

Izomax AOGV provides barrier assurance on live seawater lines allowing replacement without production shutdown on Guyana FPSO



Challenge

A prolific producing FPSO in Guyana required replacement of corroded seawater cooling piping. Despite inserting branches upstream of the corroded piping, significant flow was anticipated in the piping requiring replacement. The only alternatives deemed feasible were a 3 week shutdown, or mechanical isolation using the AOGV.

In addition to anticipated seawater flow, other challenges included a GRE to Steel flange interface on each of the four lines requiring replacement. GRE-flanges are extremely brittle, and any miscalculation in design or installation of the AOGV technology could result in fracture of the GRE-pipe, and an unplanned shutdown.

With Production of approximately 250,000 barrels per day, any shutdown time saved would be deemed a success.

Technical Snapshot

After a site survey, Izomax recommended using a 10, 14 and 36 inch AOGV with design modifications to ensure sealing without damage at the GRE to steel flange interface, as required to ensure a fit for purpose solution for each isolation.

Detailed risk assessments were performed throughout the planning process. The FPSO operator's team, as well as the field operator team were on-site at Izomax facility for testing, review and FAT of the AOGV.

Outcome

Efficient completion of this project was critical. With 4 corroded outlet pipes requiring replacement, the alternative to isolation and replacement using the AOGV was to shutdown the facility. The AOGV mechanical isolation systems offered a cost-effective solution whilst avoiding any interruption to the production process.

CHALLENGES

- Maintain system online capability – avoid 3 week shut-down
- Hi-flow seawater lines – up to 2000 litres per second anticipated
- Isolate 4 seawater cooling lines (10", 14" & 36") for pipe replacement
- Ensure full system integrity across GRE to Steel flange pair with seawater flow anticipated during isolation

SOLUTION

- Design, modify and fully test requisite AOGV for 3 sizes
- Installation of flexible bypass lines upstream of corroded piping to minimize seawater flow at isolation points (by FPSO Operator)
- Design of new customized spade to mitigate potential damage to GRE flange to allow positive mechanical isolation without shutdown
- Diligent team risk assessment process and operational reviews with FPSO Contractor and Field Operator



During the planning and feasibility engineering phase of the project, one of the concerns was the GRE to Steel flange – with the potential for damage to the GRE during installation of the AOGV and insertion of the isolation spade. Izomax have previous experience with GRE flange pairs, and GRE to Steel flange pairs, allowing proven design adaptations to be integrated into the design changes required for the project. A modified spade design was accepted and fully tested, whereby rails were integrated to mitigate spade deflection under anticipated flow of up to 630 litres per second (avoiding possible damage to GRE flange faces during insertion). For

the internal testing in the workshop and FAT a customized frame was built and utilised allowing testing with a high flow through spade insertion.

The 36" piping had a lap joint seal on the GRE flange, which resulted in a new AOGV design with a double seal engineered to mitigate risk despite the brittleness of the GRE-flange.

A new gasket was also designed, allowing installation under anticipated high rates of seawater flow.

The Izomax team and equipment mobilized on-time to the FPSO in Guyana. Operations sequencing called

for the 10" piping to be isolated, with estimated (seawater) flow rates of up to 109 litres per second expected. Despite anticipated flow rates, no flow was observed or detected during the operation. Likewise, flow rates of up to 630 litres per second were anticipated during replacement of the two 14" lines – but again, no flow was encountered during the first AOGV operation which gave the operator confidence to utilize the AOGV spade by simply inserting by hand on the second line (saving further time and cost, without compromising safety). System process and full pressure integrity was maintained throughout the operation, with the plant returned



to its original status and condition with 3 new seawater cooling outlet pipes in place.

Despite the extensive planning and testing performed, the client team decided based on lessons learned during the 10" and 14" piping replacement that the 36" line replacement could safely be postponed until the next planned shutdown – thereby reducing risk to operations.

The entire project was successfully completed safely, efficiently and on time – leading to the client placing an order for their next project on a sister FPSO.

OUTCOME

3 weeks shutdown avoided with impact of 250,000 bbls/day lost production

- ⚙️ 10" & 14" piping replaced without shut down
- ✅ All operational phase successfully executed, without damaging GRE flanges
- 👍 Excellent teamwork with Izomax, FPSO Contractor and Field Operator involvement from risk assessment and operational planning to execution on-site
- 🛡️ No HSE incidents
- ⚙️ Design modifications to AOGV successfully implemented allowing mitigation of anticipated flow and potential damage to GRE flange faces
- 👍 Based on the successes achieved, the customer placed a new order for the Izomax AOGV on a sister FPSO