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The kinematics adopted by industries for polishing porcelain stoneware tiles: implications on glossiness and slip resistance

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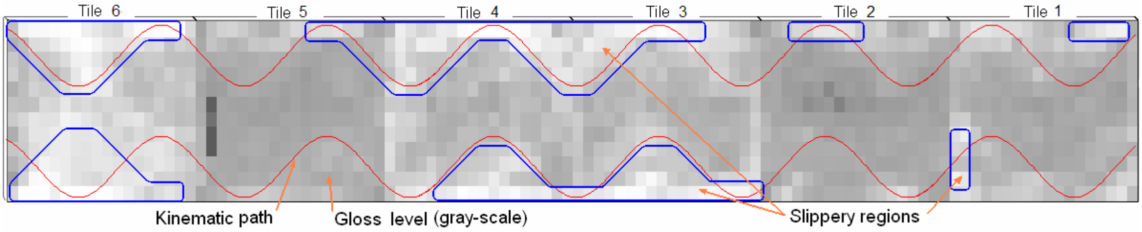
Several kinds of glossiness pattern can be seen at the surface of porcelain stoneware tiles right after the polishing process. Those glossiness patterns result mainly from the kinematics performed by the polishing train. According to the kinematic adopted, the spatial distribution of polishing time over the tile's surface may cause some regions to exhibit an outstanding glossiness while the rest undergoes the ordinary polishing. If, on one hand, the aesthetic effect of having a high level of glossiness on a floor tile is very much appreciated by customers, on the other hand, an extreme smooth surface increases the risk of slip and fall accidents. Thus, apart from costs related to energy, water and machinery consumption, the development of an efficient kinematic condition must also take into account the incidence and extension of such overpolished regions, bearing in mind all the injuries and litigation that they may cause at work and public places. Thus, the present work attempts to attain some quantitative criteria for estimating the most recommended range of polishing level, considering a balance of both glossiness and slip resistance. For this purpose three kinematic conditions leading to different amounts of extreme polished regions will be selected. The kinematic parameters to be considered for this variation are those typically available at the polishing industries: forward speed of the conveyor belt along the polishing trian, rotation of the set of polishing blocks (fickerts), amplitude and frequency of the transverse oscillation motion of the polishing heads. The spatial distribution of abrasive contacts and consequently the predominance of extreme polished areas will be analytically quantified by means of a simulation software. This software was developed in previous works, and all the equations and further details are available in literature. Three similar batches of real porcelain stoneware tiles will then be submitted to each one of the selected polishing conditions and the resulting texture will be characterized considering glossiness and friction coefficient. A complete spatial mapping of these properties will be carried out comprising the whole surface of tiles. To this end, after the polishing process the tile's surface will be divided into several small portions carefully delimited by a pencil. The measured values for each property will be presented by intensity colour graphics, where each pixel in the graphics is univocally associated with one real portion at the tile's surface. Finally, the results from both mapping will be compared so that any experimental correlation between them could be accessed, as well as the effects of the kinematic condition on the final texture of the polished tiles.

Keywords →polishing kinematics, polishing process, polished tiles, glossiness, slip resistance


Tile 6
Tile 5
Tile 4
Tile 3
Tile 2
Tile 1
Kinematic path
Gloss level (gray-scale)
Slippery regions