

Past Experience and Future Use of Duplex Stainless Steels in Upstream Oil and Gas, an Operator's View

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Duplex stainless steels have been used for several decades in the Upstream Oil and Gas industry because of their good corrosion resistance and high strength relative to their cost. The objective of this presentation is to highlight the very successful use of these alloys in various applications but also to show some cases where failures could have been avoided. The intent is to review applications where duplex stainless steels are regularly used with special attention to their limits of use. For wells their use is mostly dedicated to production tubulars in cases where strength and some H₂S cracking resistance is required. Their use has been quite extensive for piping, valves, connectors, manifolds and jumpers in subsea facilities. Another significant subsea application is umbilicals where hundreds of kilometers of small bore superduplex tubing have been laid on the seabed. For offshore topsides duplex stainless steels are typically dedicated to gas process, liquid hydrocarbon piping and valves as well as seawater cooling piping and pumps including fire water pumps. Other applications include seawater filters and various other seawater processing components. In the future, a growing use of duplex stainless steels is expected as Contractors improve their skills for the welding and fabrication in various regions of the world. Newer or less widespread applications will be addressed such as superduplex stainless steel fasteners on topsides or pipelines where duplex stainless steels may be a good alternative to clad pipelines in some cases.

Past experiences

Failures but also good experience

Failures:

Topsides

- Duplex 22Cr piping on Elgin SCC internal and external
- Duplex 22Cr piping on NKossa external SCC
- Sour service Lacq (one failure of a gas cooler)

Subsea

- HISC of umbilical welds on 25Cr SDSS Dalia
- HISC on methanol small connectors Girassol
- HISC on pipe stacks for seawater pumps (Dalia) and slop tanks (CLOV)
- HISC in seawater filters

Positive use

- Seawater piping cooling water on CLOV
- 25Cr seawater coarse filters replacement on Dalia and AKPO
- 25Cr Subsea connectors (HIP)
- 25Cr jumpers
- 25Cr SDSS umbilical tubes
- SDSS fasteners (ex Maersk Oil)

- Congo pipeline (1990's)
- 22Cr flowlines in TEP Indonesia, Congo (high temp), Elgin UK,

The future

New use of DSS for bolting on topsides for localized corrosion prevention and SCC in particular.

Pipelines (need to discuss with PLR)?

Use of lower grade DSS: is there a future for these? What prevents their use? 2101, 2202 etc ...

Quantification of DSS use in our projects (how many tons and where?)

- New projects in TEP DK, UK
- Moho Nord
- Egina
- Al-Shaheen
- Ichthys
- Mozambic
- Block 20/21
- North Platte
- Surinam
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