



# Building the Case for Asset Framework at International Paper

Presented by Rick Smith



# Agenda

- About International Paper
- Building the Case
  1. Single Version of the Truth
  2. Downtime Tracking
  3. Tracking (Energy) Consumption
- Future Plans

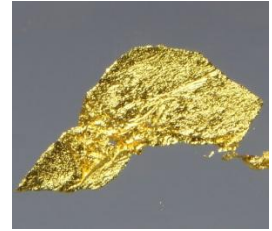
# International Paper

- World's Largest Pulp and Paper Company
  - Founded 1898 (117 Years Ago)
  - 58,000 Employees
  - \$23.6 Billion Net Sales (2014)
- OSIssoft Installed Base
  - 35 Facilities (70 PI Servers)
    - US, Brazil, France, India, Poland, Russia
  - 1.5+ Million PI Tags



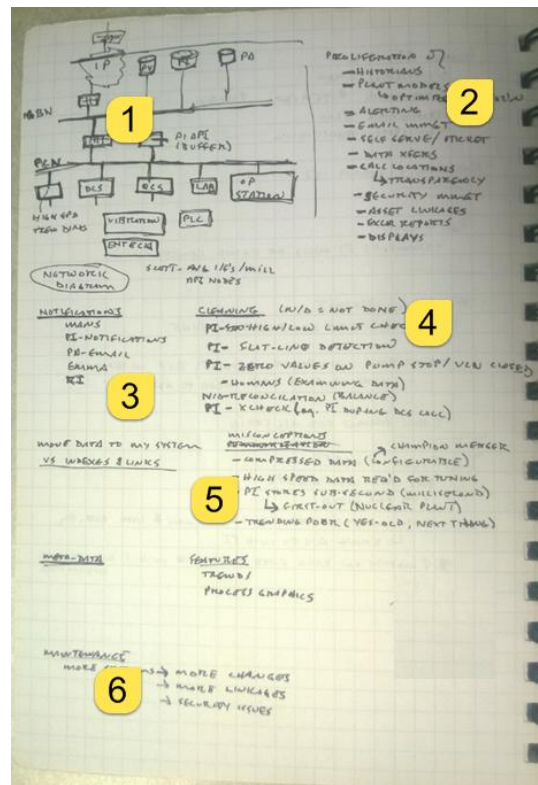
# Why Do I Need a Business Case?

- Infrastructure IS NOT a Shiny Rock
- Incumbent Solutions In Place
- Point Solutions are Everywhere
- Point-to-Point Data Exchange is Everywhere
- The Manufacturing Village is Larger Than Before
- There is Money Involved...Time is Money...
- People Like What they Have... Change is BAD!!



# Red-Eye Flight from OSISoft 2014 UC...

1. Typical Network
2. Proliferation
3. Notifications
4. Data Cleaning
5. Misconceptions
6. More...More... More



# Building the Business Case

1. Single Version of the Truth
2. Downtime Tracking
3. Tracking (Energy) Consumption

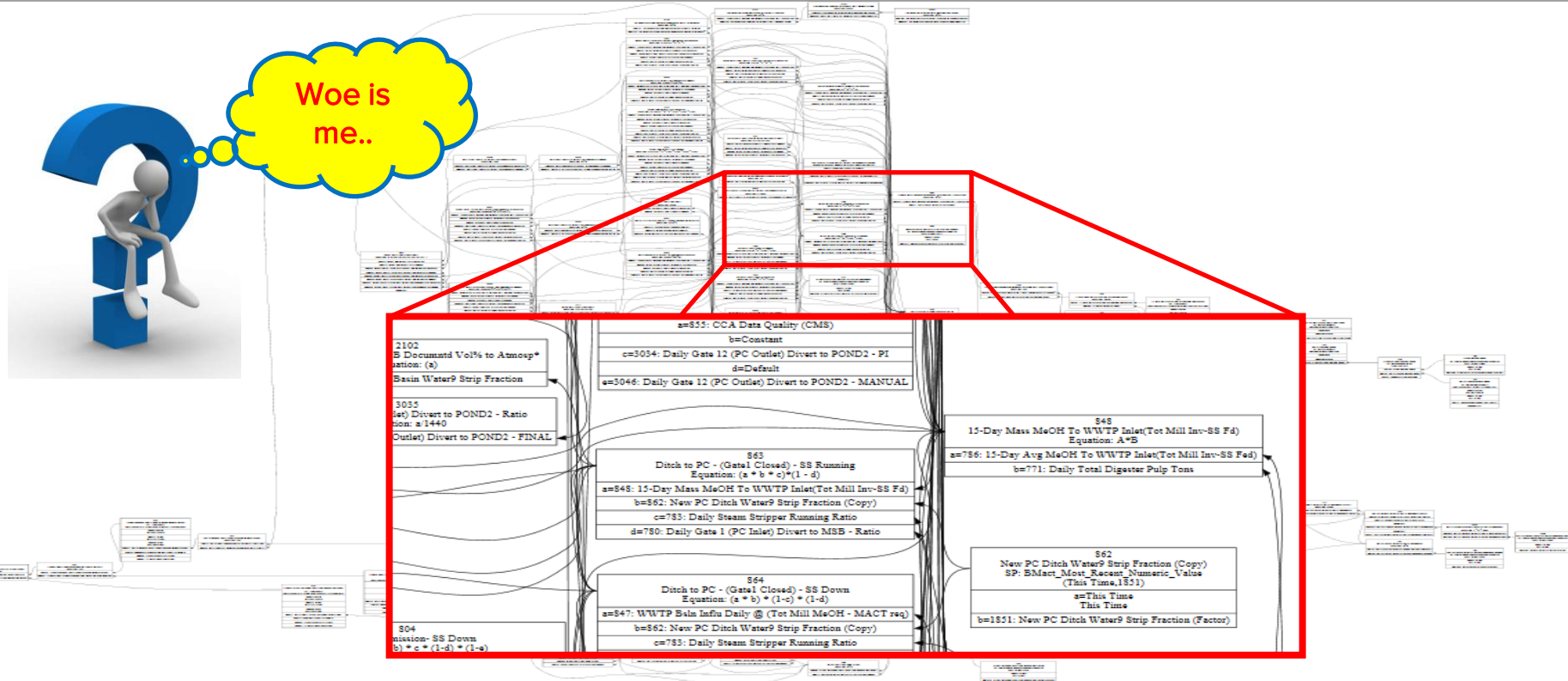


# Case #1: Single Version of the Truth

- Question: How Much We Make?
- The Answer Depends on Who You Ask...
  - What Base-Line Time Period Selected?
  - What PI Tags Were Used?
  - What Calculations Were Used?
  - How Was Data Filtered?

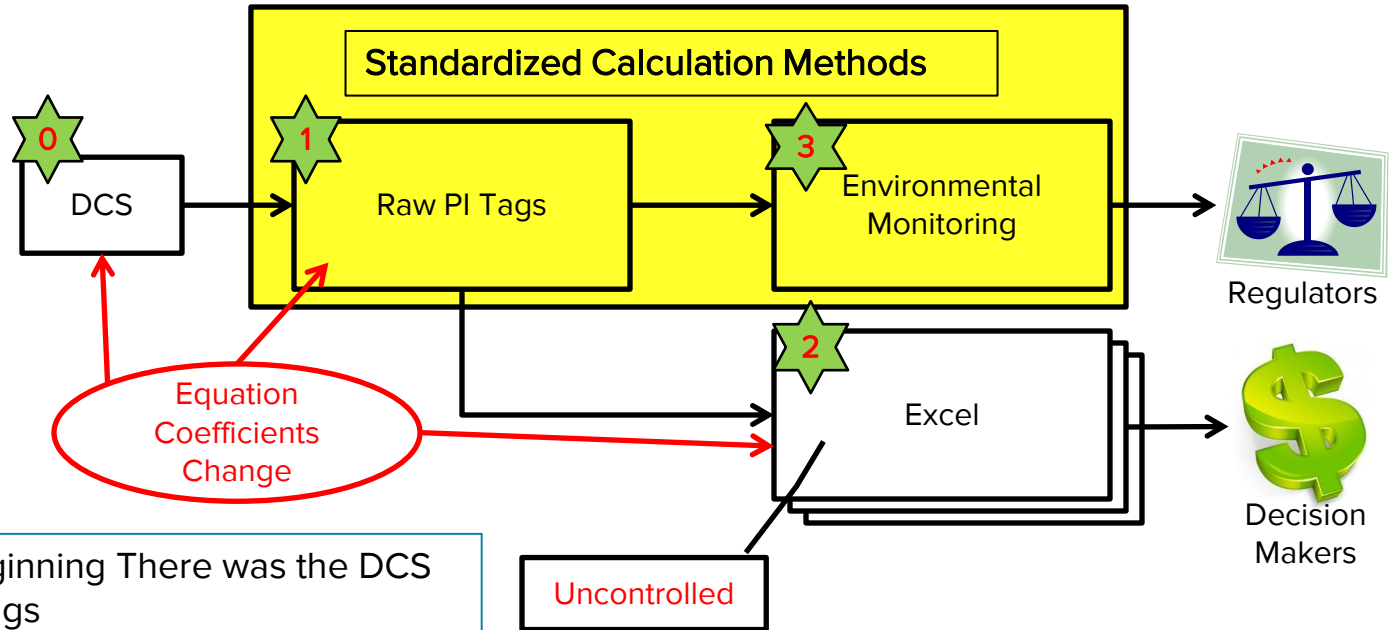
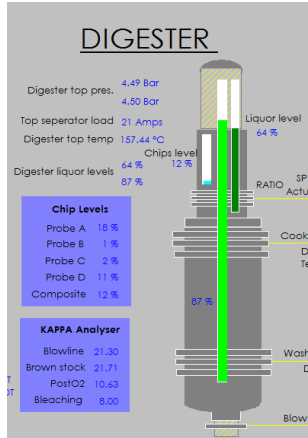


# Getting to the Answer Can be Complex





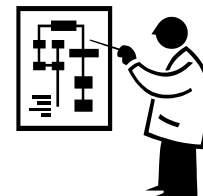
# Digester Production Calculations



0. In the Beginning There was the DCS
1. Raw PI Tags
2. Excel Calcs From Raw Inputs
3. Daily Env. Calcs Added

# Kamyr Digester Production (ADUBTPD)

Air-Dried Unbleached Tons per Day =  
Chip Meter Speed (rpms) \* Bulk Density (lb/ft<sup>3</sup>) \*  
Chip Meter Volume (ft<sup>3</sup>) \* Chip Meter Fill Factor \* Yield \*  
[1440 min/day] / [2000 lb/US Ton]



Where Yield =  $[A + B * (\text{Kappa}) + C * (\text{Kappa})^2]$

PI PE -> '03SIC103.PV' \* 10.65 \* 24.6 \* 1.0 \* (0.4198 + 0.00155 \*  
'K1Kappa.PV' + 0.0 \* 'K1Kappa.PV' \* 'K1Kappa.PV') \* 1440 /  
2000

Yield Coefficients and “Constants” Change

# Build the Calculation Template...

Library

- Testing-Rick Smith
  - Categories
    - Analysis Categories
    - Attribute Categories
    - Element Categories
    - Reference Type Categories
    - Table Categories
  - Templates
    - Element Templates
      - BMACT Boiler
      - BMACT Boiler Info
      - Digester ODTDP Production
      - Digester Yield
      - EL\_BleachPlant
      - EL\_Facility
      - EL\_PaperMachine
      - EL\_PMEnergyValue\_RMS
      - EL\_PMTTemplate
      - EL\_Refiner
      - EL\_RTS\_Downtime
      - EL\_RTS\_w\_SubStates
      - EL\_ScrubberTemplate
      - Filter-High/Low
    - Event Frame Templates
    - Model Templates
    - Notification Templates

Digester ODTDP Production Template

General Attribute Templates Ports Analysis Templates

Filter

Name	Description	Default Value	Unit Of Measure	Settings...
Category: Calculation Parameter				
Bulk Density	Bulk Density	10.65 lb/ft3		
Chip Meter Fill Factor	Chip Meter...	1		
Chip Meter Volume	Chip Meter...	24.6 ft3		
Yield		0		
Category: Calculation Result				
Production (ADTPD)	Production ...	0 ADTPD		
Production (ODTPD)	Production ...	0 ODTPD		
Category: Measurement				
Chip Meter Speed	Chip Meter...	0 rpm		
Kappa	Kappa Test	0		
Production from DCS	Production ...	0 ODTPD	oven dried pulp short t...	

Equations

$$S * D * V * F * Y * 1440 / 2000$$

Parameters

- D=Bulk Density
- F=Chip Meter Fill Factor
- S=Chip Meter Speed
- V=Chip Meter Volume
- Y=Yield

# Standard Calculations Via AF

**Elements**

- Elements
  - Batch Unit
  - Boiler MACT
  - Paper Area
    - Augusta-1
    - Augusta-3
    - Cedar River-1
    - Cedar River-2
  - Pulp Area
    - Bleach Plant (Element)
      - Augusta-2
      - Augusta-3
    - Bleach Plant (Template)
    - Digester Production
      - K1**
      - Yield Calc
        - K2
        - K3
    - Event Frames
- Element Searches

\\Loveland Dev\Testing-Rick Smith\Pulp Area\Digester Production\			
<b>K1</b>			
Bulk Density	01-Jan-70 00:00:00	10.65	lb/ft3
Chip Meter Fill Factor	01-Jan-70 00:00:00	1	
Chip Meter Speed	24-Apr-14 10:04:17	12.16644	rpm
Chip Meter Volume	01-Jan-70 00:00:00	24.6	ft3
Kappa	24-Apr-14 10:00:57	109	
Production (ADTPD)	24-Apr-14 11:04:17	1501.305	ADTPD
Production (ODTPD)	24-Apr-14 11:04:17	<b>1351.175</b>	<b>ODTPD</b>
Production from DCS	24-Apr-14 10:04:13	<b>1349.985</b>	<b>ODTPD</b>
Yield	24-Apr-14 11:00:57	0.58875	
Yield Calc  K#_Yield(A)	01-Jan-70 00:00:00	0.4198	
Yield Calc  K#_Yield(B)	01-Jan-70 00:00:00	0.00155	
Yield Calc  K#_Yield(C)	01-Jan-70 00:00:00	0	
Yield Calc  Kappa	24-Apr-14 10:00:57	109	
Yield Calc  Yield (Calculated)	24-Apr-14 11:00:57	0.58875	

\\Loveland Dev\Testing-Rick Smith\Pulp Area\Digester Production\			
<b>K2</b>			
Bulk Density	01-Jan-70 00:00:00	10.65	lb/ft3
Chip Meter Fill Factor	01-Jan-70 00:00:00	1	
Chip Meter Speed	24-Apr-14 10:05:27	9.185594	rpm
Chip Meter Volume	01-Jan-70 00:00:00	18.3	ft3
Kappa	24-Apr-14 10:00:57	109	
Production (ADTPD)	24-Apr-14 11:05:27	833.0711	ADTPD
Production (ODTPD)	24-Apr-14 11:05:27	<b>749.7639</b>	<b>ODTPD</b>
Production from DCS	24-Apr-14 10:05:33	<b>749.9898</b>	<b>ODTPD</b>
Yield	24-Apr-14 11:00:57	0.58168	
Yield Calc  K#_Yield(A)	01-Jan-70 00:00:00	0.3942	
Yield Calc  K#_Yield(B)	01-Jan-70 00:00:00	0.00172	
Yield Calc  K#_Yield(C)	01-Jan-70 00:00:00	0	
Yield Calc  Kappa	24-Apr-14 10:00:57	109	
Yield Calc  Yield (Calculated)	24-Apr-14 11:00:57	0.58168	

**Equations**

$$S * D * V * F * Y * 1440 / 2000$$

**Parameters**

D=Bulk Density  
 F=Chip Meter Fill Factor  
 S=Chip Meter Speed  
 V=Chip Meter Volume  
 Y=Yield

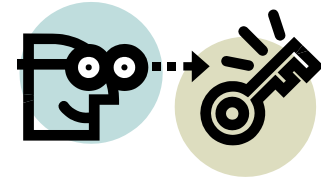
# Asset Framework (AF) Calculation Conversion Benefits

- Standard Calculation Methodology
  - Controlled By the AF Template
  - Therefore, One Version of the Truth
- AF Becomes the One Stop Shop for...
  - Enterprise Alias for Calculated Results
  - Time Stamped Coefficient Changes
  - DCS/PI Calculation Comparison



## Case #2: Downtime Tracking

- Overall Equipment Efficiency (OEE) =  
Availability \* Speed Efficiency \* Quality
  - Availability: Downtime/Slowback System (RTS)
  - Speed Efficiency: Maximum Sustainable Rate
  - Quality: A1 Tons Acceptance
- Reliability Tracking System (RTS)
  - Windows Service Reads PI Data and Writes State Information to PI
    - 0=Normal; 1=Slow; 2=Down
    - Event System Triggers Off State Tag
  - Excel Report for Each Unit Operation
  - ~300 Unit Operations Monitored



# Report Output

Top 15 Reasons Sorted by Equivalent Downtime				
YEAR-TO-DATE				
REASON LEVEL 1	REASON LEVEL 2	REASON LEVEL 3	# of Incidents	Equiv. DT (%)
Internal Equipment	#1 Lime Kiln	Other	11	0.9%
Internal Equipment	#1 Lime Kiln	ID Fan	1	0.9%
Internal Equipment	#1 Lime Kiln	Precoat Filter	21	0.9%
Internal Equipment	#1 Lime Kiln	Scrubber	4	0.7%
External Upstream	#2 Recovery Boiler	GL Inventory Low	1	0.6%
Internal Process	#1 Lime Kiln	Cool Down	1	0.2%
Internal Equipment	#1 Caustic			
External Utilities	Other			
Internal Process	#1 Lime Kiln			
Internal Process	#1 Lime Kiln			
Internal Process	#1 Lime Kiln			
Internal Process	#1 Lime Kiln			
Total *				



## INTERNATIONAL PAPER RTS Monthly Report Downtime Summary

Date	12/31/10
Mill	Mill-X
Equipment	#1 Lime Kiln

EQUIVALENT DOWNTIME	For Month			Year-To-Date		
	No. of Events	Duration (Hr)	Equival. DT (%)	No. of Events	Duration (Hr)	Equival. DT (%)
Slowback Mode	2	1.1	0.1%	3	3.2	0.0%
Downtime Mode	5	10.5	1.4%	43	1041.2	4.3%
Total			1.4%			4.3%

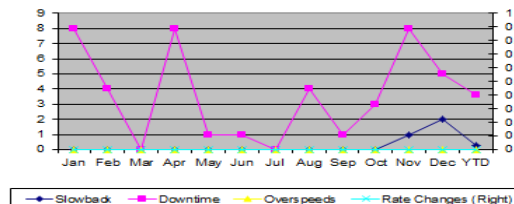
Overspeed Mode	0	0.0	0.0%	0	0.0	0.0%
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Availability (100 - Downtime %)	733.5	98.6%	7718.9	95.7%
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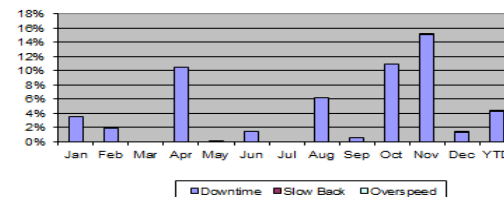
Avg. Time Between DT Events	148.8	hr	203.7	hr
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Average Downtime Event Time	0.0	hr	0.1	hr
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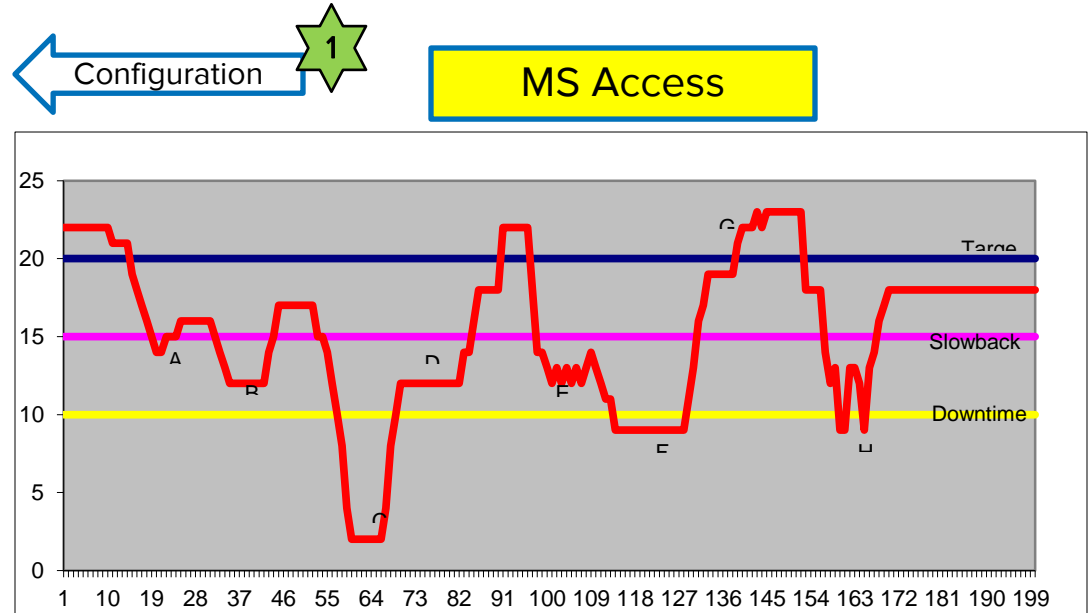
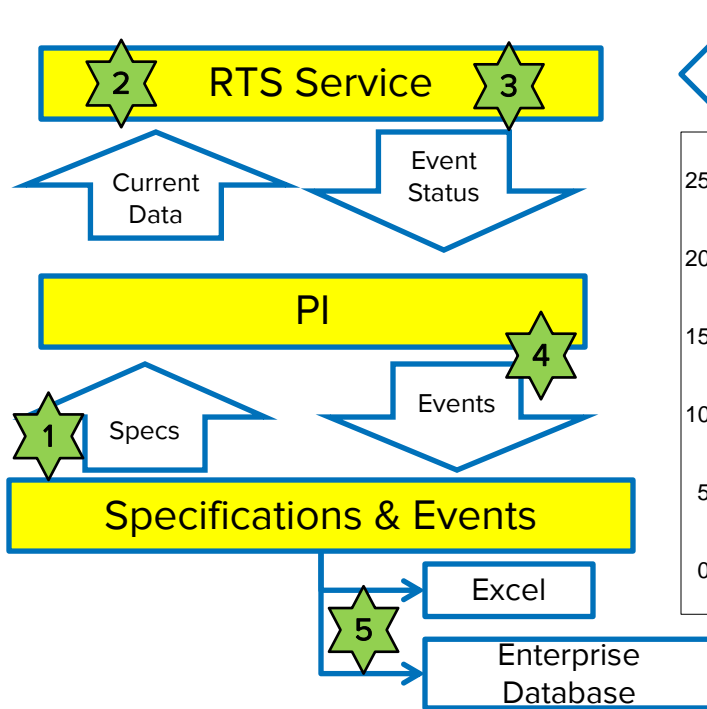
# EVENTS and RATE CHANGE COUNT



EQUIVALENT DOWNTIME

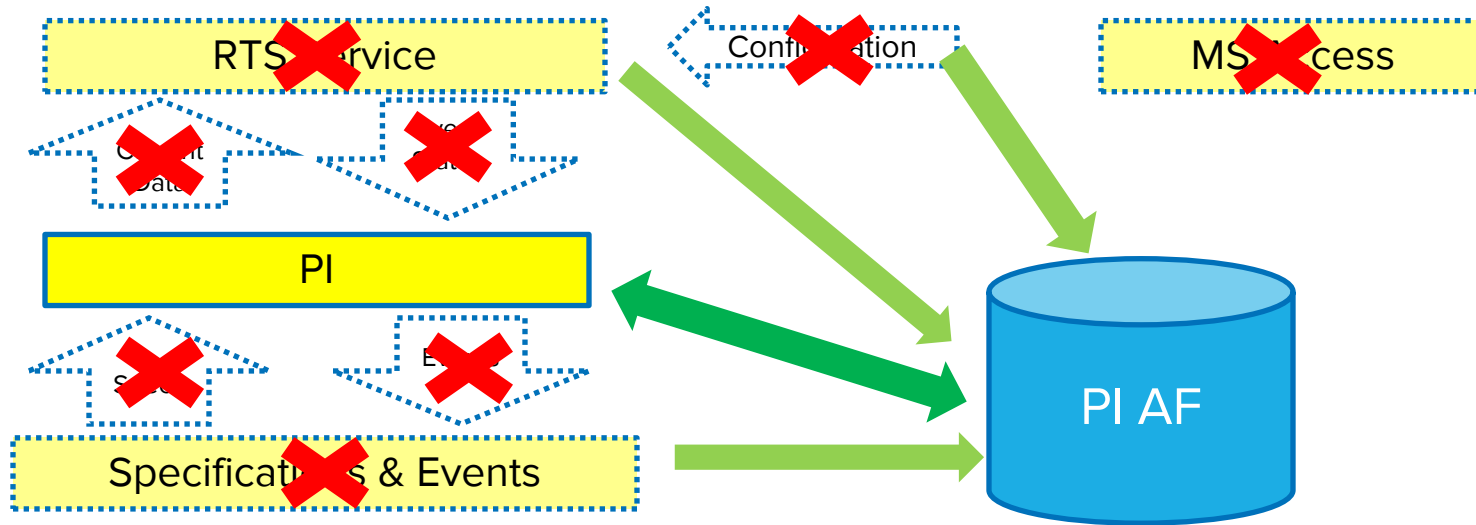


# Downtime Data Flow (2002-Present)





# Future Downtime Data Flow



Event name	Start time	End time	Duration	Target.Average	Value.Average
EF_RTS_RTS-Test1_SS_2014-09-12 06:50:00	12-Sep-14 06:50:00			40.00	45.67
EF_RTS_RTS-Test1_SS_2014-09-16 06:20:00	16-Sep-14 06:20:00	16-Sep-14 06:31:00	0 0:11:00	40.00	27.75
EF_RTS_RTS-Test1_SS_2014-09-16 06:50:00	16-Sep-14 06:50:00	16-Sep-14 11:22:00	0 4:32:00	40.00	8.11
EF_RTS_RTS-Test1_SS_2014-09-16 18:32:00	16-Sep-14 18:32:00	16-Sep-14 23:07:00	0 4:35:00	40.00	9.42
EF_RTS_RTS-Test1_SS_2014-09-16 23:11:00	16-Sep-14 23:11:00	16-Sep-14 23:32:00	0 0:21:00	40.00	26.70

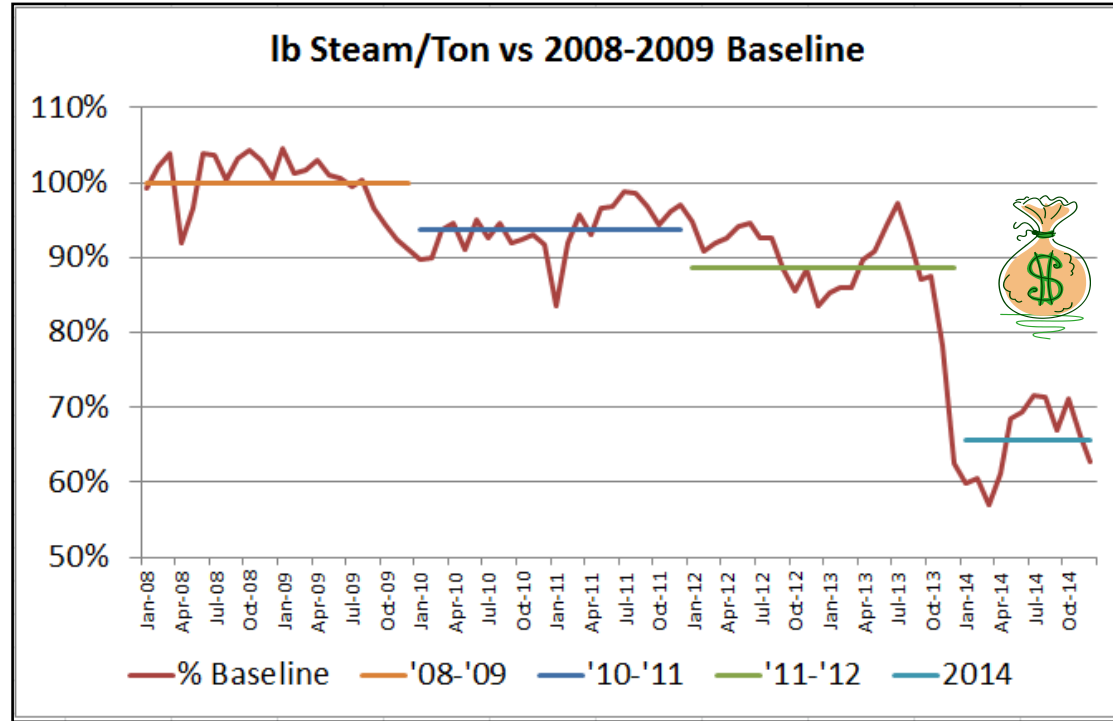
# Converting Downtime to Event Frames...

- Simplify Environment
  - Eliminate Distributed Access Databases
  - Eliminate Windows System Service
  - Remove Specification/Event System Requirement
- Configuration with Standard PI Tools
- Will Work at All IP Manufacturing Facilities
- Simplifies Reporting Requirements



# Case #3: Tracking (Energy) Consumption

- Huge Cost Driver
- Time Consuming to Monitor
- When to Invest?
- Where to Invest?



# The “Your.Name.Here” Spreadsheet

- For Each of 60 Paper Machines
- Summarize PI Data for 20-40 PI Tags
  - Retrieve 1-Month of Data
  - Allocate/Aggregate Data for “Missing” PI Tags
  - Remove “Bad Data” (Sheet Break, Downtime, etc.)
    - Copy/Paste Values into Enterprise Spreadsheet
- Update Chart Ranges (Enterprise Spreadsheet)
- This Exercise Takes 2+Days/Month



# Can We Reduce the Effort?



- OSISoft Paper Machine Demonstration
  - Jim Black (Industry Principal-OSISoft)
  - Gopal Gopalkrishnan (Solutions Architect-OSISoft)
- AF Elements
  - Steam, Electricity and Sheet Break Status
- Asset Analytics (For Each Element)
  - Value Adjusted For Sheet Break (Event-Triggered)
  - Data Quality Check (Daily Event Frame)

# Monthly Summary

	Date Range		Monthly Averages					
	Start time	End time	ProductionRate	Tons	Electricity_KwhPerTon	Steam_HP_LbsPerTon	Electricity	Steam_HP
PM1_01/2013	01-Jan-13 00:00:00	01-Feb-13 00:00:00	52.99943161	39431.57813	78.89457703	1424.099365	3110937.75	56154.48438
PM1_02/2013	01-Feb-13 00:00:00	01-Mar-13 00:00:00	65.14954376	43780.49219	72.2878418	1326.632324	3164797.25	58080.61719
PM1_03/2013	01-Mar-13 00:00:00	01-Apr-13 00:00:00	63.43252182	47130.36328	67.87601471	1332.900024	3199021.25	62820.0625
PM1_04/2013	01-Apr-13 00:00:00	01-May-13 00:00:00	60.65192032	43669.38281	71.24710846	1341.715454	3111317.25	58591.88672
PM1_01/2014	01-Jan-14 00:00:00	01-Feb-14 00:00:00	45.7202034	34015.83203	82.536026	1544.678101	2807531.5	52543.51172
PM1_02/2014	01-Feb-14 00:00:00	01-Mar-14 00:00:00	67.36373901	45268.43359	75.16860199	1325.387329	3402765	59998.21094
PM1_03/2014	01-Mar-14 00:00:00	01-Apr-14 00:00:00	57.92578125	43038.85547	76.41738892	1475.846313	3288917	63518.73438
	Start time	End time	ProductionRate	Tons	Electricity_KwhPerTon	Steam_HP_LbsPerTon	Electricity	Steam_HP
PM2_01/2013	01-Jan-13 00:00:00	01-Feb-13 00:00:00	39.713871	29547.12109	225.8252258	2240.65332	6672485.5	66204.85156
PM2_02/2013	01-Feb-13 00:00:00	01-Mar-13 00:00:00	46.81391907	31458.95313	214.6317444	2141.956787	6752090	67383.71875
PM2_03/2013	01-Mar-13 00:00:00	01-Apr-13 00:00:00	46.71214676	34707.125	211.1295166	2120.703613	7327698.5	73603.52344
PM2_04/2013	01-Apr-13 00:00:00	01-May-13 00:00:00	46.98371887	33828.27734	209.9403076	2136.415771	7101919	72271.26563
PM2_01/2014	01-Jan-14 00:00:00	01-Feb-14 00:00:00	37.06420517	27575.76953	246.0911713	2492.465332	6786153.5	68731.64844
PM2_02/2014	01-Feb-14 00:00:00	01-Mar-14 00:00:00	44.85942459	30145.53125	218.7319183	2245.138916	6593790	67680.90625
PM2_03/2014	01-Mar-14 00:00:00	01-Apr-14 00:00:00	45.86004639	34074.01563	214.614624	2179.784424	7312782	74274.00781
PM2_04/2014	01-Apr-14 00:00:00		35.81909561	23842.70313	208.6723785	2263.317139	4975320	53963.67188

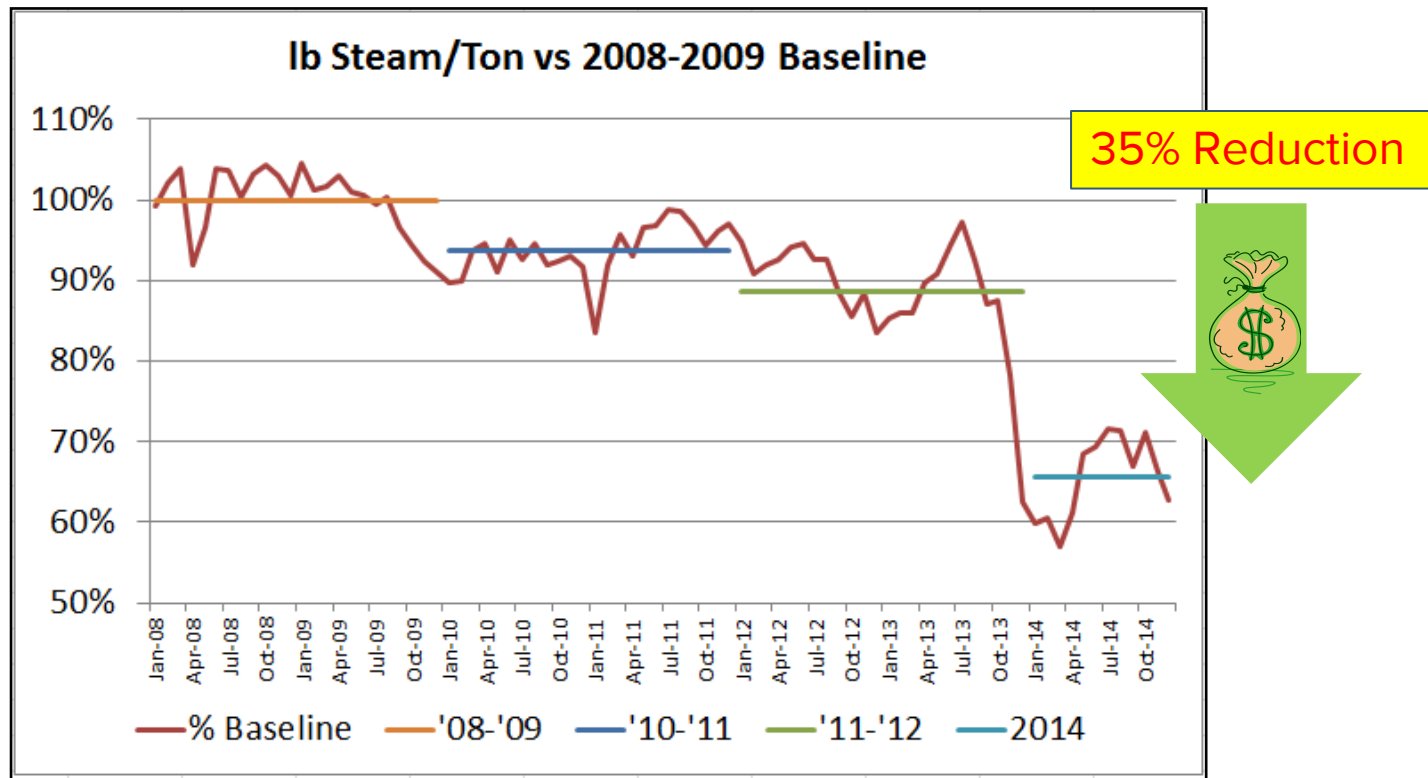
DONE!

1. 15-Second Refresh
2. Data Cleaned and Summarized

Monthly Totals



# In the End, All the Effort IS Worth It



# Benefits of Converting to Event Frames

- Reduce Monthly Task to < 4 Hours (est.)
  - Data Transfer Time Reduced by > 98%
  - Eliminate Data Cleaning Step
  - Eliminate per Ton Calculation Step
- Simplify Reporting
  - Single Version of the Truth





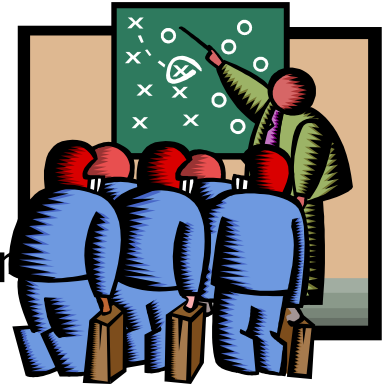
# Summarizing the Cases



1. Single Version of the Truth
  - a. Reduce Risk/Liability
  - b. Alias Name Makes Finding the Right Values Easier
2. Downtime Tracking
  - a. Simplify the Environment
  - b. Works at All IP Locations
3. Tracking (Energy) Consumption
  - a. Simplify the Methodology
  - b. Better Results with Reduced Time/Effort

# Next Steps...

- Switch PI Servers to Domain Security (Complete)
- AF Projects (Proposed)
  - Notifications
    - Replace Home Grown Solution
  - Event Frames
    - Replace Home Grown Downtime Solution
    - Daily/Monthly/Grade Analysis
  - Identify and Configure Standard Plant Model
  - ... More to Come...



# Hot Off the Press...

- Winder Cycle Time Analysis
- Batch Digester Analysis



# Rick Smith

[Richard.SmithJr@ipaper.com](mailto:Richard.SmithJr@ipaper.com)

Manufacturing Process Information Consultant  
International Paper



# Questions

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

State your  
**name & company**





# THANK YOU

“We are all salesmen...”

