

Effect of Aging Time and Mass Concentration on the Rheological Behavior of Vase of Dam

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Abstract : Water erosion, the main cause of the siltation of a dam, is a natural phenomenon governed by natural physical factors such as aggressiveness, climate change, topography, lithology, and vegetation cover. Currently, a vase from certain dams is released downstream of the dikes during devastation by hydraulic means. The vases are characterized by complex rheological behaviors: rheofluidification, yield stress, plasticity, and thixotropy. In this work, we studied the effect of the aging time of the vase in the dam and the mass concentration of the vase on the flow behavior of a vase from the Fergoug dam located in the Mascara region. In order to test the reproducibility of results, two replicates were performed for most of the experiments. The flow behavior of the vase studied as a function of storage time and mass concentration is analyzed by the Herschel Bulkey model. The increase in the aging time of the vase in the dam causes an increase in the yield stress and the consistency index of the vase. This phenomenon can be explained by the adsorption of the water by the vase and the increase in volume by swelling, which modifies the rheological parameters of the vase. The increase in the mass concentration in the vase leads to an increase in the yield stress and the consistency index as a function of the concentration. This behavior could be explained by interactions between the granules of the vase suspension. On the other hand, the increase in the aging time and the mass concentration of the vase in the dam causes a reduction in the flow index of the vase. The study also showed an exponential decrease in apparent viscosity with the increase in the aging time of the vase in the dam. If a vase is allowed to age long enough for the yield stress to be close to infinity, its apparent viscosity is also close to infinity; then the apparent viscosity also tends towards infinity; this can, for example, subsequently pose problems when dredging dams. For good dam management, it could be then deduced to reduce the dredging time of the dams as much as possible.

Keywords : vase of dam, aging time, rheological behavior, yield stress, apparent viscosity, thixotropy

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