the space between the granules, the humidity of the air will increase. This can cause condensation on the surface of the cold heat exchanger plates. Condensation on the plates will quickly lead to caking in the unit.

The Solex fertilizer cooling unit is designed for long term, reliable operation without the need for regular cleaning. To achieve this, the mechanism of condensation and product caking must be prevented. To prevent condensation the dewpoint of the air in the void space of the cooler needs to be lower than the temperature of the plate exchanger.

The dewpoint of the air in the heat exchanger changes relative to the temperature of the product. The relationship between dewpoint and temperature is governed by the critical relative humidity (CRH) of the fertilizer. Each fertilizer has a unique CRH characteristic. As the fertilizer cools when it passes through the exchanger, the dewpoint lowers. The relationship between product temperature, dewpoint and water temperature is shown on the below graph below. This graph demonstrates the importance of counter-current water flow to avoid caking and optimize energy efficiency. Understanding the science behind fertilizer cooling enables the Solex heat exchanger to be customized for each type of fertilizer and any ambient conditions.

Solex supplies a fully integrated system — the fertilizer indirect cooling unit and ancillary equipment.
Ancillary Equipment

Water Temperature Control Module

The Water Temperature Control Module (WTCM), open or closed loop, controls the cooling water temperatures and water flow rate through the Solex fertilizer cooling unit.

Key Features:

- Open loop operates strictly on plant cooling water with a recirculation circuit for water temperature control
- Closed loop (used in high chloride cooling water and other poor water quality sources), operates on a secondary self-contained water loop with a plate exchanger isolating the Solex unit from the primary plant cooling water supply
- Both open and closed loop designs include a start-up heater to preheat the plates
- Pumps can be standalone or standby depending on customer requirements
- Skid mounted

Chiller / Dry Cooler System – Optimized to Reduce Energy Cost

If plant water is not available or is too warm to meet process requirements, the WTCM may include a dry cooler and/or a chiller. This combined system will be optimized so that the chiller will only operate during summer months. The remainder of the year the system will operate solely with dry coolers to save energy costs.

Purge Air Module

The Purge Air Module provides purge air to the Solex fertilizer cooling unit. Where possible, ambient air is used, reducing operating costs and minimizing capital costs. If conditioned air is required, due to process requirements or ambient conditions an air dehumidification system is used to reduce the air dewpoint.

Comprehensive Instrumentation & Controls

The Solex Water Temperature Control Module and Purge Air Module are supplied with comprehensive controls and instrumentation including:

- Water inlet and outlet temperature controls
- Water temperature, pressure and flow rate controls
- Purge air dewpoint controls
- Purge air flow rate, temperature, pressure and dewpoint controls

The control functions for the WTCM and Purge Air Module can be integrated into the overall plant control system or provided by a local panel mounted PLC.
Solex Fertilizer Cooling Technology uses 90% Less Energy

<table>
<thead>
<tr>
<th></th>
<th>Fluid Bed Cooler</th>
<th>Solex Cooler</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fans (FD fan + ID fan)</td>
<td>540kW</td>
<td>-</td>
</tr>
<tr>
<td>Air Chiller^</td>
<td>500kW</td>
<td>-</td>
</tr>
<tr>
<td>Cooling Water Pump</td>
<td>-</td>
<td>20kW</td>
</tr>
<tr>
<td>Conditioned Air Blower</td>
<td>-</td>
<td>45kW</td>
</tr>
<tr>
<td>Bucket Elevator (typ.)</td>
<td>-</td>
<td>20kW</td>
</tr>
<tr>
<td>Total Power Consumption</td>
<td>1040kW</td>
<td>85kW</td>
</tr>
<tr>
<td>Total Energy Cost/Year</td>
<td>[ $832,000 ]</td>
<td>[ $68,000 ]</td>
</tr>
</tbody>
</table>

Estimated operating power requirements, typical for a 3600 t/d urea plant in a Gulf Coast, USA location.

^ Fluid bed chiller load is an average calculated based on mean monthly day and night ambient conditions.