Contract: ACG and Shah Deniz Structural Integrity Management

Client: Azerbaijan International Operating Company (AIOC) & BP

Location: Caspian Sea, Azerbaijan

Challenge

Noble Denton BOMEL's challenge for this Structural Integrity Management (SIM) contract has been the diverse nature of the structures involved. AIOC's Chirag-1 platform was designed, fabricated and installed in accordance with Russian practices and materials which do not conform with the Western codes typically used elsewhere, making it a very unconventional structure. By contrast, the six AIOC Azeri and Gunashli platforms, which are large structures with topsides of the order of 25,000 tonnes, are modern structures designed and built in accordance with western standards. The BP operated Shah Deniz structure is different again as it is a permanent jack-up, one of only three built worldwide to this generic design.

Expertise provided

Since 1998, Noble Denton BOMEL has provided full SIM and engineering support to the Chirag-1 platform. Involvement in the Azeri and Gunashli structures commenced in 2003, when the scope was also broadened to include Shah Deniz. Services provided include:

- Independent verification of the in-place structural analysis and fatigue analysis for all the Azeri and Gunashli platforms during the design phase
- Maintaining three-dimensional structural models of all the ACG and Shah Deniz structures, which are routinely updated to reflect modifications, damage, additions and weight changes
- For Chirag-1, extensive non-linear seismic analysis, pushover analysis, non-linear ship impact analysis, probabilistic redundancy and damage tolerance analysis, together with member criticality & reliability analysis using probabilistic techniques
- Non-linear time domain seismic analysis (using ABAQUS) to estimate the probability for collapse under seismic events exceeding DLE events
- Rapid response capability in the event of structural failure or incident
- Loading analysis and weight control programmes
- Integrity strategy and inspection plans for each structure
- Inspection workbooks for the topside, air-gap and subsea elements of each structure
- Review of inspection results, assessment and analysis of defects (including fracture analysis), and recommendations
- Preparation of annual certificates of structural integrity
- Verification of the design of structural modifications designed by AIOC/BP's engineering contractors
- Design for a significant subsea wet welding repair campaign undertaken on Chirag-1, using Noble Denton BOMEL's unique stress diffusers

Outcome and benefits

Noble Denton BOMEL has successfully managed the structural integrity of AIOC and BP's technically complex offshore structures in the Caspian Sea with no unplanned shutdowns due to structural integrity issues.

The close liaison with designers of the Azeri and Gunashli structures ensured a timely transfer of design documentation and this knowledge transfer continues to ensure that the structural integrity management of the platforms throughout their life will be as efficient and effective as possible.

Noble Denton BOMEL is a member of the Structural Integrity Work Group for AIOC.

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