Enhancing Manufacturing Decision-Making Process through Real Time KPI

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Tech. Support by Josian Escorne

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Agenda

- About Michelin – petrochemicals BU
- Business Challenge
- Applications and User Case / How the PI System was Applied
- Why we've invested in PI Infrastructure
- 2015 Success

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Michelin – Petrochemicals BU

- Michelin is a world leader in Tires Manufacturing,
- Michelin owns 2 (3 soon) elastomers manufacturing plants
  - France / USA / Indonesia

- Advanced, highly technical polymers…
  - … hence challenging to produce

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Michelin – Bassens Plant

- Bassens plant:
  - 375 employees
  - Integrated platform (utilities, manufacturing…)
  - Manufacturing model: use of visual management promoting operators accountability

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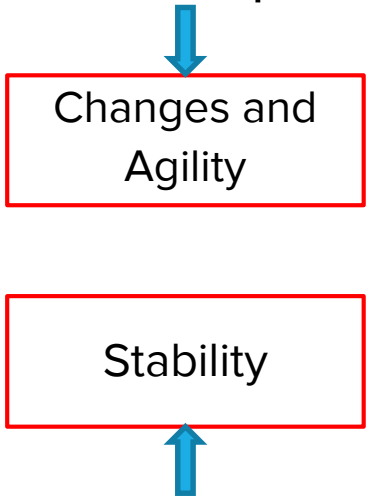
Business challenge

- Our Major Challenge is to
  - Produce highly innovative products at constant quality



  - Ensure efficient and maximal throughput

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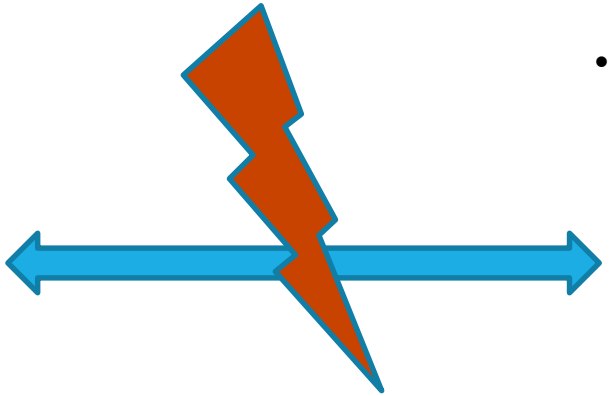
Operating Challenge

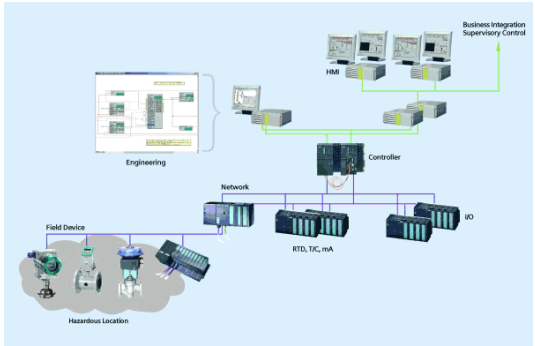
- Two powerful entities… that do not connect properly

- Petrochemicals operator:
  - OS: brain v2015
  - 90.10^9 neurons
  - 2 stereoscopic eyes



- DCS / SIS, for 1 operator:
  - 2000 TAGS
  - 200 control loops
  - BUS, 4-20mA…

- Too many real time data
- WHAT IS IMPORTANT NOW ?



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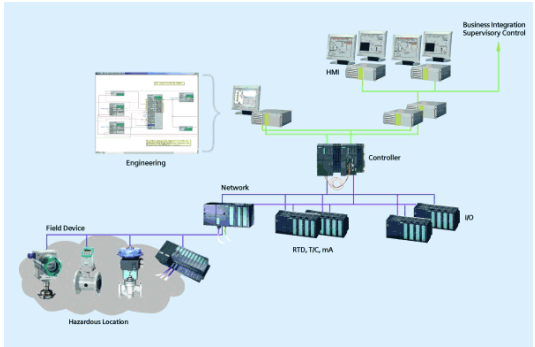
Operating Solution

- Two powerful entities connected through PI Infrastructure
  - facilitate human judgment within limited time
  - present large amounts of relevant data in a small space
  - computers perform most of the analyses
  - enhance our ability to recognize patterns, to find relevant relationships
  - monitor real time events for warning signs

Take the right decision at the right time

Successful connection !



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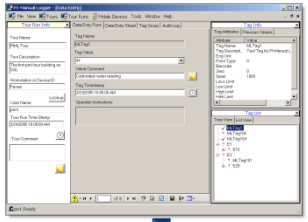
Let's see how it looks like in our plants

Structured and integrated data using PI infrastructure

PI Manual Logger
used by process engineers



Process DCS

OPC

Powerhouse SCADA

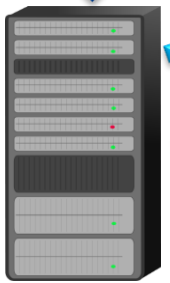
OPC

LIMS

OPC

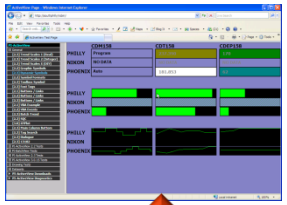
Package PLC

OPC

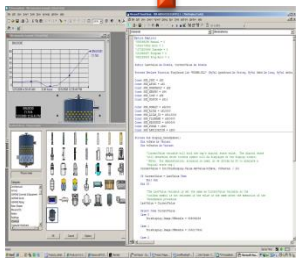


PI System Servers
PI Data Archive
Microsoft SQL
PI Asset Framework
PI WebParts
Microsoft SharePoint

PI WebParts
used by managers



PI WebParts with
PI ActiveView
used by operators



PI ProcessBook
used by engineers
and operators

PI SQC
(statistical quality control)

Visual Basic

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Who does What ?

- Definition of monitored parameters
  - Process engineer + Operator
  - Based on production referential and WIN FOCUS

- PI Infrastructure management – Hardware
  - Automation engineers

- PI data management and tool creations
  - Process engineer + Process Control engineer

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Example of Production Dashboard

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Inventory Management

Additive	Vessel		Purity (%)	Density (lb/gal)	Level (%)	Days to 10%	Days to 45%	Inven. (d)
	D-60A	Mix	16.80		21.2			12.4
	D-61A	Run			24.9	4.2		
	D-67M	Mix			50.0			
	D-66M	Run			80.0			
	D-686	Mix/Run		6.88	28.1	6.9	0.0	10.8
	D-680	Mix/Run		6.66	36.8	62.7	0.0	86.1
	D-68M	Mix		6.99	5.5			
	D-155M	Run			82.0	25.5		
	D-7A	Run		7.29	62.1	31.8		
	D-618	Run		6.60	51.4	224.3	34.4	278.5
	D-628	Mix		6.58	0.0			10.7
	D-630	Run			64.0	9.0		
	D-6A	Mix/Run		7.18	47.5	9.3	0.6	11.8
	TBD	Run						

Title: Chemical Preparation Summary Creation Date: 16-Sep-2013
Author: B. Lucas, S. McKenzie Edition Date: 19-Sep-2013

Alerts when new makeups are due

Highlights out-of-tolerance makeups

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Production Visual Management

One can see the dashboard early in the morning and immediately know last night's performance.

The dashboard answers simple questions to speed up troubleshooting for low rerun.

We see missed rerun associated with motor downtime.

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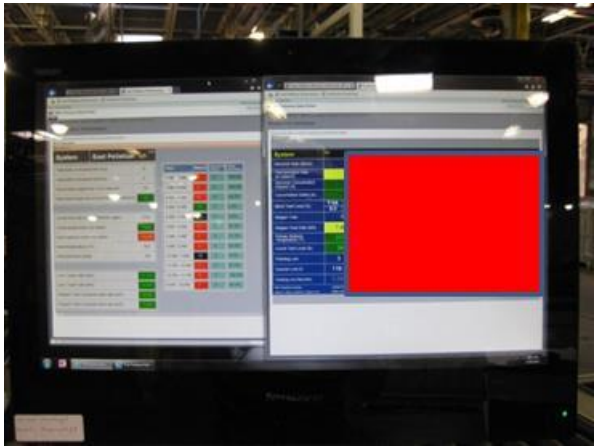
Visual Management near the operator



Operators at this post are physically near Line 1 so they know when Line 1 goes down and can lower the rerun rate. Now they can see when Line 2 goes down and can cut the rerun rate during its downtime too.

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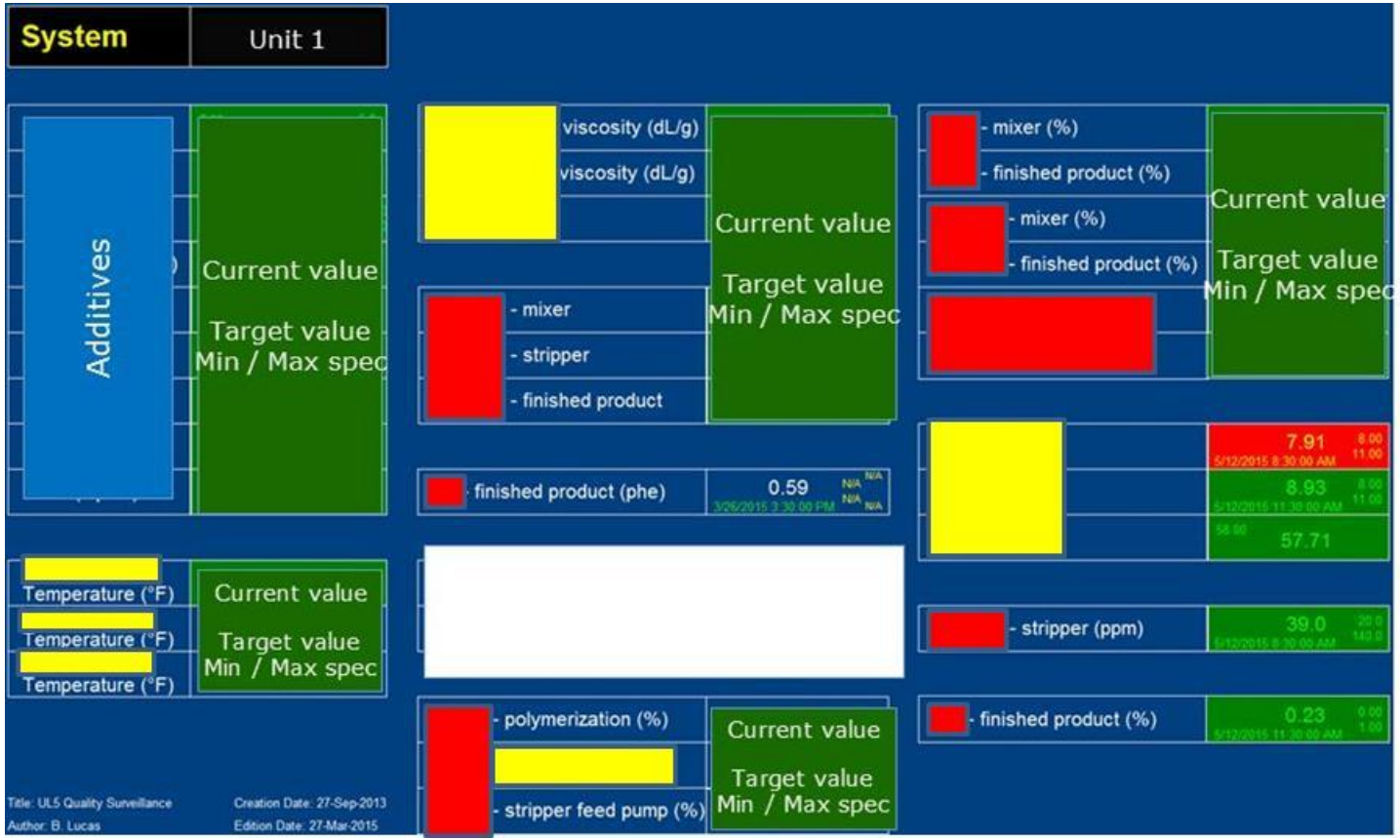
Quality Visual Management



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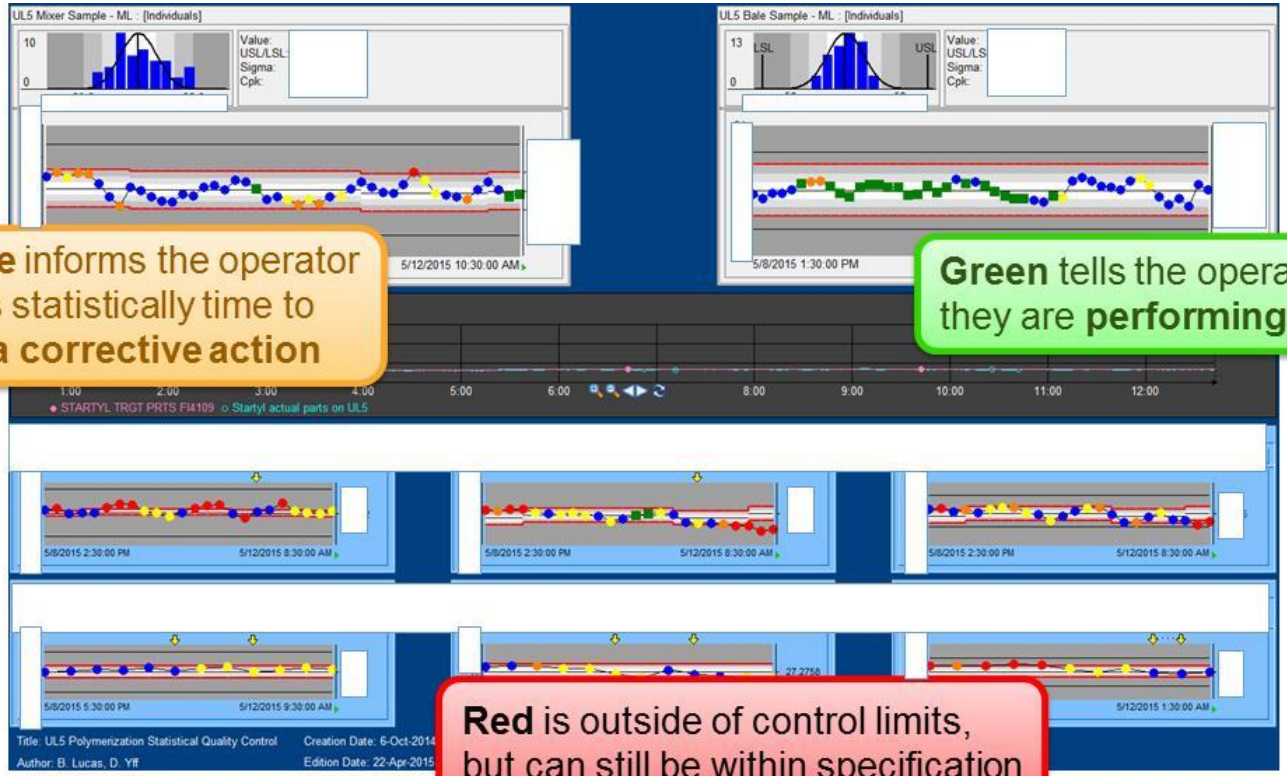
Real Time SPC (quality control)



Orange informs the operator that it's statistically time to **make a corrective action**

Green tells the operator they are **performing well**

Red is outside of control limits, but can still be within specification

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Why we've invested in PI Infrastructure? (1/4)

IT

Firewall ancestor

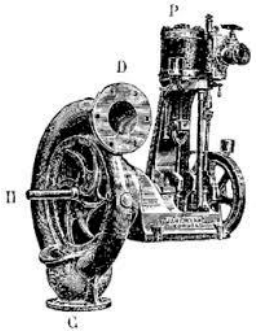
Telegraph

Telephon

Before 1800 | 1840's | 1880's

Centrifugal pumps

It's in metal
It's round
It spins



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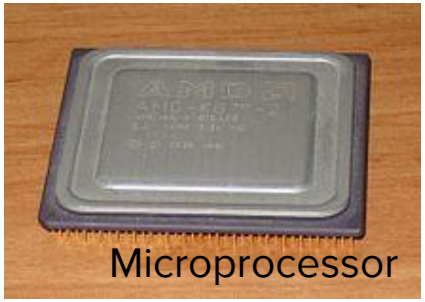
Why we've invested in PI Infrastructure? (2/4)

IT

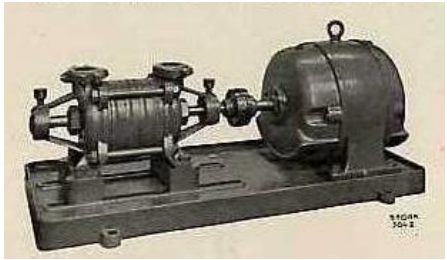
Enigma

Transistor and 2nd computer generation

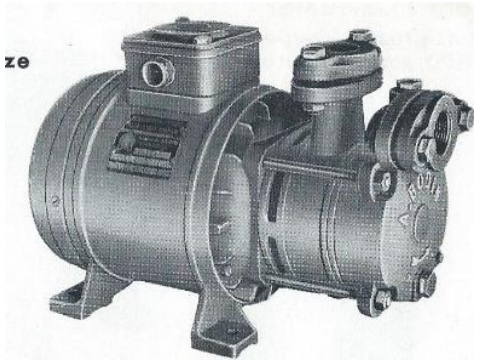


1920's — 1950's — 1970's

Centrifugal pumps



It's still in metal
It's still round
It still spins



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Why we've invested in PI Infrastructure? (3/4)

IT

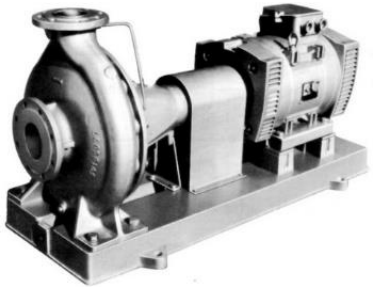
Personal Computer

Big Data, virtualization, everyone connected

It's me!

1975's | 2010 | Dec. 2015 | 2100

Centrifugal pumps



Guess what?
It's… in metal
It's… round
It… spins

I bet: metal, round, that spins!

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Why we've invested in PI Infrastructure? (4/4)

- 2015 →Investing in IT and PI infrastructure is clever and efficient

1 Pump

- CAPEX: 10k€ x 4 = 40k€
- High resource involvement for installation: process, engineering, autom, construction, operators…
- Gain: local rate and pressure increase
- Limits: tons of metal and concrete around the equipment

IT / OSI

- 40k€ ~ licences, server, AF, HMI….
- Low resource involvement for installation: process control, autom.
- Gain: impact on the whole business from real time KPI to unit throughput increase / IPI decrease
- Limit: our imagination

> 1M€ CAPEX ← +2 – 5% throughput → Proper use of IT and PI Infrastucture

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2015 Success (1/4)

- Feb 2015 = -2000tons vs plan → July 2015 = at plan
  - +2000 tons produced above unit « normal » throughput ~ +2,5%
  - Reaction Start-Up time to On-Spec consistently decreased by 20 – 30%
  - PI benefits: fast failure analysis, efficient troubleshooting, real time monitoring, reactivity by drastically reducing the time required to analyze / validate final product quality

- Off-Spec material recycling capacity + 30 – 40%
  - PI benefits: real time monitoring, increase of recycling pump throughput inside quality specification
  - Fast implementation < 2 days FTE work

- Integrated Inventory Management, connecting material quantity inside the unit's vessels with the ERP
  - raw materials including Solvent, production units, vessels
  - PI Benefits: easy mass balance with AF and volume - rate discrepancies highlight
  - Fast implementation < 5 days FTE work

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2015 Success (2/4)

- **Energy Management**
- Scope
  - ~70 Heat Exchangers
  - 4 steam sources
  - > 350 equations
- Challenge
  - Help operator to monitor and optimize , in real time, the unit steam consumption

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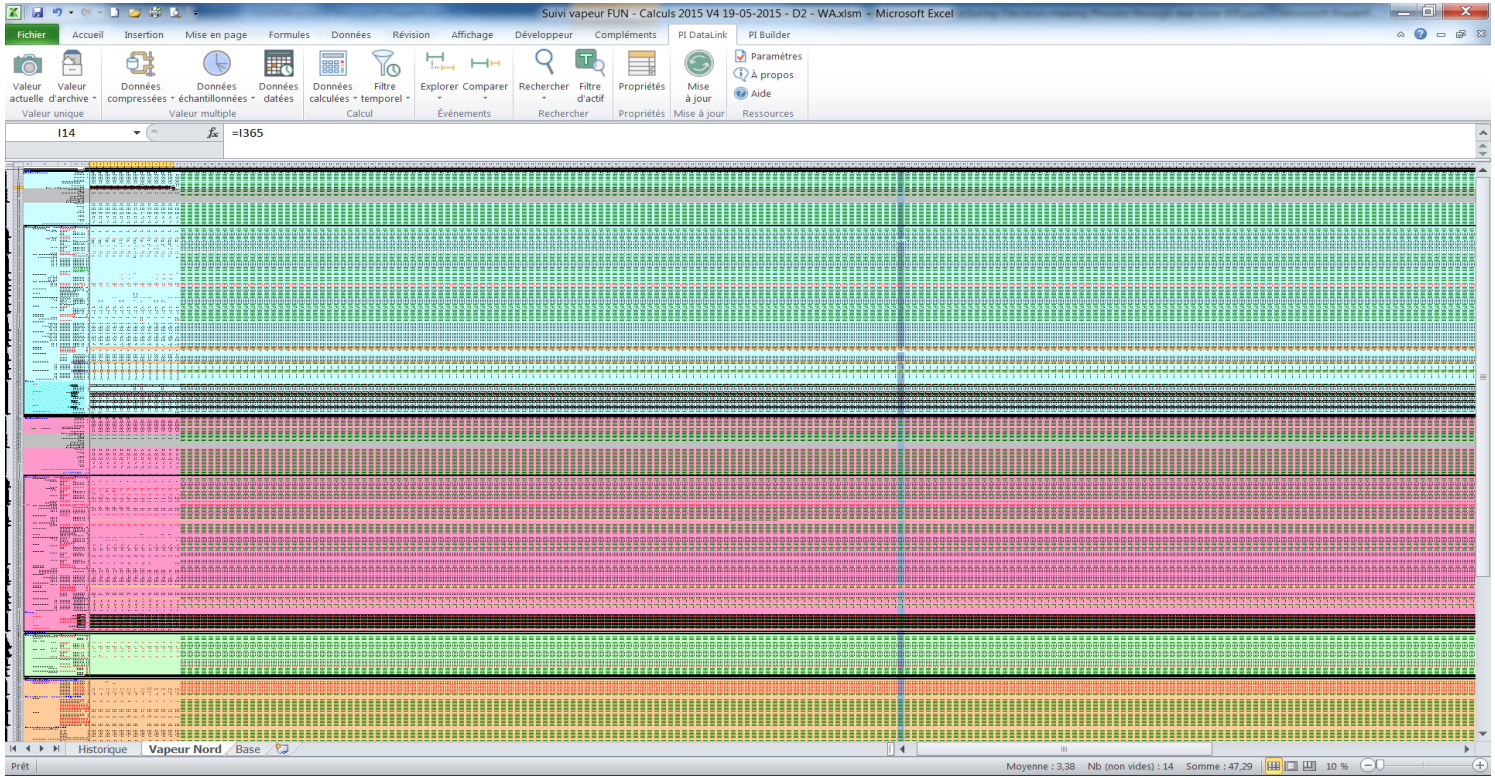
2015 Success (3/4)

- Energy Management before AF
- Never been able to successfully modelize and monitor steam consumption of production units
- Limited by Excel, VB… reliability, versioning and complexity



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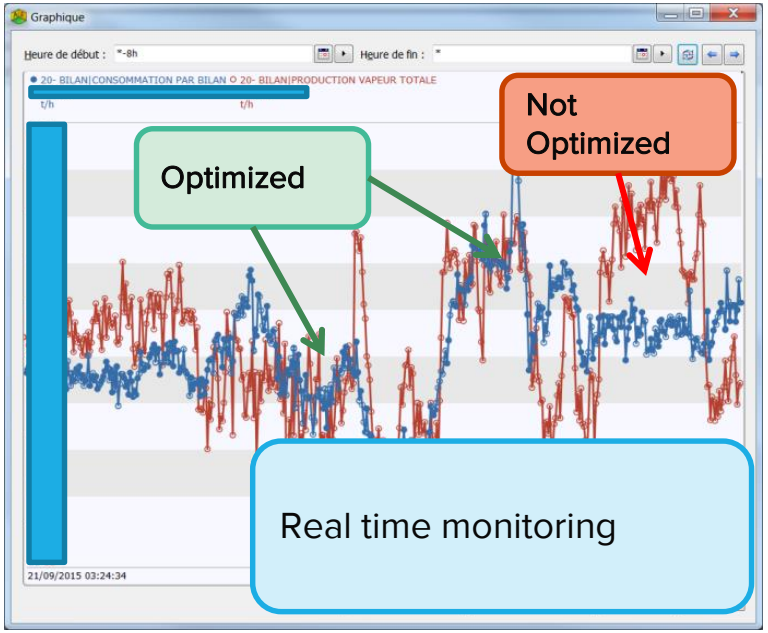
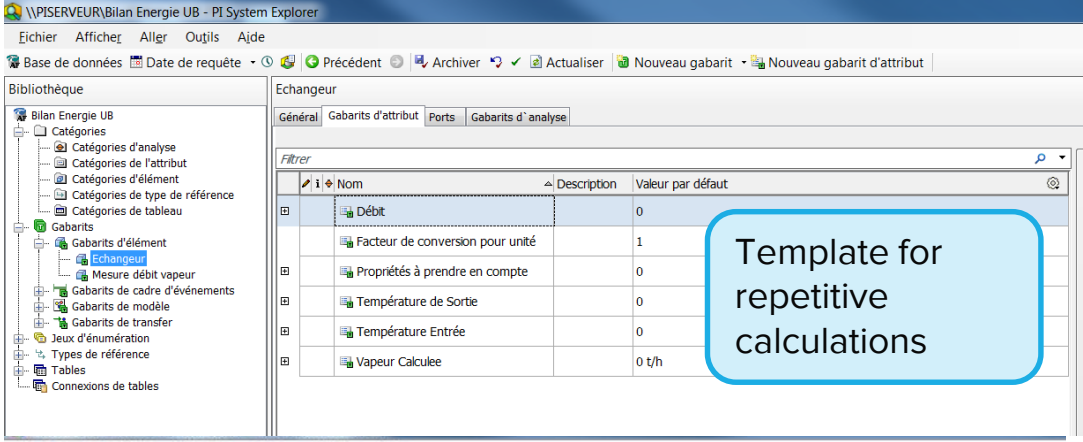
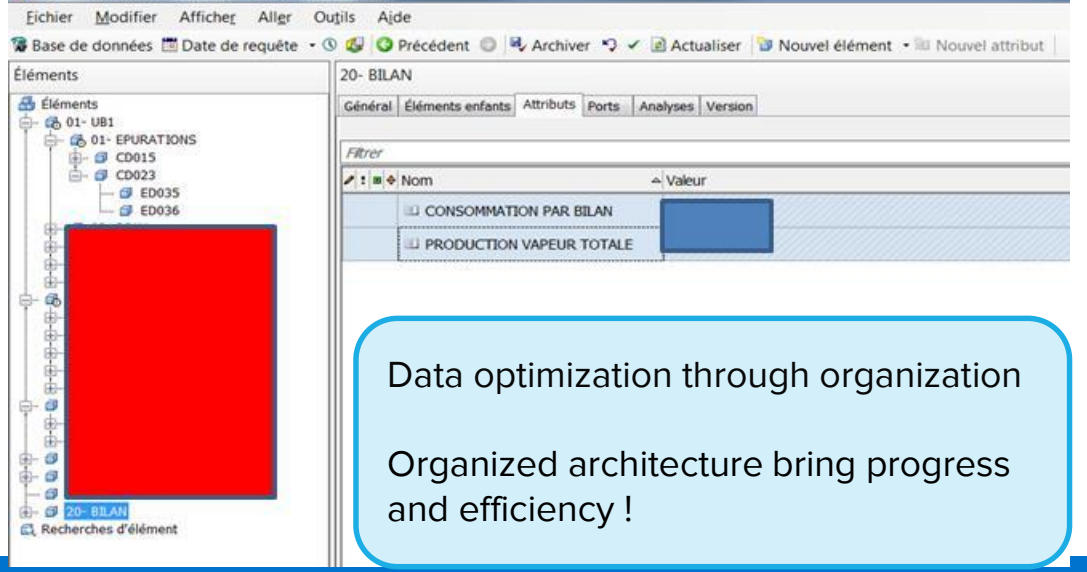
2015 Success (4/4)

- Energy Management with AF
  - 1 FTE week work
  - Real time monitoring
  - Easy KPI







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Summary

"PI is not a nice-to-have technician-centric soft, PI is a Business Improvement Tool ."

"There is nor fortune, neither fate, in my business. There are facts, physics and concrete intelligent technologies."

BUSINESS CHALLENGES

- Increase units throughput to meet increasing demand
- Reduce energy costs
- Develop agility and reactivity to adapt to innovative, sensible, elastomers quality

SOLUTION

- Increase level 2 – 3 applications skills within production site
- Apply Michelin Manufacturing Model / Lean Manufacturing and Sustainability Model
- Leverage PI System infrastructure: PI AF, PI ProcessBook, PI Datalink and PI WebParts, as foundation for further improvements

RESULTS AND BENEFITS

- Fast implementation of Business / Result-oriented tools, low resource demand
- Efficiency through data structure and organization
- Very rapid payback and results
- 15H1: +2.000 tons produced against plan

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Questions

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

State your
name & company

Please don't forget to…

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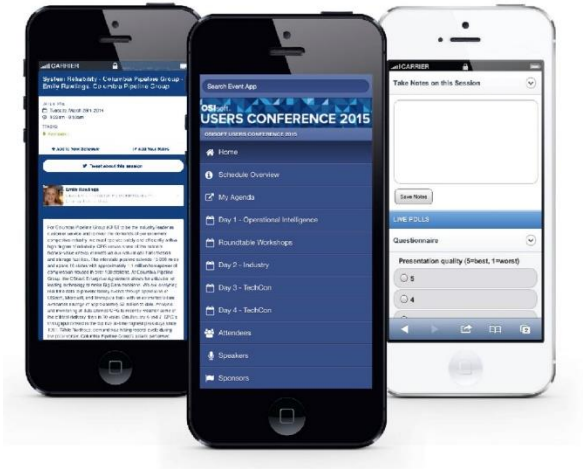

*link not yet provided

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감사합니다

谢谢

Danke

Gracias

Merci

Thank You

ありがとう

Спасибо

Obrigado

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