Risk Analysis Techniques Applied to Floating Oil Production in Deepwater Offshore Environments

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ABSTRACT

Referring to a real case located in the lower Adriatic Sea (involving the floating exploitation of an oil reservoir in deepwater conditions), the paper presents the first results of new hazard analyses focused upon the role of the components of the production system which are located between the subsea wellheads and the FPSO unit. Therefore, the main concern of the study is the validation of a risk assessment methodology and its application to a real and peculiar study case. The analysis leads to start drawing significant conclusions concerning the most serious accidental events, together with the possible implications related to the occurrence frequency and to the dimension of the occurring consequences. The results of the study outcome in a project-oriented way, as far as project review and editing (e.g.) could be concerned, with particular reference to the impact prevention toward the environment, within a global project overview.

KEY WORDS: Quantitative risk assessment, FPSO, deepwater oil production, turret.

The heavy environmental conditions and the limited amount of reserves do combine altogether to make the field development extremely complex from many different points of view.

The conditions found in deepwater impose the use of absolutely new technologies, where - moreover - the fundamentally economic pressure proper of any small oil field exploitation project requires to strongly drive down the development and operating costs, as already extensively documented in the recent past by careful studies such as: Giannesini et al., 1995.

The project includes: a FPSO (floating production storage and offloading system) unit permanently moored in about 850 m of water with associated flowlines and umbilicals, a submarine production system with horizontal Christmas Tree devices installed by SAF (say: high water depth system) technology, and downhole completion systems equipped with SCRAMS (surface-controlled reservoir analysis and management system) and also artificial lift installations, in order to support the reservoir exploitation during all the by-today projected production life (reaching - as expected so far - up to 8 or 10 years).

1. INTRODUCTION

AGIP Aquila oil field lies in 850 m of water about 45 km offshore Brindisi, mid-Otranto channel, Adriatic Sea, having proved recoverable oil reserves of 20 MM bbl, as far as today’s Reservoir Engineering know how can state, with a foreseen peak production of 17000 BOPD:4 oilwells already exist, drilled by SONAT and R.&B. contractors.

2. QUANTITATIVE RISK ASSESSMENT APPROACH (Vivalda and Carpignano, 1997)

The offshore community nowadays experiences a growing demand of Safety Cases development, whose the Quantitative Risk Assessment (QRA)