

CONSISTENTLY CONTROLLING CONSISTENCY ©

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ABSTRACT

Consistency measurement and control is one of the most important and least understood topics in the Pulp & Paper industry. Misunderstandings abound, and most training materials address only part of the topic. A new approach to this topic combines all of the issues of consistency measurement with the specific issues of controller selection and controller tuning. The proposed training program will arm the plant technician or engineer with specific technical knowledge, reference materials, and practical skills. Special emphasis is placed on specific applications of consistency control, common pitfalls, and practical solutions. The outline and approach to effectively training engineers and technicians will be presented at this poster session.

INTRODUCTION

The measurement and control of pulp stock consistency is absolutely critical to product quality in the pulp and paper industry. Variation in this key product parameter affects everything from sheet formation to basis weight and moisture, tensile strengths, opacity, and just about any other product feature of importance. Consistently controlling consistency is the foundation of product quality.

And yet, consistency measurement and control is one of the least understood topics in the industry. Our experience has shown that well over 50% of these loops, as installed, have problems with misapplication, improper installation, improper configuration, poor controller tuning, or poor design.

One of the key problems is that it is difficult to put together all of the various concepts, from laboratory measurement and calibration to equipment selection and installation, to controller tuning and filtering. This paper presents a method to provide the right level of training to the pulp & paper practitioner. The focus is on development of practical skills that can be put to work right away to improve the operation of the mill.

The proposed training is delivered in three parts, roughly one day each:

- Consistency Measurement
- Control Theory
- Applications of Consistency Control

CONSISTENCY MEASUREMENT

Consistency measurement remains something of a black art at many mills. Different measurement techniques combined with a variety of fiber and fillers, leads to often confusing results.

To effectively deal with consistency measurement, one must first remove the mystery by covering each of the following topics:

- What is Consistency - really
- Consistency measurement techniques
- Types of Consistency Sensors
- Sampling and laboratory analysis
- Selection of Consistency devices
- Proper installation of consistency devices
- Limitations of consistency measurement
- Effects of pulp and filler types on consistency measurement

TUNING & OPTIMIZATION

Tuning and optimization are a key part of improving consistency control loops. For the plant engineer or technician to be effective, they must also have a good understanding of tuning, optimization, and repair of control loops and related equipment.

Tuning and optimization training should consist of the following:

- Control Loops
- Benefits of Good Consistency Control
- Noise, Load, Disturbances

- Control Objectives
- Defining “Good” Control
- The PID Controller
- Loop tuning for optimal performance
- Traditional Tuning Methods
- Significance of Dead Time
- Modern Tools for tuning
- Filters – Selection and Sizing
- Identifying sources of variability
- Identifying valve problems
- Select optimal controller tuning (P, I, D, and Filter)
- Cascade Control & Tuning
- Ratio Control & Tuning
- Feedforward Control
- Confirm the effect on the process
- Update operating procedures as required

Of course, the student will want to be able to apply these skills to real problems, so hands-on practice should be included at every opportunity.

APPLICATIONS OF CONSISTENCY CONTROL

To be sure that the student understands the implications of measurement and control, a third component of training should be included. This third component should provide specific details on the application of the measurement and control theory to specific applications, such as:

- Basic Consistency Control Applications
- High Density Storage Consistency Applications (Brown Stock Chests, etc.)
- Agitation and mixing
- Dilution control and valve selection/sizing
- Process control applications (P&P)
- Batch pulpers.
- Blend Chests / Quick Mix Chests
- Saveall / Whitewater

EXPECTED BENEFITS

After attending a training program such as the one described above, the student should be able to improve consistency measurement and control significantly. This will have the following bottom-line results for their plant:

- Reduced process and product variability
- Reduced scrap, waste, or recycle material
- Increased throughput or production capacity
- Reduced energy costs
- Reduce cost of additives
- Improved process reliability
- Smoother operation
- Faster grade changes

CONCLUSIONS

Consistency measurement and control has been misunderstood and misapplied for many years. Training on the theory and application of measurement and control of consistency has been combined into a single course. The student will be armed with practical tools to fix real-world problems.