Study Synergy Effect on Erosion-Corrosion in Oil Pipes

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Abstract
Steel corrosion and erosion-corrosion have an important role in oil fields utilizing steel pipelines. Therefore; in the present work corrosion, erosion and erosion-corrosion tests are studied individually to investigate the interaction between corrosion and erosion processes and to quantify the synergy (that caused by erosion) in realistic flow environments.

The experimental work tests were done using special device which was designed and manufactured according to (G 73) ASTM with certain modifications.

The experimental work tests were achieved using traditional weight loss technique to measure weight loss rates in (g/md) unit. Also the microstructure observations of the test specimens are studied.

It was observed that whole tests were conducted on oil pipe (X 60) made of low carbon steel in plate form, tests were made on corrosion using 3.5 wt % sodium chloride. (NaCl) solution as sea water purged with CO2 gas as the corrosive medium in crude oil, erosion using 1 wt % silica sand as the erodent in distilled water purged with N2 gas as anti corrosive medium to get erosion just during erosion and erosion-corrosion using the same mentioned medium in the corrosion but in erosion-corrosion 1 wt % silica sand was added as slurry to that medium, all tests above were done under pumped media except in case of corrosion and pumped media had constant pressure of 1 bar, flow rate Q = 36 L/min, temperature ≈ 25 ºC and pH = 4.4 for corrosive and erosive-corrosive media but pH = 7.4 for erosive medium.

After traditional weight loss technique was achieved, it was found that corrosion rate C.R (0.18144 g/md) was the smallest, erosion rate E.R (0.80214g/md) was greater than corrosion rate (C.R), but erosion-corrosion rate EC.R (3.99161g/md) was the biggest ie. (EC.R was greatest), in addition synergy (0.0315g) was calculated by using special equation related to weight loss which was measured in (g) unit.
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Synergy effect on erosion-corrosion in oil pipes is studied. The aim of the work is to investigate the synergistic effect on weight loss of oil pipeline samples in a corrosion database. The samples were test-rolled in 3.5 wt% HCl solution at 25°C. The effect of CO₂ partial pressure on corrosion was investigated.

The results show that the presence of CO₂ enhances the corrosion rate. The corrosion rate is higher at higher CO₂ partial pressure. The synergy effect is more pronounced at higher CO₂ partial pressure. The results also show that the synergy effect is more pronounced at higher CO₂ partial pressure. The synergy effect is more pronounced at higher CO₂ partial pressure.