OSIsoft® UC 2010
Real Time Information — Currency of the New Decade

Hilton San Francisco Union Square | San Francisco, CA
April 26-28, 2010
Enhancing Six Sigma Projects with PI

Matt Corcoran
Who is RockTenn?

- One of North America’s leading manufacturers of paperboard, containerboard, consumer and corrugated packaging
- Annual net sales of approximately $2.8 billion
- Founded in 1917 and operates manufacturing facilities throughout the United States, Canada, Mexico, Argentina and Chile
- 10 Recycle Paperboard Mills, 2 Recycle Container-board Mill, 1 Bleached Board Mill
- 90+ Converting Plants
- Headquartered in Norcross, Georgia
Who is the Chattanooga Mill?

• 93 years old (The original paper mill in RockTenn)
• Produces 100% Recycled Uncoated Paperboard
• Product calipers (thickness) range .014” - .060”
• Our products Include:
  – Tube Board (Cores and Concrete Molds)
  – Folding Carton Board (Boxes and frames)
  – Partition Board (Partitions for breakable items)
  – Specialty Board (Colors, water resistant)
  – RTA Furniture Board (Backing for Furniture)
Six Sigma at RockTenn

• “RockTenn is creating a culture of innovation and high performance to ensure that our company is the first choice of our customers, our employees, and our shareholders.” - Jim Rubright (2000 Annual Report)

• Our strategy is to drive key initiatives consistent with our business strategy, with a specific focus on:
  – Implementing a long lasting process improvement initiative with significant bottom line results and significant impact on customer satisfaction
  – Investing in our employees
  – Leveraging the resources of a $2.8 Billion company over our six operating divisions

• RockTenn’s Six Sigma dept was established to provide the tools and expertise to put our strategy into action
PI Implementation at RockTenn

- 2005 Pilot program at the Chattanooga Mill
- 2006 EA began
- 2007 PI online for all our paper mills
OSIsoft Enterprise Agreement

• Diane Bricco – Enterprise Project Manager
• Field Service Engineers
• Center of Excellence
  – Brian Palmer
  – Gopal Gopalkrishnan
Pre-Project – Study Process Capability

• Business Case
  – Customers requiring a more consistent product not just in spec
• Shrinking Market
  – Strategic positioning to be the prime supplier to the market
• Healthy Customers
  – A happy and healthy customer base is a prime ingredient for long term success
• We’re not talking about just $$$ savings, we’re talking about staying in business.
Process Capability

• Having a normal distribution / bell curve allows us to measure “process capability.”
• Process capability compares your process variation to the product specifications and provides an index or “grade.”
The 3rd String Kicker

LSL

USL
The 1st String Kicker

LSL

USL

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Our Bench Mark

• Data Collection
  – Data Sources
• PI DataLink
  – Import to Excel
  – Filtering
  – Export to Minitab for analysis
• Process Capability
• You are here
• Shock and Awe
Data Collection

• DCS (Metso)
• 2 In-Line Sheet Scanners on each machine (Metso)
• Quality Database (IBM AS/400)
• All of the data from these sources are collected and archived on the PI Server.
• Access to this kind of data was nearly impossible before the PI Server was installed.
PI DataLink

Get evenly spaced, sampled data

- **Tagname(s)**: $A$4:$A$53
- **PI Expression**: PI Server [opt.]
- **Start Time**: $A$1
- **End Time**: $A$2
- **Time Interval**: 1m
- **Output Cell**: $D$4
- **Filter Expression [opt.]**
  - Mark as filtered

Example data:

<table>
<thead>
<tr>
<th>Value</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>2.00</td>
<td>3.00</td>
</tr>
<tr>
<td>4.00</td>
<td>5.00</td>
<td>6.00</td>
</tr>
<tr>
<td>7.00</td>
<td>8.00</td>
<td>9.00</td>
</tr>
</tbody>
</table>

Press **OK** or **Cancel**.
Minitab Process Capability Analysis

Potential (Within) Capability

Cp  1.48
CPL 1.08
CPU 1.89
Cpk 1.08
Grade A Moisture

Cpk = 1.08
Grade B Moisture

Cpk = 0.37
Grade C Moisture

Cpk = 0.61
All Together – You Are Here

Grade A
Cpk = 1.08

Grade B
Cpk = 0.37

Grade C
Cpk = 0.61
Project Goals

• Leverage knowledge of Grade A to our other grades
• Improve process capability of our systems
• Improve customer quality and satisfaction
• Improve performance/efficiency
• Document and standardize procedures
• Develop continuous monitoring methods (PI Displays & Reports)
A Six Sigma Project Was Born

• Six Sigma Black Belt
• Kick Off meeting followed by weekly meetings
• Divided the process into two parts
  – Fiber Management
  – Stock Prep/Machine Management
What Was Different About Grade A?

• What do we do differently on Grade A, compared to the other grades?

• Keep in mind the 6M’s. All are sources of variation:
  – Material
  – Method
  – Measurement
  – Machine (Equipment)
  – Man (People)
  – Mother Nature
Material

• We were much more careful about what fiber and how the bales were added to the process.
Method

• We had specifics on raw material, refiner settings and machine settings

GRADE SPECIFICATION CARD

Grade: Grade A
Caliper: 0.035

<table>
<thead>
<tr>
<th>Beater Room</th>
<th>Furnish</th>
<th>Dye</th>
<th>Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Liner</td>
<td>33% News</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>33% Mix</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>33% Soft Box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back Liner</td>
<td>100% DLK</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wet End Stock</th>
<th>Dye</th>
<th>Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Liner Filler</td>
<td>#2-#8</td>
<td>Size #1 &amp; #9</td>
</tr>
<tr>
<td>Back Liner</td>
<td>#1 &amp; #9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dry End</th>
<th>Top</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Stack</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>Calendar Solution</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>Dry Stack</td>
<td>Skip</td>
<td>Skip</td>
</tr>
</tbody>
</table>

Manufacturing Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Frequency</th>
<th>Target</th>
<th>Action</th>
<th>Reject</th>
<th>Profile 2-Sig Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caliper</td>
<td>Continuous</td>
<td>35</td>
<td>34.5-35.5</td>
<td>34-36</td>
<td>1</td>
</tr>
<tr>
<td>Basis Weight</td>
<td>Continuous</td>
<td>123</td>
<td>120-127</td>
<td>120-128</td>
<td>1</td>
</tr>
<tr>
<td>Moisture</td>
<td>Continuous</td>
<td>5.5</td>
<td>5-6</td>
<td>5-5.5</td>
<td>1</td>
</tr>
<tr>
<td>ZDT</td>
<td>5 per Reel</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>Mullen</td>
<td>3 per Reel</td>
<td>185</td>
<td>180</td>
<td>175</td>
<td>1</td>
</tr>
<tr>
<td>Water Drop</td>
<td>1 per Reel</td>
<td>2</td>
<td>1-3</td>
<td>.75-5</td>
<td>1</td>
</tr>
</tbody>
</table>

Special Instructions:

Beater Room: Pull from Warehouse A
Wet End: Filler Refiners set to 350 CSF, Liner Refiners set to 400 CSF
Dry End: Load calendar stack to 20 psi

Quality Lab:
Fiber Management

• We overhauled the way we purchased our raw material
• The fiber warehouses were reorganized
• The fiber feeding method was revised
• We tracked every bale we used.
Fiber Management - Warehousing

• Reorganized warehouses
• Improved inventory tracking and reordering
• Created fiber staging area
Fiber Management

- Established weight based recipes rather than "bale" based recipes
- Redistributed sludge, broke, and screen returns to better manage fiber consistency
- Established a fiber use tracking system that records fiber type and weight that was used

Shift: 1
Machine: 1
Liner Pulper: 1
Filler Pulper: 1

2
3
4

Grade(s) Running: _______________________
Operator: ___________________________
Date: _______________________________

Grade: Put grade at the top of the column and the weights for THAT grade below it.

Start a new column if you need another grade or need to continue the grade you are running.

If running FSC - notate FSC in column

______ ______ ______ ______ ______ ______ ______ ______ ______

05-Nov-2009 2:00 PM
Stock Prep/Machine Management

• With fiber feed managed stock consistency variation decreased
• Run stock refiners in automatic rather than manual
• Utilize PI ProcessBook and RtAlerts to provide real time information and process alerts
#1 PM Filler Refiner Control - 2009

**#1PM 600HP Filler Refiner Freeness**

2/9/09 - 2/13/09

- PASTED OAK
- RT-ULTRA BEAM
- DRY PARTITION BOARD
- BENDING CHIP
- PASTED OAK
- DRY PARTITION BOARD
- PASTED OAK
- PASTED OAK
- ULTRAGUARDIAN
- PLAIN CHIP
- BROWN STAIN
- BLEACHED MANILA
- PAN-L-FILLERS
- PLAIN CHIP
- BENDING CHIP
- PINK MANILA
- PAN-L-FILLERS
- PASTED OAK
- PASTED OAK
- PAN-L-FILLERS
- BENDING CHIP
- PINK MANILA
- PAN-L-FILLERS
- PASTED OAK
- BENDING CHIP

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**PM1 600 hp Filler Refiner Freeness**

**PM1 600 hp Filler Refiner Freeness Set Point**

**PM1 600 hp Filler Refiner Power**
#1PM Filler Refiner Control - 2010

#1PM 600HP Filler Refiner Freeness

2/5/10 - 2/9/10

- PM1 600 hp Filler Refiner Freeness
- PM1 600 hp Filler Refiner Freeness Set Point
- PM1 600 hp Filler Refiner Power
Project Results – Capability Improvements

- 21.2% over all improvement in caliper process capability
- 10.4% over all improvement in moisture process capability
- Reduced beater tons due to variation and out of spec material
Grade B

Before

Cpk = 0.37

After

Cpk = 0.95
Before

Grade C

After

Cpk = 0.61

Cpk = 1.06
Project Results – Value of Better Process Capability

- More consistent product for our customers
- More consistent process for better production efficiency
Project Results – Reduced Beater Tons

FY09 Beater tons for Caliper/Moisture/Profile/2Sig
(as a % of total beater tons)

47% reduction

~15% reduction

~7%
# Sustainability

## PM1 Moisture

<table>
<thead>
<tr>
<th>Grade</th>
<th>Caliper</th>
<th>Start Time</th>
<th>Minutes</th>
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</thead>
<tbody>
<tr>
<td>BENDING CHIP .018</td>
<td>0.018</td>
<td>4/9/2010 7:31:00 AM</td>
<td>170</td>
</tr>
<tr>
<td>DURAFIBRE FFO .0245</td>
<td>0.0245</td>
<td>4/8/2010 2:04:00 PM</td>
<td>1047</td>
</tr>
<tr>
<td>ULTRA BEAM .030</td>
<td>0.03</td>
<td>4/8/2010 3:07:00 AM</td>
<td>657</td>
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Reel Number: 4/9/2010 9:28:00 AM RT110D0161

Spec:

<table>
<thead>
<tr>
<th>Moisture</th>
<th>LSL</th>
<th>target</th>
<th>USL</th>
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<tbody>
<tr>
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<td>5.00</td>
<td>6.00</td>
<td>7.00</td>
</tr>
</tbody>
</table>

Grade Run Selected:

DURAFIBRE FFO .0245

---

**SQC-Caliper** : [Individuals]

<table>
<thead>
<tr>
<th>Value</th>
<th>Eng. Units</th>
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<tbody>
<tr>
<td>4.99323</td>
<td>%</td>
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<tr>
<td>6.00677</td>
<td>%</td>
</tr>
</tbody>
</table>

Chart Tag: PR:PM1-PMRL.OPR:MIUSL/LSL: 6.3 / 4.8

PM1 Reel Moisture

STDEV: 0.37517

Cpk: 0.63188

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4/8/2010 5:04:00 PM to 4/9/2010 7:31:00 AM

4.55
Thank you