CONDITIONING MONITORING AND FURNACE OPERATION AND DESIGN

(605) - BUILDING A DECARBONISATION TOOLBOX, USING HIGH ACCURACY IN-FURNACE THERMAL IMAGING FOR FURNACE AND BOILER APPLICATIONS IN GLASS, METALS, STEAM REFORMING, CEMENT AND BIOMASS

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The decarbonisation push to net-zero presents significant challenges for furnace and boiler operators and designers. National and international government policies often lack structure and clarification regarding cost/availability of fuels/credits, the role of carbon capture technology and an effective international market. In addition, biofuels require increased combustion management due to greater variability in energy and heat release than natural gas or coal.

Industrial furnace decarbonisation involves key steps, including energy efficiency, carbon-neutral fuel substitution, and carbon capture, utilisation, and storage. This paper illustrates the measures that can be taken today and provides guidance for developing long-term solutions on the road to a sustainable process.

High accuracy in-furnace thermal imaging has been demonstrated to support improvements in product quality and yield in numerous applications, reducing cost, waste disposal requirements, and, importantly, CO_2.

Similarly, energy efficiency improvements can be realised via thermal profile optimisation, early identification, and repair of refractory damage, allowing increased throughput, reducing specific energy and carbon footprint. As decarbonisation drives the use of alternative fuels, it is only by understanding the existing process limits of operation that Computational Fluid Dynamic (CFD) models can be validated to enable extrapolation for the evaluation of innovative solutions and alternative fuels.

Infrared (IR) gives new insight and data to validate CFD model assumptions and support the development of new furnaces and combustion system designs and technologies. Historically most high-temperature thermal processes have relied on single-point temperature measurements. This is likely to be inadequate for the changes to come. The next generation of thermal imaging technology from AMETEK Land, the Near Infrared Borescope (NIR-B-2K), can simultaneously measure almost 3 million temperature points of the refractory superstructure and process to identify and alarm any variance to design, limits, and optimal process.

With references from glass, steel, aluminium, steam methane reforming, cement, and biomass boiler applications, this paper helps guide your next step on the road to net-zero.