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Application of Biodegradation Testing in Brazil

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Abstract

Biodegradation has been recognized as an important element of natural attenuation of increased organic loading at the seafloor from non-aqueous drilling fluids (NAF) that are associated with drill cuttings discharge. While recognized as an important characteristic of advanced NAF design, measurement of biodegradation properties of base fluids used in NAF presents a technical and regulatory challenge as applied to certain environments. In order to meet this challenge, modification of a standardized anaerobic biodegradation test has been pursued in Brazil with the goal of developing an ecologically relevant and repeatable test that can differentiate between the various NAF technologies. This paper will review the progress to date in developing this biodegradation test for use in Brazil. In particular, the sediment, which is used as the bacteria inoculums, will be compared and contrasted with other natural sediments that have successfully been used in this type of test.

Introduction

Drilling fluids are a critical technology for drilling offshore successfully. The ability to complete projects relies on the drilling fluids to control sub-surface pressures, bring the cuttings to the surface and to stabilize the open wellbore until casing can be set. In order to maximize drilling efficiency and reduce the number of wells required to develop a project, significant advances in drilling technology have also required significant advances in drilling fluid performance. Directional drilling, deep water and extended-reach targets require high levels of shale inhibition and lubricity as well as consistency of properties under both high and low temperature conditions.

In the case of drilling performance, the performance of a drilling fluid can be evaluated by its ability to minimize torque and drag, stabilize the wellbore and maintain flow properties under high and low temperatures. These evaluations are often complex and require significant resources to analyze and maintain for optimum performance (CAPP 2001). Cost of drilling fluid can be evaluated as the cost of the fluid combined with the impact of the fluid on the overall economics of drilling and completing the well.

Operators and service companies routinely evaluate drilling and economic performance of drilling fluids to optimize performance and efficiency. From well-to-well and from region-to-region, the overall ability to drill and complete wells in a cost effective and efficient manner is under constant evaluation. Some operators focus on drilling faster while other operators focus on minimizing non-productive time with more conservative drilling rates. While there is no single standard by which all wells are evaluated, the quest for continuous improvement is a constant theme. As new technology is developed and new requirements evolve, they frequently require new evolutionary tools to evaluate the performance of the drilling fluid. Along with the technical demands on drilling fluids, increased environmental performance has been required to minimize potential impacts to the receiving environment.

Just as with drilling performance and economic considerations, the quest for minimizing environmental impacts is a never-ending series of evaluations. There is no universally accepted global standard for measuring environmental performance. However, environmental science and regulatory agencies have several core parameters that are commonly used to evaluate environmental performance and acceptability. One of the common evaluation parameters for environmental performance is the biodegradation rate of waste materials discharged into the environment. The biodegradation rate is frequently seen as a surrogate parameter for the rate at which the seafloor benthic community around the point of discharge will recover to an unaltered state