

# HEAT TECHNOLOGY

# Q & A

**Hydrocarbon Engineering** questions a number of downstream heat technology experts about R&D, testing and design, efficiency improvements and the overall market outlook.

- Q Why is heat technology so crucial to downstream process plant operations?
- Q What are the main applications for your company's heat technologies or equipment within the downstream industry?
- Q What was your company's first heat related equipment or technology aimed at the downstream oil and gas industry?
- Q In what ways can heat technology help to improve energy efficiency and reduce emissions at process plants?
- Q How have R&D methods evolved over the past 10 years in relation to downstream heat technology?
- Q Talk us through your company's design process for new heat technologies or equipment.
- Q Explain how new heat equipment or technology is tested.
- Q What has been your company's biggest technological breakthrough in terms of downstream heat technology?
- Q How has the recent oil market volatility affected the heat technology/equipment sector?
- Q Where do you see the heat technology market in 10 years?

## DENNIS LONG, WATLOW, USA

**Q Why is heat technology so crucial to downstream process plant operations?**

Heat technology is required in many downstream processes to achieve the desired chemical reaction necessary to refine a raw material into something more valuable. The ability to achieve and maintain the optimal temperature is crucial to processing and refining efficiency and productivity. Temperatures that are too high can result in thermal degradation of the heated medium or coking on critical heat transfer surfaces. Temperatures that are too low could prevent the desired chemical reaction or decrease process yields. Sometimes heat energy is added simply to offset thermal losses to the environment. Finally, heat energy is sometimes added to achieve a viscosity suitable for fluid flow or pumping.

**Q What are the main applications for your company's heat technologies or equipment within the downstream industry?**

The main downstream applications for Watlow at the highest level start with refining of petroleum crude oil and the processing of raw natural gas. At a level below that, some of the main applications include continuous catalytic regeneration columns, sulfur recovery units, amine units, air separation units, knock out drums and dehydration units. Depending on the specific application, the company's equipment typically assists by thermally regenerating both liquid and solid saturated surfaces, vapourising fluids or raising the temperature of a fluid to achieve a desired thermal reaction.

**Q What was your company's first heat related equipment or technology aimed at the downstream oil and gas industry?**

The first was a direct electric heat exchanger utilising joule heating. Those first products functioned well and the joule technology is still in use today. What has changed a lot since then is the control and sensing technologies. The power control technologies combined with the temperature controller features and algorithms give the modern user an extremely flexible menu of options that can reduce both energy consumption and improve process durability and reliability.

**Q In what ways can heat technology help to improve energy efficiency and reduce emissions at process plants?**

The sensor portion of the thermal system is a critical component to ensure reliable and accurate communications with process controllers. Whether the sensor is for pressure, temperature, flow, etc., the ability to accurately determine the process condition and appropriately adjust inputs and outputs helps to ensure the process operates as designed and intended. The intended operational mode is always the most efficient and lowest emissions scenario.

**Q How have R&D methods evolved over the past 10 years in relation to downstream heat technology?**

The use of computers for modelling and analysis continues to improve and evolve. Computing ability continues to go up in smaller packages. Finite element analysis (FEA) and computational fluid dynamics (CFD) software packages continue to evolve, and when it is paired with the latest computers, the results can be achieved at a faster rate when compared to 10 years ago. Laboratory test sensors can be paired up with small data loggers to help provide quicker and more accurate correlation with numerical modelling results. The speed of testing results and improved information is leading to smarter product design

in heat exchangers and other thermal equipment. In addition, the new knowledge can often be useful to customers through web-based application software, which can often be linked directly to the customer's equipment. It is the Internet of Things (IoT) age.

**Q Talk us through your company's design process for new heat technologies or equipment.**

Watlow uses a process called lean product development (LPD). The manufacturing facilities around the world are all lean practitioners, so there is some natural synergy gained by practicing LPD. Key resources for learning about LPD are Michael Kennedy's 'Product Development for the Lean Enterprise' (2003) and Allen Ward's 'Lean Product & Process Development' (2008). Some of the hallmarks of LPD include understanding and establishing the true needs of the customer or market, and set-based concurrent engineering.

**Q Explain how new heat equipment or technology is tested.**

Testing is part of the LPD process. In LPD, most testing occurs during the 'exploration' phase, during which multiple alternative implementations are explored (explored typically means testing or trial runs within the LPD process). When exploration is completed, the company moves to 'lock-in', during which a single solution is detailed out for the new equipment or technology that Watlow intends to take to market and/or turn into intellectual property.

**Q What has been your company's biggest technological breakthrough in terms of downstream heat technology?**

So far, it has been the OPTIMAX® electric heat exchanger technology, which has resulted in 50% or more smaller equipment sizes. This footprint and weight reduction has enabled customers to engineer smaller and lighter modules and packaged assemblies. The improved CAPEX possibilities associated with the technology are also an advantage.

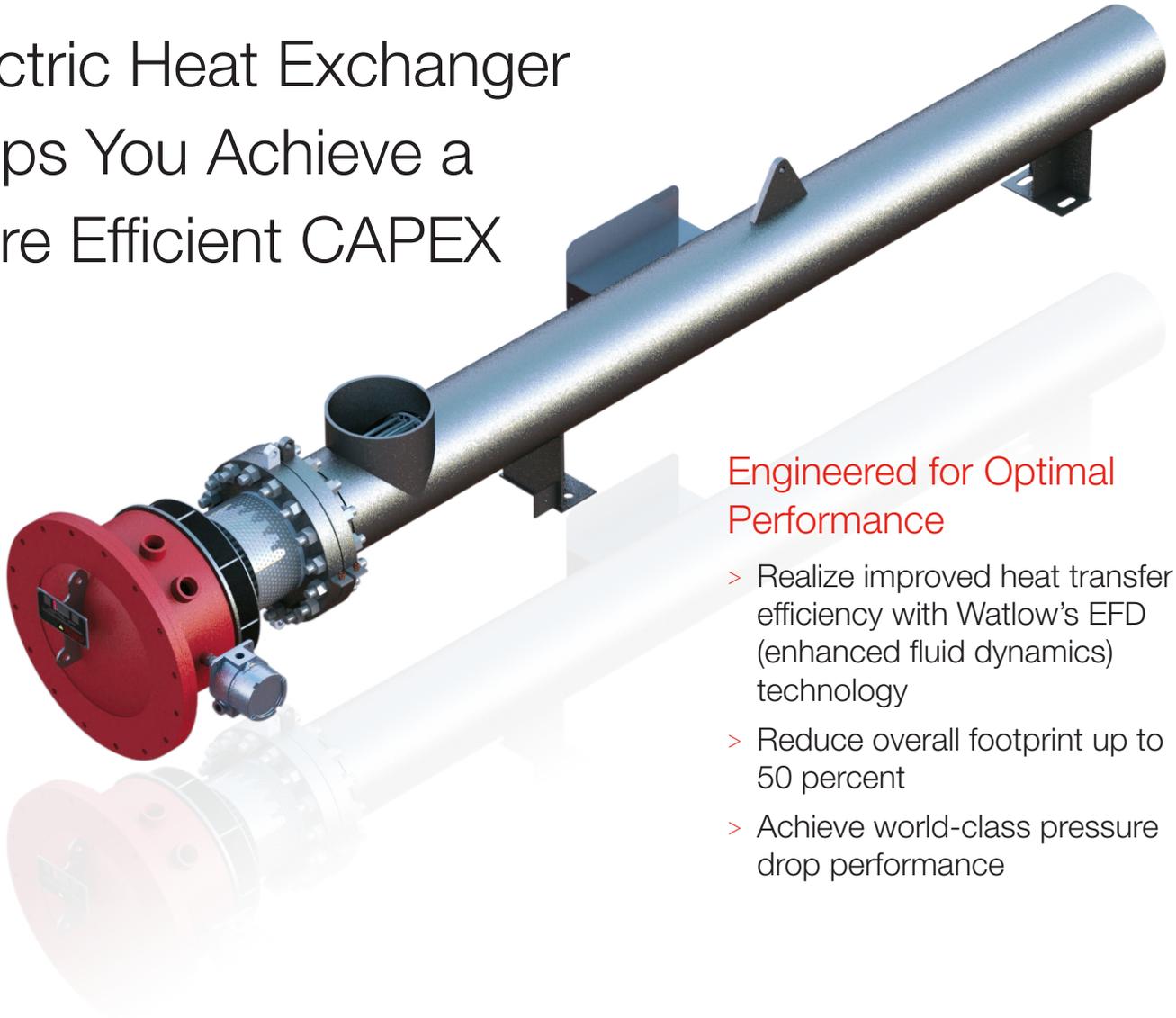
**Q How has the recent oil market volatility affected the heat technology/equipment sector?**

Primarily through reduced capital expenditure budgets, which reduce the market size for new equipment builds. Over time, that also means reduced budgets for R&D. Consequently, new technologies will arrive in the market later, which, in turn, could reduce consumer cost and/or improve workplace safety.

**Q Where do you see the heat technology market in 10 years?**

The increasing demand will be for heat technology that improves process control, asset management and capital expenditures. Government regulations around emissions will play a role in determining which heat technologies are most attractive to both customers and suppliers, particularly in new construction. Industrial IoT will take hold where there is a good value proposition for the users. The demand for refined hydrocarbons continues to grow, and process engineers will continue to seek ways to engineer out the need for adding heat energy. Ultimately, Watlow does not foresee anything on the 10 year horizon that will reduce the need for heat energy or new heat energy technologies. There will most likely be a more direct application of joule type resistance heat, rather than indirect through hot oil systems and similar, for efficiency purposes, and because the control technologies will be superior.

Watlow's OPTIMAX<sup>®</sup>  
Electric Heat Exchanger  
Helps You Achieve a  
More Efficient CAPEX



### Engineered for Optimal Performance

- > Realize improved heat transfer efficiency with Watlow's EFD (enhanced fluid dynamics) technology
- > Reduce overall footprint up to 50 percent
- > Achieve world-class pressure drop performance

**Watlow** OPTIMAX<sup>®</sup> electric heat exchanger combines tried and true, critical design criteria with new Watlow proprietary technologies to create a world-class heating system solution that is significantly smaller than traditional technologies.

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