



WHAT ARE THE KEY COMPLETION DESIGN CONSIDERATIONS FOR CRA VS. GRE LINED TUBULARS?

Regular API 5CT carbon Steel OCTG is fitted with a Glass Reinforced Epoxy (GRE) inner tube for an economical OCTG purchase option for corrosive, aggressive, and normal environments in both production and injection wells. GRE pipe technology is well used throughout the industry and is a Discontinuous Filament Winding process using high-strength fiberglass and amine cured epoxy resin as basic material. In threaded and coupled OCTG applications, an internal seal ring is placed at the well site during make-up to make a continuous link in the GRE so that no attack from corrosive wellbore production or injection fluids can take place. Over the years, there have been successful installations along with some significant well failures of GRE lined OCTG. Deploying such a completion does have some significant disadvantages when comparing it to a non-lined corrosion resistant alloy (CRA) OCTG string. These disadvantages become even more apparent when well intervention work needs to be carried out in a well completed with GRE OCTG.

Completion Jewelry, such as flow control nipples, Sliding Side Doors (SSD's), and artificial lift Gas Lift Mandrels (GLM's) are all required to be downsized, thus restricting the full bore completion ID. Intervention tool strings and BHA's must be carefully considered so as not to become stuck or damage the delicate ID of the GRE pipe. Special procedures and run speeds must be followed with Eline, slickline and coil tubing which can increase OPEX costs of intervention, maintenance and data gathering. Entry to the lower completion/liner for cleanout tools & mills, perforation guns, and perforation de-burring tools are greatly reduced or no longer possible due to the reduced ID restrictions in the upper GRE lined completion string. GRE lined OCTG can also pose a difficulty in running and obtaining clear and accurate CBL of the casings when compared to using a CRA OCTG for the completion string.

Running the GRE completion requires special attention to be taken to ensure that at each connection an internal seal ring is placed and seated correctly in the joint. Too many times, oversights have been had when fitting these and either rig time has to be spent pulling back a completion to find the connection that is missing the seal, and this comes with a cost of poor quality to the operator. Likewise, if it is left without a remedy, there is potential for the well corrosive fluids to gradually seep into the connection and behind the GRE pipe, resulting in an attack on the carbon steel. The GRE will remain unharmed, but the carbon steel will slowly corrode and leave the operator with a weakened or sometimes parted string.

The carbon steel OCTG completion string on the OD may be left exposed to attack from the annulus fluids if not correctly maintained and inhibited and this may be costly to maintain. Certain regions around the globe also have to deal with the risk of relatively shallow aquifer attack. This attack firstly occurs on carbon OCTG casing string, and through time, penetrates into the annulus between casing and completion tubing. This can occur due



to poor zonal isolation, poor cement bond, and micro channeling/erosion through the cement over time. These types of failures are not uncommon and can occur in as little as 5-8 years of well life. Reactions such as H₂S bacterial activity, electrolytic effects, and cathodic reaction all play a part in both OD and ID failures of the carbon OCTG, resulting in costly workovers, casing integrity repairs, or, in the worst case, a complete P&A situation of what was once a good producing well.

At CRA, we pride ourselves on the ability to individually evaluate your specific well conditions with a neutral opinion. We understand that there is an additional CAPEX consideration to be made when selecting CRA OCTG compared to Carbon/GRE lined OCTG. These up front planning considerations must be carefully thought out to ensure the correct OCTG material selection is made for full life of well production & injection integrity. With a combined 40+ years of industry experience, CRA's in-house metallurgy team of well completions, drilling, and intervention experts understand the technical challenges that come with OCTG casing, liner, and completion string selections. Contact our team for an expert technical evaluation and material recommendations to support the longevity of your well and ensure the long-term value of your project.

**While every effort has been made to ensure the accuracy of the above review, assessment, conclusions, and report, the appropriateness of their application and their interpretation remain the sole responsibility of the user.*