

*NAWTEC Speaker Abstract*

**Development and Testing of a High Thermal Conductivity  
Refractory Tile System in a Waste-to-Energy Combustion Unit**

**Patrick M. Stephan**  
Saint-Gobain Ceramics  
1 New Bond Street  
Worcester, MA 01606  
(508) 795-2963  
patrick.m.stephan@saint-gobain.com

Refractory systems are used for tube wall protection in waste-to-energy (WTE) boilers. Through the years, continuous adjustments have been made to the refractory materials and product designs. Design modifications have incrementally improved tile systems from bolt-on to hidden-clip to back-cast systems. Different refractory types, such as gunning cements and other monolithics, have also been used with varying degrees of success. A new refractory system is currently evolving, borrowed from other advanced high temperature applications and adapted to fit WTE boiler designs. This new system is a radical change in design from conventional refractory systems.

Advanced “siliconized” silicon carbide (SiSiC) ceramics offer many advantages over the current refractories in use. Conventional silicon carbide (SiC) tiles are pressed and contain 10-20% porosity which can oxidize and suffer corrosive and/or mechanical failure over time. The SiSiC materials are vibrocast and infiltrated with silicon metal to produce a body that is fully dense (pore free) and stronger by an order of magnitude over pressed refractories. The zero-porosity feature also yields a very high resistance to oxidation and ash / slag infiltration. In addition, the high thermal conductivity of SiSiC can lead to efficiency improvements in transmitting heat to the boiler tubes.

Trials are currently under way to establish performance of the SiSiC material. Initial results at Covanta Energy’s Bristol, CT and Jamestown, NY facilities confirm the improved properties and chemical stability in the WTE boiler environment, but reflected design issues which need to be addressed. Tile design modifications are being analyzed to minimize thermo-mechanical stresses and failure modes while balancing ease of installation and cost. Back-cast designs with a SiSiC tile are being developed, since these systems offer double protection and adaptability to different tube configurations.

Mr. Stephan is Market Manager – Incineration for Saint-Gobain Ceramics – Energy Systems. He has been with Saint-Gobain and the former Norton Company for over 20 years, specializing in refractory and high performance ceramics materials. He has previously presented papers on refractory tile systems at NAWTEC and NACE conferences.