OSIsoft PI System in the Consumer Goods Industry

Jaume Valls and Emilio Anglés

Agenda

- About Kellogg Company
- About Kellogg Manufacturing Valls
- Regulatory compliance using PI System
- Managing production lines Critical Control Points (CCP's) using PI AF
- Osisoft PI Digital Twin for improving OEE in packing lines
- Q&A

About Kellogg Company

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

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

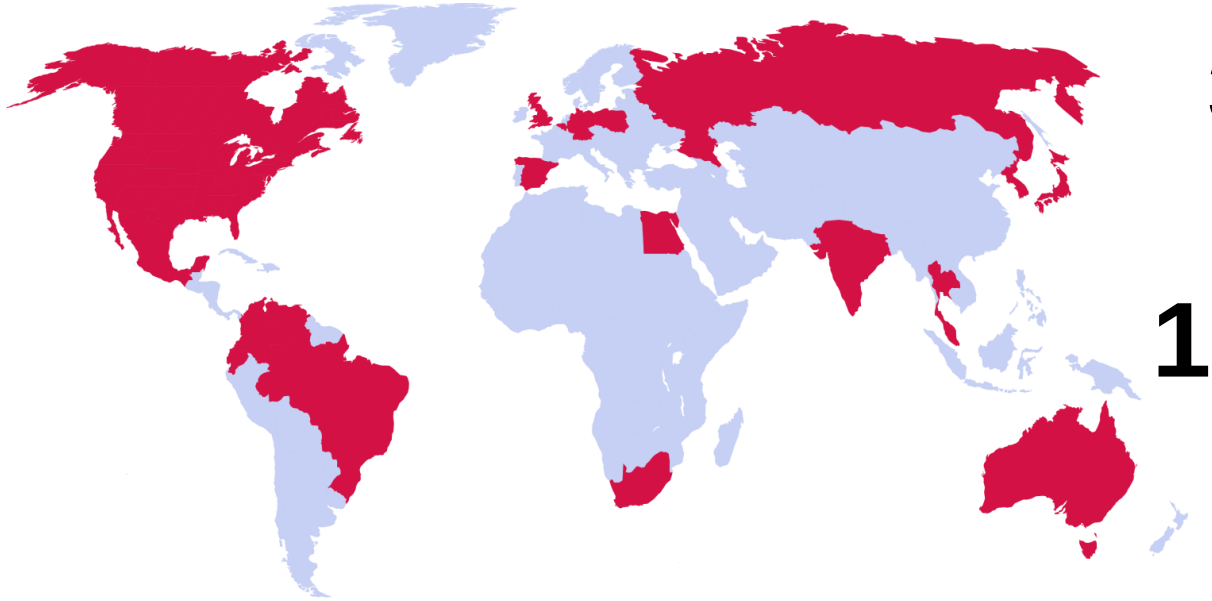
BiscoMisr

Acquired Bisco Misr, Egyptian biscuits company

Parati

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

Bringing Our Best to the World



33,000 employees

in **21** countries

1,600 foods marketed

in more than **180** countries

Kellogg Company Overview

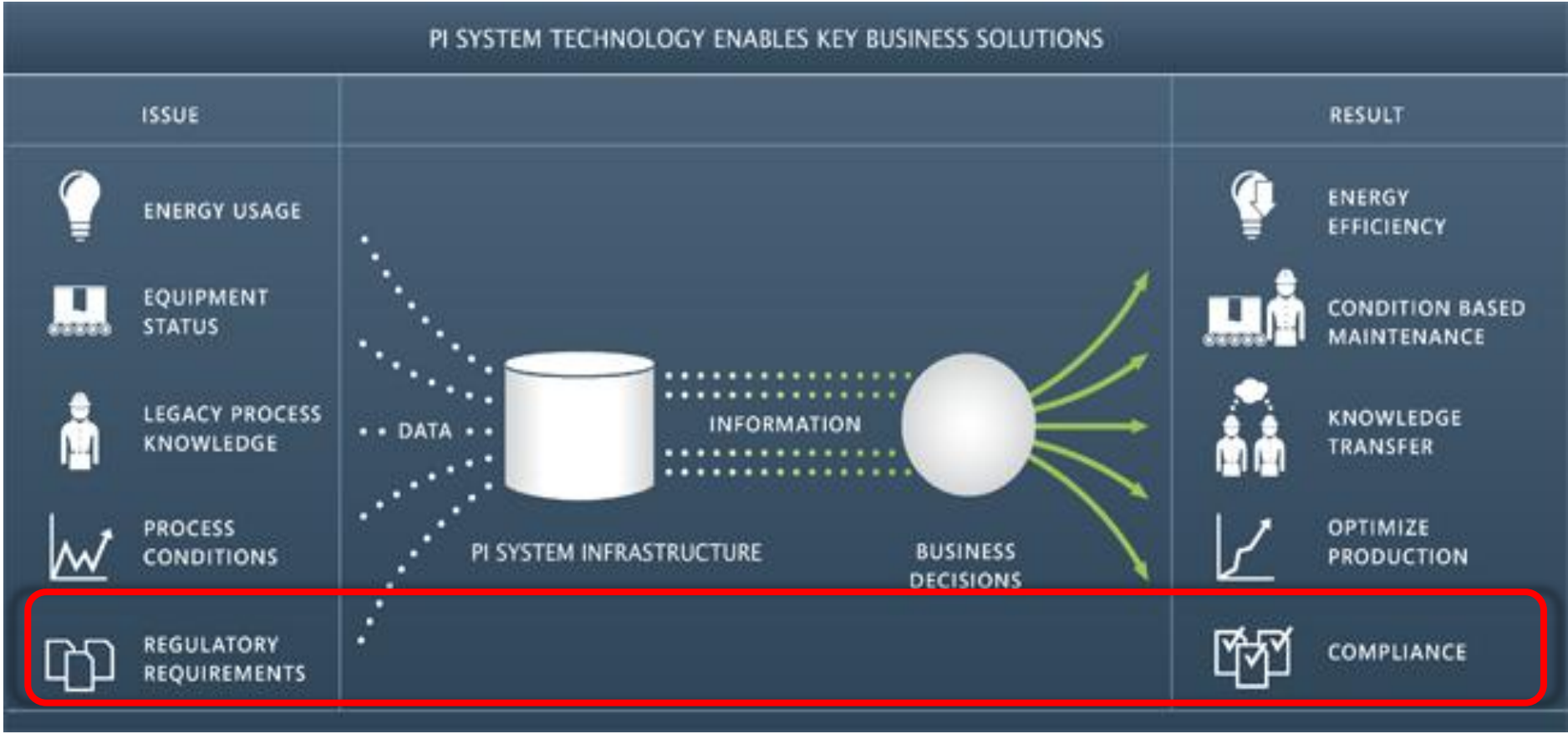
2017 net sales **~$13 Billion**

About Kellogg Manufacturing Valls (Spain)

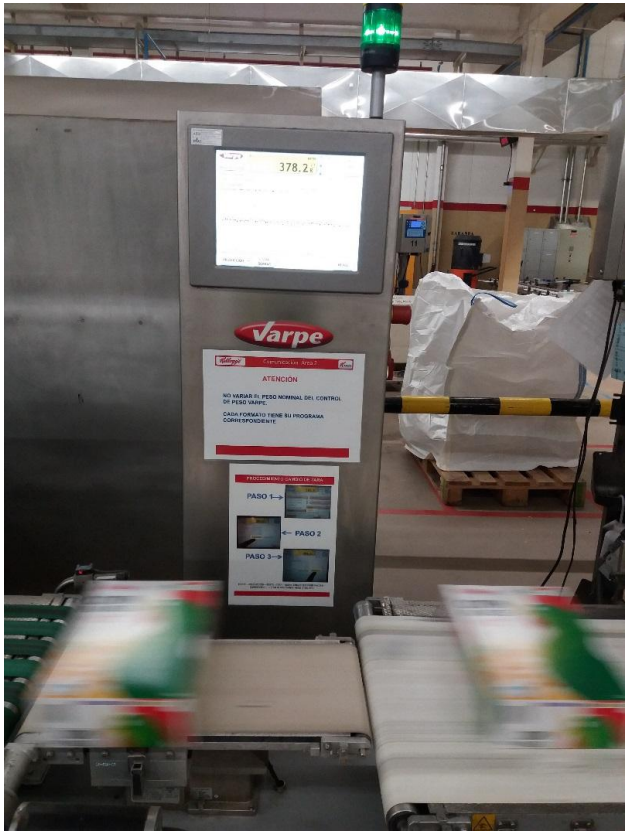
Kellogg Manufacturing Valls

What do we produce?

Consumer Product Goods Industry use cases
Kellogg Manufacturing Valls

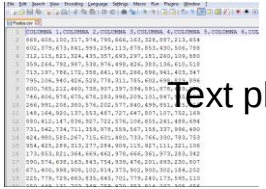


Challenge: Avoid non-conformities related with the nominal quantities that we put into our packed products during regulation and compliance audits.

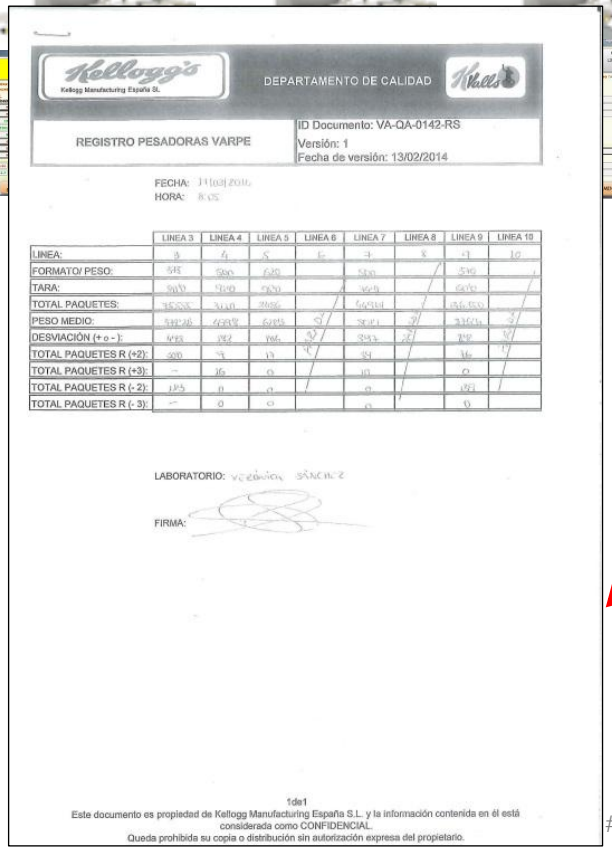


BRC GLOBAL STANDARDS

Challenge: Initial situation



Text plain file



Kellogg's
Kellogg Manufacturing España SL

DEPARTAMENTO DE CALIDAD

REGISTRO PESADORAS VARPE

ID Documento: VA-QA-0142-RS
Versión: 1
Fecha de versión: 13/02/2014

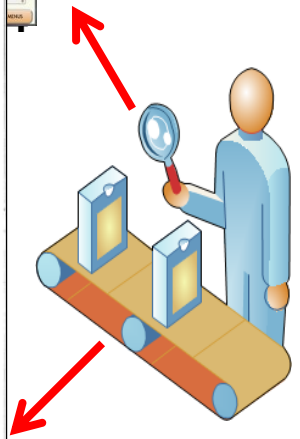
FECHA:
HORA:

	LINEA 3	LINEA 4	LINEA 5	LINEA 6	LINEA 7	LINEA 8	LINEA 9	LINEA 10
LINEA:	3	4	5	6	7	8	9	10
FORMATO/ PESO:	515	500	520		500		510	
TARA:	500	500	520		500		510	
TOTAL PAQUETES:								
PESO MEDIO:								
DESVIACIÓN (+ o -):								
TOTAL PAQUETES R (+2):	500	9	0		34		36	
TOTAL PAQUETES R (+3):	-	16	0		10		0	
TOTAL PAQUETES R (- 2):	125	0	0		0		161	
TOTAL PAQUETES R (- 3):	-	0	0		0		0	

LABORATORIO:

FIRMA:

1de1



Each shift, operators took from the line 8 samples:

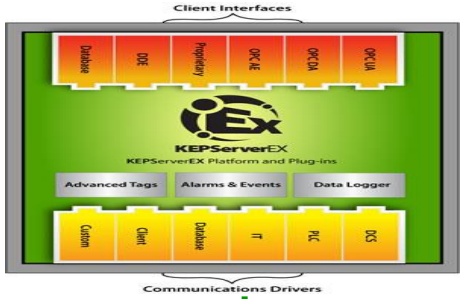
- The average weight.
- The standard deviation.
- Number of cartons produced.
- Number of cartons rejected.
  - Above the legal weight
  - Below the legal weight

Solution

OSIsoft.

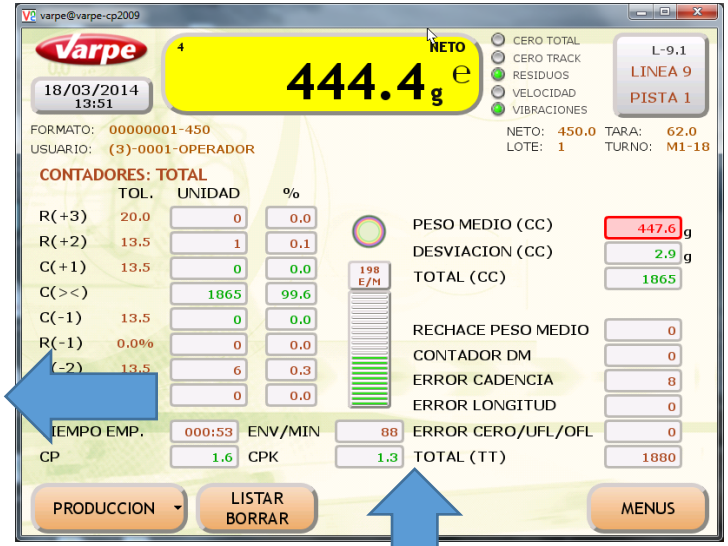
PI Server 2012

Realize the Power of Data



PI Interface for OPC DA

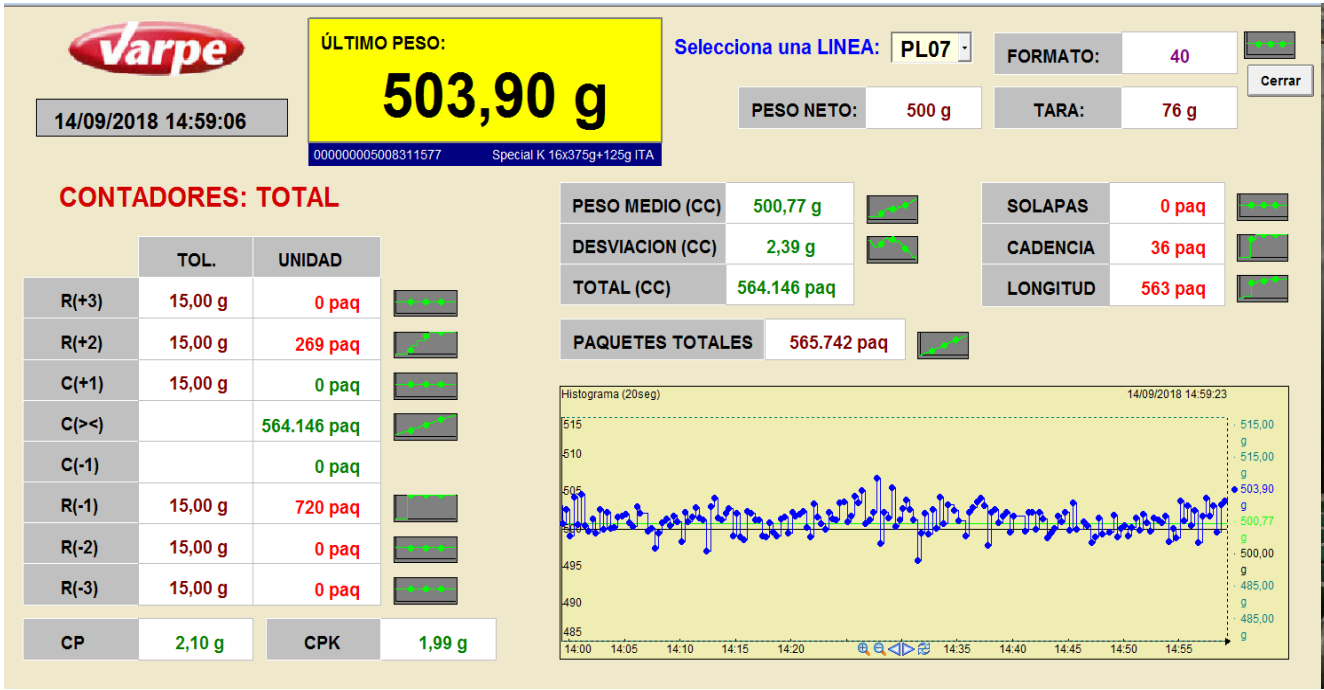
OPC FOUNDATION

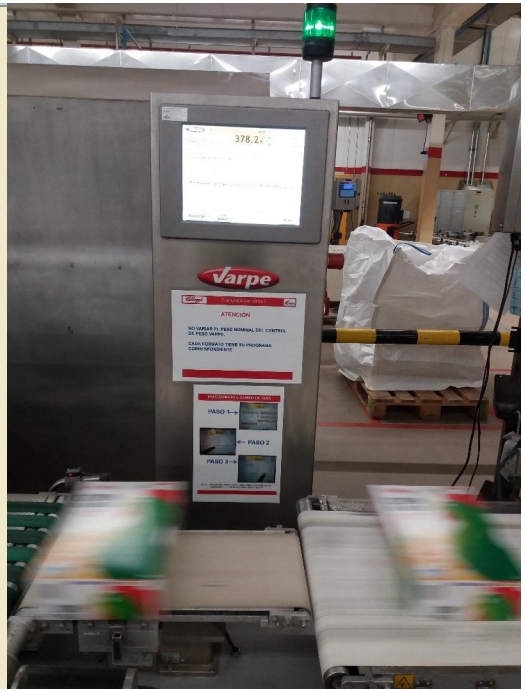


Modbus TCP/IP communication

Solution: Finally, we create the PI tags in our PI Archive server

- 1 sample every 20 secs.
- 180 samples per Hour.
- 1440 samples per Shift.





Kellogg Manufacturing Valls

Regulatory compliance: Avoid non-conformities related with the nominal quantities that we put into our packed products during regulation and compliance audits

CHALLENGE

Digitize our packing in line weight control in order to comply with legal requirements.

- Avoid Non-conformities during BRC audits.
- Eliminate operator manual data collection.
- Information in real time.

SOLUTION

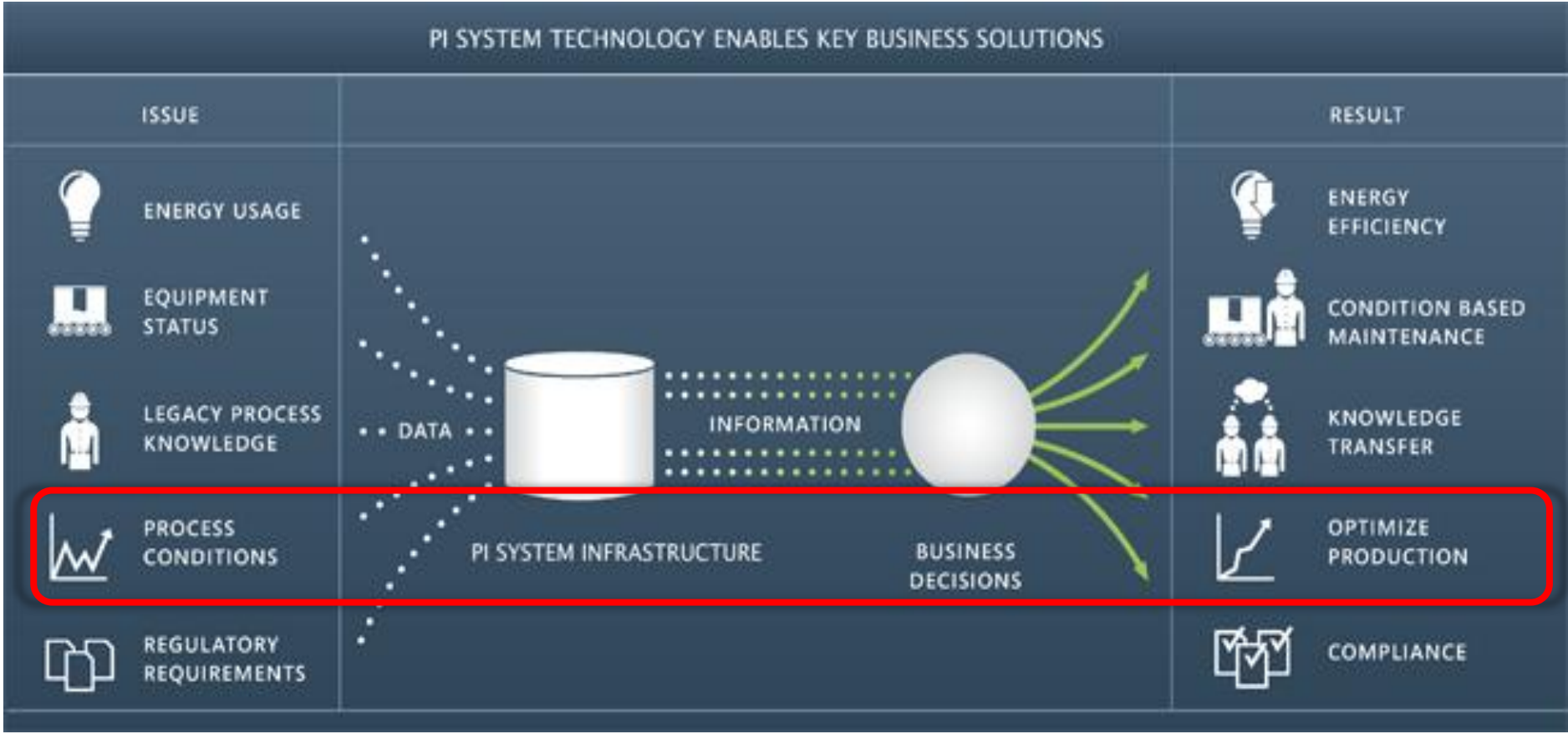
Connect packing in line weight controls to PI System.

- Connect in line weight controls via protocol Modbus/TCP .
- Automatic data collection using PI OPC Interface.

RESULTS

Regulatory requirement for Quality Compliance.

- We have not had Non-conformities during the BRC audits anymore.(1440 weight samples per shift).
- We have eliminated the human error.
- The information in real time enables to take actions at shift basis.



Challenge: Avoid product holds and food recalls controlling Critical Control Points (CCP's).

Solution

Production Area

2. Set up PI Asset Framework structure

- Production Area
  - Production Line 1
  - Production Line 2
  - Production Line 3
    - Coating 3
    - Cooking 3
      - Cooker 1 L-3
      - Cooker 2 L-3
      - Cooker 3 L-3
      - Cooker 4 L-3
      - Cooker 5 L-3
      - Dryer 1 L-3
      - Dryer 2 L-3
      - Dryer 3 L-3
      - Flaking Mill 1 L-3
      - Jet-Zone Oven L-3
      - Surge Bin L-3
  - Production Line 4
    - Coating 4
      - Drum L-4
      - Piggy Backs 1 L-4
      - Piggy Backs 2 L-4
      - Piggy Backs 3 L-4
    - Extrusion 4
      - Dryer 2 L-4
      - Dryer L-4
      - DX Extruder 2 L-4
      - DX Extruder L-4

1. Collect CCP's Temperatures from our dryers

Dryer 2 L-3

General | Child Elements | Attributes | Ports | Analyses | Notification Rules | Version

Excluded attributes are hidden.

Filter

Name	Value	Description
Category: Downtime		
Downtime - per Day	0.5425 h	Downtime per Day (in seconds) (status <> Running)
Downtime - per Hour	0 h	Downtime per hour (in seconds) (status <> Running)
Downtime - per Shift	0 h	Downtime per shift (in seconds) (status <> Running)
Category: Electricity		
Total Electricity Consumption - per Day	1579.431 kWh	Electricity Consumed (in kWh) per hour
Total Electricity Consumption - per Hour	102.3148 kWh	Electricity Consumed (in kWh) per hour
Total Electricity Consumption - per Shift	204.6859 kWh	Electricity Consumed (in kWh) per shift
Category: Metadata		
Equipment Code	Dryer 2 L-3	
Line	Production Line 3	
Site	Windsor Site	
Category: OEE		
% Availability - per Day	96.609375 %	% of Availability per Day (Status = Running)
% Availability - per Hour	100 %	% of Availability per hour (Status = Running)
% Availability - per Shift	100 %	% of Availability per shift (Status = Running)
% Quality - per Shift	100 %	
	28.0797519683838 kg/min	
	33.3540840148926 kg/min	
	9.9336338043212 9 %	
	100.527900695801 kW	
	Philips Parfait Puffs	
	0 kg/min	
	0	
	110.374687194824 °C	
	18.5747299194336 t	
	1.19339036941528 t	
	2.38722681999207 t	
	0.139359533786774 t	
	0 t	
	0 t	

Solution: 3. Use Analytics in order to monitor out of standard conditions for the CCP's

Solution: Send PI Notification

PI Notifications

lun 27/08/2018 16:39

Valls.PiNotifications@kellogg.com

CRITICAL: CCP Out of Control

Para Angles, Emili

Mensaje enviado con importancia Alta.

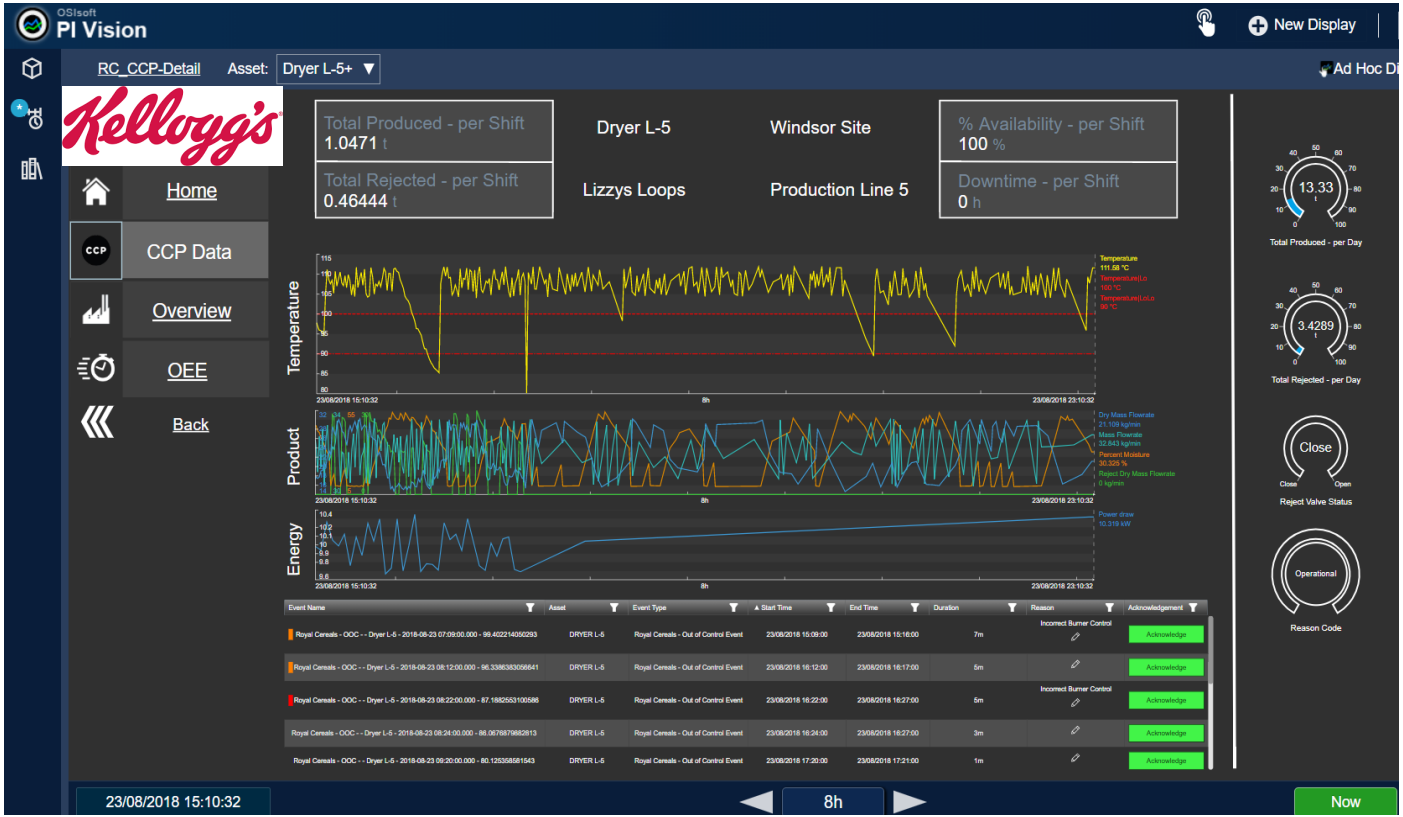
8/27/2018 4:38:45 PM Romance Daylight Time (GMT+02:00:00)

The CCP for " **Concentración REC2** " has been **15 minutes** below the Critical limit of 190 °C.

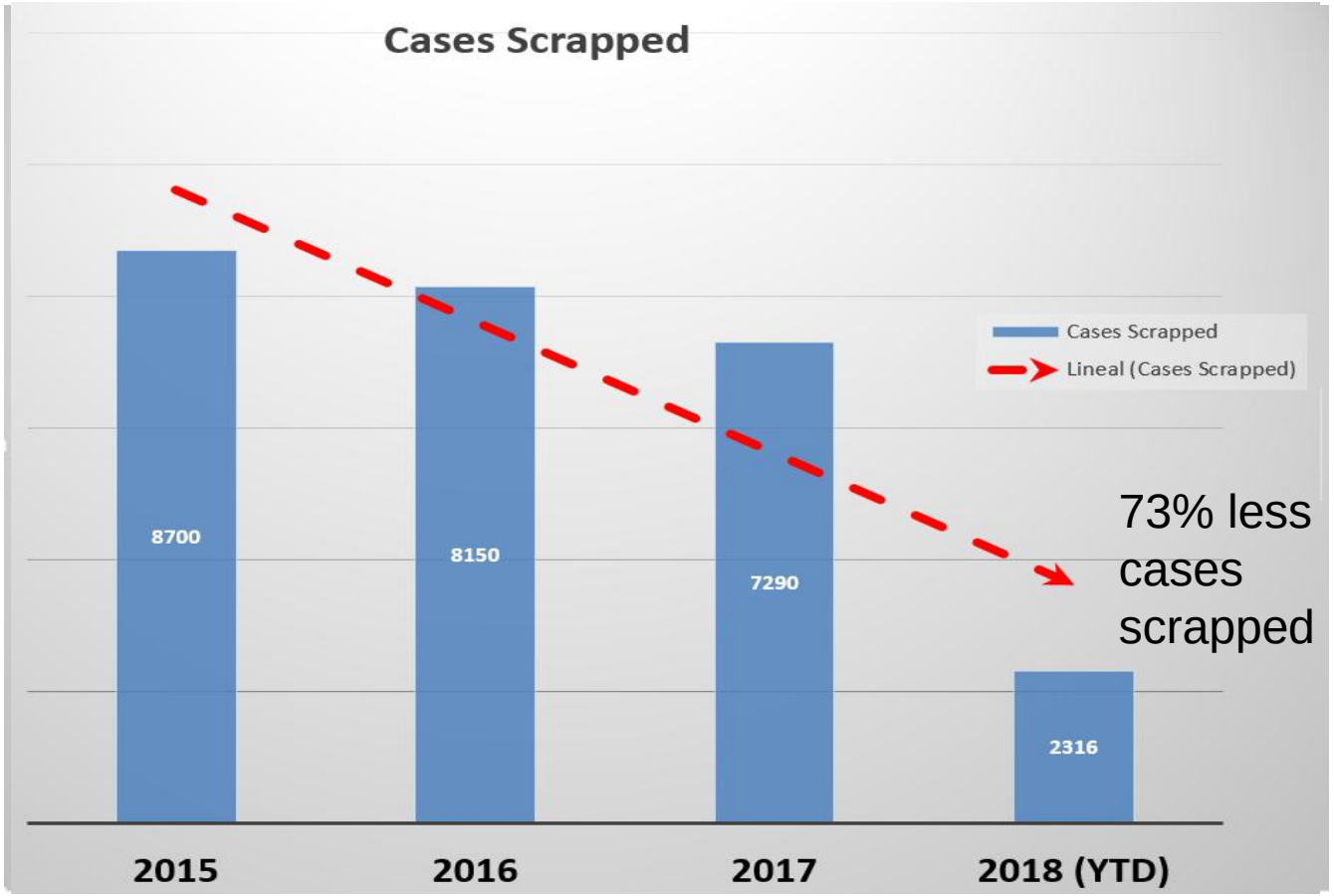
K-TRON Cereal Rate during ouf of limits was: **48 kg/min**

Please review the line and take an action inmediatly

Results: It allows to reduce variability in our process and now less time is spent looking for data and more analysing it



Results



Kellogg Manufacturing Valls

Managing production lines Critical Control Points (CCP's) using PI AF

CHALLENGE

Avoid product holds and food recalls controlling Critical Control Points using PI System

- Reduce CCP's Incidents.
- Reduce product holds.
- Make our process more stable reducing variability.
- Eliminate operator manual data collection.

SOLUTION

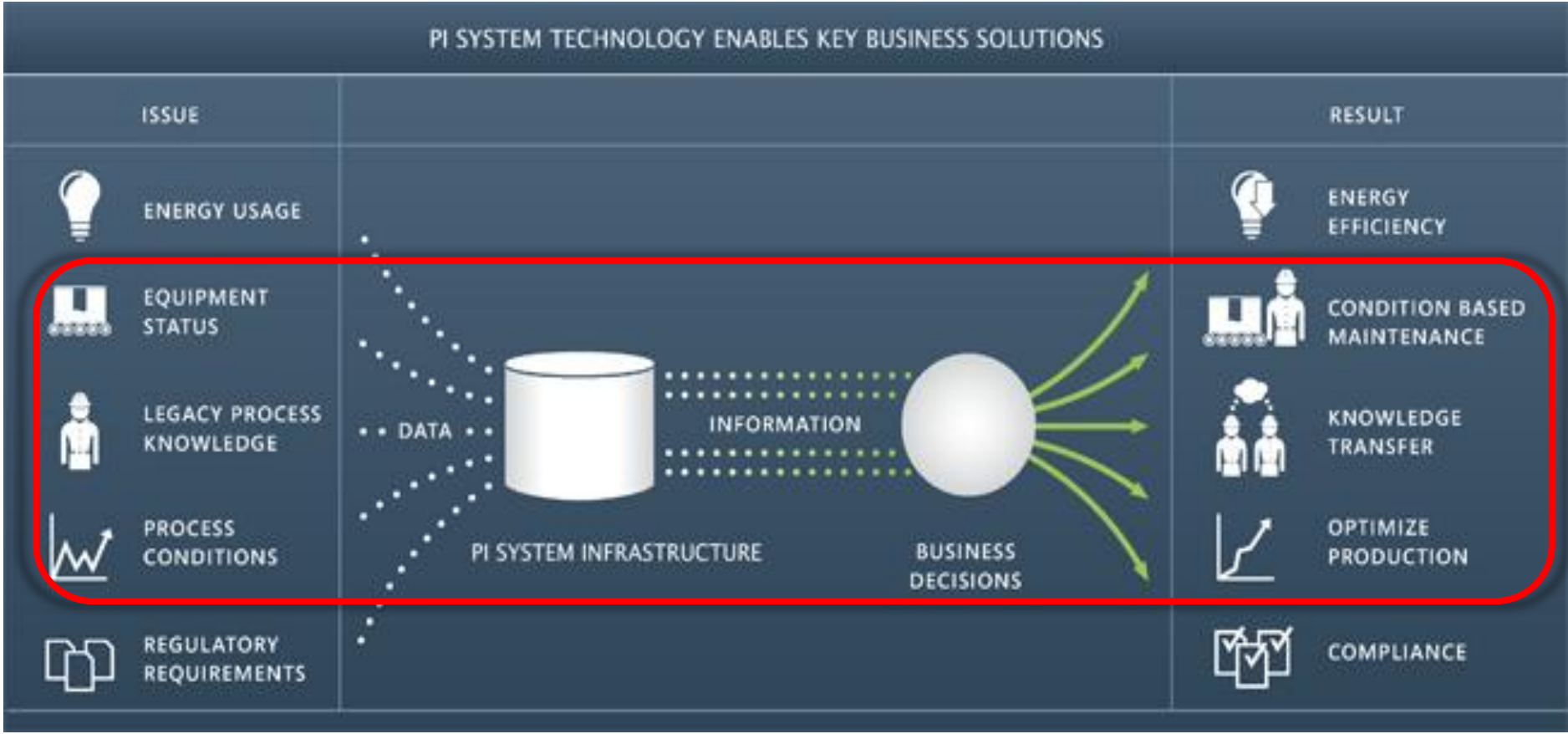
Connect production CCP's Temperatures to PI System

- Automatic data collection using PI OPC Interface of all process PLC's.
- Create a PI Asset Framework structure and setup Analytics and PI Notifications.

RESULTS

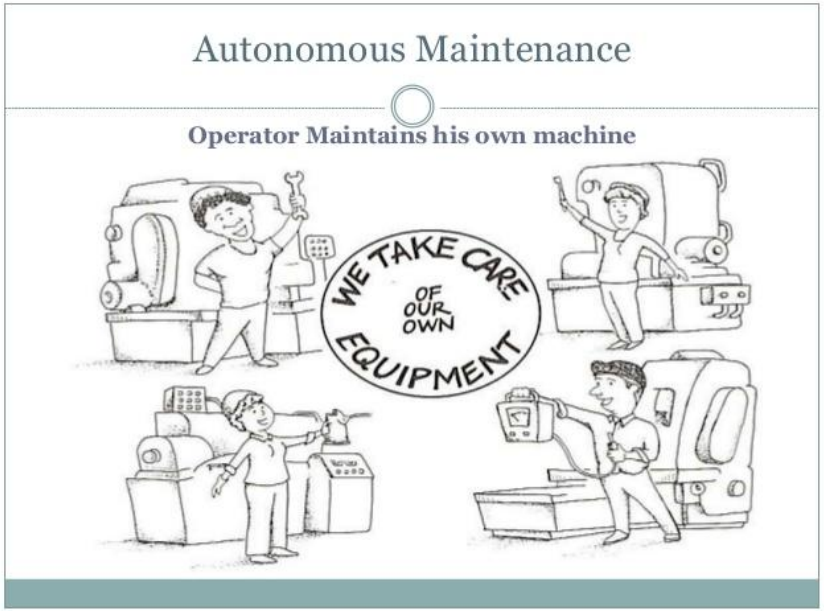
64% of CCP's incident reduction since 2015.

- From 14 Incidents in 2015 to 5 in 2018 YTD, 64% reduction.
- From 13 product holds in 2015 to 5 in 2018 YTD, 61% reduction.
- We have reduced variability in our process and cases scraped.
- Less time is spent looking for data and more time spent analyzing it.



Challenge: Be in the best in Class CPG Industry = 80% OEE

In 2015 the packing lines OEE was 68%



1. Improve Mean Time Between Failures (MTBF), **10 min in 2015**
2. Reduce minor stops per hour, **6 per hour in 2015**

Context

Continuous Improvement TEAM needs data in order to:

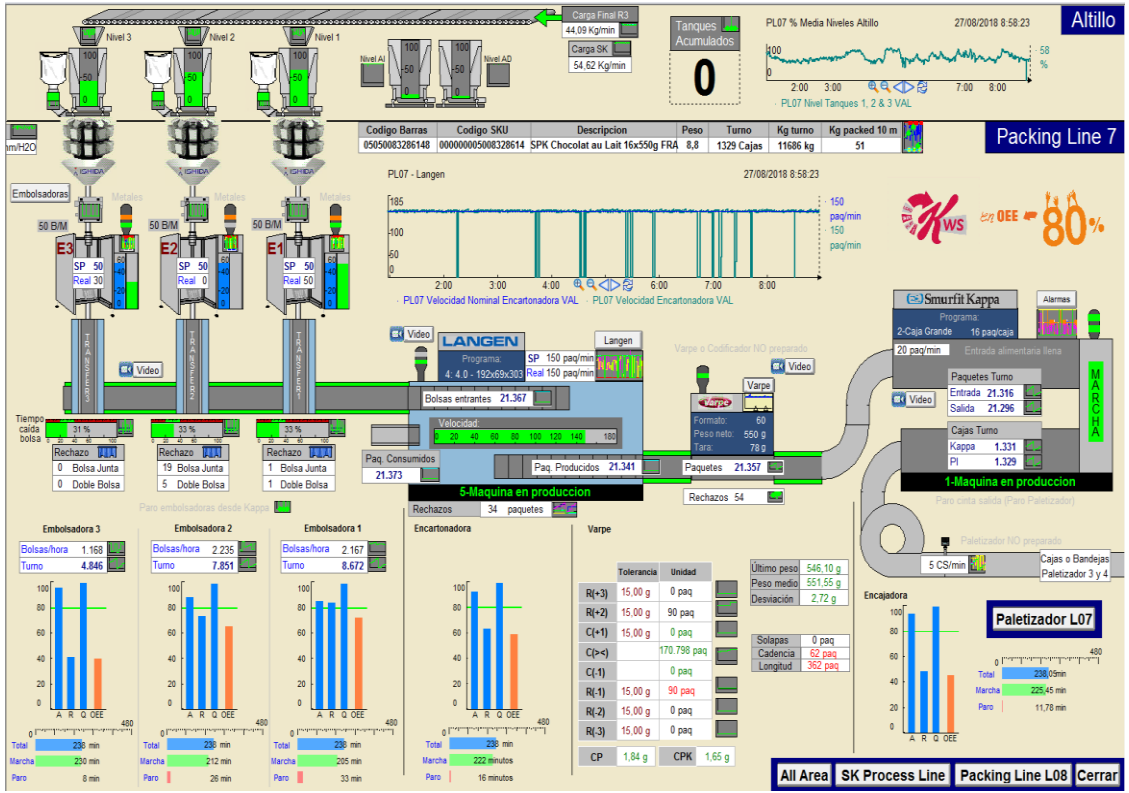
- Measure the improvement

- Eliminate the historical fights between Maintenance and Production

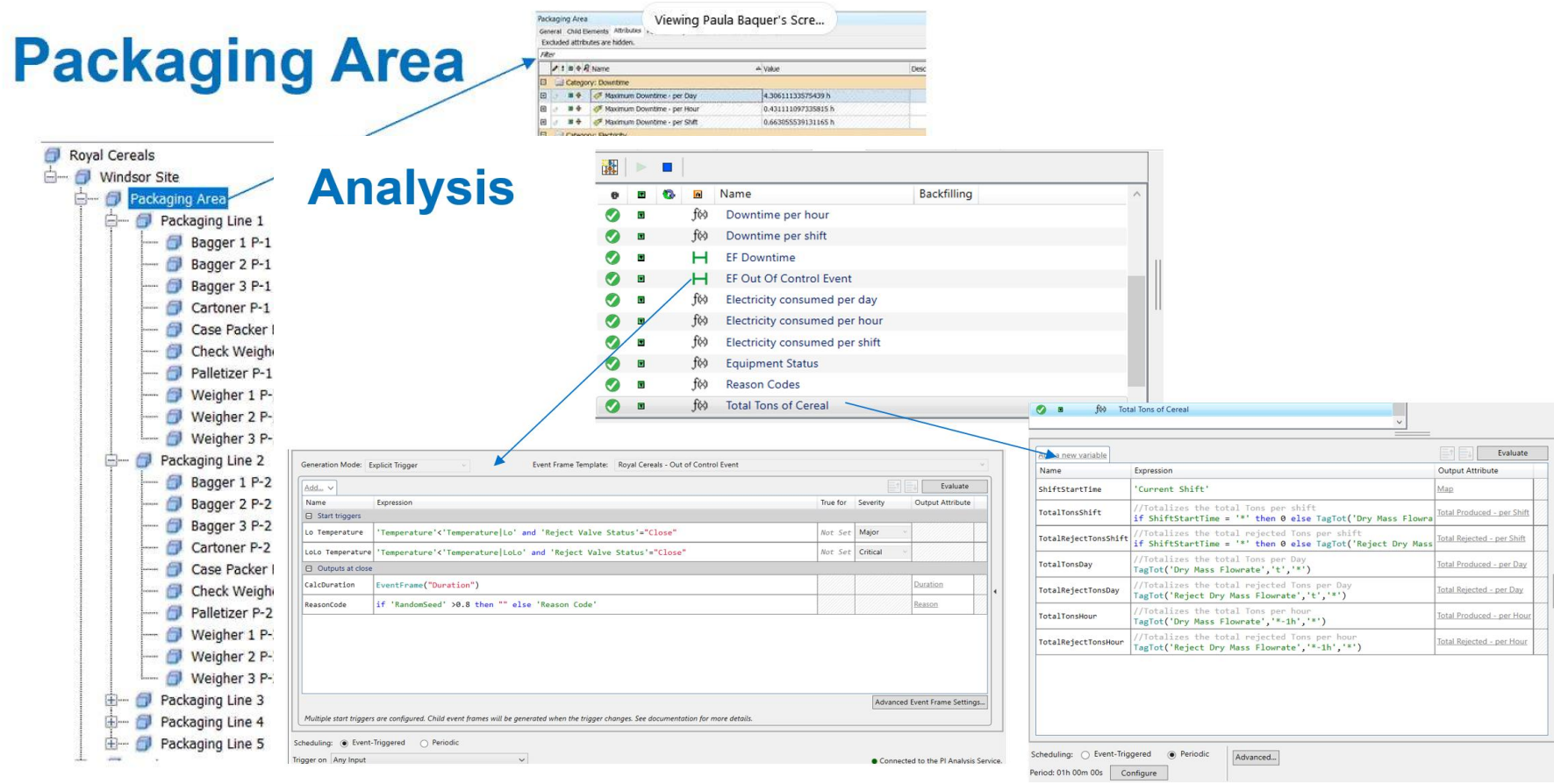
Solution

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

Digital Twin



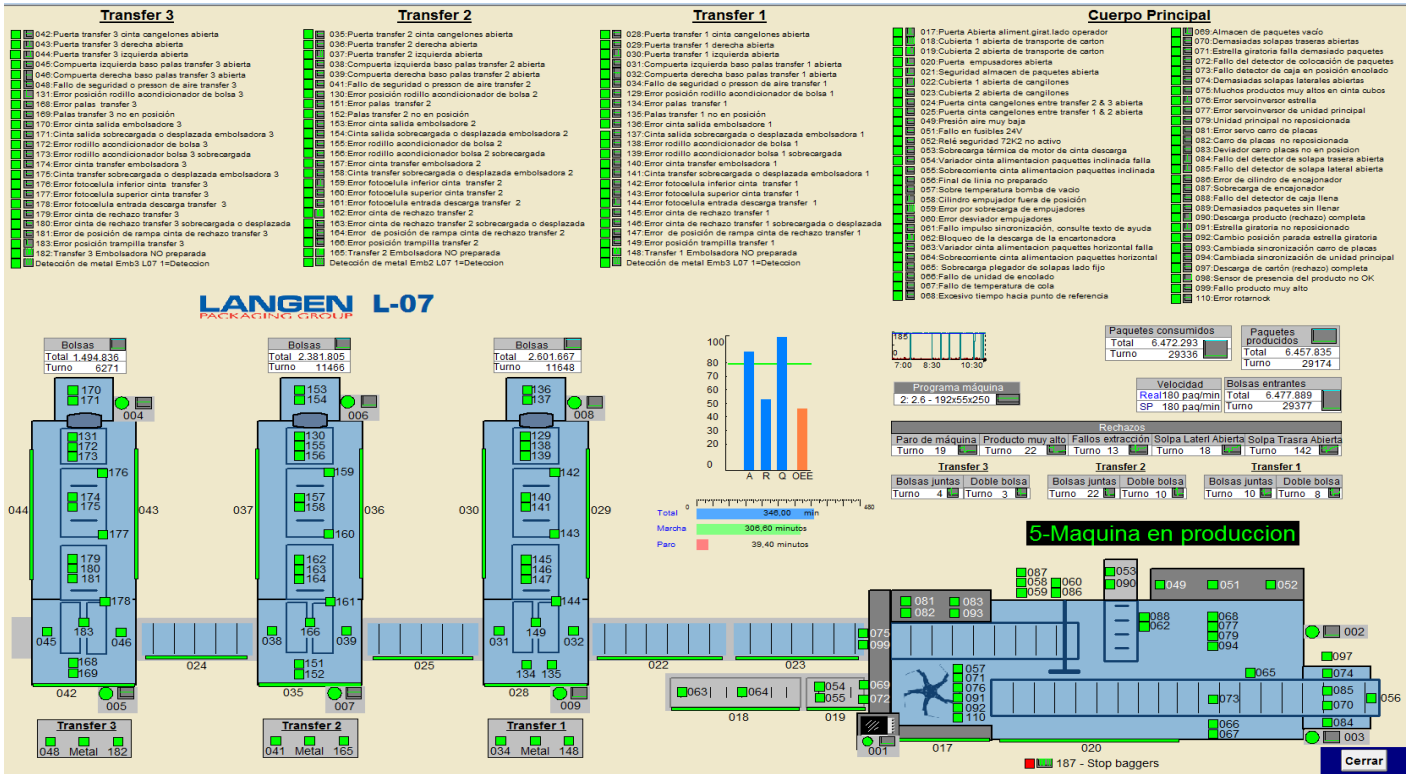
Solution: 2. Set up PI AF structure and Analytics



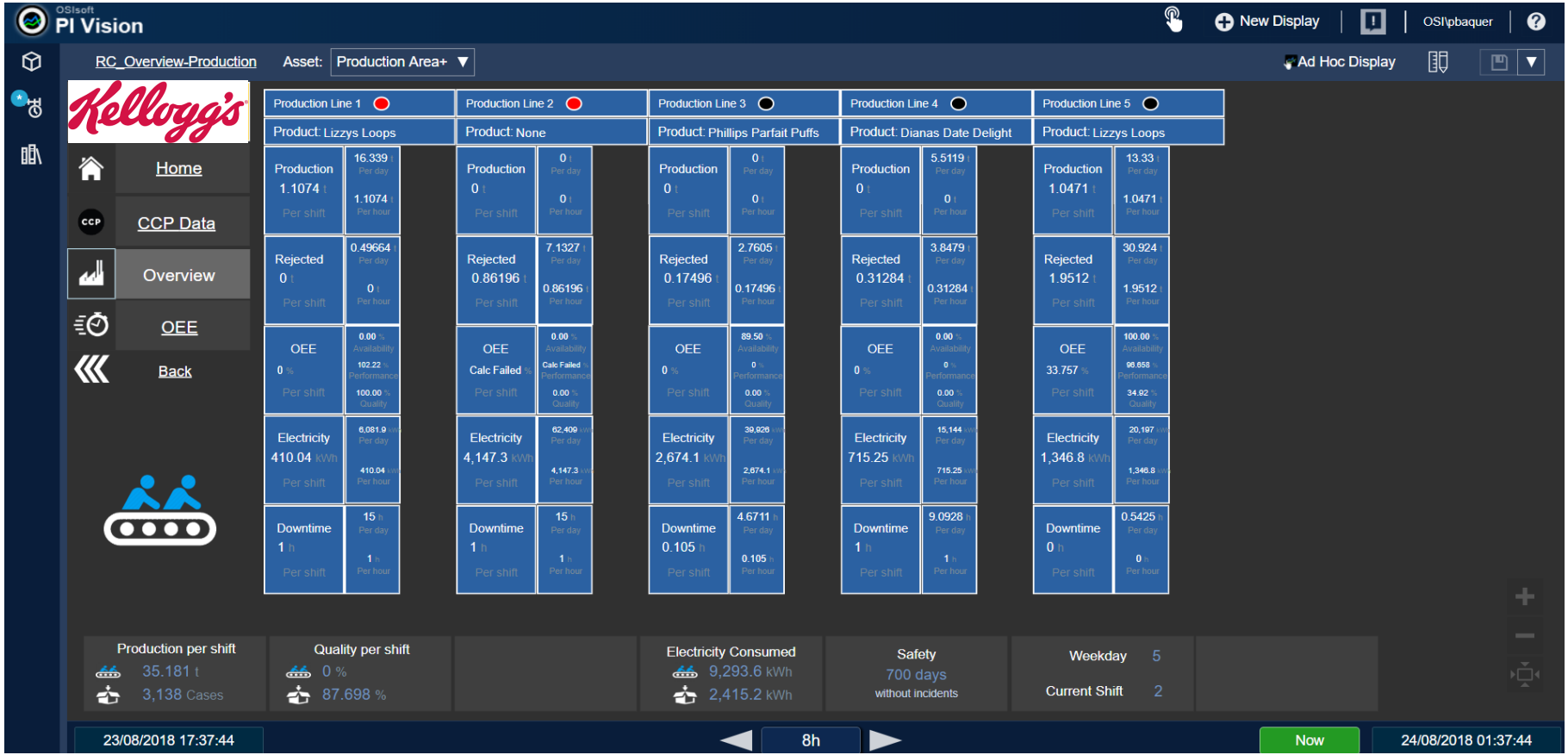
Example of equipment digitized

- It was the cartoner, **packing reference machine** which besides is our bottle neck in the production line.

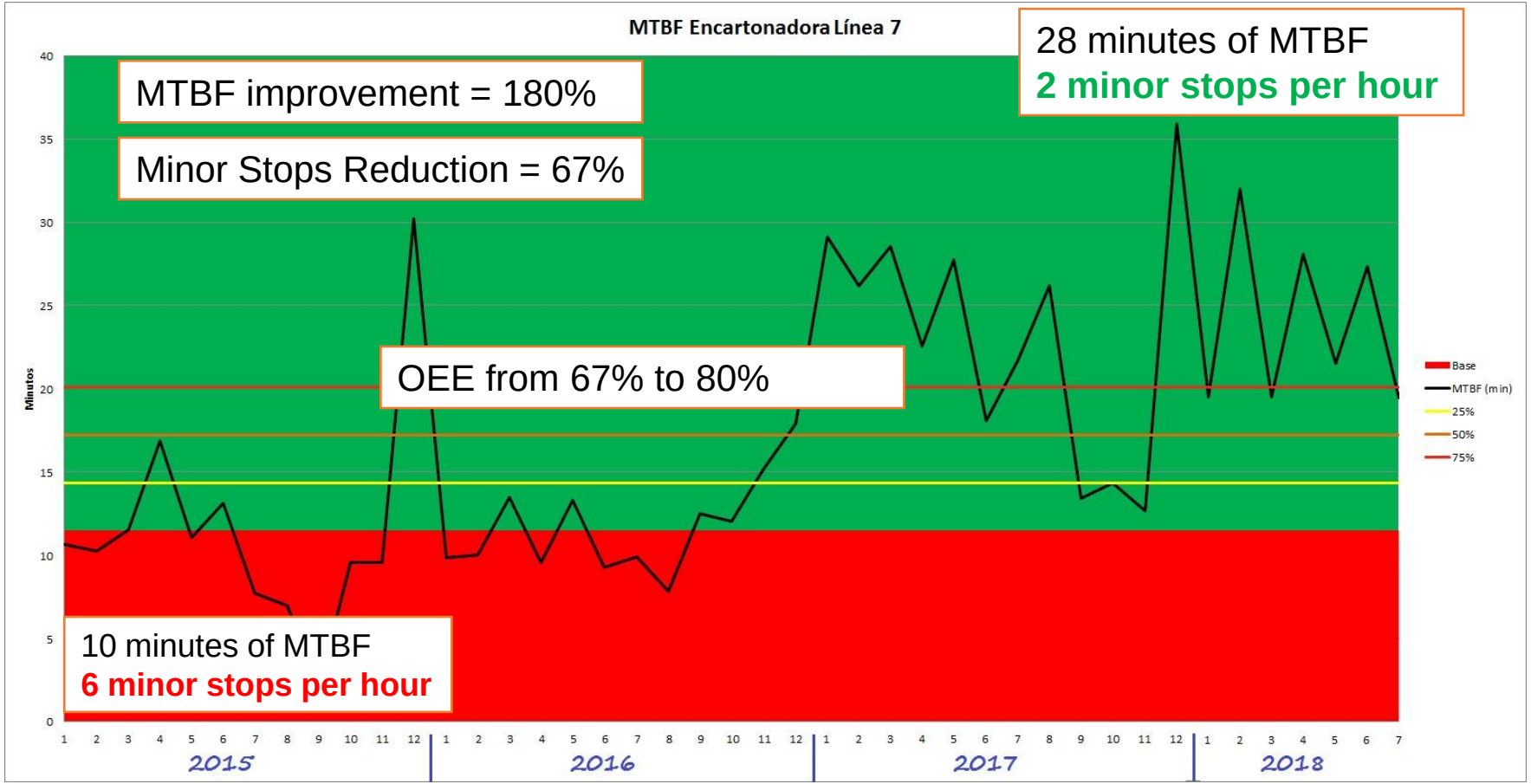
Results: To Control minor stops in real time allow us to find Root cause of inefficiencies and set up AM task accordingly



Results: We dispose a dashboard where our operations team can control the efficiency of our packing lines in real time.



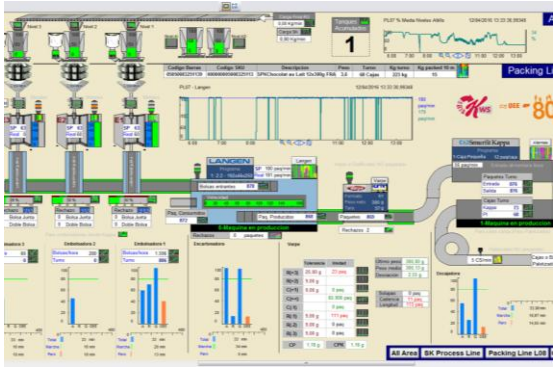
Results




LANGEN
Programa:
4 3.8 - 192x69x290
Bolsas entrantes 34.315
Paq. Consumidos 34.274
Rechazos 63 paquetes
5-Maquina en produccion
Velocidad:
0 20 40 60 80 100 120 140 180
SP 150 paq/
Real 150 paq/

Kellogg Manafucturing Valls

Osisoft PI Digital Twin for improving OEE in packing lines



CHALLENGE

In 2015 the packing lines OEE was 68% in order to be in the Best in Class CPG industry (80% OEE), the company started an Autonomous Maintenance project.

- 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

Create packing line Digital Twin using Osisoft PI System

- Automatic data collection using PI OPC Interface of all packing machines.
- Create a PI Asset Framework structure and setup Analytics.

RESULTS

80% Efficiency improvement in packing

- 67% less of minor stops per hour.
- MTBF increased from 10 minutes to 28 minutes. (180%).
- Use of the PI System to support Advanced Data Analytics and Machine Learning projects

Use cases Summary

RESULTS

Regulatory requirement for Quality Compliance.

- We have not had Non-conformities during the BRC audits anymore.(1440 weight samples per shift).
- We have eliminated the human error.
- The information in real time enables to take actions at shift basis.

RESULTS

64% of CCP's incident reduction since 2015.

- From 14 Incidents in 2015 to 5 in 2018 YTD, 64% reduction.
- From 13 product holds in 2015 to 5 in 2018 YTD, 61% reduction.
- We have reduced variability in our process.
- Less time is spent looking for data and more time spent analyzing it.

RESULTS

80% Efficiency improvement in packing

- 67% less of minor stops per hour.
- MTBF increased from 10 minutes to 28 minutes. (180%).
- Use of the PI System to support Advanced Data Analytics and Machine Learning projects

PI System in the CPG Industry

- Jaume Valls
- Technical Manager
- Kellogg Manufacturing S.L.
- jaume.valls@Kellogg.com

- Emilio Anglés
- PC&IS Manager
- Kellogg Manufacturing S.L.
- emili.angles@Kellogg.com

Questions?

Please wait for the **microphone**

State your **name & company**

Please rate this session in the mobile app!