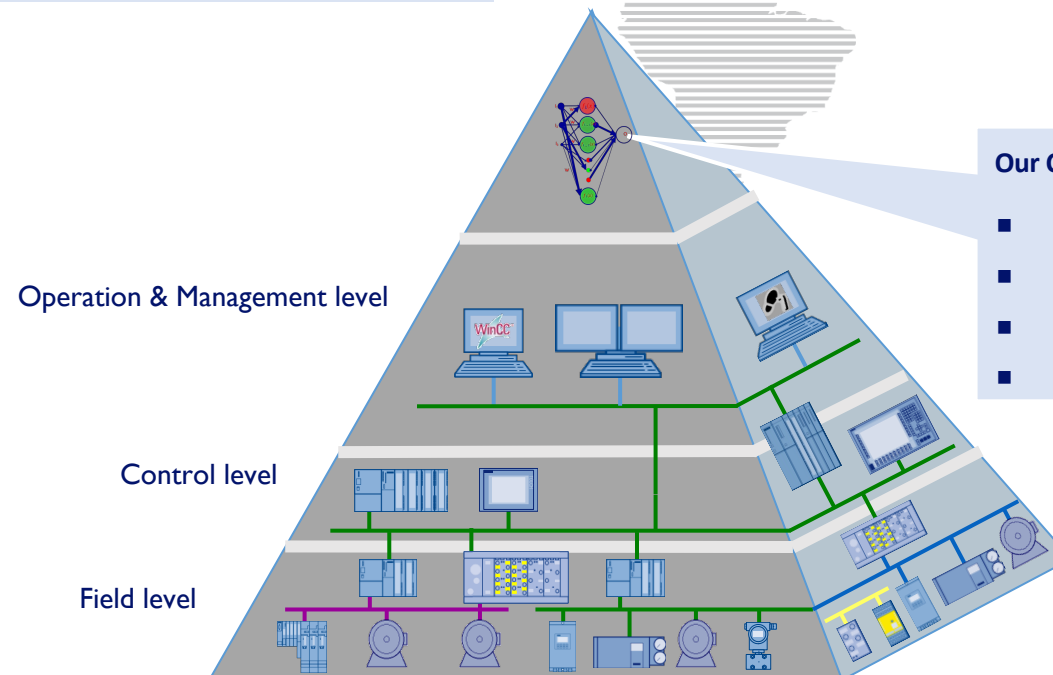
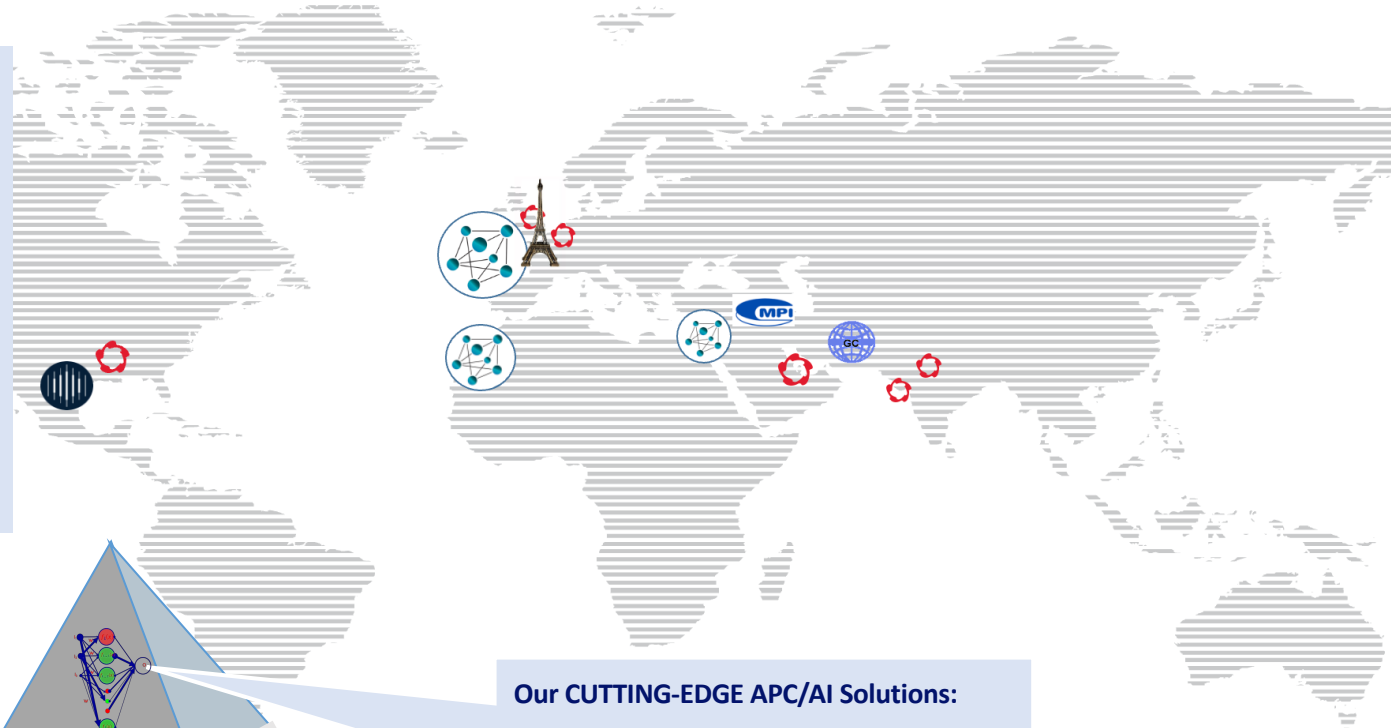




# Advanced Process Control & Process Optimization

# Global Presence – Global Recognition

- ✓ ES Processing is a leading Provider of **Advanced Process Control** and **Process Optimization** solutions for heavy industries and particularly for the **Cement Industry**
- ✓ ES Processing is headquartered in Paris area with offices and partners in EU, USA, LATAM, ME, NA & ASIA
- ✓ ES Processing is Siemens Solution Partner, **PCS7 & CEMAT Specialist** the highest level of Cement DCS expertise recognized by Siemens Germany.



## Our CUTTING-EDGE APC/AI Solutions:

- Soft Sensors
- Machine Learning
- Artificial Intelligence
- Model Predictive Control

- ✓ Extensive experience in old & new DCS for different brands (Siemens, ABB, Rockwell....)
- ✓ Cement Process Expertise
- ✓ Advanced Simulation & Automated conversion tools
- ✓ **More than 300 DCS** and **APC** turn-key projects delivered worldwide in more than 30 countries:  
Titan, Holcim, Lafarge, Secil, Vicat, Votorantim, Cimpor, Dangote...

## FAST & RISK-FREE DCS MIGRATION



- 11 PLC S7416
- 710 Motors
- 207 Valves
- 106 Dampers
- 100 PID
- 10000 I/O



**24 HOURS!**  
Setup & commissioning

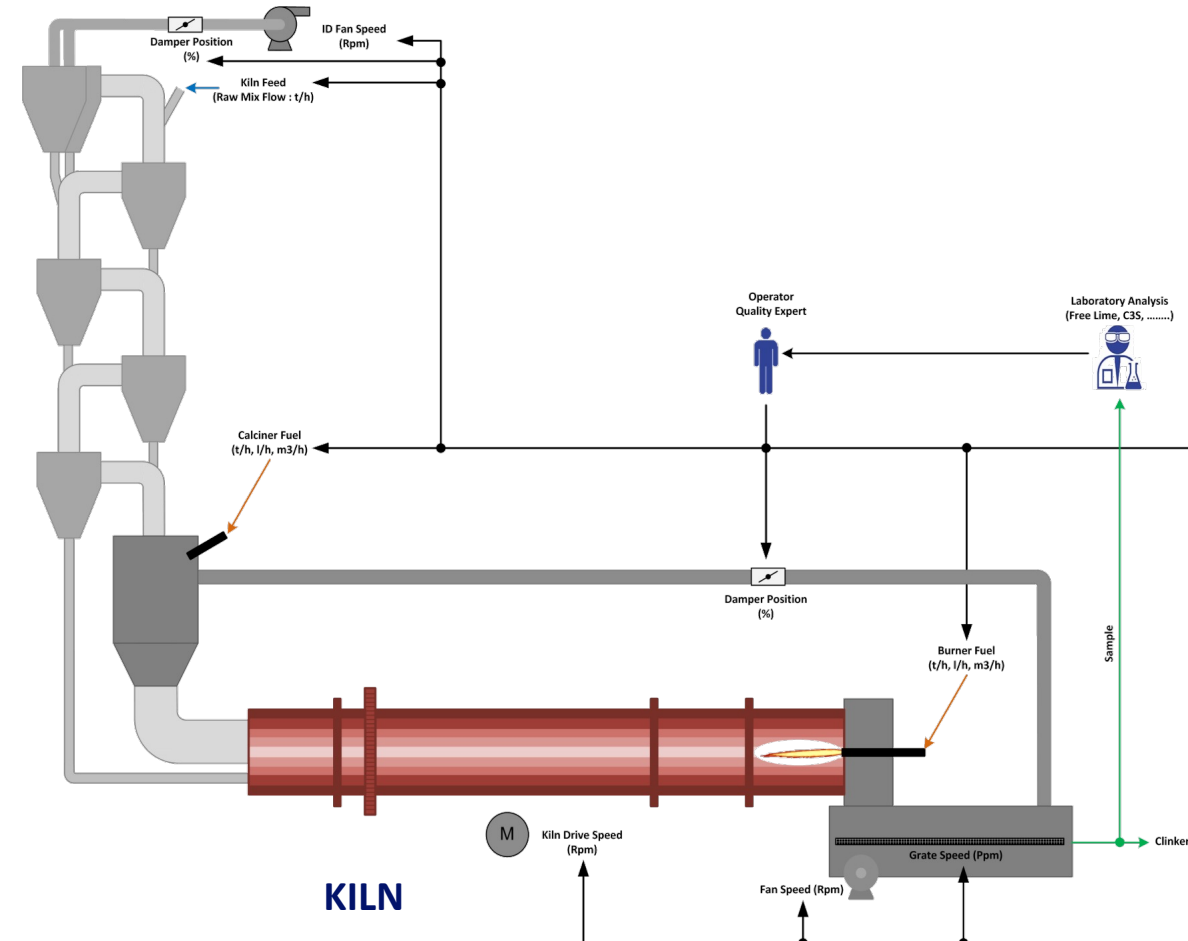


- 10 PLC S7416
- 650 Motors
- 220 Valves
- 106 Dampers
- 105 PID
- 10000 I/O

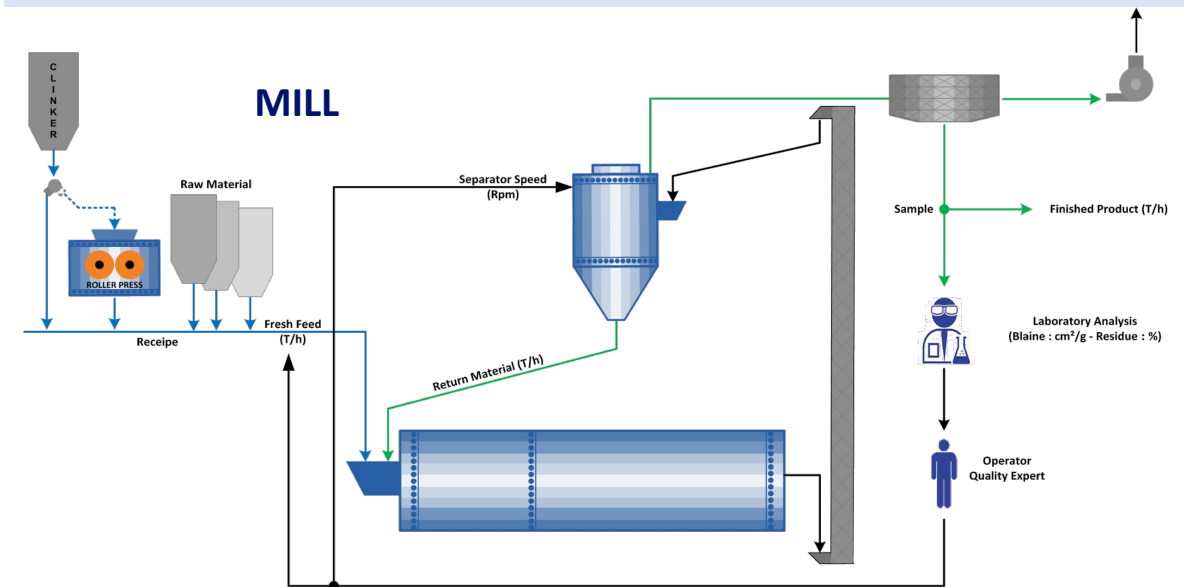


**36 HOURS!**  
Setup & commissioning





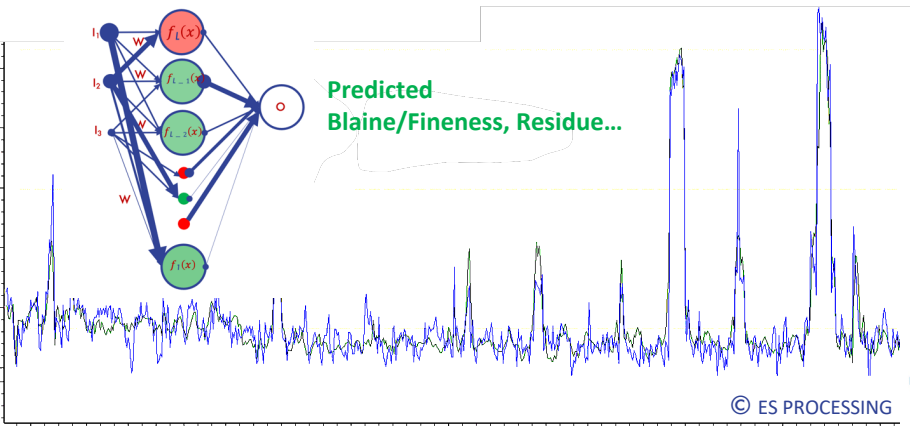
- **Process Instability :**
  - ✓ Random and limited Actions on Process Setpoints
  - ✓ Delayed clinker/cement quality analysis and low sampling frequency
- **Product Quality :**
  - ✓ Reaction of the process and affected by instability
  - ✓ Not used in continuous process control (lack of real time measurement)
- **Limited Performance:**
  - ✓ Limited Production Rate & Increased Energy Consumption
  - ✓ Non Uniform Product
  - ✓ Increased Emissions (mainly CO2)
  - ✓ Increased Wear Rate, upset conditions, stress load ...



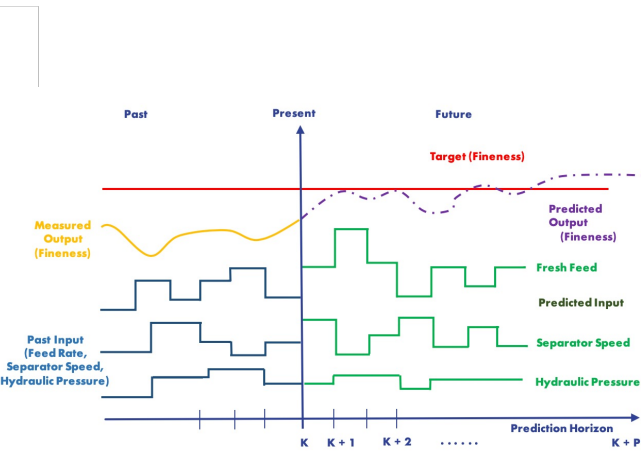
# OUR SOLUTIONS : CMO/VMO



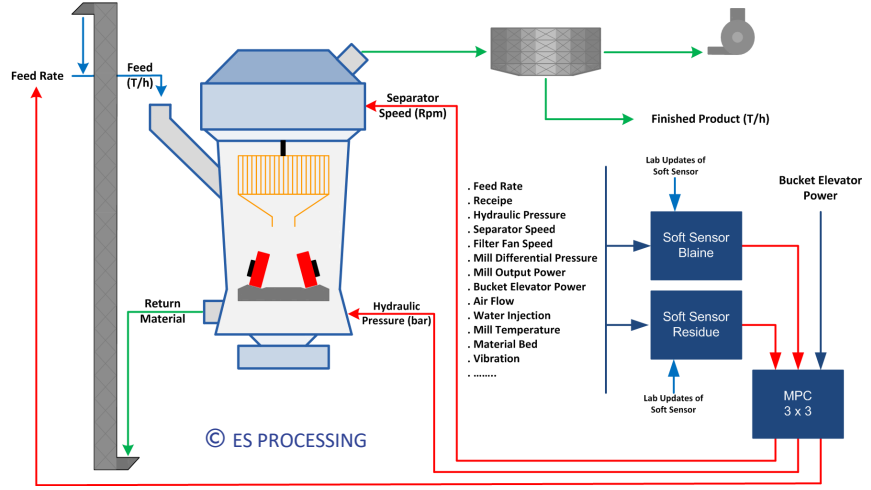
## SOFT SENSORS



## MPC



## VMO SYSTEM

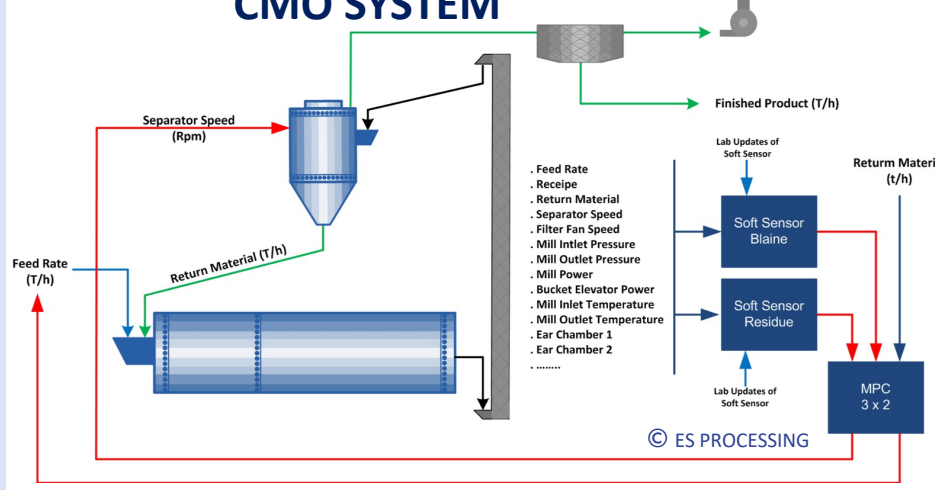


Our CMO/VMO breakthrough technology is composed of an exclusive combination of :

**Soft Sensors:** Very sophisticated models formed by combining multiple data-base algorithms adopted from machine learning and based on linear and non-linear identification techniques, PLS, genetic algorithms ... that determine the best correlation between different process parameters and fineness result, able to predict very accurately the Blaine and Residue every 30 seconds.

**MPC :** A highly complex multivariable model based on transfer functions built according to the results of impulse tests performed on each mill, able to handle complex plant dynamics, including long-dead times and non-minimum phase behavior, constraint handling, hierarchical and weighted optimization and predictive control, thus able to adjust the separator Speed, Hydraulic Pressure and Fresh Feed every 30 seconds

## CMO SYSTEM



# OUR SOLUTIONS : KPO “Kiln Process Optimizer”



**Our KPO technology, as APC/AI based solution,**

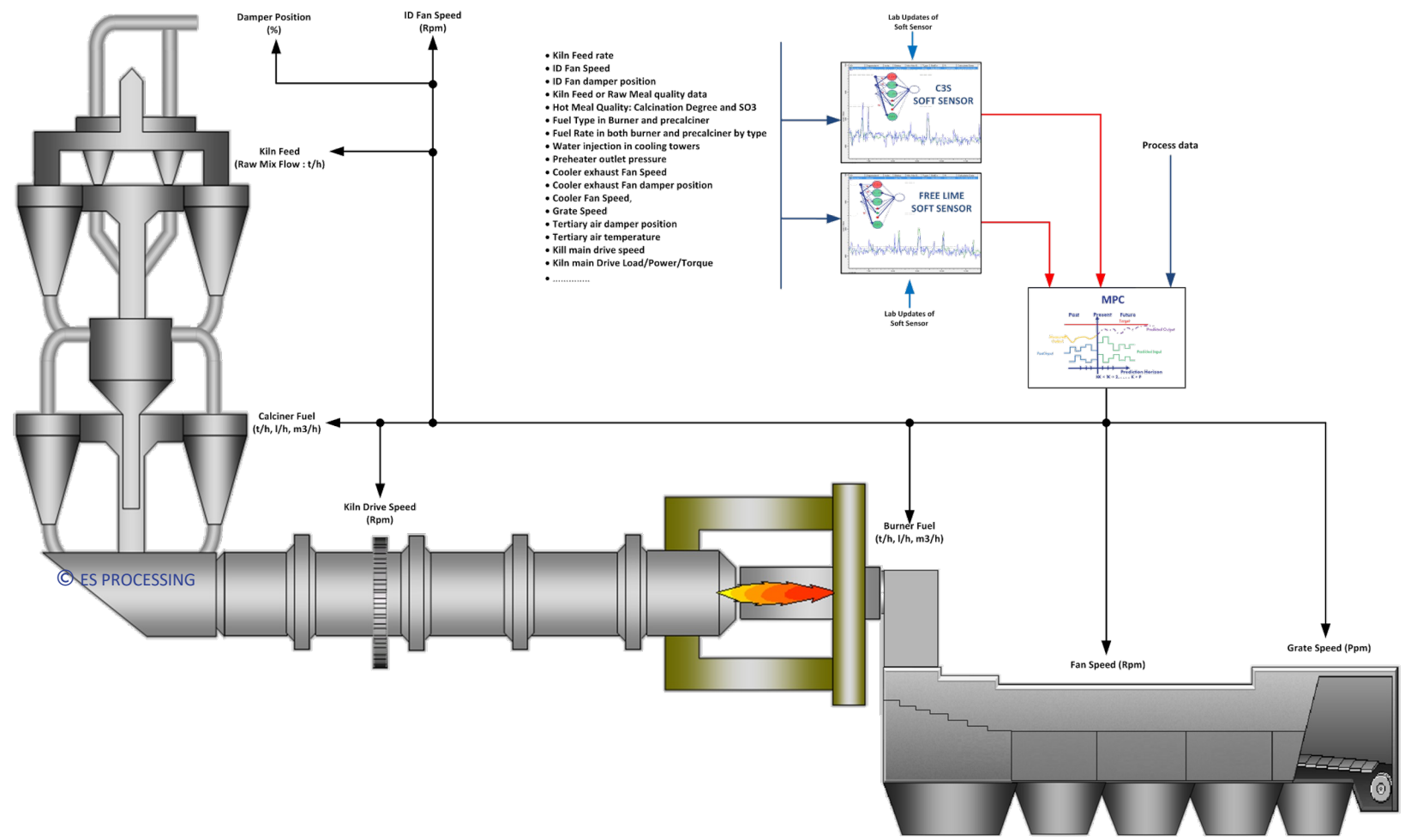
**Transforms Traditional and Reactive Operation,** based on low frequency of clinker sampling/analysis, human experience, decision matrixes and cascading control loops,

**to Proactive Intelligent Operation,** built by high frequency clinker predictions, algorithms and mathematical correlations, by an exclusive combination of:

**Soft Sensors:** determine the best correlation between different process parameters and clinker quality, able to predict very accurately the Free Lime and C3S every 30 seconds.

**MPC :** able to handle complex pyro-process dynamics and variations, to adjust the Kiln Feed, Main Burner Energy, Precalciner Energy, Preheater Draft, Kiln Speed and Cooler operation every 30 seconds

## KPO SYSTEM



## ➤ Process Stability :

- ✓ Mathematical/Algorithm Correlations
- ✓ Continuous & Accurate Predictions (every 30 seconds)
- ✓ Pro-active actions and Predictions of reactions

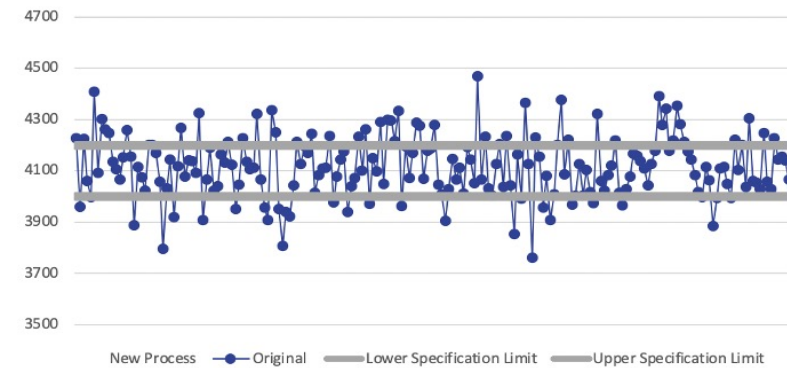
## ➤ Product Quality :

- ✓ Improved Uniformity
- ✓ Improved Quality

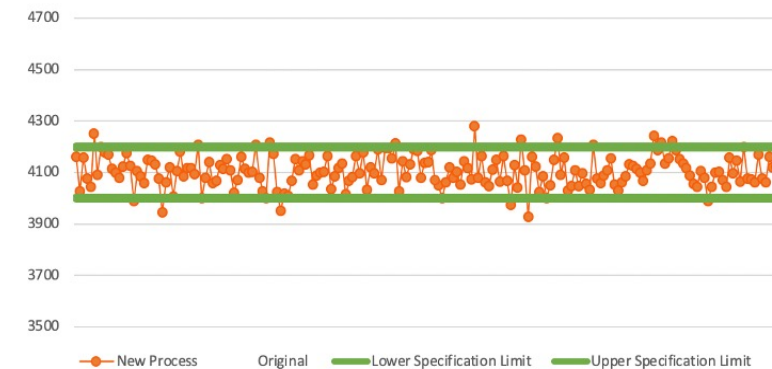
## ➤ Maximized Performance :

- ✓ Higher Production
- ✓ Reduced Specific Energy Consumption
- ✓ Reduced CO2 emissions
- ✓ Reduced stress loads, upset conditions, refractory wear

### Fineness: Before CMO



### Fineness: With CMO





## TITAN: Greece 2015 / CMO System

- Production Increase +18 % over SMART SYSTEM
- Electrical Energy Reduction -14%
- Blaine STD Reduction : -50%
  - ✓ Production increase from 110 t/h to 130 t/h
  - ✓ Cement Quality Improvement: Blaine STD reduction - 50%

Profit from Production Increase (+20 t/h): 4,400,000 USD/yr  
Saving from SEEC (-4.2 KWH/t): 500,000 USD/yr

## LAFARGEHOLCIM: 2017 / CMO System

- Production Increase +12 % over SMART SYSTEM
- Electrical Energy Reduction -9%
  - ✓ Production increase from 87 t/h with SMART SYSTEM in operation to 97 t/h
  - ✓ Specific Energy consumption reduction from 32.5kWh/tcem to 29kWh/tcem

Profit from Production Increase (+10 t/h): 2,800,000 USD/yr  
Saving from SEEC (-3.5 KWH/t): 297,000 USD/yr

## SECIL: Sibline 2018 / CMO System

- Production Increase +10 % over SMART SYSTEM
- Electrical Energy Reduction -10%
  - ✓ Production increase from 97 t/h to 107 t/h
  - ✓ Cement Quality Improvement: Blaine STD reduced from 114 cm<sup>2</sup>/g to 84 cm<sup>2</sup>/g

Profit from Production Increase (+10 t/h): 2,800,000 USD/yr  
Saving from SEEC (-3.5 KWH/t): 237,000 USD/yr

## TITAN: Greece 2019 / CMO System

- Production Increase +15 %
- Electrical Energy Reduction -8%
- Blaine STD Reduction : -50%

Profit from Production Increase (+15 t/h): 4,000,000 USD/yr  
Saving from SEEC (-2.4 KWH/t): 250,000 USD/yr



## DANGOTE : Cameroon 2020 / VMO System

- **Production Increase +7 %**
- **Blaine Average Increase +150 cm<sup>2</sup>/g**
- **Clinker Factor Reduction -1%**
- **Blaine STD Reduction -10%**
  - ✓ Production increase from 202 t/h to 215 t/h
  - ✓ Cement Quality Improvement: Blaine STD reduction from 85 cm<sup>2</sup>/g to 70 cm<sup>2</sup>/g
  - ✓ Improvement of Cement Strength due to finer grinding
  - ✓ Same Power Consumption with finer grinding (+150 cm<sup>2</sup>/g and harder to grind clinker (C3S -2%))

<b>Profit from Production Increase (+12 t/h):</b>	<b>2,350,000 USD/yr</b>
<b>Saving from reducing the Clinker Factor (-1%):</b>	<b>650,000 USD/yr</b>
<b>Saving from SEEC (-2.83 KWH/t):</b>	<b>680,000 USD/yr</b>

## DANGOTE : Senegal 2021 / VMO System

- **Production Increase +10 %**
- **Blaine Average Increase +550 cm<sup>2</sup>/g**
- **Clinker Factor Reduction -3%**
- **Blaine STD Reduction -50%**
  - ✓ Production increase from 224 t/h to 246 t/h
  - ✓ Cement Quality Improvement: Blaine STD reduction from 171 cm<sup>2</sup>/g to 84 cm<sup>2</sup>/g
  - ✓ Improvement of Cement Strength due to finer grinding
  - ✓ Same Power Consumption with finer grinding (+550 cm<sup>2</sup>/g and harder to grind clinker (C3S -2.9%))

<b>Profit from Production Increase (+22 t/h):</b>	<b>6,150,000 USD/yr</b>
<b>Saving from reducing the Clinker Factor (-3%):</b>	<b>2,400,000 USD/yr</b>
<b>Saving from SEEC (-5.32 KWH/t):</b>	<b>825,000 USD/yr</b>

- ✓ **Improvement of Cement Fineness and Uniformity**
- ✓ **Increase of Cement Production**
- ✓ **Reduction of Specific Electrical Energy Consumption**
- ✓ **Reduction of Clinker Factor and CO2 emissions**
- ✓ **Stability of Mill Operation**
- ✓ **Improvement of Operators Competency with less workload**
- ✓ **Longer Machinery span with reduced mill wear rate and stress load**
- ✓ **Installation and Commissioning without stoppages, processes or equipment modifications**

- ✓ **Improvement of Clinker Quality and Uniformity:** Uniform and improved clinker quality shall improve cement grinding volumes and contribute to reducing clinker factor in cement production.
- ✓ **Increase of Clinker Production**
- ✓ **Reduction of Specific Thermal Energy Consumption**
- ✓ **Reduction of Specific Electrical Energy Consumption**
- ✓ **Reduction of Environmental impact and CO2 emissions**
- ✓ **Stability of Kiln Operation**
- ✓ **Reduction of Operational Hazards**
- ✓ **Improvement of Operators Competency with Less workload**
- ✓ **Longer Machinery span with Reduced Kiln Stress load, Refractory Wear and upset conditions**
- ✓ **Installation and Commissioning without stoppages, processes or equipment modifications**





## **CONTACT US FOR A COMPLIMENTARY ROI STUDY**

Whether you're most focused on product quality, output, productivity/efficiency, or cost reduction, we're prepared to demonstrate precisely how we can help with actual hard data – at no cost, commitment or risk to you.

[www.es-processing.com](http://www.es-processing.com)