Chapter 8
Production Scheduling Risk

ABSTRACT

The method is applied to Production Scheduling to manage the associated risk. DMAIC framework applies stochastic techniques. It runs stochastic optimisation to determine the optimal production schedules to minimise costs. It stimulates every determined optimal production schedule and calculate costs, risks, and Six Sigma metrics to measure against specified target limits. It analyses simulation results and identify and quantify the main contributors to the costs variability by using sensitivity analysis. The optimal production schedules are ranked based on their costs and associated risk factors. The technically best optimal production schedule is recommended to the management for implementation. Control stage is elaborated by reusing the data and presented stochastic optimisation and simulation models for ongoing management of the optimal strategy. Some changes are applied to the data and models however, in order to emulate the scenario of an implemented strategy.

INTRODUCTION

This chapter presents the second Income Management application class of the method. It is applied in Production to manage the risk in scheduling production plan of a factory for the next season.

Production schedule is the timetable for the use of resources and processes required by a business to produce goods. Typically, a business will determine its production schedule based on customers’ demand, in order to manage resources, reduce costs, and increase overall production efficiency. Customers’
demand is inherently uncertain, thus creating risks in production planning in general. This chapter discusses Production Scheduling Risk Management. Production scheduling techniques are generic across industries. So, the generic techniques consider and resolve the industry specific business aspects. The major challenge for production scheduling is to determine an optimal production schedule which minimises the expected costs considering the inherently uncertain demand.

Bierwirth and Mattfeld (1999) elaborated on a general model for production scheduling which applies to static, dynamic and non-deterministic production circumstances. A genetic algorithm is presented which solves the production scheduling problem. This algorithm substantially improves the quality of schedules. It was tested in a dynamic environment under different workload situations, experimentally proving that conventional methods of production control are evidently inferior.

An optimisation approach to production scheduling for mining industry in view of high grade of uncertainty was published by Godoy and Dimitrakopoulos (2004). The approach applied an economic model considering the mining industry specifics. The utilisation of grade uncertainty and optimal mining rates leads to production schedules that meet targets whilst being risk resilient and generating substantial improvements in project net present value. A case study from a large gold mine demonstrates the approach.

A paper published by Sarker, Essam, Kamrul Hasan and Mustafizul Karim (2016) presented an algorithm for production scheduling under ideal conditions and rescheduling under machinery breakdown. The article delivered a risk analysis for a production business case. The extended algorithm provided for better understanding and results than existing algorithms. The rescheduling showed a good way of recovering from disruptions, and the risk analysis showed an effective way of maximising return under such situations.

Ramazan and Dimitrakopoulos (2004) published a conference paper presenting an application of stochastic optimisation to production scheduling under uncertainty. Conditional simulation was applied to quantitatively address the resulting grade uncertainty. Iterative simulation provided input for Stochastic Integer Programming (SIP), that determined the optimal production schedule for a defined set of objectives under uncertainty. The objectives were to maximise the total net present value (NPV) and to minimise unsatisfied demand for processed ore. Using iterative simulation models as input into
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(2018). Novel Six Sigma Approaches to Risk Assessment and Management (pp. 233-238).
www.igi-global.com/chapter/risk-management-future-directions/185966?camid=4v1a