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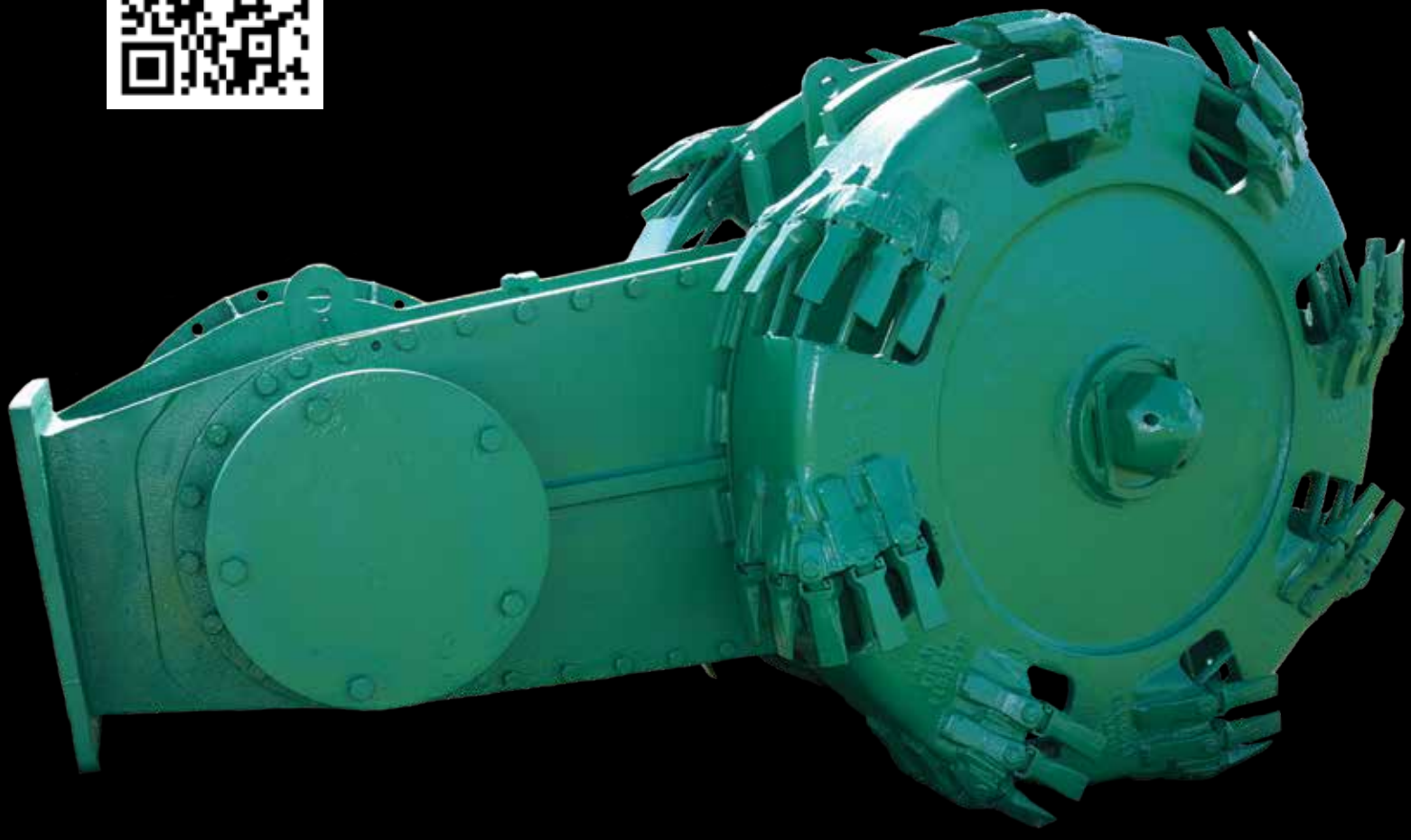

Nutrien Lanigan celebrates 55 years of production mining

Selective solution mining, a paradigm shift in potash production

Coating solutions for potash fertilizer storage and transport

Addressing potash's carbon challenge

HOW HEAT EXCHANGE TECHNOLOGY OFFERS A PRAGMATIC APPROACH TO DECARBONIZATION

BY IGOR MAKARENKO, SOLEX THERMAL SCIENCE AND CHRIS PAYNE, ECONOTHERM

The potash industry has an important role to play in the global pursuit of net-zero targets. As the scale of many operations continues to grow relative to soaring demand, so too has the expectation for the industry to properly manage and mitigate environmental impacts.

Potash producers have been taking steps to improve their carbon profiles for decades. For example, Canadian potash, which annually accounts for more than one-third of the global total, is produced with an approximately 50 per cent lower greenhouse gas (GHG) intensity when compared with competitors, according to 2020 data from Cheminfo Services.

Despite this, industry figures show current decarbonization efforts will not be enough to reach certain targets. Fertilizer Canada, for example, estimates adoption of technologies that offer a needed 50 per cent reduction of GHG emissions or greater will still require at least five to 10 years to implement and could cost upward of $1 billion per facility.

Meanwhile, the International Fertilizer Association acknowledges that while the efforts of its more than 450 members to reduce emissions are noteworthy, the industry must rapidly adopt new technologies to reach targets set in the Paris Agreement.

Addressing the natural gas challenge

The single largest source of GHG emissions traces back to the combustion of natural gas – most commonly during product drying. A recent study by University of Alberta researchers found the combustion of natural gas at this processing step represents nearly one-third of total emissions in conventional and solution mining combined.

The application of heat pipe heat exchangers (HPHXs) in potash applications represents a novel opportunity to recovering energy from otherwise-wasted process streams and, in turn, reducing both primary energy consumption and GHG emissions.

HPHXs recover thermal energy from exhaust heat by taking the latent heat of vapourization from the working fluid in the heat pipe – for example, from a liquid to a gas – to absorb the heat contained in the hot exhaust gas or liquid. The vapour subsequently rises to the top of the heat pipe where the pipe is in contact with a cold fluid – air or water – that causes the vapour to condense and release its heat. This heat is then absorbed by the cold fluid.

As an example of their application within potash applications, HPHXs can recover thermal energy from particle-laden air that is exhausted from the drying process. The exchangers accomplish this by taking this "one-pass air" and extracting heat from it that can then be used to pre-heat ambient air that goes back into the dryer.

In doing so, potash producers can reduce the natural gas consumption needed for product drying, while also reducing the temperature of the air that's being sent to the scrubbers to reduce scrubbing capacity.

Alternatively, the recovered energy from the dryer can be used to pre-heat water that is used in solution mining processes. Research has shown that the combustion of natural gas to heat water that is pumped through the ore body to dissolve the potash is another significant source of GHG emissions.

Conclusion

Potash-based fertilizers will continue to play a crucial role in global food production systems. Yet the industry itself needs to ensure its efforts complement the world's sustainability goals.

A key pathway to accelerating the sustainability transformation of the potash industry is to accelerate innovation, which includes the adoption of new technologies and processes.

Heat pipe heat exchangers, common in many other industries around the world, represents a novel approach to supporting the decarbonization efforts of potash producers. Their adoption offers a pragmatic avenue to reducing operations' primary energy consumption and GHG emissions – and in doing so, demonstrates a measured step toward a more eco-friendly approach to global agriculture. ▲