Yaoyu HU

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Education

Shanghai Jiao Tong University Nuclear Science & Engineering	Dr. En	2017.3
East China University of Science & Technology Mechanical Design, Manufacture & Automation	B. En	2009.6

Research Experiences

- **Thesis: Study on the Shields Clearance Flow and Its Rotordynamic Effects for Large Canned Motor Reactor Coolant Pump (2016)**
  Highlights: CFD program development, 3D finite volume method with coordinate transformation, collocated grid, TVD scheme, SST k-ω model, parallel computing, developed in C++/Python, running on Linux.
  Fluid-induced forces measurement. Online vibration and rotor trajectory measurement.

- **Research on the Effects of Annular Flow on the Stability of the Rotordynamic System in Canned Motor RCP (2016)**
  Highlights: Experiment rig design. PIV test of flow field. Simultaneously measurement of the flow field and rotordynamic characteristics. Rotordynamic test based on rotor trajectory. Developing data acquisition software using LabView. Automatic data processing by MATLAB.

- **Key Scientific Issues in the Manufacturing of Reactor Coolant Pump –**
  Sub-project: Safety assessment of the rotor components (2013)
  Task: Rotordynamic experiments, test of fluid-induced vibration.
  Rotordynamics analysis and programming, hydrodynamic lubricated bearings analysis and programming, liquid seal analysis and programming.

- **Structure Safety Analysis and Physical Simulation of Reactor Coolant Pump (2011)**
  Task: Dynamic simulation based on mixed rigid-deformable bodies.

- **Structure and Safety Analysis of the Prototype Pump for Molten-Salt Reactor (2014)**
  Task: Rotordynamics analysis and programming (critical speed, steady-state response and transient response), CFD simulation of liquid seals, liquid seal-rotor coupled characteristics analysis.
  Pump performance test. Measurements of modal frequency and temperature distribution.

- **Safety Analysis of a Main Feed Water Pump in the Second Loop of a Nuclear Power Plant (2015)**
  Task: CFD simulation of the hydraulic components, CFD simulation of the liquid seals, rotordynamics analysis and programming, liquid seal-rotor coupled characteristics analysis, stress analysis of hydraulic components (with mechanical loads, flow induced loads and thermal loads).
  Pump performance test.

- **Study of Physical Simulation Technology for the Canned Motor Pump in AP1000 System (2011)**
  Task: Programming of the 3D physical simulation (rigid-body dynamics) and visualization.

Publications

- **Leading author**
- **Hu Y**, Wang D, Yin J, et al. Numerical analysis of single pad of thrust bearing with the energy equation solved by the characteristic-based split method. *Advances in Mechanical Engineering*, 2015, 7(9): 1687814015606282.
- **Hu Y**, Wang D Z, Fu Y, et al. Numerical study on rotordynamic coefficients of the seal of molten salt pump. *Nuclear Science and Techniques*, 2016, 27(5): 114.
- **Hu Y**, Wang D, Wang Y, et al. Stability Analysis for Reactor Coolant Pump With Vertical Rotor Supported by Fluid Film Bearings. *2012 20th International Conference on Nuclear Engineering and the ASME 2012 Power Conference*. American Society of Mechanical Engineers, 2012: 67-74.
- **Hu Y**, Wang D, Yin J, et al. Numerical Analysis of Rotordynamic Coefficients of Annular Flow in Canned Motor RCP. *2014 22nd International Conference on Nuclear Engineering*. American Society of Mechanical Engineers, 2014: V001T03A018.
- **Hu Y**, Lin Y X, Wang D Z, Miu F M, Yin J L. Numerical Study on the Resistance Characteristics and Rotordynamic Coefficients of a Helically Grooved Annular Seal. *The 7th International Conference on Pumps and Fans, Hangzhou*, China October 18-21, 2015.
- **Coauthor**
- Long Y, Wang D, Yin J, **Hu Y**, Ran H. Numerical investigation on the unsteady characteristics of reactor coolant pumps with non-uniform inflow. *Nuclear Engineering and Design, 2017*, 320: 65-76. (**Role:** Data processing, manuscript preparation)
- Long Y, Wang D, Yin J, **Hu Y**. Experimental investigation on the unsteady pressure pulsation of reactor coolant pumps with non-uniform inflow. *Annals of Nuclear Energy,* 2017, 110: 501-510. (**Role:** Experiment design, data processing)
- Wang Y, Wang D, Guo W, Yin J, **Hu Y**. The effect of smaller turbulent motions on heat transfer in the annular gap flow of flywheel. *Annals of Nuclear Energy*, 2016, 91: 1-7. (**Role:** UDF development)
- Long Y, Yin J, Wang D, **Hu Y**. The Effect of the Channel Head on the Unsteady Pressure Pulsation Characteristics at the Inlet and Outlet of Reactor Coolant Pumps. *IOP Conference Series: Earth and Environmental Science*. Vol. 49. No. 3. IOP Publishing, 2016. (**Role:** Data processing, MATLAB program development)
- Cheng H, Li H, Yin J, Gu X, **Hu Y,** Wang D. Investigation of the distortion suction flow on the performance of the canned nuclear coolant pump. *ISFMFE2014*, Wuhan, China. (**Role:** Data processing)
- Wang Y, Wang D, Yin J, **Hu Y**. The Use of Experimental Design for the Shrink-Fit Assembly of Multi-Ring Flywheel. *2014 22nd International Conference on Nuclear Engineering*. American Society of Mechanical Engineers, 2014. (**Role:** Data processing)
- Wang Y, Wang D, **Hu Y**. Vibration Analysis of Coolant Pump With Two Unbalanced Disks Based on the State-Space Newmark Method. *2012 20th International Conference on Nuclear Engineering and the ASME 2012 Power Conference*. American Society of Mechanical Engineers, 2012. (**Role:** MATLAB program development)

Technical Skills

- **CFD:** Programming, 3D unstructured grids with turbulent model, parallel computing, FLUENT (UDF), CFX, OpenFOAM
- **FEM:** Programming, ANSYS
- **Programming:** C/C++, MATLAB, Python, Linux programming (shell scripting & multi-threading)
- **Rotordynamics:** Programming, ANSYS, DyRoBeS, related experiment equipment, sensors & instruments, data processing methods
- **Analysis of hydrodynamic lubricated bearings:** Programming, 2D Reynolds Eqs., 3D Thermo-Elasto-Hydro-Dynamics analysis
- **Experiments:** Rotordynamic and vibration test. PIV measurement.
- **Frequently used tools:** Eclipse(Linux), Visual Studio, MATLAB, Emacs/Vim(Linux), MySQL(Linux), Sublime Text, git, cmake, gdb, valgrind, ANSYS(APDL, FLUENT, CFX, ICEM, Workbench), OpenFOAM, Autodesk AutoCAD, Autodesk Inventor, Solidworks, UG NX, LabView, Microsoft Office (Word, Power Point, Excel, Access, Viso), Latex

Research Interests

- CFD
  hybrid LES/RANS, turbulence model, parallel computing, CFD programming
- Fluid induced vibration and acoustics, fluid structure interaction
- Flow separation, boundary layer instability
- Cavitation in pump and turbine, multiphase flow