The 3rd Offshore Structural Reliability Conference
OSRC2016

14-16 September, Stavanger, Norway

Risk-Based Structural Integrity Management for Offshore Jacket Platforms

Francis Guédé
Bureau Veritas, Marine & Offshore Division, Neuilly-sur-Seine, France
email: francis.guede@bureauveritas.com

ABSTRACT: This paper presents Bureau Veritas' method for risk assessment and inspection plan development as part of the risk-based structural integrity management of offshore jacket platforms. The method provides a global risk assessment which allows inspection interval and general inspection requirements to be defined. It provides also local risk ranking of the platform's structural components, which allows, if required, the local inspections' scope to be defined. The method uses a rule-based scoring approach to compute the likelihood of failure. This approach has been already used by many other oil & gas companies and has been demonstrated to allow effective inspection strategies to be developed. The consequence of failure is based on criteria on the extent of loss of life, environmental and economic impact. An example of application of the method is set out by showing the results of a project carried out by Bureau Veritas.

KEY WORDS: structural integrity management; risk assessment; offshore jacket platform.

1 INTRODUCTION

Existing standards (e.g. API-RP-2SIM) for the structural integrity management (SIM) of offshore platforms have emphasized the value of using risk-based approach to develop effective inspection strategy and program. Bureau Veritas contributed to the joint industry project for the development of the API-RP-2SIM, and it has produced a risk-based SIM methodology for offshore jacket platforms based on API recommendations.

The method provides a risk assessment and inspection strategy for offshore jacket platforms. The risk assessment includes the platform's global risk level and the local risk levels of the platform's structural components (e.g. tubular joints). The global risk level is based on key platform's characteristic data e.g. robustness, present condition from previous inspection findings and loading exposure. It allows the inspection interval to be defined along with general inspection requirements. It may be used also to perform risk ranking of the platforms in a fleet. The local risk levels are based structural analysis results and previous local inspections findings. They allow, if required, the scope of the inspections of tubular joints and/or structural members to be defined.

The method uses a semi-quantitative assessment for the likelihood of failure and categorizes consequence of failure with respect to the expected loss of life, the estimated volume of hydrocarbon release and/or the estimated cost in economic loss. The main issue of this method is to provide a simple risk assessment which involves all the drivers that affect a platform's susceptibility to failure and the resulting consequences.

This paper describes the Bureau Veritas' method, after an overview of the API guidance on risk-based SIM for offshore jacket structures. The method is illustrated on some platforms that were involved in a SIM project.

2 OVERVIEW OF API GUIDANCE FOR RISK-BASED SIM OF JACKET PLATFORMS

The API-RP-2SIM includes guidance for risk-based approach to structural integrity management of offshore jacket platforms. It provides general guidelines for assigning a risk category to the platforms in terms of the exposure category and the likelihood of failure. The exposure category is defined with respect to life safety exposure and consequence of failure including the environmental and the economic impact (Table 1). A description of the relevant factors to consider for determining the life safety exposure category and the level of consequence of failure is also given. The standard allows qualitative, semi-quantitative, or fully quantitative methods to be used in assessing the level of likelihood of failure. However no detail is given on how to implement those methods. Only general guidelines are defined for the assessment of likelihood of failure category.

Table 1. Exposure Matrix (API-RP-2SIM)

	Consequence of failure category		
Life safety category	C-1: high	C-2: medium	C-3: low
S-1: manned non-evacuated	L-1	L-1	L-1
S-2: manned evacuated	L-1	L-2	L-2
S-3: unmanned	L-1	L-2	L-3

L-1: high; L-2: medium; L-3: low

The risk-based inspection strategy is specifically concerned with the routine underwater inspections. However, it requires