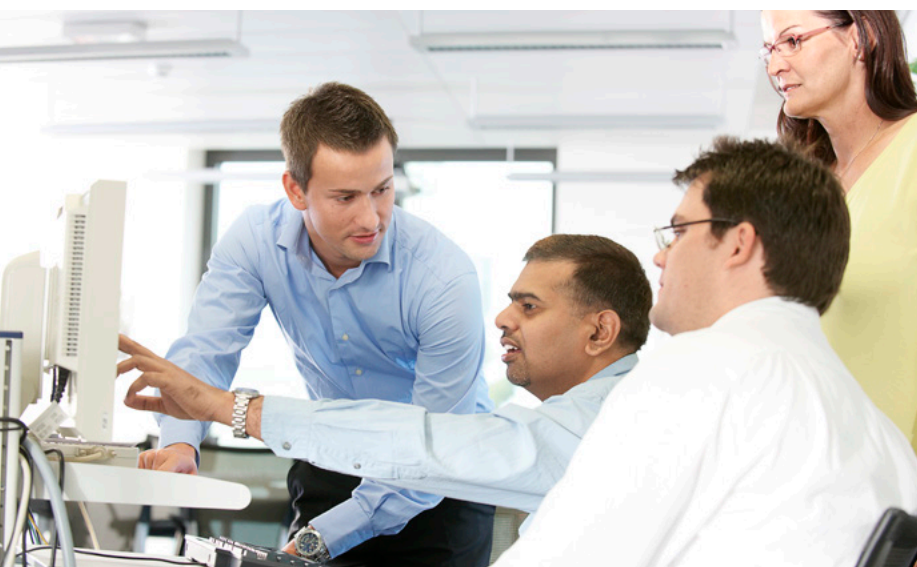# C103
Quality Control System Machine Direction Control

Learn to setup, tune, and verify machine direction controls in the ABB Quality Control System.

Course type and methods
This is an instructor led workshop with short presentations and demonstrations, extended exercises, and hands-on sessions and discussion.

Student Profile
This course is targeted to process control engineers.

Prerequisites
Students should have completed Z200 or be able to demonstrate equivalent skills.

Course objectives
This course covers setup, tuning, and validating of ABB QCS paper machine direction controls on a single headbox Fourdrinier machine. Students will learn appropriate tuning techniques for cascade, deadtime compensation, feedback, and feedforward types of controllers. Laboratory exercises utilize a process simulator to provide hands-on practice of setup, tuning, and verification steps.

The class will be taught from a System 800xA platform, but the fundamental machine direction control knowledge gained in this course can be applied to an ABB QCS with MP280, AC450, or System 800xA hardware.

User interface and program differences will be related back to the other platforms.

Upon completion of this course the participants will be able to:
• Use the reel report variance portioned analysis (VPA) data to quantify control performance
• Set-up and implement data collection methods
• Determine the return on investment related to process control
• Setup, tune, and validate both incremental and full value style actuators
• Setup, tune, and validate basis weight, moisture 1, moisture 2, opacity, and ash controls
• Setup, tune, and validate drystock compensation
• Utilize system features such as: dryer reduction, dryer loading, and sheet break recovery suspend logic

Duration
The duration is 5 days

Course Outline

Day 1	Day 2	Day 3	Day 4	Day 5

• Kick off and introductions
• Reel report VPA data
  - Definitions of variation: CD, MDL, MDS, and total
  - Source of data
  - Analysis techniques
• Data collection options
  - OPC
  - PMR
  - System trending
• ROI of process control
• Lab
  - Setup data collection options
  - Extract VPA data
  - Analyze VPA data to establish a performance base line
  - Setup data collection programs
  - Determine financial impacts for both regulation and time to target improvements
	• Review: questions and answers
	• MD control overview
	  - Cascade control
	  - Deadtime compensation
	  - Feedback control
	  - Feedforward compensation
	• System navigation
	  - Tuning displays
	  - User displays
	  - Trends
	• Actuator level setup and tuning
	  - Incremental no valve position feedback, PD
	  - Incremental with valve position feedback, PI
	  - Full value, PID
	• Lab
	  - Incremental tuning of stock, speed, PCC, and gross slice
	  - Full value tuning of steam
		• Review: questions and answers
		• Measurement processing
		  - MD and CD separation
		• Process decoupling
		• Moisture 1 and moisture 2 with respect to stock
		  - Moisture 1 with respect to the steam of moisture 2
		  - Bone dry with respect to stockflow
		  - Bump test size determination
		  - Feedforward setup, tuning, and verification
		• Lab
		  - Perform bump tests to determine feedforward models
		  - Tune and verify feedforward control structured text
			• Review: questions and answers
			• Scan level weight, moisture 1, and moisture 2 controls
			  - Target entry options
			  - Deadtime compensation
			  - Delay speed reference
			  - Process model
			  - Abort/suspend conditions
			  - Setpoint change versus disturbance rejection tuning
			  - Verification steps
			• Ash control
			  - Filler/PCC to dryweight target decoupling
			  - Filler/PCC to ash gain decoupling
			  - Filler/PCC base loading and addition points
			• Control expectations
			  - Cutoff frequency
			  - Time-to-target issues
			• Lab
			• Perform bump tests to determine feedback model parameters
			• Tune and verify all scan level controls for both setpoint and disturbance regulation
				• Review: question/answer
				• Drystock compensation
				  - Setup and tuning
				  - Wet weight calculation
				• When to use inferred stock flow
				• Sheet break recovery options
				• Dryer controls
				  - Loading
				  - Reduction
				• Review field module Requirements
				• Lab
				  - Setup, tune, and verify drystock compensation
				  - Setup dryer loading and dryer reduction