Optimization of a blasting process through a service-oriented architecture

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Abstract

The paper describes the optimization of a blasting process through a three-layered service-oriented industrial architecture (Fig. 1) [1], [2]. The goals of the optimization are: a minimized manufacturing time, the automated usage of the production plans, and flexibility and reusability. To obtain a minimized processing time, a mixed-inter programming (MIP) model is developed, which is solved with a linear programming library. To ensure both short- and long-term flexibility, as well as reusability, the model has been rendered as generic as possible [3]. A set of constraints are defined, which:

- ensure that the sum of final products is equal to the number of ordered parts;
- ensure that the available amount of initial parts are processed;
- ensure that the total processing times are correctly computed for each manufacturing station.

Finally, the objective function of the MIP model is defined, which represents a minimization of the highest processing time on the available stations. Besides the detailed description of the MIP model, other important implementation details are presented: the OPC unified architecture (UA) address space structure [4], the complex service used for monitoring and controlling the application (Fig. 2), and the generic control graph implemented inside the programmable logic controllers (Fig. 3). The results show that the workload is distributed evenly between the work stations and over 99% of the total time is dedicated to the actual manufacturing process.

Fig. 1. Main components of the service oriented architecture.

Fig. 2. Complex service used for monitoring and controlling the blasting application.

Fig. 3. Generic control graph implemented inside the PLCs.

References