

Centrifugal Pump Design and Performance

This is the most thorough, up-to-date, and comprehensive review of centrifugal pump design published in many years. The authors are practicing engineers with a wealth of experience in pump hydraulic and mechanical design, manufacture, installation, and troubleshooting. The book outlines significant contributions made to the pump technology industry worldwide and is a must for every pump engineer.

Background and Foundation of Pump Performance

- Introduction
- Levels of design
- Conclusions
- Problems

Impeller Flow Physics

- An introduction to impeller flow states
- Impeller secondary flows
- Impeller modeling and design possibilities
- Impeller exit velocity profiles
- Isentropic incremental efficiency penalties
- Conclusions
- Appendix 1: Basic modeling choices
- Appendix 2: Numbers describing rotating diffuser phenomena
- Problems

Diffusers in Centrifugal Pump Design

- The role of the diffuser in pump performance
- Historical pump diffusers
- Vaneless diffusers
- Cascade (airfoil) diffuser design
- Channel diffusers including rectangular, conical, and double divergence passages
- Variable geometry
- Problems

Additional Stage Elements

- Introduction
- The pump inlet
- Pump volute performance
- Flow collectors
- Return channel performance
- External crossovers
- Casing design including gaps
- Problems

Operating Limits: Stability and Cavitation

- Review of steady stall
- Rotating stall in centrifugal pumps and compressors
- Impeller-stator interaction
- System instability and modeling

- Stable operating range extension
- Summary of stability considerations
- Cavitation
- Problems

Centrifugal Pump Stress and Structural Vibration

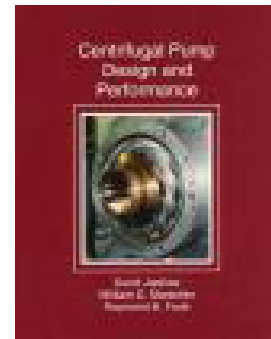
- Introduction
- Vibration concepts and terminology
- Stress concepts and terminology
- Hydraulic and mechanical loads at design point
- Stress and structural vibration analysis methods
- Rotordynamic analysis
- Vibration test equipment and procedures
- Time-averaged modal excitation vibration testing
- Troubleshooting and revamp support using vibration test and analysis
- Vibration specifications for acceptance, alarm, and shutdown

Systematic Design and Optimization

- Application diversity and configurations
- Design alternatives
- Design optimization strategies
- Three-dimensional analysis: the design tools and usage
- Design example
- Closure
- Problems

Design and Performance of Rocket Engine Turbopumps

- Introduction
- Centrifugal pumps
- Turbopump weight
- Turbopump rotational speed
- Inducers
- Thermodynamic suppression
- Inducer cavitation damage
- Low speed booster pumps
- Radial load
- Axial thrust
- Closure



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Experimental Development

- Experimental examination and product development
- Overall measurements
- Pump inlet investigations
- Impeller cover and cavity examination
- Impeller exit evaluation
- Vaneless diffuser studies
- Channel diffuser investigations
- Cascade diffusers
- Return channel or deswirl cascades
- Volute flow evaluation
- Further interpretation of data
- Closure
- Appendix 1 Test codes and standards
- Problems

Glossary Index