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# *INVESTIGATION ON THE FATIGUE RELIABILITY OF OFFSHORE PLATFORMS*

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***Key words:*** *Fatigue, Reliability, Jack-up, Bending to membrane stress ratio*

## *INTRODUCTION*

*The objective of structural codes is to guide the proper design and construction of offshore platforms meeting functionality, safety and economical aspects. They are closely connected to each other and an iterative procedure is necessary to achieve an optimal design. The consequences of failure concern the safety of humans, pollution, and the cost of structures and equipment. Therefore, the assessment of the safety of offshore platforms including jack-up platform become essential.*

*Time-varying nature of environmental loads such as wave and wind will cause fluctuation of stresses in structural components of platforms. The fatigue damage is a deterioration process, which arises from fluctuation of stress, and should be evaluated before reaching a critical level. Traditionally, fatigue has not been considered as an important problem in jack-up platforms. The main reason was the most platforms were designed in areas with low or moderate environment conditions. Recently, by using jack-up platforms in regions with more severe sea states or as permanent platforms, the fatigue damage becomes an important factor in evaluating the integrity and safety of the structures [1].*

*The present study investigates one of important aspect that influence on the fatigue reliability of offshore platforms. It is the bending to membrane stress ratio that can change by far fatigue reliability index.*

## *FATIGUE CRACK GROWTH MODEL*

*Fatigue crack growth model is established based on the fracture mechanics and assume the existence of a flaw or crack e.g. at the weld toe due to a welding process. The starting point for a description of crack propagation in fracture mechanics is the relation between the crack growth rate, da/dN, and the stress intensity factor range, $\Delta K=K_{max}-K_{min}$, which is known as the Paris and Erdogan equation[2]. To simplify the problem in this model, the fatigue crack is supposed a semi-elliptical shape and during propagation of crack its shape remains semi-elliptic. As shown in Fig.1, the crack depth (a) and crack length (2C) are two sufficient parameters to describe the crack front completely. Based on the Paris-Erdogan expression, the increment crack size dr ($\phi$)*