Corrosion Mechanism:
TLC (Top of the Line Corrosion)

Alloy:
Plain carbon steel, X52

Equipment:
NPS 4 emulsion flowline

Corrosive Environment:
The line transports produced emulsion, as well as sour gas (5.5% CO_2 and 1.2% H_2S at 1200 kPa and 15 °C) from an individual well. Produced brine has a low salinity.

Comments:
The line was in operation for 9 year before failure. The failure site was located along flat terrain approximately 50 meters from the individual well producing into the line. The line was not under any corrosion inhibition program and there was no pigging to promote fluid wetting to the top pipe position. It was identified that corrosion mechanism is top of line corrosion due to acidity of condensed water created by the presence of acid gases (CO_2 and H_2S) and volatile organic acids.
There was no internal corrosion activity to the bottom or lower side wall indicating the low salinity produced brine with a near neutral pH in combination with hydrogen sulfide and a low operating temperature results in a low corrosivity to steel in the water phase.

Remedy:
Pigging in combination with batch corrosion inhibition program is required to provide a protective film on top of the line in contact with the vapor phase in the line.