Corrosion has been an important issue for the offshore oil and gas industry since its very beginning. Today material specification favours the use of large amounts of corrosion resistant alloys. Duplex stainless steels have proven their worth in this sector already, but is it time for these to be pushed even further, and for new duplex grades to take centre stage?

By Babak Bahar, Material Specialist, Kvaerner Engineering, Norway

There is no doubt about the fact that offshore platforms play a vital role in the production and processing of hydrocarbons around the world. The production processes used here are complicated and demanding for materials and take place in a marine environment that is highly restricted by legislations to any kind of pollution. As a direct result, the safety and longevity requirements for the platforms are high in order to ensure the environmental aspects. These are normally guaranteed by robust material selection and continuous preventive maintenance.

From my professional perspective duplex stainless steel grades have played an important role within offshore process efficiency since their introduction in the market. Many of the oil and gas offshore installations in the North Sea began production in the late 1970s and in that time it was common to

Aker H-3 rig being built 1970 at Aker Brygge, Oslo. No duplex grades were used for topside due to the fact that the main market introduction of duplex grades within offshore industry was in early 1980s. Photo courtesy Kvaerner.
use large quantities of carbon steel for equipment and process piping. Per today the situation is totally different and using duplex grades is a common practice in order to obtain a long life time with e.g. minimum requirements for maintenance and modification offshore.

**Offshore topsides deserve materials for top performance**

Today very little carbon steel is used within process system for new platforms. Materials are mainly selected in stainless steels based on weight saving potential, long design life expectations and more corrosive process media than before due to e.g. higher pressure and temperature. The expected lifetime for the new platforms is up to 50 years in North Sea with minimum requirements for costly maintenance.

The long life time expectancy pushes the materials selection into more corrosion resistant grades such as duplex stainless steel, e.g. 22Cr duplex and 25Cr super duplex. However the main question is if we could push the offshore process efficiency even further via considering higher duplex grades than 25Cr super duplex? If yes, further activities within standardisation, price establishment, and offshore applications development are important for the new duplex grades. Also bearing in mind the fact that from customer procurement point of view, it is preferred to have several sources to a particular duplex grade.

Let’s look at the mentioned points a little bit more in detail. Within Norwegian offshore market NORSOK standard is well known and followed by many companies. This standard recommends that all duplex grades in any product form and dimensions to be approved according to NORSOK M-650. For example making a shell and tube heat exchanger in a new duplex grade could require NORSOK approval for plates and pipes within certain thickness intervals. The market experience is negative regarding the single source of materials due to the risks related to delivery time and price. The common strategy is to have several competitive suppliers for the same material to avoid any delays to the projects and fluctuations in final price. Again, the oil and gas industry is a conservative industry. The reason for this conservatism is partly due to possible high risks and enormous consequences with any failure scenario in field. A problem free and long reference list is a very good help. Therefore early application development and following up the product in field is beneficial and helps to build up a holistic reference list. For example per today the recommended metallic material selection for untreated seawater over 20°C is titanium according to NORSOK M-001. The same standard recommends 25Cr super duplex from the same system if the temperature is below 20°C. Any improvement in order to improve the corrosion resistance and mechanical strength of super duplex grades is beneficial.

**About the author**

Babak Bahar works as a materials specialist for Kvaerner Engineering in Oslo. He holds a Master of Science degree (M.Sc.) within materials science from Luleå technical University in Sweden. He has over 16 years of broad and solid international experience within materials & corrosion engineering. In recent years he has been involved in materials selection and corrosion protection for offshore platforms. Some of the material challenges he has tackled have been presented as articles and interviews via Stainless Steel World Magazine. Babak’s specific areas of expertise are corrosion resistant alloys, coatings and atmospheric corrosion protection. His current position as a specialist engineer positions him as a key resource within the projects team at Kvaerner. The variety of the projects, ranging from material selection for offshore topsides to be installed in North Sea to gravity based structures to be installed in arctic area, require a holistic feeling for material selection and corrosion protection. Babak has been a member of the Steering Committee for Duplex Seminar & Summit since 2013 and is Chairman of the 2016 Duplex World Seminar & Summit. For information about participating in or attending Duplex World, see www.duplexworld.com