

# 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 diamonds. 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 diamond shape with a white 'W' inside, 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 vertical bar on the left side with the labels "subject:", "summary:", and "typical specifications for DEHEs:". To the right of this bar is the main content area, which contains the title "How Watt Density Specifications May Be Holding Back Optimal Electric Heat Exchanger Design" in a large, dark grey font. Below the title is a horizontal line with a small diamond in the center. The "summary:" section contains a paragraph of text: "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." The "typical specifications for DEHEs:" section contains two paragraphs: "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." and "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." At the bottom of the thumbnail is a yellow bar with a large, stylized white 'W' logo in the center.

(abcimg://Watt%20Density%20White%20Paper%20Thumbnail)