CONTROLLING THE BLUES --
Implementing Process Control in Indigo Dyeing

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ABSTRACT

While it has been said that "*color is highly individual*", the color *indigo* has been collectively accepted throughout the world -- especially via one of the staples of the individual wardrobe, *blue jeans*. *Blue jeans* made of *indigo blue denim* have endured in the marketplace as a fashion item in every global location regardless of economic circumstances for many years; each year the textile industry embraces the production requirements for this item. Those companies who successfully dye the *blue* warp yarns that are woven in the *indigo denim* process can be profitable -- if they are able to produce a *blue indigo* denim product which meets customer requirements cost effectively. *Process automation*, including *process control* has been successfully utilized in the dyeing and finishing operations of the textile industry for many years in order to consistently produce good quality products cost effectively; however, its application to the *Indigo Dyeing* process is relatively new. It is the objective of this paper to review a list of critical processing steps which must be addressed for successful implementation of process control in *Indigo Dyeing*. A Case Study will be given which describes how a major textile company is utilizing this computer technology to *control the blues*.

INTRODUCTION

For the past several years, *indigo denim* has been reportedly produced by the textile industry more than any other woven fabric. And jeans made from blue denim has been one of the fashion industry's staples for an equally long duration. Its popularity has been attributed to its relatively low cost, its toughness, and its ability to wash down to a nice faded blue shade without staining the white filling yarn. Blue jeans are worn by everyone -- from the presidents of companies to students to industry workers to small kids -- *everybody loves the blues!*

Many textile companies make blue denim as a *bread and butter* item in their product lines. Most of these companies use indigo as the dyestuff in the manufacture of blue denim because of customer demand -- the dyestuff produces a deep navy product which when repeatedly washed fades to a lighter brighter blue. Dyeing with indigo is tough -- but the other processes involved in the production of the product -- slashing, weaving, and finishing add their own levels of complexity to *controlling the blues*. Companies who have been successful in its production have mastered the techniques required to achieve and maintain *equilibrium* in their indigo denim processes -- *balancing* the nuances associated with the machinery, the chemicals, and the mills with *experienced personnel* and tools such as *computer technology* to reduce and ultimately *control* the effects of known process variation.

In the discussion that follows, a brief review of the history and chemistry associated with the use of *indigo* as a dyestuff for denim will be reviewed. The historical discussion will be followed by an overview of the factors which influence the end product produced by indigo dyeing. Finally, the systems which have been developed by Avondale's Integrated Manufacturing Systems (*AIMS*) group will be discussed relative *to control* of these factors at the Graniteville Indigo Dyeing Plant of Avondale Mills, Inc., in Graniteville, South Carolina.