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USE OF THE FACTORIAL STATISTICAL DESIGN FOR ASSESS THE INFLUENCE OF THE FIRING CONDITIONS IN THE WATER ABSORPTION OF CERAMIC TILES THE STATE OF SERGIPE - BRAZIL

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The use of ceramic tiles has grown around the world. According to ANFACER (2012) Brazil is the second largest producer and consumer world of ceramic tiles. A special attention must be given to the northeastern region of Brazil, specifically in the state of Sergipe, which has two plants for the production of ceramic tiles. The ceramic tile made the State of Sergipe is classified in the group of absorption "BIIb" according to NBR 13817:97 of the Brazilian Association of Technical Standards (ABNT). One of the main problems currently faced by the industry the state of Sergipe is in getting water absorption within the limits established in accordance with its current classification. Moreover, given the increasing competitiveness of the market of the ceramic tile industry, the industry of state of Sergipe needs not only ensure the classification actual, as well as improving technical classification of your product.

According to the literature, the main factors that influence the characteristics of ceramic tiles are: formulation of the mass, size distribution and particle shape, degree of compaction, and firing conditions. The firing stage is one of the most important stages of ceramic processing where happens the consolidation of the ceramic tiles format obtained in the operation powder conformation.

This work aimed to study the influence of the main variables of the firing stage of ceramic processing (heating rate, maximum firing temperature and time of permanence at maximum temperature) based on an appropriate statistical analysis, showing how the conscious use of the techniques experimental design can help to improve the production process of ceramic tiles with low water absorption .

For the experiments, samples were collected from two clay deposits used by the ceramic industry the State of Sergipe. Test specimens were prepared, kept constant in this work, the formulation, grain size, and compaction pressure, whose values were obtained in previous studies. Was conducted a full factorial design at two levels with three input variables Firing conditions studied. Triplicates were made in each experimental condition and 06 replicates at the center point.

The statistical model found for factorial statistical design was able to identify how each variable influences the water absorption of ceramic tiles, and which experimental condition, provides water absorption lower for the experimental conditions studied. The results showed that, for the experimental conditions studied, two conditions had values of water absorption ($\approx 9\%$) within the limits established for the classification at absorption group BIIb ($\geq 6\%$ and $\leq 10\%$), well below of the obtained by industry the state of Sergipe ($\approx 12\%$). With the statistical

model found, was possible also identify and validate the experimental condition what reduce the of water absorption and has the smallest time of permanence at maximum temperature.

The use of the statistical technique allowed that the aimed could be achieved with minimal effort, thereby reducing the number of experiments, the time and cost of experimentation.

KEYWORDS: Factorial design; ceramic tile; Firing condition; water absorption.