STEPS TO GENERATE TRANSFER FUNCTION POD

Draft of 5/31/05

1. Define the intended use of the POD activity.
    a. Identify characteristics of the inspection (i.e., surface connected crack via eddy current, volumetric defect via ultrasonic at normal incidence)
    b. Absolute curves for use in lifing / risk analysis
    c. Relative comparison – if a relative comparison is desired, use only artificial defects in the actual geometry
2. Generate artificial flaws in geometry of interest
    a. Identify artificial flaw type appropriate for the inspection technique and inspection approach considering the geometry and flaw orientation, and inspection physics.
3. Generate artificial flaws in simple geometry
    a. Artificial flaws generated in the simple geometry should be of the same size range and geometry as the artificial flaws in the geometry of interest. For example, if the artificial flaw for an eddy current inspection is an EDM notch installed normal to the surface with a 3:1 aspect ratio, then the artificial flaw in the simple geometry should be an EDM notch installed normal to the surface with a 3:1 aspect ratio.
4. Generate realistic flaws in simple geometry
    a. The same simple geometry should be used for the realistic flaws as was used for the artificial flaws in the previous step.
    b. The realistic flaws should as closely as possible replicate the flaw that the inspection is intended to detect.
5. Collect data on the 3 sample types identified.
    a. Data shall be collected using the same probe type as used in the inspection. Where practical, data shall be collected on all specimens with the same probe. Circumstances may arise where the probe geometry is not conducive to the scanning both the complex geometry and the simple geometry. In this situation, the same sensor design may be used for the simple and complex geometry though in different probe bodies. If two probes are required, both probes should be related to each other through a common artificial defect.
    b. The data should be collected in a manner to minimize variability in a way that is consistent with a laboratory measurement as opposed to an inspection as the intent is to develop an analytical expression to ultimately describe the relationship that will transfer the response of actual defects in to the complex geometry where realistic defects

can not be practically generated in quantities sufficient for a purely empirical POD to be generated.

6. Establish relationship between realistic flaws and artificial flaws for simple geometries using data from well-controlled lab studies
    a. Generate regressions to relate realistic defects and artificial defects in the simple geometry.
    b. Generate regressions to relate artificial defects in simple geometry and the complex geometry.
    c. Using the 2 regressions generate above, generate a relationship between the real defects in the simple geometry and the artificial defects in the complex geometry.
7. Determine variability through POD study of artificial defects in geometry of interest.
    a. The POD test matrix should be constructed using the guidelines in MIL-HDBK-1823 or other accepted methodology.
    b. An inspection procedure shall be drafted and the inspectors to be utilized in the POD exercise trained to perform the inspection utilizing specimens not to be used in the POD exercise.
    c. Collect and record the signal response data per the test matrix utilizing trained inspectors and an established inspection procedure.
8. Utilize relationship from samples (step 6) and variability data from artificial defects in complex geometry (step 7) to generate variability data for cracks in geometry of interest
9. Generate POD vs. crack size curves for the geometry of interest utilizing MIL-HDBK-1823 or other accepted methodology.