Rotor Dynamics

State of the Art Rotor Dynamics

Rotor Dynamics: Rotor dynamic expertise was originally developed during the Department of Energy Gas Centrifuge Program of the 1970s and 1980s. It has been further developed in support of the USEC American Centrifuge Project since 2000.

In addition to balancing algorithm and code development, DSAS Group members have been involved in training USEC and strategic supplier employees in the use of the balance codes.

The group maintains significant expertise in the area of rolling element bearings.

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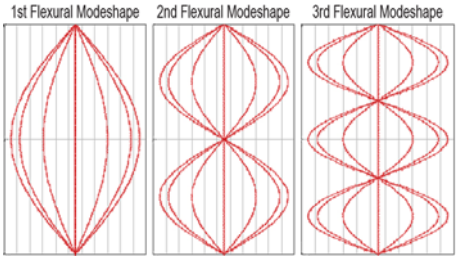
Rotor dynamics is one of the core technical areas for the Dynamic Systems Analysis and Simulation (DSAS) Group. Capability in this area includes modeling and simulation, both steady-state and transient, and rotor balancing of both subcritical and supercritical rotors. In addition, the group has experience in one- and two-plane balancing and simulation of multi-shaft supercritical rotor systems. Group members have developed and implemented all the balancing algorithms and codes used by the USEC American Centrifuge Project. (Rotor dynamic codes and balancing algorithms developed under the USEC Cooperative Research and Development Agreement are not available for use in other projects.)

Rotor Dynamic Analysis

Rotor dynamic analysis is a critical step in the design of any rotor system. This analysis guides the selection of rotor stiffness properties, rotor geometry, and the bearing and suspension properties. Additionally, rotor dynamic analysis will indicate the location of "critical" speeds and safe operating speed ranges. Matlab-based rotor dynamics codes can be used to perform the following analyses:

- Critical speed and mode shape analysis.
- Steady-state deflection due to imbalance, static offset, or applied point forces or moments.
- Campbell plots showing the change in natural frequencies with angular velocity.
- Parametric studies for suspension matching and selection.
- Transient analysis.

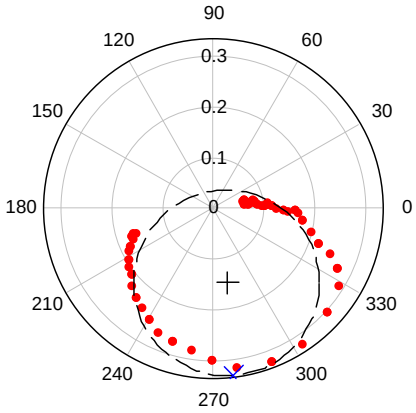
These codes can be used for rotor system design or for trouble shooting problems with existing rotor systems.



Calculated mode shapes.

Rotor Balancing

DSAS has developed algorithms for balancing subcritical and supercritical rotors. These algorithms can be applied to specific balancing applications, with the implementation normally being in Matlab or Visual Basic.



Measured balance data.

Contact Information

To learn more about the professional solutions DSAS can bring to your systems problems, please contact Brian Damiano (bdz@ornl.gov) at 865-574-5541.