Computational Modeling for Fault Diagnosis of Centrifugal Pump Using Coupled Finite Element – System Identification

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Abstract

Fault Diagnosis of rotary machines, pumps, turbines, generators, etc, plays a critical role in cost assessment, since any unpredicted failure would shut down the production line and bring financial damage to the company. By employing condition monitoring, one can predict and identify the source of failure and implement a preventive maintenance strategy to increase the machine life and enhance its performance. Here, a coupled computational model is developed to study the effect of impeller fault on the dynamic response of a centrifugal pump. We implement the Finite Element (FE) and System Identification (SI) methods in this approach. Also, an experiment is proposed for tuning the FEM. The experimental setup is consist of a 3 horsepower pedestal pump coupled with a 3 horsepower, 3600 rpm motor. We developed FEM trials on the frequency response of faulted and perfect impeller and compared it with our experiment. This program can provide a real world study to introduce the principles of condition monitoring.