



## Report on an Evening Talk Session on 'Assessing the Integrity of Fixed Offshore Platforms in Malaysia'

By: *Engr. Dr Jeffrey Chiang Choong Luin, M.I.E.M., P. Eng.*

The IEM Civil and Structural Engineering Technical Division had organised an evening talk session on 'Assessing the Integrity of Fixed Offshore Platforms in Malaysia' on 9 July 2007, at IEM HQ Conference Room in Petaling Jaya. It was chaired by Engr. Dr Jeffrey Chiang Choon Luin and was attended by 87 participants. The seminar was presented by Dr Goh Tok Kwong, who is the Principal Structural Engineer of a reputable local oil and gas company.

Dr Goh holds a PhD in Civil Engineering (majoring in shakedown analysis of fixed offshore structures), Bachelor of Engineering (Civil) and Bachelor of Economics from Monash University, Australia. He has authored several papers on 'Non-linear Cyclic Analysis of Fixed Offshore Structures', 'Optimum Inspection Planning of Ageing Jacket Structures', 'Risk based Inspection of Platform Structures' and 'Structural Reliability Analysis of Fixed Offshore Platforms'. He is currently responsible for the risk based inspection programs and structural integrity of pipelines and structures for a Malaysian oil and gas company.

Dr Goh commenced his presentation by introducing his early days with the company (back in 1995) working on offshore projects, and how not many engineers were familiar or experienced in that particular field. Most of them had experiences only in onshore structures – hence, it took some time for the engineers to be trained to work on offshore platforms.

Dr Goh then gave an overview of the nature of work involved in analysing the structural integrity of offshore platforms, focusing mainly on fixed structures, as opposed to floating structures, which are more difficult to predict and assess. He gave a general idea of the scope of work involved; there are close to 200 offshore platforms in the waters of Malaysia, and it would take his team of engineers a year or two to assess about 10 such structures. Hence, it would take a total of 20 years to

assess all offshore structures. And in the Southeast Asian region, there are over 1,000 offshore structures to be analysed and assessed. Currently, his company is fully stretched in terms of expertise and the number of manpower to deal with the scope of work involved.

Dr Goh also emphasised on the technical aspects of the assessment work involved, to study the environmental factors and to analyse the structural integrity of fixed offshore platforms. Advanced structural analysis techniques, such as probabilistic fracture mechanics fatigue assessment, non-linear plastic collapse analysis and structural reliability analysis have been used to assess and quantify the structural capacity and criticality of fixed offshore platforms. The application of these advanced structural analysis has significantly reduced the risk exposure of fixed offshore platforms.

Some of the interesting features of failures or potential danger spots of fixed offshore platforms are, higher than expected wave heights (over 12m), corrosion of steel components exposed to harsh environments (seawater and oxygen), collision with moving shipping crafts resulting in buckling of key supporting members, potential formation of shallow gas bubbles causing collapse of the whole structure, and many other aspects. Interestingly, there are no fixed international standards – the most widely accepted standard used is the American Petroleum Institute (API). However, because of the regular changes in environment and technologies, the provisions are frequently updated.

Besides the technical aspects of the talk, Dr Goh also presented the risk analysis and management work being undertaken by his team of engineers to ensure that personnel working on offshore structures are assured of their general safety. According to him, in principle, offshore platform workers are as safe as any person driving on normal roads on any given day.

In summary, the various topics addressed by Dr Goh are:

- Offshore platform engineering work is gaining prominence in Malaysia, with some local oil and gas companies taking the initiative in developing, harnessing and sharing its expertise and knowhow with Malaysian engineers and consultants.
- Analytical tools and methodologies have been developed to assess offshore platforms on their resistance and behaviour under all kinds of conditions and environment in high seas.
- Most international petroleum industry players adhere to API standards, which changes very frequently due to rapid changes in technologies and environmental hazards.
- Risk analysis and management tools are also utilised to ensure safety to workers and acceptable occupational hazards faced in an offshore work environment.

The talk ended at 7.00 p.m. followed by a short Q&A session, in which interesting questions and comments were raised, such as how to prevent the exodus of local engineers to other countries or regions (such as Middle East and the United States), where the offshore petroleum corporations are willing to pay high premium salaries to experienced and qualified offshore structural engineers – some to the tune of £10,000. Hence, a few local oil and gas companies are keen to offload the structural integrity assessment work to external consultants due to dwindling manpower resources.

Finally, Dr Goh was thanked and presented with a certificate of appreciation by the organisers of the event for his invaluable contributions to the knowledge and benefit of local practicing engineers in the field of offshore platform structure engineering in the local oil and gas industry. ■