

Rheological Study of Natural Sediments: Application in Filling of Estuaries

Authors : S. Serhal, Y. Melinge, D. Rangeard, F. Hage Chehadeh

Abstract : Filling of estuaries is an international problem that can cause economic and environmental damage. This work aims the study of the rheological structuring mechanisms of natural sedimentary liquid-solid mixture in estuaries in order to better understand their filling. The estuary of the Rance river, located in Brittany, France is particularly targeted by the study. The aim is to provide answers on the rheological behavior of natural sediments by detecting structural factors influencing the rheological parameters. So we can better understand the fillings estuarine areas and especially consider sustainable solutions of 'cleansing' of these areas. The sediments were collected from the trap of Lyvet in Rance estuary. This trap was created by the association COEUR (Comité Opérationnel des Elus et Usagers de la Rance) in 1996 in order to facilitate the cleansing of the estuary. It creates a privileged area for the deposition of sediments and consequently makes the cleansing of the estuary easier. We began our work with a preliminary study to establish the trend of the rheological behavior of the suspensions and to specify the dormant phase which precedes the beginning of the biochemical reactivity of the suspensions. Then we highlight the visco-plastic character at younger age using the Kinexus rheometer, plate-plate geometry. This rheological behavior of suspensions is represented by the Bingham model using dynamic yield stress and viscosity which can be a function of volume fraction, granular extent, and chemical reactivity. The evolution of the viscosity as a function of the solid volume fraction is modeled by the Krieger-Dougherty model. On the other hand, the analysis of the dynamic yield stress showed a fairly functional link with the solid volume fraction.

Keywords : estuaries, rheological behavior, sediments, Kinexus rheometer, Bingham model, viscosity, yield stress

Conference Title : ICRCF 2018 : International Conference on Rheology and Complex Fluids

Conference Location : London, United Kingdom

Conference Dates : October 15-16, 2018