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Lecture

Development of a post oxidizing process over nitrided medium alloy steels for wear and corrosion protection in oil sucker rod lift

📅 Thursday (27.09.2018)

🕒 15:00 - 15:15 📍 S1/03 - 123 (/index.php?id=5980&L=0&tx_dgmprogram_fullprogram%5Broom%5D=123&tx_dgmprogram_fullprogram%5Baction%5D=show&tx_dgmprogram_fullprogram%5Bcontroller)

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📌 Part of:

F02.3: Corrosion and Wear Protection Control Session

📅 Thursday (27.09.2018)

🕒 14:45 - 16:15

GAS INDUSTRY WEAR PROTECTION CONTROL

OXIDE LAYER

PLASMA NITRIDING
PPD

In the Oil & Gas industry, the Sucker Rod Lift is an artificial lift method to extract fluids (oil, water, condensate and/or gas) from a well with a sucker rod string and sucker rod pump operating in a linear reciprocating mode.

Polished pumping devices (PPD) are used in sucker rod lift systems. These PPD have a surface finish designed to facilitate a pressure seal in a stuffing box and to provide a mechanical link between equipment inside and outside the well. Nowadays, available commercial PPD are surface coated with electrolytic hard chrome or by thermal spray techniques. Nevertheless, many failures have been reported in these mechanical devices: a combination of wear and corrosion causes hard chrome linear scratching (wear out) and localized coating delamination (flake off). Also, environmental concern on the use of hexavalent chromium stimulated the research activities for alternatives of hard chromium.

Plasma nitriding plus oxidizing is a promising duplex process to replace electrolytic hard chrome in low and medium alloy steels. To study this surface treatment, AISI 4140 polished PPD prototypes were nitrided, in a DC Plasma industrial equipment, and then were oxidized in the same chamber. Witness specimens were also treated and analyzed in the laboratory. Surface layers were characterized by XRD, Raman Spectroscopy, optical and electronic microscopy. They were tested in wear and corrosion experiments, comparing them with the blank base material or the nitrided steel without oxidizing. Pin on disk, scratch test, salt spray fog and electrochemical measurements were carried out.

The oxide layer as post treatment was good for atmospheric corrosion resistance tested in salt spray fog. In accelerated corrosion tests, on the other hand, the integrity of the nitrided compound layers and the surface finishing were determinant (more than the oxide layer). So, the finer the polishing, better the results. The nitrided layers assure a good mechanical behavior in sliding wear and scratch test.

Finally, PPD prototypes were tested in a linear motion mechanical device that simulates field sucker rod lift. The environment was an aggressive Cl, Mg, Na and Ca artificial water solution. Chrome coated rods were tested as a standard comparison too. In this type of coated rods, surface damage initiation was detected at 240 h. They suffered linear wear and localized pitting. In the nitrated and oxidation PPD prototypes, no damage was detected until 380 hs.

Speaker:

Dipl.-Ing. Pablo Cirimello ([https://2018.mse-congress.de/index.php?id=3045&L=0&tx_management_profile%5Bpk%5D=fvwwwvj24nj01c7946tpnCoPe&tx_management_profile%5Baction%5D=index&tx_management_profile%5Bcontroller%5D=YPF_Tecnología_S.A_\(Y-TEC\)](https://2018.mse-congress.de/index.php?id=3045&L=0&tx_management_profile%5Bpk%5D=fvwwwvj24nj01c7946tpnCoPe&tx_management_profile%5Baction%5D=index&tx_management_profile%5Bcontroller%5D=YPF_Tecnología_S.A_(Y-TEC)))

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Symposium				
● F02: Surface Engineering and Functionalisation (/index.php?id=5980&L=0&tx_dgmprogram_fullprogram%5Bcategory%5D=1600&tx_dgmprogram_fullprogram%5Baction%5D=singleview&tx_dgmprogram_fullprogram%5Bcontroller%5D=Category&cHash=)				
F02.1: Wear and Friction Reduction				Session
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F02.2: Nanomaterials and Nanostructuring				Session
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F02.3: Corrosion and Wear Protection Control				Session
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F02.4: Sensors and Wetting Control				Session
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F02.5: Bioresponse to Functionalized Surfaces				Session
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🕒 18:00 - 19:00 (/index.php?id=5980&L=0&tx_dgmprogram_fullprogram%5Bcategory%5D=2279&tx_dgmprogram_fullprogram%5Baction%5D=singleview&tx_dgmprogram_fullprogram%5Bcontroller%5D=Category&cHash=)				

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