

Dynamic Reliability for a Complex System and Process: Application on Offshore Platform in Mozambique

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Abstract : The search for and exploitation of new fossil energy resources is taking place in the context of the gradual depletion of existing deposits. Despite the adoption of international targets to combat global warming, the demand for fuels continues to grow, contradicting the movement towards an energy-efficient society. The increase in the share of offshore in global hydrocarbon production tends to compensate for the depletion of terrestrial reserves, thus constituting a major challenge for the players in the sector. Through the economic potential it represents, and the energy independence it provides, offshore exploitation is also a challenge for States such as Mozambique, which have large maritime areas and whose environmental wealth must be considered. The exploitation of new reserves on economically viable terms depends on available technologies. The development of deep and ultra-deep offshore requires significant research and development efforts. Progress has also been made in managing the multiple risks inherent in this activity. Our study proposes a reliability approach to develop products and processes designed to live at sea. Indeed, the context of an offshore platform requires highly reliable solutions to overcome the difficulties of access to the system for regular maintenance and quick repairs and which must resist deterioration and degradation processes. One of the characteristics of failures that we consider is the actual conditions of use that are considered 'extreme.' These conditions depend on time and the interactions between the different causes. These are the two factors that give the degradation process its dynamic character, hence the need to develop dynamic reliability models. Our work highlights mathematical models that can explicitly manage interactions between components and process variables. These models are accompanied by numerical resolution methods that help to structure a dynamic reliability approach in a physical and probabilistic context. The application developed makes it possible to evaluate the reliability, availability, and maintainability of a floating storage and unloading platform for liquefied natural gas production.

Keywords : dynamic reliability, offshore platform, stochastic process, uncertainties

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