A multifunction crane is the key equipment of the foundry plant. Its productivity normally affects the whole production line productivity a lot. However, very often it breaks down because of the failure of cabinet air conditioner as the working environment is extremely harsh. There has been no mature solution for this application.

Multifunction crane is one of the most important equipment in foundry plants. Taking the electrolytic aluminum plant for instance, the crane is responsible for moving the positive pole, refilling alumina powders, clearing the electrolyte shell on the oven, transporting the liquid aluminum and etc. which means once the crane breaks down, the whole plant production stops.
According to the 2015 China domestic electrolytic aluminum production capacity of 40 million tons, the usage number of cranes in China is as follow:

- Electrolysis multifunction crane: 1,600 units
  (8 units/200,000 tons)
- Roasting multifunction crane: 400 units
  (2 units/200,000 tons)
- General bridge crane: 1,200 units
  (6 units/200,000 tons)

There are a big number of cranes in foundry plants. However, the ambient condition in the foundry plant is very challenging. There are full of dirt/metal powders, high ambient temperature, which is up to 70°C in summer time, corrosive gas, and even strong electro-magnetic field in electrolytic plants. So the lifecycle of the cooling units for the control panel of the crane is very short, which is normally less than three years during when sometimes service technicians have to do some repairing, which means climbing onto and working on the crane bridge at about 20 meters high. Only famous European brand cooling units are accepted in this industry, like Rittal. But still the plant has to afford the occasional shutdown.
Knowing the pain point of the customer, Pfannenberg does a full investigation on the application:

- High ambient temperature: 60 ~ 70 °C in summer time, open heat load in the workshop
- Vibration: installed on the moving bridge
- Dust: mainly aluminum powder, which may bring short circuits on electronic contacts
- Corrosion environment: the mixture of hydrogen fluoride gas and condensate generated by the cooling units ends in hydrofluoric acid to corrode of pipelines, fins of the equipment
- Strong electromagnetic field: damage the controller without suitable shielding

Then Pfannenberg developed a particular solution for this industry as chiller plus air/water heat exchanger. The chiller is designed for high ambient temperature with R142b refrigerant which is suitable for high condensing temperature. Flexible metal piping is used for hydraulic connection. Air/water heat exchanger offers IP55 system protection to the control cabinet. An accurate water temperature control on the chiller side as ±1 °C and set up by the environmental temperature extremely eliminate the possibility of condensate on the piping and fins so that the hydrofluoric acid is totally prevented. Last but not least, the controller needs to be shielded and protected from magnetic field.

Until the end of the year 2016, the first set of high temperature chiller and PWS have been installed and commissioned in Qinghai Aluminum Plant. After solving a few slight issues on site, the products have been running well so far.
Facts at a glance

<table>
<thead>
<tr>
<th>Task</th>
<th>Develop an industrial solution – high temperature chiller and air/water heat exchanger for foundry crane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenges</td>
<td>High ambient temperature, heavy dirt, vibration, corrosive gas, electromagnetic field</td>
</tr>
<tr>
<td>Products used</td>
<td>VLV 6 CE CUS, PWS 8302 230V 7035 HT</td>
</tr>
</tbody>
</table>
| Success factors | • Full investigation in the special application.  
• Cooperate with local OEM supplier. |

Summary

The foundry crane is a very challenging application for thermal management products to survive from high ambient temperature, vibration, dust, corrosive gas and strong magnetic field. Pfannenberg did a complete investigation on the application and analyze the common failure mode of current products. Based on the result, Pfannenberg cooperated with a local OEM supplier to co-develop the high temperature chiller and PWS solution, which is expected to solve the problem completely and promoted to the industry.

“The HPP project has proved to be very attractive due to the specificity and the innovativity of the application. It required a detailed planning while setting up a testing ground for the development of our skills in new application fields.”

Andrea Pavarani  
Industry Group Specialist - Food & Beverage  
Pfannenberg Italia srl

Application

HPP Italia is the first Italian company dedicated to offer the food processing industry the HPP method - High Pressure Processing. This innovative technology is already widespread in the US while in Europe, Asia Pacific and Latin America there has been a growth in the supply and demand, due to a growing awareness among food business operators regarding the benefits of using high pressure technology instead of traditional pasteurization techniques.

High Pressure Processing brings the advantage of providing food products that maintain unaltered their organoleptic characteristics in terms of aroma, color, texture, flavor and nutritional properties. At the same time it ensures the maximum in terms of food safety and allows a significantly longer shelf life.