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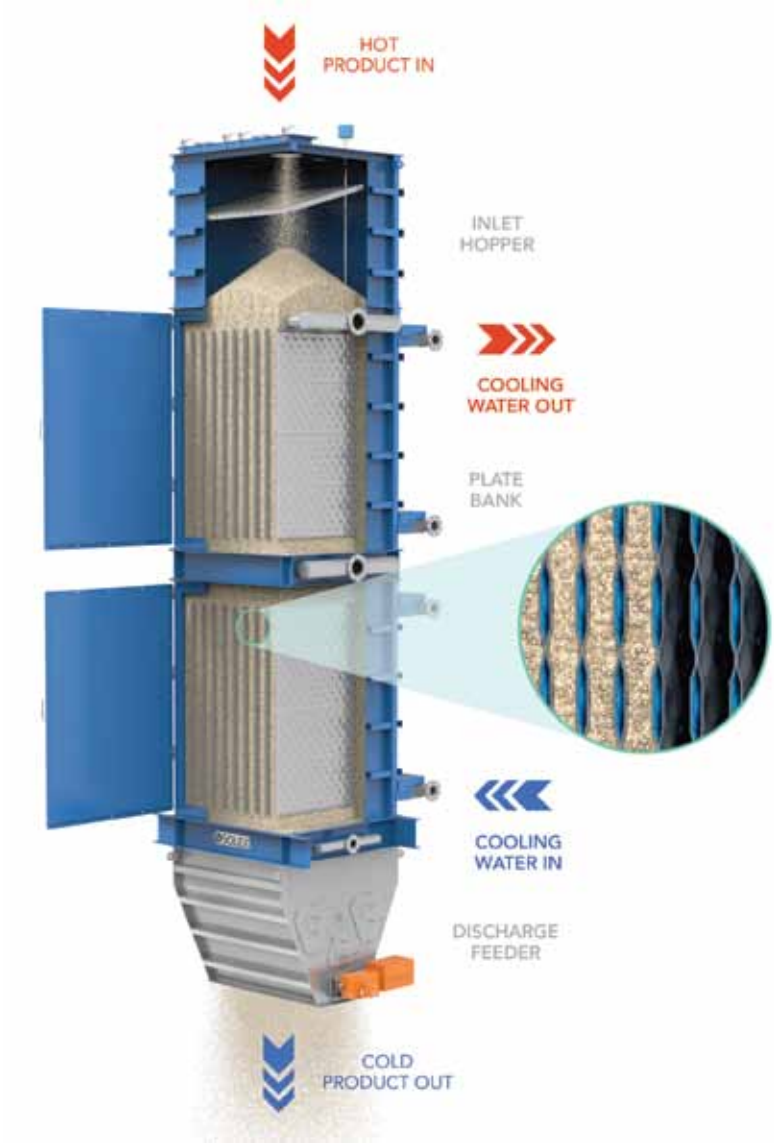
COOLING AND THE CORROSION CHALLENGE

Advances in heat exchange technology provide potash producers with tools to remain productive

SOLEX THERMAL SCIENCE

By Igor Makarenko



The potash enters the heat exchanger, and then travels gradually between a parallel series of plates, which contain a counter-current flow of water or other heat transfer fluids. All photos courtesy of Solex Thermal Science.

The milling and processing of potash into a necessary and valuable commodity for producing food requires robust machinery capable of withstanding the demanding conditions that's prevalent in these facilities.

One of the primary challenges faced by potash producers is the corrosive nature of the processed material itself. The introduction of water, which forms a highly corrosive brine, only exacerbates the corrosive effects, as does moisture and carbon dioxide from the ambient air.

This corrosiveness poses a significant threat to the effectiveness and reliability of machinery within the facilities. Freshly exposed metal surfaces on processing equipment, where mechanical wear has removed the corroded layer or protective passive film, are particularly vulnerable to corrosion. This leads to challenges such as operational setbacks and costly downtime, equipment maintenance, and retrofits.

Corrosion-related issues are prominent during the product cooling stage, which directly precedes storage, packaging, and transportation. Advances in moving bed heat exchange (MBHE) technology are mitigating this with a plate-based approach that circumvents the conventional challenges associated with corrosion and complex maintenance requirements.

MBHE TECHNOLOGY EXPLAINED

Operationally, plate-based MBHE technology is built on a distinctive tower-like design that facilitates conduction-based cooling rather than relying on convection (e.g., air cooling). Potash particles, in their free-flowing state,

enter the exchanger at temperatures around 120°C or sometimes higher. They then travel gradually between a parallel series of heat exchanger plates, which contain a counter-current flow of water or other heat transfer fluids.

This configuration enables efficient heat transfer from the potash to the fluid, resulting in a gradual and controlled cooling process as the product gravitates downward under precise discharge control.

MBHE TECHNOLOGY ADVANTAGES

One of the key advantages of plate-based MBHEs lies in the fabrication process, specifically concerning the use of laser welding technology. Specifically chosen high-quality stainless-steel grades serve as the benchmark, ensuring resistance to corrosion in the finished units. The smooth surface finish of the plates minimizes opportunities for pitting and crevice corrosion, and prevents material hang-ups.

Furthermore, the design adheres to strict American Society of Mechanical Engineers (ASME) and/or Pressure Equipment Directive (PED) vessel codes, while the plates themselves are typically manufactured from corrosion-resistant material, such as high-alloy austenitic stainless steel.

Extensive studies conducted at the University of Saskatchewan (U of S) over the past two decades have demonstrated that common construction materials used in potash facilities within Western Canada suffer significant degradation due to localized corrosion, such as pitting and crevice corrosion. In contrast, these studies at the U of S have confirmed the exceptional pitting resistance of high-alloy stainless steels compared to alternative materials.

The specifically chosen high-quality stainless-steel used in the fabrication of plate-based moving bed heat exchangers ensures resistance to corrosion in the finished units.

CONCLUSION

As North American potash producers look to meet rising global demand for their product, the need for reliable and cost-efficient operations becomes even more crucial. Equipment failures or unplanned maintenance resulting in costly production losses are simply not an option.

Plate-based moving bed heat exchange technology equips potash producers with the peace of mind they need to sustain productivity. Their stainless-steel design has been extensively tested and proven. In fact, these exchangers often outlast other equipment in potash operations due to their exceptional durability.

For further information on enhancing the efficiency of potash cooling, please visit www.solexthermal.com.

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