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## **Question 51: What key parameters of coker furnace tube design and metallurgy do you experience that can impact run-length? What metallurgy do you use specifically to increase run-length and tube life?**

**PAT BERNHAGEN** (Amec Foster Wheeler)

For many years, our standard has been 9 Cr-1 Mo tubes. We also have numerous Amec Foster Wheeler delayed coker heaters that have been retubed with 347SS. For setting the design temperature and pressure, we use the maximum design temperature of the 9Cr-1Mo material (1300°F) and full pump shutoff pressure as our coil design basis. With an approximate 1000°F clean tube metal temperature (TMT) and the 1300°F maximum, a 300°F range of operations is achieved. Typically, a 50°F margin is applied to the maximum as a limiting temperature. This temperature (1250°F) corresponds to the maximum recommended temperature by our Operations group based on their experience, as exceeding this number causes harder coke deposits on the tubes. The harder coke does not spall off readily, and online spalling is the greatest tool to impact run-length of a delayed coker heater. Due to our experience with the harder coke, we do not recommend design temperatures above 1300°F with operations above 1250°F.

Therefore, the use of 347SS is a retrofit option that clients have used for increased spalling operations, as we understand. We caution clients using 347SS that compounds in the feed and fuel, along with any condensate used for injection or spalling medium, can cause stress corrosion and other attack forms in the tube materials. Industry has used soda ash washes and flushes to prevent such attacks, among other remedies.

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