A Critical Review of Testing Techniques for Evaluating the Performance of Kinetic Hydrate Inhibitors (KHIs)

A critical review of testing techniques for evaluating the performance of Kinetic Hydrate Inhibitors

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Kinetic Hydrate Inhibitors (KHI) are regarded as Low Dosage Hydrate Inhibitors (LDHI), as their dose rates are normally less than 3% of the aqueous phase. They are becoming popular, in particular in offshore developments as they could significantly reduce footprint and weight requirement for hydrate inhibition facilities. KHIs could reduce the amount of MEG considerably, affecting CAPEX. They can be recovered from produced water, hence reducing OPEX and minimizing the effect on the environment.

Recent developments in testing techniques, i.e., Crystal Growth Inhibition (CGI) are becoming popular among experimentalists. However, some labs/companies find the procedure complicated and time-consuming, hence expensive. Therefore, some of the labs are still using the old Induction Time (IT) techniques. There are doubts on the results of the induction time technique, despite repeating the test 3-5 times. Definitely, running the induction time technique 3-5 times will make it more expensive/time-consuming than CGI method.

In this communication, we propose a modified Induction Time, called Induction Time Plus (IT^+) that is repeatable/reliable. The technique is based on conducting the IT technique with a very small amount of hydrates (or hydrate memory). This technique removes the effect of nucleation on hydrate formation, as nucleation depends on many factors. In the technique the system is cooled-down to form hydrates, then the system is heated to around 1 °C above hydrate dissociation temperature, finally, the system is cooled down to the target temperature (at desired pressure) and monitored.

In this communication, the IT^+ technique is described in detail with some examples. A critical review of testing techniques is presented at the end, summarizing the advantages and disadvantages of the three techniques.

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