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On-line deformation monitoring of thin ceramics tiles

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Abstract

The new scenario in the ceramic industry sees the evolution of the production to thin tiles with large area (thickness lower than 4 mm and size larger than 1200x600 mm^2). These products allowto reduce raw material consumption, to optimizepackaging and transport efforts, storage and installation time, with a reduction of 1/3 of the CO_2 compared to the traditional products. On the other hand, the new production processes of large and thin tilesare so sophisticated to require more accurate and timely control of all production parameters.Specific material composition andfiring profiles are necessary to guaranteeoptimalmechanical and morphological characteristics compared to traditional ceramic tiles, otherwise unexpected problems can appear.An accurate analysis of the new production processes for thin tiles highlighted possible periodical deformations on the surface, potentially dueto pyroplastic effectafter the firing process, that compromise the shape of the final product.This paper investigates the correlation of the entity of this effect with production parametersusing a non-contact method based on laser triangulation for on-line monitoring of the tile shape. The inspection technique must be fast enough for production, but with high resolution to capture small variation (in the order of 0.01 mm) that can produce relevant effects on the final product.The on-line measurement allows tocharacterize the deformation on the tile surface and tosystematically correlate shape variationswith process parameters, with particular focus on the firing curve profiles.The analysis of results allowed to improve understanding on the origins of these undesired effects and to implement strategies for its minimization. In future the on-line system could be potentially used to keep the phenomenon within the desired tolerances.

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