Gathering POD Data with Virtual Round Robin

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Round-robin exercises are instrumental in assessing the current capability of non-destructive inspections. Especially for challenging inspections, such as dissimilar metal welds, blind exercises and comparative studies give vital information about the true capability of various used methods and procedures and enable comparison between currently used and newly developed methodologies. For inspection companies, round-robin exercises give rare opportunity to benchmark against other inspection companies. Probability of detection (POD) analysis is routinely used in many industries to quantify the NDT performance. For the nuclear industry, POD has proven difficult to obtain. The key reason for this is, that proper POD determination requires statistically significant number of cracks in a blind inspection exercise and producing (and testing) large number of cracked samples has been economically infeasible. Recently, the use of virtual flaws have made it possible to increase the apparent number of cracks in ultrasonic data artificially and to produce statistically significant data set without manufacturing or scanning equal number of actual physical mock-ups. The way this works is, that a limited number of mock-ups and flaws are scanned to form a source data file. This source data file is then modified to produce number of data files with varying number and types of flaws included. Within the framework of international project "PIONIC" (Program for Investigation of NDE by International Collaboration), this new technology is put to use in the form of a new round-robin exercise. Such a virtual round-robin provides several advantages over traditional round-robins: there's no need to ship the physical samples around and thus participating companies can act in parallel, greatly speeding up the process. While the data modification may induce some characteristic features on the data (e.g. repeating noise), the virtual flaws themselves are indistinguishable from normal flaws in the data. Furthermore, the repeated effort of scanning the samples is avoided, and the round-robin can be focused on data analysis only. This reduces the effort required to participate. At the same time, significantly greater number of flaws can be included to provide sufficient result for statistical analysis and POD determination. This paper reports the results on the PIONIC virtual round robin and provides insight and lessons learned from this first virtual round robin of its kind.