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## **Improvements for Ver 19.02**

**May 9, 2017**

- Improve the Text Output Format (\*.OU2 and \*.OU4).
- Correct some spelling errors.
- Fix a bug existed in Ver 19.01 in the heat balance calculation for the Fixed Lobe Bearing Type with Advanced Features ON.
- Fix a graphic error in the torsional mode shape plot when Rigid Link in the Shaft Elements tab is checked to connect two shafts.
- Batch mode examples for verifications and future expansion – see BatchRunRotor.bat, BatchBePerfTpj.bat, BatchRunLobeDNF.bat, BatchRunReynolds.bat, and BatchRunExample.bat

## **Improvements for Ver 19.01**

**January 7, 2017**

- Use the latest Safenet (Software Protection Software) drivers.

## **Improvements for Ver 19.00**

**January 1, 2017**

- Allows dot (“.”) and white space (“ “) in the file and path name.
- Speed dependent bearing coefficients can be either spline interpolation or linear interpolation in the Rotor program. Spline function was used before Ver 19. The Bearing coefficients after the interpolation are printed in the text output file.
- Critical Speed Analysis – for speed dependent bearing coefficients, the stiffness at the last speed point was used. Now, the speed point can be specified. The damping effect can also be included if the bearing dynamic stiffness is desired.
- Add more model checking features to avoid any mistakes in building the rotor model. An element L/D checking feature can be pre-specified in the Preference Settings – Model Display Settings.
- Model Flipping (Reversing) – allows to flip the rotor model (left to right)
- Models Combining (Merging or Appending) – allows to combine tow model files into a single file. This allows users to build the complicated model with multiple rotors one rotor at a time.
- Fixed the Rotor Rigid Link feature for the torsional and axial analysis. It was initially designed for the lateral vibration only.
- Whenever possible, the formats for the number printout on the plots can be specified under Option – Settings, or pre-defined in the Preference Settings – Post Processor Graphic Settings. Also, the color for the text printout on the plots can be associated with the curve color.
- Add more graphs in program – RotorBal – Tools.
- Add minimize and maximize screen options for the main menu in RotorBal and GearLoad.
- Add leakage calculation for carbon ring seals – Rotor – Tools – Estimate Carbon Ring Seal Leakage.
- Add calculation for the maximum allowable residual unbalance per API and ISO specifications.

For more details on these enhancements, see pdf document – “Ver 19\_Examples.pdf”.

### Improvements for Ver 18.30

October 1, 2016

- Add Steady State Harmonic Response Analysis for Coupled Lateral-Torsional-Axial Vibration.
- Add descriptions for the probes and Speeds in the Rotor Balancing Program.
- Add LabySeal option in the new Main Menu
- Rewrite the Print to File for the figures and Animation files

### Improvements for Ver 18.20

January 1, 2016

- Add water properties into the lubricant library for bearing programs BePerf and ThrustBrg.
- Add hydrostatic thrust bearing into ThrustBrg.
- Add circular pad thrust bearing into ThrustBrg.
- Add summary results in the graphic output into ThrustBrg.
- For Floating Ring Bearing in Heat Balance Calculation, allow different Inlet Temperatures and Heat Carry Away Factors for the inner and outer films.
- Increase Stack Size for large rotor models.
- Add Herrinbone Gears (double - helix) and many other options in GearLoad.

### Improvements for Ver 18.10

July 1, 2015

- Allows for different single pad properties, such as preload, offset, arc length, and pivot location for each pad in tilting pad bearings.
- Add inputs & outputs summary in thrust bearing graphic outputs.
- Fixed bug in thrust bearing graphics for multiple runs
- Add Reset button in the critical speed map plot to enter the bearing stiffness manually
- Add more general motor driving torque for the torsional startup analysis

$$T_d = T_{rated} \left[ T_{avg} + T_1 \sin(\omega_1 t + \phi_1) + T_2 \sin(\omega_2 t + \phi_2) \right]$$

### Improvements for Ver 18.00

November 15, 2014

- Add Thrust Bearing and Spiral Face Seal modules
- Add more features for the Floating Ring Bearing in both Rotor & BePerf
- Improve computational efficiency, including x64

### Improvements for Ver 17.10

July 15, 2014

- Add engine misfire feature for the torsional reciprocating steady state response

- Add initial conditions (theta, theta dot) for the torsional time transient analysis

### **Improvements for Ver 17.00**

**May 15, 2014**

- Add Lateral-Torsional-Axial coupled vibration through gear meshes and thrust collars (Rider Rings).
- Add Catenary Curve Analysis using optimization technique.
- Allows for the next shaft starting station number equal to the previous shaft last station number, if they have the same speed. Like rigid link between two shafts.
- Improve computational efficiency
- Add direction of rotation in the graph
- Bearing can be plotted like inter-shaft bearing with a rectangle if Brglength = -1
- Many Rotor & Bepperf graphics improvements.
- Improve the GearLoad program, more options and more graphics
- Improve the tilting pad bearing calculation when the eccentricity ratio is very high

### **Improvements for Ver 16.20**

**January 15, 2013**

- Add torsional damped natural frequency interference diagram.
- Improve torsional time transient analysis postprocessor graphic speed
- Add hole split in the balancing program

### **Improvements for Ver 16.10**

**October 20, 2012**

- Add reciprocating torsional excitation.
- Add curve fitting selection in the torsional driving torque input
- Add more checking features in the data input

### **Improvements for Ver 16.00**

**July 1, 2012**

- Add engine torsional excitation.
- Add hydrostatic-hybrid bearing analysis.
- Add axial stiffness for the thrust bearing analysis.
- Add speed dependent viscosities and speed ratios for the floating ring bearing.
- Add weighting factors for probes and speeds in the balancing calculation.
- Add PNG, JPEG, GIF, BMP graphic formats.

### **Improvements for Ver 15.10**

**September 3, 2011**

- Add more numerical integration methods and control parameters.
- Add Phase Data for the bearing/support force.
- Add bearing/seal mass coefficients in bearing type 1 (speed dependent bearing) and 2 (bearing from data file).
- Add Frequency Dependent Damping (Dynamic Magnifier) in the torsional analysis.

- Add backlash in the torsional non-linear connection/coupling.