Digital Transformation with PI System in Food Industry

Emilio Anglés Isern

November 5th, 2020

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Agenda

- About Kellogg Company.
- About Kellogg Manufacturing Valls (Spain).
- Valls Plant PI System Architecture.
- Using PI Notifications and PI Vision for silos inventory control.
- Using PI System data for Energy Saving projects.
- Improving Operations Efficiency with PI AF and PI Analysis.

About Kellogg Company

Morning Star Farms

Kellogg's Special K

Parati

Kellogg's mini MAX

Mini-Wheats

ALL-BRAN

Kellogg's
Kelloggs
"We are a company of dedicated
people making quality products
for a healthier world"
W K Kellogg
POWERED
BY KELLOGG IT

100+ Year Heritage, Progressive Growth

1906 - Kellogg Company founded

Canadian expansion

Overseas expansion into UK, Australia

1950s – Latin America, Mexico entry

1960s – Asia, Japan entry

Expands into select Frozen Food products in U.S. and bars

Eggo Nutri-Grain

Enters biscuits, cookies, crackers with Keebler acquisition

Keebler

Kellogg's 100

Acquired Pringles

Pringles

Wilmar International joint venture

Tolaram Africa joint venture

Tolaram Group

Acquired Mass Food Group, leading Egyptian cereal company

MASS FOOD

Acquired RXBAR, fastest-growing US nutrition bar brand

RXBAR

1906 1920 1940 1960 1980 2000 2012 2013 2014 2015 2016 2017 2018

Numerous iconic foods launched from the 1930s to the 1980s

Kashi

MorningStar Farms

Acquired Kashi and MorningStar Farms soy-based vegetarian foods

$14.6 billion in sales

Bisco Misr

Acquired Bisco Misr, Egyptian biscuits company

Parati

Acquired Parati, leading Brazilian biscuits, pasta and powder beverage company

Acquired Verival Austrian Bio Organic food company

About KELLOGG COMPANY

2019 SALES:
~ $13.6B
(IN USD)

OVER
1,000 FOODS
MARKETED IN
180
COUNTRIES

32.000 employees worldwide

WORLD'S LEADING CEREAL COMPANY

WORLD'S 2ND LARGEST SAVORY SNACK COMPANY

A LEADING GLOBAL PLANT-BASED FOODS COMPANY

LEADING NORTH AMERICAN FROZEN FOODS COMPANY

GLOBAL OPERATIONS ACROSS 4 REGIONS:

NORTH AMERICA
(including Canada & United States)

EUROPE
(including Russia)

LATIN AMERICA
(including Mexico, Central America & South America)

AMEA
(including Asia, Middle East, Africa & Turkey)

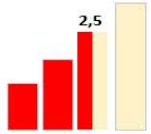
About Kellogg Manufacturing Valls (Spain)

A
Kellogg´s

Kellogg Manufacturing Valls

What do we produce?

Digital journey
Valls Manufacturing Plant



SIEMENS
Schneider Electric
INICIO AUTOMATIZACIÓN PROCESO PRODUCTIVO

COMUNICACIÓN PLC'S

PLC´s S7 400 + INDUSTRIAL ETHERNET

PLANT FLOOR DATA COLLECTION SYSTEM

IMPLANTACIÓN ERP

ACCESO REMOTO AL PROCESO PRODUCTIVO
ROBOTS ABB PALETIZADO

RED FIBRA OPTICA + NETWORKING

WEOL: VIRTUALIZACION

MODELO ISA 95 MEDIANTE OPC

PROYECTO WMS RAW MATERIAL

1980 | 1981 | 1991 | 1998 | 2003 | 2005 | 2008 | 2009 | 2012 | 2013 | 2015 | 2016 | 2018 | 2020

1980 — INAUGURACIÓN PLANTA COCCIÓN 1

1981 — TORRE + REC 1

1991 — REC 2

1998 — COCCIÓN 2

2003 — Proyecto SK

2005 — PROYECTO PARKER

2008 — Lean

2009 — PROYECTO PAKO

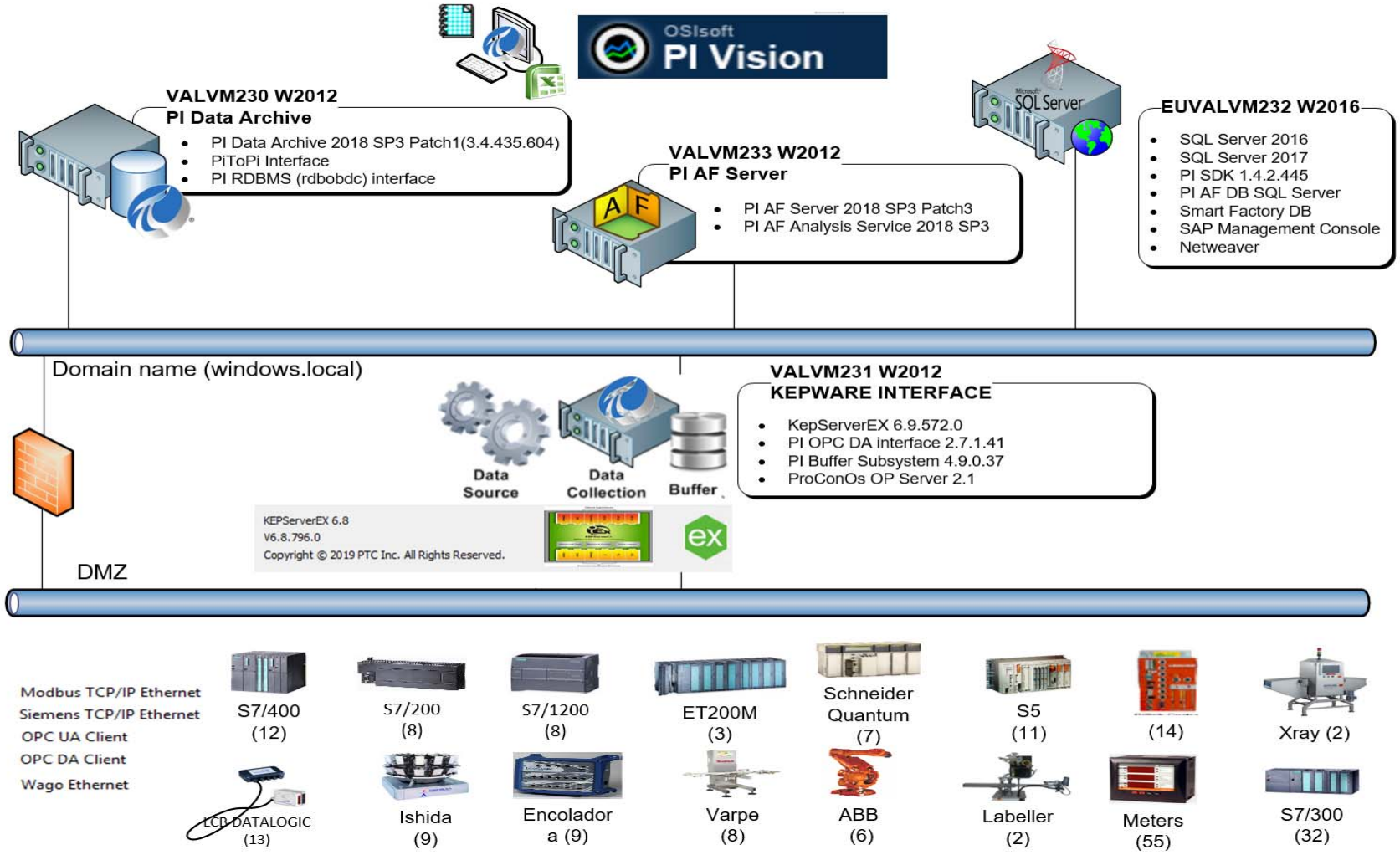
2012 — KWS

2013 — SECADERO COCCIÓN 1

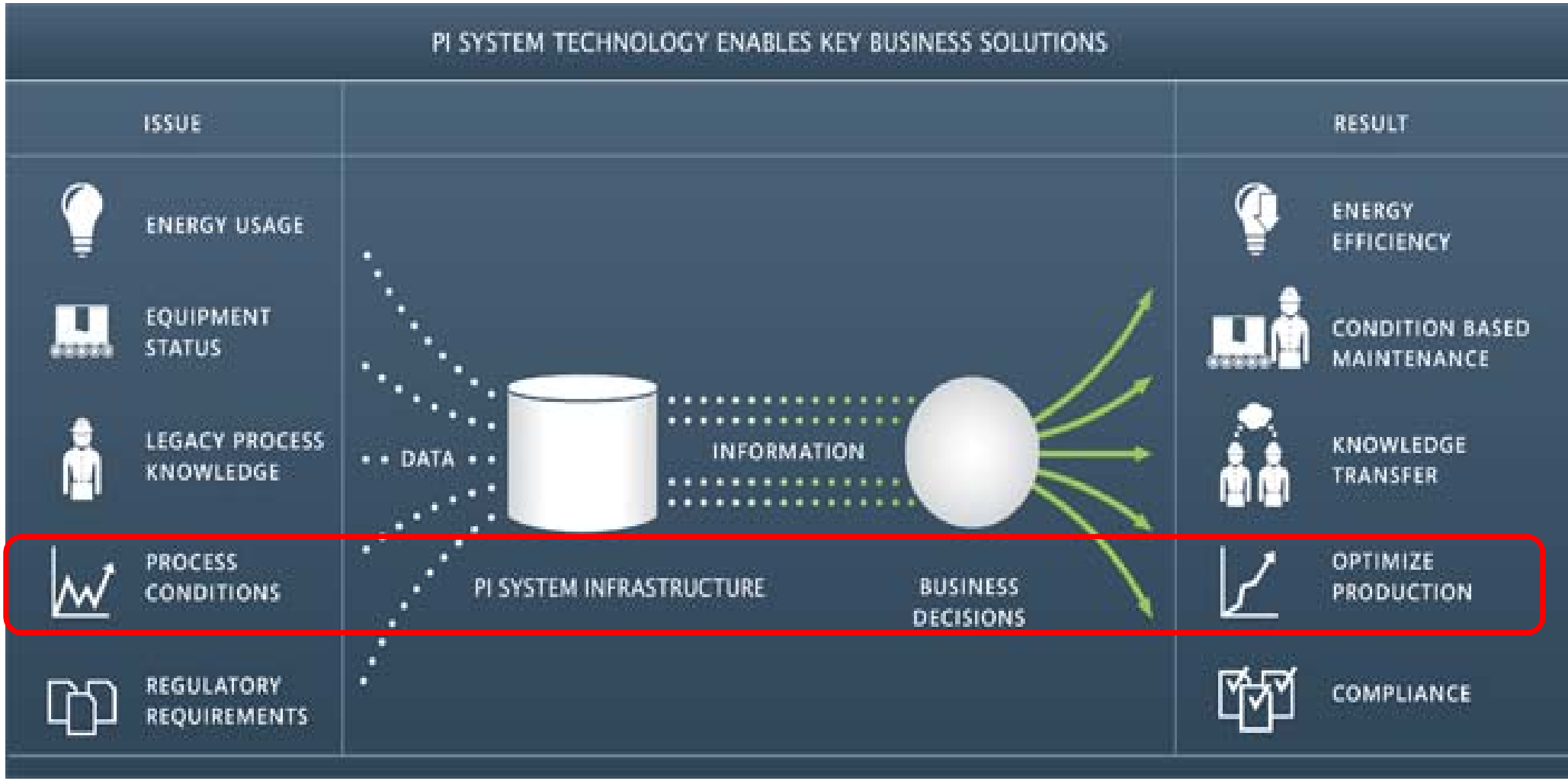
2015 2016 — Industria 4.0

- ACCESO AL PROCESO: MES 4.0
- ROBOTS COLABORATIVOS
- VISION ARTIFICIAL
- IMPRESIÓN 3D/ADITIVA
- REALIDAD AUMENTADA
- MACHINE LEARNIG
- REALIDAD VIRTUAL

Kellogg's Valls Plant PI System Architecture



Using PI Notifications and PI Vision for silos inventory control


PI SYSTEM TECHNOLOGY ENABLES KEY BUSINESS SOLUTIONS
ISSUE
RESULT
ENERGY USAGE
ENERGY EFFICIENCY
EQUIPMENT STATUS
CONDITION BASED MAINTENANCE
LEGACY PROCESS KNOWLEDGE
KNOWLEDGE TRANSFER
DATA
INFORMATION
PROCESS CONDITIONS
PI SYSTEM INFRASTRUCTURE
BUSINESS DECISIONS
OPTIMIZE PRODUCTION
REGULATORY REQUIREMENTS
COMPLIANCE

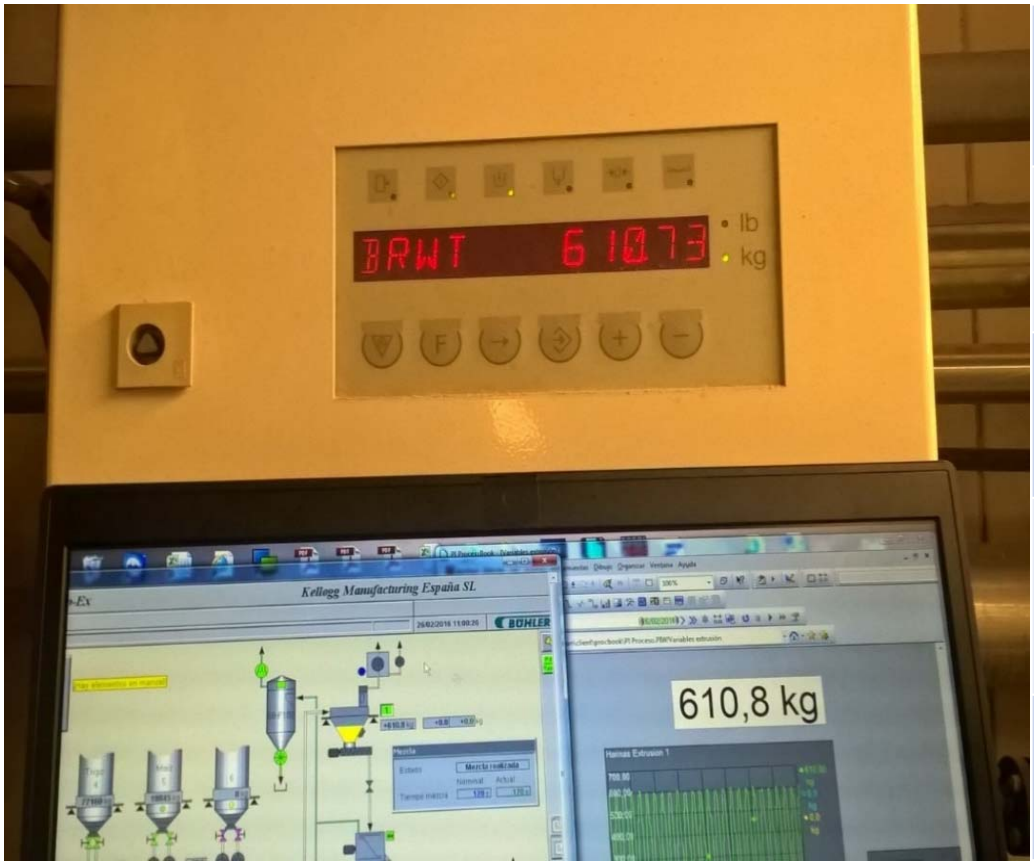
- Challenge

We have to pay an additional cost for having raw material trucks waiting to unload in the Silos, for requesting more raw material than necessary because the silo was still full.

- Challenge

Raw Materials Management

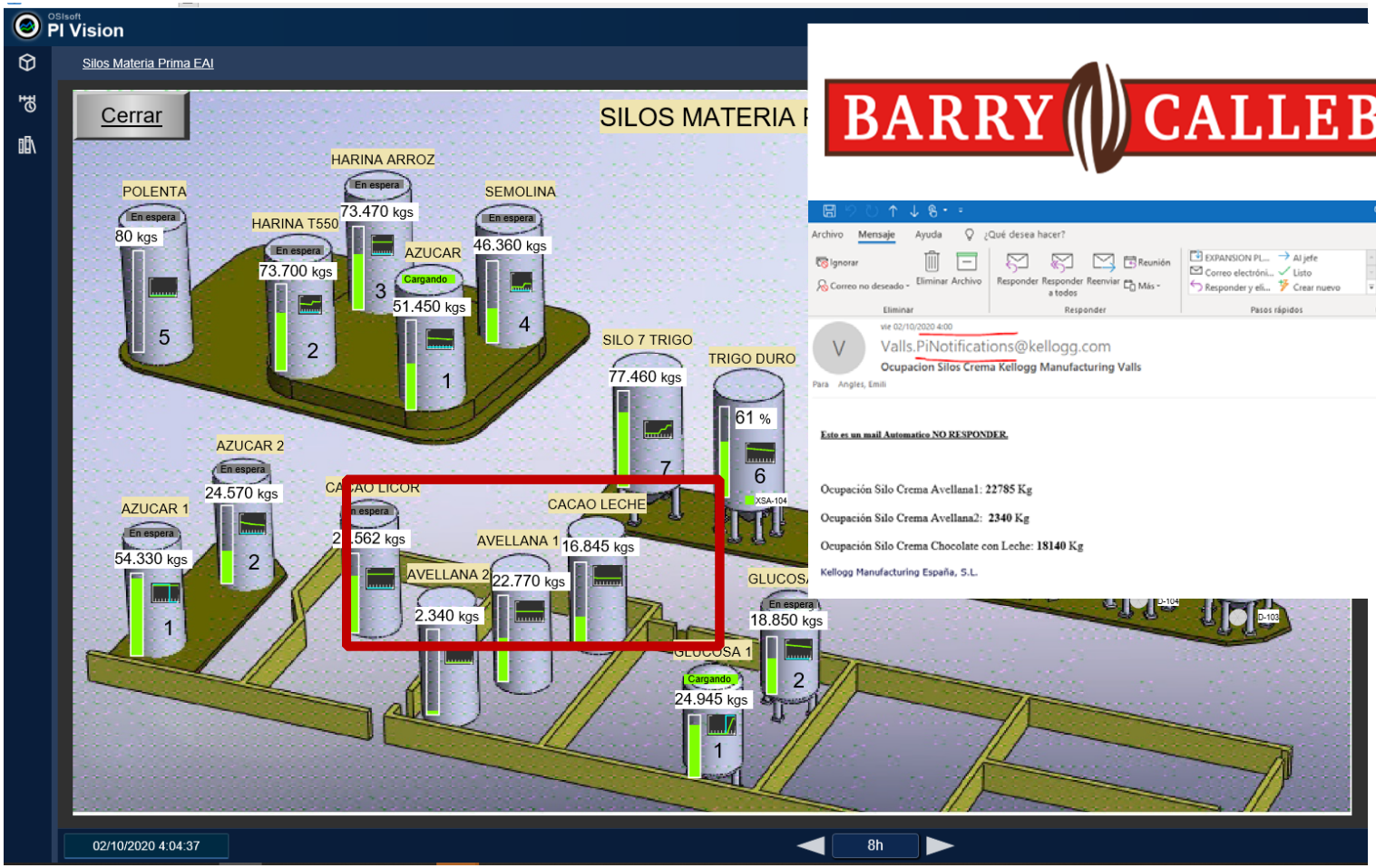
In Co-Extrusion process we had Unplanned plant shutdown due to lack of Chocolate Cream supply.



Using PI Notifications for silos inventory control

PI AF

PI Notifications



BARRY CALLEBAUT

Ocupacion Silos Crema Kellogg Manufacturing Valls - Mensaje (HTML)

Archivo Mensaje Ayuda ¿Qué desea hacer?

Ignorar Eliminar Archivo Responder Responder a todos Reenviar Reunión Más Mover Reglas OneNote Acciones Marcar como no leído Categorizar Seguimiento

Eliminar Responder Pasos rápidos Mover Etiquetas

vie 02/10/2020 4:00

Valls.PiNotifications@kellogg.com

Ocupacion Silos Crema Kellogg Manufacturing Valls

Para Angles, Emili

Esto es un mail Automatico NO RESPONDER.

Ocupación Silo Crema Avellana1: **22785** Kg

Ocupación Silo Crema Avellana2: **2340** Kg

Ocupación Silo Crema Chocolate con Leche: **18140** Kg

Kellogg Manufacturing España, S.L.

Food and Beverage

Using PI Notifications for silos inventory control

Challenge

- Reduce unplanned plant shutdown due to lack of raw material supply.

- Avoid the extra costs for having raw material trucks waiting for discharge in the Silos.

Solution

Deployed the latest OSIsoft PI technology including PI AF & Analytics and PI Vision plus email PI Notifications.

Benefits

- Increased production and operational efficiency, eliminating the unplanned plant shutdowns for run out of chocolate cream in Coex process..

- We reduce the waiting cost for discharge by 100%.

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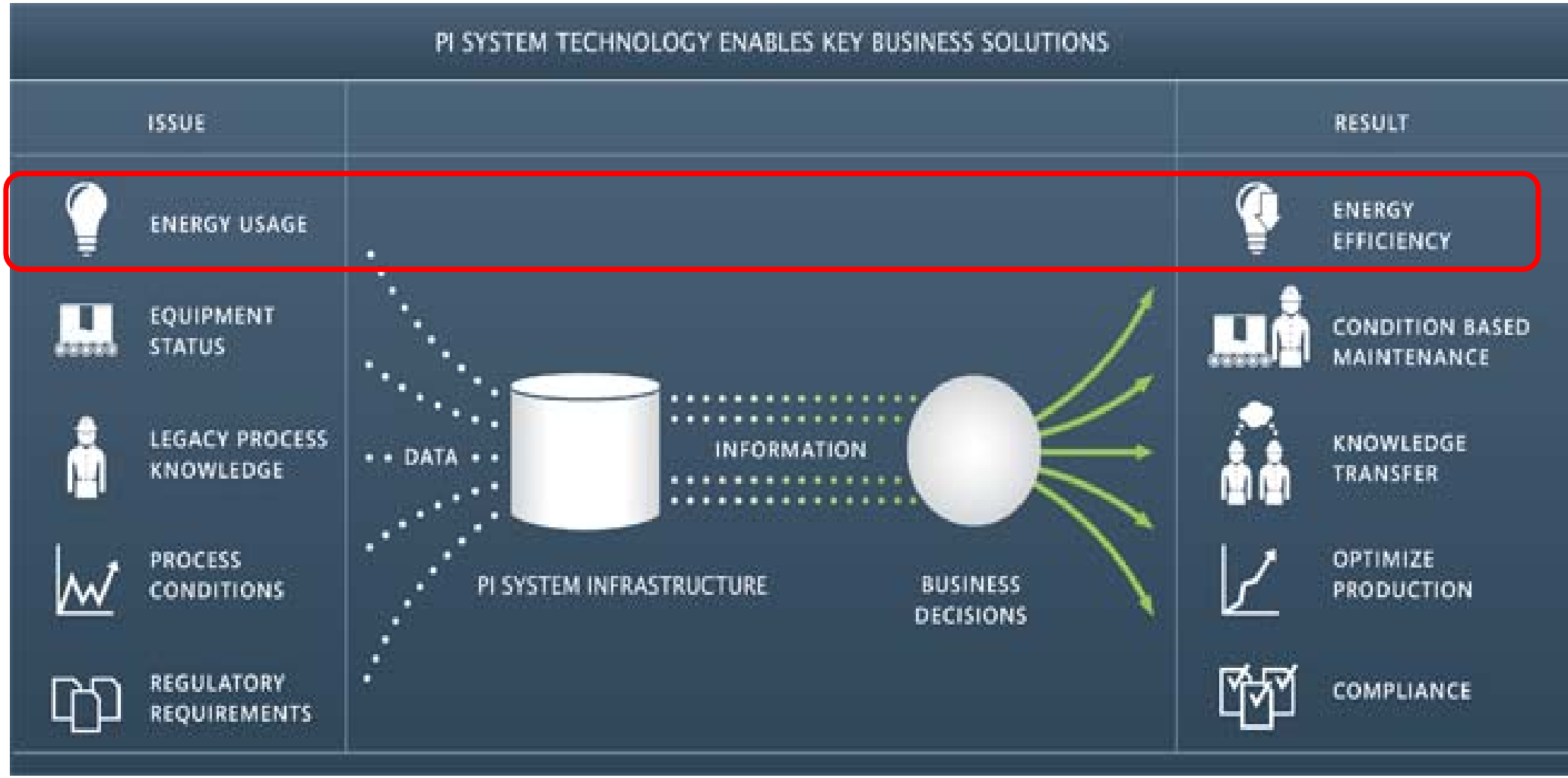
Using PI System data for Energy Saving projects.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REGULATORY REQUIREMENTS
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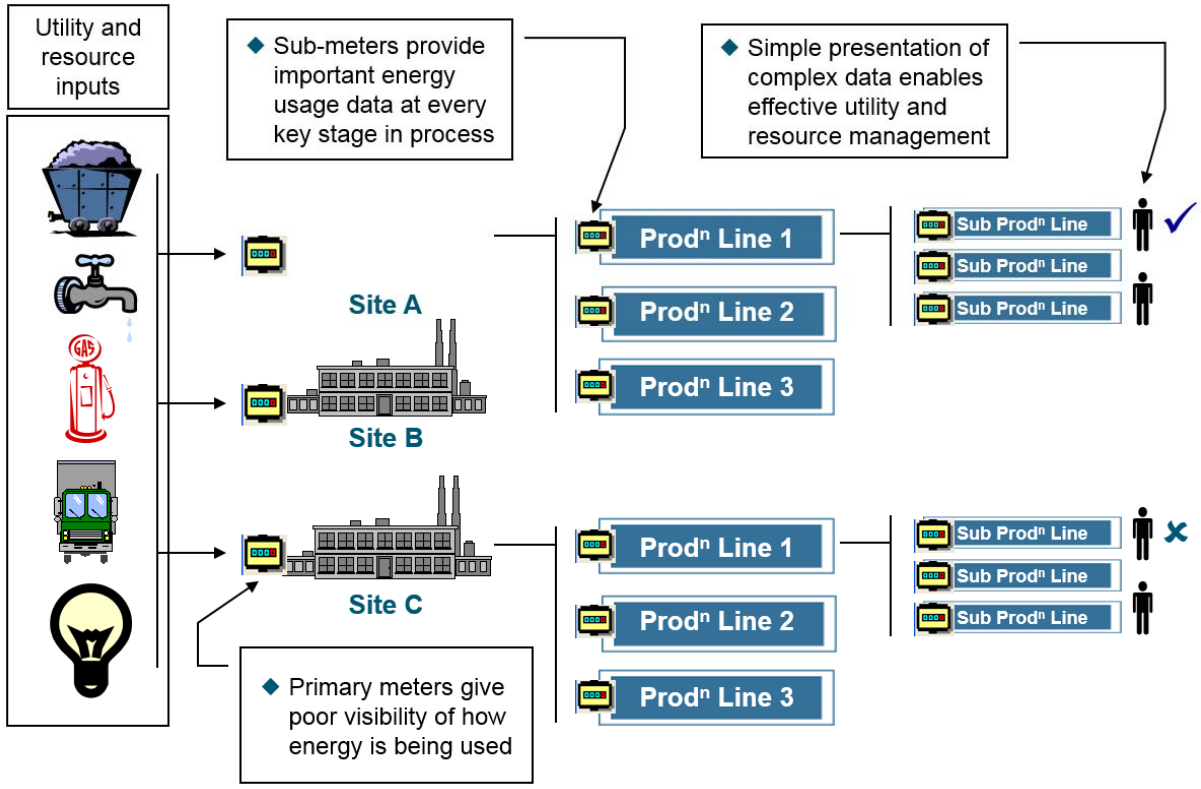
INFORMATION
PI SYSTEM INFRASTRUCTURE
BUSINESS DECISIONS

- Challenge

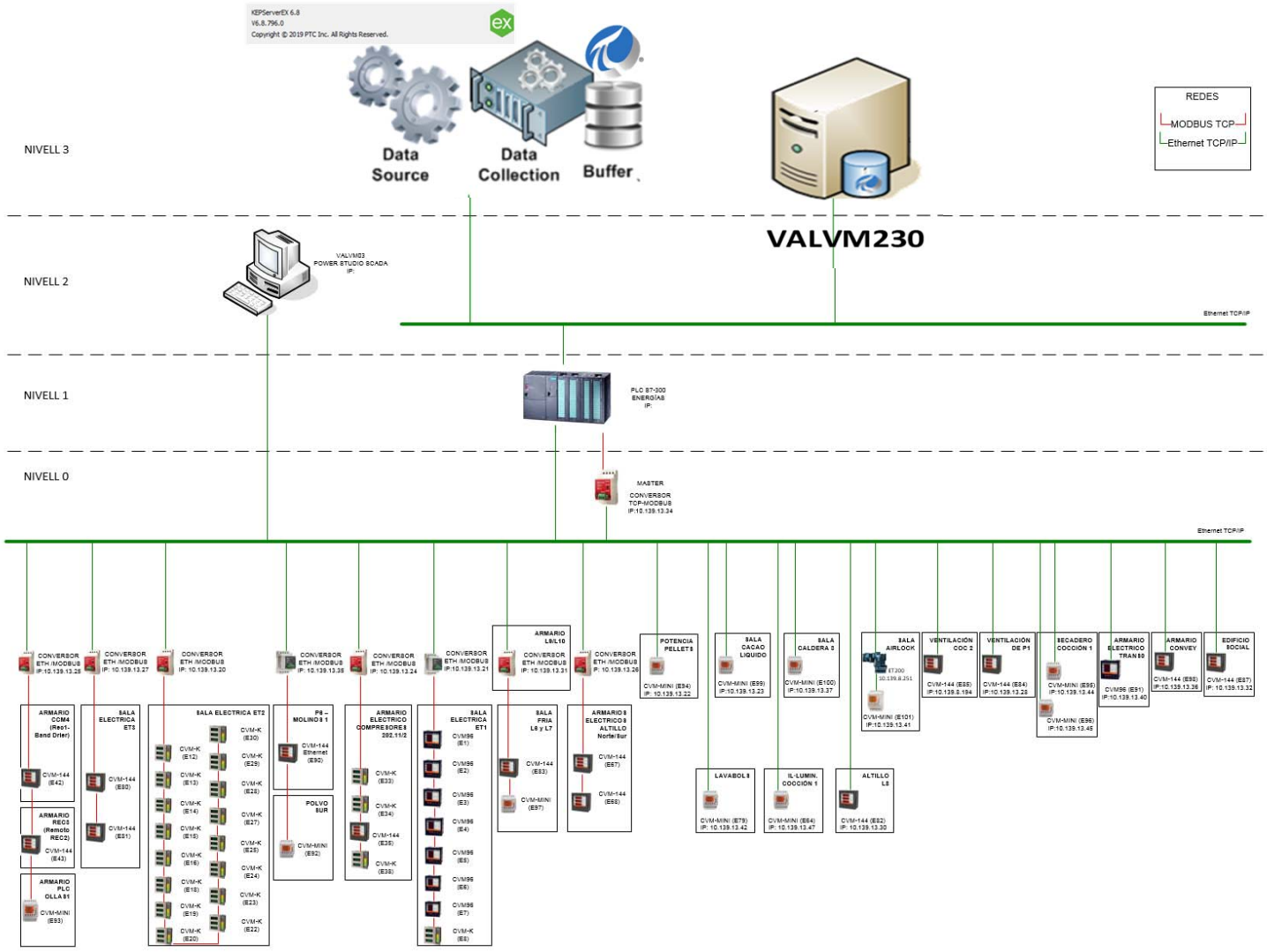
In 2005 Kellogg's Company had a challenge to reduce 20% Energy usage (Kw/Ton) in 15 years in all Kellogg Manufacturing Plants worldwide

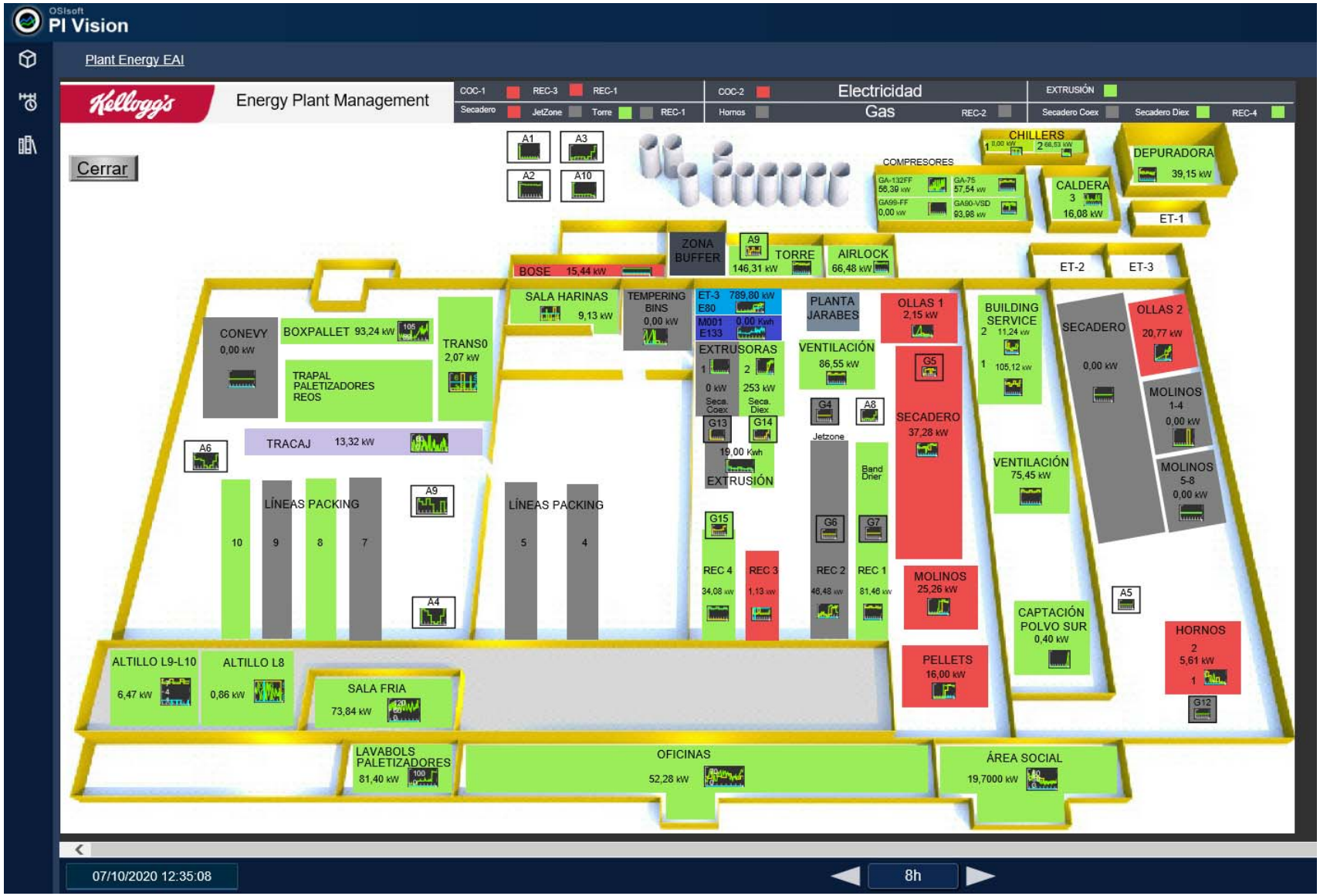
Energy Management

Making the invisible, visible!



Energy Management Architecture



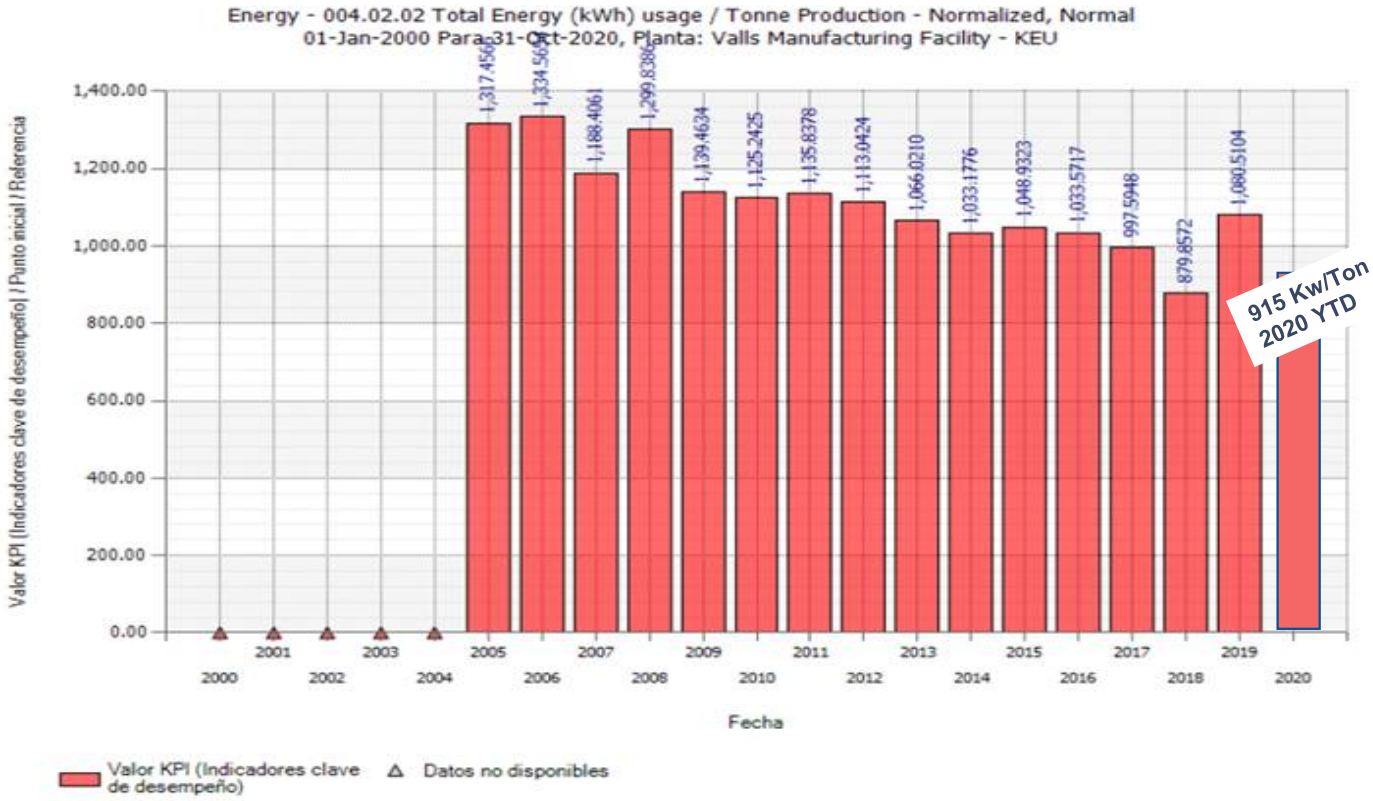

OSIsoft
PI Vision
Plant Energy EAI
Kellogg's
Energy Plant Management
COC-1
REC-3
REC-1
Secadero
JetZone
Torre
REC-1
COC-2
Electricidad
Hornos
Gas
REC-2
EXTRUSIÓN
Secadero Coex
Secadero Diex
REC-4
Cerrar
A1
A3
A2
A10
CHILLERS
COMPRESORES
GA-132FF
56,39 kW
GA-75
57,54 kW
GA90-FF
0,00 kW
GA90-VSD
93,98 kW
DEPURADORA
39,15 kW
CALDERA
3
16,08 kW
ET-1
ET-2
ET-3
ZONA BUFFER
A9
TORRE
146,31 kW
AIRLOCK
66,48 kW
BOSE
15,44 kW
SALA HARINAS
9,13 kW
TEMPERING BINS
0,00 kW
ET-3
789,80 kW
E80
M001
0,00 Kwh
E133
EXTRUSORAS
0 kW
253 kW
Seca. Coex
Seca. Diex
PLANTA JARABES
OLLAS 1
2,15 kW
VENTILACIÓN
86,55 kW
BUILDING SERVICE
11,24 kW
105,12 kW
SECADERO
0,00 kW
OLLAS 2
20,77 kW
MOLINOS 1-4
0,00 kW
MOLINOS 5-8
0,00 kW
CONEVY
0,00 kW
BOXPALLET
93,24 kW
TRANS0
2,07 kW
TRAPAL PALETIZADORES REOS
TRACAJ
13,32 kW
A6
G13
G14
19,00 Kwh
EXTRUSIÓN
G4
A8
Jetzone
G5
SECADERO
37,28 kW
VENTILACIÓN
75,45 kW
Band Dnier
A9
LÍNEAS PACKING
10
9
8
7
LÍNEAS PACKING
5
4
G15
G6
G7
REC 4
34,08 kW
REC 3
1,13 kW
REC 2
46,48 kW
REC 1
81,46 kW
MOLINOS
25,26 kW
PELLETS
16,00 kW
A4
A5
CAPTACIÓN POLVO SUR
0,40 kW
HORNOS
2
5,61 kW
1
G12
ALTILLO L9-L10
6,47 kW
ALTILLO L8
0,86 kW
SALA FRIA
73,84 kW
LAVABOLS PALETIZADORES
81,40 kW
OFICINAS
52,28 kW
ÁREA SOCIAL
19,7000 kW
07/10/2020 12:35:08
8h

E.A.I

We have reduced the kW / Ton consumption by 30% in the last 15 years

Informes KPI
Valls Manufacturing Facility - KEU

Mostrar valores de KPI Drill-down type: By Interval By Site



Food and Beverage

Using PI System data for Energy Saving

Challenge

20% Energy usage (Kw/Ton) in 15 years in all Kellogg Manufacturing Plants

Solution

Deployed the latest OSIsoft PI technology including PI AF and PI Vision along with energy meters, (Electricity, Gas Compress Air and Water) for Monitoring energy consumption in real and use the data for defining Energy Saving Engineering projects

Benefits

- 30% energy consumption reduction in 2020 YTD compared with 2005.
- The information in real time enables to take actions at shift basis

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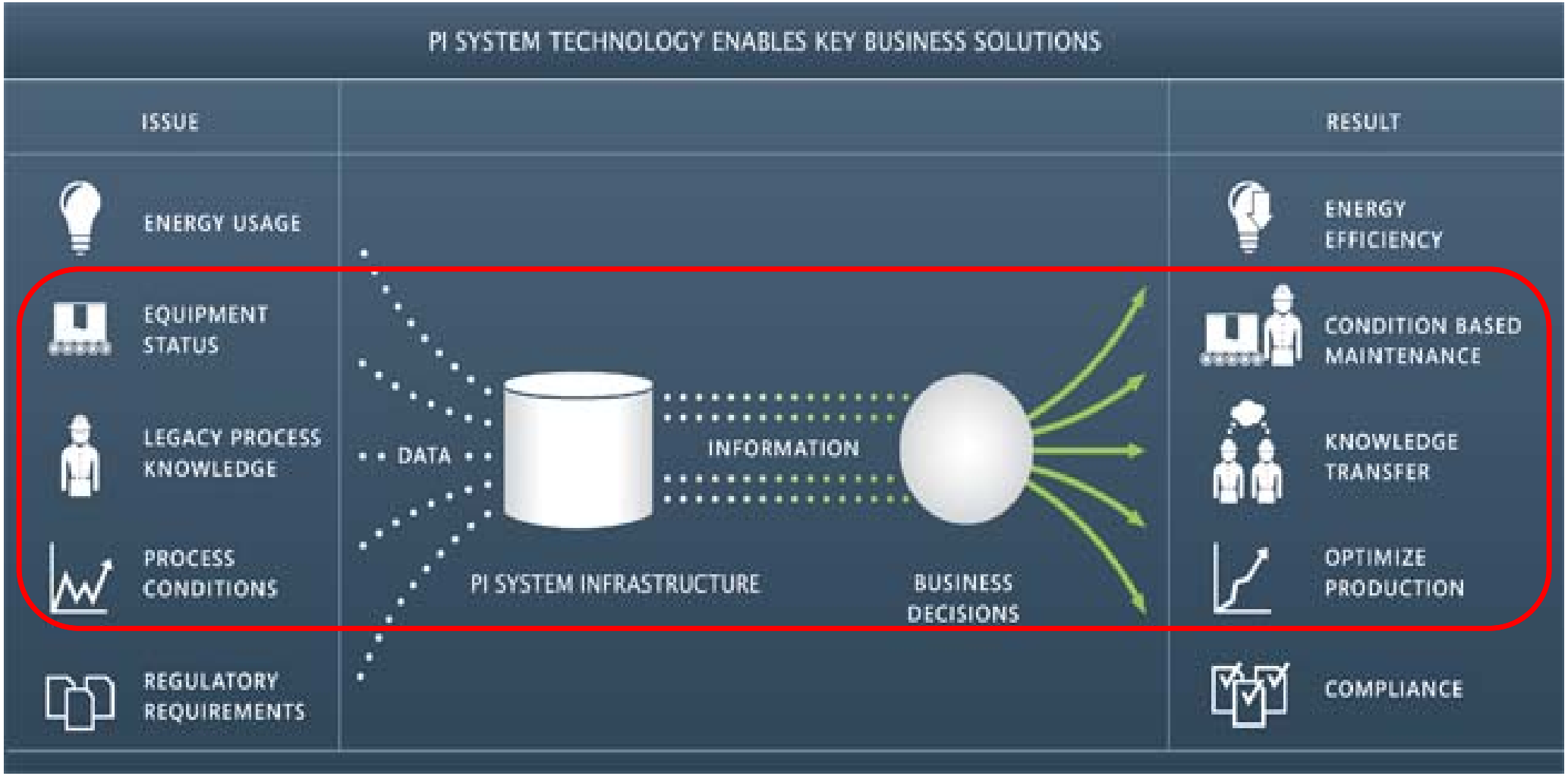
Improving Operations Efficiency with PI Asset Framework and PI Analysis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BUSINESS DECISIONS

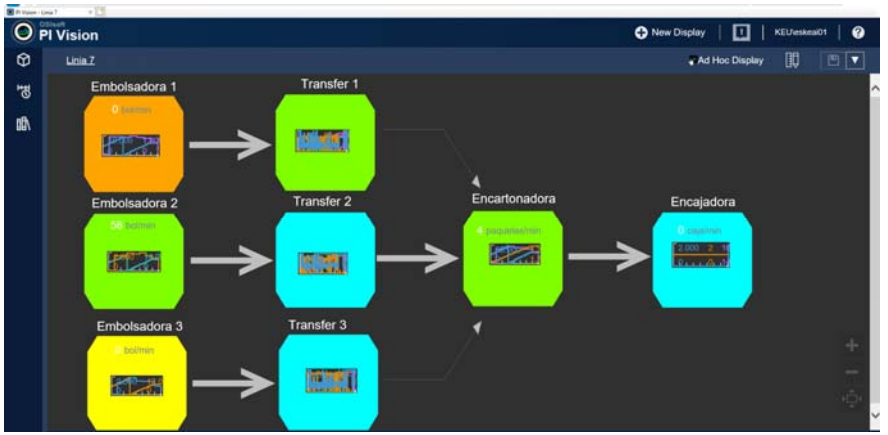
Challenge: Be in the best in Class Consumer Product Goods Industry = 80% OEE

In <u>2017</u> the packing lines OEE was <u>68%</u>

Context

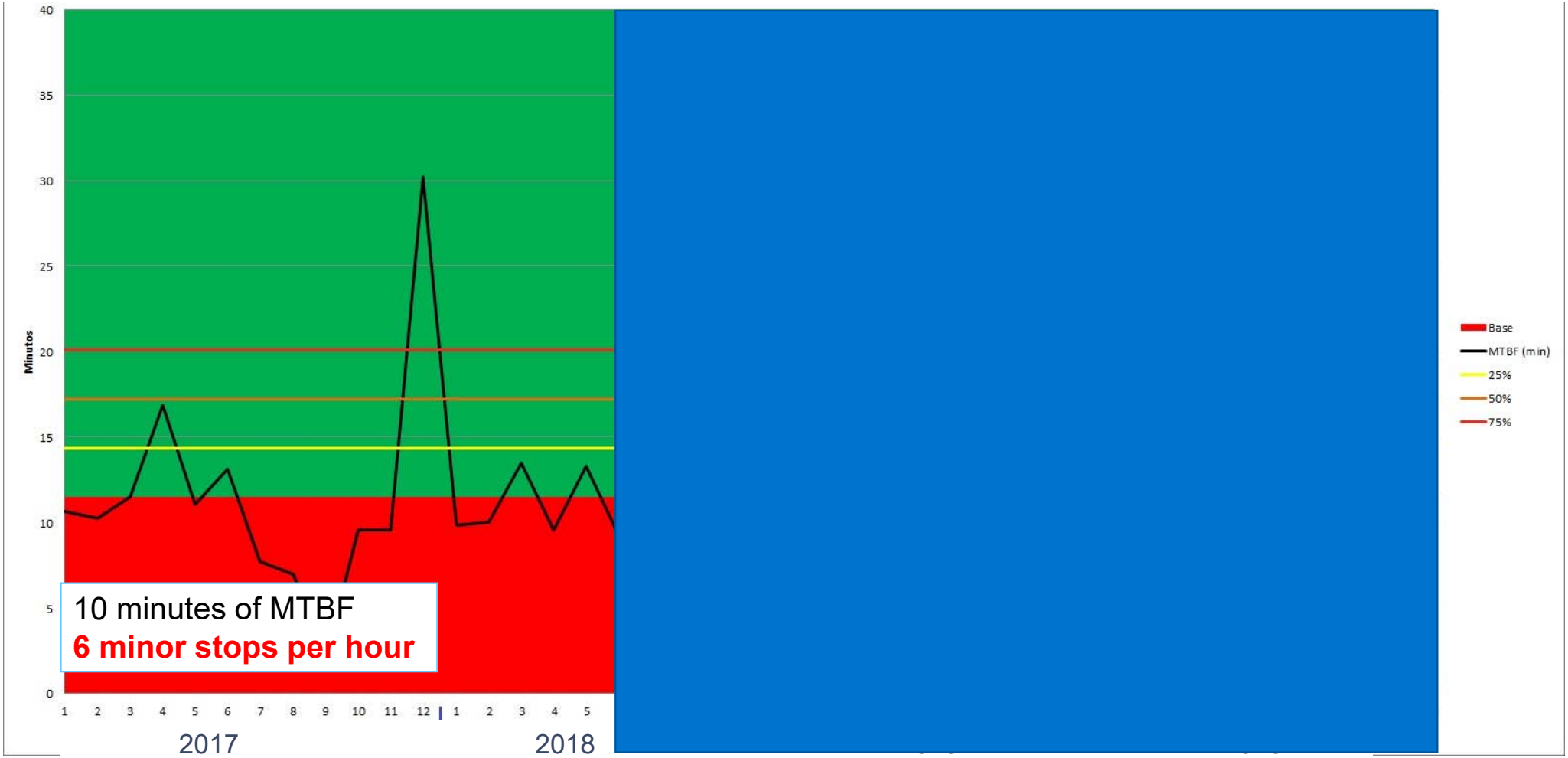
Operations TEAM needs data in order to:

- Measure the improvement after the periodic “Pit Stops” where maintenance and cleaning task are executed.

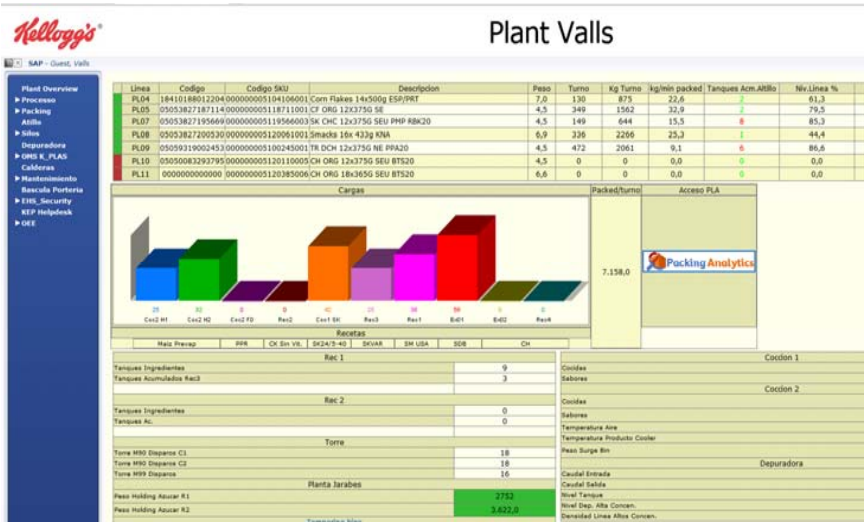


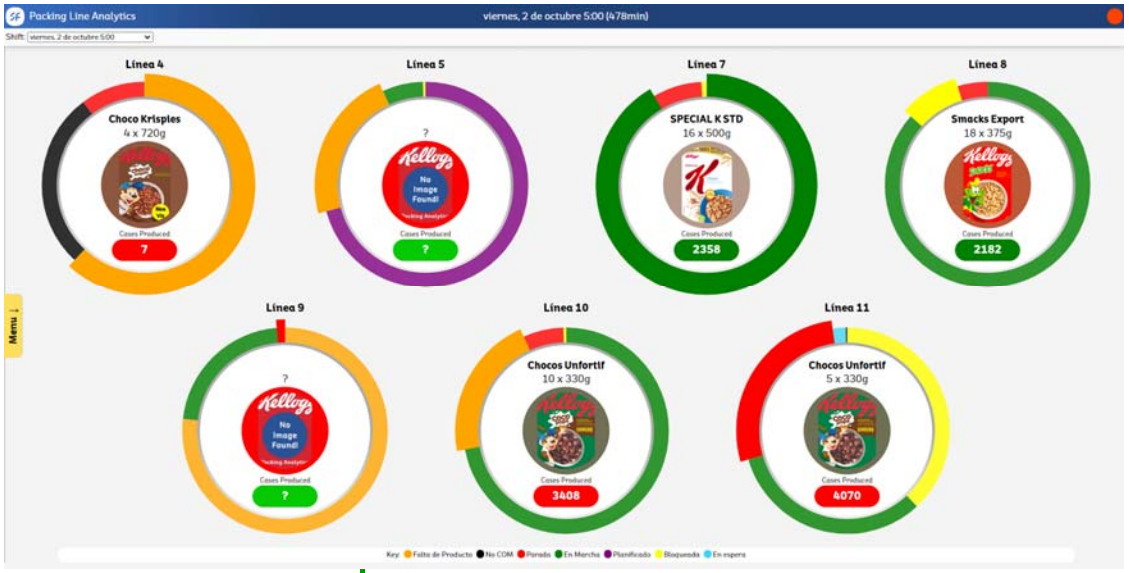
- Eliminate the historical fights between Maintenance and Production

Packing lines MTBF in 2017

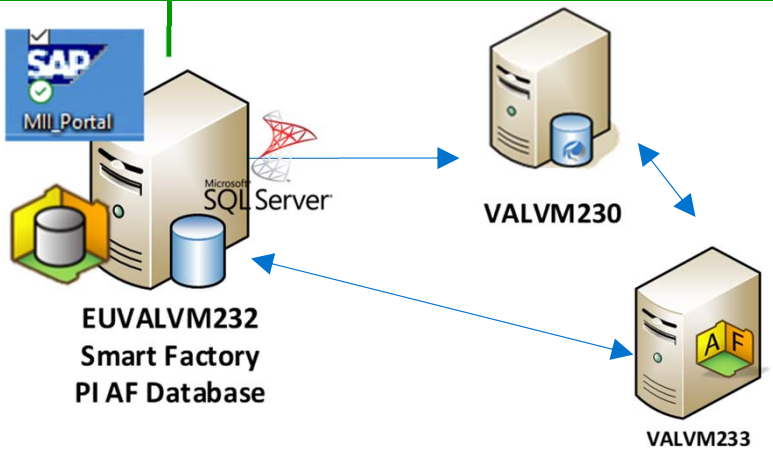


Use the PI System data along with SAP xMII





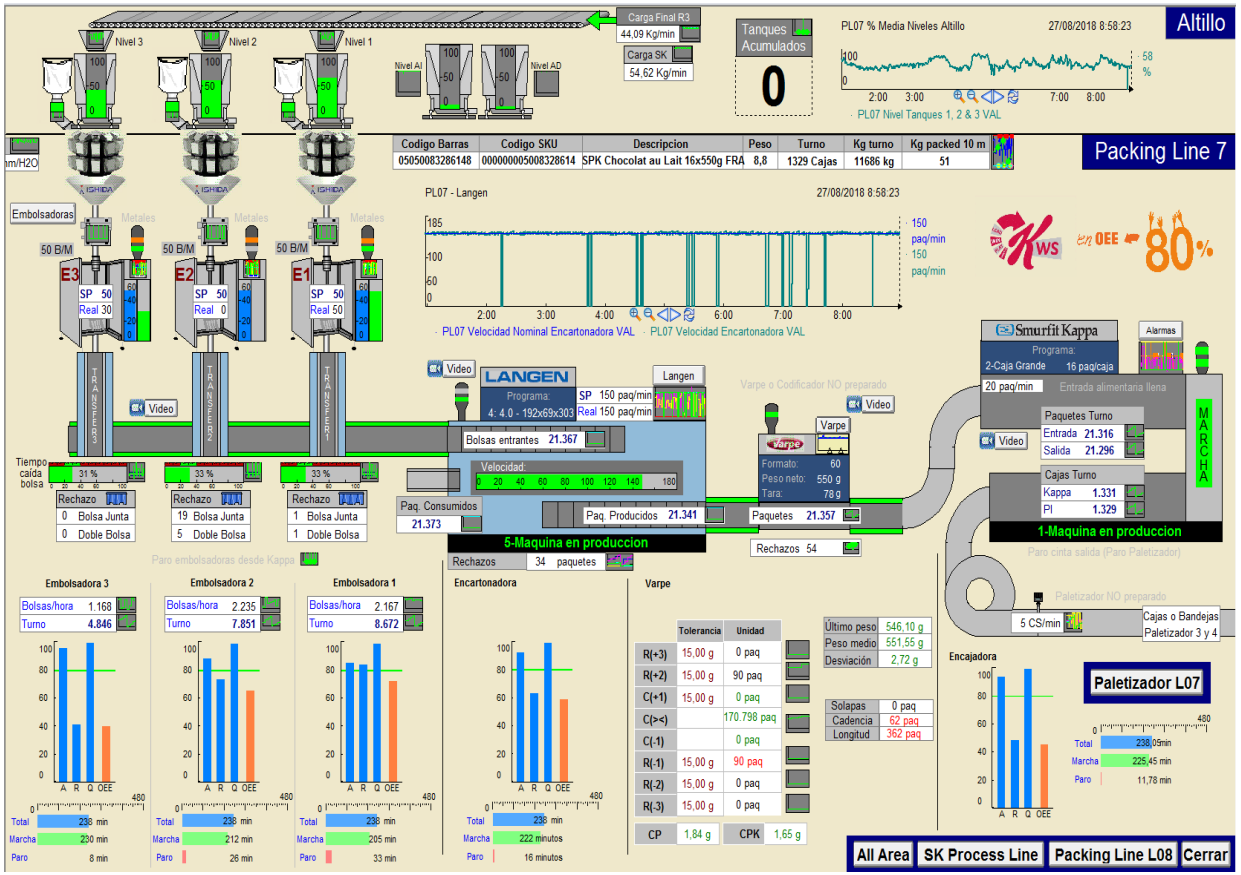
Valls PI System Architecture 2020 for Smart Factory, Packing Lines Analytics (PLA)



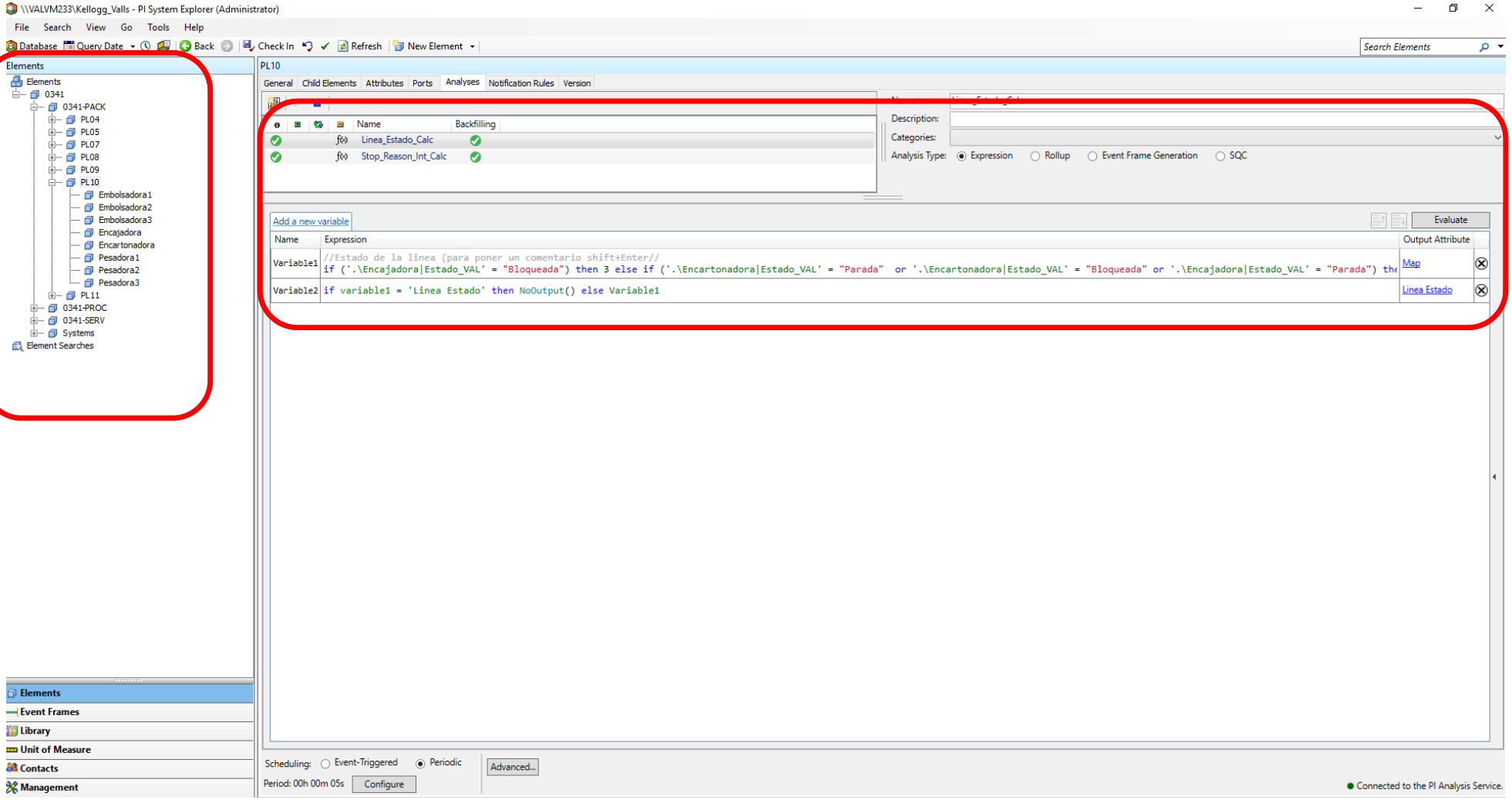
Solution

1. Create a Digital Twin connecting all **Packing** machines to PI System via PI Interface for OPC DA

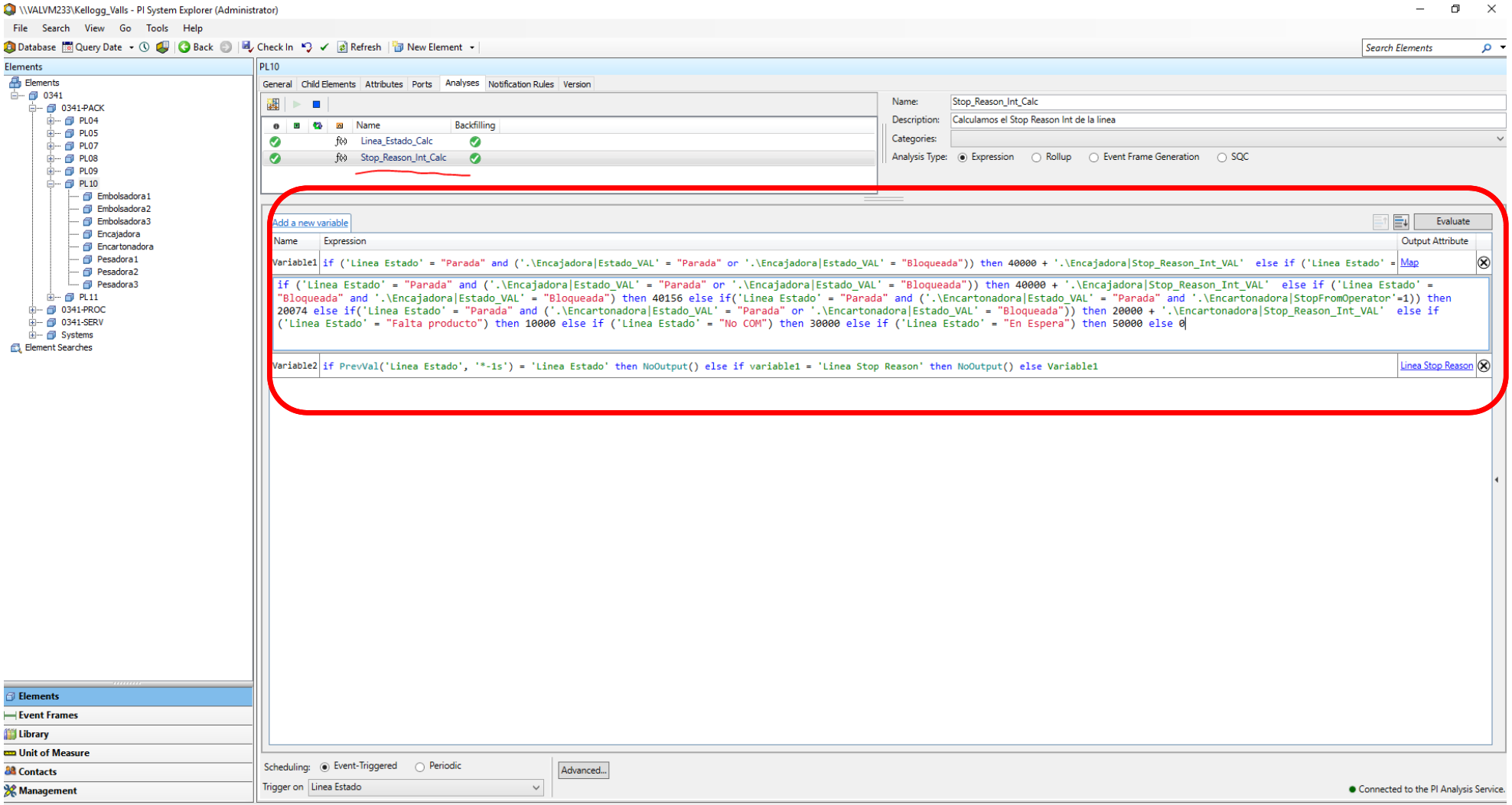
Digital Twin



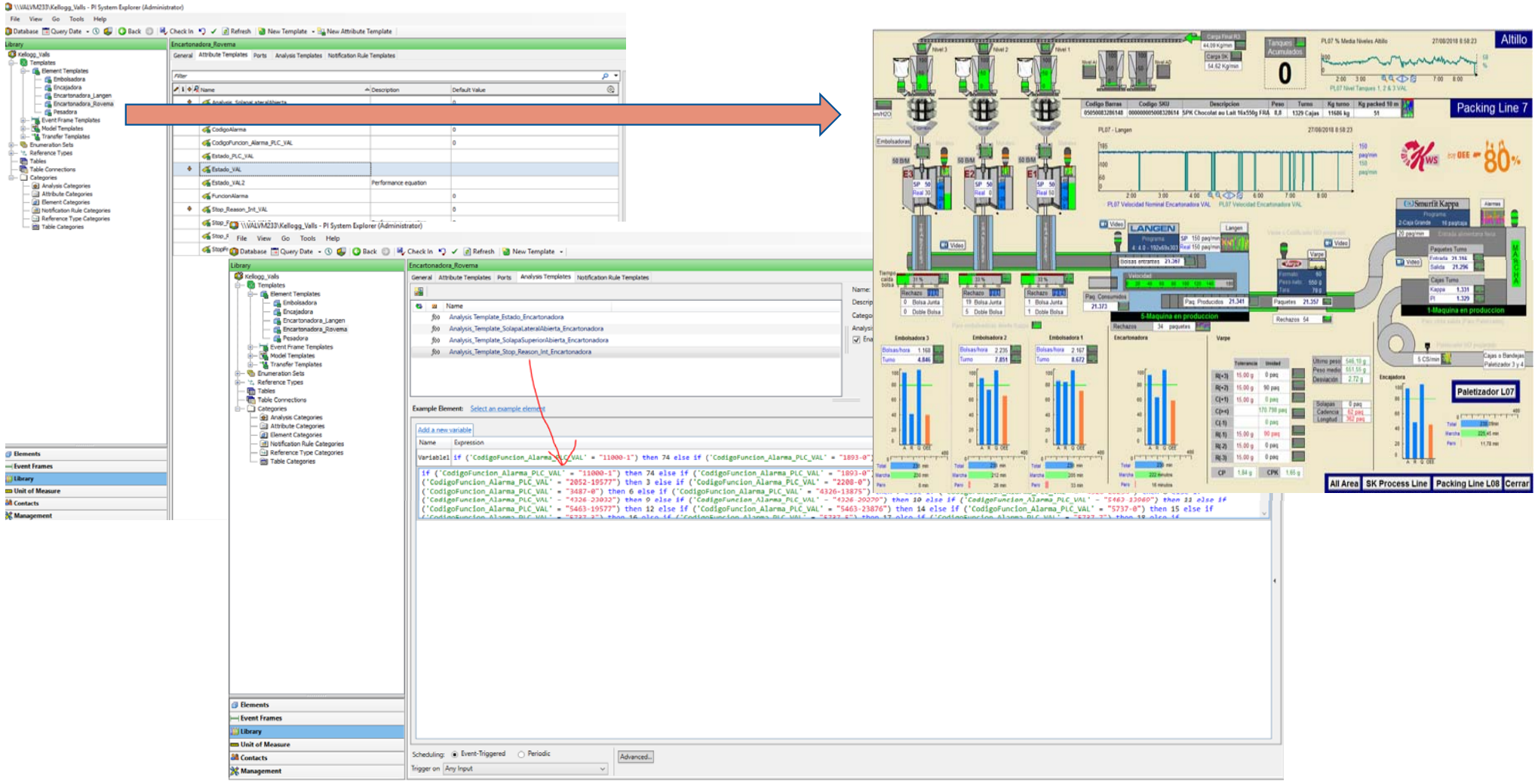
2. Set up PI AF structure and Analytics for calculating line status

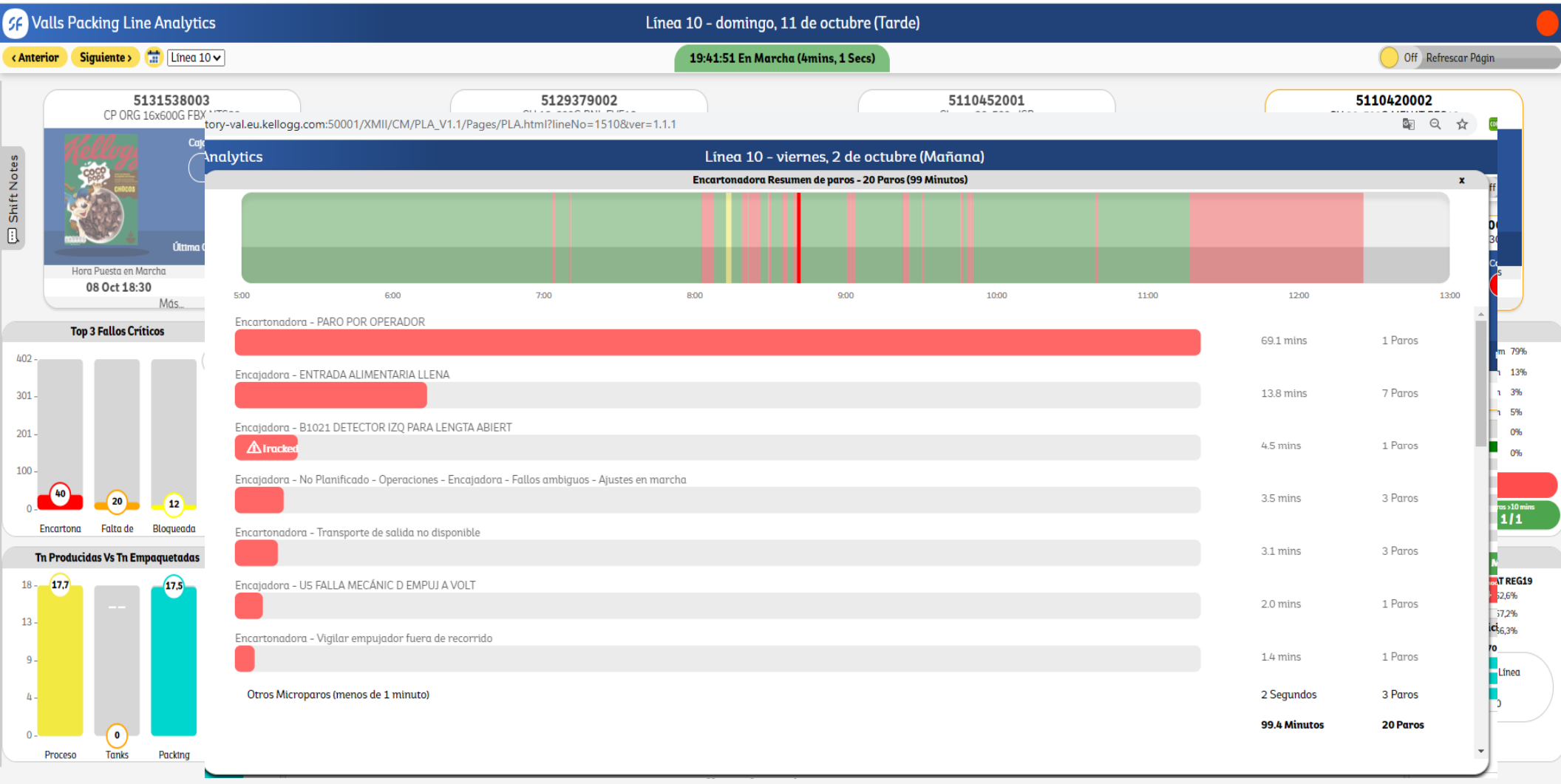


3.We set up Packing line stop reason analyses

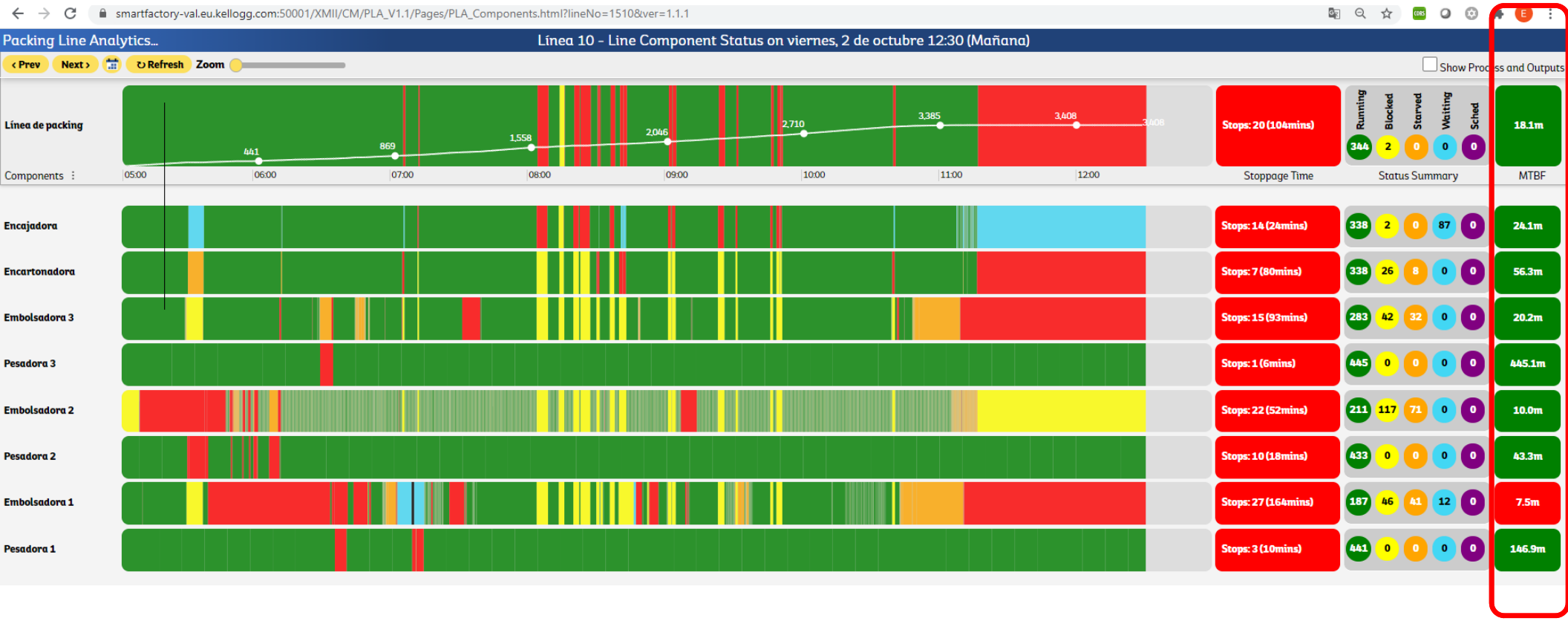


4. We created a packing line equipment structure and analyses in PI AF using Element Templates.

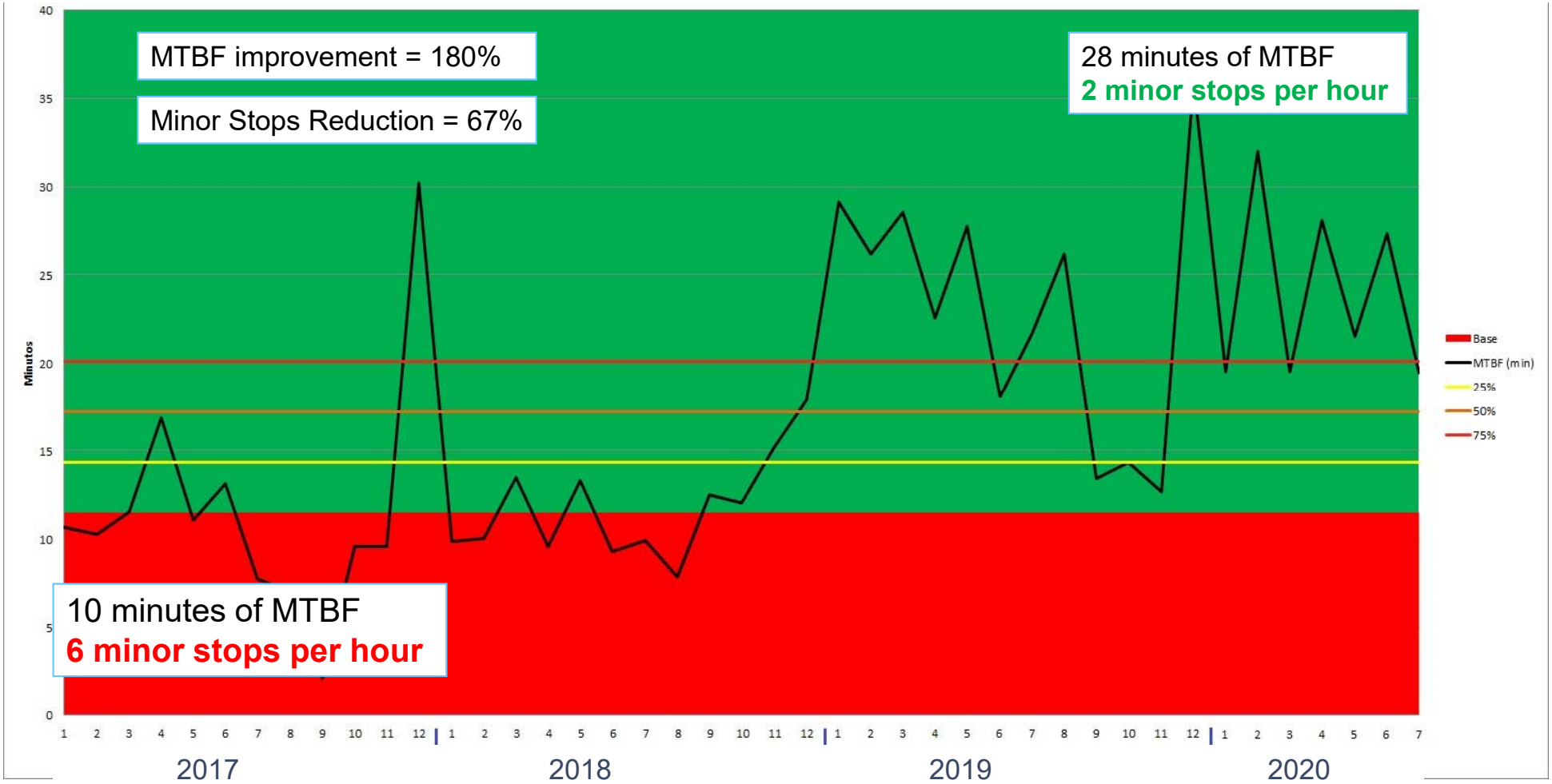



Valls Packing Line Analytics
Línea 10 - domingo, 11 de octubre (Tarde)
‹ Anterior
Siguiente ›
Línea 10
19:41:51 En Marcha (4mins, 1 Secs)
Off
Refrescar Págin
5131538003
CP ORG 16x600G FBX
5129379002
5110452001
5110420002
Hora Puesta en Marcha
08 Oct 18:30
Más...
Shift Notes
Top 3 Fallos Críticos
402
301
201
100
0
40
20
12
Encartona
Falta de
Bloqueada
Tn Producidas Vs Tn Empaquetadas
18
13
9
4
0
17,7
0
17,5
Proceso
Tanks
Packing
tory-val.eu.kellogg.com:50001/XMII/CM/PLA_V1.1/Pages/PLA.html?lineNo=1510&ver=1.1.1
Analytics
Línea 10 - viernes, 2 de octubre (Mañana)
Encartonadora Resumen de paros - 20 Paros (99 Minutos)
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
Encartonadora - PARO POR OPERADOR
69.1 mins
1 Paros
Encajadora - ENTRADA ALIMENTARIA LLENA
13.8 mins
7 Paros
Encajadora - B1021 DETECTOR IZQ PARA LENGTA ABIERT
Iracked
4.5 mins
1 Paros
Encajadora - No Planificado - Operaciones - Encajadora - Fallos ambiguos - Ajustes en marcha
3.5 mins
3 Paros
Encartonadora - Transporte de salida no disponible
3.1 mins
3 Paros
Encajadora - US FALLA MECÁNIC D EMPUJ A VOLT
2.0 mins
1 Paros
Encartonadora - Vigilar empujador fuera de recorrido
1.4 mins
1 Paros
Otros Microparos (menos de 1 minuto)
2 Segundos
3 Paros
99.4 Minutos
20 Paros
1/1

Packing Line equipment status and MTBF



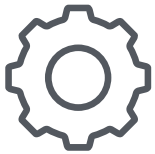
Results 2020 YTD



Smart Factory
Digital Workstation Paperless Plant

Food and Beverage

Using PI Notifications and PI Vision for silos inventory control



Challenge

- 68% Valls Plant packing lines OEE 2015

Reduce line minor stops, 6 per hour in 2015.

Improve the 10 minutes MTBF that we had in 2015.

No automatic data capture for Root Cause Analysis

Solution

Deployed the latest OSIsoft PI technology including PI AF & Advanced Analytics and connect to SAP xMII in order to monitor the packing line status and stop reason in real time

Benefits

- 76% OEE in packing lines

- 67% less of minor stops per hour.

- MTBF increased from 10 minutes to 28 minutes. (180%).

- We have eliminated paper in the packing lines.

- The information in real time enables to take actions at shift basis

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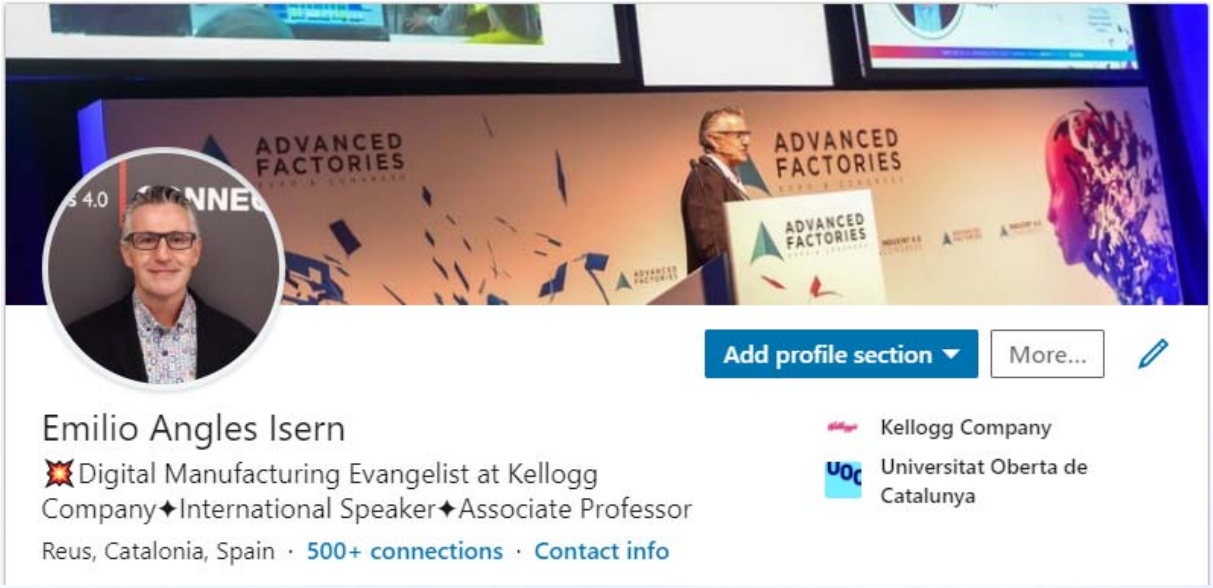

Thank you

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