

STEPS TO GENERATE MODEL-ASSISTED POD

1. Identify controlling factors whose influence on a flaw response signal can be deterministically predicted using a physics-based model with appropriate input parameters.
2. Develop appropriate model.
3. Validate the accuracy of the physics-based model in the laboratory through well controlled experiments
 - a. This step should include a careful analysis of uncertainties
 - i. Uncertainties in the experimental measurements
 - ii. Uncertainties in the values of input parameters to the model
 - iii. Sensitivity of model predictions to the latter
 - b. It will be necessary to establish what level of agreement between experimental measurements and the predicted results is satisfactory
4. Determine values of input parameters (or parameter ranges) that describe field application
5. Use simulation tool to predict mean response and those components of variability controlled by well understood physical phenomena
 - a. In this context, “simulation tool” refers to a computer code, based on a physics model and provided with a set of input parameters, that makes a deterministic prediction of a flaw response.
 - b. A simulation tool can also be used to predict the distribution of signals that would be produced by a distribution of input parameters
6. Identify additional sources of variability associated with components of variability not controlled by either

- a. well understood physical phenomena or
 - b. variations of input parameters that cannot be fully controlled in the production environment
7. Determine if these are statistically independent so that variances add
8. Design experiments to determine these additional sources of variability
 - a. This will generally require less time/cost than the experiments required for a fully empirical POD determination because one will be seeking less information from the data.
 - b. This may be a necessary step to assess the variability attributed to system/operator which are not calculable but rather require an empirical assessment.
9. Conduct those experiments
10. Compute POD
 - a. Assume variance is the sum of the variances predicted in terms of models and the additional variances that must be determined empirically