Modeling of Hydro Pumps During Island Grid Operation

During the research project LINDA 2.0, a local island grid is set up using a hydropower station to provide an emergency power supply for drinking water pumps. A simulation model is set up to identify critical system conditions. Figure 1 compares the detailed simulation model and the real measurement data of a hydro pump's stationary active and reactive power demand at different frequency values. The characteristic curve derives from the asynchronous machine characteristic. If the frequency deviates, the inertia gives a dynamic response to the hydro pump's active and reactive power consumption due to the acceleration (increasing frequency) or deceleration (falling frequency) of the pump. This dynamic behavior depends on the rate of change of frequency and is shown for the active power in Figure 2. Both figures show that the simulation model reproduces the real pump behavior in the investigated range for stationary and dynamic studies.

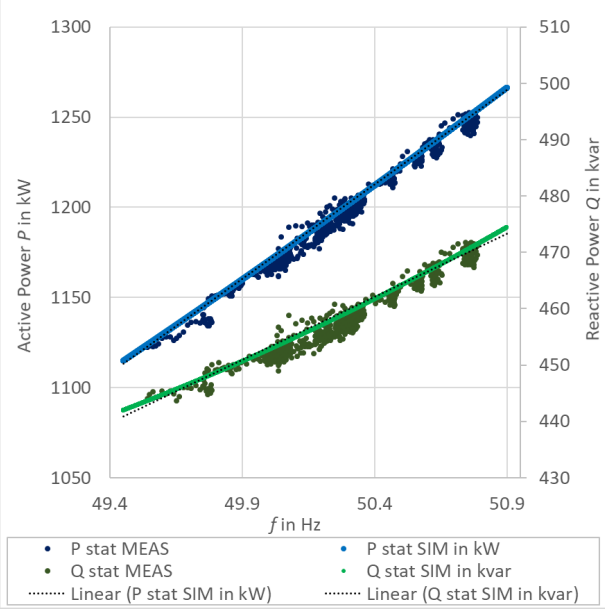

Figure 1: Measured and simulated active and reactive power demand of a hydro pump

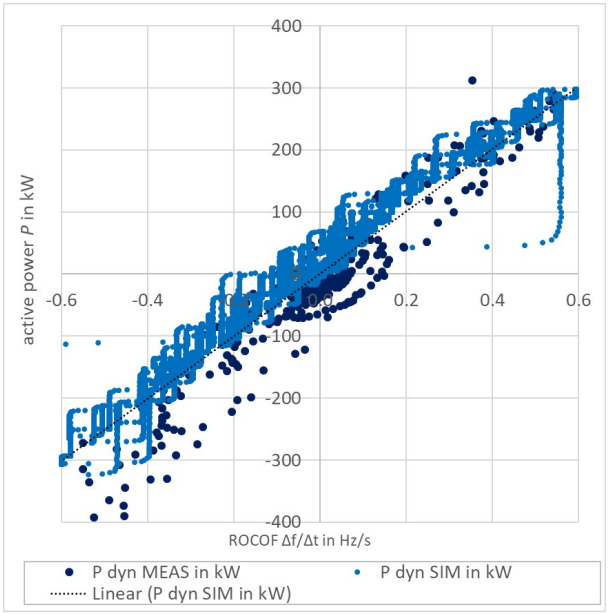

Figure 2: Dynamic active and reactive power demand during a frequency deviation at different frequency gradients

Scope of the internships, applied study semester, or thesis.

During the thesis, two different approaches for modeling the static and dynamic response of electrical loads during voltage and frequency deviations should be applied to a new data set to compare the performance of the simplified models. The supervisor of the Master Thesis is Sebastian Seifried. Prof. Dr.-Ing. Michael Finkel is the mentoring professor and examiner of the thesis.

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Special requirements

- Knowledge about power systems
- Experience using Microsoft Excel
- Basic knowledge using Matlab or Python

Qualification level: Advanced Bachelor's degree or Master's degree

Programs lines: SRI, A2S, BA/MA

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