



**Talk on “Enhanced Oil Recovery in Malaysia – The Challenges”
by Ir. Abdul Razak Yakob**

Ir. Abdul Razak Yakob is currently the Secretary in Oil, Gas and Mining Engineering Technical Division (OGMTD).

On Wednesday, 18th May 2016, the IEM Oil, Gas and Mining Engineering Technical Division (OGMTD) organized a talk session on “Enhanced Oil Recovery in Malaysia – The Challenges” at the Lecture Room of Wisma IEM. The talk was attended by 31 participants.

The session was chaired by Ir. Danaraj Chandrasegaran who started the session with an introduction of the speaker. Ir. Razak Yakob is an independent consultant specializing in Drilling Engineering, a sub-discipline



of Petroleum Engineering. He was the Head of Well Delivery at the Enhanced Oil Recovery Center (EORC), an unincorporated joint venture between Shell Malaysia and Petronas Carigali in 2013. Razak graduated from Colorado School of Mines with Petroleum Engineering Degree and worked in Drilling with ExxonMobil and Halliburton before deciding to venture into his own practice in 2005. As consultants, he has provided services to Talisman Energy, Petronas Carigali and other operators and service providers. He is also currently a part time lecturer at the UCSI University, lecturing on Drilling Engineering in Field Development Projects.

The objectives of the talk was to share the knowledge of Enhanced Oil Recovery (EOR) and to discuss the challenges of implementing EOR programs in Malaysia. Ir. Razak started off the session with the introduction of what EOR is, how it is implemented, why it is needed and where were they implemented or are targeted in Malaysia.

Enhanced Oil Recovery (EOR) refers to the most complex method of bringing the hydrocarbon to the surface. There are three levels of oil recovery mechanism. “Primary” refers to conventional development wells. “Secondary” refers to Improved Oil Recovery (IOR) such as water-flooding or pressure maintenance.

“Tertiary” or better known as EOR is proven to be effective with recovery factor reaching 50-80% as compared to other levels with recovery less than 40%.

Many of the fields in Malaysia have been produced for as long as 40 years and reaching the maturity with applied secondary levels. Newly discovered areas are highly challenging to be developed with extremely high CO₂, high pressure and high temperature region, abnormal pressure zones, carbonates and/or deep water development.

In order to sustain the local production, EOR is one of the major agenda in our Economic Transformation Program. It is one of the 13 Entry Points Project that supports the Oil, Gas and Energy NKEA (National Key Economic Areas). Even with the high recovery factor, EOR is still a very challenging program to be implemented in Malaysia due to the offshore environment, formation characteristics, high investment cost, and expertise availability.



Almost all of the development in Malaysia are offshore based. While EOR is a proven technology for the onshore development in other parts of the world, the cost of EOR offshore development is much higher than EOR onshore development. The higher cost is due to the higher risk of operations, logistics cost, modification or new facilities support structure and requirement for highly deviated wells to be drilled from a surface location center to the injection points.

The suitability of formation characteristics for oil reservoir in Malaysia posed a big challenge to the EOR development. The reservoirs are complex, scattered and compartmentalized. The fields are matured and reservoirs are depleted, which posed the challenge of pressure maintenance as well as drilling into the incorrectly predicted pressure of the zones due to depletion. Many of the reservoirs' temperatures are high in some areas or deeper depth (> 150deg C). The high quality oil that we have in Malaysia is light which pose an issue in the push efficiency of the oil (about 45deg API).

Most of the projects in the world, with the exception of a few, are cost-driven. The investment for EOR offshore development is undeniably high especially in Malaysia, where many of the EOR candidates are old. The facilities are aging, where some have been in production for 20 to 40 years for example Tapis, Baronia, and Baram. These fields require high cost of modification before entering into EOR development.

Modification such as structure strengthening, facilities addition/replacement, conductor recovery/replacement/addition, requirements to make the platform safer or sometimes a new built is required.

Malaysia is still new in EOR. EOR technology is neither matured in other parts the world. Seeking for expertise in this area can be very challenging. Finding resources with strong background of the field and understand the details of EOR mechanism and a team that can understand the importance of cost efficiency in EOR program is crucial.

Current oil price however does not promote most of the EOR program to be implemented because of the margin is not attractive for final investment review approval. Many of the programs are “put on hold” for future development. However, ongoing program such as Tapis EOR by ExxonMobil is still ongoing. Tapis the first largescale offshore EOR project in South East Asia and one of the world’s largest offshore WAG (Water Alternating Gas) project.

The talk session ended with question and answer session, which went on for about 15 minutes. Many questions and discussion revolve around the effect of oil price slumping to the EOR programs, future of EOR and formation pressure maintenance.

The session ended at about 7:10pm with the presentation of token by the session chairman to the speaker.