



## Control of Yarn Inventory for a Cotton Spinning Plant: Part 1: Uncorrelated Demand

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### ABSTRACT

*In this paper, a process control-based inventory control methodology is developed for a yarn spinning plant. The technique attempts to control the inventory at a specified level using separate proportional/derivative control equations for each product (yarn) type. The system is unique in that the controlling variable (number of spinning frames producing a yarn type) is discrete while the output of the control equation is continuous. Additionally, each controller is contending for a common set of resources (spinning frames). The approach is compared with a traditional min/max system via computer simulation for the case of uncorrelated demand.*

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

### 1. Introduction

In the globally competitive textile industry the ability to meet orders in the lead-time specified, i.e., service level is critical. This is not a new phenomenon. In the late 1980's Sara Lee Knit Products (SLKP) became unhappy with their yarn suppliers. The suppliers were unable to satisfy SLKP's large demand and the average spinning machine at their mills was 20 years old. Consequently, in 1990, SLKP created Mountain City Yarn Mill so that it could reduce its dependence on external yarn sources. Spinning their own yarn

resulted in more economical and higher quality yarn (Textile World, June 1992). One approach for yarn suppliers to maintain customer satisfaction and to keep customers from spinning their own yarn like SLKP is to implement a yarn inventory system that holds the optimal amount of yarn; enough to meet demand yet small enough to be cost effective. In 1978, K. Govindarajulu and R. Nataraj studied the optimal in-process stock to be held in spinning. The in-process inventory depends upon many factors such as yarn count, type of machinery, etc.