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IMPACT OF TIME AND COSTS WHEN DETERMINING BATCH SIZE IN A SUPPLY CHAIN

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Abstract. *This paper addresses planning a set of jobs on a sequence of machines considering the possibility of producing and delivery in batches either to other stages for further processing or to customers in a supply chain network. Determining batch size at each stage unavoidably is of importance at this point. Using large batch size can put away some costs but time is wasted as trade-off. Small batch size can speed up the process but certain costs are increasing. To represent both time and costs aspects, a nonlinear integer mathematical model with the objective function of minimizing both time and costs simultaneously is studied and applied to determine (production) batch size to match up the flow of production at manufacturer with the demand required at retailers and appropriate means of shipment (transfer batch size). In view of the fact that time and costs are different in units; this paper furthermore investigates the relationship between them through varying coefficients and parameters. Since this problem is classically NP-hard at each stage of supply chain; the acceptable production and transfer batch sizes are obtained using the advantage of random search approach. The numerical illustrations and results substantiate that the model proposed is useful to simultaneously consider both time and costs when determining batch size at each stage in a supply chain network and it is not necessary to use the same batch size when manufacturing and transferring. Moreover, we found that the conversion factor is statistically robust to the objective function value when the ratio of the production time over the setup time is not high.*

Keywords: Supply chain, Non-linear programming model, Batch processing, Batch delivery

1. **Introduction.** In a supply chain network, problem arises in the context of coordination between machine processing and a distribution system. The possibility of producing in batches and delivery in batches to customers or to other stages for further processing have attracted wide attention of the research community over the years. It is not straightforward to determine batch size when manufacturing and transferring. Using large production batch size can put away some costs such as setup costs; however, when more than one type of product arrives at large-sized production stage, newcomer has to