

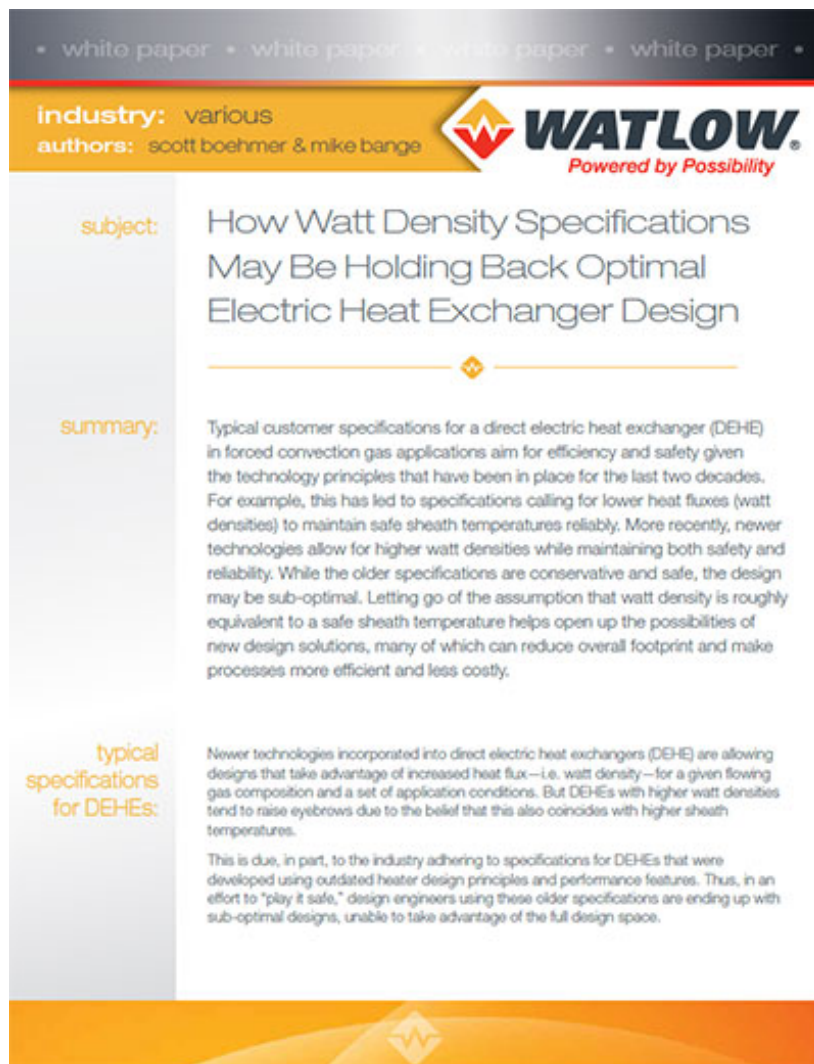
# WHITE PAPER: How Watt Density Specifications May Be Holding Back Optimal Electric Heat Exchanger Design

By: - April 20, 2020

## Summary

Typical customer specifications for a direct electric heat exchanger (DEHE) in forced convection gas applications aim for efficiency and safety given the technology principles that have been in place for the last two decades. While the older specifications are conservative and safe, the design may be sub-optimal.

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The image is a thumbnail for a white paper. At the top, there is a dark grey bar with the text "white paper" repeated four times, separated by small white circles. Below this is a yellow bar containing the text "industry: various" and "authors: scott boehmer & mike bange". To the right of this bar is the WATLOW logo, which consists of a stylized red and white 'W' inside a yellow diamond, followed by the word "WATLOW" in bold black letters and the tagline "Powered by Possibility" in red. Below the yellow bar is a light grey section with the following text: "subject: How Watt Density Specifications May Be Holding Back Optimal Electric Heat Exchanger Design". This is followed by a decorative horizontal line with a small diamond in the center. Below that is a "summary:" section with a paragraph of text. To the left of the summary is a vertical grey bar with the text "typical specifications for DEHEs:". Below the summary is another paragraph of text. At the bottom of the thumbnail is a dark orange bar with a stylized white 'W' inside a white diamond.

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industry: various  
authors: scott boehmer & mike bange

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subject: How Watt Density Specifications May Be Holding Back Optimal Electric Heat Exchanger Design

summary: Typical customer specifications for a direct electric heat exchanger (DEHE) in forced convection gas applications aim for efficiency and safety given the technology principles that have been in place for the last two decades. For example, this has led to specifications calling for lower heat fluxes (watt densities) to maintain safe sheath temperatures reliably. More recently, newer technologies allow for higher watt densities while maintaining both safety and reliability. While the older specifications are conservative and safe, the design may be sub-optimal. Letting go of the assumption that watt density is roughly equivalent to a safe sheath temperature helps open up the possibilities of new design solutions, many of which can reduce overall footprint and make processes more efficient and less costly.

typical specifications for DEHEs: Newer technologies incorporated into direct electric heat exchangers (DEHE) are allowing designs that take advantage of increased heat flux—i.e. watt density—for a given flowing gas composition and a set of application conditions. But DEHEs with higher watt densities tend to raise eyebrows due to the belief that this also coincides with higher sheath temperatures. This is due, in part, to the industry adhering to specifications for DEHEs that were developed using outdated heater design principles and performance features. Thus, in an effort to “play it safe,” design engineers using these older specifications are ending up with sub-optimal designs, unable to take advantage of the full design space.

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