Leveraging Machine Learning to Improve Flaw Depth Sizing in Balance-of-Plant Components

Thiago Seuaciuc-Osorio[1]

[1]Nuclear Sector, Electric Power Research Institute, USA

Eddy current (EC) inspections are commonly employed to assess the condition of balance-of-plant (BOP) components in the nuclear industry, such as heat exchanger tubing. While capable of reliably detecting relevant indications, current industry practices can be challenged to provide accurate accurately characterization, especially for certain types of damage such as microbiologically induced corrosion (MIC). On the one hand, poor depth sizing may negatively affect performance if it leads to tubes being unnecessarily removed from service; on the other, it may compromise safety if severely damaged tubes are left in service. In this presentation, the author will describe the process used both to establish a benchmark for the performance of the industry's current practices in depth sizing inner diameter pits in heat exchanger tubing through eddy current testing, as well as to build machine learning (ML) models for the same purpose. The results show that, when compared to current practices, ML approaches not only provide a performance at least two times better than realistically expected field performance, but also better than an ideal unattainable case obtained with self-calibration. Lastly, the author will show that, although inconclusive due to limited available data, the approach has yielded promising results when used to characterize MIC damage in field-removed samples.