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**2010-2011 SPE Distinguished Lecturer**

**Near Surface External Casing Corrosion: Cause, Remediation and Mitigation**

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Surface casing failures on a group of relatively new wells prompted an investigation into the cause. External corrosion had occurred on the surface casing near the cement top between the casing and conductor and was caused by repetitive wetting events from water entering the unsealed annulus. Testing of water and cement samples indicate that the presence of oxygenated water and chemical salts that leach from the cement creates a low-resistance electrolyte resulting in an extremely corrosive environment. The oxygenated water in this environment creates an electro-chemical cell that corrodes the surface casing. Elevated casing temperatures and a high temperature gradient between the casing and the conductor accelerates the corrosion rate by creating a thermo-galvanic corrosion cell.

The damaged surface casing has been mechanically repaired on numerous wells by excavation and installation of welded sleeve patches. Inhibiting the corrosion mechanism is considered an important mitigation for surface casings not yet compromised by the corrosion mechanism.

This presentation will:

- Discuss the extent of shallow external casing corrosion observed in the field

- Detail the mechanisms leading to the external corrosion

- Detail the mechanical repair procedures used to return the wells to service

- Discuss mitigation methods and remedial treatment to inhibit corrosion on new and existing wells.

This lecture illustrates that well barrier problems are not limited to being internal and deep in the well and require expensive (i.e., rig) methods to repair. Inexpensive repair approaches "outside the box" of traditional methods can be done safely, reduce risk and provide economic value for the company. The corrosion mechanism discussion should be applicable to most oil and gas operating areas around the globe.



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For the past 11 years, his focus has been on well integrity issues including policy, diagnostics, best practices, program management and regulatory compliance. Dethlefs has a Bachelor of Science in General Engineering, a Master of Science in Civil Engineering and a Masters of Business Administration.