

Reservoir sediment, a new source for the fired clay industry ? - Input from the Durance watershed (SE France)

F. Haurine^{1,2}, I. Cojan², M.A. Bruneaux¹

¹ Centre Technique des Matériaux Naturels de Construction (CTMNC), Service Céramique, 92140 Clamart, France

² MINES ParisTech, Centre des Géosciences, 35 rue St Honoré, 77305 Fontainebleau

The preservation of natural resources becomes an important issue in the general frame of European environmental policies. In this context, clay deposits in river, in particular associated with hydraulic structures (dams, harbors, locks,...), are possible alternatives to the exploitation of fossil deposits in quarries. Through the example of the Durance watershed, we present a methodology to evaluate the potential of clay deposits in retention dams for its use in the industry of fired clay.

Durance river and its tributaries are characterized by an important flux of suspended particulate matter (SPM). Some of these SPM are exported to Rhône river (3Mt/year), another (fully 1Mt/year) is trapped in the 17 reservoirs of hydropower dams in the Durance watershed. In comparison with annual consumption of raw material by fired clay industry (7Mt/year), this flux is quite significant.

Comparison of mineralogical and geochemical compositions of samples from three dam reservoirs, Serre Ponçon (upper Durance river), Castillon (upper Verdon river, main tributary of Durance) and Cadarache (downstream of Durance-Verdon confluence) allows us to assess the evolution of the mineralogical composition of SPM along the Durance course according to geological sources. Clay mineral assemblages are dominated by mica and illite in the upstream reaches of the Durance course (unfavorable). A significant percentage of smectite (favorable) is observed downstream of Serre Ponçon dam. The CaCO₃ content is relatively high all along the Durance and its tributaries (especially the Verdon).

To assess the valorization potential of natural samples, an industrial referential was established from representative industrial samples for grain size distribution, mineralogical and geochemical compositions. Comparison of the mineralogical, geochemical and grain size composition of the Durance samples with the industrial referential provides a rapid evaluation of the potential of these sediments. Following this first evaluation, tests specific of fired clay industry (firing, drying, resistance ...) are conducted on the natural sample and on mixtures.

Samples from Serre Ponçon were discarded due to their mineralogical composition, that did not permit to perform any of the fired clay industry tests. Samples from Verdon due to their high CaCO₃ content present default during the extruding phase that prevented to conduct the other tests. All tests could be performed on the Cadarache samples although the grain size distribution is too fine. On this last site, mixture were prepared by adding sand or calcined clay (chamotte). Both the grain size distribution and the geochemical composition were improved without significantly modifying their drying and firing properties.

These results on the Durance watershed reveals that substitution of fossil sediments by modern reservoir sediments is feasible and can represent a significant mass when compared the present fired clay industry consumption.