

## Human Factors Support to Frade EPCI Phase 4 Chevron, Houston, USA

**Chevron has commissioned Atkins to provide a Human Factors Engineering (HFE) program of work for the Engineering, Procurement, Construction and Implementation (EPCI) Phase 4 of the Frade Project. This is to identify human factors requirements and ensure full integration of HFE into the design, construction and operation of the Floating Production Storage and Offloading facility.**

The Frade Field is located in the North Campos Basin offshore of Brazil, approximately 110 kilometres off the coast and 215 kilometres North-East of Macaé. Water depth in the field ranges from 1000 to 1300 metres. The field was discovered in 1986 by Petrobras and was subsequently appraised with a Petrobras well in 1989 and two Texaco wells in 2001.

The development plan consists of subsea production wells and water injection wells tied back to a Floating Production Storage and Offloading (FPSO) processing

facility, using flexible flowlines and risers. The Frade FPSO was built from the converted VLCC tanker 'Lu San' by extensive refurbishing of the existing hull and by adding topside modules, the internal turret anchoring system and other marine equipment.

Chevron has commissioned Atkins to provide a Human Factors Engineering (HFE) program of work for the Engineering, Procurement, Construction and Implementation (EPCI) Phase 4.



The purpose of the human factors work is to identify human factors requirements and ensure full integration of HFE into the design, construction and operation of the FPSO. In undertaking this work Atkins has completed the following activities:

**Human factors training:** Atkins conducted a set of comprehensive training courses for project personnel, topsides contractor (SBM) and marine contractor (FMC).

**Working Environment:** Atkins provided input into the working environment design for the topsides, hull, marine and accommodation block. This was achieved through facilitated model review, desktop drawing reviews and construction site inspections, as well as continuous liaison with the contractor's engineers.

Atkins assessed noise, vibration and lighting calculations for areas throughout the FPSO. We facilitated and supported discussions to identify pragmatic solutions for mitigating non-compliant

noise sources. Lighting design was provided for the Central Control Room and lighting calculations for other areas were assessed.

**Control Room and Human-Machine Interface Design:** Atkins clarified the operational requirements through task and link analyses. We then provided a detailed inventory of equipment and proposed layouts for workspace in the Central Control Room and Emergency Control Centre. Atkins also produced design requirements for the Human-Machine Interface and alarm system, facilitating an Alarm Objective Analysis. These design efforts aimed to mitigate the risk of high workload and to promote operator awareness during emergency and abnormal scenarios.

**Verification:** Atkins provided comprehensive documentation to satisfy verification requirements and evidence for acceptable integration of Human Factors Engineering into the design. This supported the development of the Design and Operation Safety Cases.



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