Lessons Learnt from Recent Deepwater Riser Projects

Jean-François Saint-Marcoux
Acergy, London, UK

Marin Abelanet
Acergy, Singapore, Singapore

Stéphane Bombino
Acergy, Paris, France

ABSTRACT

Major Risers development Projects have been launched recently (Total CLOV and Petrobras Pre-salt to name a few). The Business strategy of major Oil and Gas companies with regards to Subsea Umbilicals Flowlines and Risers is evolving towards a more segmented approach requiring optimization of each individual element of the SURF package. This in turn requires a thorough review of the capabilities of the concept of each segment to a level that was not considered before.

Acergy has gathered experience in all types of flowlines (rigid, flexibles, bundles) and risers (SCR’s, Flexibles, single and bundle Hybrid riser Towers). In particular, Acergy has pioneered the use of Hybrid Riser Towers and have completed in 2007 the largest bundle HRT to-date.

The paper will focus on how Risers become industrialized products with their components being systematically organized through a technical hierarchy. This in turns allow a detailed FMECA and a structured detailed engineering package. From the structured engineering package, result robust interfaces for material sourcing and Fabrication.

KEY WORDS: Risers, FMECA, Hybrid Riser Towers, Risers, Ultra-deepwater, Industrial model

NOMENCLATURE

ANSI: American National Standard Institute
API: American Petroleum Institute
BT: Buoyancy Tank
CRA: Corrosion Resistant Alloys
FEED: Front End Engineering Design
FJC: Field Joint Coating
FMECA: Failure Modes, Effects and Criticality Analysis
FPSO: Floating Production Storage and Offloading [unit]
FPU: Floating Production Unit
GOM: Gulf of Mexico
HRT: Hybrid Riser Towers
IMR: Inspection, Maintenance, Repair
ISO: International Standard Organization
LRA: Lower riser assembly
NACE: National Association of Corrosion Engineers
OHTC: Overall Heat Transfer Coefficient
OREDA: Offshore Reliability Data
PIP: Pipe in Pipe
PLET: Pipeline End Termination
SCM: Supply Chain Management
SCR: Steel Catenary Risers
SLOR: Single Line offset Risers
SURF: Subsea Umbilicals Flowlines and Risers
URA: Upper Riser Assembly

INTRODUCTION

As ultra deepwater¹ fields are being developed, it becomes more and more clear that, with the notable exception of the Gulf of Mexico, FPSO based field architecture with wet Xmas trees is becoming the norm. Typical examples are Total Angola CLOV development and Petrobras Brazil Tupi area fields.

Operators, to a large extent, handle themselves directly or through engineering companies their overall field developments. These field developments include: Flowlines, Risers, and Floating Production Units. They expect cost effective solutions and, as they have done for other areas of petroleum industry, they split their ultra-deepwater scope of work into segments: Flowlines, Risers and Umbilicals. Therefore it is for the contractors as they provide any of these segments to adapt their offer accordingly. As has been well known for centuries, industrialization is the only solution to achieve a step change in cost-effectiveness. This paper specifically deals with ultra-deepwater risers as one of these segments.

STAKES

Industrialization brings cost-effectiveness and reliability through standardization and repeatable processes. For a basically tailor-made equipment such as HRT, this implies adapting methods that are of frequent use in serial manufacturing industries, for instance System Engineering and Value Analysis concepts.

The main stake is to find relevant tools, among general industrial engineering methodologies, that can apply to this specific problem, and that meet operators needs.

The frame to this industrialization / standardization is given by the following complementary objectives:

1) Structured feedback and lessons learnt through a standardized description of studied equipment:

¹ Taken as deeper than 1800m per ANSI/API 17A