TECHNICAL BULLETIN

PROGRESSING CAVITY PUMPS | LS-TB-016

BULLETIN NO.	TOPIC	ISSUE DATE	ISSUED BY
LS-TB-016	PC PUMP CORROSION RESISTANT COATINGS	OCT 6 2020	ENGINEERING

BACKGROUND

Within the Canadian market most progressing cavity (PC) pump stators are no longer painted as the historical paint only served a cosmetic purpose and was as such was a non-added value cost in a cost sensitive market. The result is that the typically carbon steel stator tubes experience corrosion when stored outside or after exposure to the downhole well environment. Normally this corrosion is limited to the surface such as shown in Figure 1a and has no impact on pump functionality given that the stator tube is usually is not subject to high loads and serves primarily as a housing for the elastomer and attachment to the tubing and other accessories. However, there are downhole environments where the tube corrosion can become more aggressive such as shown in Figure 1b where it has resulted in pits and associated loss of tube material. If severe enough the structural integrity of the stator body or end connections can be compromised potentially leading to failures.

Figure 1 Stator Tube Corrosion – (a) normal surface corrosion; (b) structural corrosion.

Corrosion inhibition can be effective at minimizing stator tube corrosion provided that the treatment can contact the stator surface but this is often not a preferred solution due to treatment logistics and cost.

CORROSION RESISTANT COATINGS

In an effort to cost effectively address mild to moderate corrosive environments LSI identified various corrosion resistant coatings and evaluated them on endless rod and stator tube materials through laboratory corrosion testing. Extended duration outside environmental testing is also being conducted on full stator tubes and while still ongoing is anticipated to support the lab findings. Based on the lab testing, as well as consideration to the application process and coating cost, coatings LSI-SS has been selected for stator field trial testing.

LSI-SS has 33% stainless steel in the dry film with the rest of the composition comprised of epoxy and phenolic resin-based material. Figure 2 shows before and after pictures from testing of the LSI-SS coating relative to an uncoated tube in a 5% KCl water solution in an open bath at 30°C for 7 days. As illustrated, there was visibly evident surface corrosion on the uncoated tube while the uncoated tube exhibited no sign of corrosion.

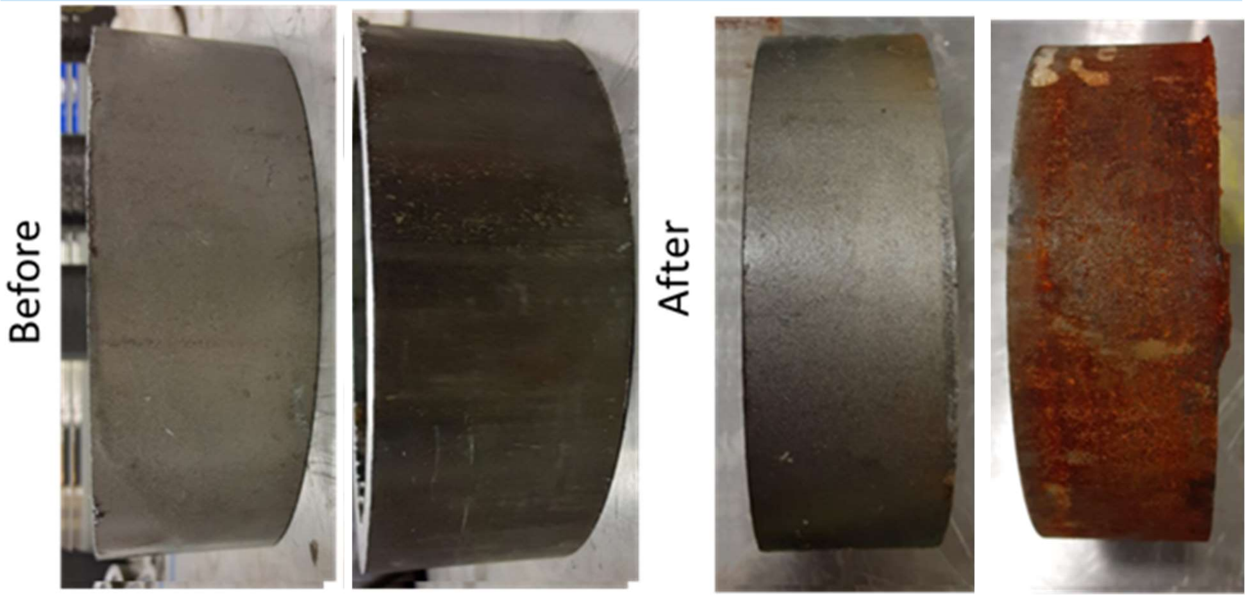

Figure 2 Lab Corrosion Testing of LSI-SS Coating and Bare Tube – (a) before ; (b) after 5% KCL 30C/7 day exposure.

FIELD TRIAL PROGRAM

The LSI-SS coating is sprayed resulting in a thin dry film. Due to the nature of the material and its thin layer (<0.001") this coating is anticipated to have limited durability. Accordingly, the coating has the potential to have its barrier protection compromised, or potentially the coating removed, under handling or operational conditions that induce significant mechanical contact. Field testing is being conducted to evaluate the durability of the coating and protection it provides downhole. An evaluation will be made based on post-pull inspection of the stator tubes.

ONGOING INVESTIGATION

Investigation is ongoing into other potential stator tube coatings with a focus on one with a similar make-up but that can be applied by painting to simplify the application process. Additionally, thicker more durable coatings are being explored and while a variety of options exist, they introduce additional manufacturing complexity and cost as well as give rise to the potential contamination of the produced fluid stream of foreign materials.

Stators can be manufactured with corrosion resistant tube materials such as stainless steel, but the material cost and complexity added to the manufacturing and assembly (welding) process render this a last resort for severe environments.