

SAUDI ARABIA REDRAWS ITS WATER SECTOR

THE KINGDOM'S HUGE RESTRUCTURING PROGRAMME IS SET TO OPEN UP INVESTMENT FUNDS FOR A HOST OF STATE BODIES

THE SHOCKING SIDE OF WATER'S CARBON FOOTPRINT

GW_I STATISTICS REVEAL THE TECHNOLOGIES CONTRIBUTING TO CHANGE, AND LAY OUT THE REGIONAL WATER CARBON HOTSPOTS

CHINA TIGHTENS ITS GRIP ON PRIVATE WATER FIRMS

AS PRIVATE WATER DEVELOPERS SUFFER FROM ZERO-COVID RESTRICTIONS, STATE-BACKED INVESTORS ARE CLAMPING DOWN

CTO OUTLOOK

PFAS, power and process efficiency

Efficiency is at the forefront of Heartland Water Technology's innovative wastewater management strategy. Ricardo Bernal explains how the company is rising to the challenge of providing cost-effective treatment amid PFAS regulations and mounting waste disposal costs.



RICARDO BERNAL

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Ricardo Bernal is a water development director with over 25 years of experience in the water industry. He has held roles in business development, project management and product line management at GE Water & Ionics and as a global industrial director for Abengoa Water. He is currently responsible for technology strategy for Heartland Water Technology.

What are the key drivers of your technology strategy?

Across multiple sectors of industrial wastewater treatment, customers are seeing rapid price escalation and environmental challenges for the treatment and disposal of wastewaters and sludges. In parallel, there is a growing focus on environmental stewardship. The logical outgrowth – providing economic solutions that are environmentally responsible – is wastewater reuse and resource recovery. This is our focus.

Without question, the rapid onset of per- and polyfluoroalkyl substance (PFAS) regulatory action and litigation, and the concomitant rise of public PFAS awareness, will have customers rethinking most of their longstanding wastewater management solutions.

These trends are driving a growing need for modular, scalable distributed on-site technology focused on the intersection between wastewater treatment, innovative and efficient use of energy, and resource recovery.

What are the key technology areas you are looking at in your R&D and why?

For both the leachate and biosolids segments, we are looking at advanced electro-oxidation, membrane separation and thermal conversion technologies to address rising concerns around handling high levels of PFAS in concentrated residual streams. Minimum liquid discharge (MLD) to zero liquid discharge (ZLD) solutions are going to be critical for treating concentrated effluents. Going forward, we expect that a requirement for PFAS destruction will drive technology decisions.

What gaps do you see in Heartland's portfolio that could be strengthened?

PFAS is a growing concern for customers in both municipal and industrial sectors. Currently, technologies which 'treat' PFAS either concentrate it (such as reverse osmosis, activated carbon and ion exchange) or there are thermal technologies which sometimes apply significant amounts of heat. Thermal technologies are often challenging to operate and may transform PFAS rather than eliminating it, leaving downstream operators such as wastewa-

ter treatment plants and landfills with an unresolved challenge. Heartland is in the final stages of commercialising a novel thermal conversion technology to destroy PFAS.

What trends do you see in the sludge treatment market?

In the United States, average biosolids management costs are rising in response to PFAS regulation. The cost increase is also driven by constricting disposal options and rising transportation costs. Landfills are limiting the amount of sludge intake as a percentage of municipal solid weight (MSW) tons. Nutrient loading and PFAS concerns are driving the curtailment of land application, and incinerator capacity is capped and declining. Finally, rising fuel costs combined with driver shortages inflate transportation costs at a time when constricted disposal options increase hauling requirements.

Rising costs and constricting disposal options are driving the demand for on-site biosolids treatment paired with a solution which can effectively reduce transport and disposal costs and deal with elevated PFAS concerns.

What are your activities in zero liquid discharge and what changes are you seeing to this market?

Heartland sees the combination of advanced membrane technology with evaporation as the core to delivering cost-effective and environmentally sustainable ZLD solutions to numerous wastewater segments including municipal solid waste, oil and gas, and power generation. Our ROVAP solution combines application-specific membrane technology with Heartland's patented Low Momentum-High Turbulence evaporation system to treat concentrate. A final dewatering step may be required depending on water chemistry and application requirements.

What work are you doing in the biogas space and how does your hybrid technology play into this?

Heartland's hybrid configuration seamlessly switches between a variety of thermal energy sources to achieve desired levels ►

of evaporation. The system cost-effectively uses energy sources such as landfill gas, low BTU biogas, or engine exhaust when possible and supplements with natural gas as necessary.

Our COVAP configuration optimises the value of biogas by using waste heat from renewable energy systems (such as reciprocating engines or a gas turbine) to evaporate industrial wastewaters. The hybrid configuration can be used to increase biogas utilisation of renewable natural gas (RNG) facilities.

Through what other methods is the circular economy ethos growing in industrial wastewater treatment?

“Circular economy” is a broad term, but it includes both wastewater reuse and resource recovery. We are seeing large industrial corporations setting tangible and achievable goals focused on achieving net zero carbon targets. Technologies such as Heartland’s ROVAP solution generate clean water for reuse to help achieve these goals. As examples, one Heartland customer is generating over 50,000 gpd (189 m³/d) of clean water from leachate through their system and a second customer has avoided 5,500 metric tons of CO₂ annually, by evaporating on-site and taking trucks off the road.

What have been the key trends in the landfill leachate market over the last few years?

Wastewater treatment plants are refusing to accept landfill leachate, driving a transition from off-site to on-site leachate treatment. Landfill operators see significant benefits associated with cost certainty, reduction of environmental risk, and increased operational control.

When moving to on-site treatment, operators favour technologies that are simpler and easier to operate than conventional biological treatment systems. Increasingly operators look to leachate treatment service providers to completely outsource design and operation of their on-site system. Landfill operators want to focus on their main business and spend less time and resources dealing with leachate.

Which of your end-user markets are in the most need of innovative technology solutions?

Small- and medium-sized municipalities are looking for low-cost biosolids treatment solutions that are not energy-intensive and that address PFAS concerns.

Both private and municipal-operated landfills are looking for on-site treatment solutions to address rising costs of leachate

CONCENTRATED AMBITIONS

Energy efficiency is a core focus of Heartland Water Technology’s vision to facilitate effective MLD and ZLD. Its Low Momentum-High Turbulence concentrator can be operated using a variety of thermal energy sources including engine exhaust.



Source: Heartland Water Technology

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Ricardo Bernal, Heartland Water Technology

disposal and the real or perceived threat that current treatment options may be cut off due to contaminant concerns.

Oil and gas operators are looking for produced water treatment alternatives to supplement deep well disposal. Increasing environmental, social and governance (ESG) focus, combined with increasing concern around produced water disposal-induced seismicity, is forcing the consideration of alternatives. Operators are seeking innovative solutions to treat and reuse produced water beneficially at a competitive cost.

Across each of these segments, there is a growing interest in wastewater treatment services which allow operators to focus capital and operating resources on their respective core businesses and away from wastewater treatment.

Where are you looking for new ideas and innovations outside of Heartland Water Technology?

Heartland’s DNA has always been to part-

ner and collaborate with companies that bring innovative solutions. We have developed partnerships with numerous companies dealing with a range of technologies from advanced membrane technology to novel biosolids/wastewater thermal conversion.

What do you think will be the game-changing technologies in the water sector in the next ten years? What is ripe for disruption?

Over the next ten years, resource recovery is going to change the game. Specifically, technologies which can capture energy from waste and enable treatment systems to deliver net zero or near net zero emissions will be disruptive. We believe that, in the medium term, technology will be available to capture sufficient energy from concentrated wastewater and biosolids streams to support wastewater treatment and recover valuable resources for beneficial use. These technology advances will drive the economic and environmental gains necessary to move into the circular economy. ■