NEW PROCESSES FOR DRYING AND INFORMATION GATHERING

Mil Shipp and Rodger Price
Weyerhaeuser Company
Raymond, WA

INTRODUCTION

This presentation will be in two parts. In Part I, Rodger Price will discuss process control and the flexibility it provides. In Part II, Mil Shipp will discuss statistical process control in the lumber manufacturing process.

PART I - INFORMATION SYSTEMS FOR WOOD DRYING

Fifteen years ago, who would have thought the demand for information and communications would be as great as it is. Who would have thought our business card would have our business, home, fax, and mobile phone numbers. Today how many of us use electronic mail on our personal computers? Fifteen years ago, how many manufactures realized responding to customer demands may require the kind of flexibility in which OEM's would redirect their whole business strategy to make a sale? Competition in today's business world is forcing us to have access to more and more information. Changing traditional thinking, and demanding us to communicate as partners in business sharing statistical information so we can improve our operating processes. We need to research technology and align ourselves with progressive innovative solutions so we can take advantage of information and processes that will help us better manage our responsibilities.

How many times have your Sales, Quality Control Department, or God forbid the "Mill Manager" requested an explanation from the Kiln Operator or Department Manager about a kiln charge because customers have complained about quality degrade? How many times were you able to reconstruct in detail the events that lead to the degrade, or better yet, have already communicated to your manager the aberration and potential quality degrades before the customer ever complains. With the full utilization of today's technology we can understand Wood Drying Processes. Manufacturers of process control equipment are constantly improving their stake in the market place, improving their sensors, and developing better ways of measuring process variables. With the advent of the personal computer revolution and the development of computer graphics, anything from the industrial environment that we need to measure, record for analysis, or display graphically is available in a user-friendly format. Intuitive operator graphic interaction is possible.

The forgoing statements being a reality for us at Raymond, and while we try to adjust to a demanding market place, a customer base that is becoming increasingly selective, we felt the need to have as much information available about our drying process as we could. We would need ready access to information, all of our process variables, and the flexibility to add other measurement devices when we thought necessary. We wanted to create an opportunity to have a working test kiln. Our Operations people knew they were going to test traditional thought. The operations people have the determination to control moisture content distribution, evaluate quality degrade, improve

productivity, and test high temperature drying. We settled on a PC, Programmable Logic Controller, for machine control, and a personal computer for supervision of the operator interface and data acquisition. The equipment diagram in Figure 1 illustrates our present hardware configuration with future expansion capabilities. Our current Texas Instrument 545 PLC's link through a Network Interface module allowing any of the supervisory terminals to communicate independently to either Kiln control system.

The software support systems consist of:

Micro Soft Window 3.1	DOS 5.0
Word for Windows 2.0	Wonder ware Intouch 4.0
Micro Soft Excel 4.0	Texas Instrument TI Soft 2.0

The graphics in Figure 2 illustrate some of the present operating system windows on our system.

The graph in Figure 3 is one of several that are available online. It is a product of some tests we ran through the course of a few weeks. We weighed one wheel of a kiln car trying to understand the effects of weight loss during the drying schedule and what it could teach us. We wanted to try to flag the process variables that we would use as control points for future tests. These graphics demonstrate how the operations people can collect, analyze and display data.

With the DDE (dynamic data exchange) capabilities of our system we have been able to optimize our steam management, test kiln schedules, improve wood quality and production schedules. Our hope is to learn about free water removal during the early part of the drying schedule and how to optimize that process.

We are sure we haven't written the book on the challenge ahead of us. We know there are very talented people in our industry, and outside our industry, that share our zest for research and improvement.

PART II - STATISTICAL PROCESS CONTROL IN LUMBER MANUFACTURING

For statistical process control applied to pre- and post-kiln cycle activities, the crucial issue is to have the ability and capability to replicate the process and end results, cycle after cycle. And at the same time, continuously improve the process and the end results.

We should all remember and be continuously aware that the process and end results can be impacted from the woods until the lumber package goes on the truck. One tool that I use is Deming's 14 points for management. These are shown in Table 1. If one pursued these points as a reference for conducting our daily activities, we would continuously improve in all aspects of our activities.

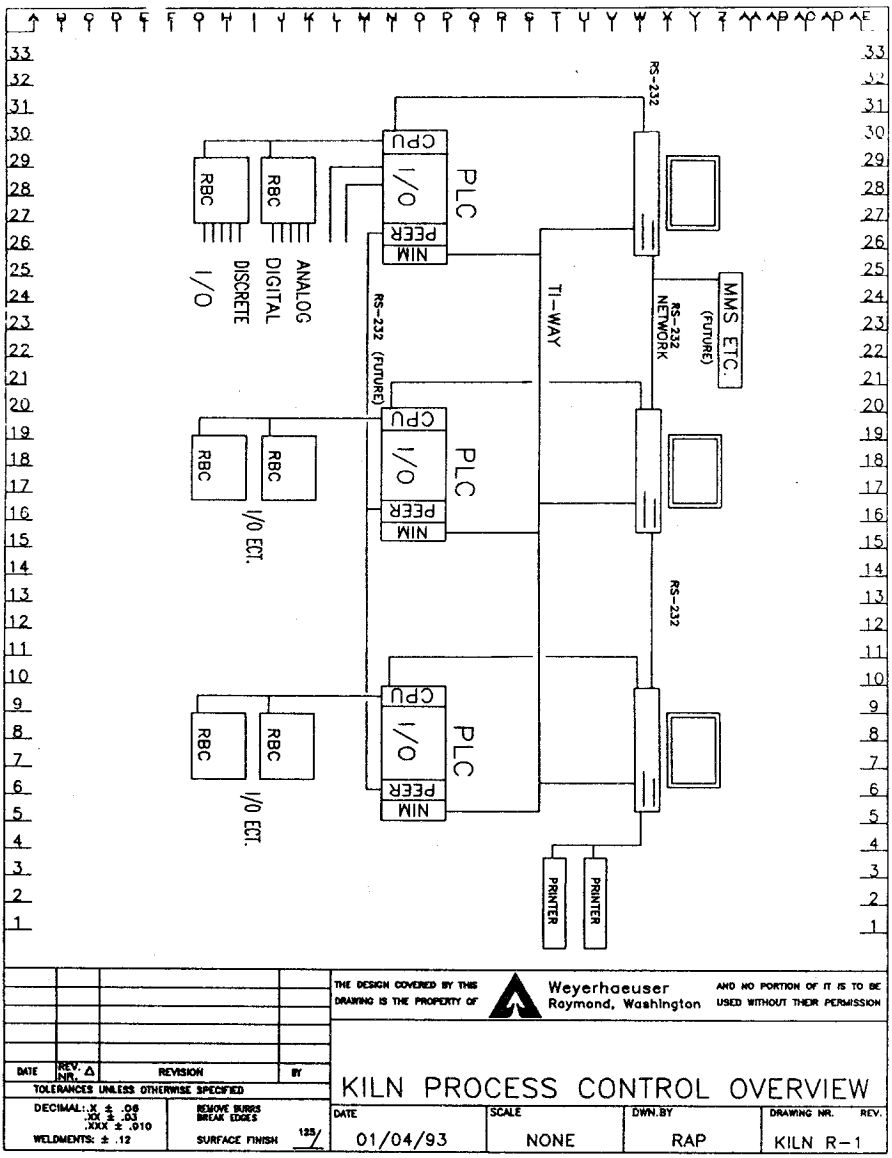

Figure 1. Hardware configuration.

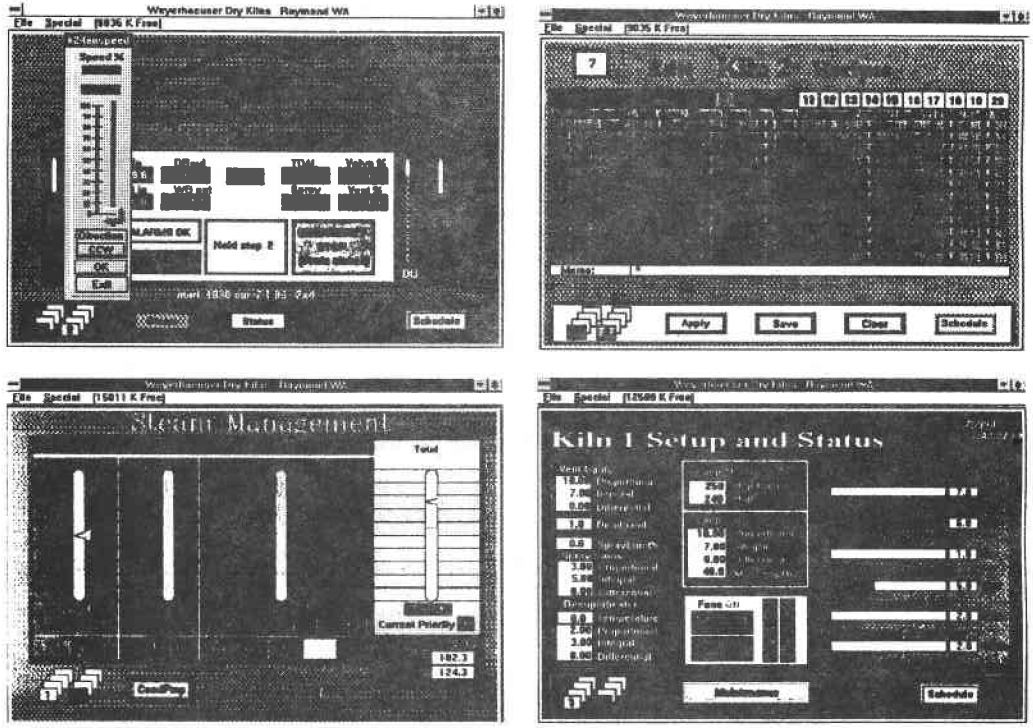

Figure 2. Information screens from kiln control system.

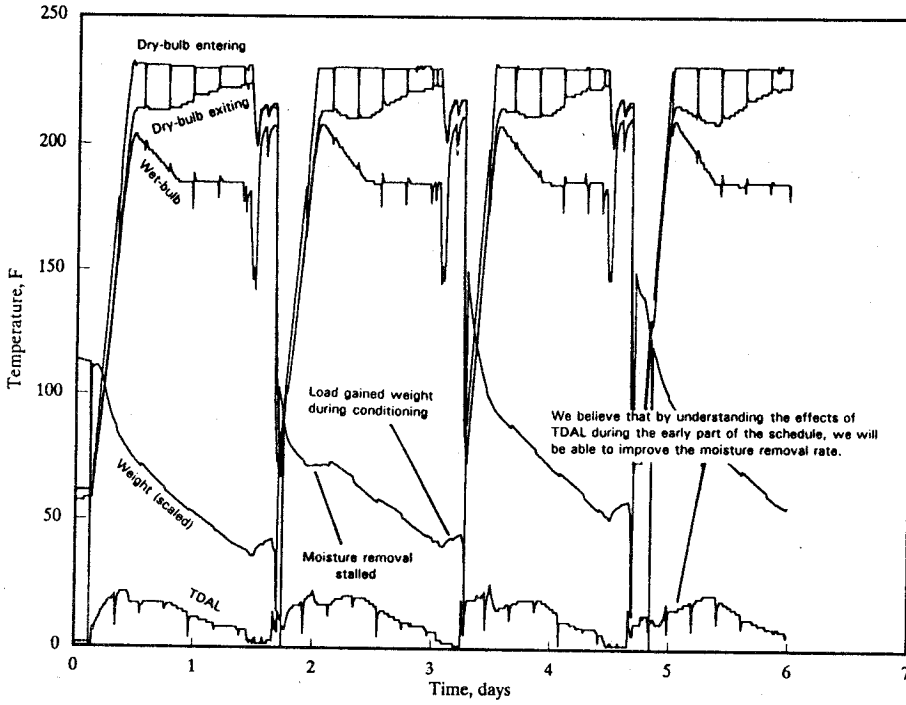

Figure 3. Temperature and weight histories for several kiln charges.

#13 INSTITUTE A VIGOROUS PROGRAM OF EDUCATION AND TRAINING. To meet high expectations and improvement criteria, people must possess the knowledge and comfort level to take action.

#9 BREAKDOWN BARRIERS BETWEEN DEPARTMENTS AND LOCATIONS. With all of the variables from woods to truck which can affect the end result, communication must be able to flow across departments and individuals to allow for correction of deficiencies, i.e., the kiln operator must be able to discuss poor stacking with the stacker operator or sawmill supervisor and mutually solve an issue.

#5 FIND PROBLEMS AND FIX THEM. CONTINUOUSLY REDUCE WASTE AND IMPROVE QUALITY.

#1 CREATE CONSTANCY OF PURPOSE TOWARD IMPROVEMENT OF PRODUCT SERVICE. One must possess a reliable measurement and tracking system to define problems, measure results and improvements.

#2 ADOPT THE NEW PHILOSOPHY, ACCEPTANCE OF POOR PRODUCT AND SERVICE IS A ROADBLOCK TO PRODUCTIVITY. Strive for excellence, don't allow yourself to be a victim or helpless.

#2 ADOPT THE NEW PHILOSOPHY, ACCEPTANCE OF POOR PRODUCT AND SERVICE IS A ROADBLOCK TO PRODUCTIVITY. Strive for excellence, don't allow yourself to be a victim or helpless.

#14 CREATE A STRUCTURE IN TOP MANAGEMENT THAT WILL PUSH EVERYDAY ON THE PREVIOUS 13 POINTS. Understand the basic leverage points, have an effective measurement and tracking system, and strive for continuous improvement and excellence.

At the kilns the basic requirements to implement quality control are:

1. Measurement systems
   - Quality control checks in both green and dry form
     Understand log quality, manufacturing quality, drying degrade
   - Audit all phases of the process
     Stacking
     Storage
     Car building
     Change building
     Hot checks
     Kiln history charts
   - Track kiln performance for trends
     Total hours
     Wet reject
     Average moisture content
     Kiln moisture profile over length of kiln and side to side
   - Inline metering of individual boards tracked by car and kiln change
2. Feedback system
   - Moisture data
     Immediate response to kilns on problems or good performance as it occurs
     Weekly overview previous weeks performance with head kiln operator and head grader
   - Zero defects audits are utilized to track leverage points and establish feedback that is measurable and trackable for kiln department and other departments. One method for this is shown in as a Dry Kiln Matrix in Figure 4.

We can no longer allow ourselves to operate in a mode where we assume a level of excellence because of no bad news or complaints. Continuous improvement requires reliable methods and statistical measurement and control of results.

Suggested reading:

The Deming Management Method	Walton
TPM Introduction	Nakajima
TPM Development Program	Nakajima
Developing Superior Work Teams	Kinlaw
Quality Control in Lumber Manufacturing	Terry Brown

GREEN YARD	CH BUILDING	KILN FOOTAGE	HOUSEKEEPING	SAFETY	% DEGRADE	% WET REJECT	CRITERIA
							PERFORMANCE
0	0	2.50	0	0	0	4	10
1	1	2.45	1	.1	.2	5	9
2	2	2.40	2	.2	.4	6	8
3	3	2.35	3	.3	.8	7	7
4	4	2.30	4	.4	1.0	8	6
5	5	2.25	5	.5	1.2	9	5
6	6	2.20	6	.6	1.4	10	4
7	7	2.15	7	.7	1.6	11	3
8	8	2.10	8	.8	2.0	12	2
9	9	2.05	9	.9	2.4	13	1
10	10	2.00	10	1.0	2.6	14	0
							SCORE
15	15	10	10	10	20	20	WEIGHT
							VALUE
							INDEX

SCORES

Figure 4. Dry kiln matrix.