THREE-DIMENSIONAL MODELLING OF THE EVOLUTION OF TILE DEFORMATION ACROSS THE KILN, THROUGHOUT THE CYCLE

P. Corma(*); D. Garzón(**); E. Buforn(*)

(*)(QPT) - (**)(Aquateknica)

The presence of convex and concave deformations and warping in single-fire ceramic floor and wall tile production is one of the problems relating to quality, which arises with growing tile sizes and the convenience of making thinner bodies.

Reducing or suppressing such deformations will be a basic quality requisite and need in undertaking other process or material improvements. Thus, determining the factors that encourage such phenomena, defining the causes that produce these factors and establishing a methodology for suppressing the causes will be a basic objective to be taken into account in ceramic production.

Firing conditions are determining factors in the appearance of such differential deformation:

In the present study, temperature measurements were taken:

- Inside the tile
- In different points of the tile
- In different tiles across the kiln
- Throughout the whole cycle, that is, along tile travel through the kiln

The following parameters were held steady:

- Engobe and glaze used as well as applied layer
- Thickness of the piece
- Conditions of the body used
- Firing cycle and curve

The evolution of curvature and warping (body/glaze stresses) in the piece was taken as the mobile variable with the foregoing parameters across the kiln, throughout the cycle, i.e., establishing the effect of temperature variations.

FOUR points were taken along the kiln cycle, and the curvature and deformation exhibited by the tile at these points were modelled three-dimensionally. It should be noted that as many points can be taken as desired.

The model involves actually monitoring the evolution of the curvature and deformation in the tiles across the width and length of the kiln, thus being able to act upon the variables relating to these phenomena and minimise them.

Industrial facilities and materials were used. To measure the temperatures a "Datapaq" instrument was used with different probes to be put inside different parts of the tile, in different tiles in the row.

Tables are presented with temperature data in each part and region, as well as the plots obtained on superimposing the predicted curves for the top part of the tile and inner part of the tile. These graphs or models are presented in 2D and 3D, and provide a clear idea of what the deformation will be like at each moment, as well as the predicted deformation of the finished product.