Impact Testing

Impact testing is typically used to determine the natural frequency on the end-turns for stator and rotor coils as well as rigid structures. An Impact and Modal Test (Bump) for a Stator typically requires the following activities:

1. Set-up and Preparation
   - Equipment set up
   - Get dimensional information for mode shape models.
   - Perform Reciprocity testing to determine:
     a. Hammer tip hardness.
     b. Instrumentation settings.
     c. Structure is linear and conforms to standard testing techniques.
2. Global End Basket Test, Impact on Basket

   An impact will be applied at a single location. This location is typically on the nose ring or somewhere near the end of the basket at the 6:00 position. The basket's response to this impact will be measured in the radial, tangential and axial directions at a sufficient number of points to characterize the baskets mode shapes. This will include 3 rings, one adjacent to the core, one at the middle of the basket and another near the basket end. Each ring will contain a minimum of 12 equally spaced measurement points.
3. Local End Turn Testing

   EME will impact and measure the response on all coil end turns at both ends in all three directions. The impact will be applied in a radial direction. The results will be reviewed throughout the testing for an immediate assessment.
4. Phase Lead Tests

   Each phase lead, top and bottom, will be tested. The final procedure used for this testing will be determined as the testing proceeds. Initially the accelerometer will be affixed to the phase lead at or near its connection to the coil end. The response will be measured in each of the three directions to an impact in the corresponding direction. As the testing proceeds and based on sound engineering judgment, this test may be altered in order to better characterize the phase lead response.

For 'rigid' structures, the Impact Modal Test is utilized to determine natural frequency (□n) and relative response of a composite structure to determine how closely coupled the individual components are. (e.g. Generator Mounting pedestal and Generator Foot.) Closely coupled responses indicate the two components in question behave as a single structure. Significant differences in the responses indicate the components are not solidly connected. When comparing two components for consolidation it is useful to determine a "loose" and "tight' configuration. This is typically done on a mockup purpose built for establishing these conditions. As part of a Rotor Dynamics Study, Impact Modal Testing of a Freely Suspended rotor is an excellent data point for comparison to the analytical model. Additionally, the Impact Modal Test can be applied to determine the relative response of the rotor components, provided sufficient physical space exists to instrument the various components with accelerometers.

Throughout the testing, particular attention is given to both global and local responses at the operating speed frequency (e.g. 120 Hz region for a 2 pole Turbo Generator). The test results will be reviewed and discussed with the customer and general recommendations based on the test results provided based on our experience and the application of sound engineering judgment.

Following completion of testing, a report will be assembled which contains graphic presentations of the data, descriptive interpretations of the data and conclusions and recommendations. Modifications to this general procedure may be made by the test engineer when in order to adapt to the specific conditions at the machine during testing.