ADORE Update Version 5.23

Release Date: June 15, 2005

This update modifies the cage initial conditions for dynamic simulations.

Since for most bearings it has been fairly well documented that under most stable conditions the cage whirl velocity is equal to its angular velocity and the cage whirls in a fairly circular orbit, cage motion with purely circular whirl was set as initial condition in versions 4.1 and higher. At the time it was speculated that if the cage interactions are superimposed on such a stable motion a steady-state cage motion may be reached in greatly reduced number of steps. Also, in the event of any instability the motion resulting from excessive cage interactions will be more significant in comparison to the initial circular whirl motion. However, since, there is really no applied force sustaining the initial whirl, the implementation of such a such a motion was truly an assumption based on certain experimental evidence.

Over the past few years after modeling a variety of applications it is found that with the above initial conditions, the cage interactions are greatly reduced at least during the early transients and for some applications the time required to reach steady-state is greatly increased. Furthermore, the steady-state cage whirl has demonstrated certain dependence on the initial conditions. Based on these observations, the assumption of initial circular whirl, first introduced in version 4.1 is withdrawn in version 5.23. The cage mass center velocity, corresponding to the initial whirl velocity, is now reset as simple translational velocity as done in versions earlier than 4.1. It is speculated that although the steady-state circular whirl, if and when it exists, may take a longer time to reach, cage instabilities, when they exist, may be more rapidly identified. Since there is no applied force required under such conditions, such a specification is consistent with with equations of motion and free from any assumptions.

Cage whirl in comparison to rotation about the mass center can be immediately visualized by closely examining the animated 2D cage motion provided by the animation code, AGORE, which is now also available for the Java platform. Thus implementation is much more flexible in comparison to earlier codes based on the PHIGS libraries.

The above update is only significant when bearing motion is simulated with initial non-zero whirl velocity of the cage.