

Calcined Clay from a Recovered Feedstock: Firing Regime and Batch Variability at a Historic Anatolian Tile Works



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ABSTRACT

Supplementary cementitious materials are becoming scarce. Fly ash is disappearing as coal plants close and blast-furnace slag is already committed, leaving calcined clay as the only substitute available at the scale the cement industry needs. Anatolia has met this need before. Horasan, the ground fired-brick pozzolan of Seljuk and Ottoman mortars, known elsewhere as cocchiopesto or surkhi, was made from clay fired deliberately differently from building brick. That distinction, between clay fired to make a wall and clay fired to make a binder, is the subject of this paper.

The study examines a works in Çorum that has processed local clay since the 1930s, when it began with hand-moulded brick, and that still fires hand-moulded brick and industrial roof tile side by side, at 900-950 °C and 1000-1200 °C respectively. Its waste-recovery facility is licensed for 23 waste codes and yields two clay-bearing outputs, sifted clay and tile fines, together about 53,500 tonnes a year, or 145 tonnes a day. Feedstock for calcination would come from recovery rather than from a quarry.

Recovered clay streams have been calcined and tested elsewhere, among them tunnelling spoil, dredged sediment and coal tailings, the last taken as far as an industrial trial. It also reported the scatter: fractions of one sample ranged from 54 to 176 J/g around a mean of 136. The question here is whether a variable, multi-source recovered stream can be qualified batch by batch against a cement-grade specification, and what firing regime an existing works must adopt. The paper sets out the industrial case and a staged qualification protocol covering mineralogy, reactivity and batch-to-batch variation, with thresholds drawn from the calcined-clay literature.

Three conclusions follow. Firing regime, not the fact of firing, governs reactivity: pozzolanic activity peaks near 700-800 °C, and neither regime above falls within it, the hand-moulded line sitting at the upper limit of the activation range and the tile line beyond it. Fired clay from this site is therefore not a pozzolan by default, and a dedicated regime is required, a bounded modification rather than reuse of the line as it stands. Variability rather than chemistry is the governing operational problem of a recovered stream, met here by batch-level qualification. Horasan supplies the precedent for both: it too was fired to a specification of its own. The protocol has been defined and initiated; its outcomes will be reported subsequently.

KEY WORDS: calcined clay; horasan; supplementary cementitious materials; waste recovery; firing regime