On-line Optimal Control of a Multi-Pump System

Graduate/Master Thesis Project
Cooperated between Aalborg University Esbjerg and Grundfos ApS

1. INTRODUCTION

The large pump-boosting system often consists of a number of pumps connected into a network system. Usually a central control unit is required to monitor and control the multi-pump operation so as to achieve a required performance.

Fig.1 The lab-sized tree-pump booting system

2. OBJECTIVE

This project focuses on the efficiency of a multi-pump network system provided by Grundfos ApS as shown in Fig.1. An on-line optimization strategy is expected to control the start/stop of each pump and the speed(s) of the operating pump(s) as well, so as to minimize the energy consumption without degrading the system performance.

3. STRATEGY

The model-based switching control and optimization approach, as a kind of typical intelligent control method for complicated systems, is adopted.
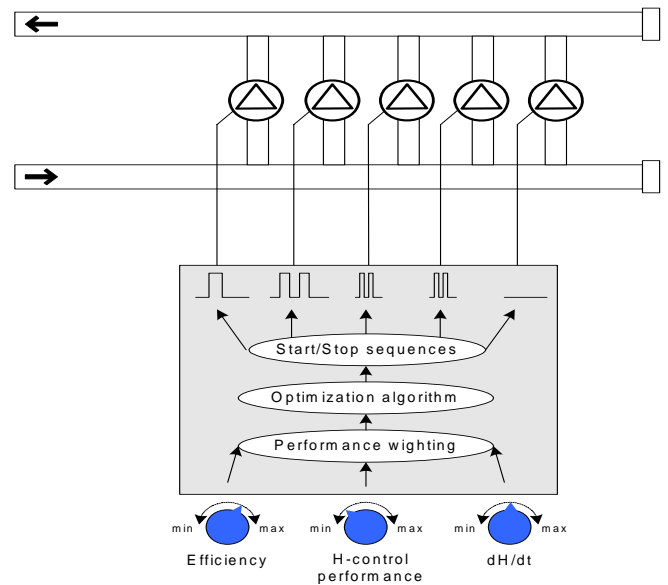

Fig.2 The multiple-pump control diagram

4. RESULTS

- An optimal switching algorithm for monitoring and controlling the given multi-pump system
- Feature analysis of the developed algorithm in Matlab/LabView simulation environment
- Implementation in the prototype set-up