Ties Together Enterprise OEE for Clearwater Paper

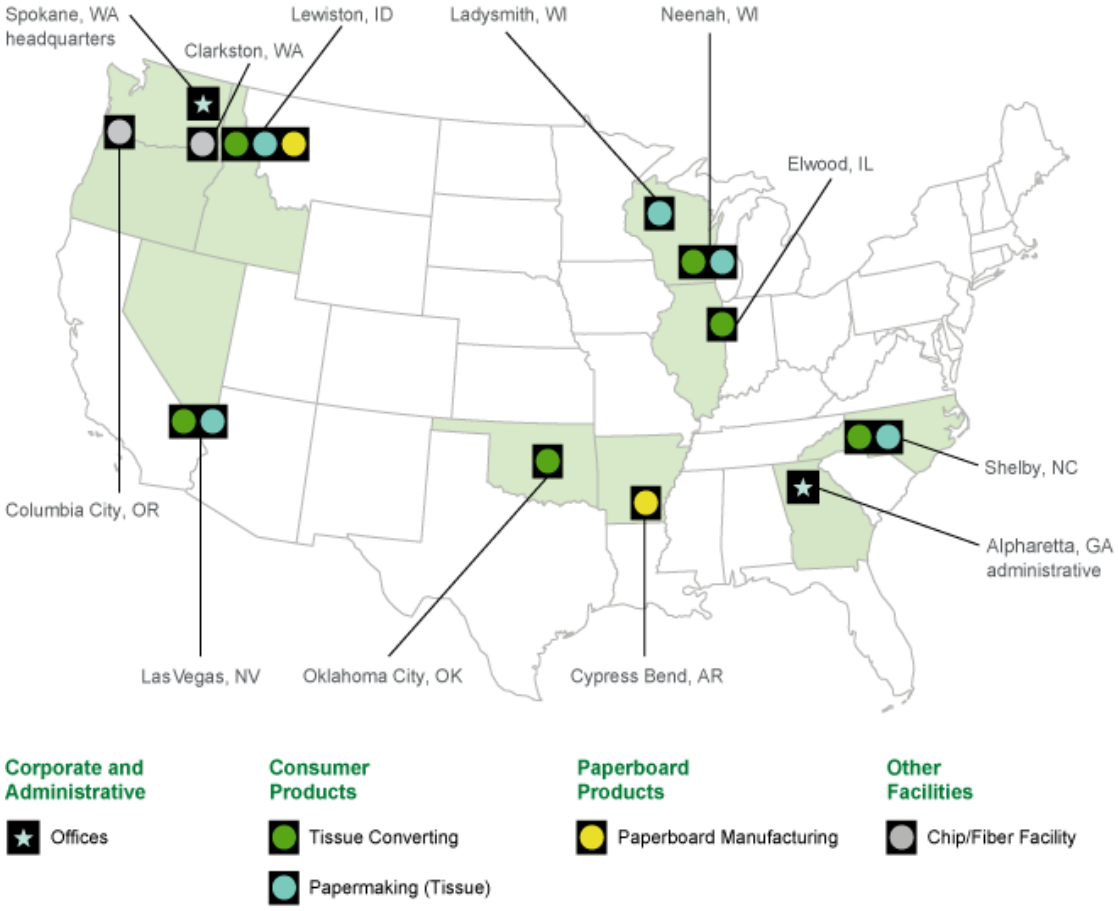
Presented by **Ryland Bingham**

Agenda

- About Clearwater Paper
- The Mandate to Report OEE
- Challenges
- Project Approach
- How we used the PI system to build an enterprise view of OEE.
- Results and Lessons Learned
- Conclusion

CLEARWATER PAPER

Clearwater Paper is the country's largest provider of private label tissue to retail grocery chains and a world-class manufacturer of high-quality bleached paperboard.



A little company history…

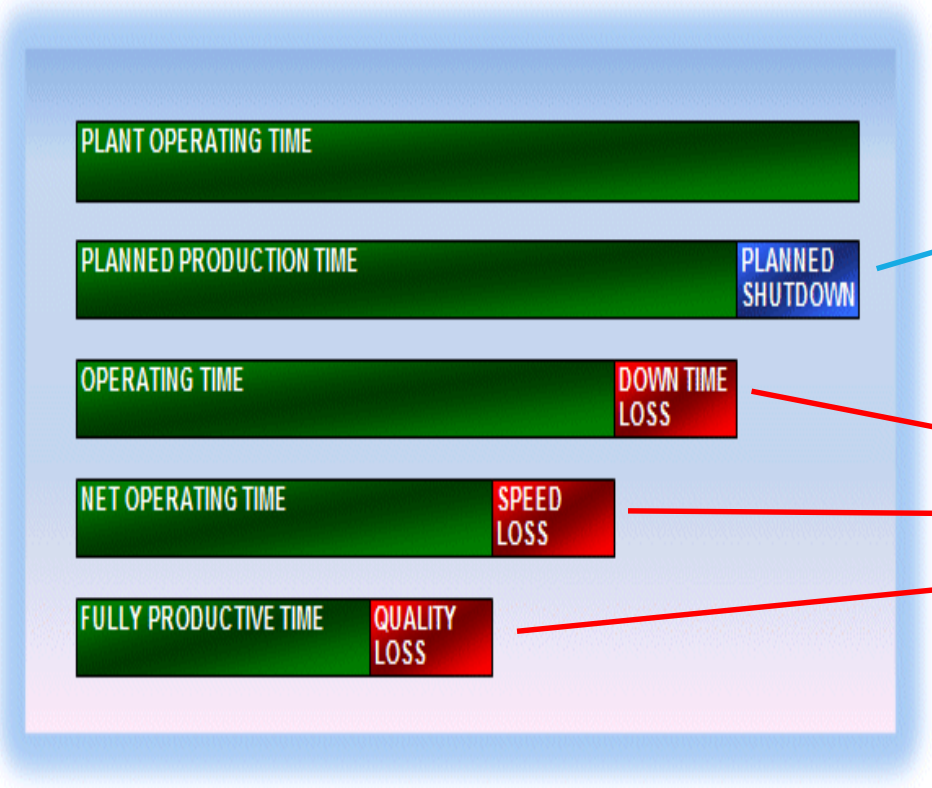
- 2008 Spin-off from Potlatch Corp.
- 2010 Cellu Tissue acquisition
- 2011 Sale of Wood Products Division
- 2012 Greenfield startup of Shelby, NC Mill
- 2012-2013 Standardization of MES at Paperboard Division
- 2014 Sale of specialty mills
- 2013-2015 Standardization of MES/ERP at Consumer Products division

The Mandate to Report OEE

- Provide an enterprise view of Overall Equipment Effectiveness (OEE) based on real-time data for all Clearwater paper machines and tissue converting assets.

- OEE = (Uptime %) x (Speed %) x (Quality %)

Converting OEE to Time

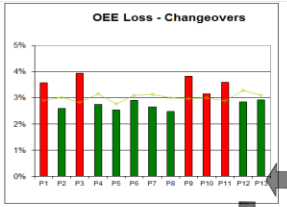


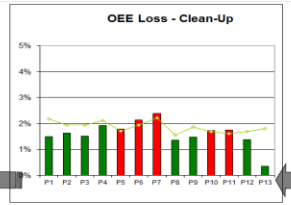
PLANNED DOWNTIME

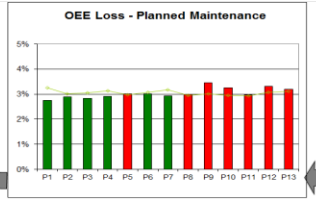
- Change over Time
- Sanitation / Cleaning Time
- Planned Maintenance
- Start-up / Shut down time
- Meetings
- TPM Events (Kaizen)

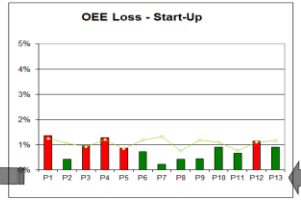
UNPLANNED DOWNTIME

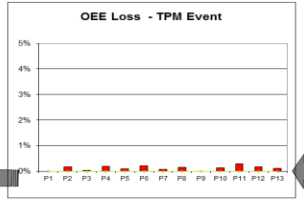
- Breakdown Time
- Process Upset Time
- Minor Stop Time
- Speed Loss
- Quality Loss

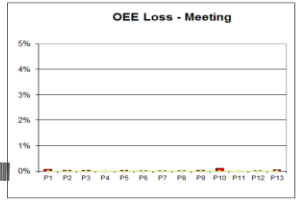

OEE Loss - Changeovers

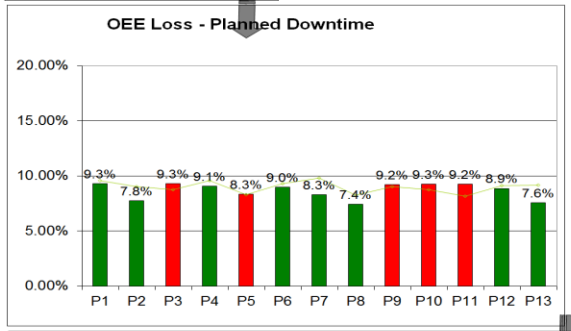

OEE Loss - Clean-Up

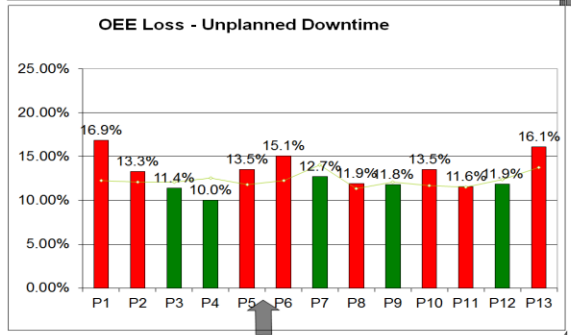

OEE Loss - Planned Maintenance

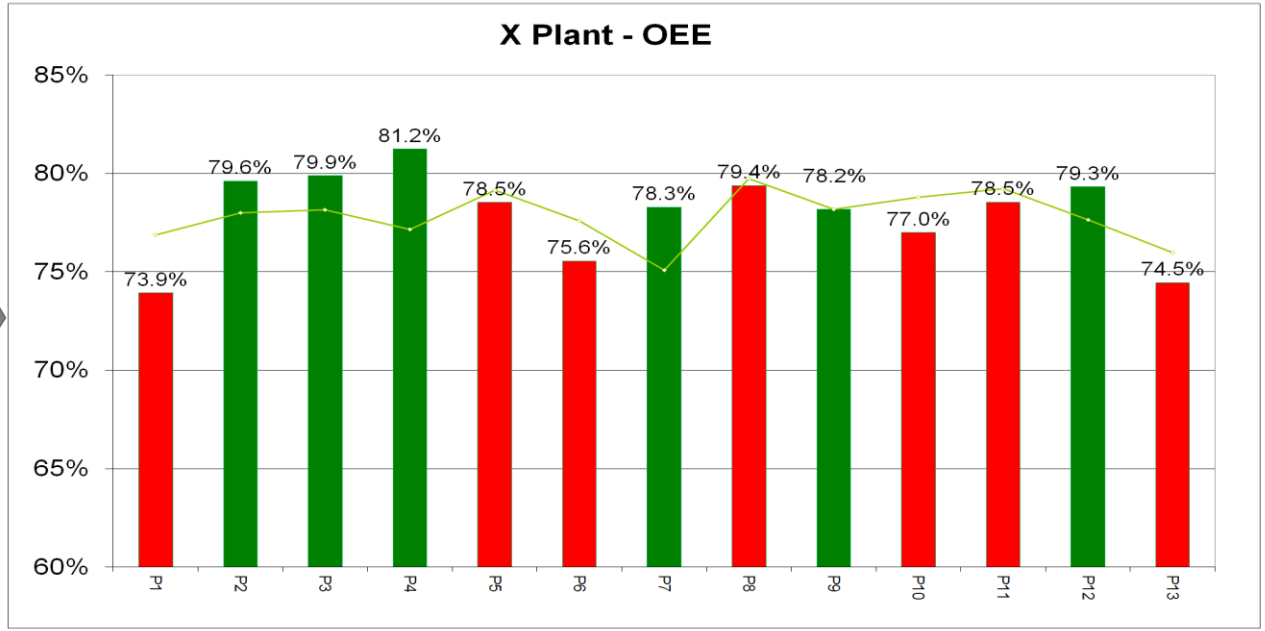

OEE Loss - Start-Up

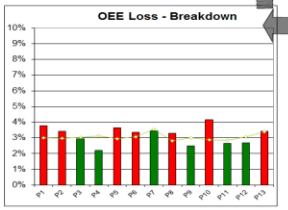

OEE Loss - TPM Event

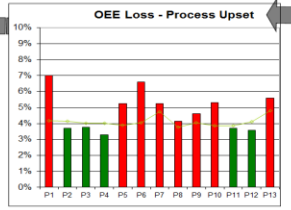

OEE Loss - Meeting

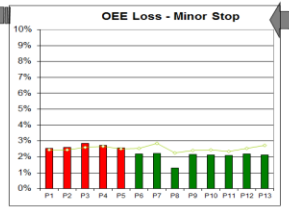

OEE Loss - Planned Downtime
20.00%
15.00%
10.00%
5.00%
0.00%
9.3%
7.8%
9.3%
9.1%
8.3%
9.0%
8.3%
7.4%
9.2%
9.3%
9.2%
8.9%
7.6%
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12 P13

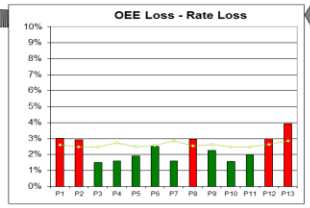

OEE Loss - Unplanned Downtime
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
16.9%
13.3%
11.4%
10.0%
13.5%
15.1%
12.7%
11.9%
11.8%
13.5%
11.6%
11.9%
16.1%
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12 P13

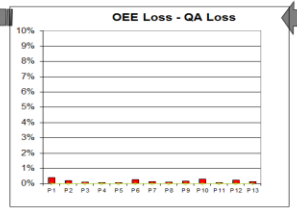

X Plant - OEE
85%
80%
75%
70%
65%
60%
73.9%
79.6%
79.9%
81.2%
78.5%
75.6%
78.3%
79.4%
78.2%
77.0%
78.5%
79.3%
74.5%
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12 P13

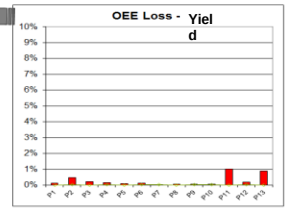

OEE Loss - Breakdown


OEE Loss - Process Upset


OEE Loss - Minor Stop


OEE Loss - Rate Loss

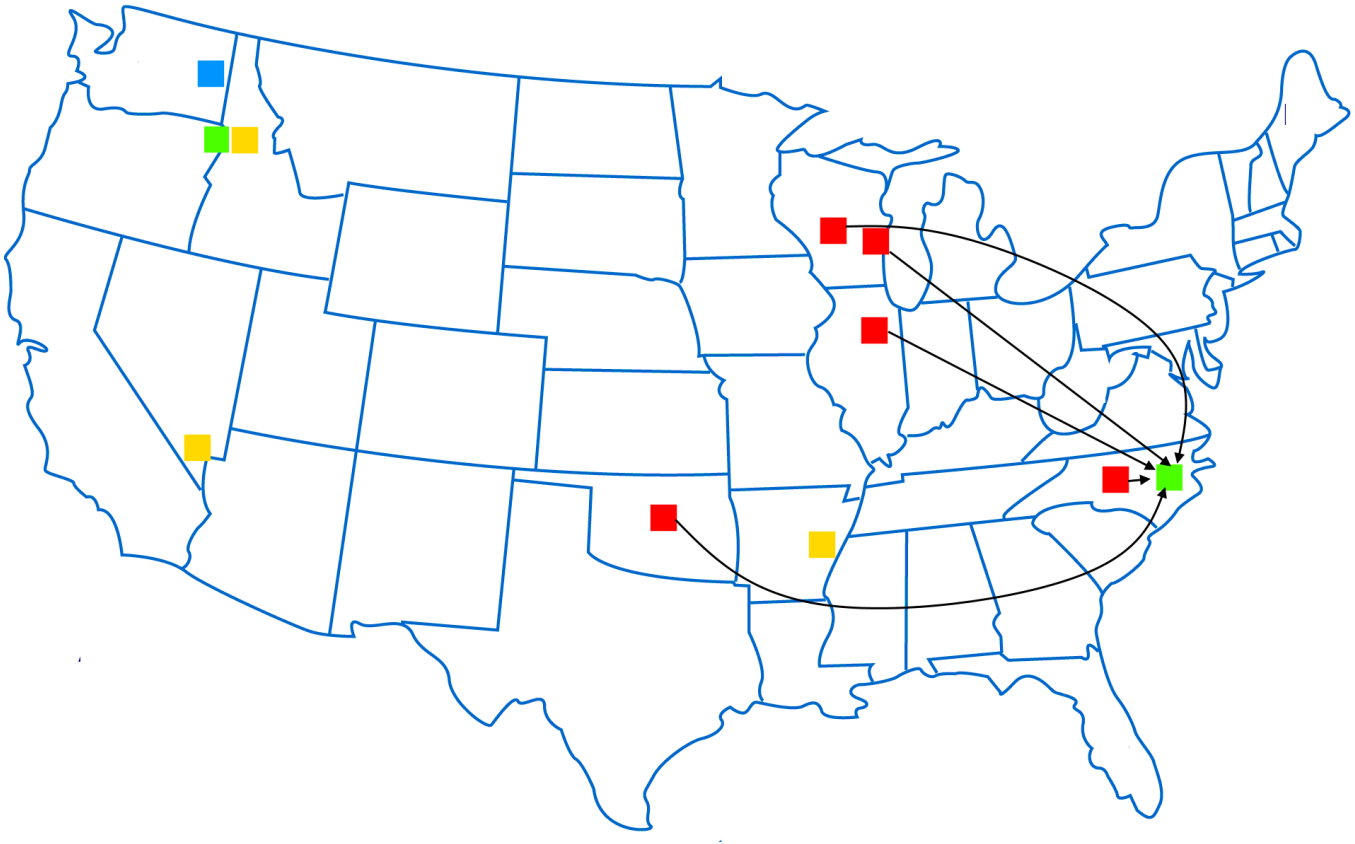

OEE Loss - QA Loss


OEE Loss - Yield

The Challenges

- Between 2012 and 2014 most mills had already developed location specific OEE metrics
- There were 5 distinct systems in use for recording downtime
- Only 4 mills used real-time data for OEE, most relied on manual entry, after the fact
- Less than 10% of Clearwater's Converting assets were hooked into a historian
- Change in project sponsorship halfway through

Locations with PI and their status at the start of the project



- 5 Mills with no on-site PI server
- 3 Mills requiring upgrades
- 2 Locations required no PI updates
- 1 AF server in Spokane

The Approach

- Capture Speed, Up/Down indicator and Total Production in PI Data Archive
- Standardize on a single system for downtime collection and categorization
- Limit converting assets to measurement at winder/folder only
- Organize all OEE data into a single PI Asset Framework hierarchy
- Feed our Enterprise BI system directly from PI AF.

Site Assessment and Setting up Data Collection

- Seven out of nine sites required new PI interfaces
- Most sites required some level of network infrastructure improvements.
- Many converting assets required PLC programming for communication and tag creation.
- The only way to finalize requirements was for the project team to visit each site.
- Follow up visits to implement, test and train

Build PI AF Event Frames interface to Parcview for Downtime

- Parcview downtime alarm events are very similar to PI event frames
- The details of a downtime event can change up to 40 days after creation
- Used to PI AF SDK to create a simple C# program to create, update and delete Event Frames as downtimes are updated in Parcview.

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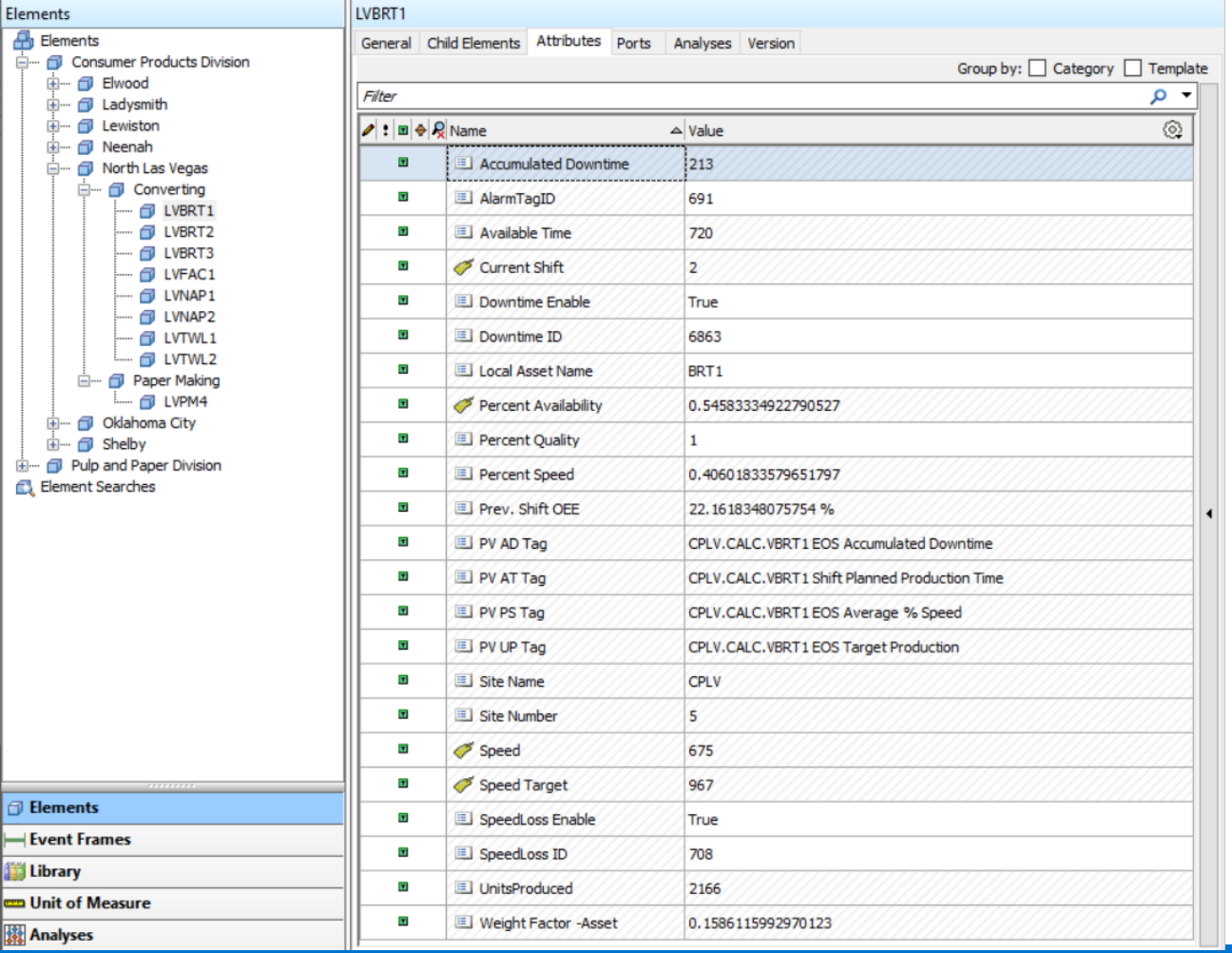
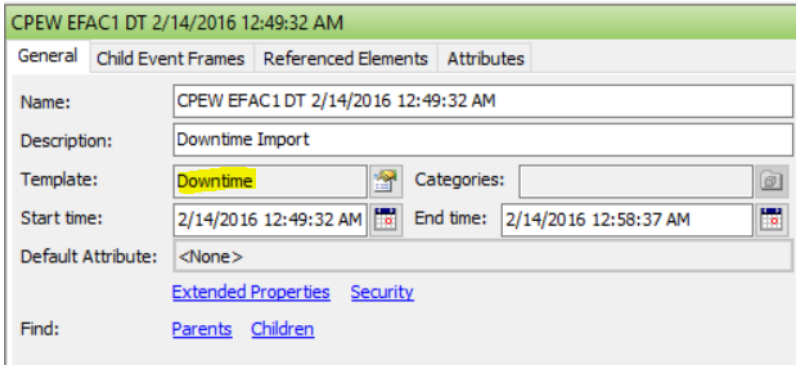


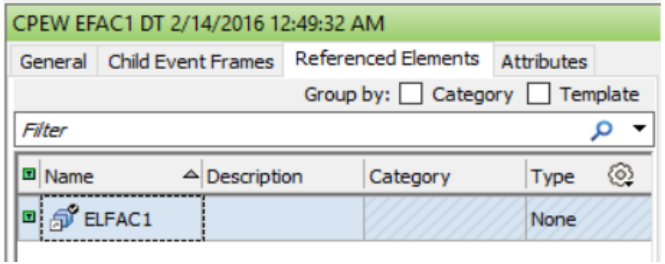
Configuration of Downtime Event Frame Interface

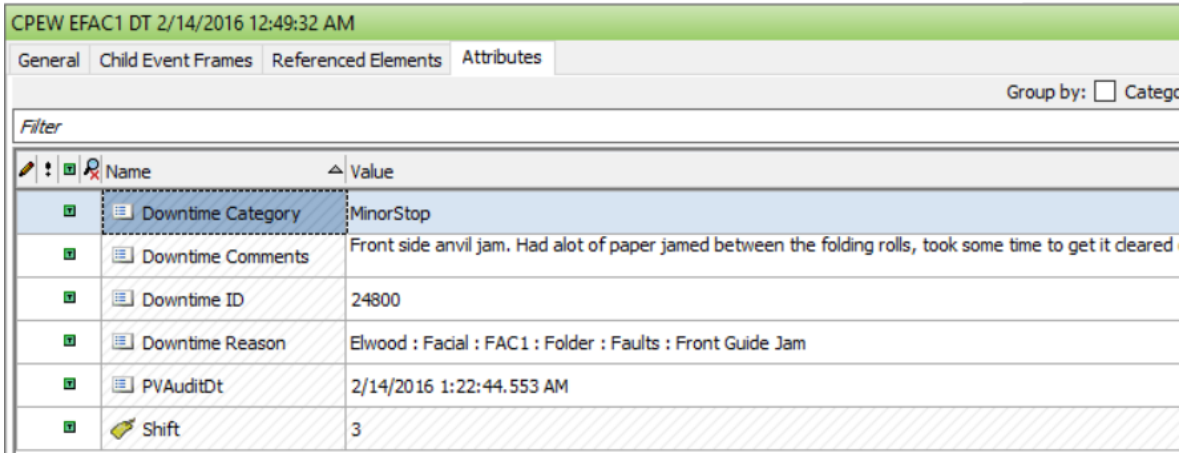
Asset Level Configuration

- Downtime and speed loss ID's in Parcview
- Parcview calculated tags
- Enable and disable collection by asset
- Asset weight factor
- Shift number
- Speed and uptime results by shift

Example Downtime Event Frame

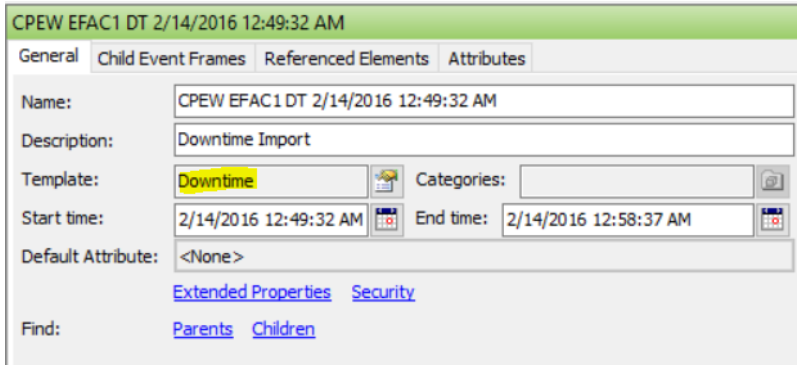


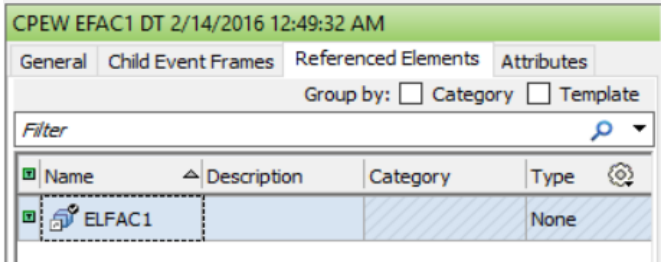


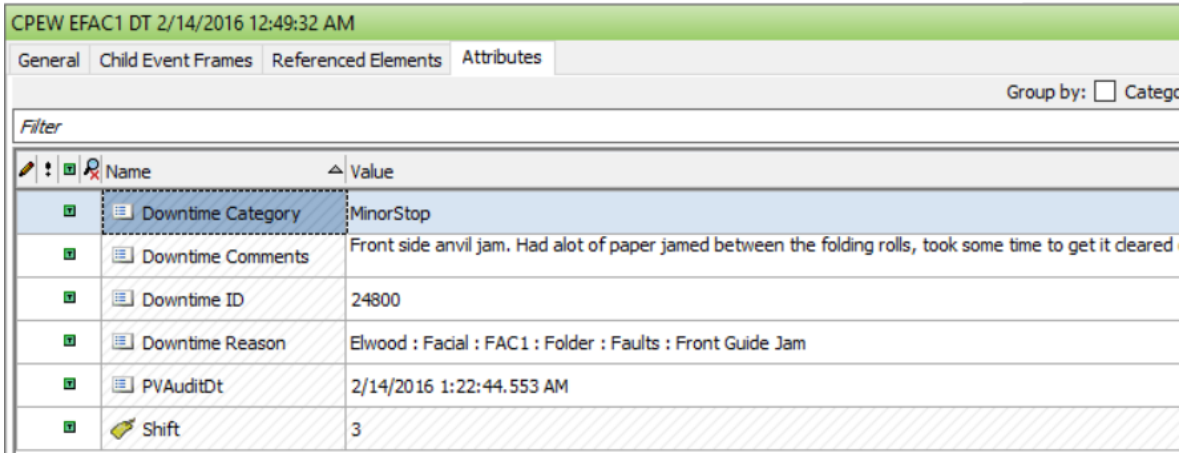


- Use of Templates
- Every Event Frame is associated with an Asset
- Categories are Great!
- Modification of an Attribute does not update Modified Date of an Event Frame

Example Downtime Event Frame







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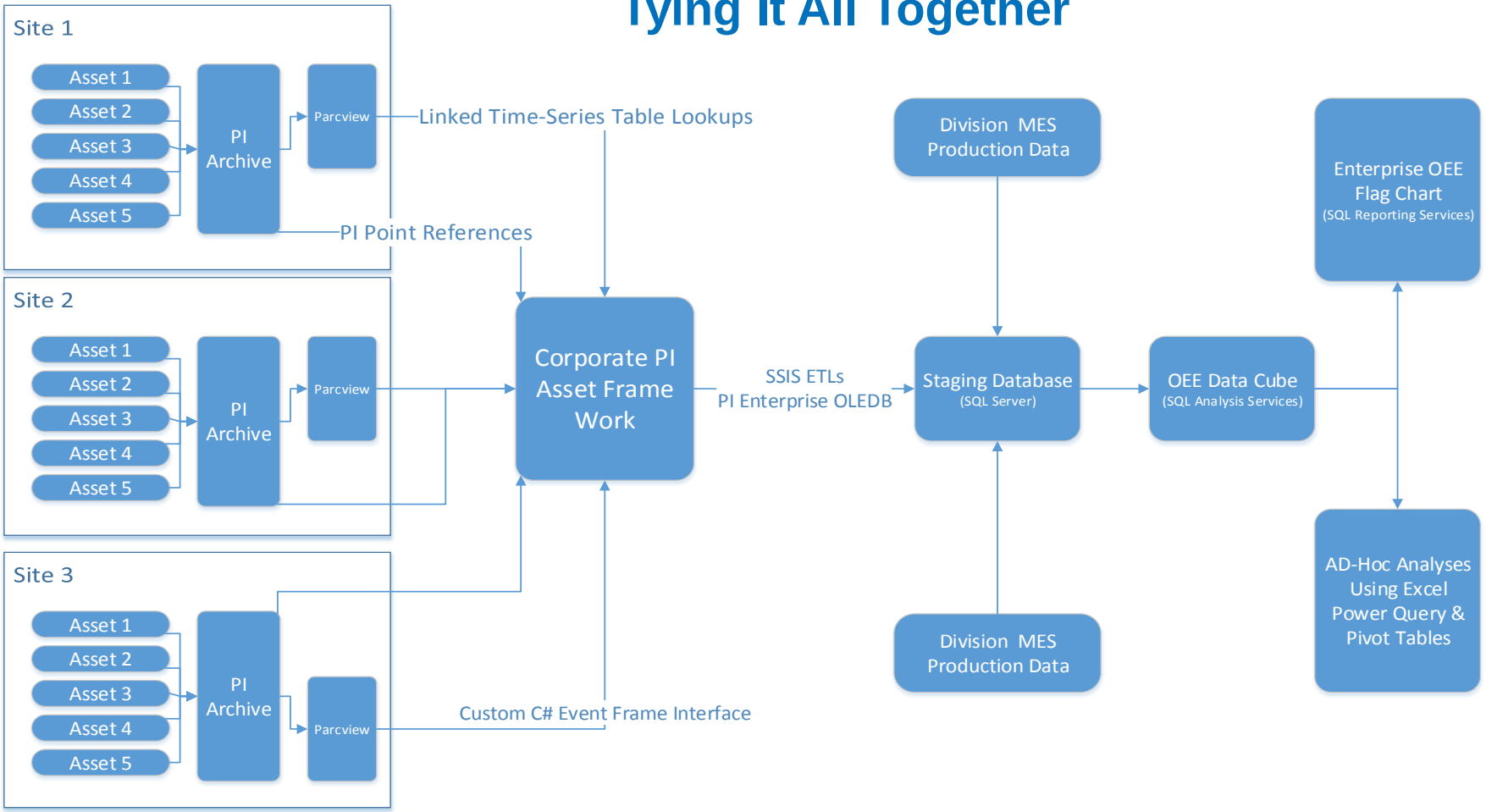
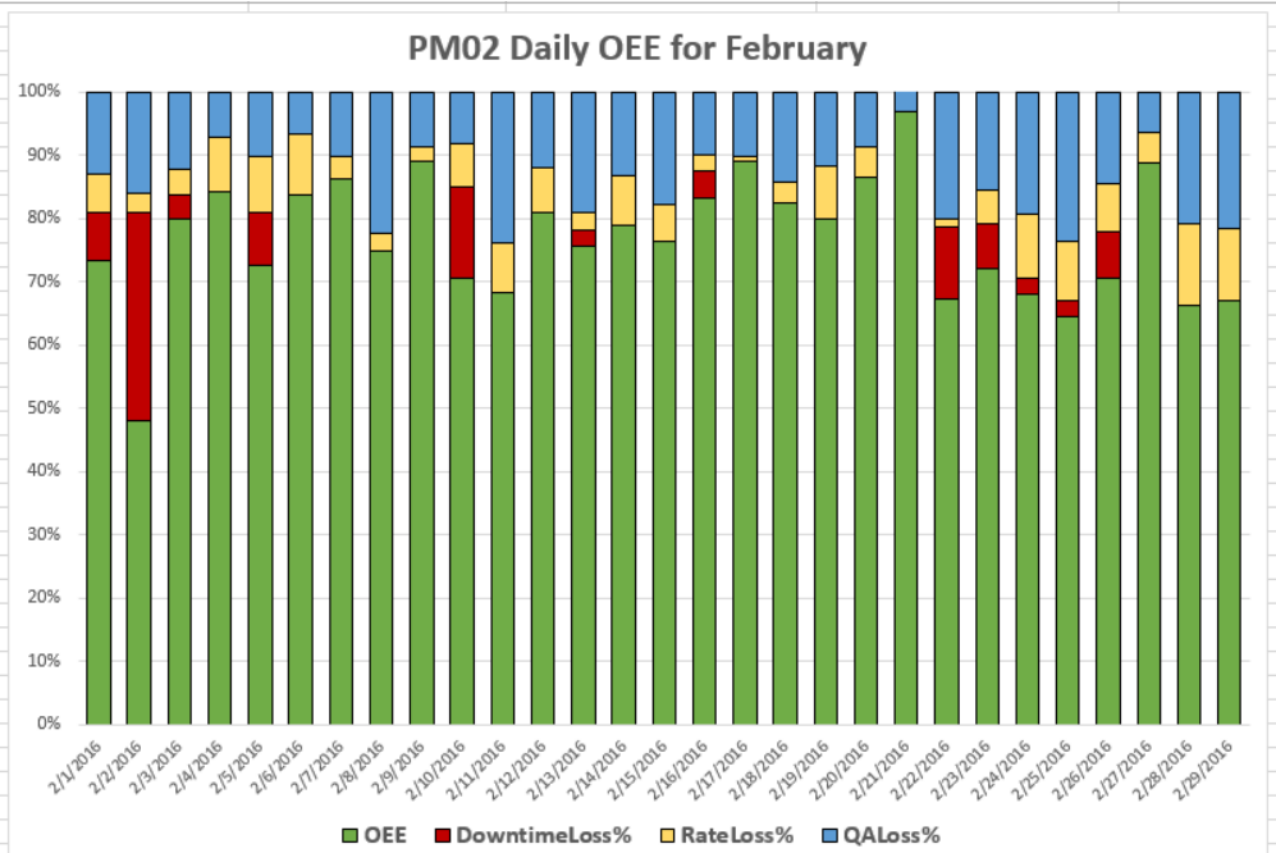
Tying It All Together



Enterprise Flag Chart for Longer term and Strategic Planning

Ad-hoc Mill Report provides more timely view of

Machine Parent	PM02	PM02 Daily OEE for February			
Y-Q-M-D	February				
As Of Yesterday	Current Y	r To Date			
Date	OEE	DowntimeLoss%	RateLoss%	QALoss%	
2/1/2016	73.4%	7.6%	6.1%	12.9%	
2/2/2016	48.2%	32.7%	3.0%	16.1%	
2/3/2016	80.1%	3.6%	4.1%	12.2%	
2/4/2016	84.4%	0.0%	8.5%	7.1%	
2/5/2016	72.6%	8.4%	8.8%	10.2%	
2/6/2016	83.9%	0.0%	9.5%	6.6%	
2/7/2016	86.4%	0.0%	3.6%	10.1%	
2/8/2016	74.9%	0.0%	2.7%	22.4%	
2/9/2016	89.2%	0.0%	2.1%	8.7%	
2/10/2016	70.5%	14.6%	6.7%	8.1%	
2/11/2016	68.2%	0.0%	7.9%	23.9%	
2/12/2016	81.1%	0.0%	7.0%	11.9%	
2/13/2016	75.7%	2.6%	2.6%	19.1%	
2/14/2016	79.0%	0.0%	7.8%	13.2%	
2/15/2016	76.3%	0.0%	5.9%	17.8%	
2/16/2016	83.3%	4.3%	2.5%	9.9%	
2/17/2016	89.2%	0.0%	0.7%	10.1%	
2/18/2016	82.4%	0.0%	3.3%	14.3%	
2/19/2016	79.9%	0.0%	8.6%	11.6%	
2/20/2016	86.6%	0.0%	4.9%	8.6%	
2/21/2016	96.9%	0.0%	-3.2%	6.3%	
2/22/2016	67.3%	11.3%	1.3%	20.1%	
2/23/2016	72.2%	7.1%	5.3%	15.4%	
2/24/2016	68.1%	2.5%	10.1%	19.3%	
2/25/2016	64.6%	2.3%	9.5%	23.6%	
2/26/2016	70.7%	7.3%	7.6%	14.5%	
2/27/2016	88.7%	0.0%	5.0%	6.3%	
2/28/2016	66.3%	0.0%	12.9%	20.8%	
2/29/2016	67.1%	0.0%	11.5%	21.4%	
Grand Total *	76.8%	3.6%	5.7%	13.9%	



Results

- Downtime Events for the entire company now reside in a single place, in a standard format.
- Baselines have been created for all assets based on data collected at the end on 2015.
- In 2016, operational improvement goals are all based on OEE measurements in the new system.
- We've made it over "the hump." Acceptance and ownership of the changes are taking off.

Lessons Learned

- Pay attention to time zones!
- The project ends the effort does not.
- PI Square is an excellent resource
- Requires cooperation for success
- The technology is the easy part

Next Steps

- Install local PI systems on premise for sites that are currently sharing.(Complete!)
- Develop OEE metrics for converting asset components downstream from winders/folders.
- We continue to grow local expertise with PI.
- Expand initial AF Hierarchy to track additional metrics.
- Enterprise Agreement?

Achieving an Enterprise View of Asset Efficiency with PI Asset Framework

COMPANY and GOAL

Clearwater Paper is a young company made up by mills who developed their own operational reporting. It wanted to find a way to standardize Enterprise OEE reporting, across all sites, based on real-time data.

CLEARWATER PAPER.

CHALLENGE

A myriad of different systems and pre-existing OEE reports made an “Apples to Apples” comparison between sites impossible.

- In many cases real-time data was not even recorded for Clearwater’s converting assets.

SOLUTION

Standardize on a system that make’s use of PI data to detect downtime events. Use the PI system to tie the data together.

- New OPC interfaces to pull in real-time data.
- PI Asset Framework to build the enterprise hierarchy
- PI Enterprise OLEDB to feed the data to BI tools.

RESULTS

For the first time Clearwater is able to measure the performance of all it’s assets using identical metrics.

- OEE baselines established.
- Performance goals based on this solution.
- Datasets actively being used by several six-sigma projects

Contact Information

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Clearwater Paper Corporation

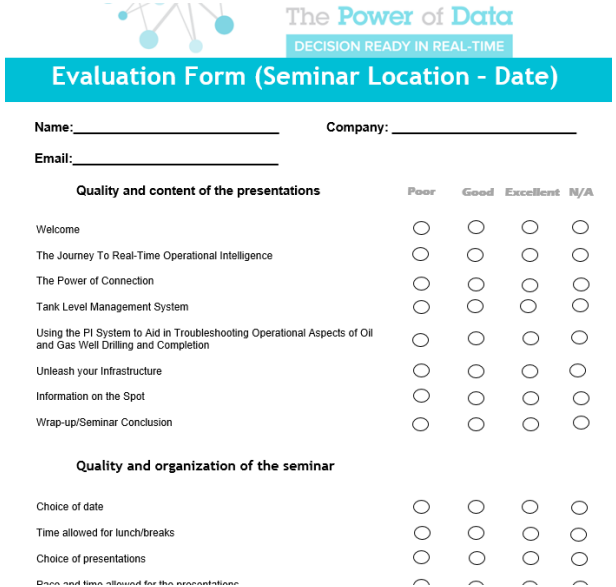
Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please don't forget to…

Complete the Survey for this session



The Power of Data

DECISION READY IN REAL-TIME

Evaluation Form (Seminar Location - Date)

Name:_____ Company: _____

Email:_____

Quality and content of the presentations	Poor	Good	Excellent	N/A
Welcome	○	○	○	○
The Journey To Real-Time Operational Intelligence	○	○	○	○
The Power of Connection	○	○	○	○
Tank Level Management System	○	○	○	○
Using the PI System to Aid in Troubleshooting Operational Aspects of Oil and Gas Well Drilling and Completion	○	○	○	○
Unleash your Infrastructure	○	○	○	○
Information on the Spot	○	○	○	○
Wrap-up/Seminar Conclusion	○	○	○	○

Quality and organization of the seminar				
Choice of date	○	○	○	○
Time allowed for lunch/breaks	○	○	○	○
Choice of presentations	○	○	○	○
Pace and time allowed for the presentations	○	○	○	○

감사합니다

谢谢

Danke

Gracias

Merci

Thank You

ありがとう

Спасибо

Obrigado