TA001
MATERIALS PROCESSING - CERAMICS

MICROWAVE AUTOGENOUS FIRING OF HEAVY CLAY PRODUCTS

Garth V.A. Tayler and Paul Williams
Acme Brick Company, Technical Department
2821 W 7th Street
Fort Worth, Texas 76107, USA.

Thermal analyses and dielectric property measurements of the heavy clay bodies provide data for the development of optimum body compositions best suited for hybrid microwave/gas firing systems. Brick clay bodies contain compounds with good dielectric properties and are therefore well suited to hybrid gas/microwave firing. The addition of carbon to the body further increases the complex permittivity and a marked improvement in the efficiency of microwave coupling results. Hybrid firing of these carbon-containing bodies harnesses the mechanism known as *Microwave Autogenous Firing* (MWAF). This mechanism enables the researcher to minimize the microwave proportion in the total energy balance to the lowest practical level. Less cost is therefore incurred on the more expensive microwave energy, while the maximum benefit is derived from the more efficient microwave volumetric heating. The ultimate goal in developing the MWAF process is the reduction of overall energy consumption and the achievement of faster firing cycle times.

The temperature differentials across the sections of the pieces being fired need to be minimized during the firing process to avoid thermal runaway. The precise control of the MWAF process is achieved by the use of modulated-pulsed microwave power, applied correctly, in the various reaction stages in the firing cycle. This is critical for the most efficient combination of microwave energy with natural gas firing. The paper describes some important aspects of the current development work and proposes some of the design features of continuous and intermittent, hybrid MWAF industrial firing systems envisaged for the firing of heavy clay products in the future.