



Process Efficiency Discussion

Presented by **Rick Smith**



Challenges for Pulp and Paper



Process Productivity

Need to control costs

Improve operational efficiencies



Energy Efficiency

Tracking energy usage

Volatile costs make it difficult to plan



Asset Health

Aging equipment

Volatile costs make it difficult to plan



Regulatory & Safety

Air and water compliance

Be a good corporate citizen, run a sustainable business

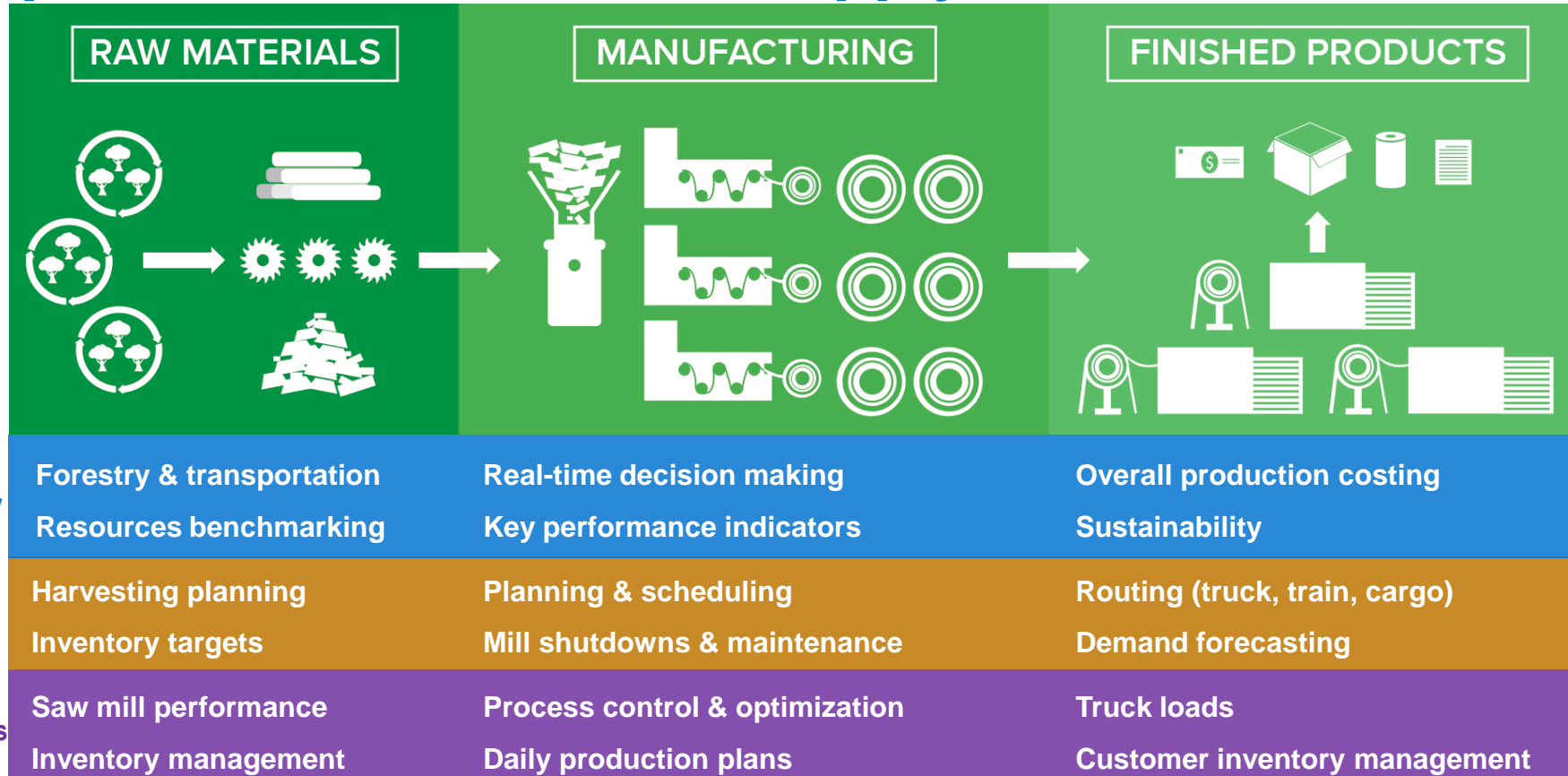


Quality Tracking

Access to product manufacturing history

Need equipment operating history

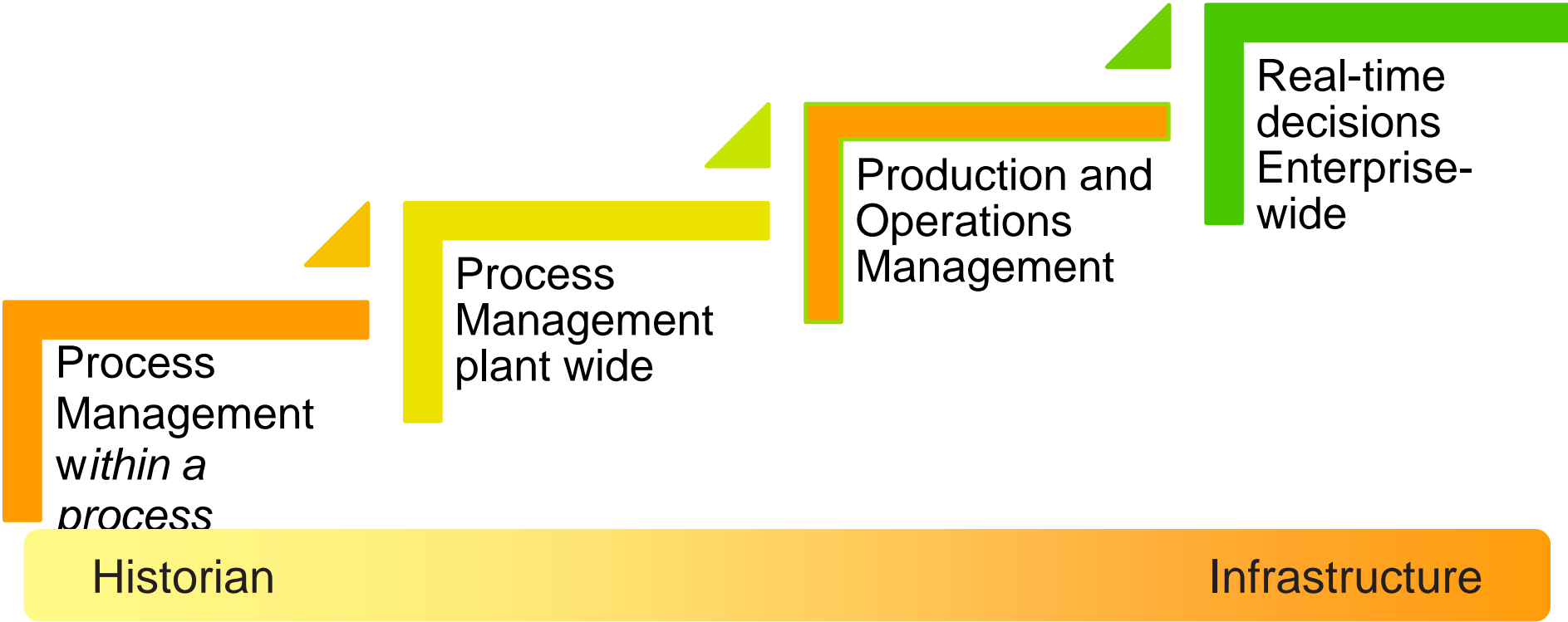
Opportunities Across the Supply Chain



A Couple of Years Ago... The Need for 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!!

Evolution: Mill-wide to Enterprise-wide



Enhancing Operational Data

International Paper had a goal to start promising projects to improve in three specific area: **managing data, downtime tracking, energy management**

International Paper

Rick Smith, Manufacturing Process Information Consultant



BUSINESS CHALLENGES

- Important tasks using spreadsheets and mired in 'excel hell'. Other systems with a lot of point to point data exchange, and point solutions.

People like what they have – difficult to change

SOLUTION

Develop and share the business case for implementing Asset Framework and other newer solutions

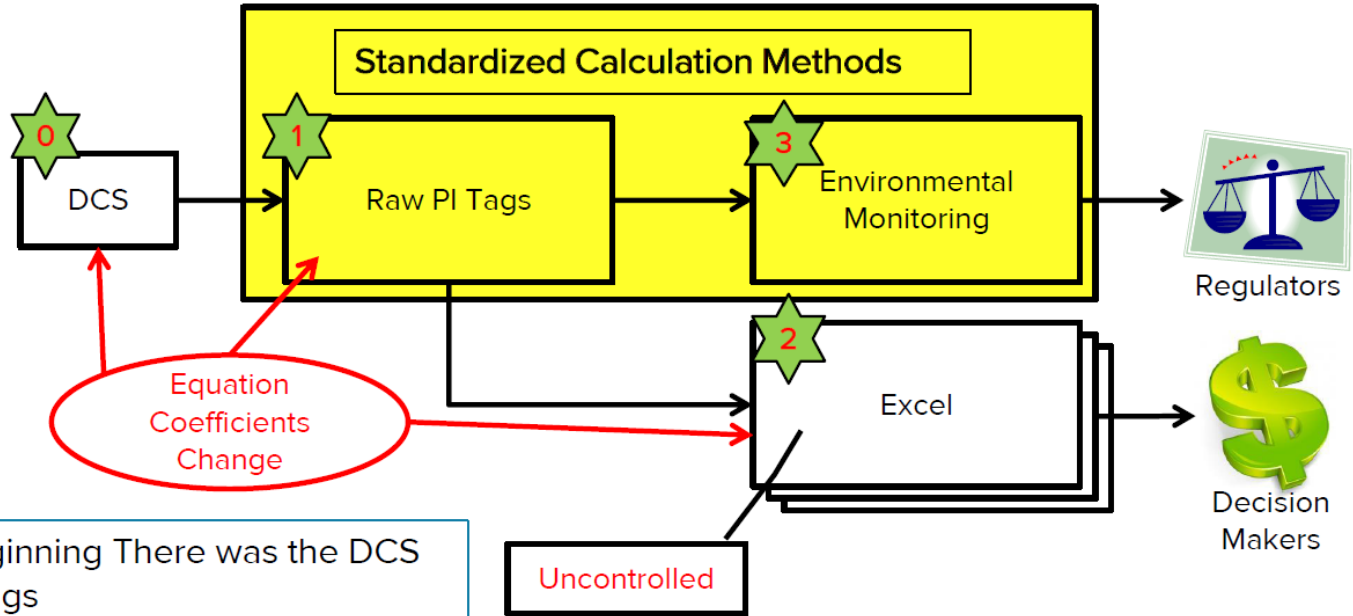
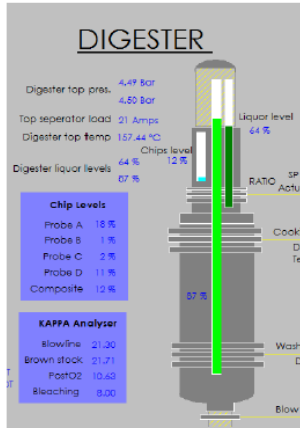
Build a business case for change and improvement

RESULTS AND BENEFITS

- New projects in in three areas: single version of the truth, downtime (asset) tracking, and tracking energy consumption.

Infrastructure for future improvement projects

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

Digester Production (ADUBTPD)

Air-Dried Unbleached Tons per Day =
Chip Meter Speed (rpms) * Bulk Density (lb/ft³) *
Chip Meter Volume (ft³) * 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

Smart Objects!

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_PMTemplate
 - 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		

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

Standardization in AF

Elements

- Elements
 - Batch Unit
 - Boiler MACT
 - Paper Area
 - Augusta-1
 - Augusta-3
 - Cedar River-1
 - Cedar River-2
 - Pulp Area
 - Bleach Plant (Elements)
 - 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\			
K1			
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	1501.205	ADTPD
Production (ODTPD)	24-Apr-14 11:04:17	1351.175	ODTPD
Production from DCS	24-Apr-14 10:04:13	1349.985	ODTPD
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\			
K2			
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	749.7639	ODTPD
Production from DCS	24-Apr-14 10:05:33	749.9898	ODTPD
Yield	24-Apr-14 11:00:57	0.58875	
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	

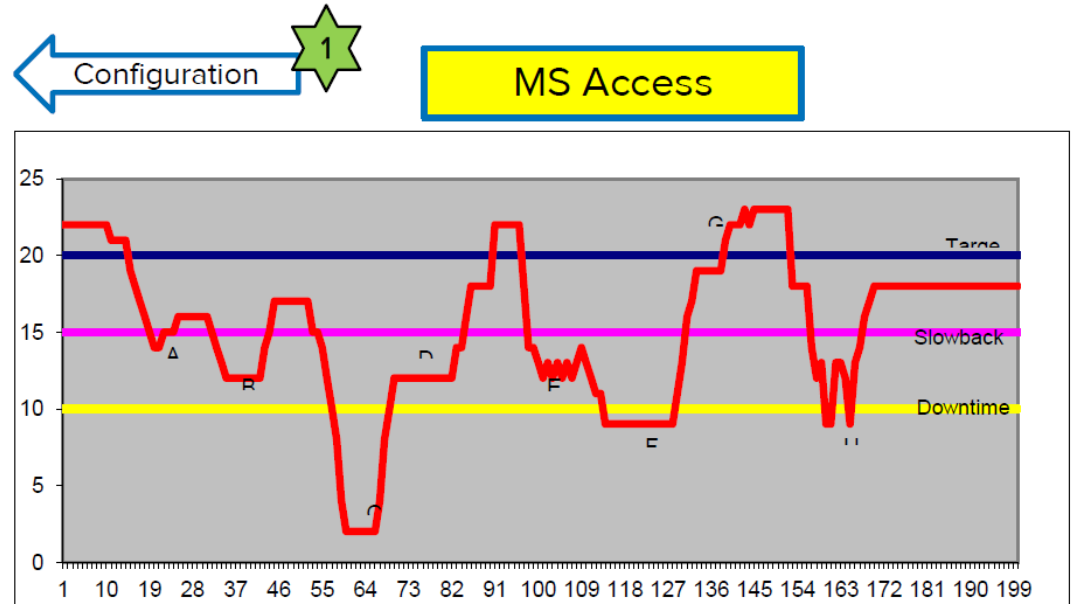
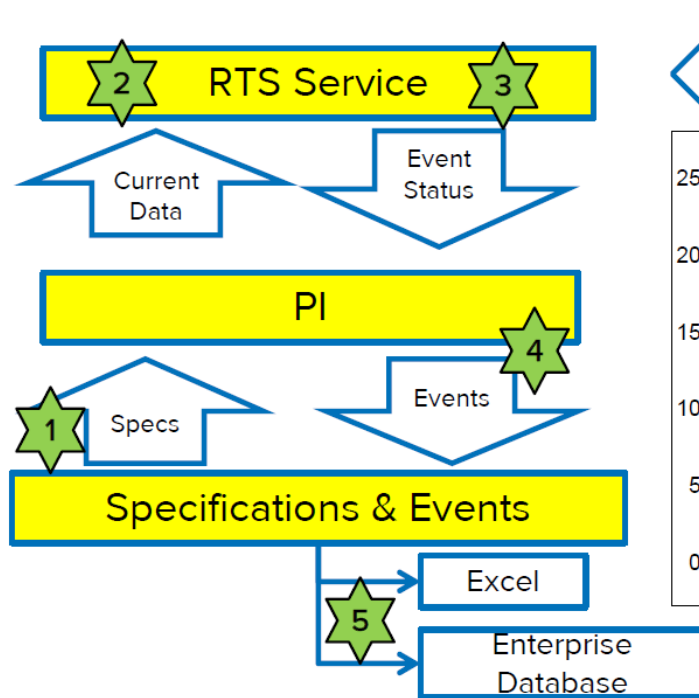
Equations

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

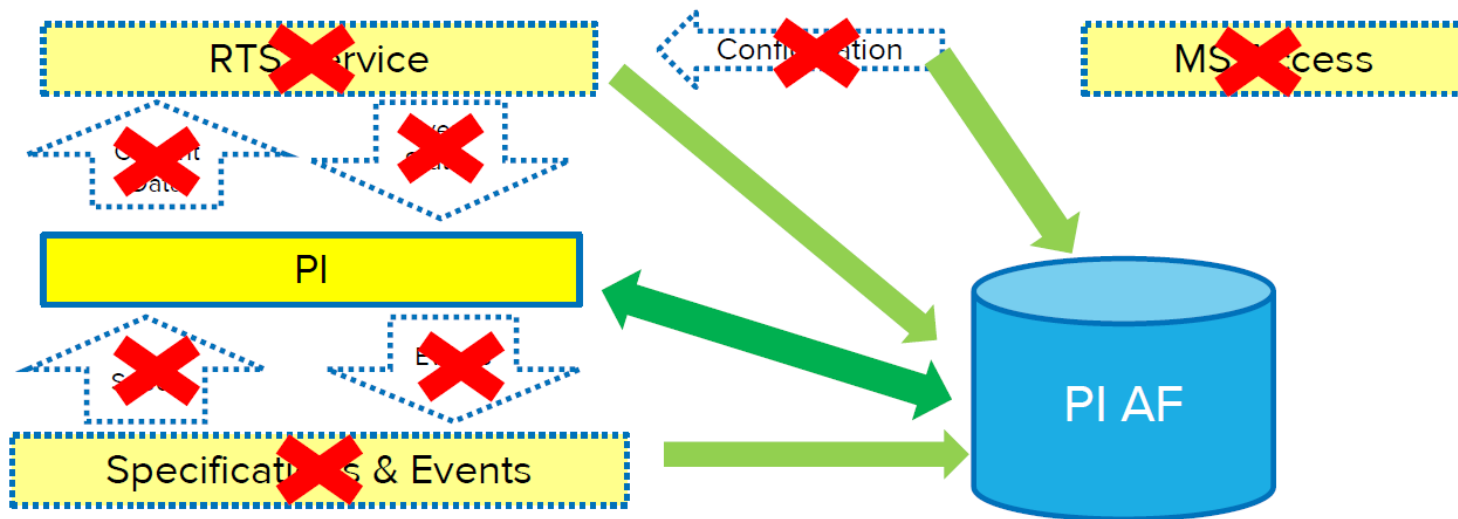
Parameters

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

Downtime Data Flow



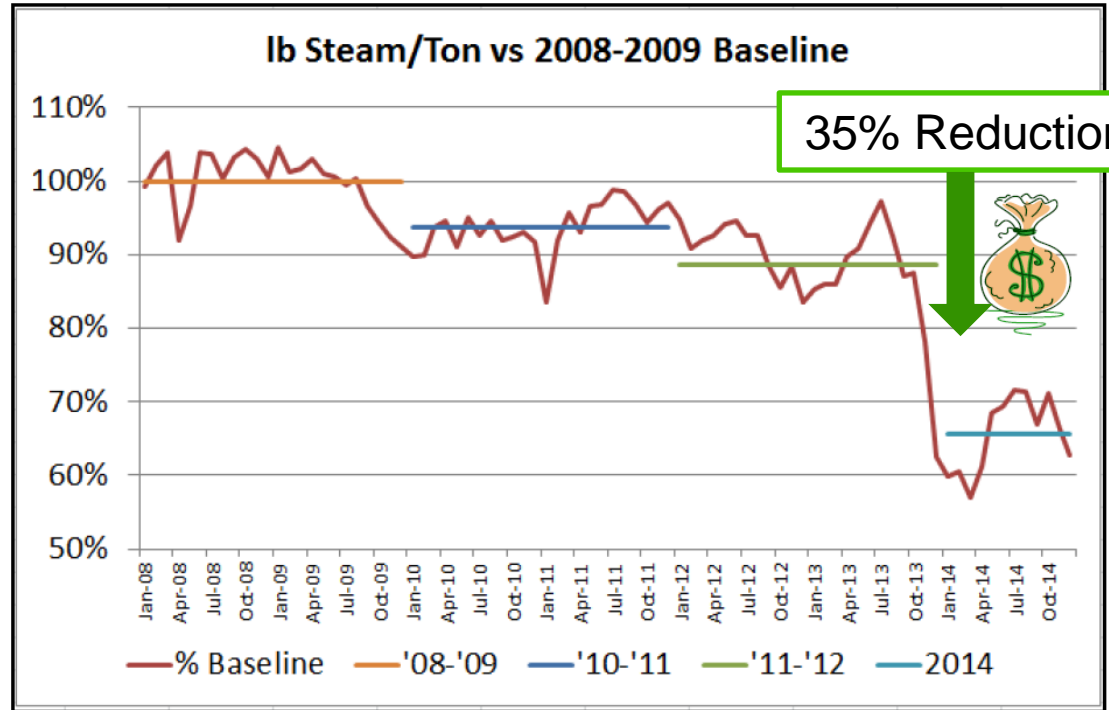
Consolidation of Data Flow in AF



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

Tracking Energy Consumption

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



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

	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	52.99945161	394311.57813	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	58080.61715
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	62820.0621
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	58591.8867
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	52543.5117
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
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	214.616424	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

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Questions

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谢谢

Danke

Merci

Gracias

Thank You

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Спасибо

Obrigado