

Corrosion Prevention and Simulation: From Design to Practical Solutions

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In a previous Corrosion Symposium, Elsyca presented “Initiating corrosion prevention during the design phase,” highlighting the importance of integrating corrosion prevention early using Computer-Aided Analysis (CAA). These tools rapidly assess corrosion risks in assemblies with different materials and surface finishes under varying environmental conditions, enabling engineers to proactively mitigate issues during development. This presentation shows how CAA evaluations generate key indicators such as Time to Exposure (TE) and Time to Dimensional Intolerance (TDI). TE estimates how long protective layers (e.g. Zn or Zn-Ni) last before exposing the substrate, while TDI indicates when corrosion will compromise dimensional specifications.

Passivating materials like aluminum, titanium, and stainless steel are widely used but prone to pitting corrosion, a complex form of galvanic corrosion. Traditional modeling approaches are insufficient, as corrosion rates depend on pit initiation and growth. This work highlights the need to integrate heuristic pit nucleation models into CAA tools to improve predictive accuracy.