



Control of Yarn Inventory for a Cotton Spinning Plant: Part 2: Correlated Demand and Seasonality

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ABSTRACT

In the first paper, a novel application of process control was developed for controlling inventory in a yarn spinning plant. This technique, proportional/derivative control, was compared to a traditional min/max system via computer simulation for situations in which demand is uncorrelated. In this second paper, the performance of both techniques is compared in situations in which the demand from period to period exhibits correlation. In addition, demand seasonality is also considered. The proposed methodology is shown to provide superior control allowing lower levels of inventory with fewer frame changeovers to achieve the same levels of shipping performance. It also is able to quickly adjust inventories to track changes in demand.

KEYWORDS: spinning, proportional derivative control, min max control, inventory control, process control, cotton

1. Introduction

In Part 1, the simulation model assumed basic goods with an independently and identically distributed (i.i.d.) stochastic demand for contract orders generated from a normal distribution with a constant mean and variance for each yarn type *i*. Experimentation under this model showed the discrete PD algorithm to be superior to the min/max algorithms. However, typically real-world spinning plants do not experience uncorrelated demand. With this in mind, the question arises of how the performance of

the algorithms is affected by correlated demand. In addition, to validate fully the appropriateness of the PD algorithm, it is also tested using seasonal goods which create non-stationary conditions.

2. Correlated Demand

2.1 Generation of Correlated Demand in the Model

Correlated demand was created using a time series moving average lag 1