

OCTOBER 2021

SECIL: Using PI System to improve performance management

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AVEVA PI WORLD

The AVEVA logo is displayed in white, bold, sans-serif capital letters. The background of the slide features a dark blue gradient with abstract, glowing patterns of dots and lines in shades of blue, orange, and purple, creating a sense of motion and technology.



Summary

About Secil

Business Challenge

Architecture Definition

PI Server: Asset Framework

PI Vision

PI DataLink

PI Server: Event Frames

PI Server: Notifications

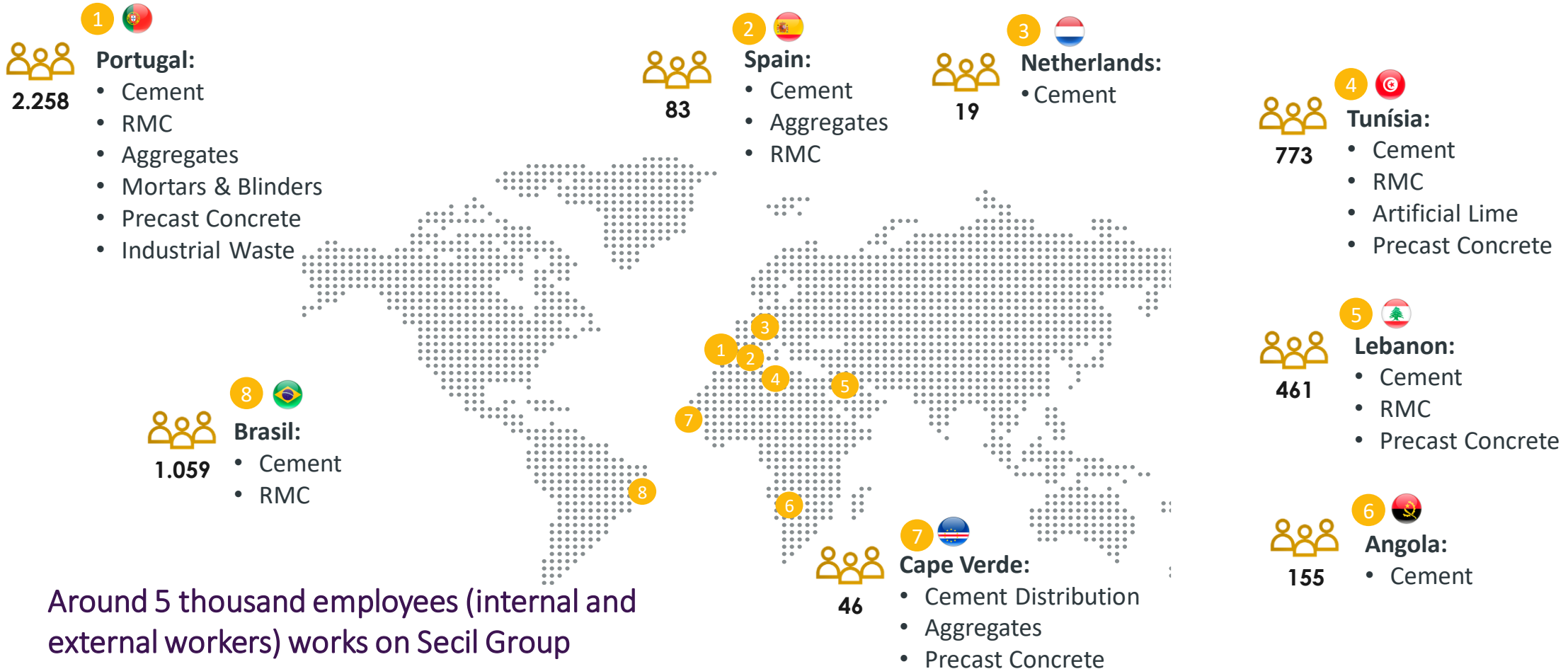
PI Integrator for Business Analytics

Machine Learning / Data Analytics

Next Steps

Conclusion

International Presence

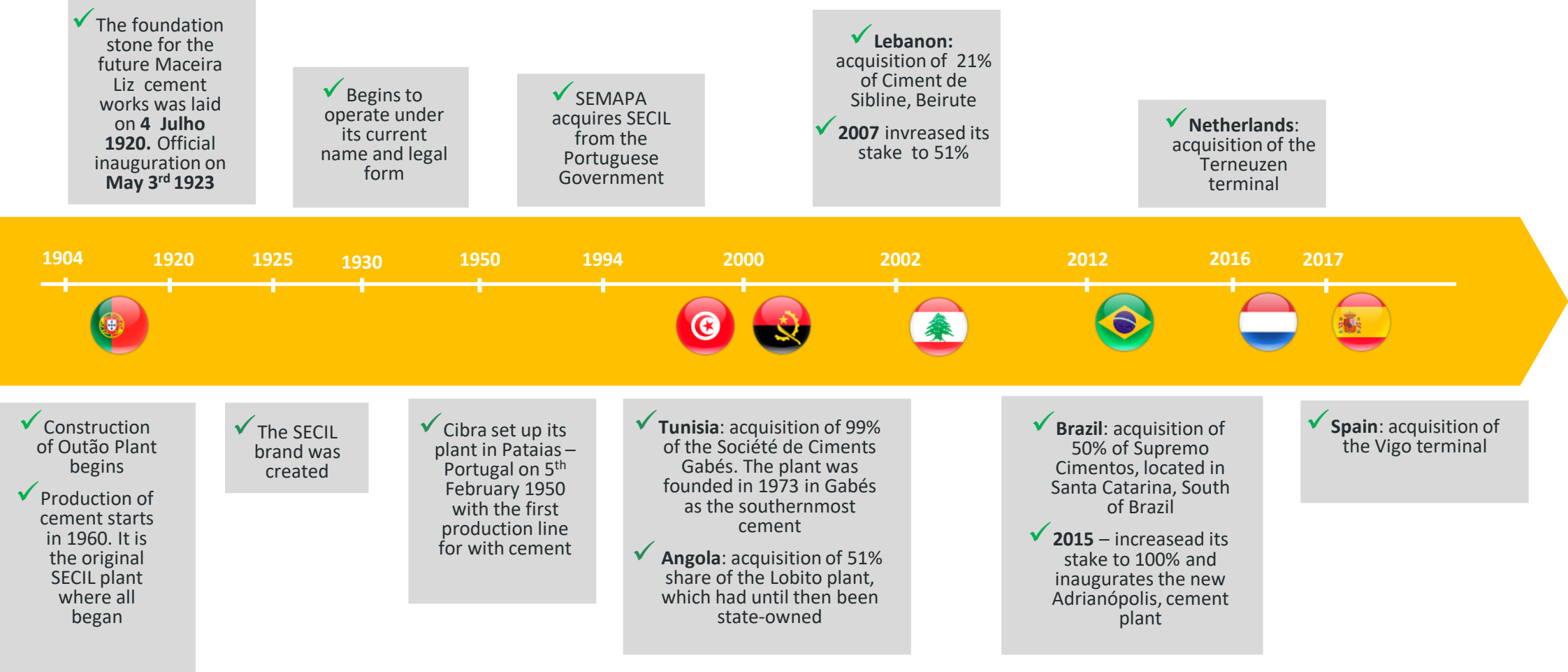


Around 5 thousand employees (internal and external workers) works on Secil Group

 Number of employees

Annual cement production capacity is 10 million tons

SECIL History



The future: Sustainability and Innovation



Environment and Technology



In 2009 Secil was awarded the EEP Prize – European Environmental Press - CO2 Emissions Mitigation through bioenergy and microalgae culture

Research and Development

- R&D Cooperation Protocols with Portuguese and International Universities
- Patents pending for new products and components
- Awarded the Honorable Mention in the Decarbonization category of the Sustainability Business Awards in 2021.



Innovation for Sustainability



In 2011 Secil was awarded with the “European Business Awards for the Environment” due to its sustainability management principles and procedures

ECOQUARRY PROJECT

Ecotechnology for environmental recovery of limestone quarries. Integrated in the EU LIFE program and coordinated by the University of Barcelona

Secil is a member of:



AVEVA

Business Challenge



Challenge

- Process data being lost every day
- Data spread along several systems
- Different versions of the "truth"
- No group wide standards
- Human action dependency for report generation



Solution

- Long term data historization
- Different systems data Integration capability
- Integrated visualization tools
- Easily accessible data



Benefits

- Standard information structure among the group
- Easier and faster report generation
- Easier and on time decisions
- Knowledge creation
- Cultural change

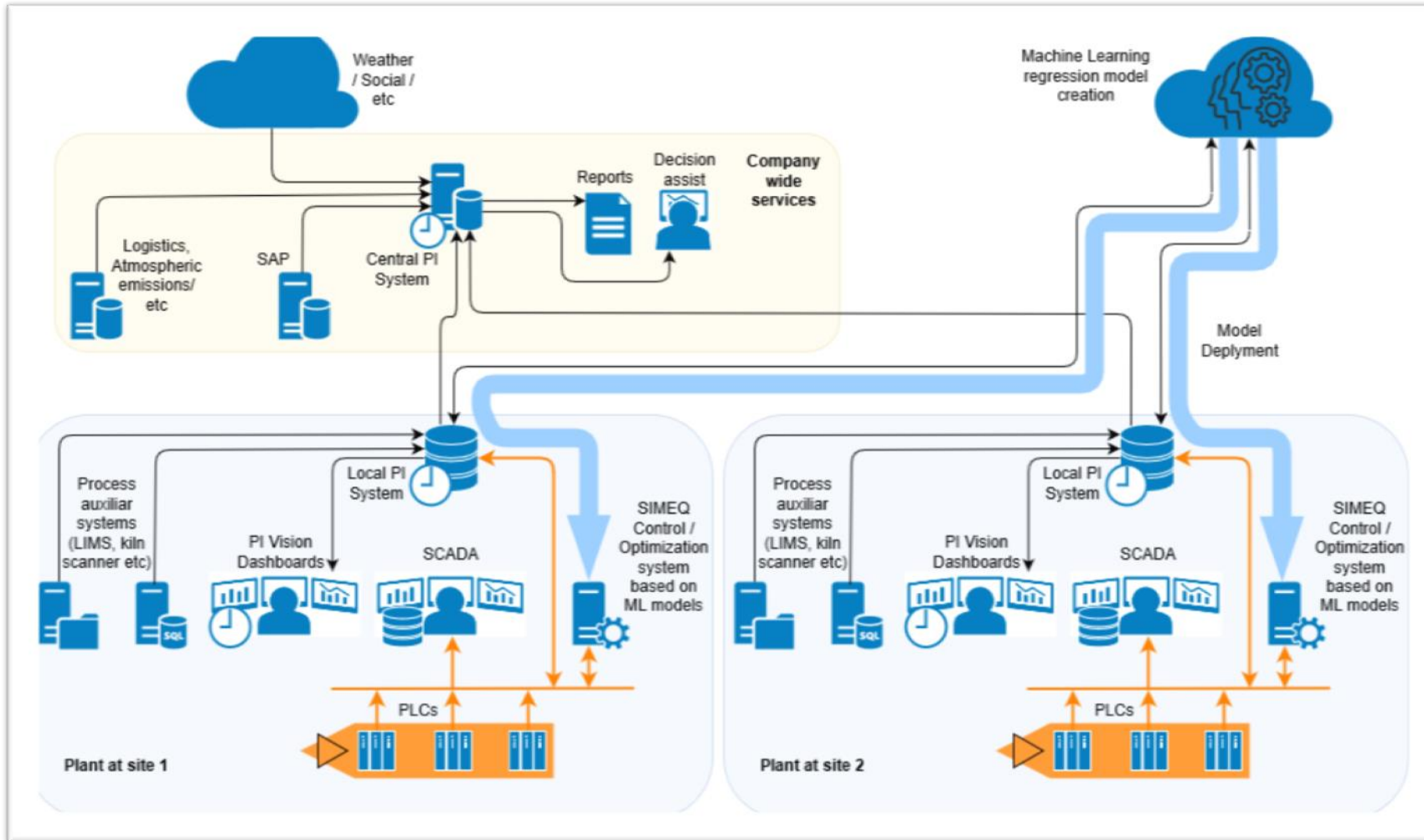
Gather all pertinent data generated in cement plants and other locations, store and transform it into valuable information to **reduce costs** and **increase performance**. Our baseline goals were:

Increase Reliability Factor

Decrease Clinker Factor

Reduce Maintenance Costs

Architecture Definition



Layout definition taking into consideration:

- Security
- Scalability
- Maintainability

PI Server: Asset Framework



The screenshot displays the PI Server Asset Framework interface. On the left, a tree view shows the hierarchy: Elements > Maceira Liz > 000 - General > 100 - Raw Materials Handling > Library > Secil > Templates > Element Templates. The main panel shows the configuration for 'Cement Mill' (431 - Kiln) under the 'General' tab. A table lists KPIs 19 - Utilization Rate Daily, Monthly, Shift, and Weekly. Below this, an 'Example Element' is shown: 'Maceira Liz\500 - Cement Grinding\533 - Cement Mill'. A table of variables and their expressions is displayed:

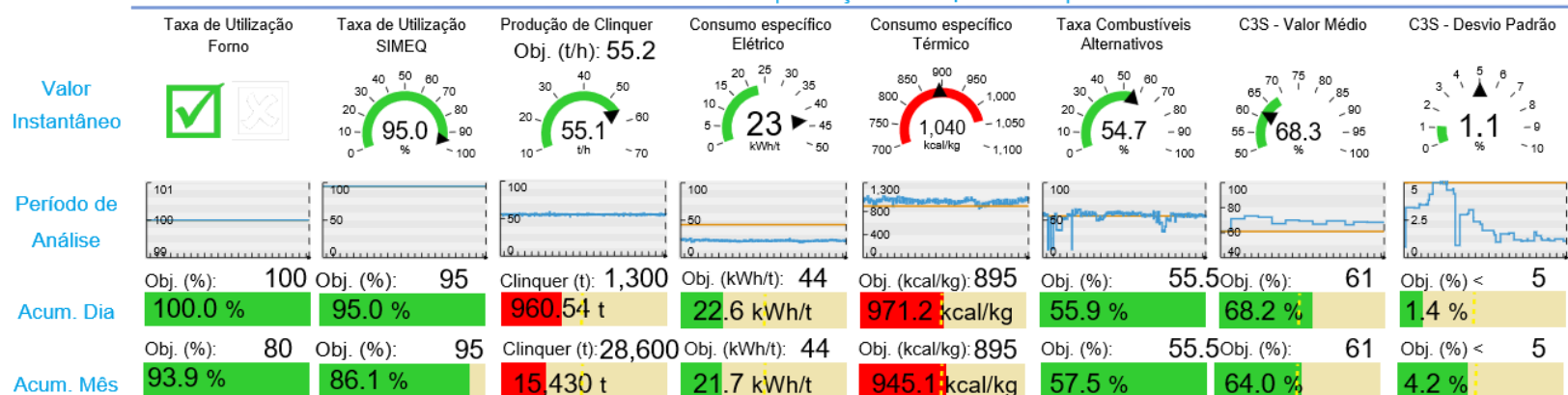
Name	Expression	Output Attribute
InicioTurno	if Hour('*') < 8 Then 't' else if Hour('*') >= 8 and Hour('	Map
Turno	TimeEq('Running', InicioTurno, HoraActual, 1) / 60 / 60	Map
TiempoTurno	if Hour('*') < 8 Then (Daysec('*') / 60 / 60) else if Hour('*') >= 8 and Hour('	Map
RateDiaria	Diaria / (DaySec('*') / 60 / 60) * 100	Map
RateDiariaCorregida	if BadVal(RateDiaria) then 0 else RateDiaria	Utilization Rate
RateTurno	Turno / TiempoTurno * 100	Map
RateTurnoCorregida	if BadVal(RateTurno) then 0 else RateTurno	Utilization Rate

At the bottom, the 'Scheduling' section shows 'Event-Triggered' and 'Periodic' options, with 'Periodic' selected. The 'Period' is set to '00h 10m 00s' and the 'Offset' is '00h 09m 59s'. A 'Configure' button is available.

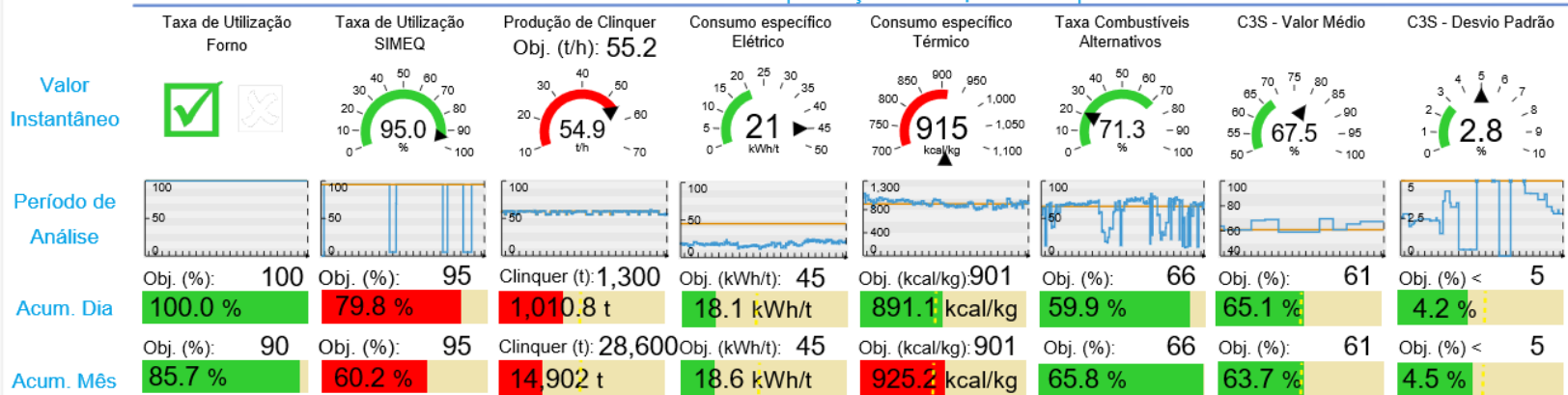
Usage of Asset Framework to perform a **standard structure to be applied to all the group plants**, with templates and analysis to ensure a common KPI definition:

- Real time values;
- Per shift, per day, per week, per month and per year KPI attributes;
- Per asset and per process phase organization.

400 - Clinker Production | Produção de Clinker - Kiln 5 | Forno 5



400 - Clinker Production | Produção de Clinker - Kiln 6 | Forno 6



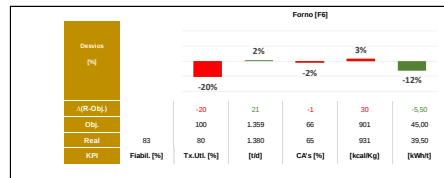
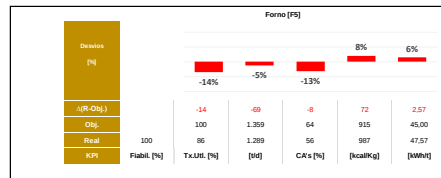
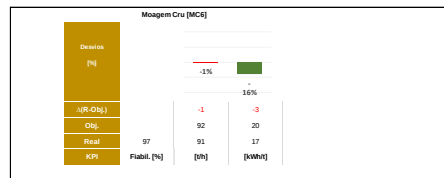
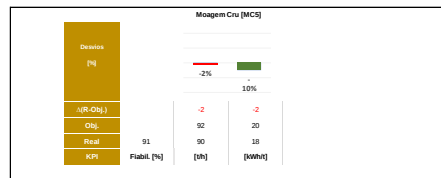
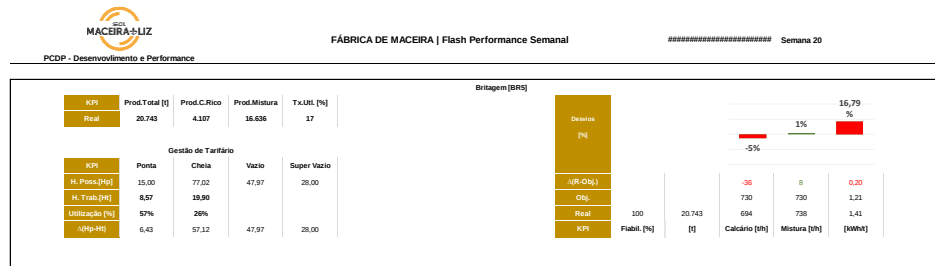
Creation of a set of asset KPIs allowing a **quick process status overview** and implementing a **Short Interval Control** management routine.

Use of manual data entry symbols for targets and production plan definition.

Users with ability to create specific use cases dashboards for performance assessment.

FABRICAÇÃO - Relatório de Turno

Equipa				Gestor Turno: Horácio Alexandre		Data	16-05-2021	Turno:	08:00 16:00			
				Oper.(L5/MCim): Horácio Alexandre								
				Oper.(L6): Jorge Santos								
	Par.	Arr.	Cau.				Objetivos		Processo			
							ACT (actual)	0.00	Emprego - (At) L6 (h)		0.00	



PI Server: Event Frames



Plant
Start Time
2021-05-13
End Time
2021-05-14
Last 24H

Admin
Select Language:
☐ PORTUGUÊS
☒ ENGLISH
☐ FRANÇAIS

STOPPAGES RATING

Local Name
321 - Raw Mill - Moagem Cru 5
Original Stoppage Cause
Unscheduled [Not Determined]
2nd Stoppage Classification

3rd Stoppage Classification

Event Classification
Local Name
431 - Kiln - Forno 5
Start Time
2021-05-18 03:45:31
End Time
2021-05-18 04:34:59
Stoppage Category
Unscheduled
Department
431 - Forno 5
Stoppage Type
Electrical Failure
Equipment
Aumund 202 - A5
Failure Type
Rotation Fault
Annotations
Corrective Actions
Original Stoppage Cause
Start Time
2021-05-18 03:45:31
Reason
Unscheduled | Electrical Failure | Rotation Fault
2nd Stoppage
Start Time
Reason
3rd Stoppage
Start Time
Reason
Delete Event Classification
Delete Event Classification
Cancel
SAVE
☐ Close Event

Acknowledge By
SECIL\amjeronimo
Annotations By

Local Name
321 - Raw Mill - Moagem Cru 5
322 - Raw Mill - Moagem Cru 6
461 - Coal Mill - Moagem Carvão 2
423 - Filler Mill - Moagem Filler 1
462 - Coal Mill - Moagem Carvão 1
531 - Cement Mill - Moagem Cimento 7
532 - Cement Mill - Moagem Cimento 8
533 - Cement Mill - Moagem Cimento 9
111 - Crushing - Britagem 5
462 - Coal Mill - Moagem Carvão 1
461 - Coal Mill - Moagem Carvão 2
462 - Coal Mill - Moagem Carvão 1
461 - Coal Mill - Moagem Carvão 2
462 - Coal Mill - Moagem Carvão 1
531 - Cement Mill - Moagem Cimento 7
532 - Cement Mill - Moagem Cimento 8
533 - Cement Mill - Moagem Cimento 9

Event Frame Search 1
Group by: ☐ Category ☐ Template

Filter	Name	Duration	Start Time	End Time	Reason	Equipment
OK	532 - Cement Mill - Moagem Cimento 8 - Stoppage...	13:46:30	11/05/2021 08:19:33	11/05/2021 22:06:03	Programada Produção Gestão de Energia	532-Moagem Cimento 8
OK	532 - Cement Mill - Moagem Cimento 8 - Stoppage...	0:40:00	12/05/2021 04:27:03	12/05/2021 05:07:03	Não Programada Anomalia Mecânica Sensores de Proteção (Ca...	Ventilador 8446 - MC8
OK	532 - Cement Mill - Moagem Cimento 8 - Stoppage...	4:00:30	12/05/2021 08:55:33	12/05/2021 12:56:03	Programada Produção Gestão de Energia	532-Moagem Cimento 8
OK	532 - Cement Mill - Moagem Cimento 8 - Stoppage...	4:09:30	13/05/2021 09:06:04	13/05/2021 13:15:34	Programada Produção Gestão de Energia	532-Moagem Cimento 8
OK	532 - Cement Mill - Moagem Cimento 8 - Stoppage...	16:28:30	14/05/2021 07:00:33	14/05/2021 23:29:03	Programada Produção Gestão de Energia	532-Moagem Cimento 8
OK	532 - Cement Mill - Moagem Cimento 8 - Stoppage...	0:19:30	15/05/2021 06:03:03	15/05/2021 06:22:33	Não Programada Anomalia Mecânica Outra Causa	Elevador TM1 (61) - TM
OK	532 - Cement Mill - Moagem Cimento 8 - Stoppage...	13:16:01	15/05/2021 08:59:03	15/05/2021 22:15:04	Programada Produção Gestão de Energia	532-Moagem Cimento 8

Use of Event Frames to implement a downtime classification tool, based on MS Excel, VBA and PI Web API.

Standardization of downtime classification by defining a group wide set of predefined stoppages causes.

PI Server: Notifications



Web Service Configuration

Web Service Address: `http://SCPTSAPERP1.secil.pt:8000/sap/bc/srt/wsd/rlv_10002A111AD1/bndg_url/sap/bc/srt/rfc/sap/zbapi`

Web Service: ZBAPI_ALM_NOTIF_CREATE

Web Method: CallZBAPI_ALM_NOTIF_CREATE

Name	Value Type	Value
ZBAPI_ALM_NOTIF_CREATE.NOTIFHEADER.FUNCT_LOC	String	Installation Location:Val
ZBAPI_ALM_NOTIF_CREATE.NOTIFHEADER.PRIORITY	String	3
ZBAPI_ALM_NOTIF_CREATE.NOTIFHEADER.SHORT_TEXT	String	Brief Description:Value A
ZBAPI_ALM_NOTIF_CREATE.NOTIFHEADER.REPORTEDBY	String	OSISOFT
ZBAPI_ALM_NOTIF_CREATE.NOTIF_TYPE	String	M2
ZBAPI_ALM_NOTIF_CREATE.NOTITEM[0].ITEM_SORT_NO	String	001
ZBAPI_ALM_NOTIF_CREATE.NOTITEM[0].DL_CODE	String	Part Object 2:Value At Se
ZBAPI_ALM_NOTIF_CREATE.NOTITEM[0].DL_CODEGRP	String	Part Object 1:Value At Se

Exibir nota PM: Nota de avaria

Nota: 0135852 M2 PRE ROLO FIXO TEMP ENROLAM 2 MOTOR

Status da nota: MSPN

Objeto de referência

Loc. instalação: FM-PRE-PRO-ACC ACCIONAMENTO

Equipamento:

Conjunto:

Situação

Descrição: PRE ROLO FIXO TEMP ENROLAM 2 MOTOR

Responsabilidades

Grp.plnj.PM: / 1820

CenTrab respon.:

Pessoa responsável:

Notificador: OSISOFT Data da nota: 20.04.2021 16:39:09

Datas-base

Prioridade: 3 Média

Parada:

Item

Parte objeto: E145 106 Estator

Sintom.dano:

Texto:

Causa:

Texto da causa:

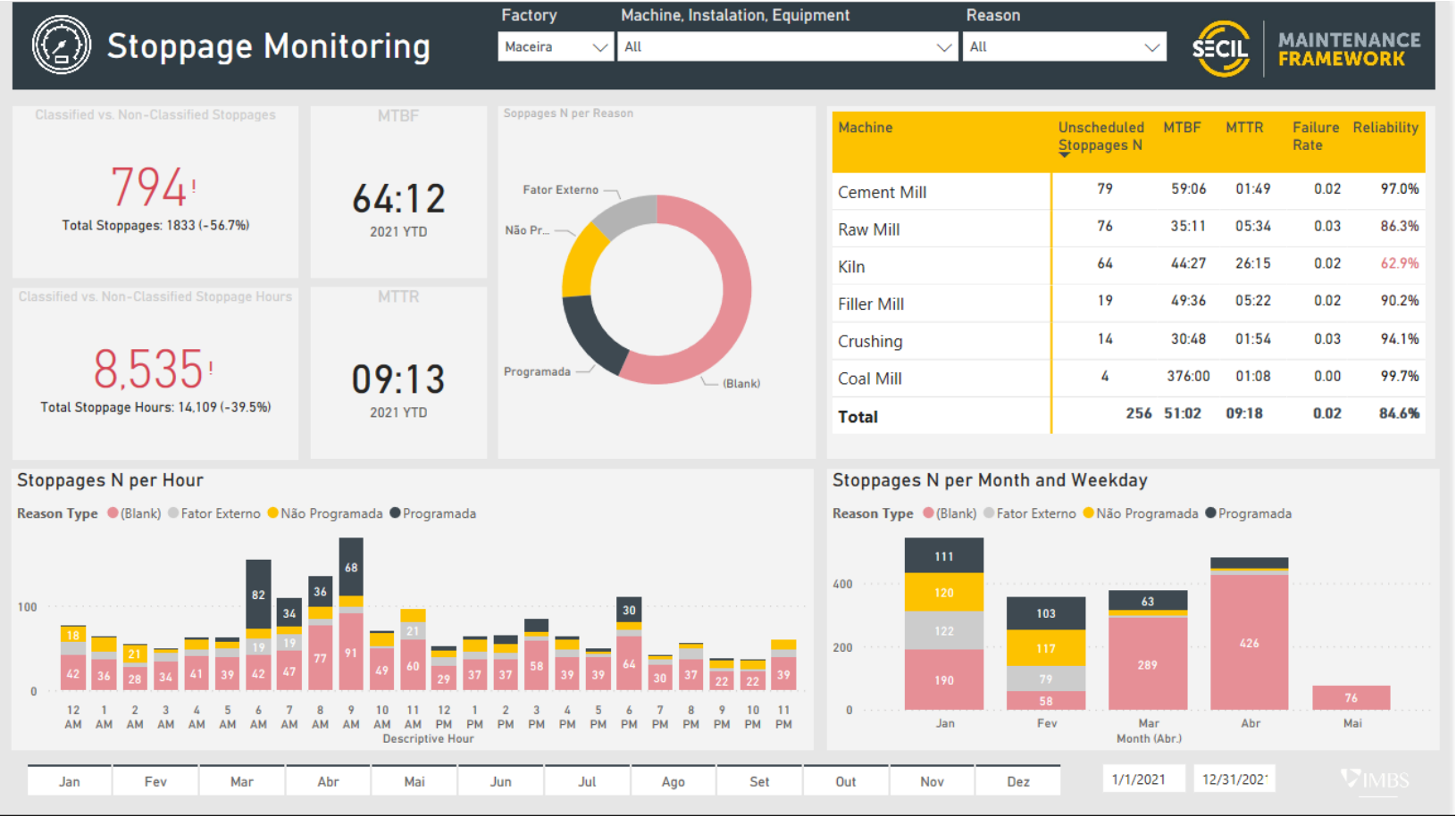
Entrada 1 de 1

Triggers definition for conditions to deploy an alarm message:

- through e-mail notification;
- directly to *SAP/IBM Maximo* using SOAP messages to create Failure Notes.

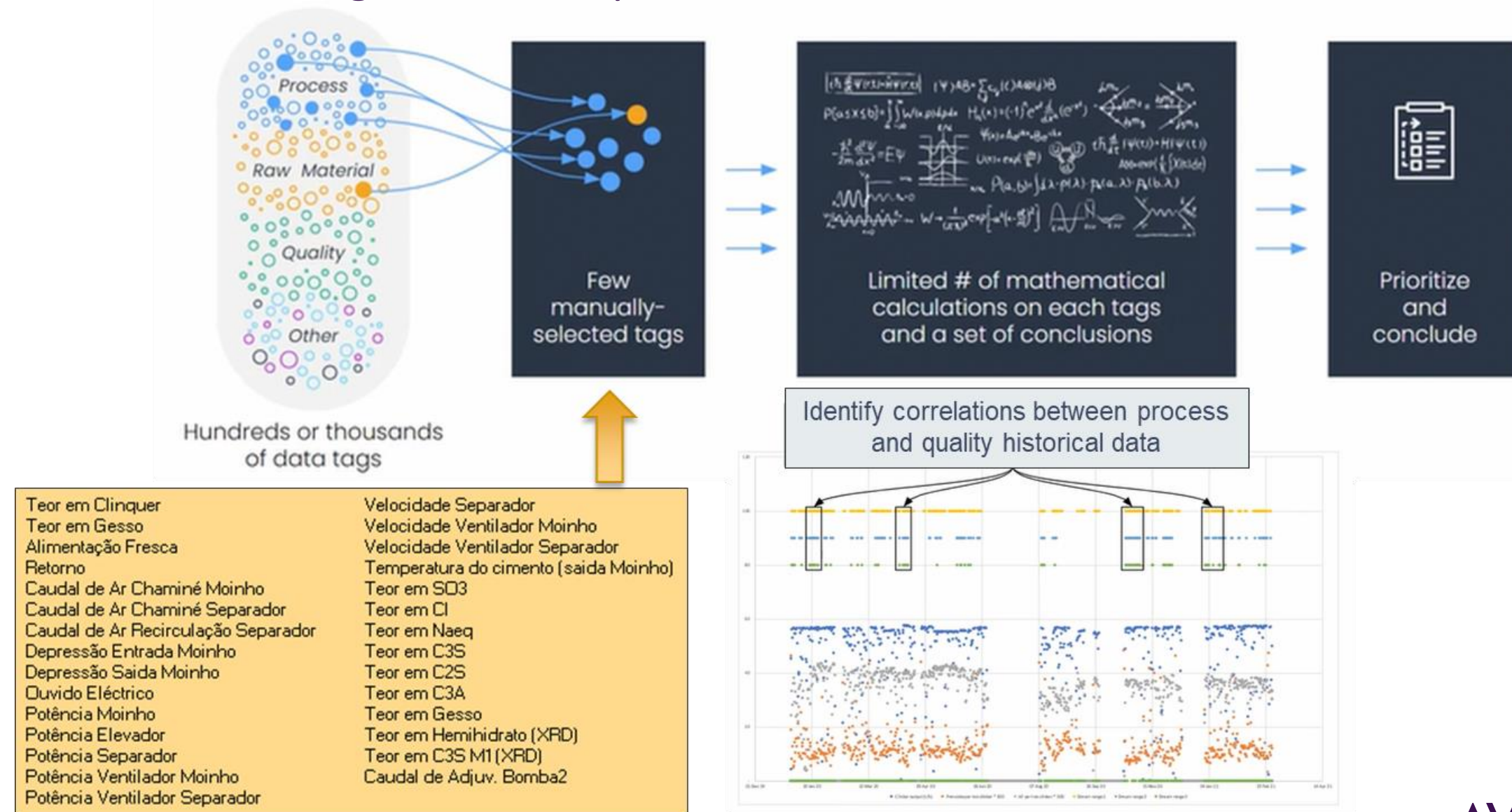
Maintenance Plans converted from calendar time based to running hours. PI system sends daily notifications to *SAP/IBM Maximo* feeding the plans with running hours.

PI Integrator for Business Analytics

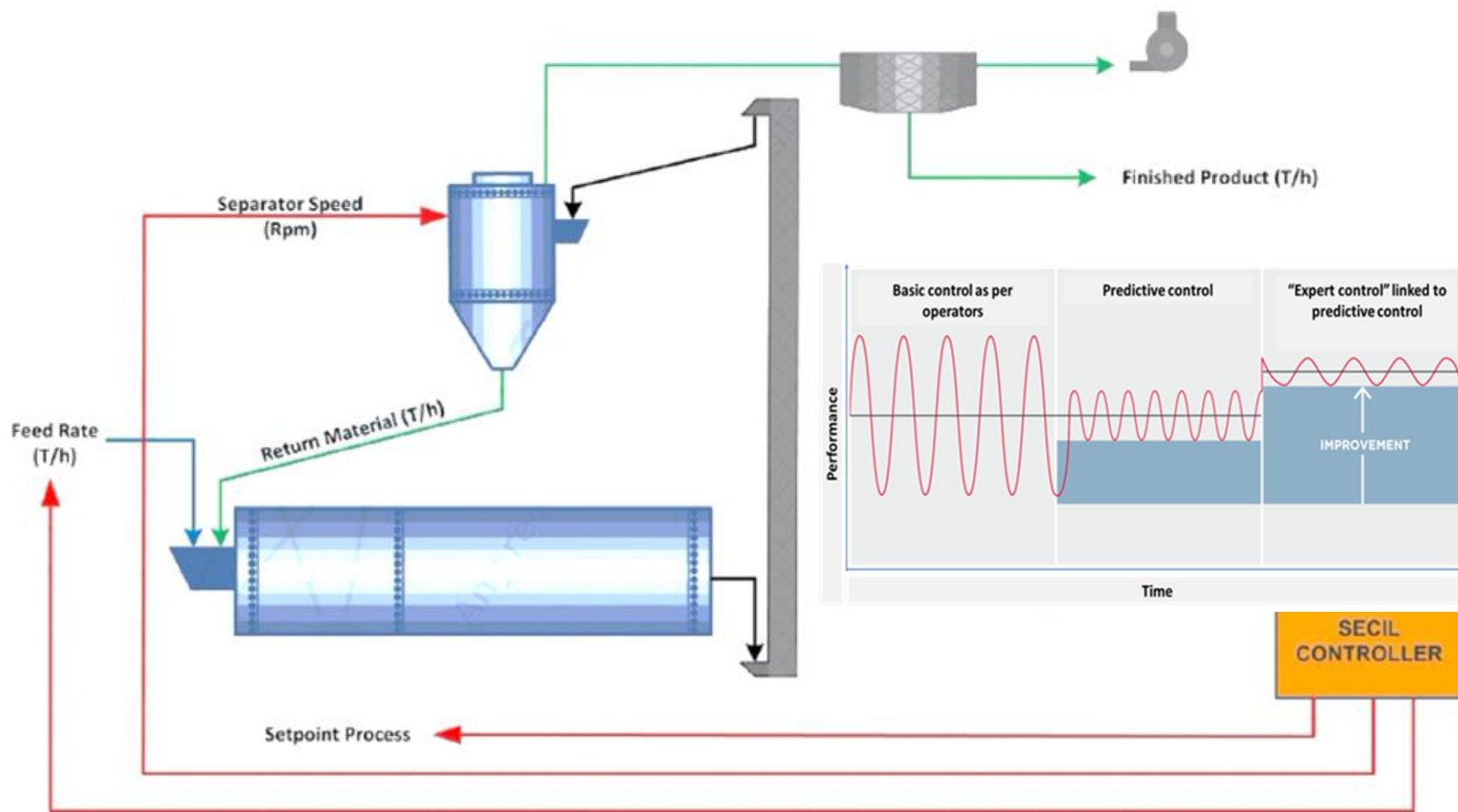


Management tools for visualization and analysis on MS Power BI, using PI Integrator for Business Analytics.

Machine Learning / Data Analytics



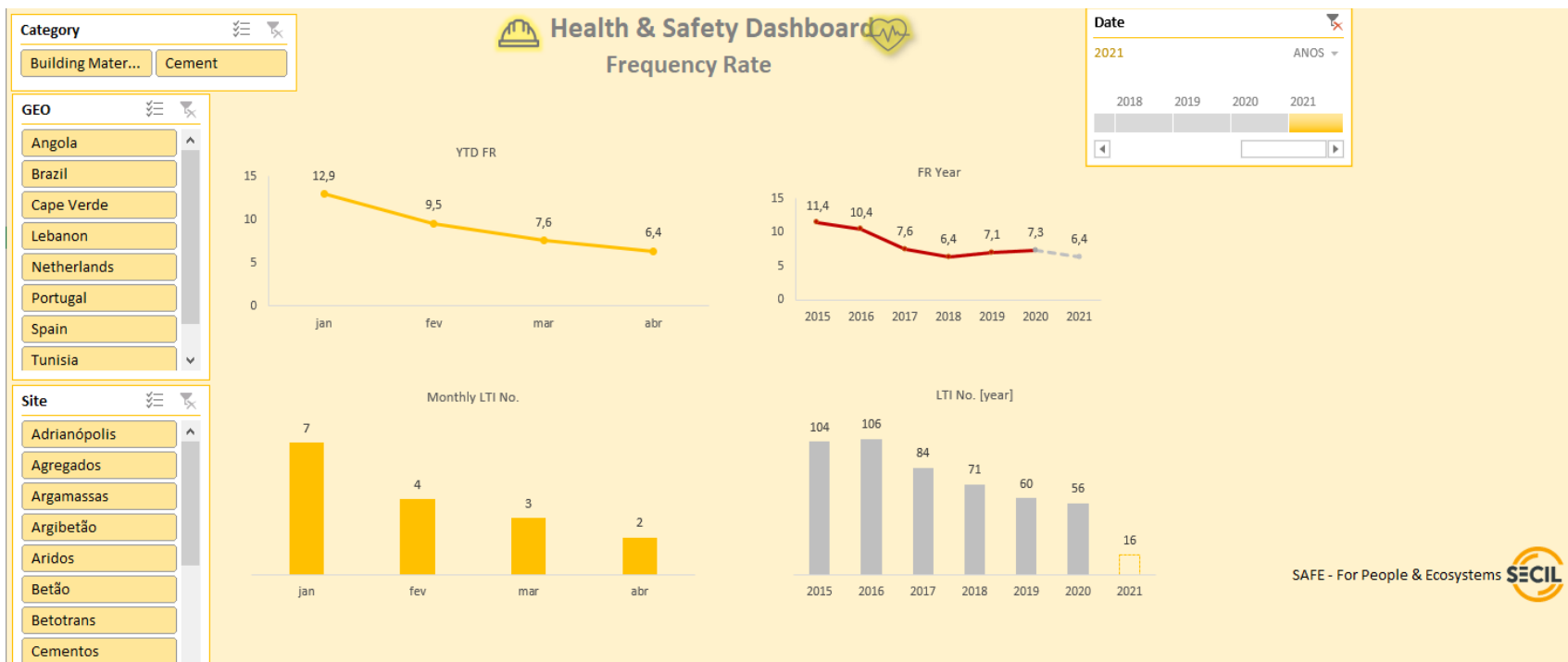
Machine Learning / Data Analytics



Interfacing with 3rd party companies for development of data based predictors, taking action on the process through OSI PI interfaces.

- Online and historical Process and Quality data feed the Soft Sensor Model
- Soft Sensor returns online measurements to Expert System control loop setpoint, that adjusts separator speed or fresh feed online

PI to PI Interface and PI System Connector



Use of PI to PI Interface and PI System Connector to gather group data from all plants into a central corporate PI Server for a inter group performance analysis.

Take advantage of long term history to create data driven models that will allow to optimize the process performance:

- Reduce **carbon foot print** by increasing alternative fuels co-processing rate
- Reduce primary raw materials on the manufacturing process
- Smart usage of natural energy sources
- Recovery of waste heat energy

CLEAN CEMENT LINE – CONCEITO

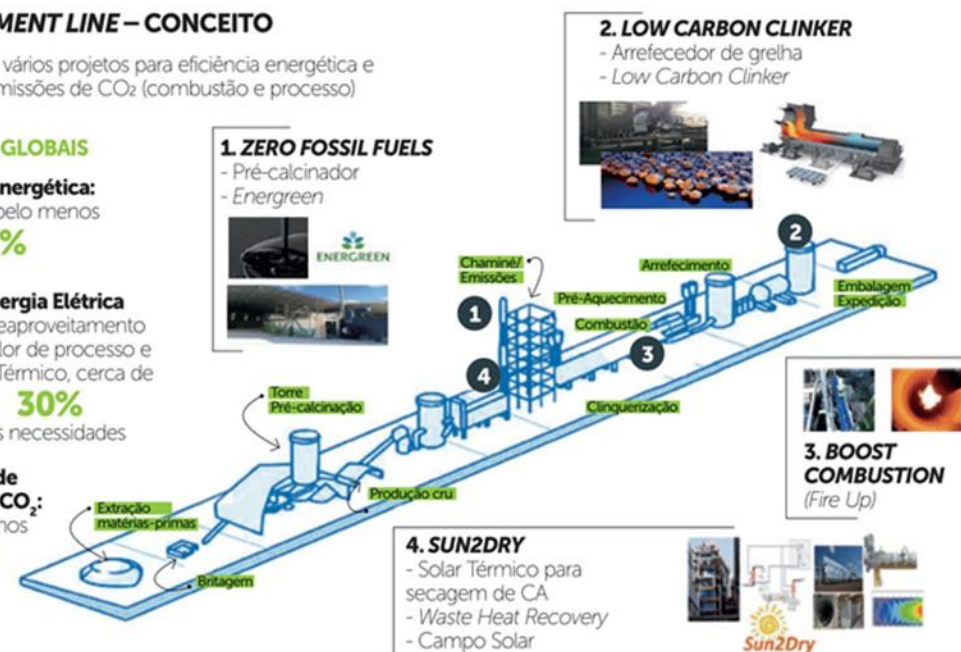
Integração de vários projetos para eficiência energética e redução de emissões de CO₂ (combustão e processo)

BENEFÍCIOS GLOBAIS

Eficiência Energética:
redução de pelo menos
20%

Energia Elétrica
por reaproveitamento
do calor de processo e
Solar Térmico, cerca de
30%
das necessidades

Redução de Emissões de CO₂:
de pelo menos
20%



Conclusion



- **Enterprise Agreement** materialized as a commitment between SECIL and OSISOFT that allowed accelerating the project implementation.
- Online data and instantaneous KPIs visible in the control room for operators and area managers putting focus on the **Short Interval Control** management cycle.
- Taking advantage of online operational data and linking it to SAP/IBM MAXIMO led to an **optimization on the maintenance department resources** and a better focus according to the criticality of the assets.
- PI System democratization – getting users engaged – is a major catalyser for the project success. **End users are key elements in the whole picture!**



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