SICODYN International Benchmark

Improving the quality and the reliability of a simulation in rotating machinery dynamics

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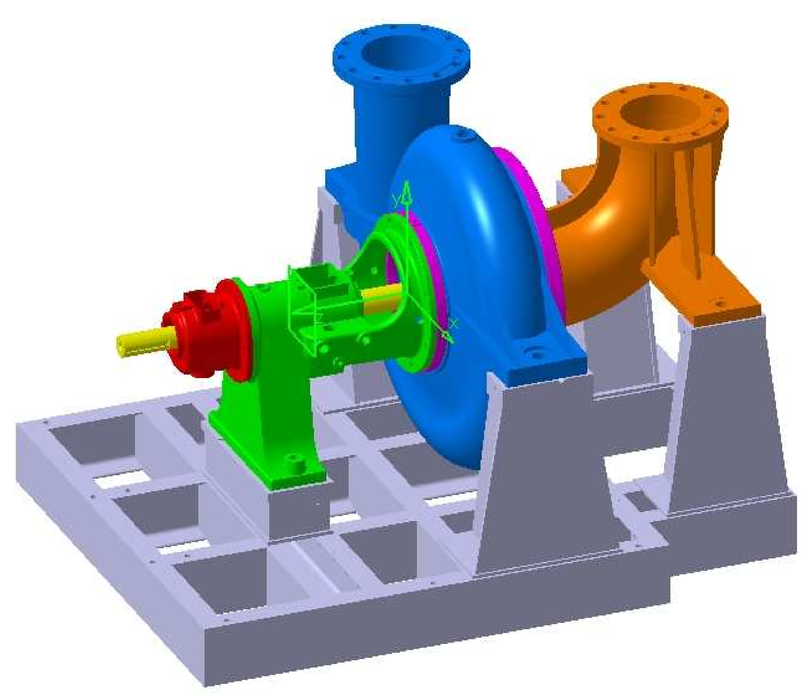
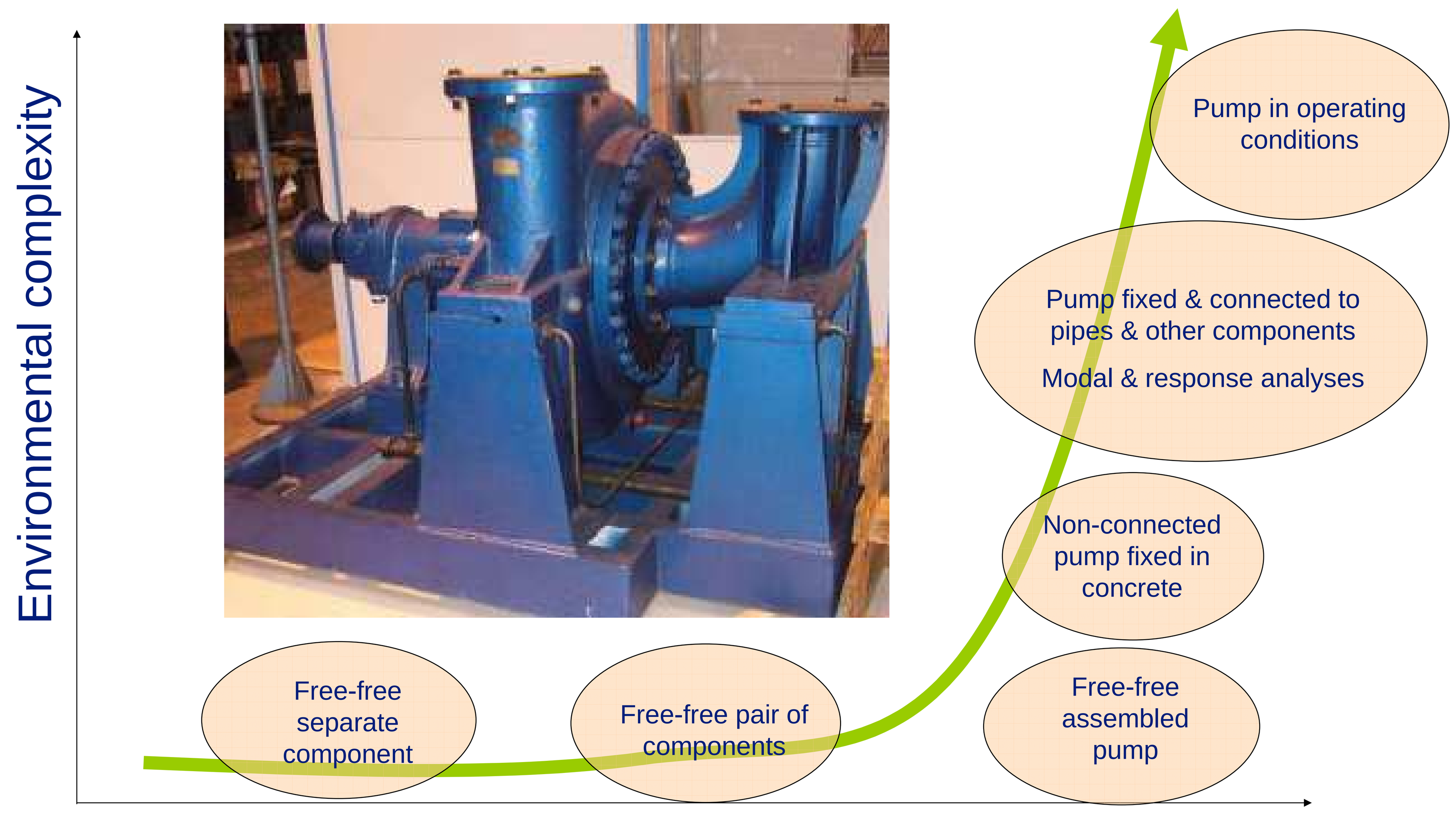
Objectives



The CAD model pump assembly

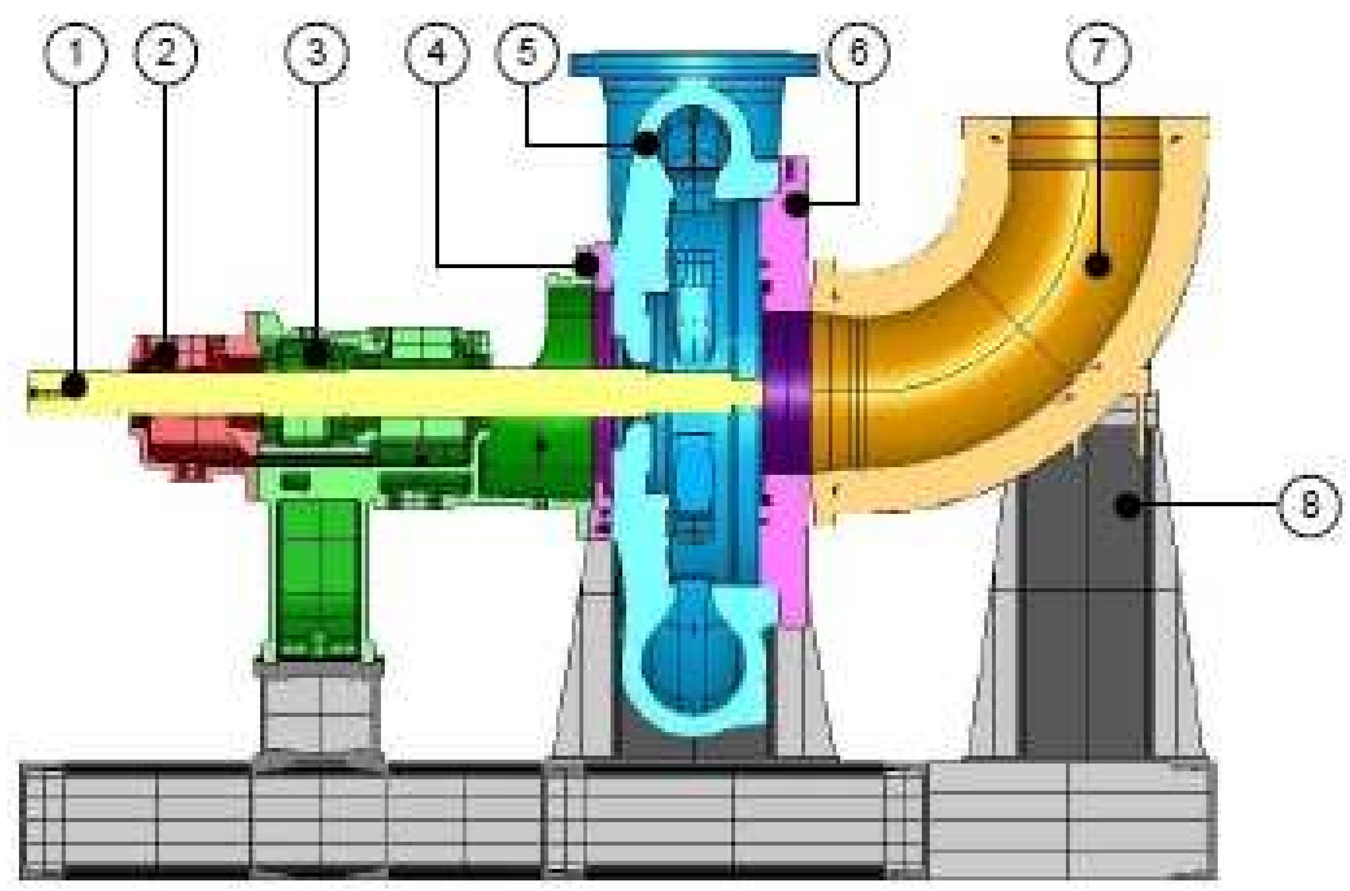
- Quantify the *a posteriori* variability of a dynamics simulation by proposing to partners to carry out a series of blind identical simulations on an industrial rotating machine.
- Validate the FE simulation phase by an industrial experimental demonstrator: a pump used in EDF thermal units.
- Main difficulties of such a simulation:
  - Assembly (pump component connection, bearings, foundation);
  - Pump-pipe connection;
  - Uncertainty on parameters, on boundary conditions, on load in operating condition;
  - Fluid-structure interactions
  - Nonlinear behaviour (friction, gap, …)

Hierarchical process

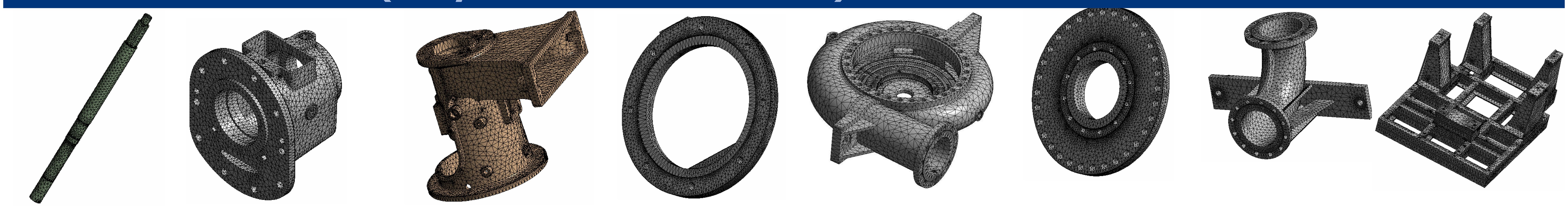


Industrial demonstrator

The Sulzer one-stage horizontal booster pump:

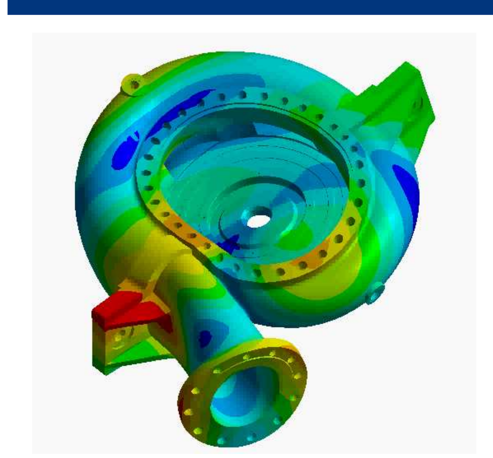


Finite element models (Ansys & Catia FE softwares)

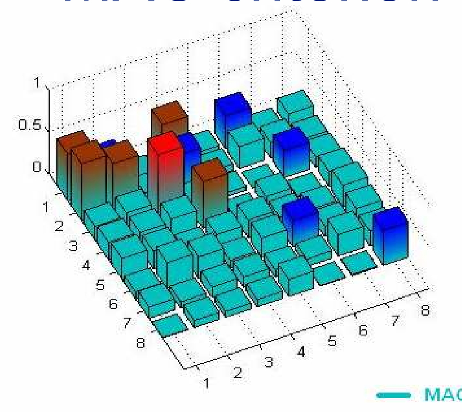


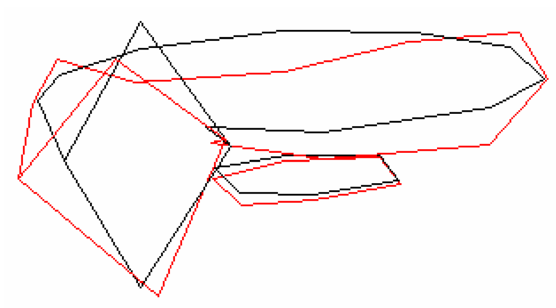
1-Pump shaft **2**-Bearing casing **3**-Bearing support **4**-Cooling flange **5**-Pump casing **6**-Suction flange **7**-Elbow **8**-Frame

Predicted & measured mode shapes

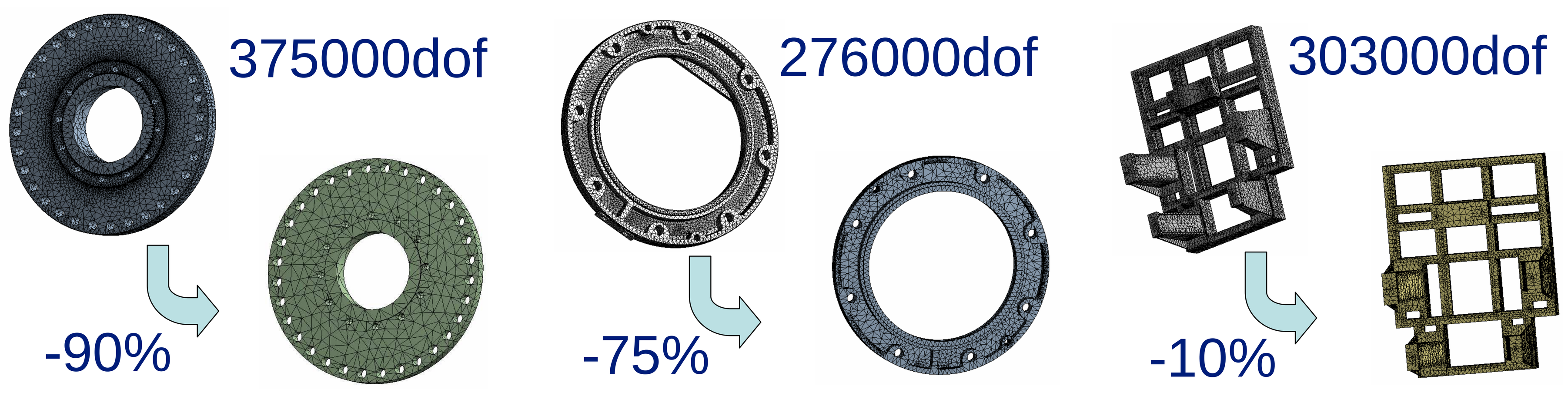


MAC criterion





Defeaturing of parts & mesh reduction (%)

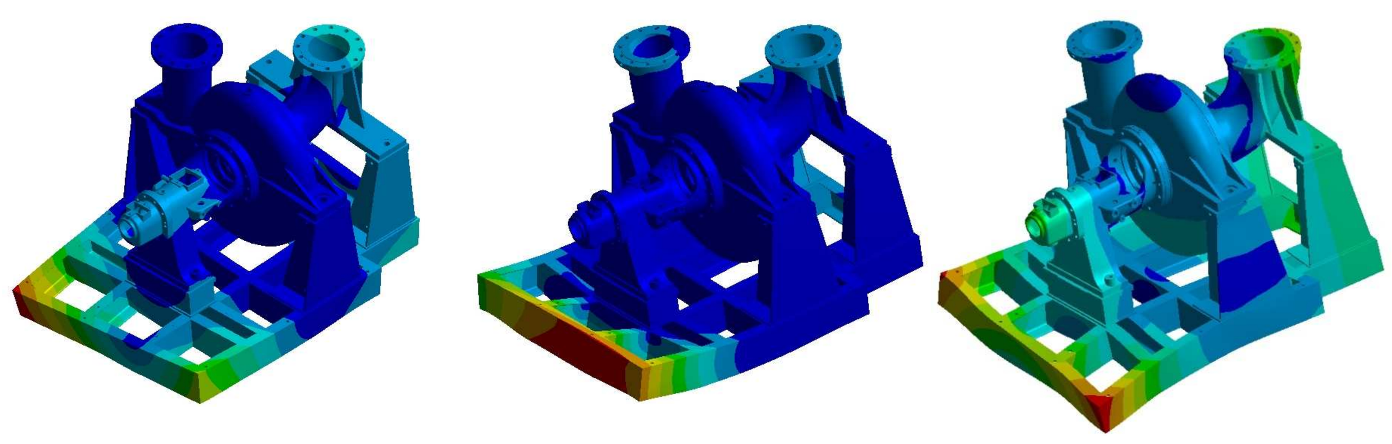


International industrial & academic partners

- EDF R&D, Sulzer Pompes
- FEMTO-ST LMARC Besançon, INSA Lyon LaMCoS
- VIBRATEC, CETIM, PHIMECA Engineering
- TU Delft, Bristol University, Politecnico di Milano, Ecole Polytechnique de Lausanne
- SAMTECH, ILM Technology
- Gologanu (Romania), MSO Industrial (Colombia), PIKITAN (Spain), CAEnable (USA)

Stator assembly: free-free conditions

No influence of the defeaturing on the first 3 modes



Defeaturing:	**Mode 1**	**Mode 2**	**Mode 3**
Before	129.2 Hz	134.8 Hz	169.8 Hz
After	128.3 Hz	133.3 Hz	169.2 Hz

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