

AVEVA PI WORLD

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# Digitalizing the food industry with the PI System

Presented By: Emilio Angles Isern

**AVEVA**

- 
- About Kellogg Company.
  - About Kellogg Manufacturing Valls (Spain).
  - Valls Plant PI System Architecture.
  - Using PI creating plant equipment digital twins.
  - Personal experience migrating legacy PI ProcessBook displays to PI Vision.



Emilio Angles  
IT Engineer, currently  
Power, Controls and Information  
Systems Manager in Kellogg's  
Manufacturing Valls, (Spain)

# About Kellogg Company

Morning  
Star  
FARMS

Kellogg's  
Special  
K

Parati

Kellogg's  
mini  
MAX

RICE  
BUBBLES

Pringles

Kashi

CHOCO  
KRISPIS

ZUCARITAS

Mini-  
Wheats

ALL-  
BRAN

COCO  
POPS

Radkai

RICE  
KRISPIES

CORN  
FLAKES

CHEEZ-IT

Sultana  
Bran

pop-  
tarts

RXBAR

TOWN  
HOUSE

Raisin  
Bran

Gardenburger

Eggo



AVEVA



*About*  
**KELLOGG  
COMPANY**



**WORLD'S  
LEADING  
CEREAL  
COMPANY**



**A LEADING  
GLOBAL  
PLANT-BASED  
FOODS  
COMPANY**



**2019 SALES:  
~ \$13.6B  
(IN USD)**



**WORLD'S  
2<sup>ND</sup> LARGEST  
SAVORY  
SNACK  
COMPANY**

**LEADING  
NORTH  
AMERICAN  
FROZEN FOODS  
COMPANY**



**OVER  
1,000 FOODS  
MARKETED IN  
180  
COUNTRIES**



**32.000  
employees  
worldwide**





## About Kellogg Manufacturing Valls (Spain)



# Kellogg Manufacturing Valls

**47.060m<sup>2</sup>**

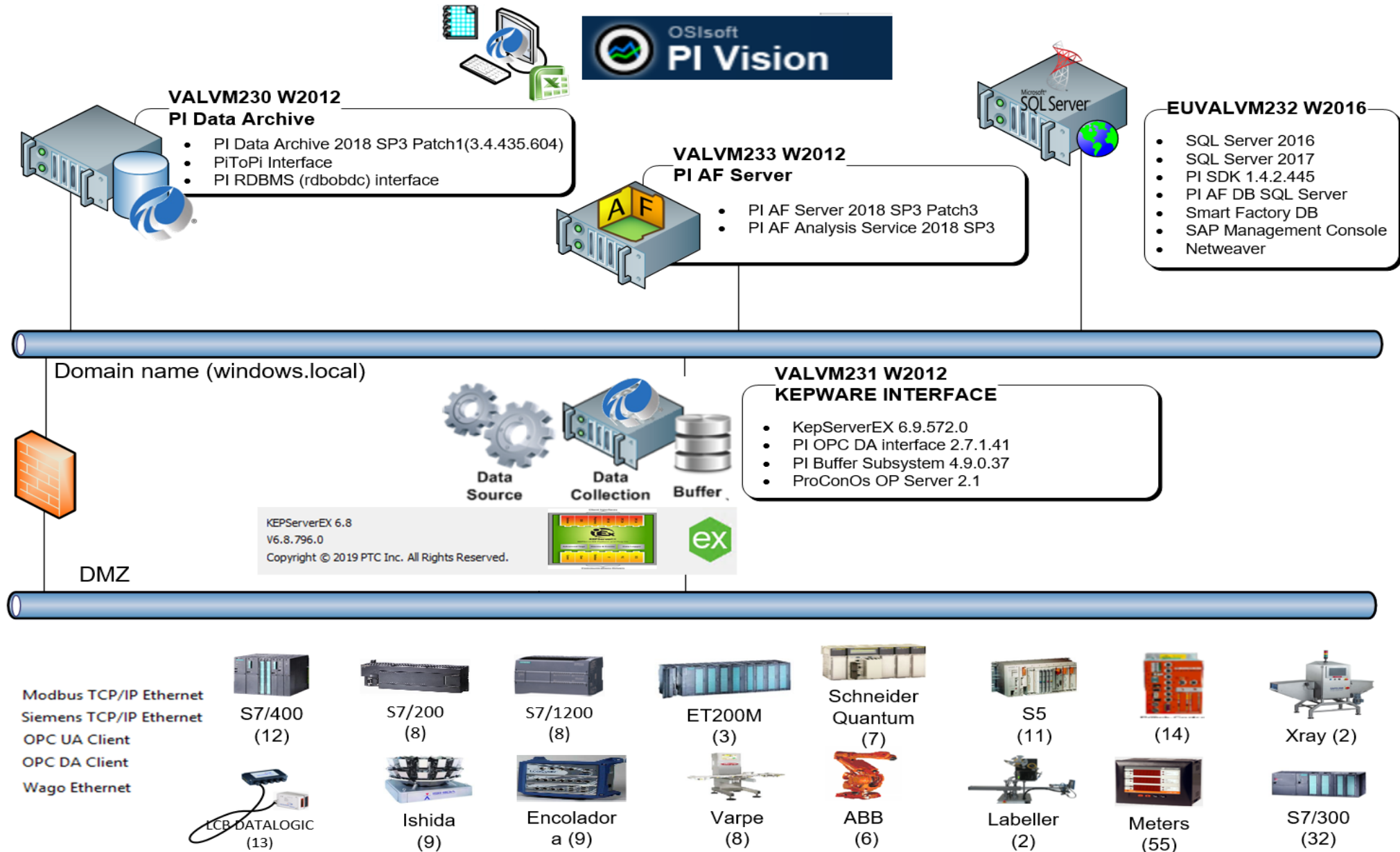
**24H 7DAYS**

**+ 300  
EMPLOYEES**

**CAPACITY 120M KG**

**AVEVA**

# Kellogg's Valls Plant PI System Architecture







Using PI System to create plant  
equipment digital twins

# Solution

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

Packing line 7

Digital Twin



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

\\VALVM233\Kellogg\_Valls - PI System Explorer (Administrator)

File Search View Go Tools Help

Database Query Date Back Check In Refresh New Element Search Elements

**Elements**

- 0341
- 0341-PACK
  - PL04
  - PL05
  - PL07
  - PL08
  - PL09
  - PL10
    - Embolsadora1
    - Embolsadora2
    - Embolsadora3
    - Encajadora
    - Encartonadora
    - Pesadora1
    - Pesadora2
    - Pesadora3
  - PL11
- 0341-PROC
- 0341-SERV
- Systems
- Element Searches

**PL10**

General Child Elements Attributes Ports Analyses Notification Rules Version

Name	Backfilling
Linea_Estado_Calc	✓
Stop_Reason_Int_Calc	✓


Description:

Categories:

Analysis Type: ☒ Expression ☐ Rollup ☐ Event Frame Generation ☐ SQC

[Add a new variable](#) Evaluate

Name	Expression	Output Attribute
Variable1	//Estado de la linea (para poner un comentario shift+Enter// if ('.\Encajadora Estado_VAL' = "Bloqueada") then 3 else if ('.\Encartonadora Estado_VAL' = "Parada" or '.\Encartonadora Estado_VAL' = "Bloqueada" or '.\Encajadora Estado_VAL' = "Parada") then	Map
Variable2	if variable1 = 'Linea Estado' then NoOutput() else Variable1	Linea Estado



Scheduling: ☐ Event-Triggered ☒ Periodic  
Period: 00h 00m 05s [Configure](#) [Advanced...](#)

Connected to the PI Analysis Service.

# 3. We configured Packing line stop reason analyses

\\VALVM233\Kellogg\_Valls - PI System Explorer (Administrator)

File Search View Go Tools Help

Database Query Date Back Refresh New Element

Search Elements

Elements

- 0341
- PL04
- PL05
- PL07
- PL08
- PL09
- PL10
- PL11
- 0341-PROC
- 0341-SERV
- Systems
- Element Searches

0341-PACK

- Embolsadora1
- Embolsadora2
- Embolsadora3
- Encajadora
- Encartonadora
- Pesadora1
- Pesadora2
- Pesadora3

PL10

General Child Elements Attributes Ports Analyses Notification Rules Version

Name	Backfilling
Linea_Estado_Calc	✓
Stop_Reason_Int_Calc	✓

Name: Stop\_Reason\_Int\_Calc

Description: Calculamos el Stop Reason Int de la linea

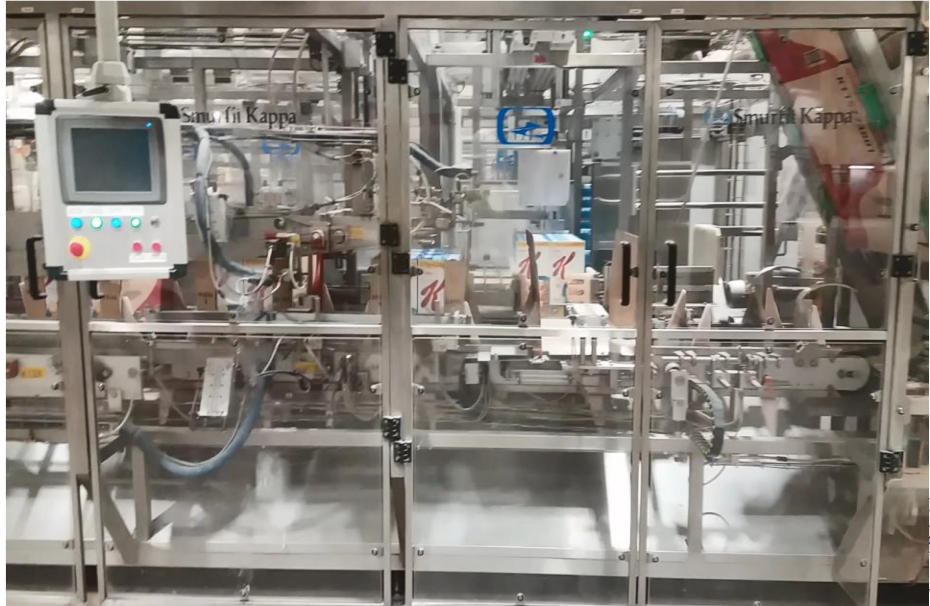
Categories:

Analysis Type: ☒ Expression ☐ Rollup ☐ Event Frame Generation ☐ SQC

Add a new variable

Name	Expression	Output Attribute
Variable1	<pre>if ('Linea Estado' = "Parada" and ('.\Encajadora Estado_VAL' = "Parada" or '.\Encajadora Estado_VAL' = "Bloqueada")) then 40000 + '.\Encajadora Stop_Reason_Int_VAL' else if ('Linea Estado' = "Bloqueada" and '.\Encajadora Estado_VAL' = "Bloqueada") then 40156 else if ('Linea Estado' = "Parada" and ('.\Encartonadora Estado_VAL' = "Parada" and '.\Encartonadora StopFromOperator'=1)) then 20074 else if ('Linea Estado' = "Parada" and ('.\Encartonadora Estado_VAL' = "Parada" or '.\Encartonadora Estado_VAL' = "Bloqueada")) then 20000 + '.\Encartonadora Stop_Reason_Int_VAL' else if ('Linea Estado' = "Falta producto") then 10000 else if ('Linea Estado' = "No COM") then 30000 else if ('Linea Estado' = "En Espera") then 50000 else 0</pre>	Map
Variable2	<pre>if PrevVal('Linea Estado', '-1s') = 'Linea Estado' then NoOutput() else if variable1 = 'Linea Stop Reason' then NoOutput() else Variable1</pre>	Linea Stop Reason

Connected to the PI Analysis Service.





## \\VALVM233\Kellogg\_Valls - PI System Explorer (Administrator)

**AVEVA**

**5131538003**  
CP ORG 16x600G FBX NTS20



Cajas producidas: 0  
Objetivo: 0  
Última Caja: 09 Oct 08:18

Hora Puesta en Marcha: 08 Oct 18:30  
Total Realizadas: 4204

Más...

Cambio de paquetería  
10min

**5129379002**  
CH 16x600G BNL EVE19



Cajas producidas: 0  
Objetivo: 0  
Última Caja: 09 Oct 23:26

Hora Puesta en Marcha: 09 Oct 08:28  
Total Realizadas: 3874

Más...

Cambio de formato  
1hr 36min

**5110452001**  
Chocos 20x500g ISR



Cajas producidas: 0  
Objetivo: 0  
Última Caja: 11 Oct 07:00

Hora Puesta en Marcha: 10 Oct 01:02  
Total Realizadas: 4716

Más...

Cambio de paquetería  
11min

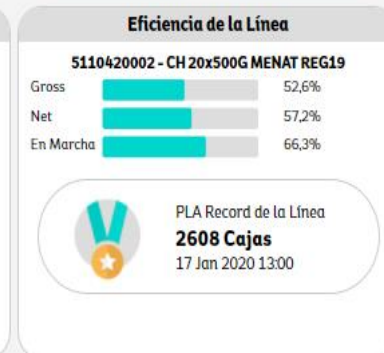
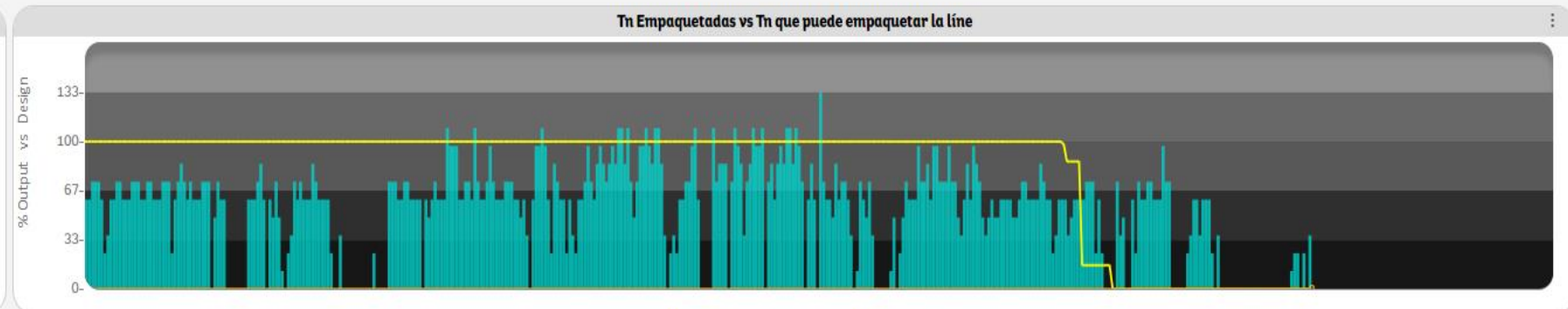
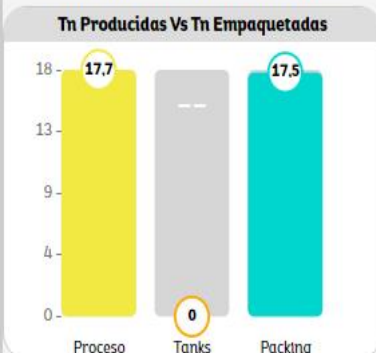
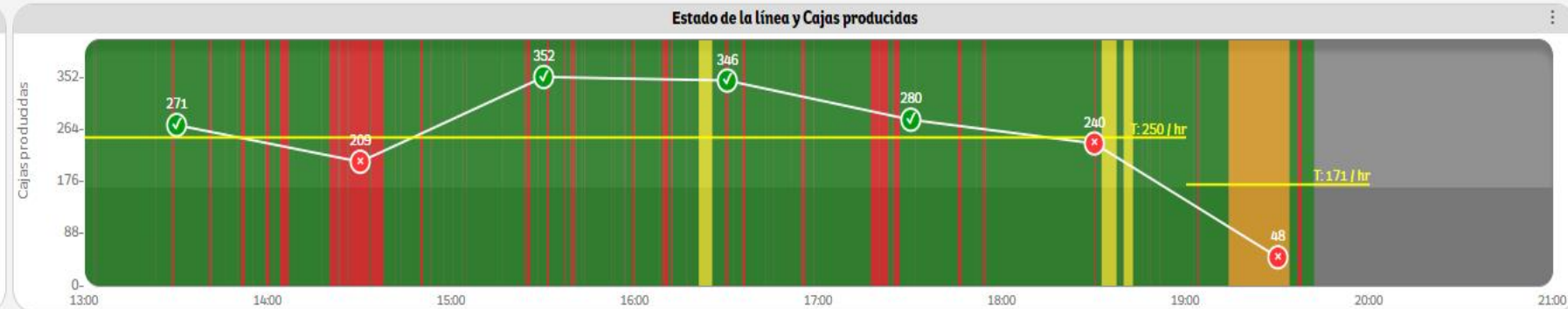
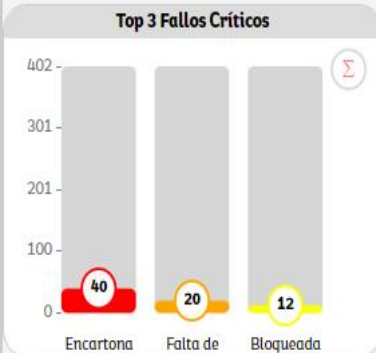
**5110420002**  
CH 20x500G MENAT REG19



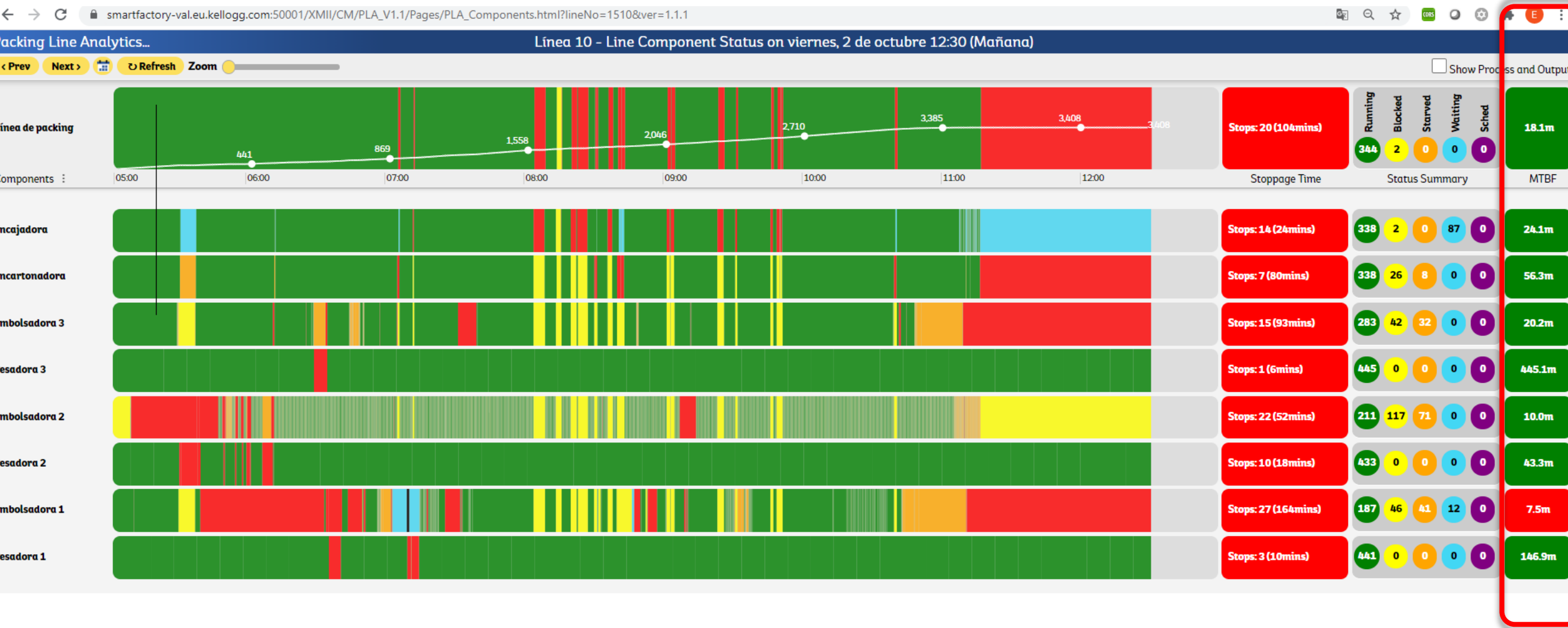
Cajas producidas: 1746  
Objetivo: 1670  
En producción

Hora Puesta en Marcha: 11 Oct 07:11  
Total Realizadas: 3510

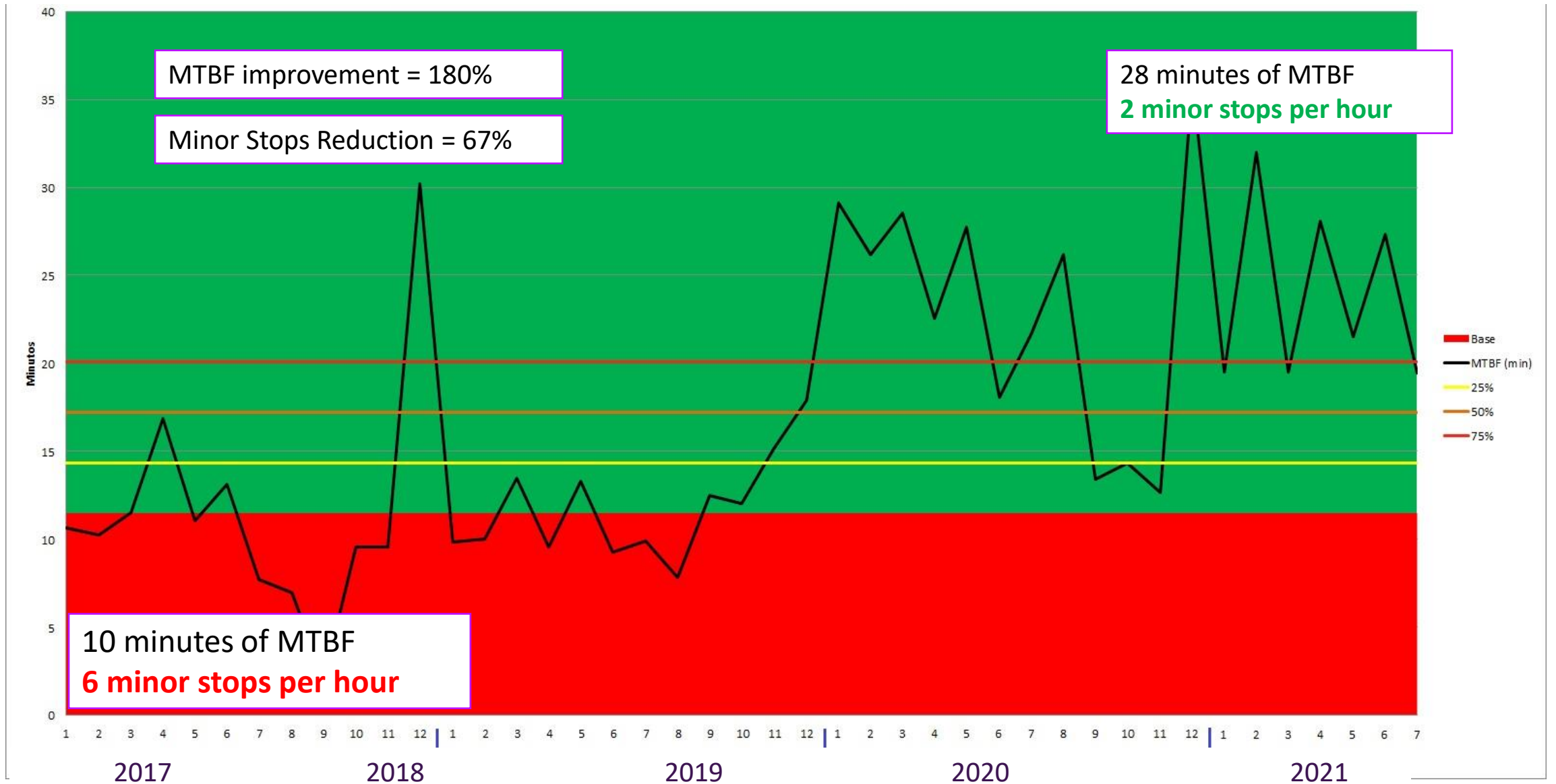
Más...



# Packing Line equipment status and MTBF



# Results 2021 YTD





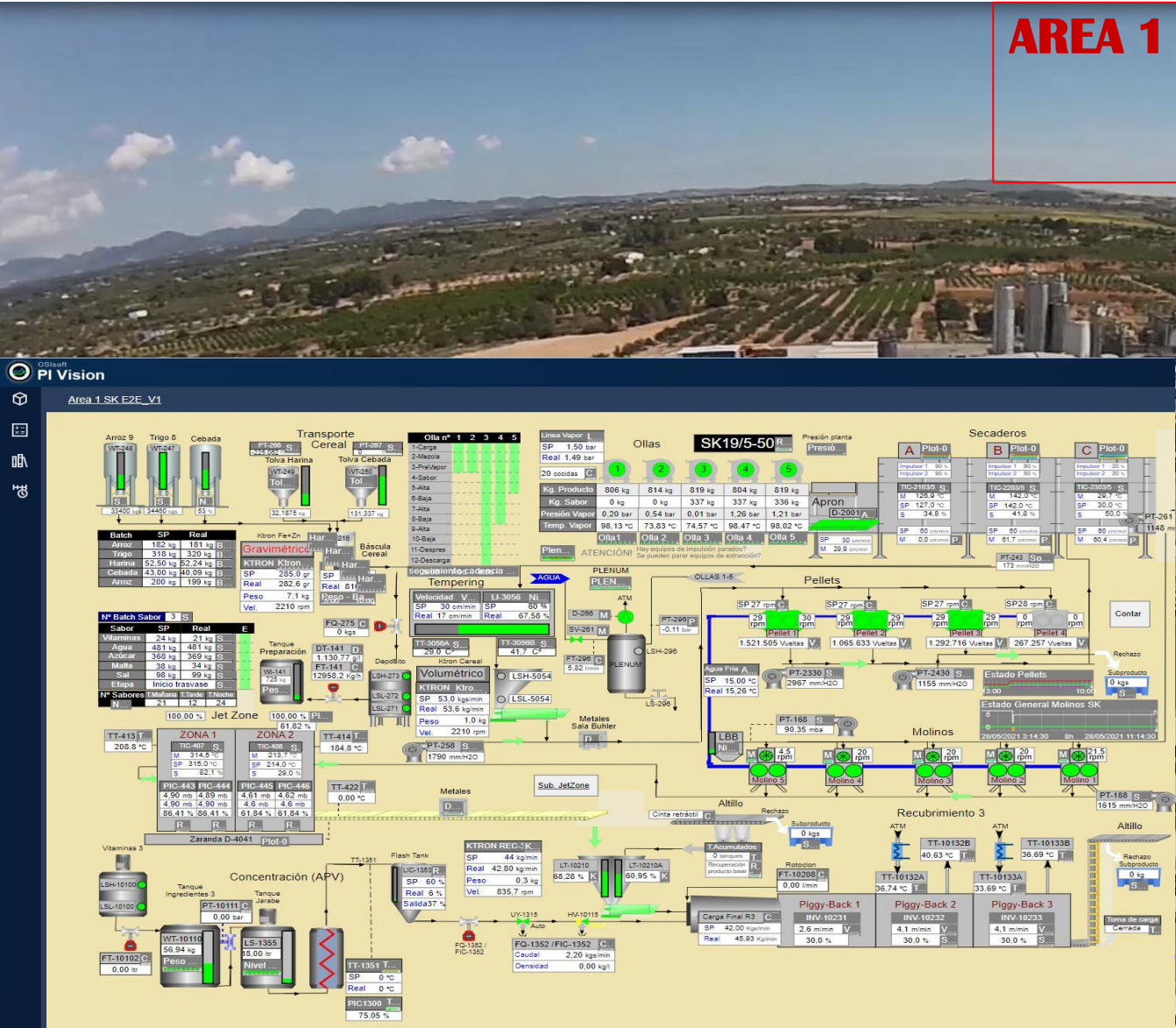


Smart Factory  
Digital Workstation Paperless Plant



# Process Lines Digital Twins

**AREA 1 Sp K : Classic + Variants**  
**Smacks**  
**2 packing lines**



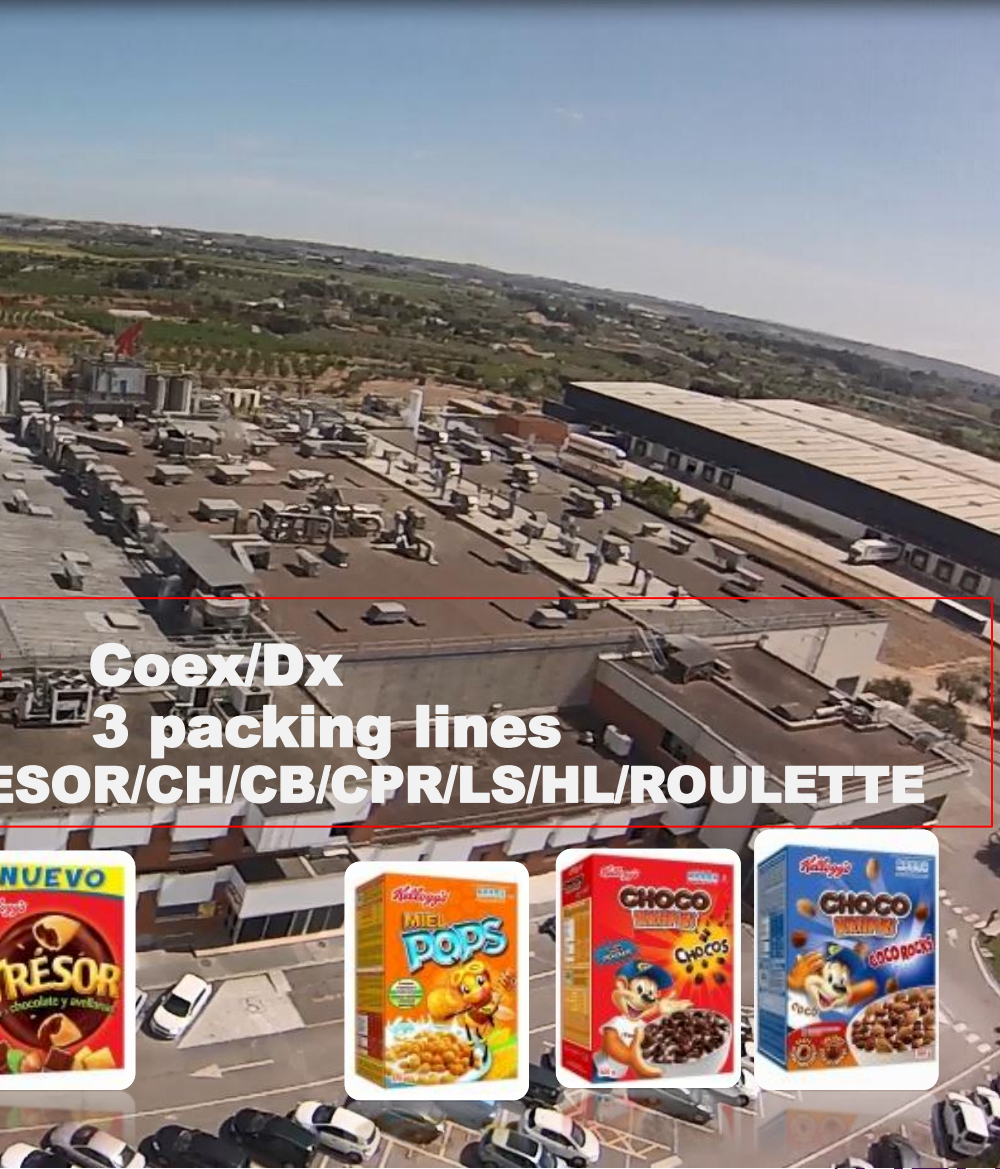
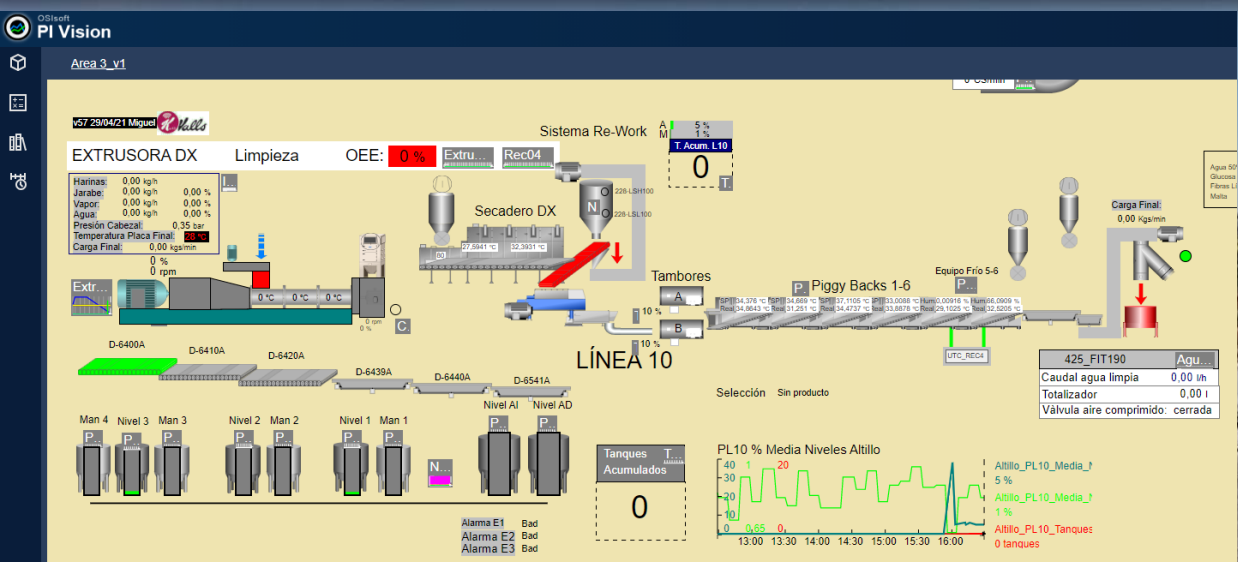


# Process Line Digital Twins



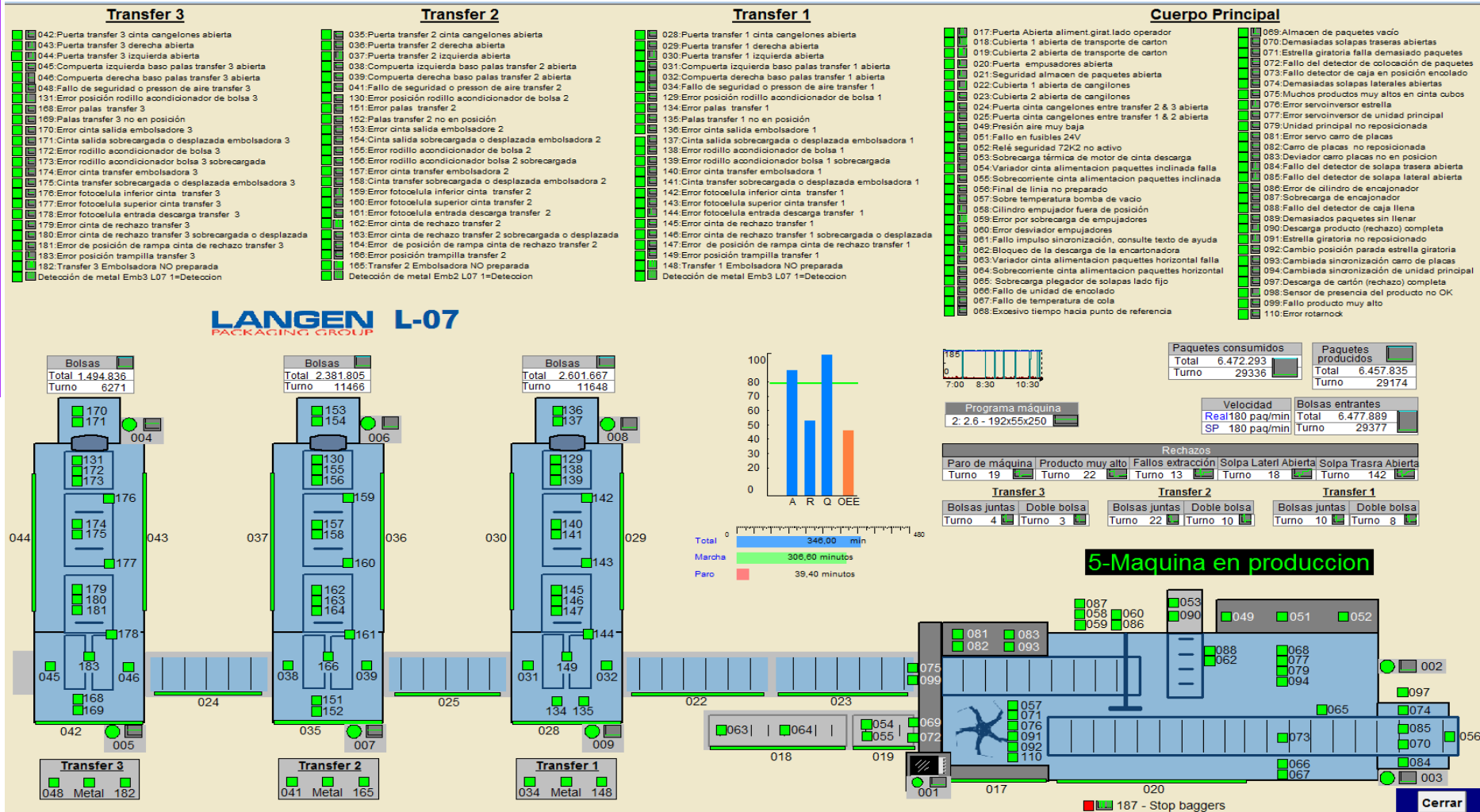


# Process Lines Digital Twins

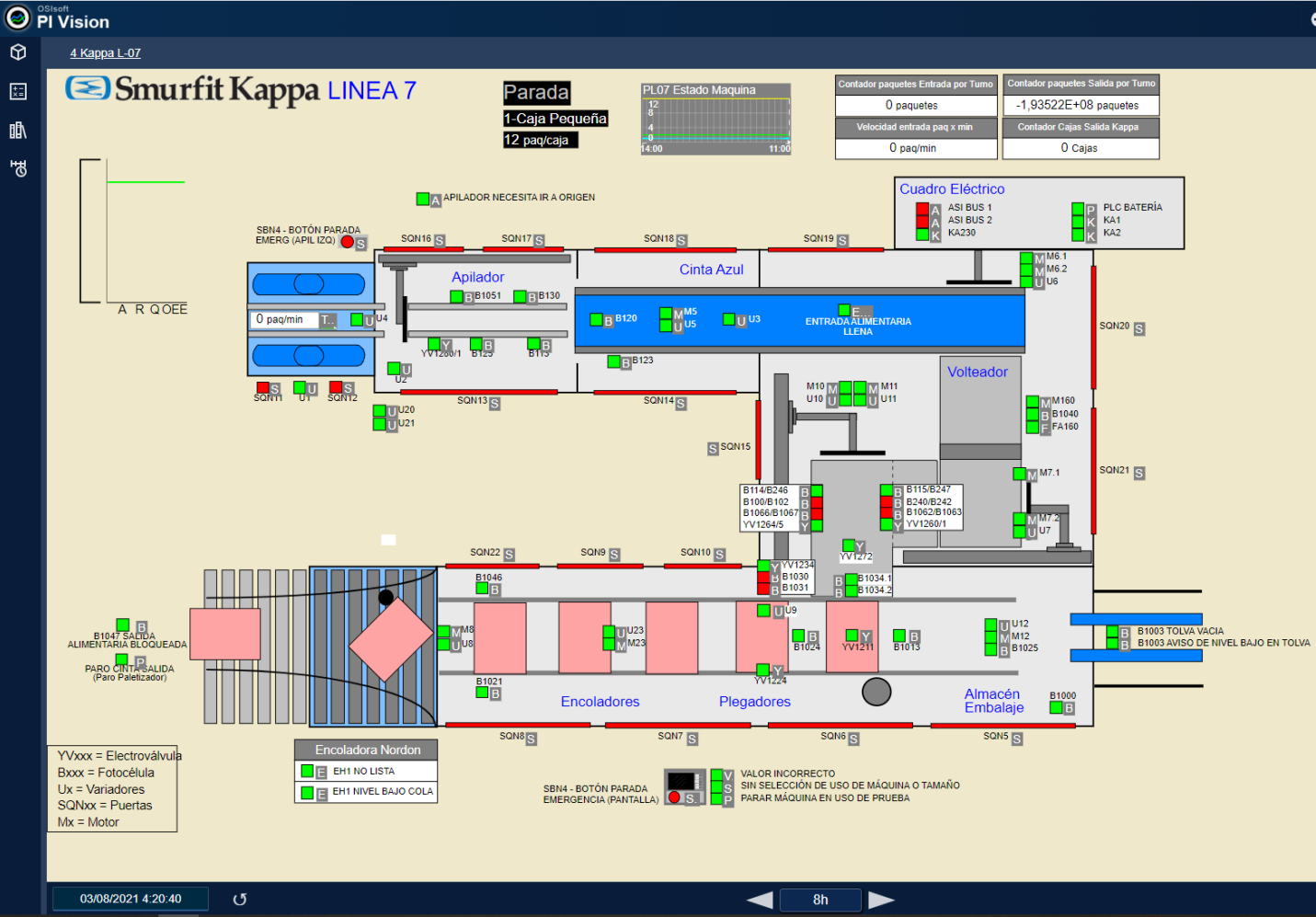




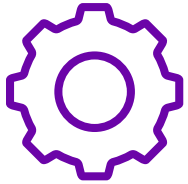
# Maintenance Plans based on working hours



# Pit Stops Clean, Inspection and Lubrication tasks



# Using PI creating plant equipment digital Twins



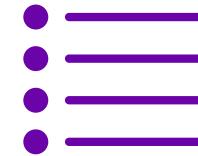
## Challenge

- Providing real-time monitoring and analytics capabilities for plant critical equipment in order to improve MTBF and create maintenance plans based on working hours



## Solution

- Connect the equipment via PI OPC DA, create a model using PI Asset Framework and use analytics to create the maintenance plans.



## Benefits

- Increased production and operational efficiency OEE, also we see improvement in unplanned down time, improvement in yield of our product, and scrap reduction.
- Reduce maintenance cost and increase equipment MTBF.

“Digital Twins allow us to take operational decisions in real time based on data which make us more efficient and productive.”

Emilio Anglés

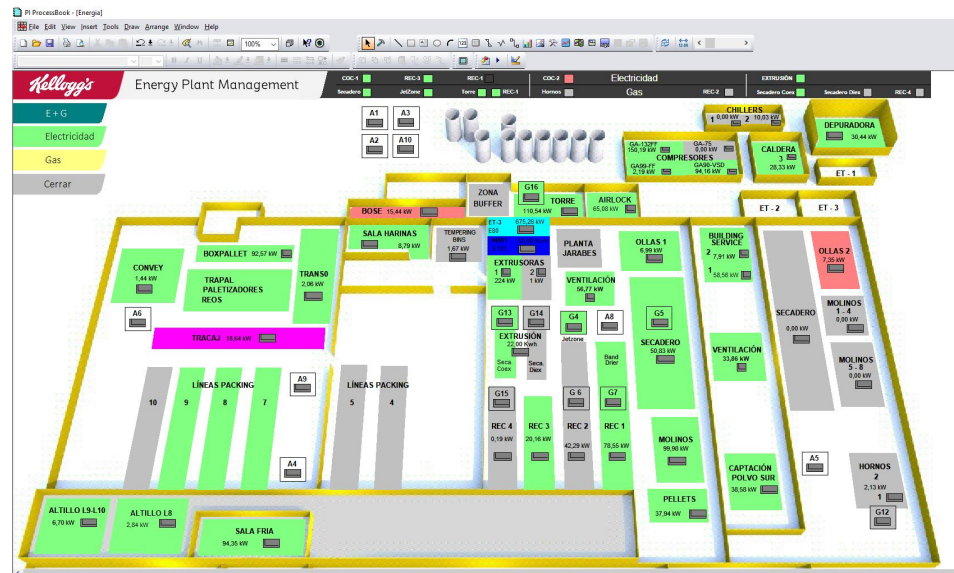
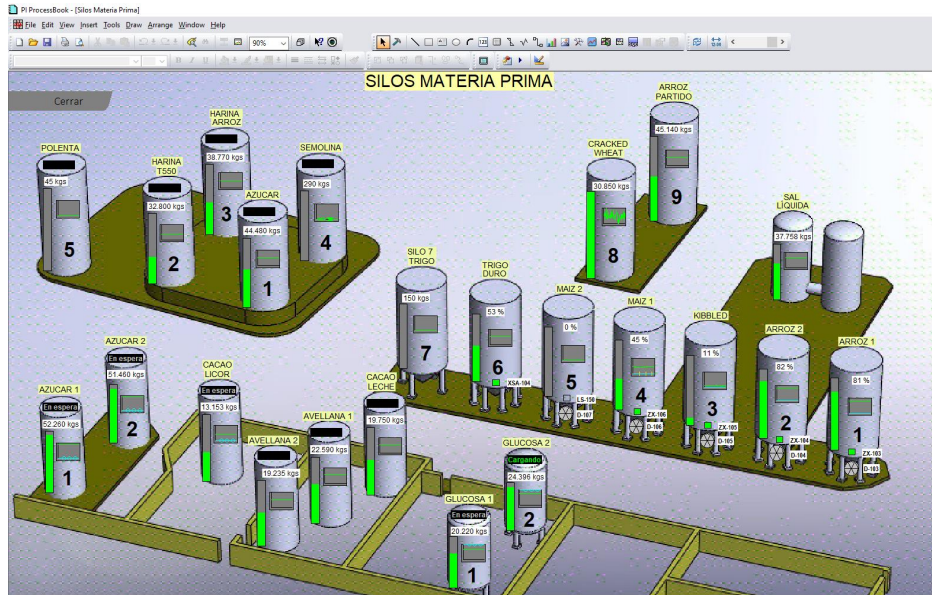
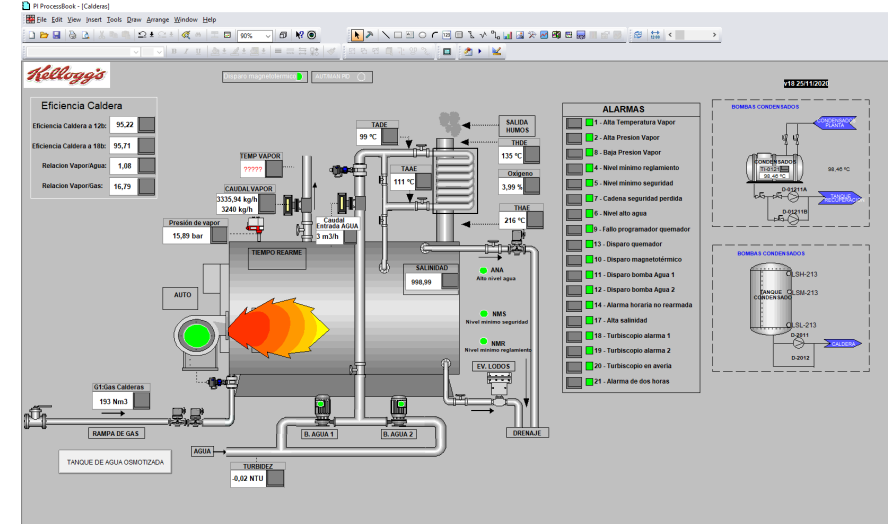
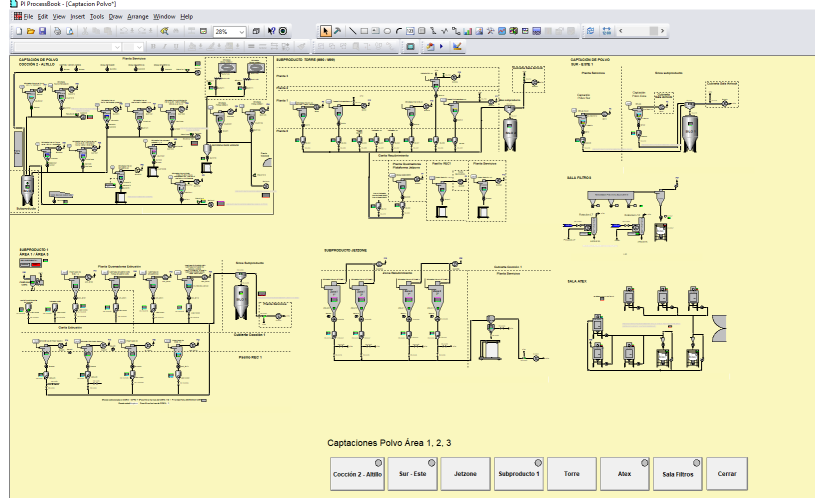
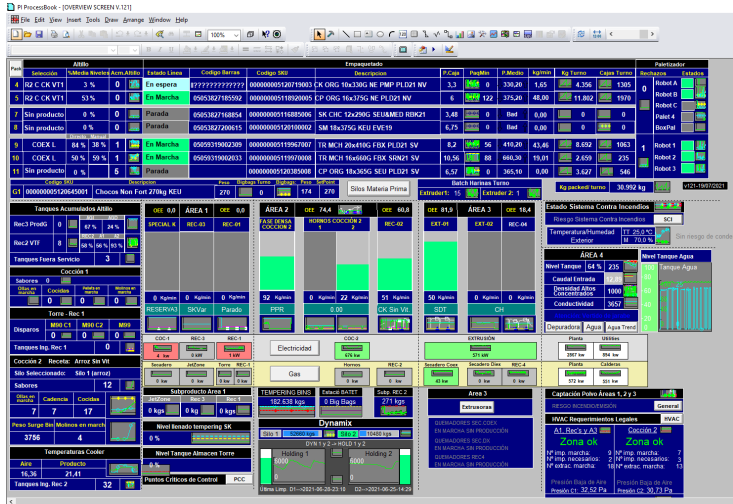
Kellogg's Manufacturing Spain





Personal experience migrating legacy PI  
ProcessBook displays to PI Vision

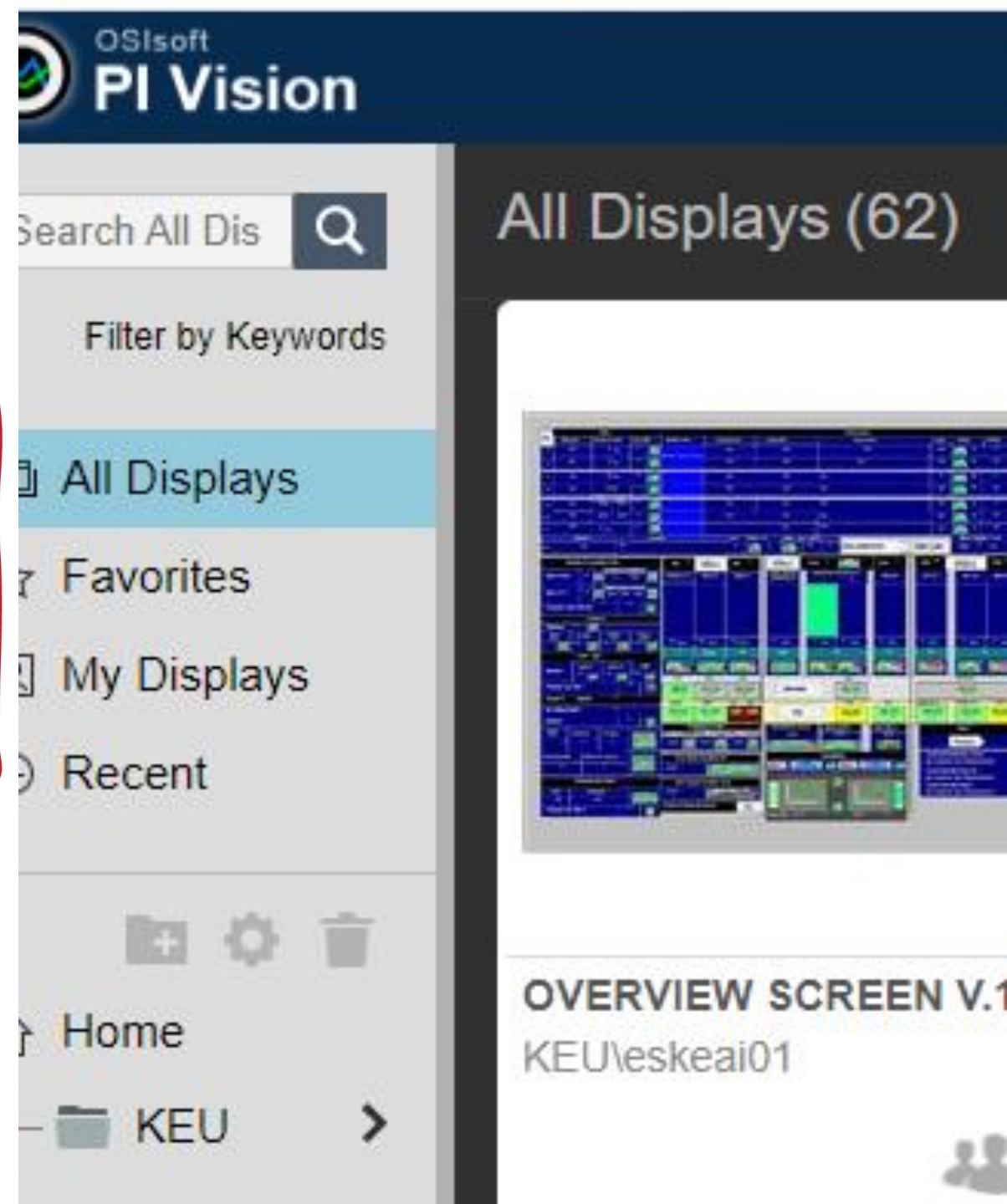
# We have more than 70 legacy ProcessBook displays



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# PI VISION VALLS PILOT

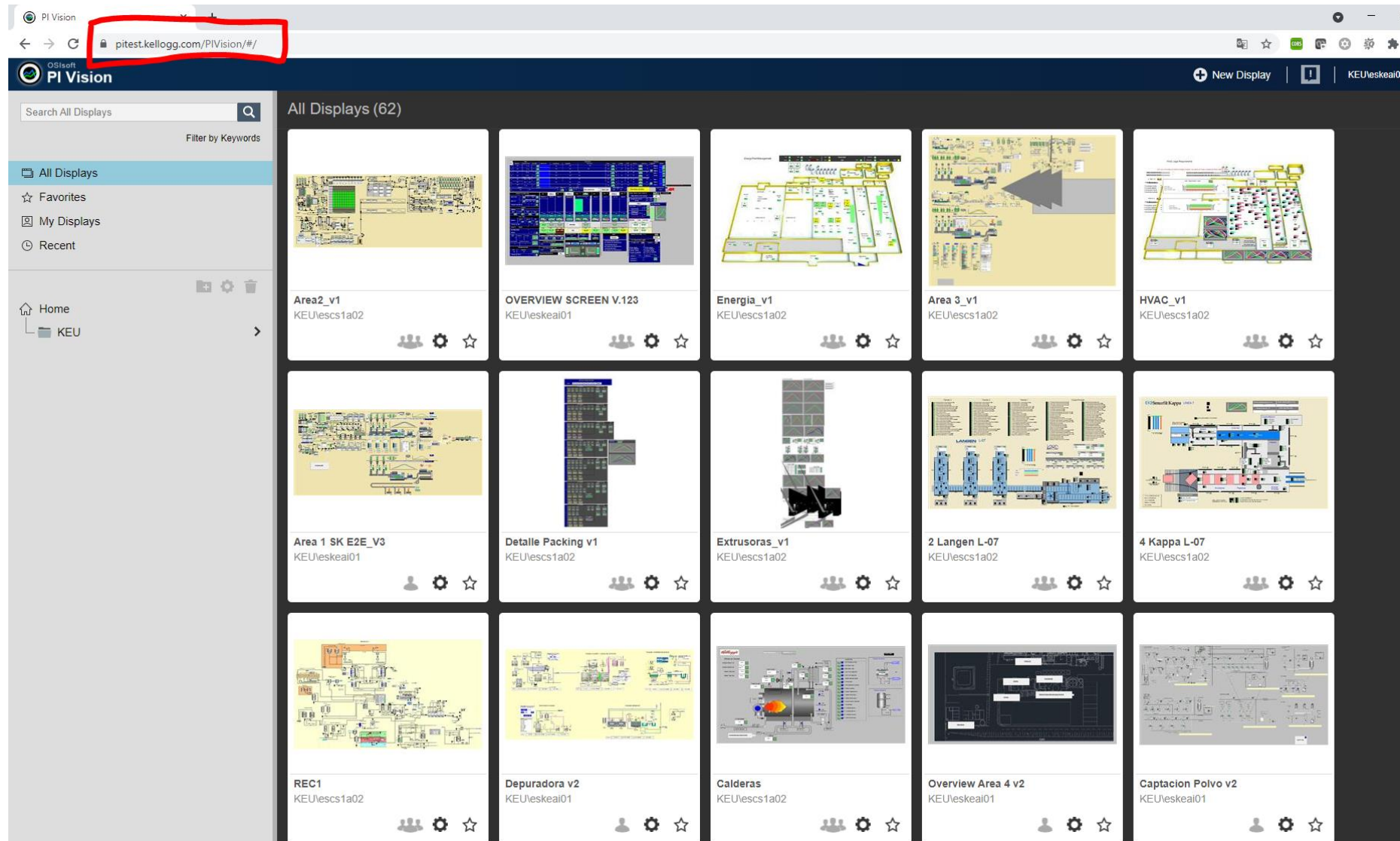
Osisoft PI Vision  
Visualization system





# Pilot PI Vision test server

PI Vision Web application and a Test Server was set up in KNA





In 2020 OSIsoft released PI ProcessBook to PI Vision Migration Utility



PI ProcessBook to PI Vision Migration Utility

User Guide

## Process book to PI Vision migration tool

## Migrate PI ProcessBook Displays

- 1 Add and select displays to analyze

② View analysis results, select displays, and run migration

## Files and Folders

## Analysis Results

Issues	Progress
--------	----------

 Not Migrated

We migrated 76 ProcessBook Displays, (15 years of development) in just 5 working days.

1

• 3



Remove From List

## Run Analysis



# PI Vision Plant overview

PI ProcessBook - [OVERVIEW SCREEN V.124]

File Edit View Insert Tools Draw Arrange Window Help

100%

PI Vision

Attilio				Empaquetado										Paletizador		
Pack	Selección	%Media Nivelado	Accm. Attilio	Estado Línea	Código Barras	Código SKU	Description	P.Caja	PaqMin	P.Medio	kg/min	Kg Turno	Cajas Turno	Rechazos	Estados	
4	C2 E/F CF	89 %	5	En Marcha	05053827187114	000000005118711006	CF ORG 12x375G SEU SOP21 SV	4,5	0	375,20	18,00	4.914	1088	0	Robot A	
5	C2 E/F CF	66 %	5	En Marcha	000000005104106006	000000005104106006	CF ORG 14x500G SEU PLD21 SV	7	79	500,19	43,48	5.943	861	0	Robot B	
7	R3 J SK CH	53 %	13	Parada	05050083313516	000000005131351005	SK CHC 16x550G SEU RBK21	8,8	88	550,20	42,31	5.896	676	0	Robot C	
8	Sin producto	0 %	0	Parada	05053827200615	000000005120082001	Smacks 8x433g 3800016046	3,46	0	Bad	0,00	0	0	0	Palet 4	
9	COEX L	21 %	2	0	Parada	05059319002309	000000005115619009	TR CHN 18x620G FBX PLD21 SV	11,16	88	620,30	48,14	8.839	796	4	Robot 1
10	COEX L	2 %	1	0	Parada	05059319002033	000000005117606009	KR CHN 18x600G SEU PLD21 SV	10,8	0	600,29	0,00	2.376	0	Robot 2	
11	R4 K	60 %	2	En Marcha	000000005120108006	000000005120108006	CH ORG 6X375G FBX PLD21 SV	2,25	162	375,20	5	0	0	0	Robot 3	

Batch Harinas Turno			
Extruder1	9	Extruder 2	10
G1	000000005120645001	Chocos Non Fort 270kg KEU	

Tanques Acumulados Attilio			
Rec3 Prod3	0	Rec2 VIF	0
Tanques Fuera Servicio: 4			

Cocción 1			
Sabores	6	Disparos	0
Tanques Ing. Rec 1: 0			

Cocción 2 Receta: Maiz Prevap			
Sabores	12	Disparos	0
Tanques Ing. Rec 2: 0			

Subproducto Area 1			
JetZone	Rec 3	Rec 1	0
Nivel llenado tempering SK: 54 %			

Temperaturas Cooler			
Aire	29,90	Producto	31,50
Tanques Ing. Rec 2: 0			

Puntos Críticos de Control			
PCC	0		
Última Limp. D1: 2021-06-28-23:10 D2: 2021-06-25-14:29			

ÁREA 1			
OEE 86,4	ÁREA 2	OEE 99,7	OEE 0,0
Fase Densa Cocción 2			

ÁREA 3			
OEE 98,9	ÁREA 4	OEE 80,0	OEE 0,0
EXT-01 EXT-02 REC-04			

Estado Sistema Contra Incendios			
Riesgo Sistema Contra Incendios	Temperatura/Humedad Exterior	Nivel Tanque	33 %
Atención: Verificado de parabe			

Electricidad			
Gas	Horros	Secadero Coax	Secadero Diex
Area 3 Extrusoras			

Captación Polvo Áreas 1, 2 y 3			
Área 1	Área 2	Área 3	Área 4
Zona ok			

Overview Screen V.123

Attilio				Empaquetado										Paletizador	
Pack	Selección	%Media Nivelado	Accm. Attilio	Estado Línea	Código Barras	Código SKU	Description	P.Caja	PaqMin	P.Medio	kg/min	Kg Turno	Cajas Turno	Rechazos	Estados
4	R2 C FF VT1	3 %	0	En espera	05053827185547	000000005118554007	FR ORG 8x375G SEU FBTB21	3	0	375,20	0,00	513	2157	0	Robot A
5	R2 C FF VT1	59 %	0	En Marcha	000000005100917002	000000005100917002	ORG 12x450G SEU&FBX FAR21 SV	5,4	114	450,20	26,46	576	1409	0	Robot B
7	R3 J SK	52 %	0	En Marcha	05013593160497	000000005105050006	SK ORG 16x500G SEU RBK21	8	81	500,21	44,00	14.472	1812	0	Robot C
8	R1 B SM	86 %	0	En Marcha	05053827200615	000000005120274001	SMACKS 8x330g NE	2,64	22	330,12	1,98	1.640	4401	0	Palet 4
9	COEX L	87 %	1	Parada	05050083501708	000000005150170007	TR MCH 12x375G FBX PLD21 SV	4,5	0	375,20	5,40	12.311	2987	63	Robot 1
10	COEX L	87 %	1	En Marcha	05059319002033	000000005154242009	TR MCH 12x1KG FBX SRN21 SV	12	0	1000,49	0,00	5.772	475	0	Robot 2
11	R4 K	18 %	10	Bloqueada	000000005120159001	000000005120159001	CHOCOS 5x330g NE	1,65	0	330,19	11,55	4.165	2524	0	Robot 3

Batch Harinas Turno			
Extruder1	9	Extruder 2	10
G1	000000005119511001	Choco Krispies (nonvit) 1x225Kg	

Tanques Acumulados Attilio			
Rec3 Prod3	0	Rec2 VIF	0
Tanques Fuera Servicio: 3			

Cocción 1			
Sabores	21	Disparos	0
Tanques Ing. Rec 1: 49			

Cocción 2 Receta: Maiz Prevap			
Sabores	8	Disparos	0
Tanques Ing. Rec 2: 43			

Subproducto Area 1			
JetZone	Rec 3	Rec 1	0
Nivel llenado tempering SK: 68 %			

Temperaturas Cooler			
Aire	26,35	Producto	25,69
Tanques Ing. Rec 2: 43			

Puntos Críticos de Control			
PCC	0		
Última Limp. D1: 2021-05-29-03:49 D2: 2021-04-19-15:00			

ÁREA 1			
OEE 104,8	ÁREA 2	OEE 92,1	OEE 57,2
Fase Densa Cocción 2			

ÁREA 3			
OEE 98,9	ÁREA 4	OEE 80,0	OEE 0,0
EXT-01 EXT-02 REC-04			

Estado Sistema Contra Incendios			
Riesgo Sistema Contra Incendios	Temperatura/Humedad Exterior	Nivel Tanque	39 %
Sin riesgo de condensación			

Electricidad			
Gas	Horros	Secadero Coax	Secadero Diex
Area 3 Extrusoras			

Captación Polvo Áreas 1, 2 y 3			
Área 1	Área 2	Área 3	Área 4
Zona ok			

32

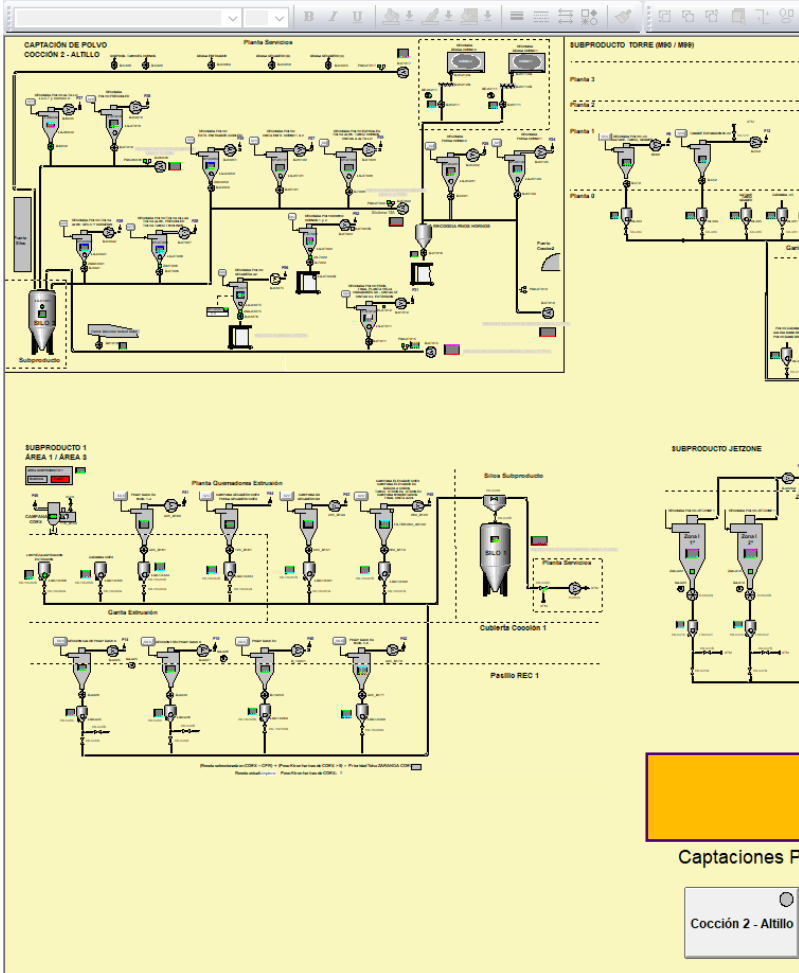
AVEVA



# PI Vision Dust Collection System

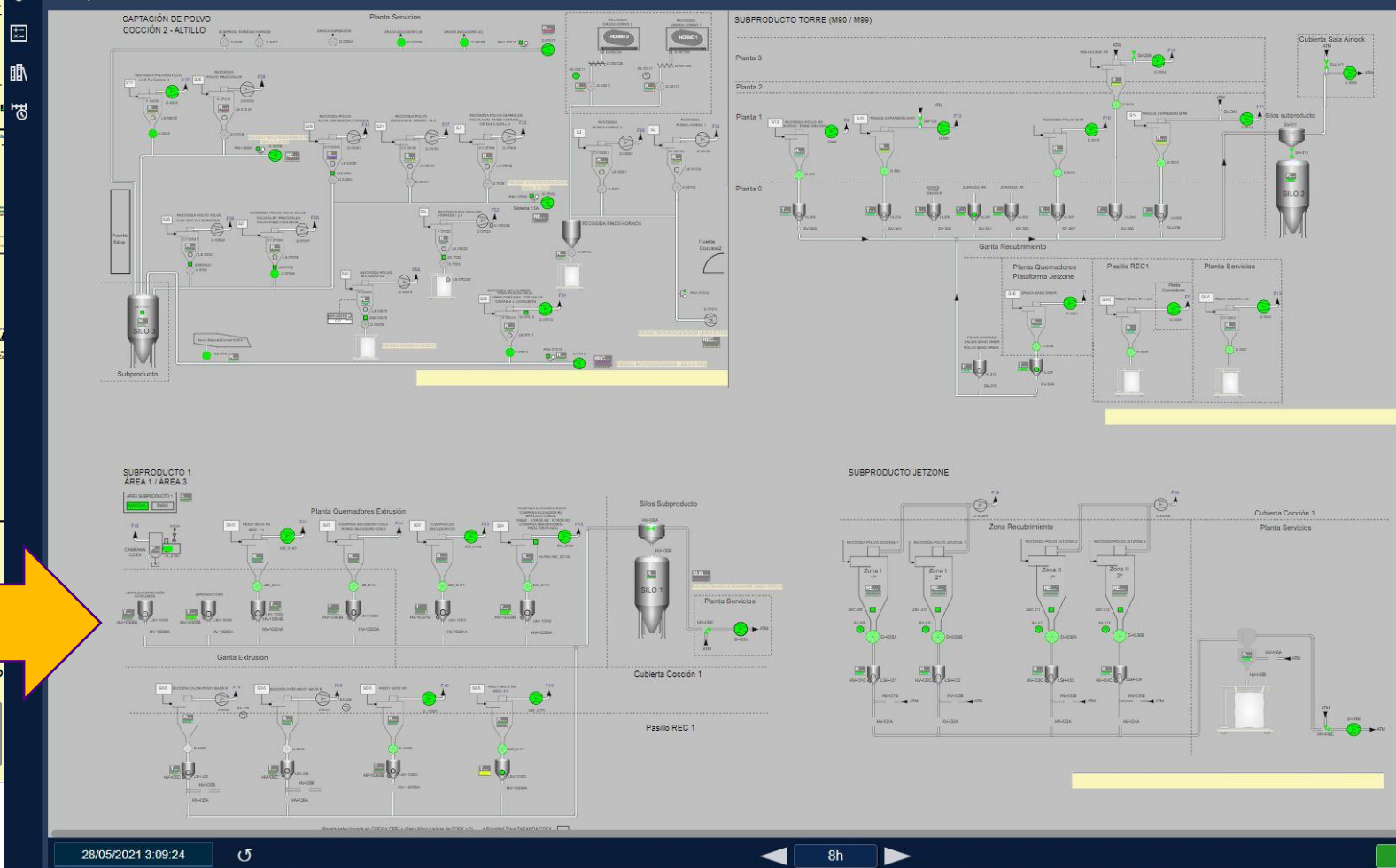
PI ProcessBook - [Captacion Polvo\*]

File Edit View Insert Tools Draw Arrange Window Help



PI Vision

Captacion Polvo v1



28/05/2021 3:09:24



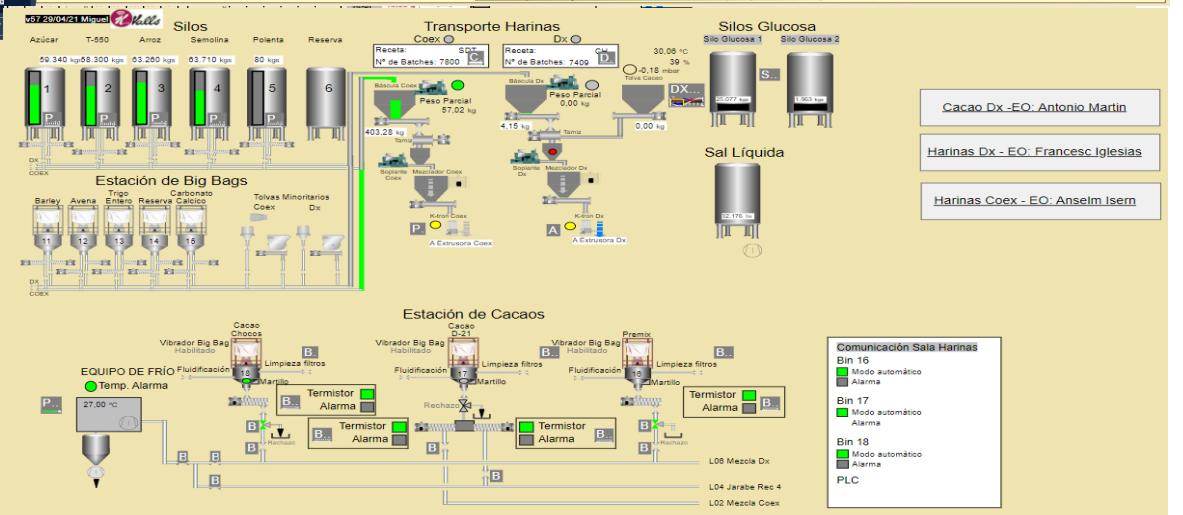
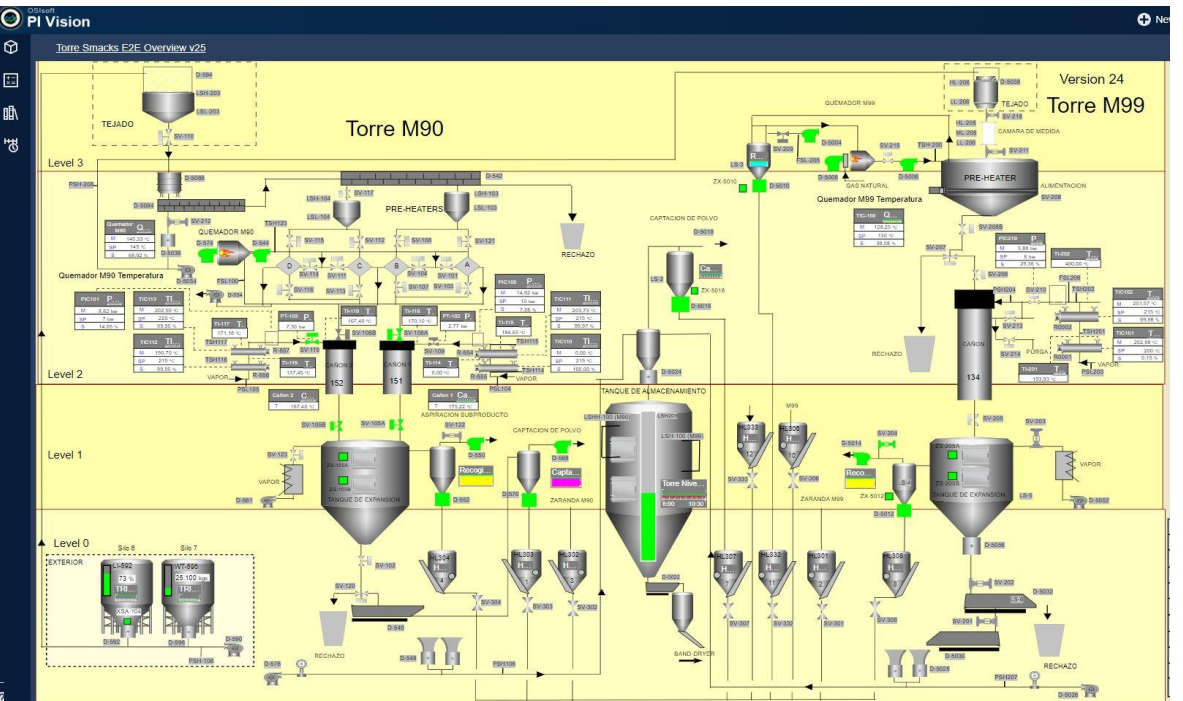
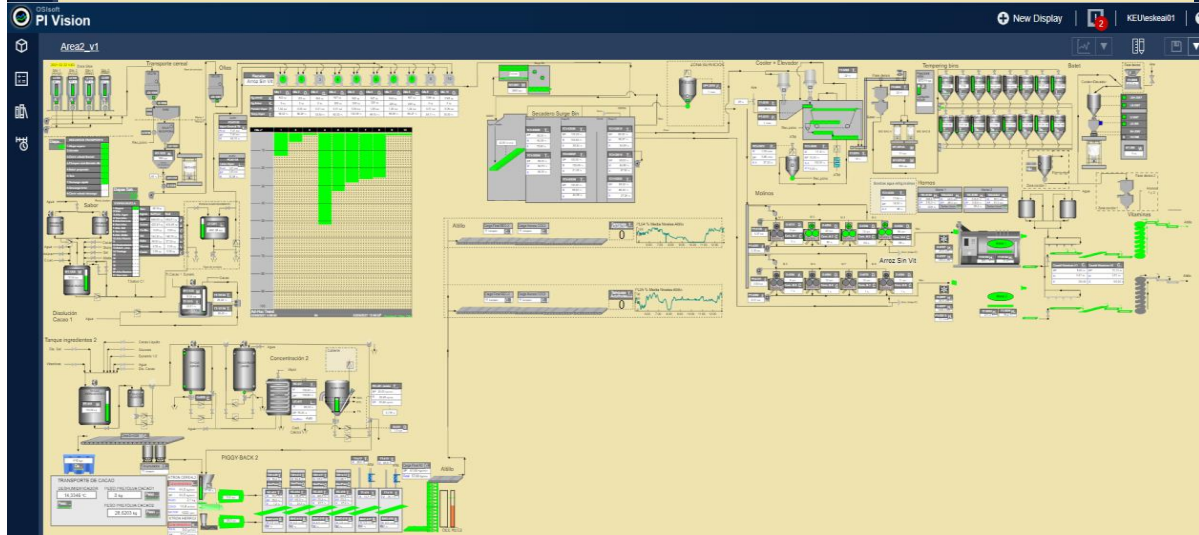
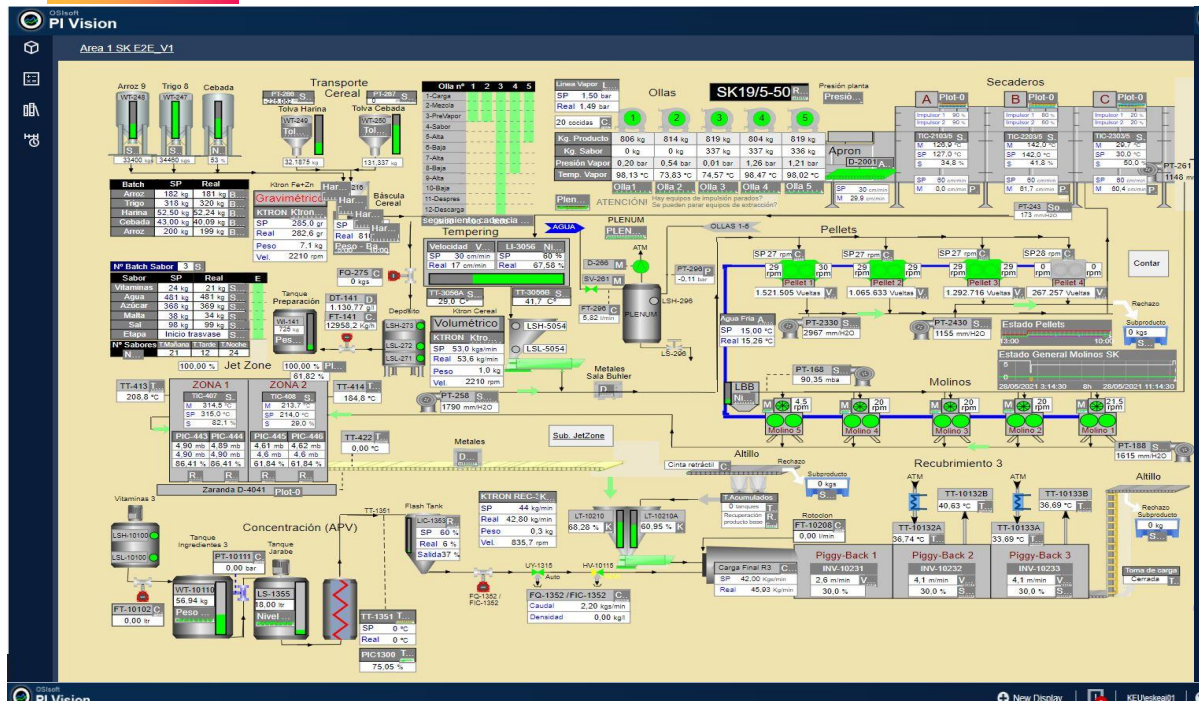
8h



AVEVA

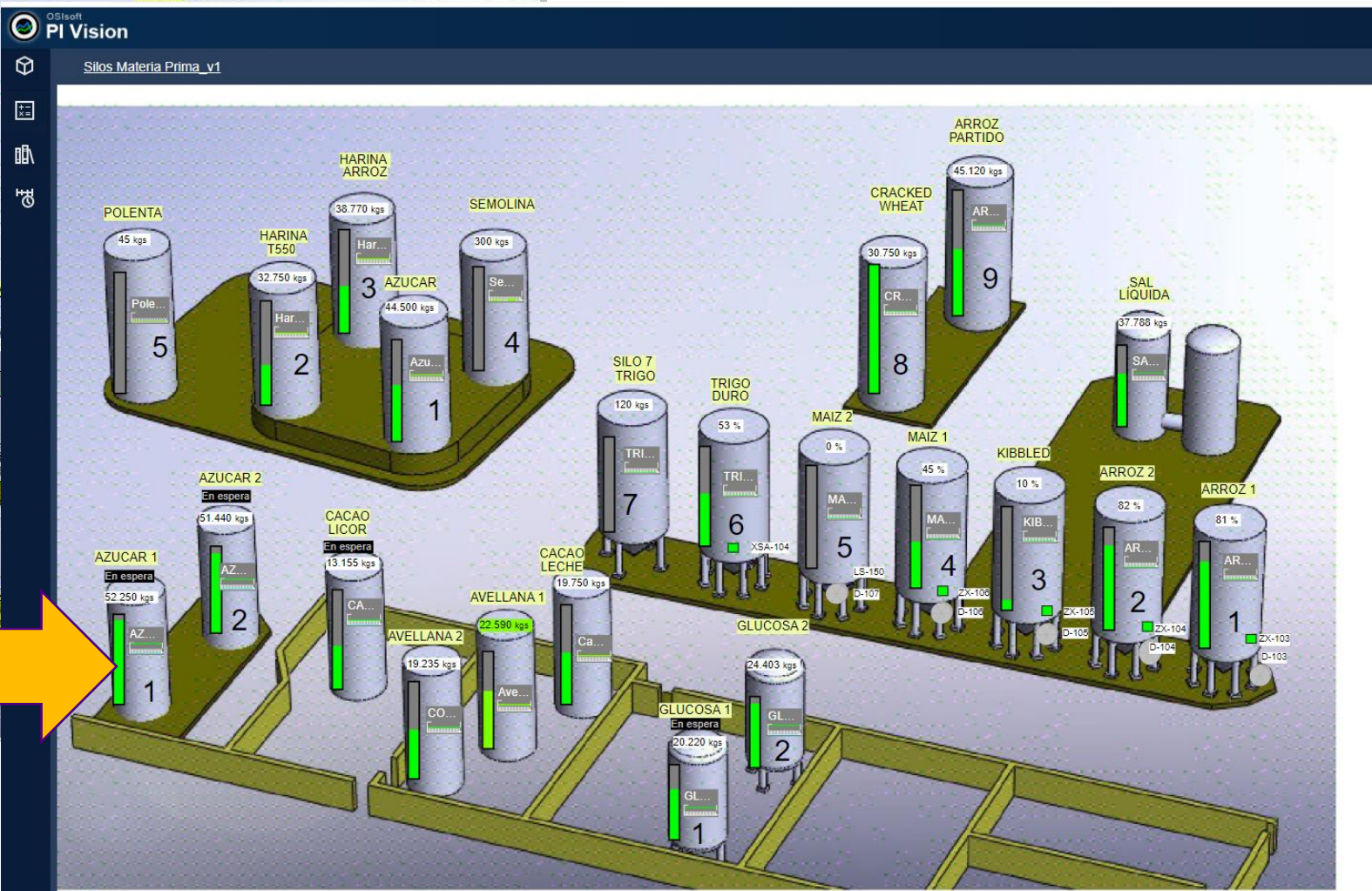
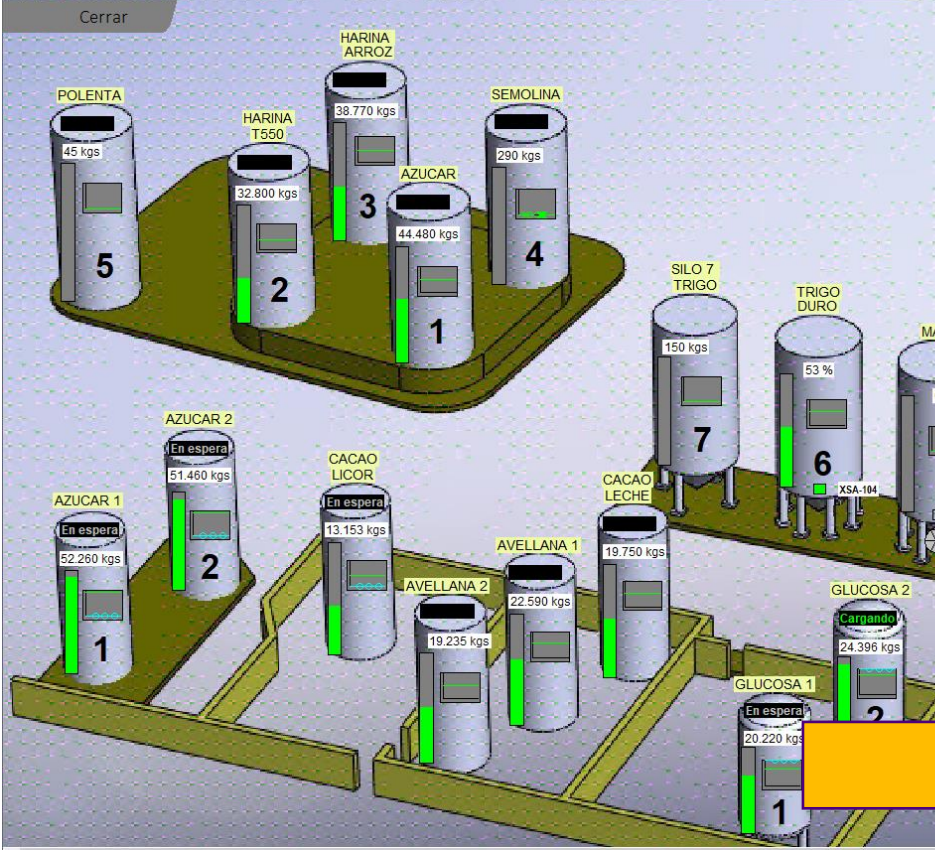
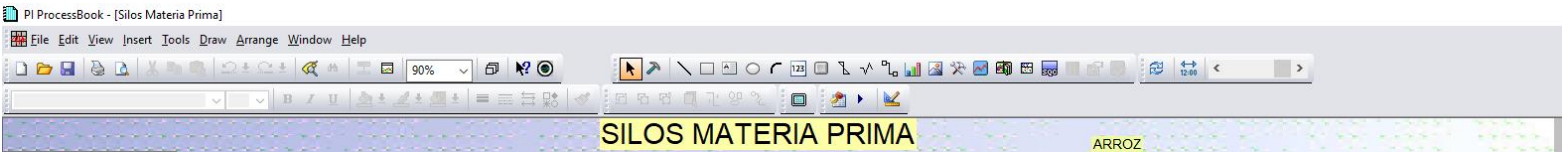


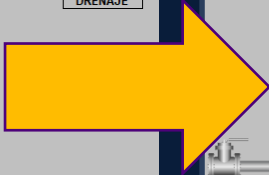
# PI Vision digital twin Process Areas





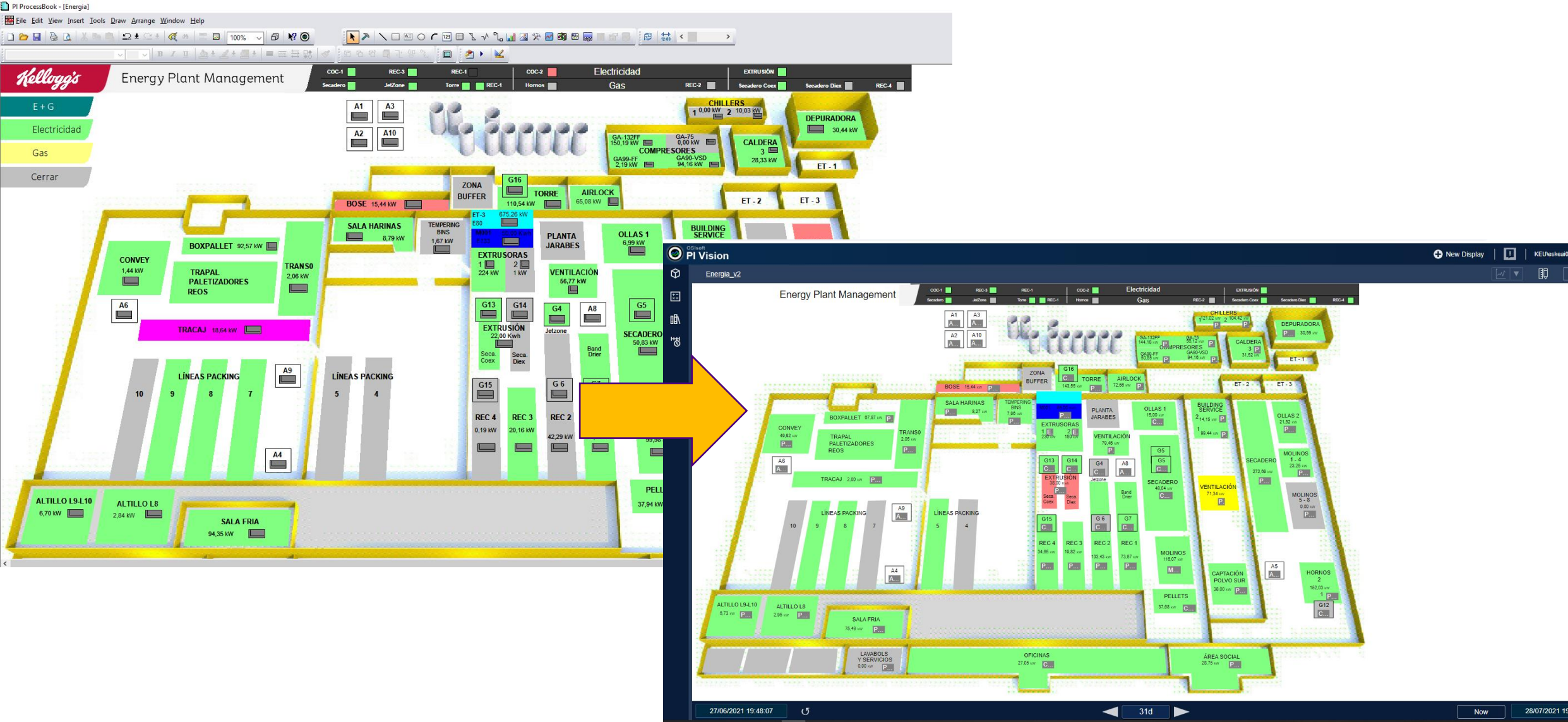
# PI Vision Raw Material Silos

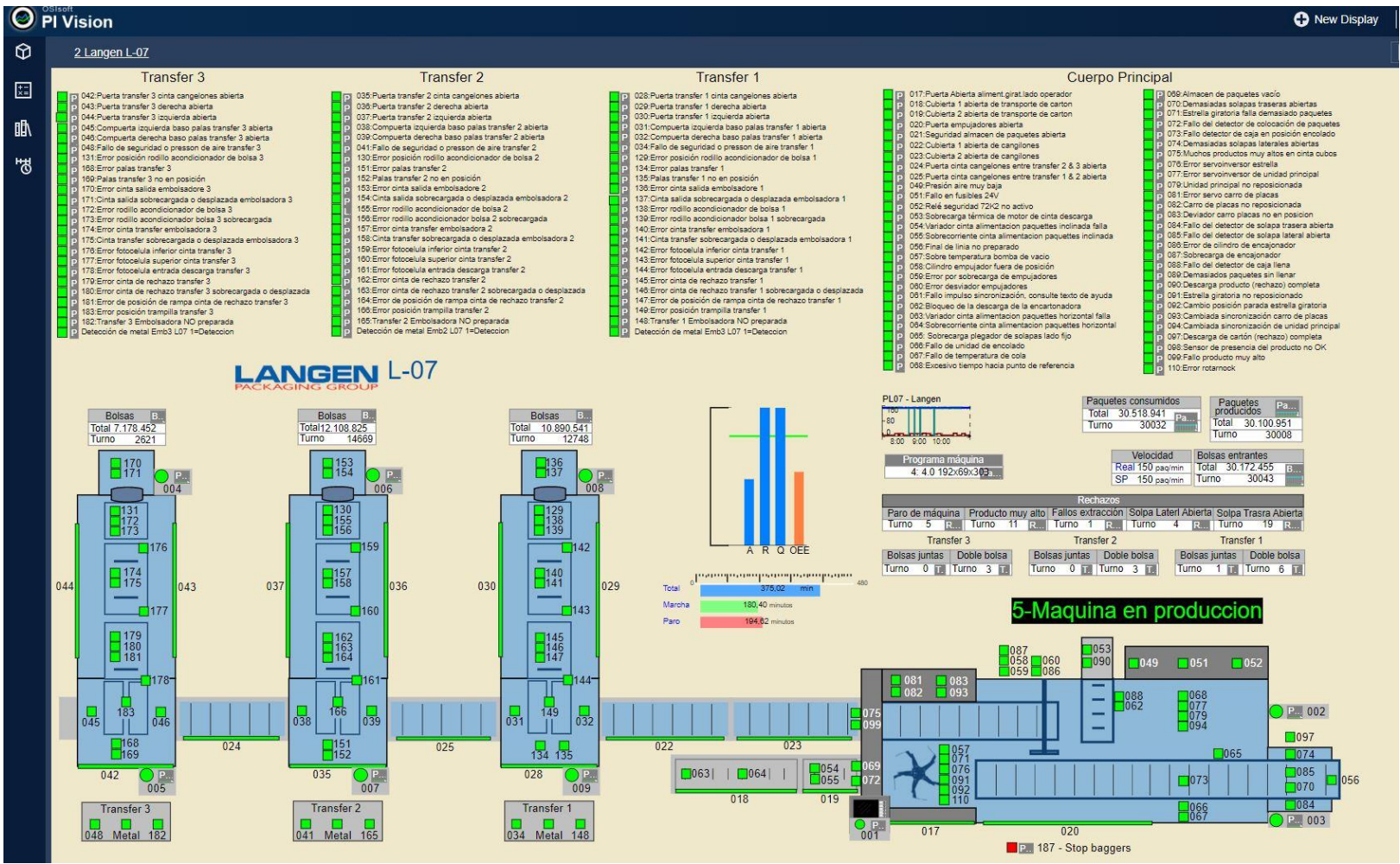






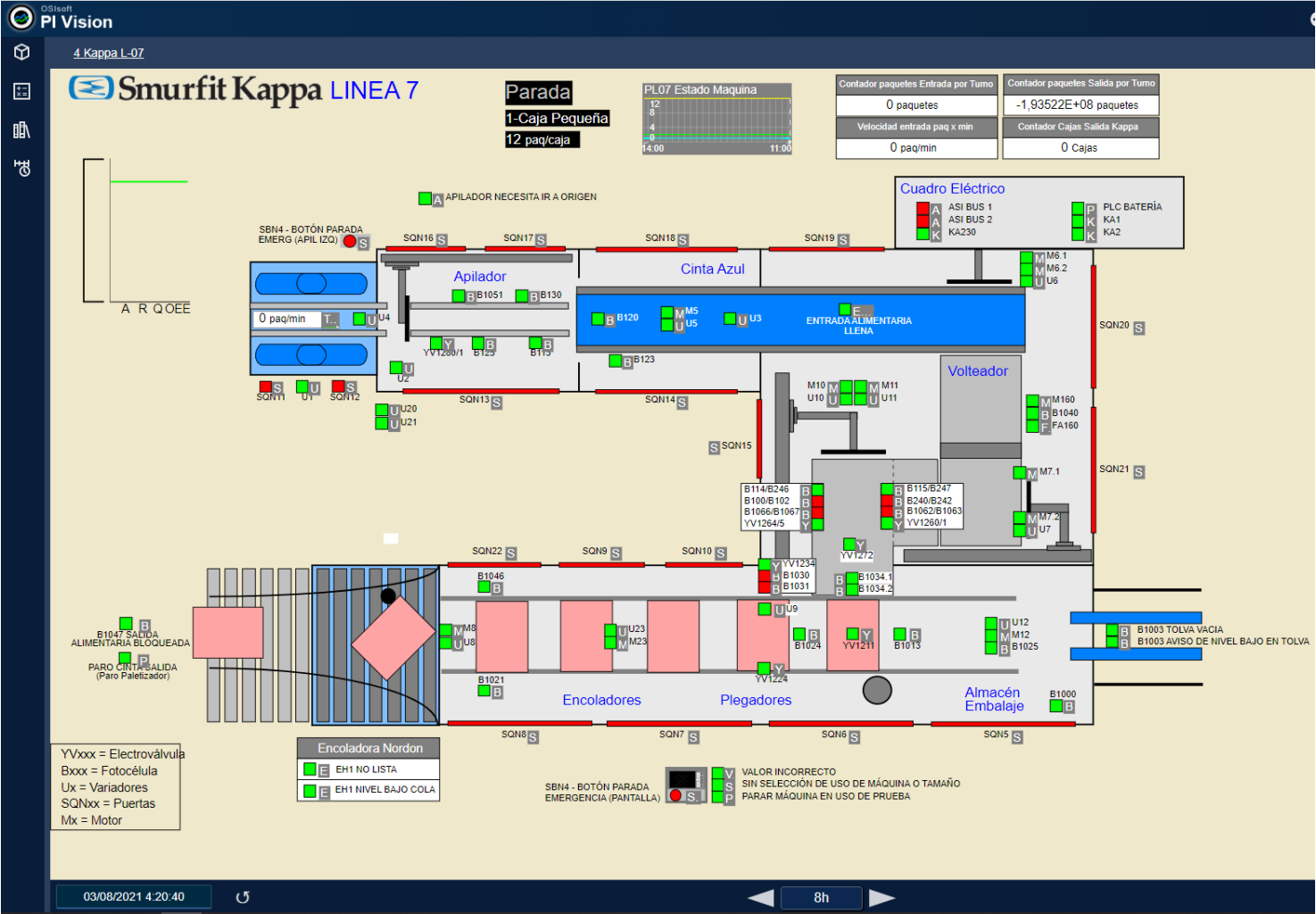
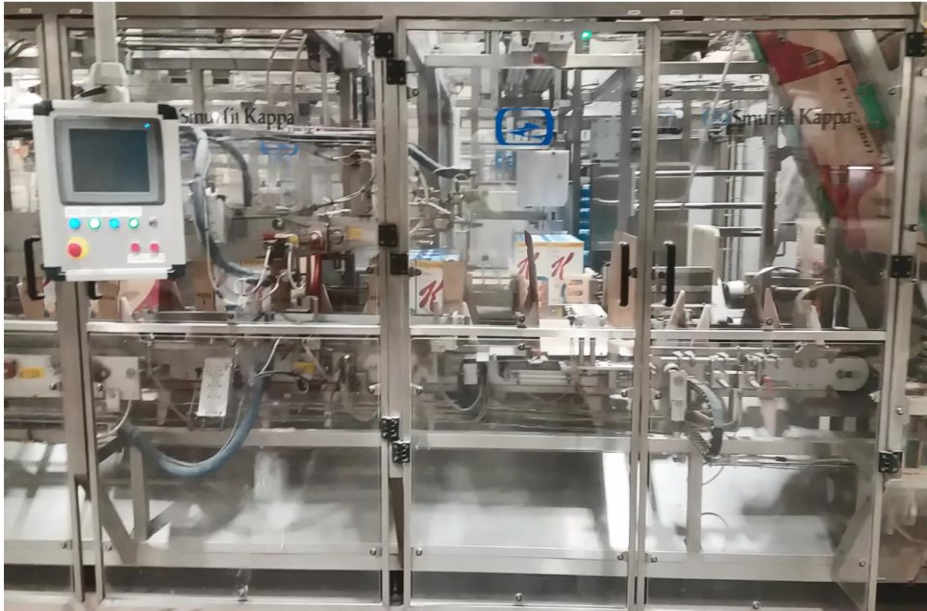
# PI Vision Energy Management







# CASE PACKER DIGITAL TWIN



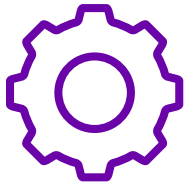


# THE MAIN PI VISION ADVANTAGES

- Web based application, therefore faster to access the information.
- It give us a more intuitive user experience.
- There are Youtube tutorials available in Osisoft Learning Academy.
- Short learning curve.
- Reduce development time.
- Reuse old PI Processbook stuff by means of PI PB to PI Vision.
- It will allow us to create future Control Tower for plant control.



# Personal experience migrating legacy PI ProcessBook displays to PI Vision



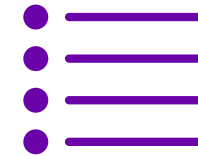
## Challenge

- Migrate 15 years of legacy PI ProcessBook displays to PI Vision



## Solution

- PI ProcessBook to PI Vision Migration Utility



## Benefits

- We have migrated 15 years of legacy PI ProcessBook displays in just one week.
- Have web based real time dashboards in PI Vision which is going to allow us to create a Control Tower System.

“We have moved 15 years of PI ProcessBook developments to PI Vision in just one week”

Emilio Anglés

Kellogg's Manufacturing Spain







## Emilio Anglés Isern

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AVEVA, a global leader in industrial software, drives digital transformation for industrial organizations managing complex operational processes. Through Performance Intelligence, AVEVA connects the power of information and artificial intelligence (AI) with human insight, to enable faster and more precise decision making, helping industries to boost operational delivery and sustainability. Our cloud-enabled data platform, combined with software that spans design, engineering and operations, asset performance, monitoring and control solutions delivers proven business value and outcomes to over 20,000 customers worldwide, supported by the largest industrial software ecosystem, including 5,500 partners and 5,700 certified developers. AVEVA is headquartered in Cambridge, UK, with over 6,000 employees at 90 locations in more than 40 countries. For more details visit: [www.aveva.com](https://www.aveva.com)