

The background of the entire image is a dark blue gradient. On the left side, there is a faint, stylized illustration of the San Francisco Bay Bridge. On the right side, there is a faint silhouette of the San Francisco skyline, including the Transamerica Pyramid. The overall aesthetic is professional and tech-oriented.

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Asset Framework Ties Together Enterprise OEE for Clearwater Paper

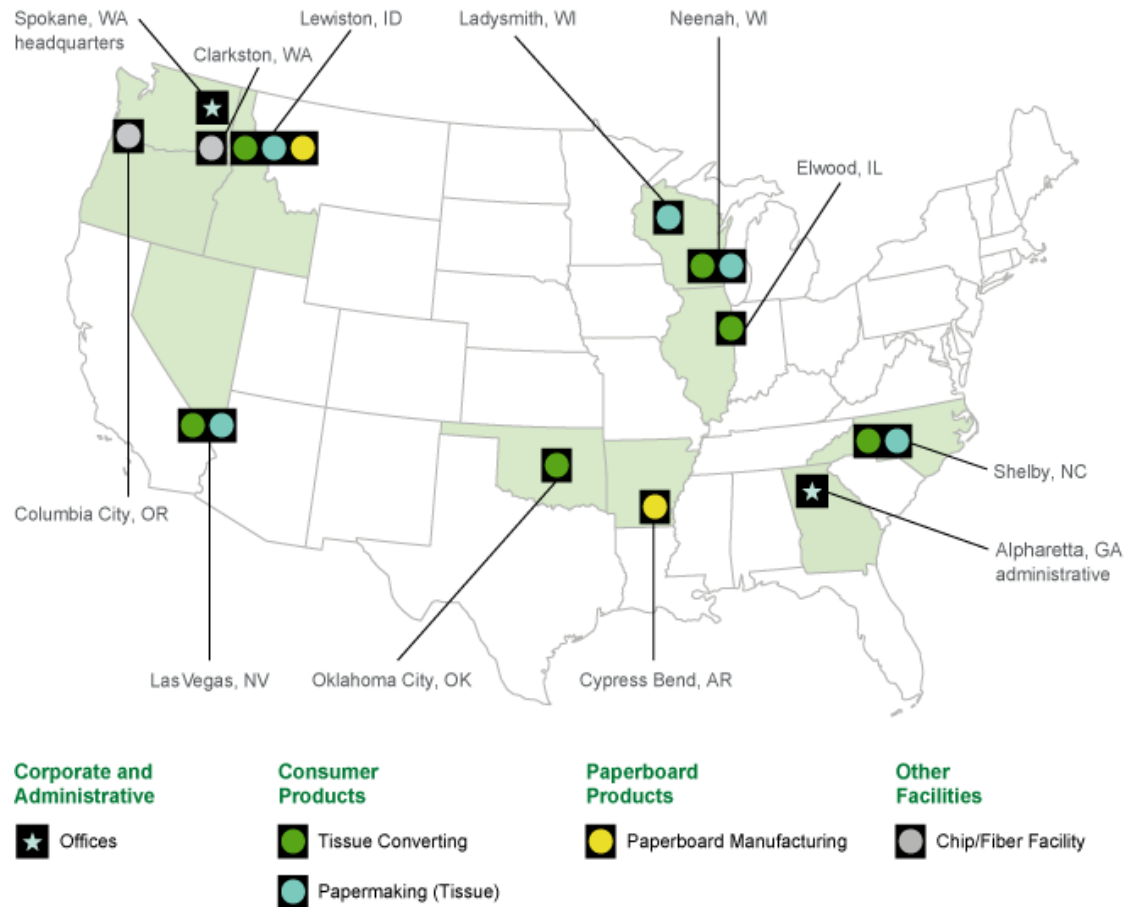
Presented by **Ryland Bingham**



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 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
- $OEE = (Uptime \%) \times (Speed \%) \times (Quality \%)$

Converting OEE to Time

PLANT OPERATING TIME

PLANNED PRODUCTION TIME

PLANNED
SHUTDOWN

OPERATING TIME

DOWN TIME
LOSS

NET OPERATING TIME

SPEED
LOSS

FULLY PRODUCTIVE TIME

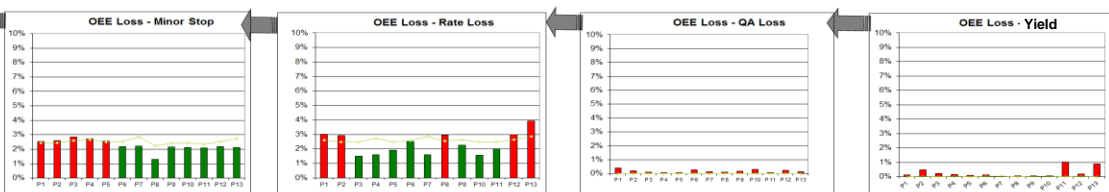
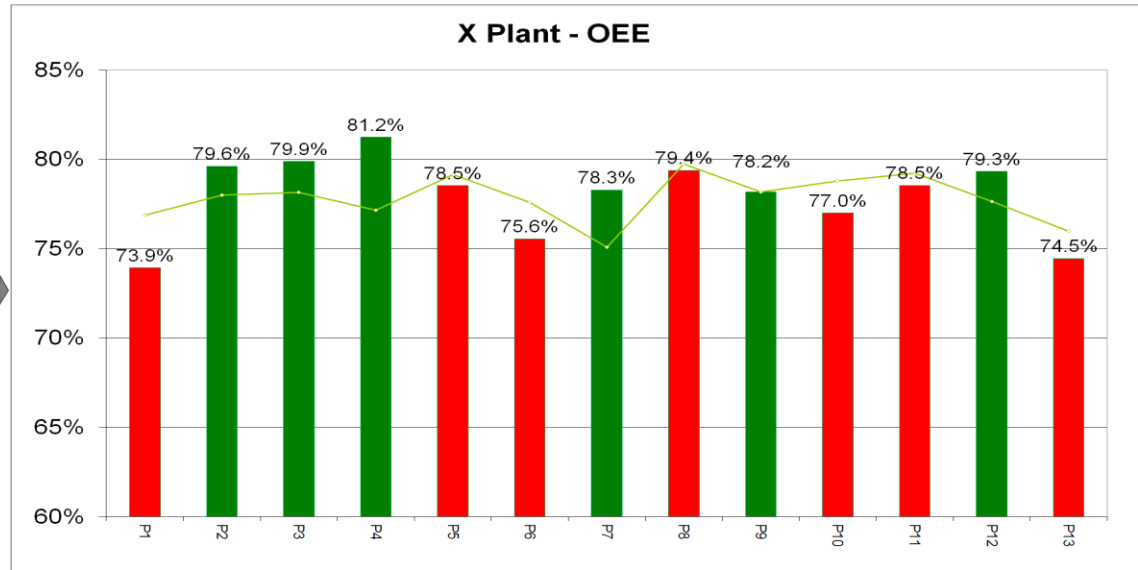
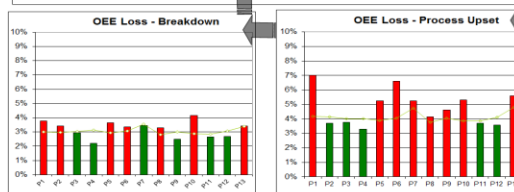
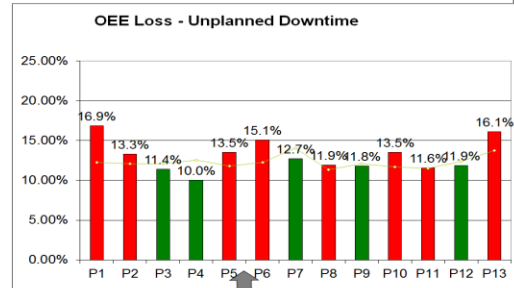
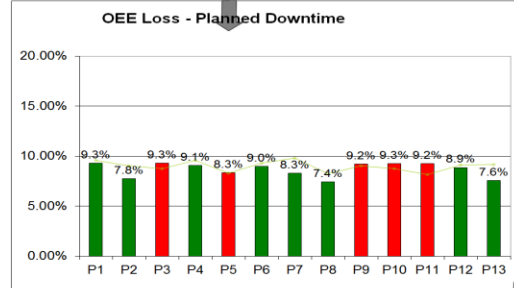
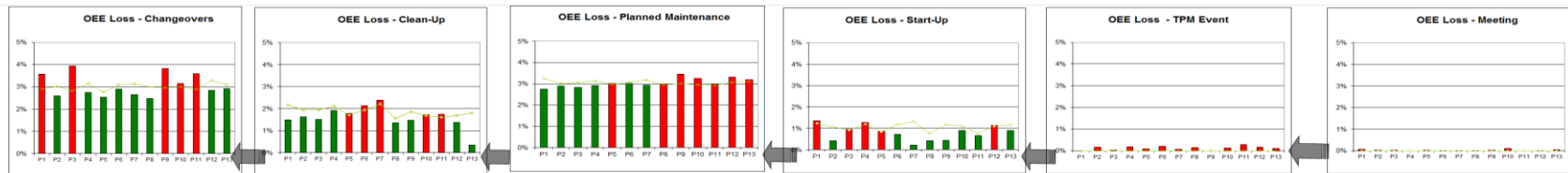
QUALITY
LOSS

PLANNED DOWNTIME

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

UNPLANNED DOWNTIME

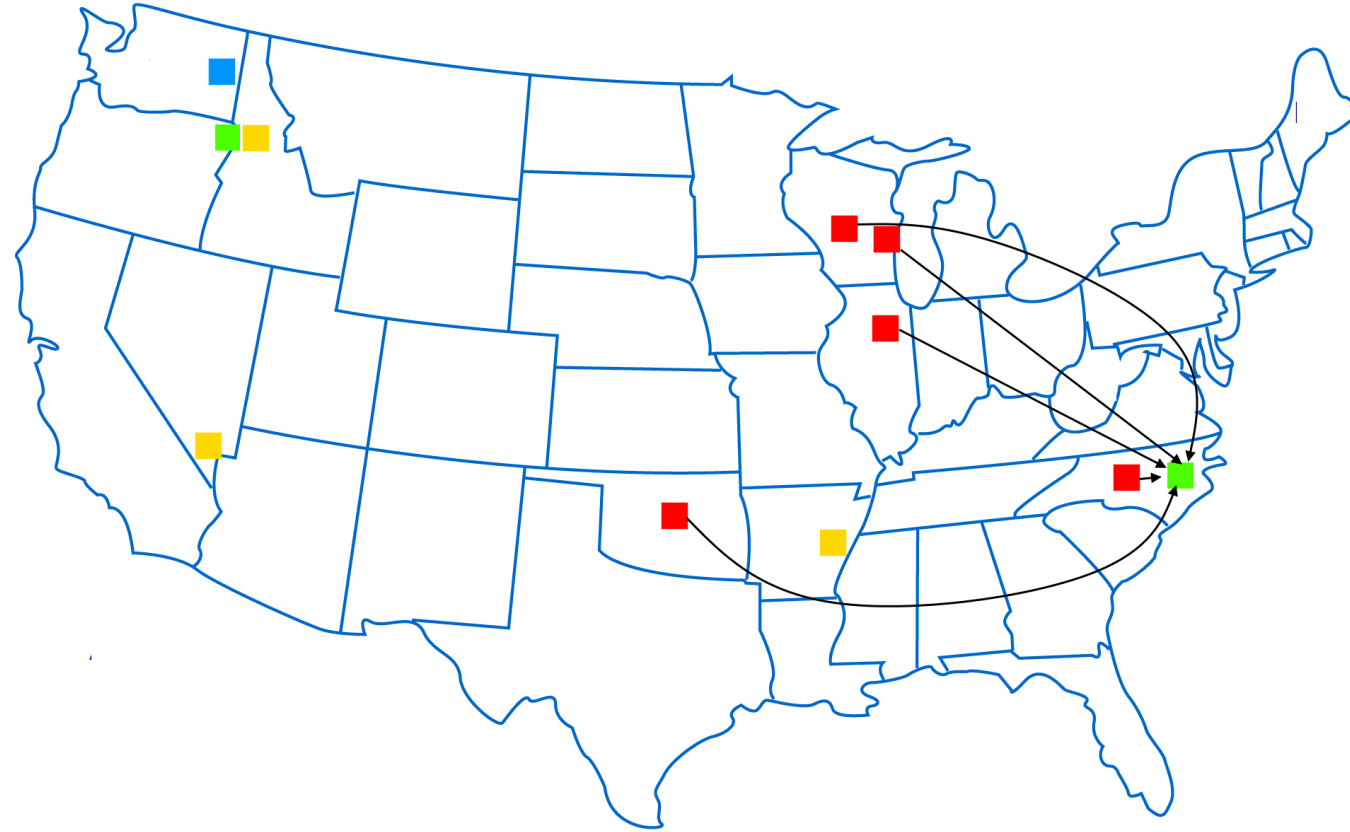
- Breakdown Time
- Process Upset Time
- Minor Stop Time
- Speed Loss
- Quality Loss



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 Asset Framework (AF) server in Spokane

The Approach

- Capture speed, up/down indicator and total production in 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 Asset Framework (AF) hierarchy
- Feed our Enterprise Business Intelligence (BI) system directly from AF.

Site Assessment and Setting up Data Collection

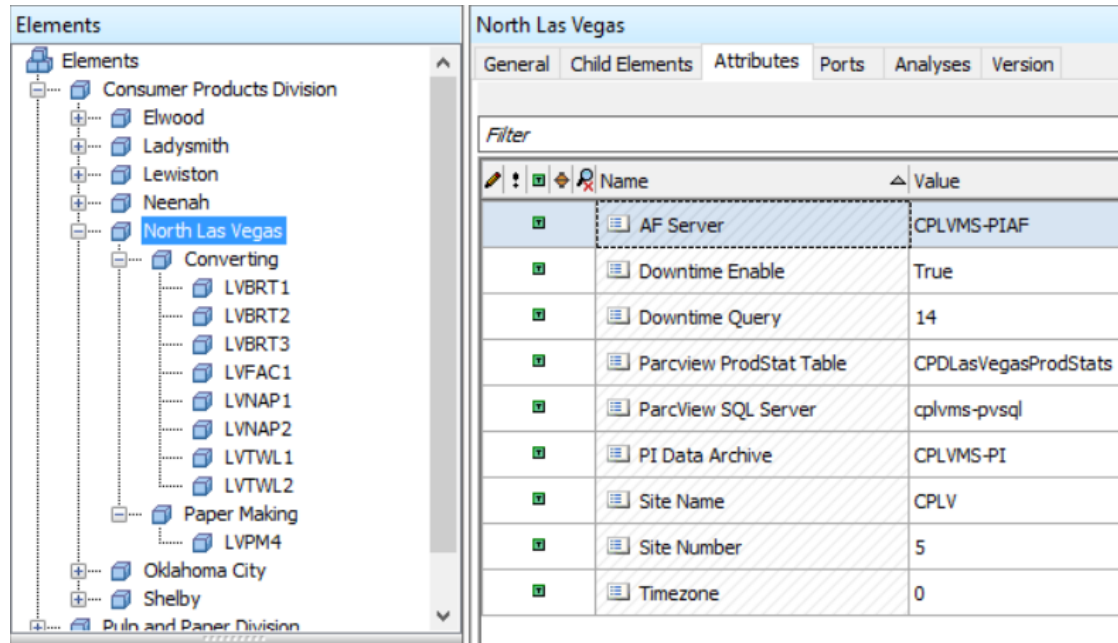
- Seven out of nine sites required new PI System interfaces
- Most sites required some level of network infrastructure improvements
- Many converting assets required PLC programming for communication and tag creation.
- The only way to finalize requirements was for the project team to visit each site.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

Build Event Frames Interface to Parcview for Downtime

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

Configuration of Downtime Event Frame Interface

- Mill Level Configuration



The screenshot displays the 'Elements' tree on the left, where 'North Las Vegas' is selected. The right pane shows the configuration for 'North Las Vegas' with the following parameters:

Name	Value
AF Server	CPLVMS-PIAF
Downtime Enable	True
Downtime Query	14
Parcview ProdStat Table	CPDLasVegasProdStats
ParcView SQL Server	cplvms-pvsql
PI Data Archive	CPLVMS-PI
Site Name	CPLV
Site Number	5
Timezone	0

- Site servers
- Disable data collection
- Number of days to query
- Linked table name
- Site prefix for Event Frame names
- Time offset relative to PST

Elements

- Consumer Products Division
 - Elwood
 - Ladysmith
 - Lewiston
 - Neenah
- North Las Vegas
 - Converting
 - LVBRT1
 - LVBRT2
 - LVBRT3
 - LVFAC1
 - LVNAP1
 - LVNAP2
 - LVTWL1
 - LVTWL2
 - Paper Making
 - LVPM4
- Oklahoma City
- Shelby
- Pulp and Paper Division
- Element Searches

Elements

Event Frames

Library

Unit of Measure

Analyses

LVBRT1

General Child Elements Attributes Ports Analyses Version

Group by: ☐ Category ☐ Template

Filter

Name	Value
Accumulated Downtime	213
AlarmTagID	691
Available Time	720
Current Shift	2
Downtime Enable	True
Downtime ID	6863
Local Asset Name	BRT 1
Percent Availability	0.54583334922790527
Percent Quality	1
Percent Speed	0.40601833579651797
Prev. Shift OEE	22.1618348075754 %
PV AD Tag	CPLV.CALC.VBRT1 EOS Accumulated Downtime
PV AT Tag	CPLV.CALC.VBRT1 Shift Planned Production Time
PV PS Tag	CPLV.CALC.VBRT1 EOS Average % Speed
PV UP Tag	CPLV.CALC.VBRT1 EOS Target Production
Site Name	CPLV
Site Number	5
Speed	675
Speed Target	967
SpeedLoss Enable	True
SpeedLoss ID	708
UnitsProduced	2166
Weight Factor -Asset	0.1586115992970123

Configuration of Downtime Event Frames Interface

Asset Level Configuration

- Downtime and speed loss IDs 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

CPEW EFAC1 DT 2/14/2016 12:49:32 AM

General Child Event Frames Referenced Elements Attributes

Name: CPEW EFAC1 DT 2/14/2016 12:49:32 AM

Description: Downtime Import

Template: Downtime Categories:

Start time: 2/14/2016 12:49:32 AM End time: 2/14/2016 12:58:37 AM

Default Attribute: <None>

[Extended Properties](#) [Security](#)

Find: [Parents](#) [Children](#)

CPEW EFAC1 DT 2/14/2016 12:49:32 AM

General Child Event Frames Referenced Elements Attributes

Group by: ☐ Category ☐ Template

Filter

Name	Description	Category	Type
ELFAC1			None

CPEW EFAC1 DT 2/14/2016 12:49:32 AM

General Child Event Frames Referenced Elements Attributes

Group by: ☐ Category

Filter

Name	Value
Downtime Category	MinorStop
Downtime Comments	Front side anvil jam. Had alot of paper jamed between the folding rolls, took some time to get it cleared
Downtime ID	24800
Downtime Reason	Elwood : Facial : FAC1 : Folder : Faults : Front Guide Jam
PVAuditDt	2/14/2016 1:22:44.553 AM
Shift	3

- 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

Linking to Speed, Availability and Production Calculations

- There are a number of calculations that are grade/SKU dependent and are therefore performed in Parcview.
- Used linked time-series tables
- Used element relative references in the element templates.

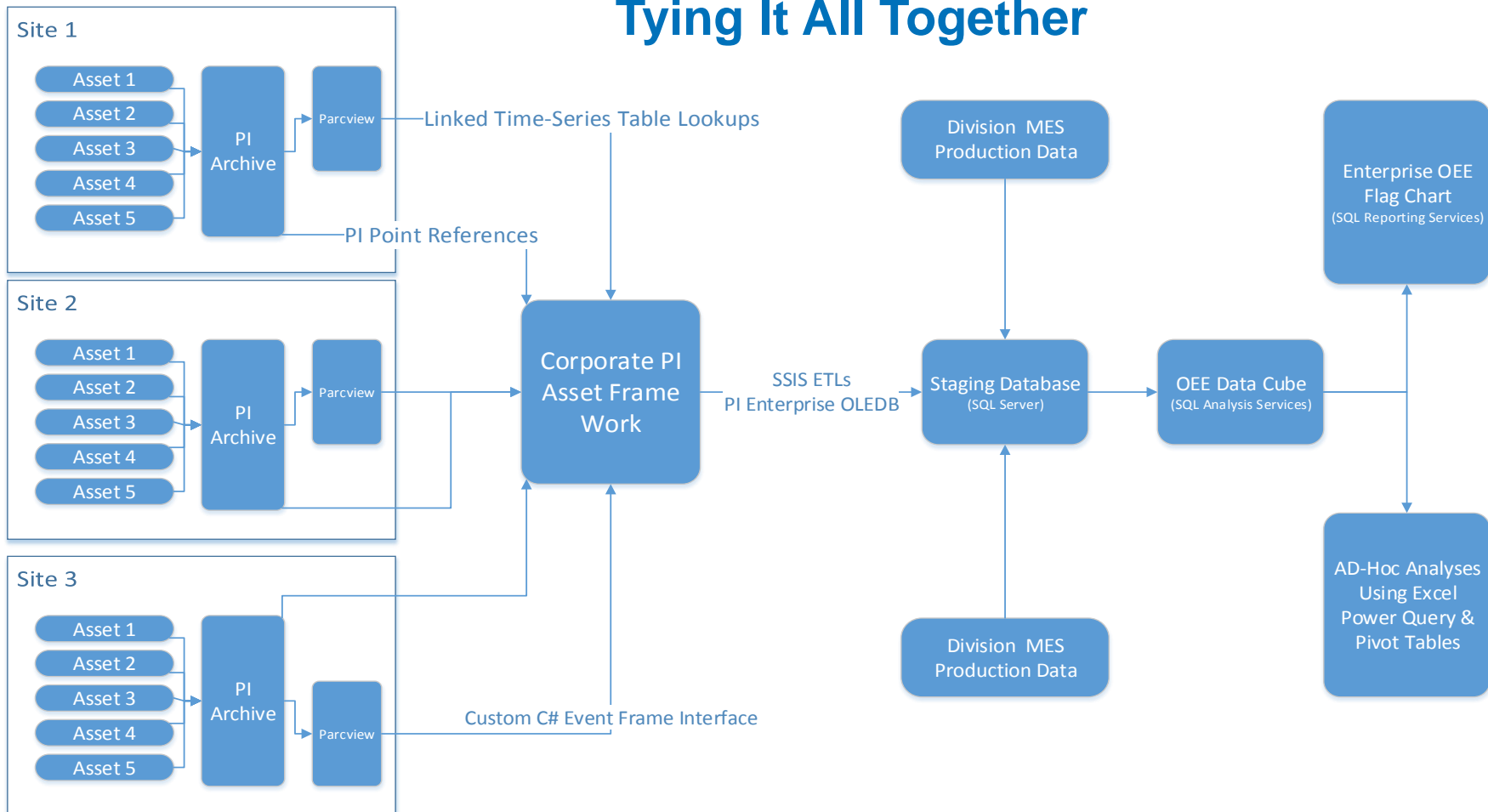
The 'Define Table' window shows configuration for 'CPDLasVegasProdStats'. It includes fields for Name, Description, Categories, Connection, Query, Time Zone, and Cache Interval. The 'Query' field is set to 'Linked - SELECT * FROM cus_LV_40daysOEE'. The 'Time Zone' is '(UTC-08:00) Pacific Time (US & Canada)' with a 'Convert To Local' checkbox. The 'Cache Interval' is '15 Minutes'. There are 'Import...', 'Link', and 'Unlink' buttons at the bottom.

Field	Value
Name	CPDLasVegasProdStats
Description	
Categories	
Connection	Linked - Provider=SQLOLEDB;Persist Security Info=False;User ID=qry_user;Initial Catalog=ctc_config;Dat
Query	Linked - SELECT * FROM cus_LV_40daysOEE
Time Zone	(UTC-08:00) Pacific Time (US & Canada) <input checked="" type="checkbox"/> Convert To Local
Cache Interval	15 Minutes

The 'Attributes' tab displays a table of attributes. The 'Percent Speed' attribute is highlighted. To the right, a 'Table Lookup' configuration is shown, including a 'Name' field, a 'Description' field, and a 'Data Reference' dropdown set to 'Table Lookup'. Below this, a SQL query is displayed: 'SELECT value FROM CPDLasVegasProdStats WHERE tagName = @[PV PS Tag];TC=timestamp'.

Name	Value
Accumulated Downtime	107
AlarmTagID	692
Available Time	720
Current Shift	2
Downtime Enable	True
Downtime ID	6864
Local Asset Name	BRT2
Percent Availability	0.508333325386...
Percent Quality	1
Percent Speed	0.647829017812...
Prev. Shift OEE	32.93130789063...
PV AD Tag	CPLV.CALC.VBRT...
PV AT Tag	CPLV.CALC.VBRT...
PV PS Tag	CPLV.CALC.VBRT...

Tying It All Together



Enterprise Flag Chart for Longer term and Strategic Planning

OEE Flag Chart Report

PDF Remove From Favorites Close

Actions 1 of 1 Find Next 100%

OEE Flagchart Report

12 MONTHS

13 WEEKS

52 WEEKS

The OEE data is complete through 3/8/2016 11:15:01 AM



Clearwater Paper - Information Delivery 2015

Page 1 of 1

Parameters

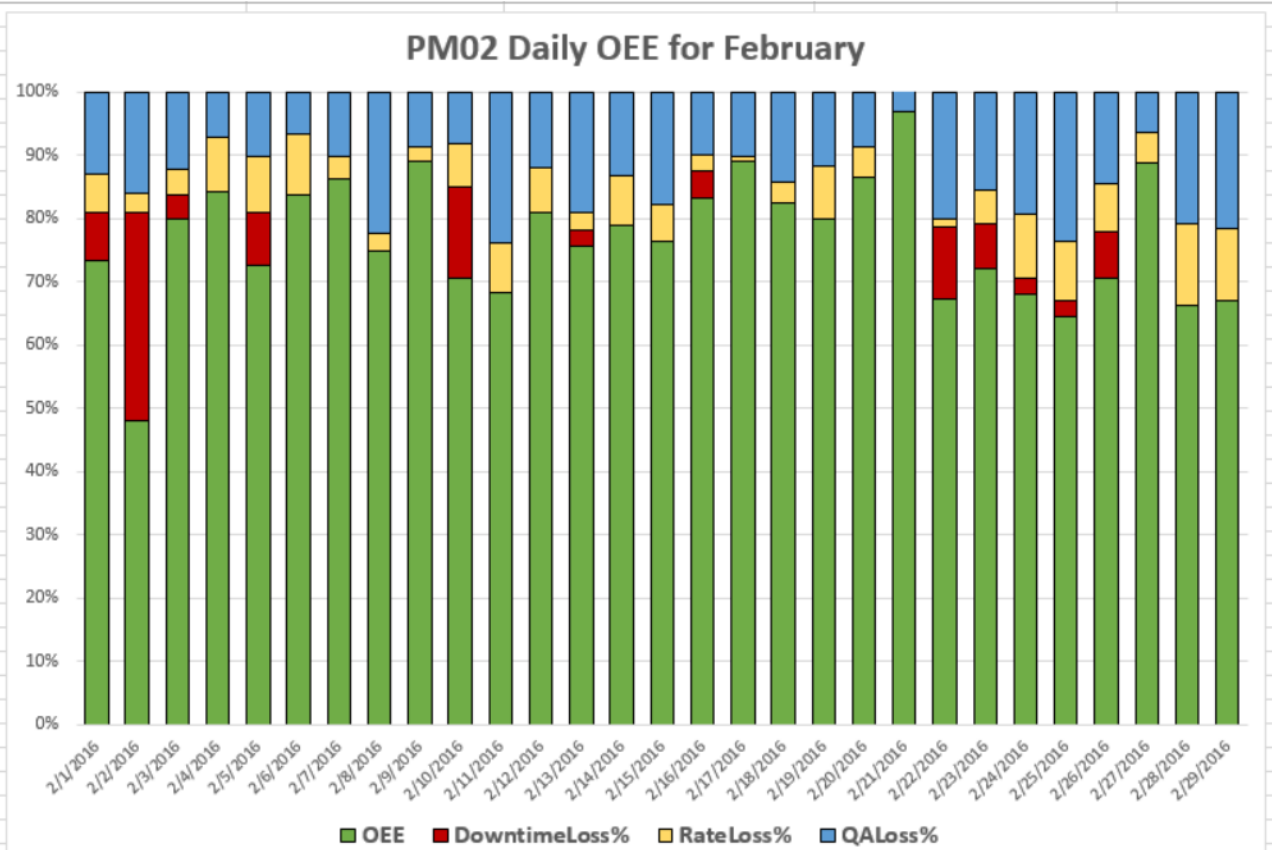
Division: PPD
 SITE/MILL: ARKANSAS PULP & PAPERBOARD
 TYPE: CTR, PM
 MACHINE: CBEXT, EXT72, EXT84, PM01, R

Apply

Ad-hoc Mill Report provides more timely view of OEE data

Machine Parent **PM02** ☐ PM02 Daily OEE for February
 Y-Q-M-D February ☐
 As Of Yesterday Current ☐ 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 of 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!
- How to read German
- 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.
- Develop OEE metrics for converting asset components downstream from winders/folders.
- We continue to grow local expertise with the PI System.
- Enterprise Agreement?

Achieving an Enterprise View of Asset Efficiency with Asset Framework

COMPANY and GOAL

Clearwater Paper is a young company made up of 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.



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 recorded for Clearwater’s converting assets.

SOLUTION

Standardize on a system that makes use of PI System data to detect downtime events. Use the PI System to tie the data together.

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

RESULTS

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

- OEE baselines established.
- Performance goals based on this solution.
- Data sets actively being used by several Six Sigma projects

Contact Information

Ryland Bingham

Ryland.Bingham@clearwaterpaper.com

Sr. Enterprise Systems Analyst

Clearwater Paper Corporation

Questions

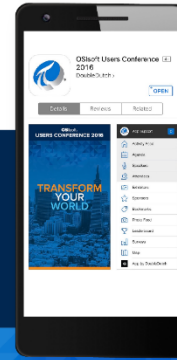
Please wait for the **microphone** before asking your questions



State your **name & company**

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado

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