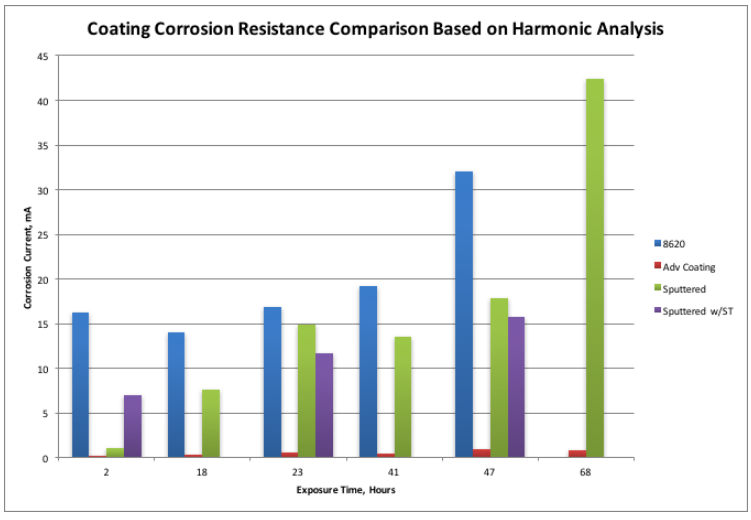
Falex Litigation Technical Investigations
Corrosion Rate Case Study

Falex Litigation Technical Investigations conducts failure analysis investigations for insurers and litigators, which sometimes involve testing of materials, lubricants, and fuels to determine the cause of corrosion. This case study demonstrates our comprehensive approach to obtaining reliable corrosion rate data for difficult-to- measure systems. In this case, we examine coatings on 8620 steel that can offer significant wear and corrosion resistance, but make it difficult to screen with conventional test methods. Our results show what insight can be obtained from our approach, which can go well beyond just the corrosion rate and provide extremely valuable information on the structure of coatings, such as the porosity and rate of water uptake, so that reliable, long-term estimates of performance can be obtained.

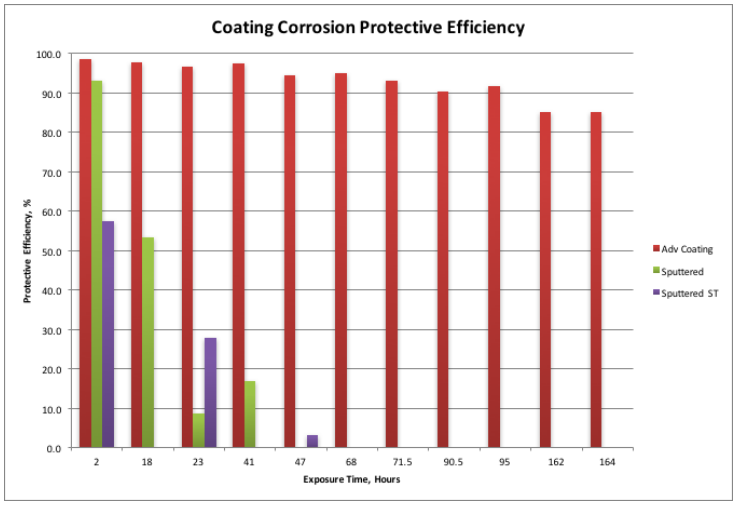
The measured corrosion rates for the bare metal (8620) and three coatings are shown in the next Figure. There is variation between absolute values of the various techniques, which is typical for these techniques, but there is good agreement in the trends for the techniques. The conclusions for the corrosion resistance of the specimens are the same for all of the techniques. The results show that the corrosion current for bare 8620 is substantial by two hours of exposure to 3.5 wt. % NaCl. The corrosion current for the sputtered coating starts out substantially lower than for bare 8620, but attains the rate of bare 8620 by about 24 hours. The sputtered coating with a surface treatment (Sputtered ST) does not perform any better. The advanced coating shows excellent corrosion resistance.



The protective efficiency, *P%*, of a coating is defined as:

$$\% = \left(1 - \frac{I_{corr-coating}}{I_{corr-8620}}\right) * 100 \quad .$$

The next Figure shows the protective efficiencies of the coatings. The protective efficiencies are all relative to 2 hours exposure of bare 8620. This may be an easier to understand presentation of the data than showing corrosion rates.



More detail on the technical methods and tests we use can be found in:

- *Electrochemical Corrosion Testing Methodology*
- *Electrochemical Corrosion Test Methods*
- *Corrosion Mechanism Case Study*