Program System for Turbomachinery
Rotordynamics Analysis

DYNAMICS R4

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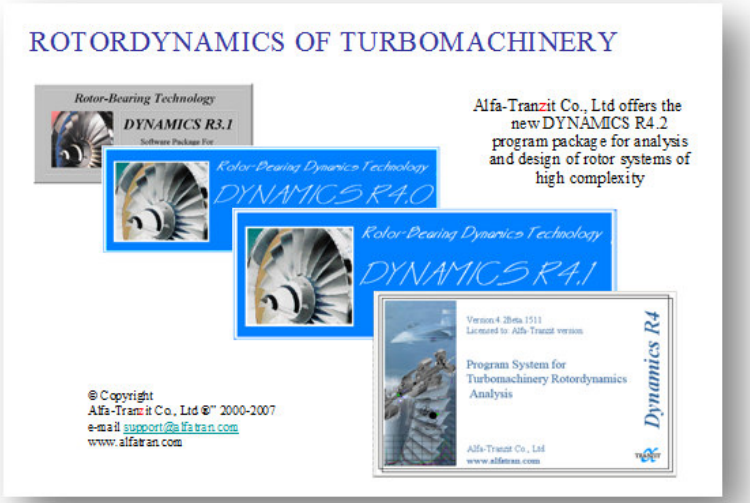
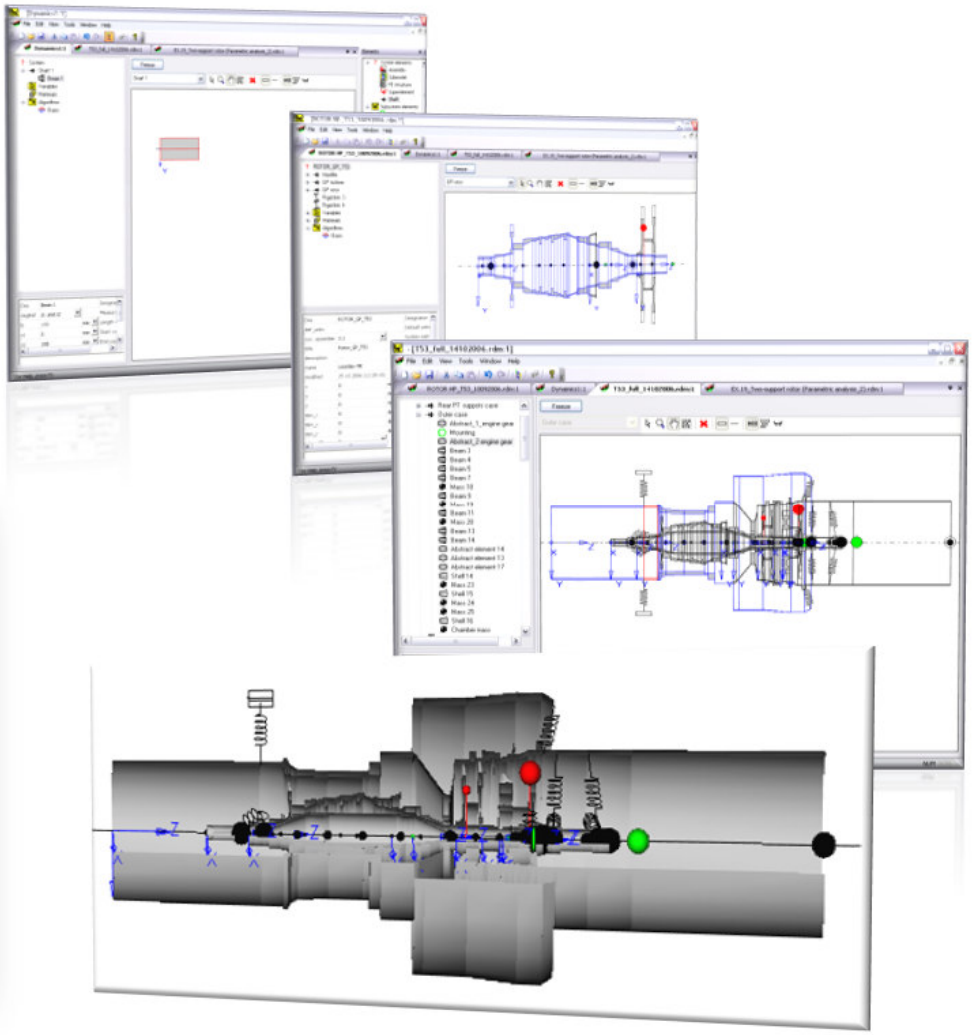
Dynamics R4 for professionals

DYNAMICS R4 – the software package is specifically developed for design, analysis and trouble shooting of many kinds rotating machinery





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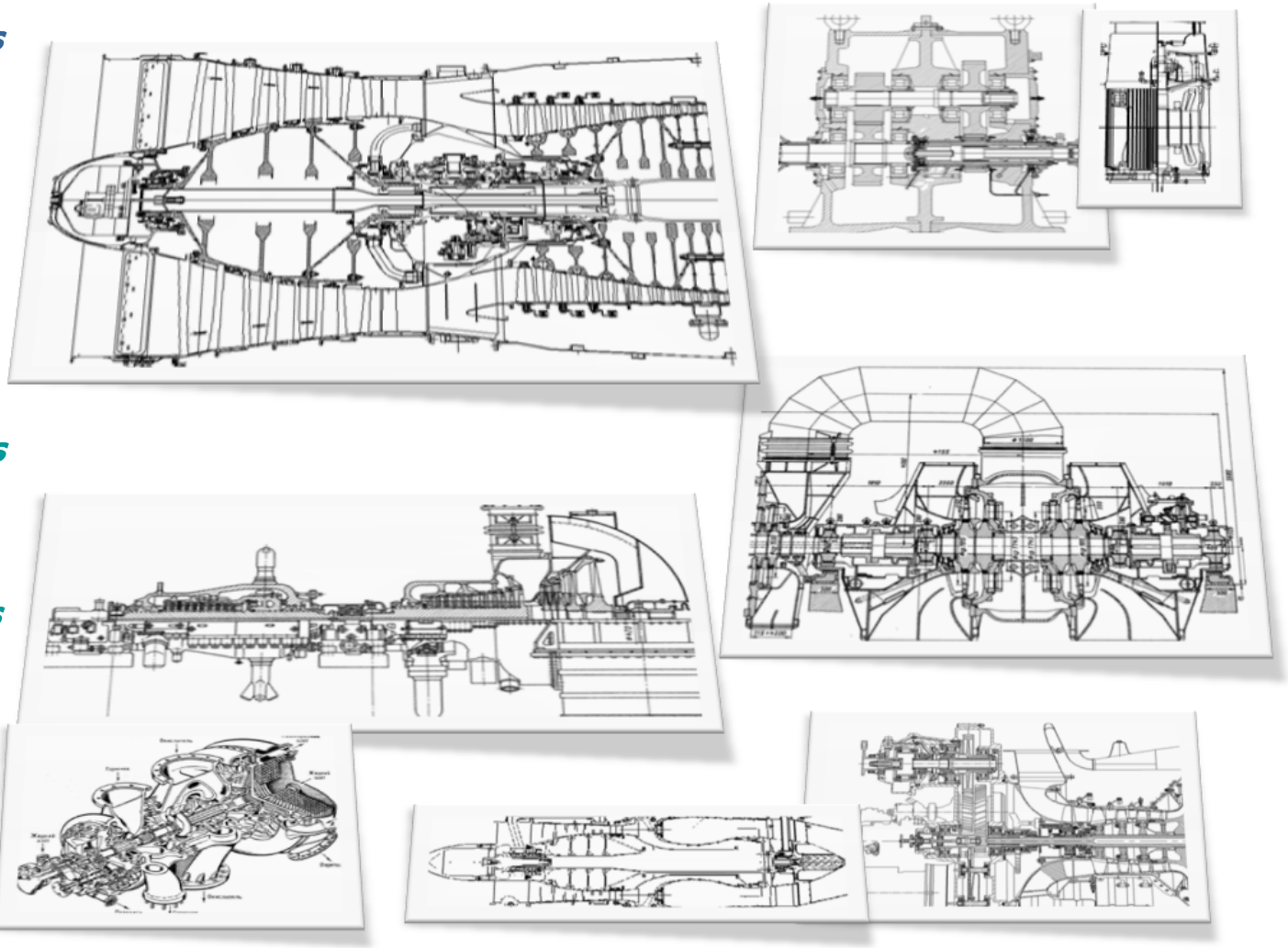
The objects of research

- *Gas-turbine engines*
- *Power plants*
- *Air compressors*
- *Starters*
- *Turbo-expanders*
- *Turbo-driven pumps*
- *Gear systems*
- *Submersible motors*
- *etc*



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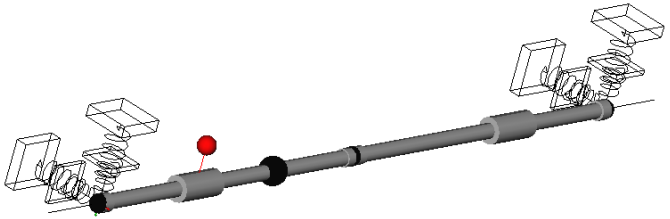
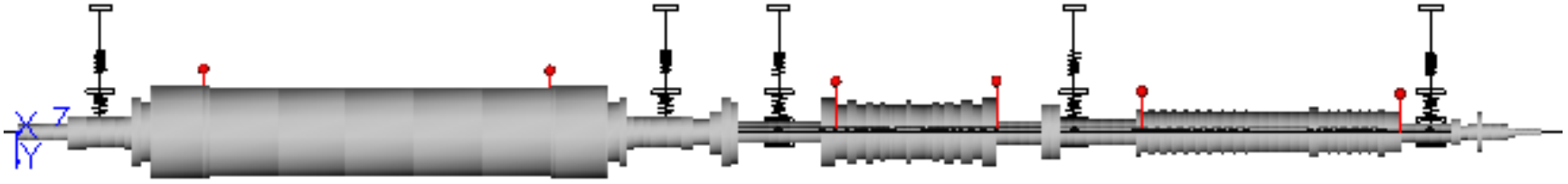
Software features

- *Finite element capabilities*
- *Coupled lateral-torsional-axial vibrations*
- *Linear analysis of rotating structures*
- *Nonlinear analysis*
- *Quasi-nonlinear analysis*
- *High accuracy and speed of computation*
- *Adaptive methods of numerical integration in transient analysis*
- *Modular architecture of program system*
- *Implantation of user's algorithms and elements into software*
- *Advanced system of information, help functions, warnings and error messages, extensive online help*
- *SI and English units*
- *More than 45 examples of models and solutions*

From simple…



…to complex



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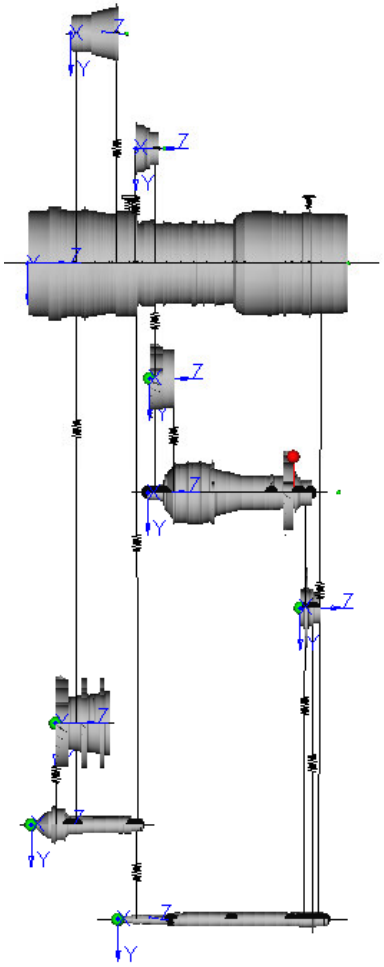
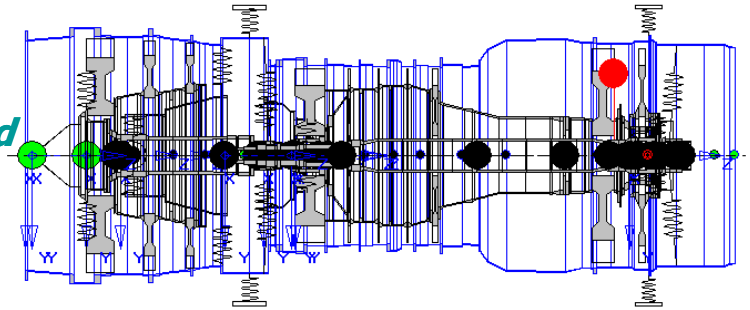
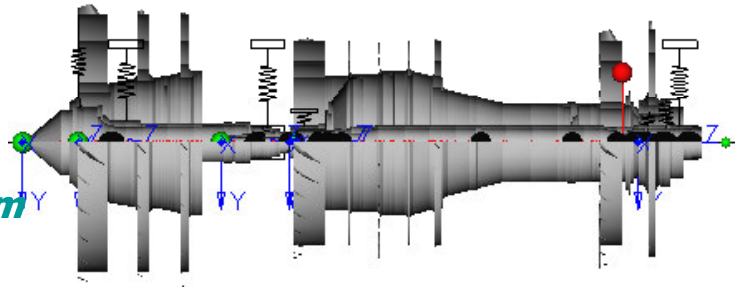
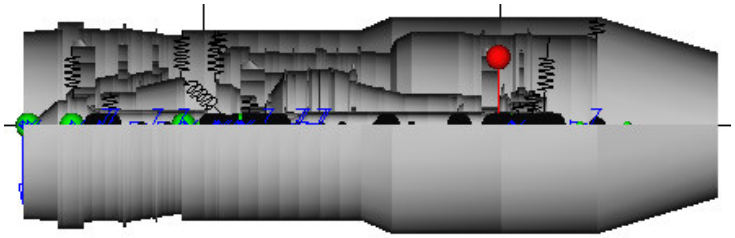
Modeling Capacity



- *Modeling of multi-shaft rotor structures with housings*
- *Modeling of spatial rotor systems and gears (helical, bevel, planet)*
- *Multi-level of model architecture: submodels, subsystems, assemblies*
- *Super-element modeling of rotor structures, import super-elements from ABAQUS, …*
- *Wide variety of shaft and bearing modeling elements for linear analysis*
- *Wide variety of bearing modeling elements for transient analysis*







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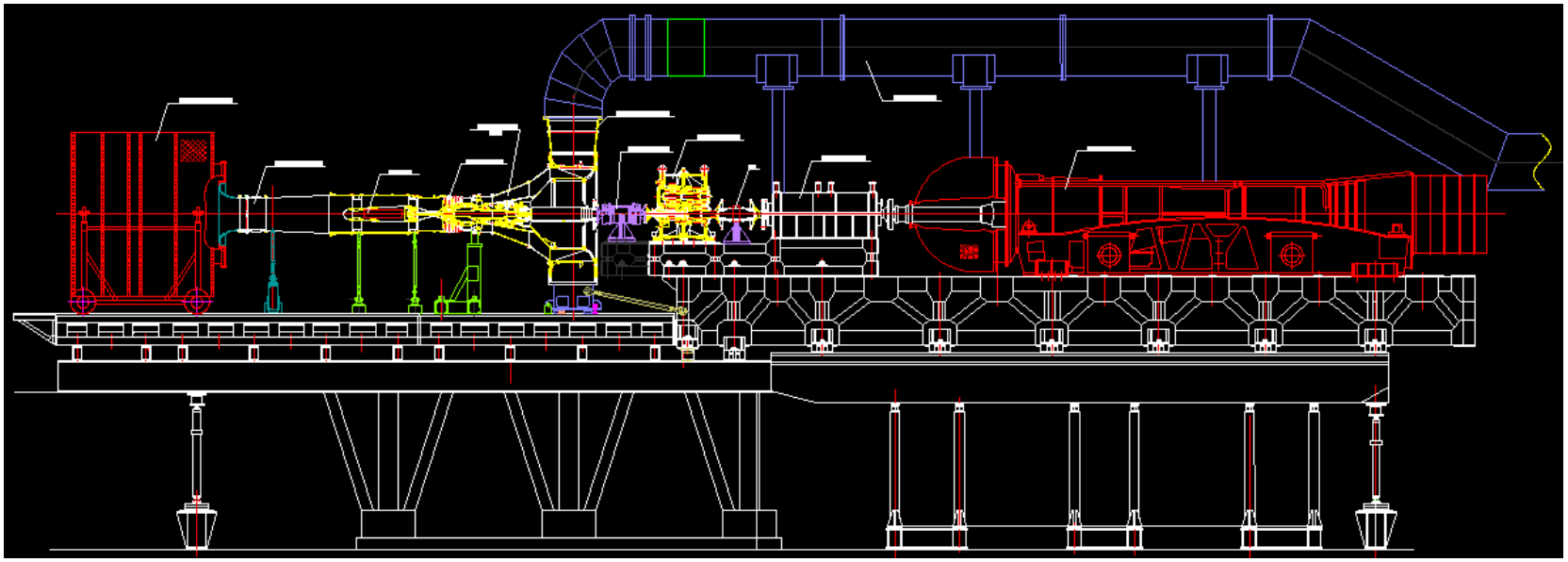
Modeling Capacity

- *Wide variety of fixed geometry and tilting-pad journal bearings for quasi-nonlinear analysis*
- *Different kinds of dampers*
- *Synchronous and asynchronous rotating forces*
- *Numerous steady and arbitrary time-dependent loads*
- *Alford 's forces*
- *Time variation of speed, stiffness and damping, loads, support position, etc*



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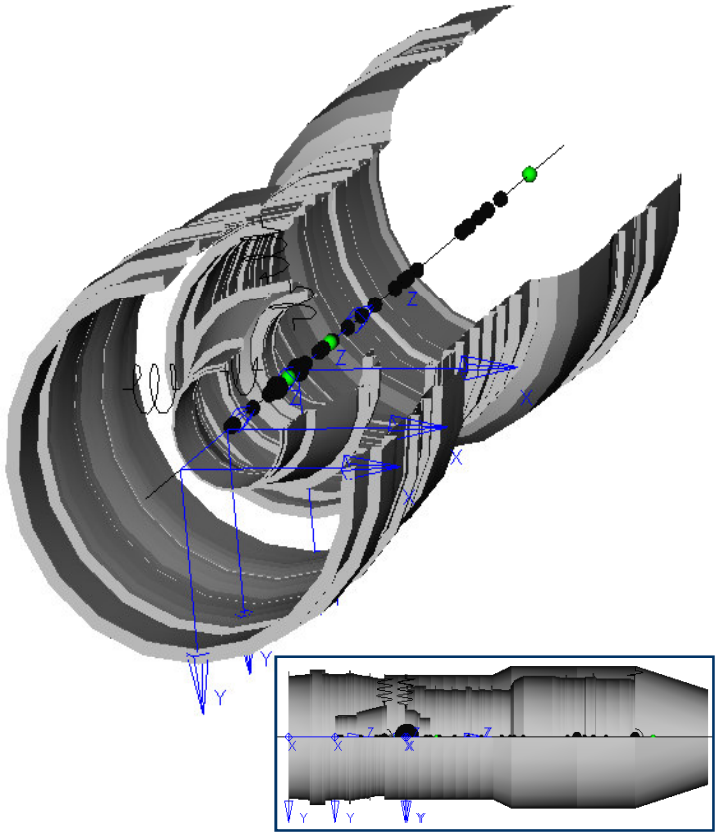
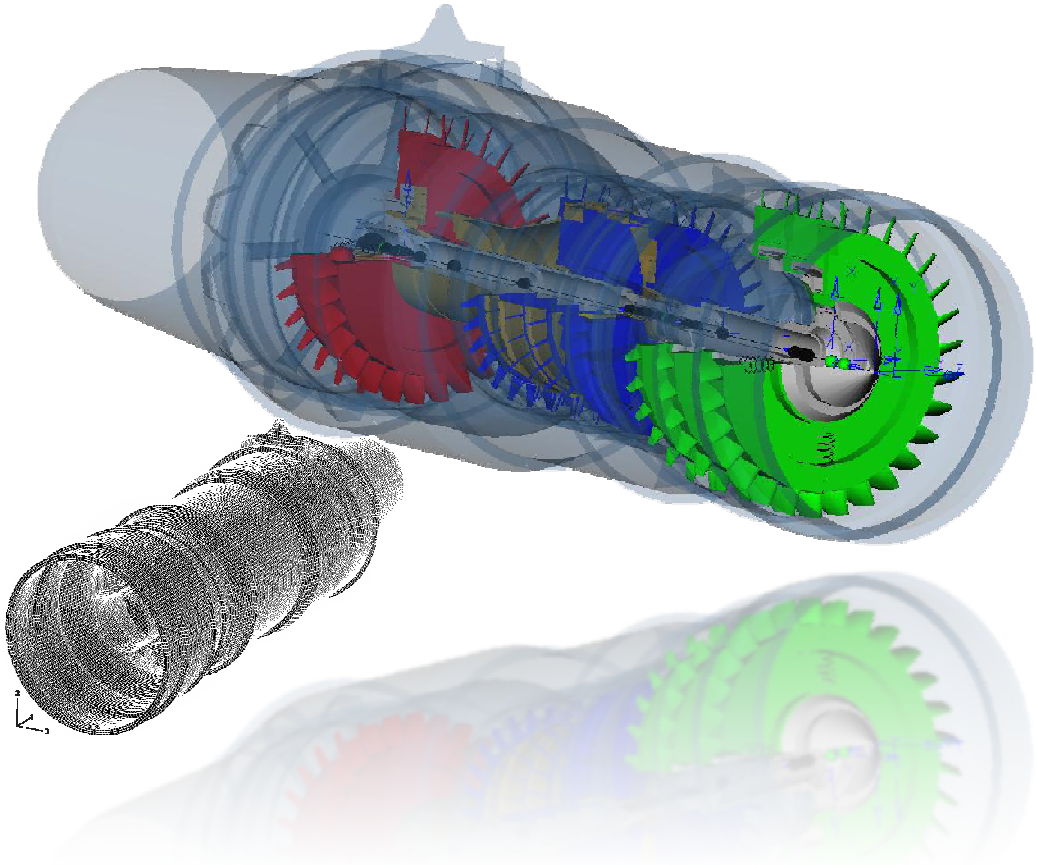
Housing models

Modeling elements – shells and rigid links





Dynamics R4 also lets importing of housings FEM from ABAQUS, NASTRAN, ANSYS

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Bearings for transient analysis

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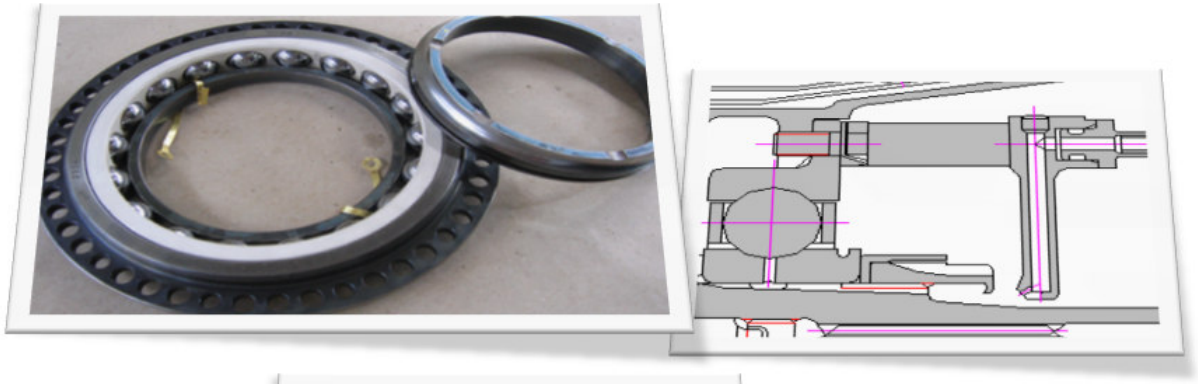
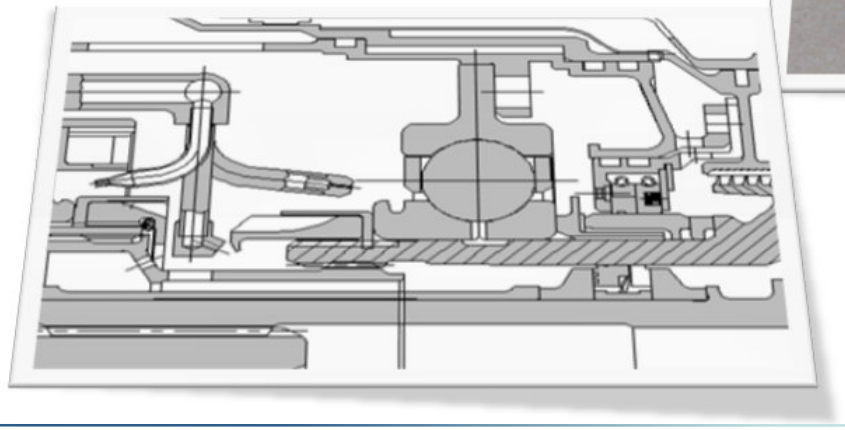
- *Plain journal bearings*
- *Squeeze-film damper support*
- *Clearance*
- *Rolling bearings*
- *Nonlinear support*
- *User's link*





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Bearings for quasi-nonlinear analysis

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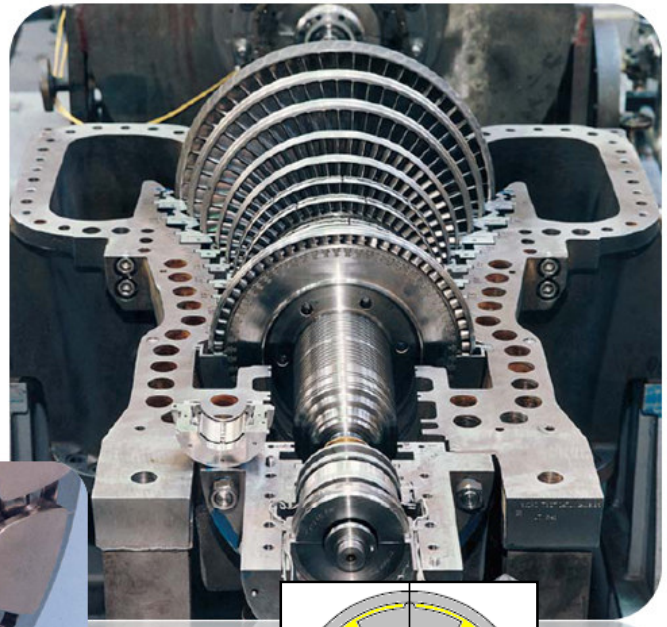
Nonlinear support (non-symmetrical stiffness and damping matrixes)

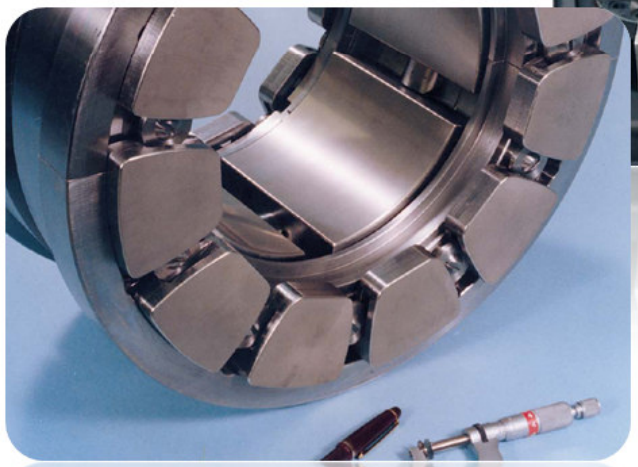
User can model the any kind of nonlinear supports.

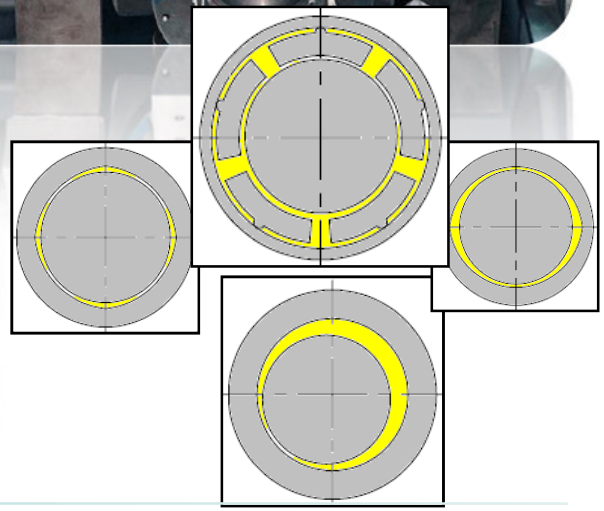
Among them:

- ***Plain sleeve bearings***
- ***Multi-lobe sleeve and lemon bearings***
- ***Partial arc***
- ***Pressure dam***
- ***Tilting pads***

etc







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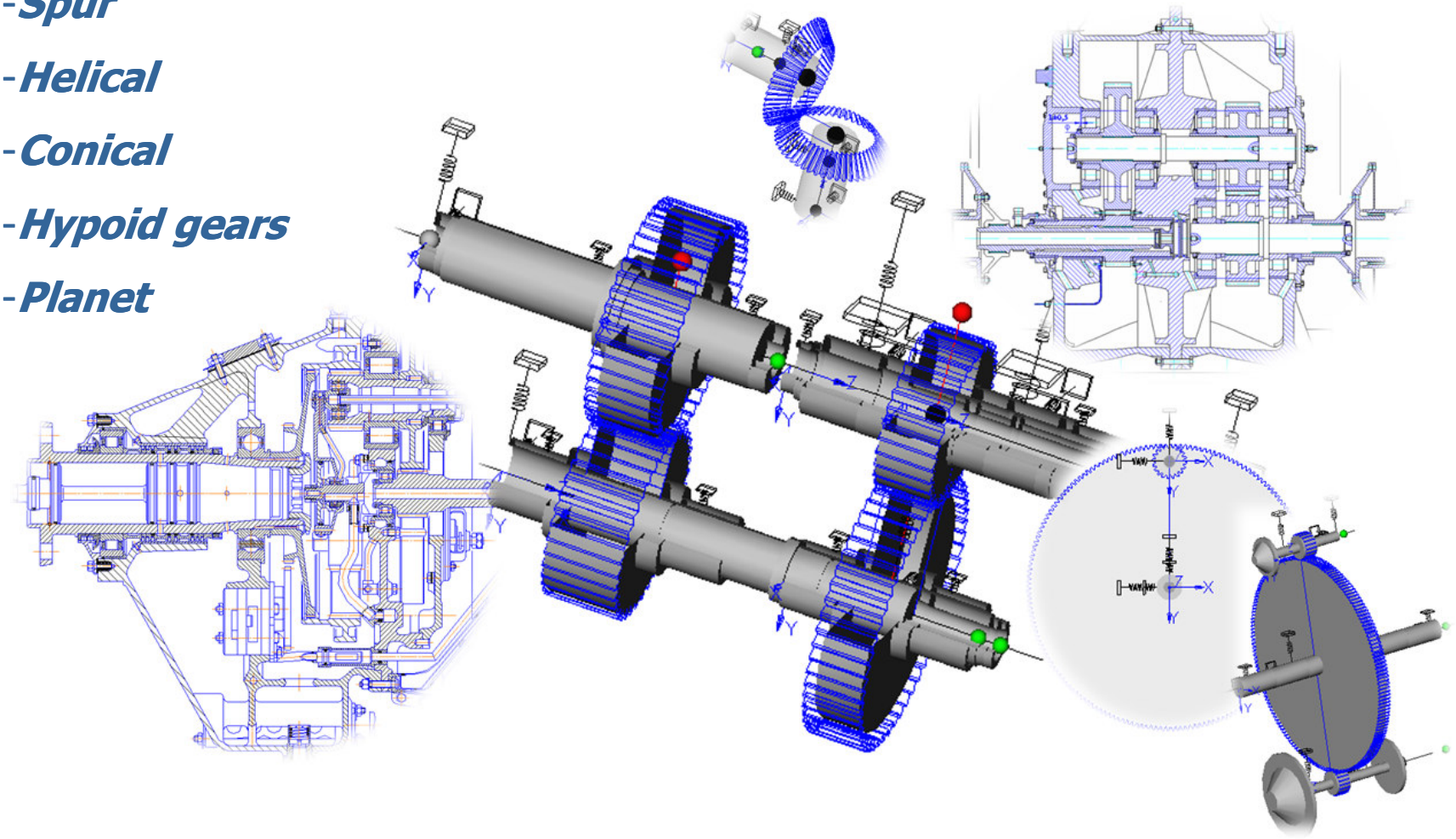
Gears

- *Spur*
- *Helical*
- *Conical*
- *Hypoid gears*
- *Planet*



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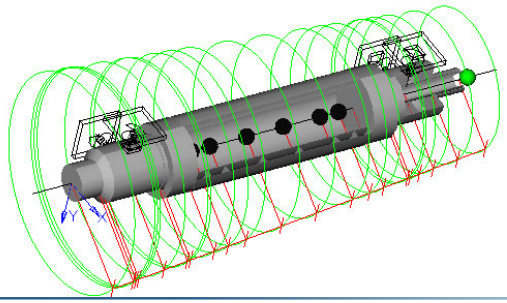
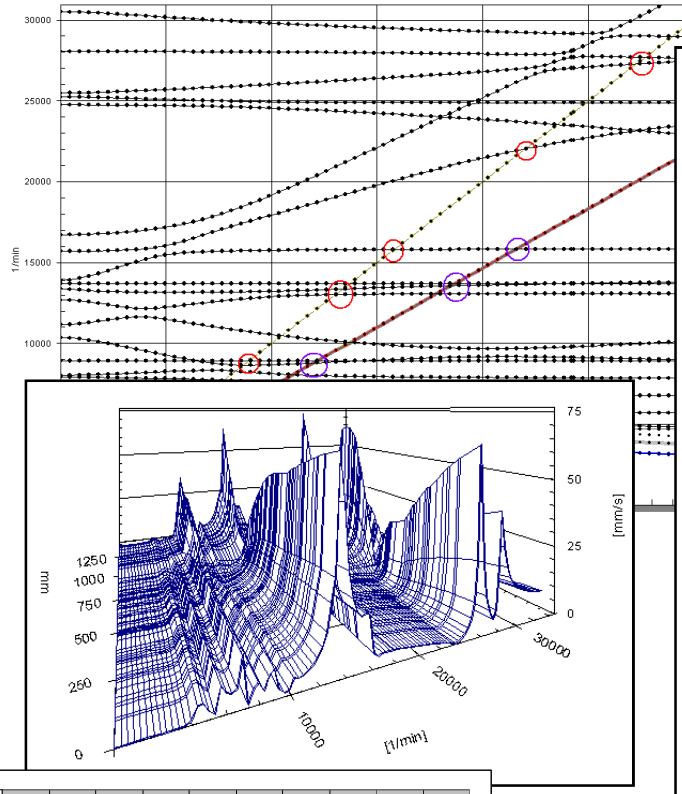
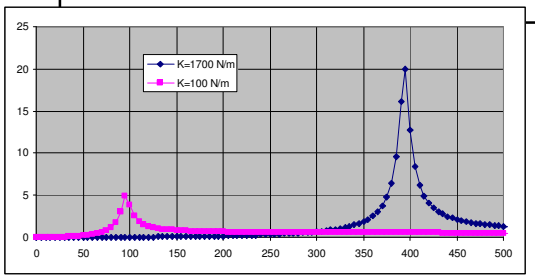
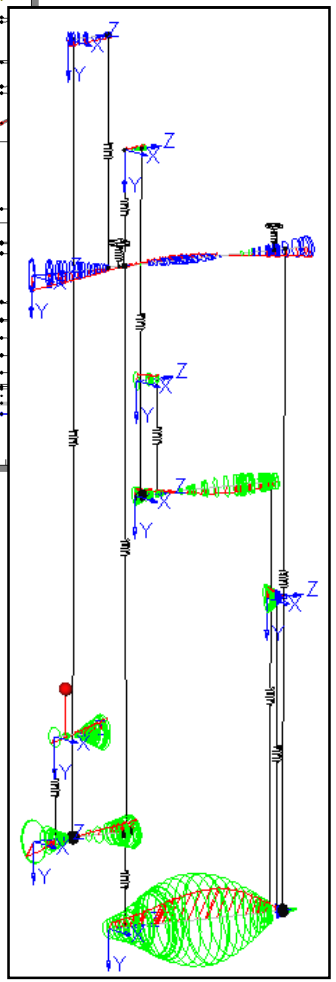
General Problems of Linear Dynamics

- *Damped natural frequencies and mode shapes of rotating systems*
- *Kinetic and potential energy distribution*
- *Natural frequencies and stability maps*
- *Critical speeds*
- *Critical speed maps*
- *Time depended stiffness and damping matrixes*
- *Parametric analysis and maps*
- *Synchronous unbalance response*
- *Asynchronous response to rotating forces*









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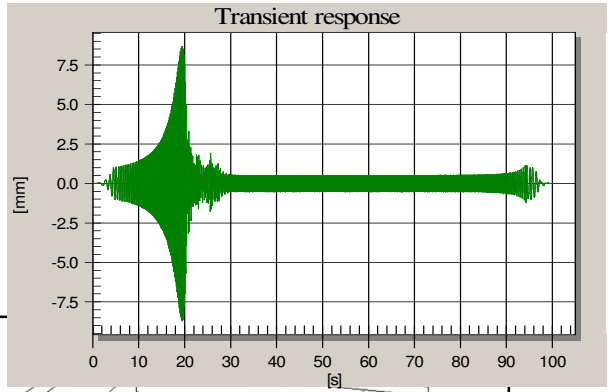
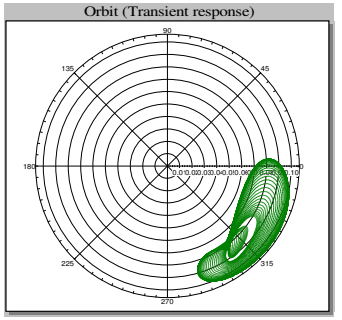
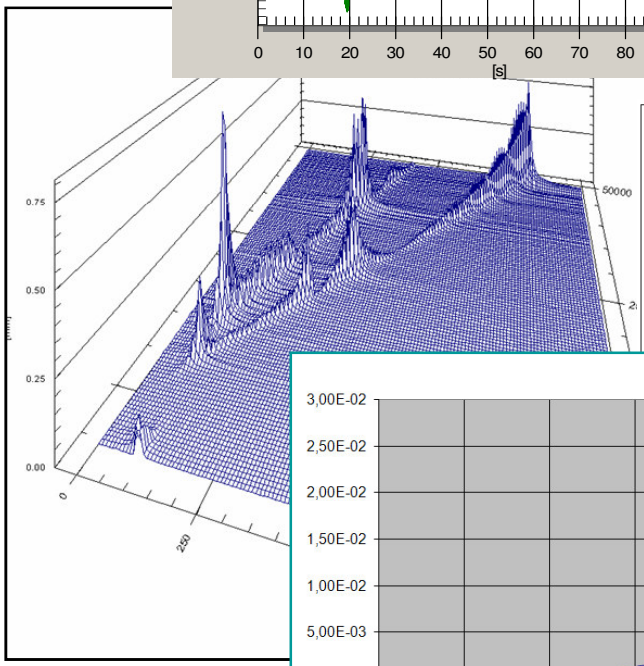
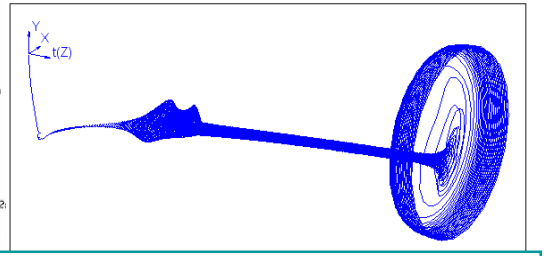
General Problems of Transient and Non-linear Dynamics

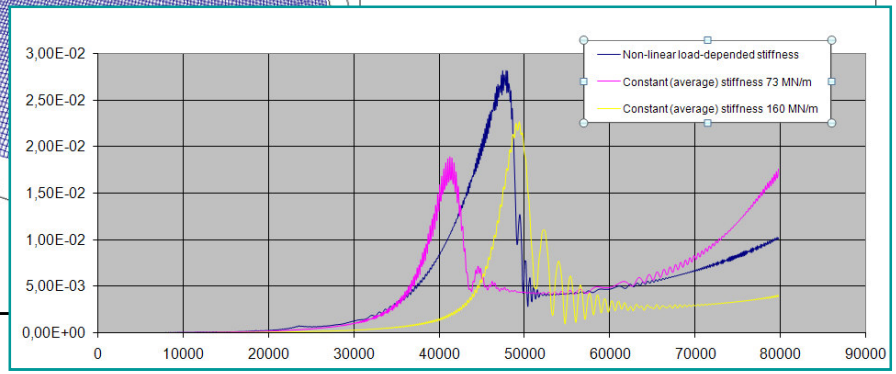
- *Acceleration and deceleration of rotor system*
- *Various of arbitrary time-dependent loads*
- *Computation of rotor systems with journal bearings*
- *Computation of rotor systems supported on rolling bearings*
- *Computation of rotor systems with squeeze-film dampers*
- *Clearances and rubbings*
- *Stability thresholds computation*
- *Static deflections due to weight*











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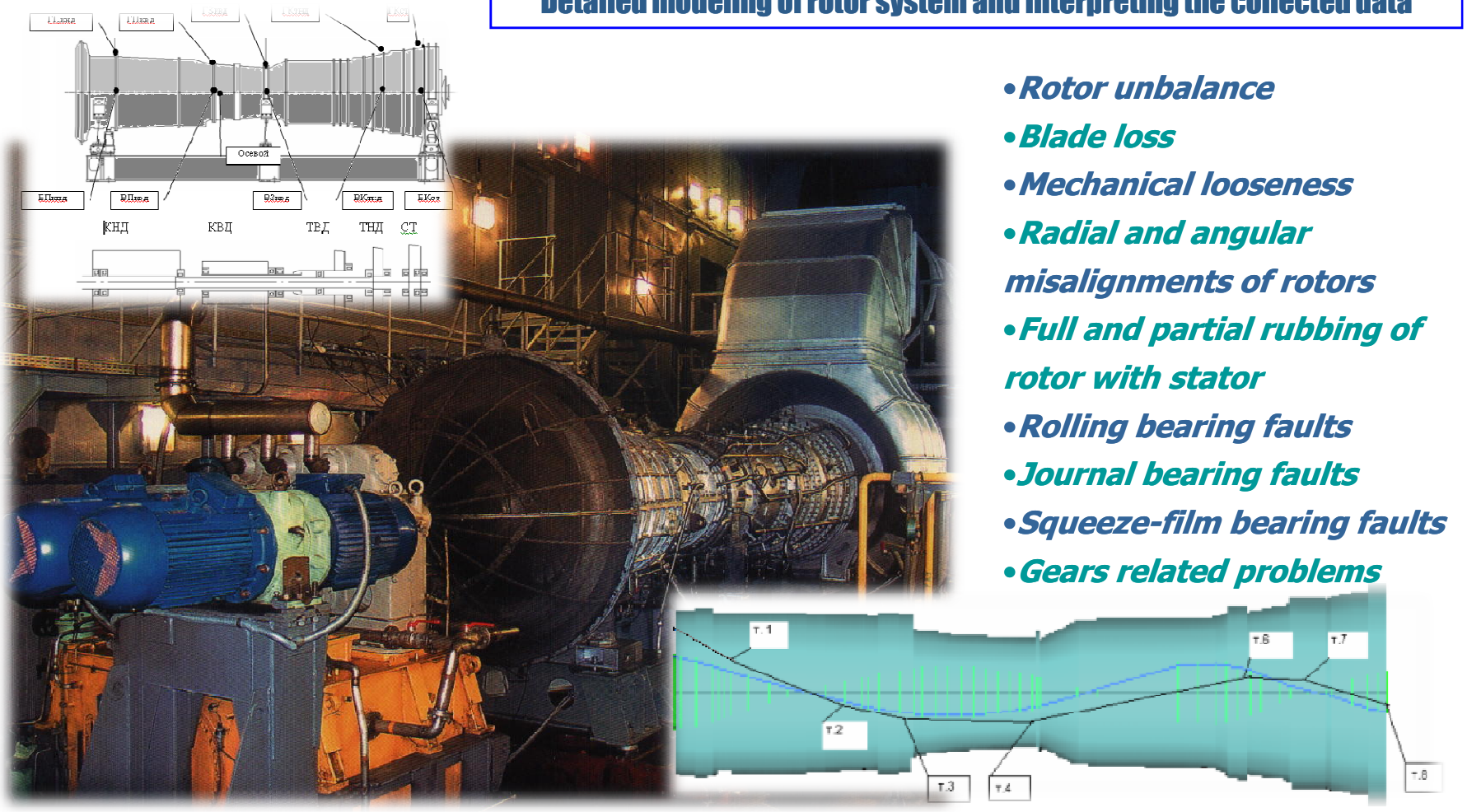
DYNAMICS R4 for model based diagnostic

Detailed modeling of rotor system and interpreting the collected data



- *Rotor unbalance*
- *Blade loss*
- *Mechanical looseness*
- *Radial and angular misalignments of rotors*
- *Full and partial rubbing of rotor with stator*
- *Rolling bearing faults*
- *Journal bearing faults*
- *Squeeze-film bearing faults*
- *Gears related problems*

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