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The use of geostatistics in the extraction and mine planning of brick making clay

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2016-07-14
http://hdl.handle.net/10539/20585

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ABSTRACT

Corobrik supplies a variety of uniquely coloured face bricks to the market. These bricks are manufactured by blending several clay varieties, which, when combined, provide a unique range of products. Colour variation in bricks is a major challenge with regard to product consistency, being influenced by the raw material composition and consistency. Homogeneity of the raw materials that are mined from year to year is crucial for continuously providing bricks of consistent colour. 'Top-face' clay mined at the Lawley Factory is an important raw material in the Nebraska product range being the major component affecting the colour of the product. Geological exploration borehole data were utilised for geostatistical analysis, variography and ordinary kriging by which means the variables SiO_2, Al_2O_3, Fe_2O_3 and K_2O, and loss on ignition (L.o.I) in the top-face clay was modelled, evaluated and interpreted. Geostatistics, a modified form of classical regression techniques, provides the tools to understanding spatial continuity of critical variables in naturally occurring clay deposits allowing one to study, explain, and describe them. Geostatistics has been applied to the modelling of the 'top-face' clay providing valuable information for improving mine planning. The kriging estimates indicated that the upper top-face layer is richer in K_2O and Fe_2O_3 than the bottom layer. This finding could contribute to improving mine planning, which, in turn, could assist in raw material consistency during the stockpile construction phase. The variability of K_2O in the deposit, together with the presence of Fe_2O_3, is the major contributor to the colour variability of the product and requires tight control. Estimating the clay domains 'sandy kaolin', 'chocolate', 'red kaolin', 'stained top-face' and 'smectite' that also occur in the deposit is recommended. Geostatistical methods and techniques applied in this study could be extended to all the ISO accredited factories of the Corobrik Group to assist in improving the colour consistency of the clay face-brick products.