MAY 18, 2022

Decarbonisation with AI & Digital Transformation

OYAK Cement 4.0 Project «Indus**tr**AI»

Presented By: Berkan Fidan

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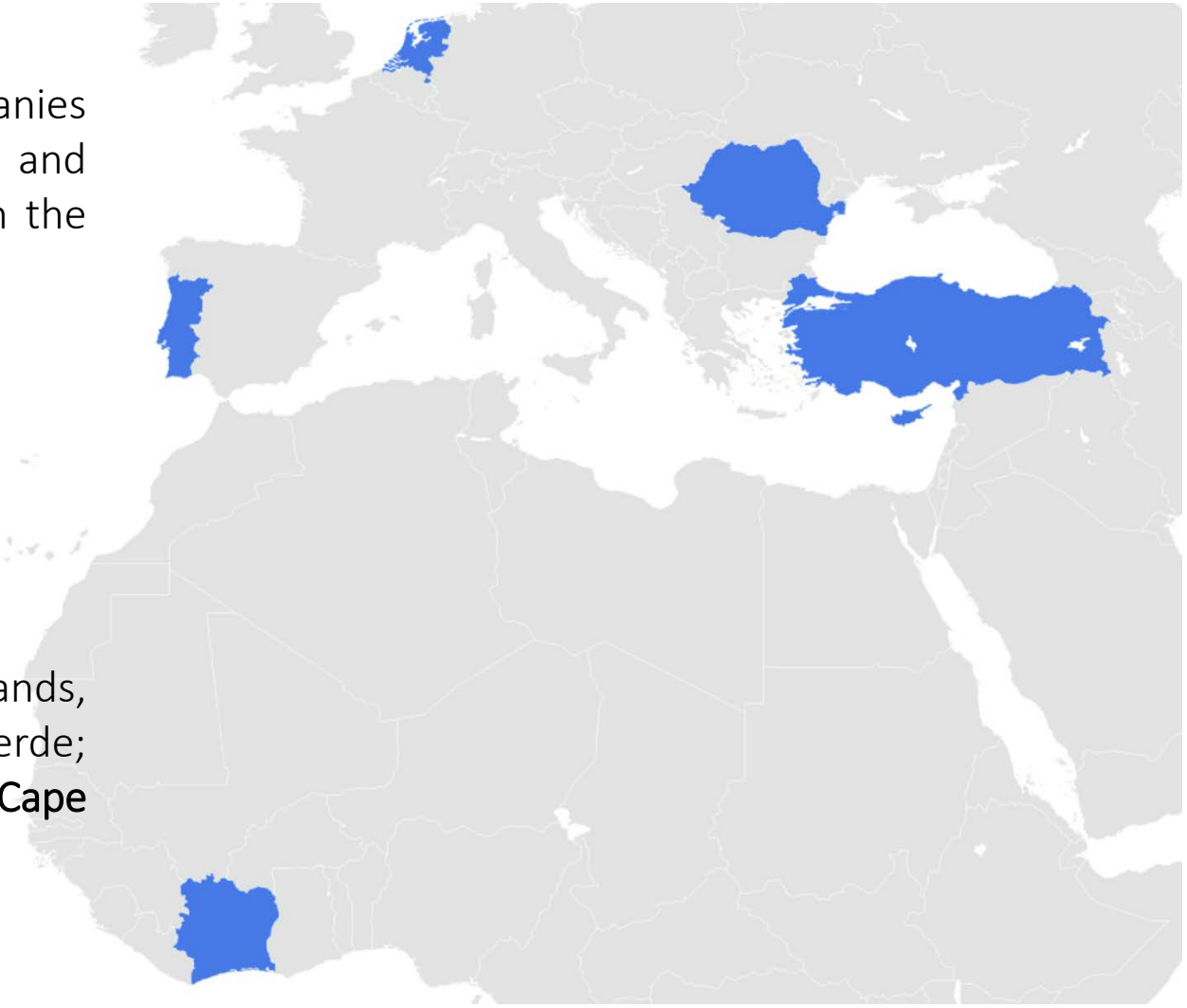
About CIMPOR Global Holdings BV

CIMPOR Global Holdings is a group of companies established by **Ordu Yardımlaşma Kurumu (OYAK)** and **Taiwan Cement Corporation (TCC)** that operates in the field of Cement, Concrete, Kraft Paper, and Bag.

CIMPOR Global Holdings operates in the Netherlands, Turkey, Portugal, Romania, Ivory Coast, and Cape Verde; incorporates the **OYAK Cement**, **CIMPOR Portugal & Cape Verde** and **CIMPOR Côte d'Ivoire** brands.



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Cement Operations of CIMPOR Global

OYAK Cement

Turkey's largest cement and concrete brand

Production capacity:
22.5M tons of cement
12.4M tons of clinker

CIMPOR Portugal & CV

The leader of the cement industry in Portugal and Cape Verde

Production Capacity:
5.5M tons of cement
8.4M tons of clinker

CIMPOR Côte d'Ivoire

World’s first greenfield calcined clay integrated cement plant

Production Capacity:
0.8M tons of cement
0.4M tons of calcined clay

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https://cimporglobal.com/

Digital Transformation Journey of CIMPOR GH

OYAK Cement 4.0 Project

Challenge

- Online visualization of cement, concrete and aggregate operations on 3 different continents
- AI Supported Industrial Ops – Priority Use Cases
  - In-process predictions to improve efficiency, productivity and quality of products
  - High reliability with predictive and prescriptive maintenance methodologies
  - Tracking CO_2 emissions and predictive approach on NOx emissions

Solution

- Main architecture was developed by PI AF with standardized formats
- Drill-down original visualization structure was generated with PI Vision
- Classified tags and calculated artificial data are filtered, validated and transferred simultaneously to AI engine by the help of PI Integrator for BA
- AI supported predictions are collected in PI System, monitored and analyzed at PI Vision as actual, past and future data

Benefits

- Improved capacities, less energy consumptions and higher overall equipment efficiencies
- High accuracy and efficiency on pyro-processing and grinding stages with frequent F.CaO and fineness data
- Anomaly detections on equipments before failures, and predicting potential failures
- Predicting upcoming NOx emissions and managing the process & managing reducing actions
- Monitoring actual CO_2 levels and actual effects of actions

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The Motivation of Digitalization in Cement Industry

Potentials with adaptive, compatible and manageable data infrastructure

- Operational activities in 18 different cement plants, +100 RMX concrete plants and +10 aggregate plants on 3 different continents
- Comparably high amount of data with high frequency (nearly 800 billions of individual records per year)
- Unique quality evaluation principles, and optimization & management of future results
- Continuous processes and relational efficiency effects
- Energy-intensive operations – direct effect of high efficiency on performance and the costs
- Low maintenance & service costs with high reliability and preventive actions
- Lastly but most importantly; **potentials on CO_2 reduction and the sustainability**

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The Challenges

Collection of messy data and evaluation with a standard vision

- Well-organized and globally connected monitoring structure
- Standardizing hierarchical formation and designing a well-classified digital asset library
- Variety of data sources, connections and attributes
- Matching time-stamps of process, quality and maintenance data
- Dynamic editing options to revise, generate or derive without losing the raw data
- AI compatibility on both proper data transfers and analytical investigations on live data, and notifications

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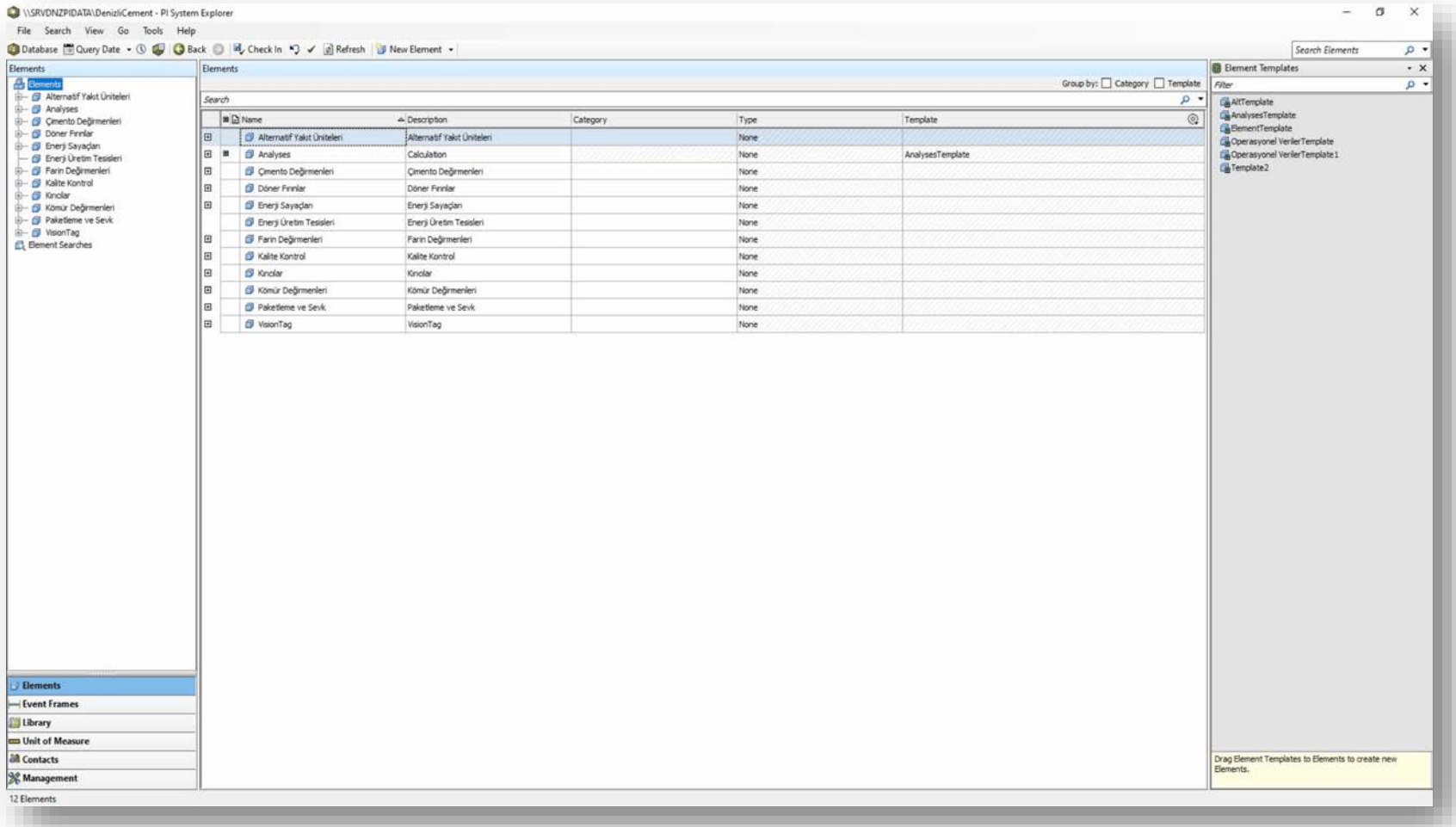
Sophisticated Architecture with PI Explorer and PI AF

Standardized hierarchy



- Originally designed and structured by the project team
- Several artificial tags with complicated calculations
- Standardized formation and hierarchal structure on AF

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Visualization of OYAK Cement 4.0 Project with PI Vision

- Unique visual design
- Drill-down formation
- ERP and Web based data integrations

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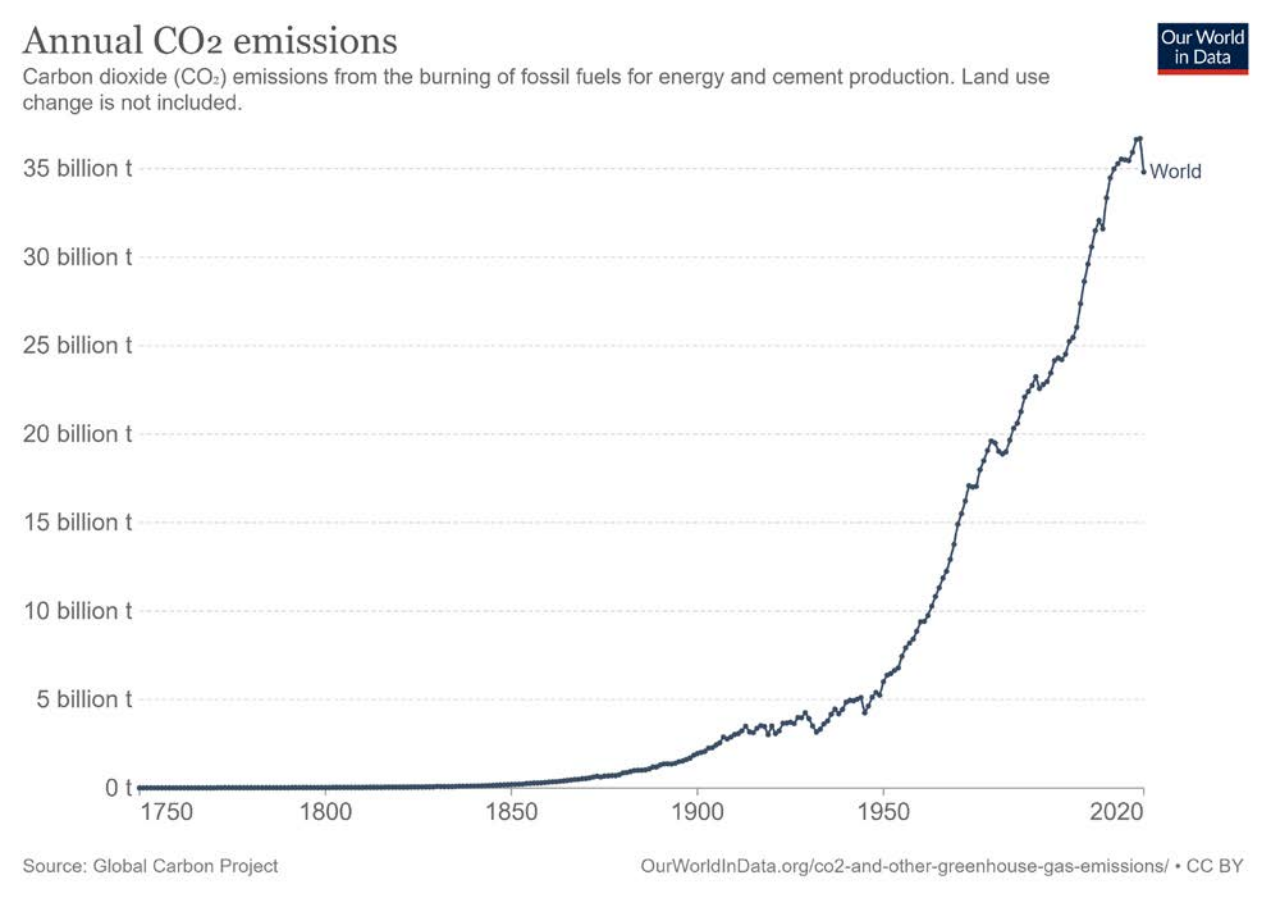
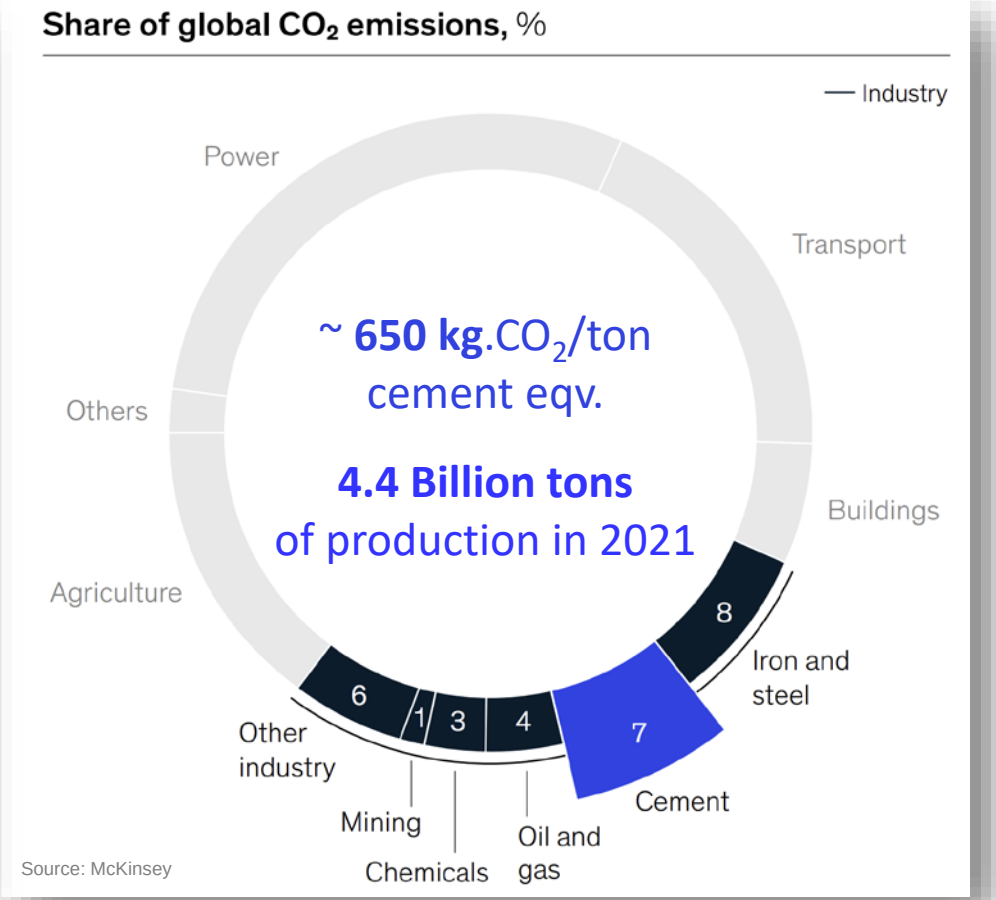
CO_2 & Cement Industry

Responsibility of Cement Industry on CO_2 & GHG reduction





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Low CO_2 & GHG Emissions with Digitalisation

Role of PI in our decarbonisation strategies

- Online Monitoring and Analyzing Capability
- Predicting Emissions & Guiding Process Control
- Higher Combustion Efficiency with Less Fossil Fuels
- High Energy Efficiency on Grinding Process with Predicted Fineness
- Reducing CO_2 Footprints with Improved Quality
- High Productivity and Efficiency on Renewable Energy Systems

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Online Monitoring & Analyzing Capability

Tracking emissions instantly

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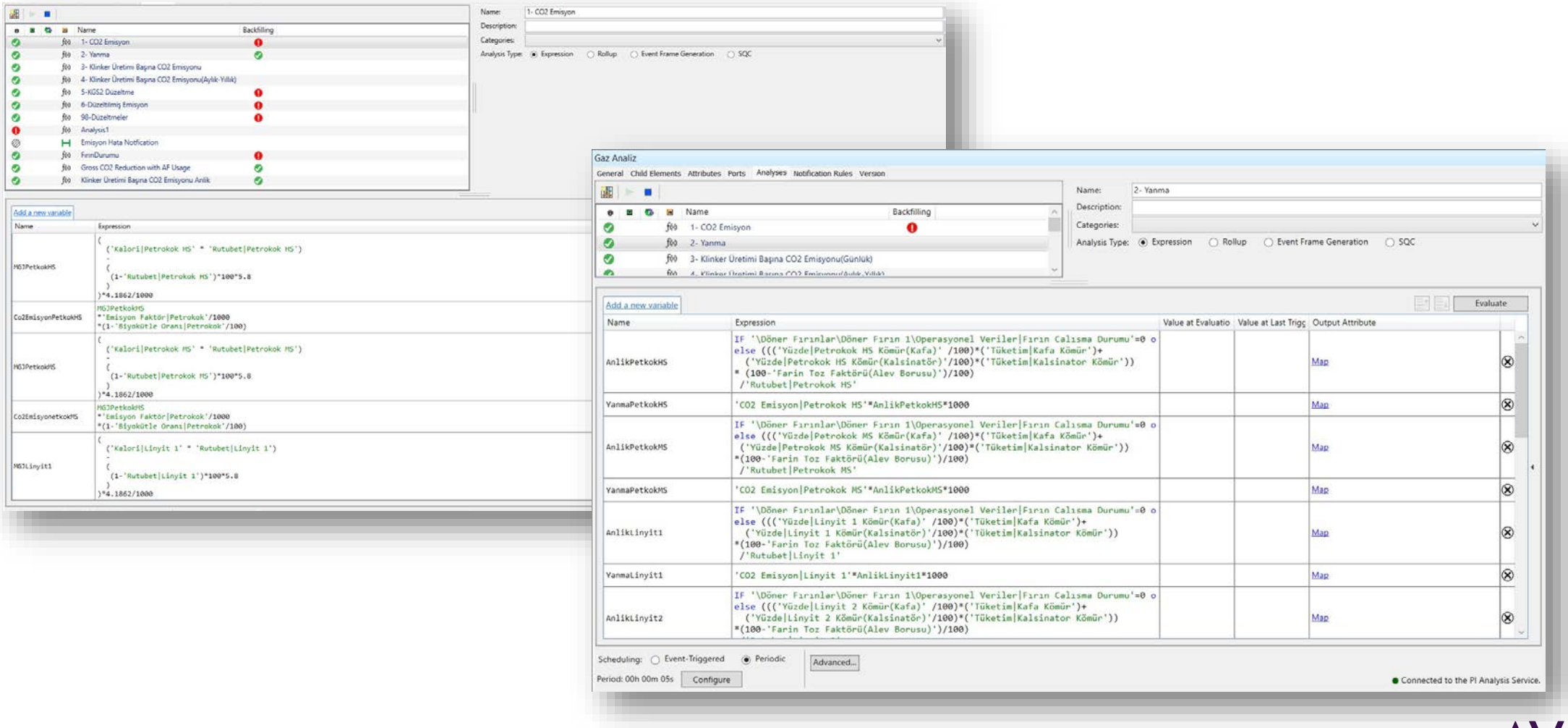
Online Monitoring & Analyzing Capability

Complicated calculations and generation of artificial tags



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Online Monitoring & Analyzing Capability

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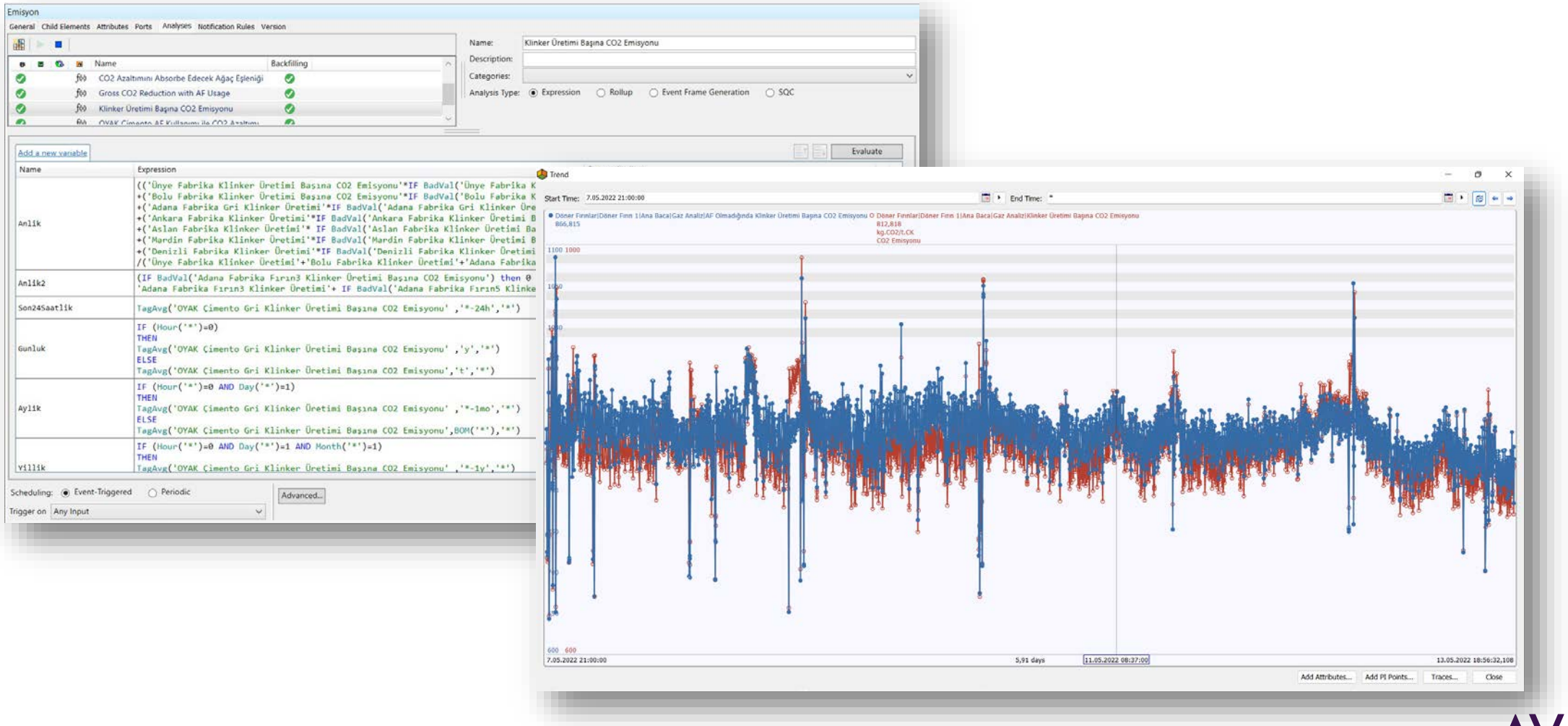

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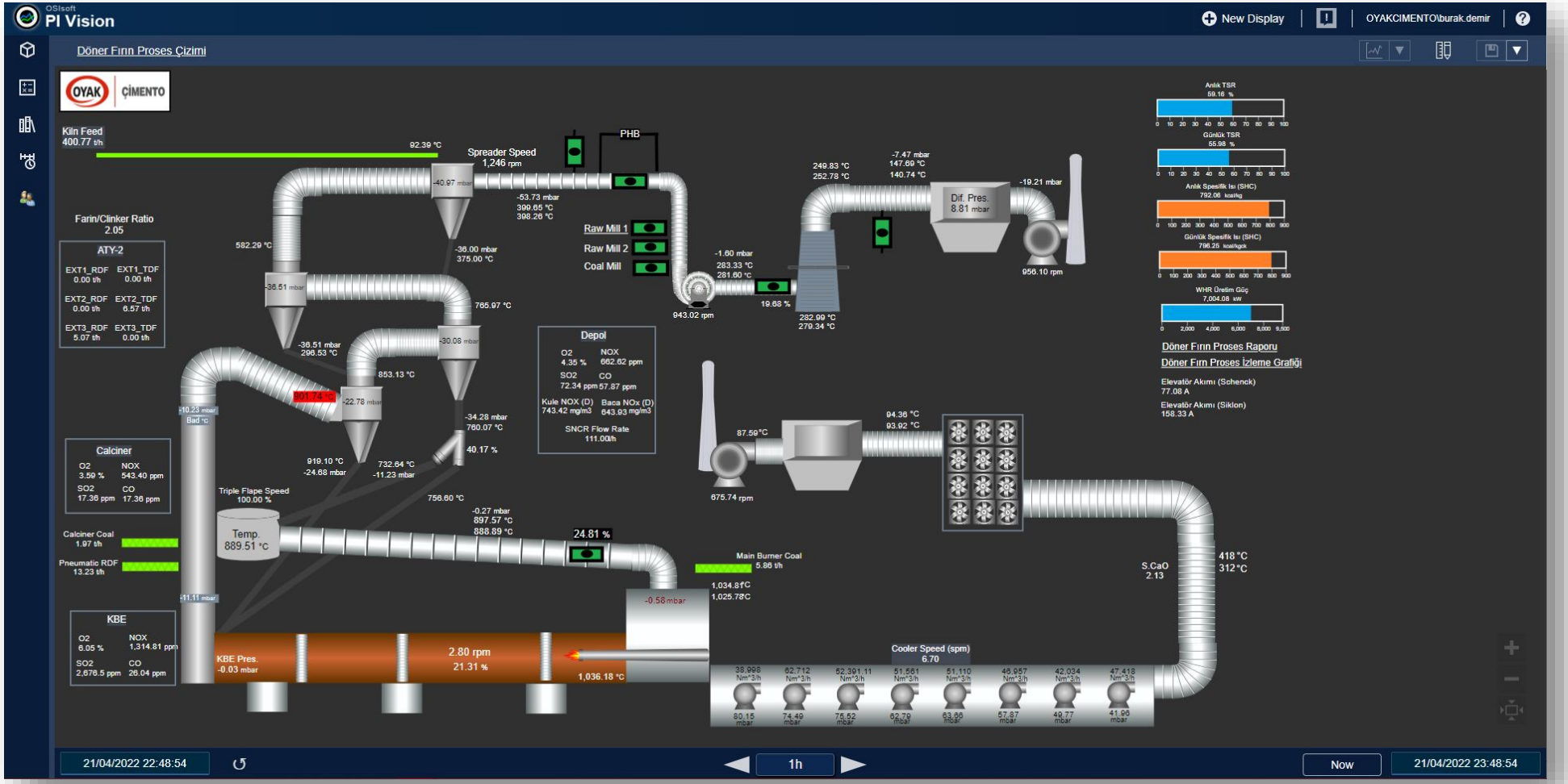
Predicting Emissions & Guiding Process Control

Process control adaptations – includes online heat&mass balance pages



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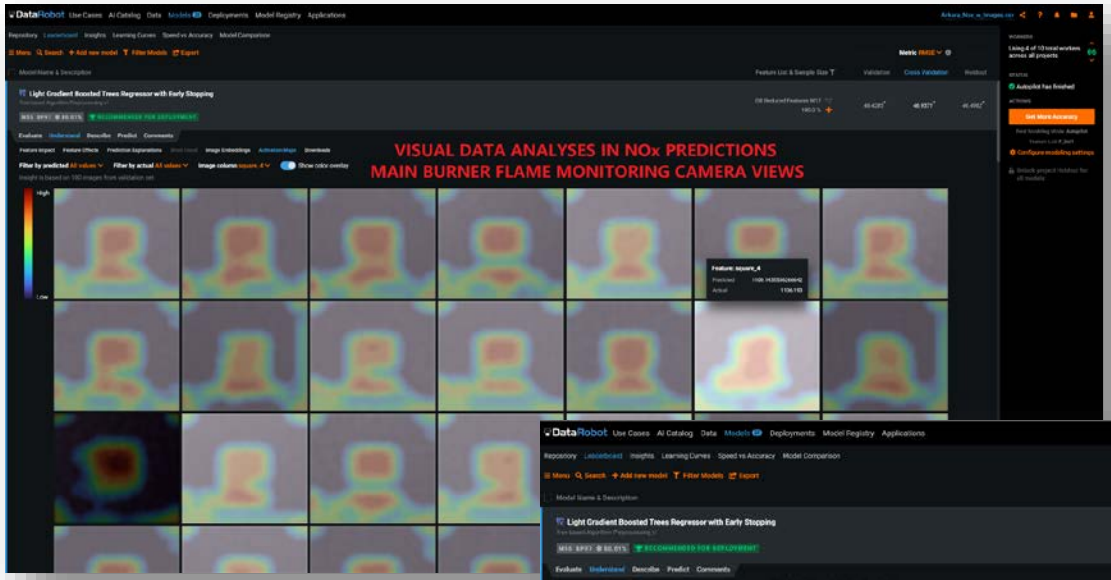
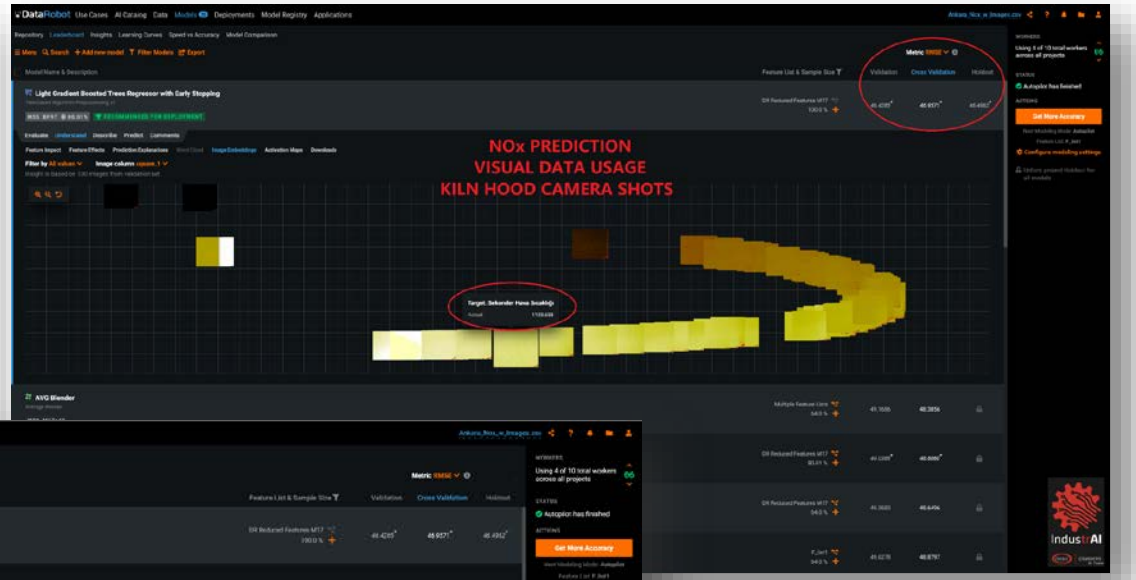
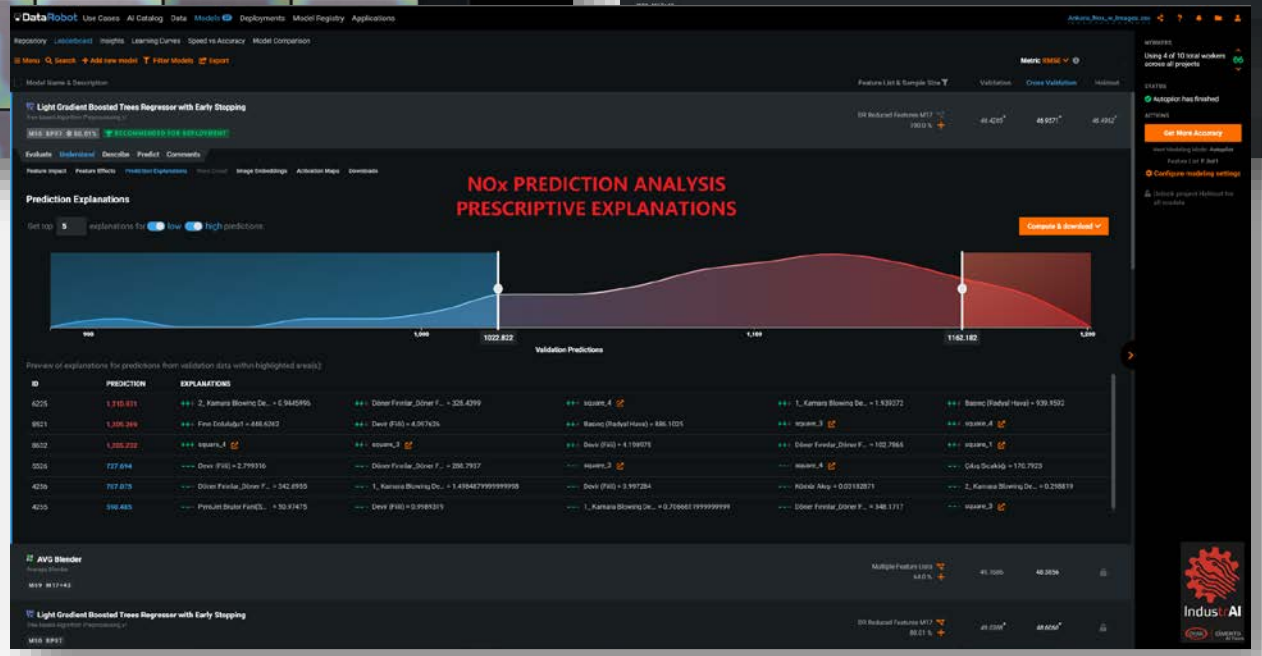
Predicting Emissions & Guiding Process Control

Not only numbers, also visuals are being used in AI models – to predict near future emissions







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Predicting Emissions & Guiding Process Control

Not only numbers, also visuals are being used in AI models – to predict near future emissions

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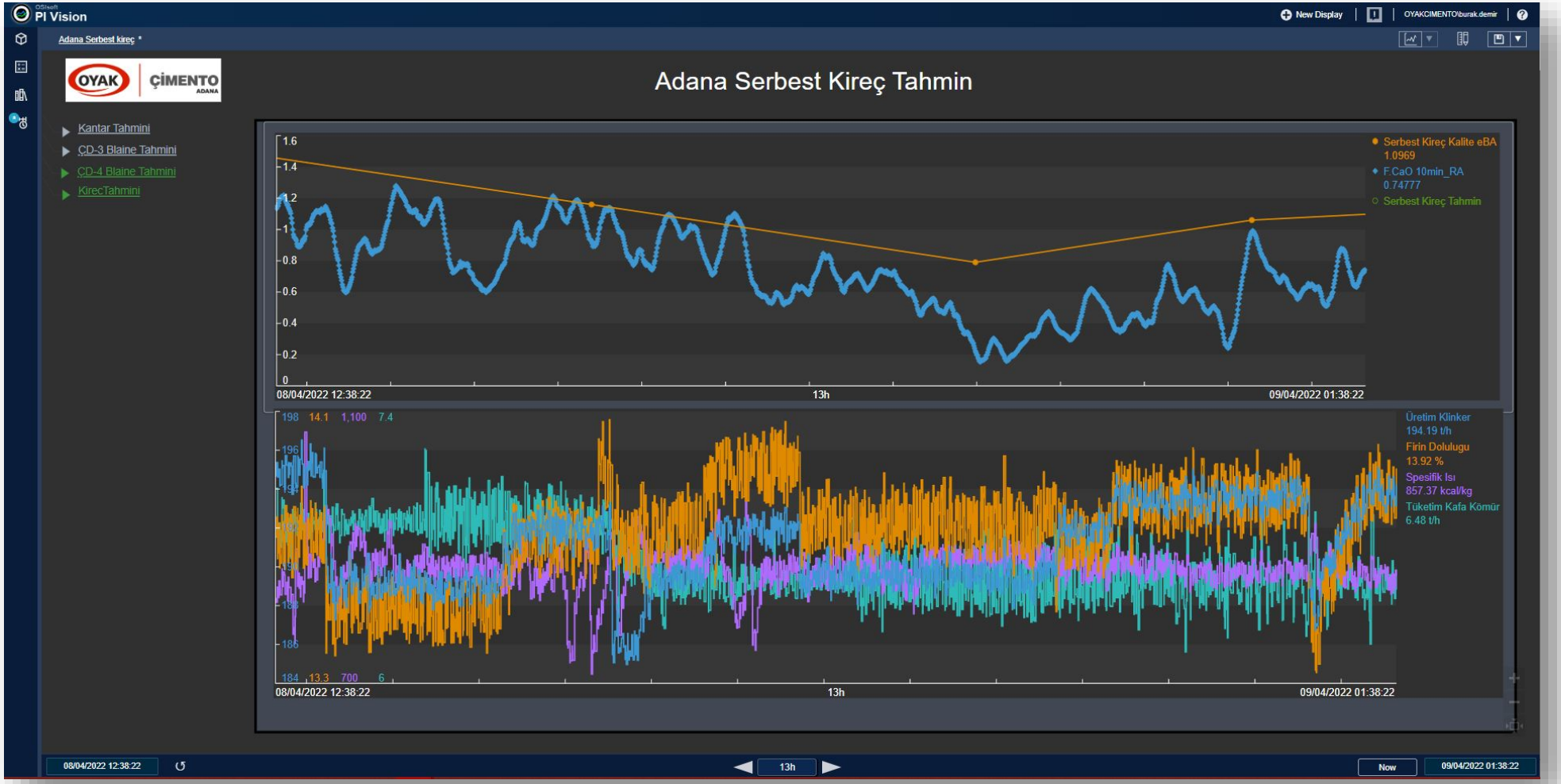
Higher Combustion Efficiency with Less Fossil Fuels

Online Free-Lime Monitoring with AI Supported Predictions



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Higher Combustion Efficiency with Less Fossil Fuels

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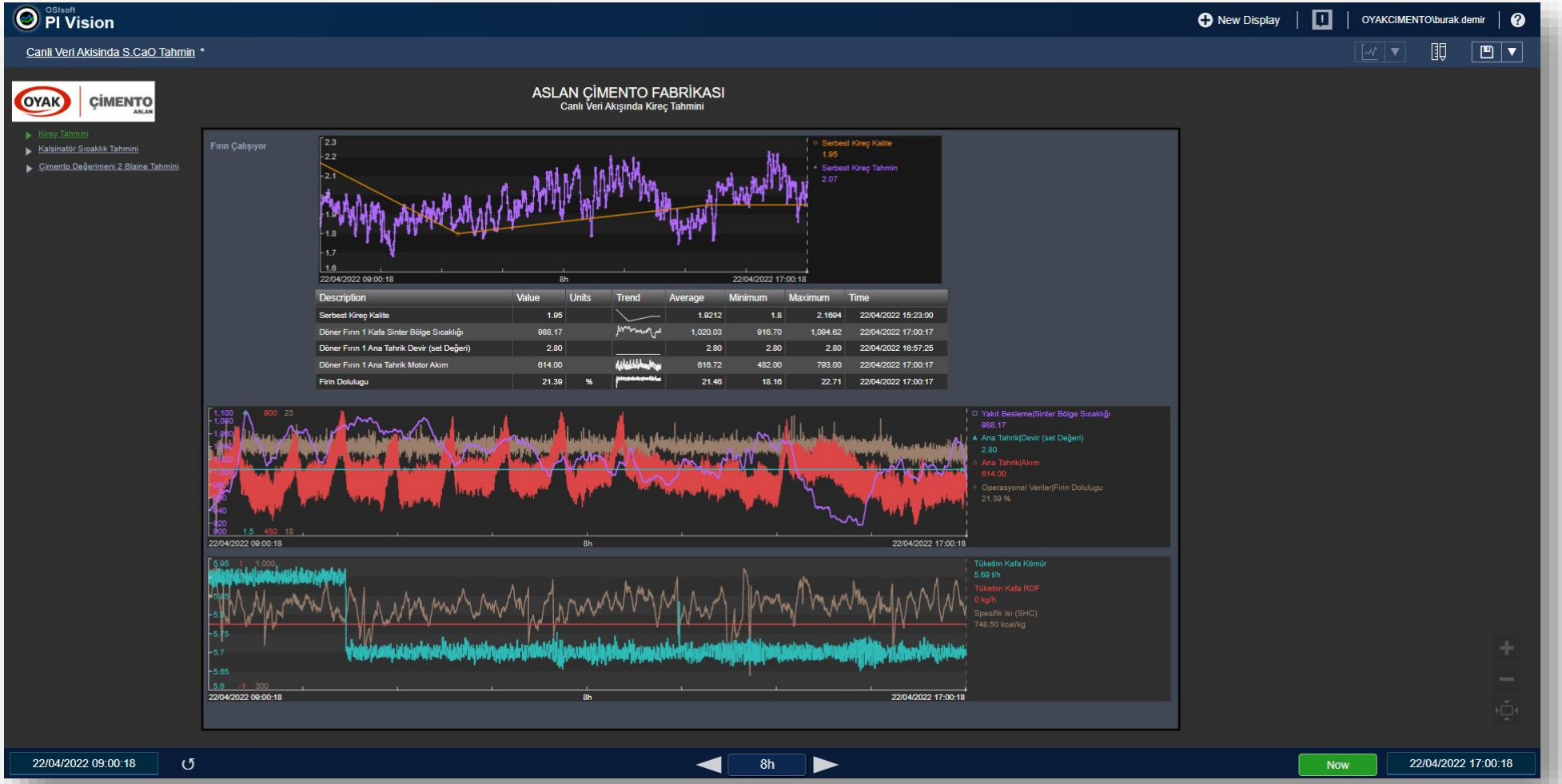

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Higher Combustion Efficiency with Less Fossil Fuels

Less Fossil Fuels & More Secondary Fuels – means less CO_2 emissions

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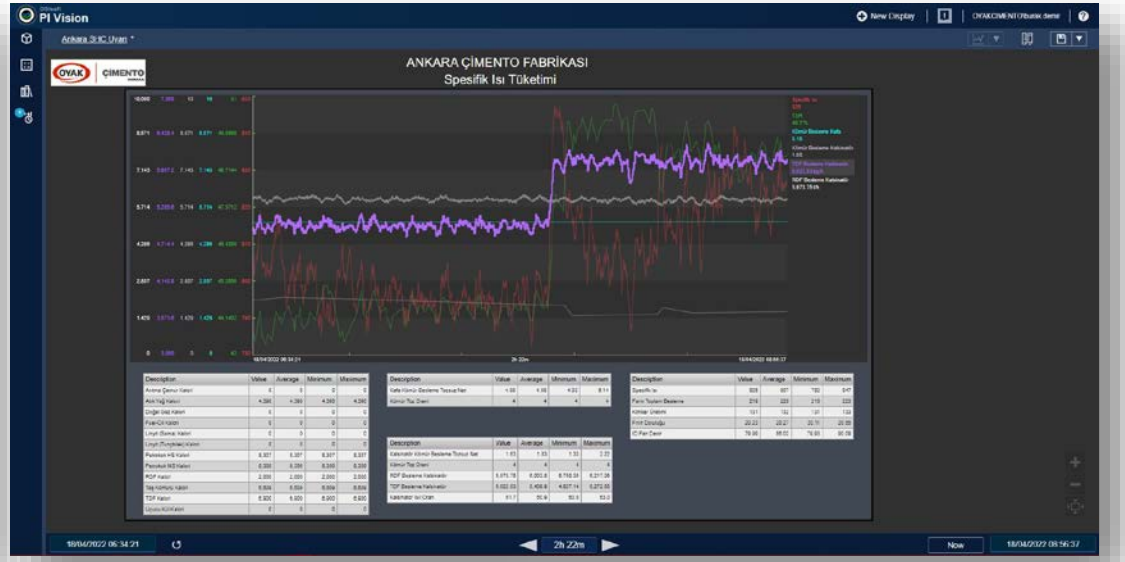
Higher Combustion Efficiency with Less Fossil Fuels

Continous Monitoring and Automatic Notifications



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bolu_ankara@oyakpisystem.com

Döner Fırın 1 Spesifik Isı Değeri Kontrolü (Başlangıç)

To

Sayın Yönetici,

Fırın Özgül Isı Tüketimi çok yüksek/düşük yakıt besleme kantarlarının kalibrasyonunu/kalori değerlerinin kontrol edilmesi gerekmektedir.

Mail Gönderim Zamanı: 4/15/2022 9:18:22 AM Turkey Standard Time (GMT+03:00:00)

Fırın Durumu : Fırın Çalışıyor
Spesifik Isı : 670
TSR : 30.0%

Bu e-mail ve ekleri **OYAK Cement AI** platformu tarafından, tarafınıza otomatik olarak paylaşılmıştır.

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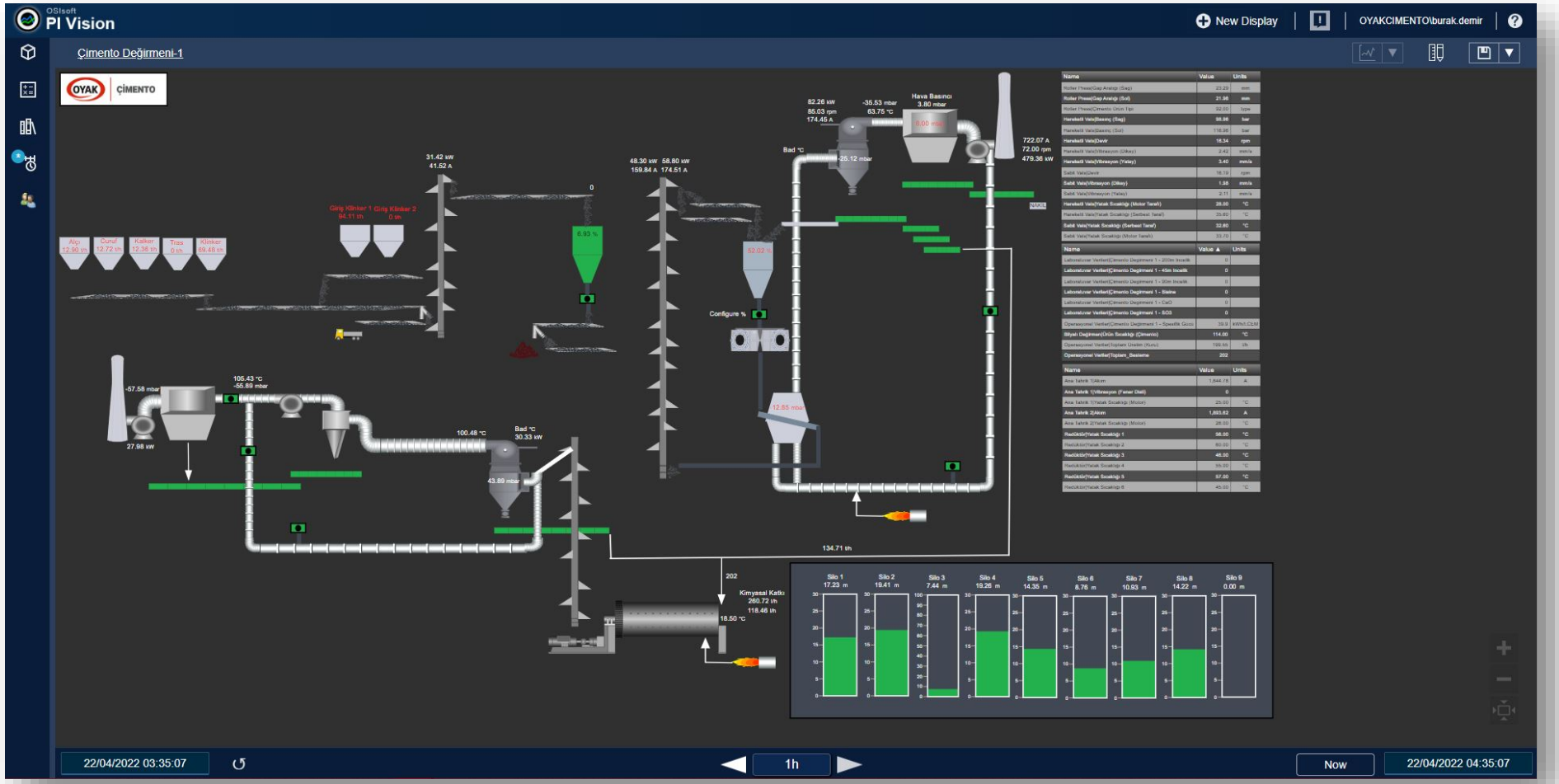
Boosted Energy Efficiency on Cement Grinding

Monitoring Actual Parameters and Predicted Values



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Boosted Energy Efficiency on Cement Grinding

Predicting Particle Size Characteristics

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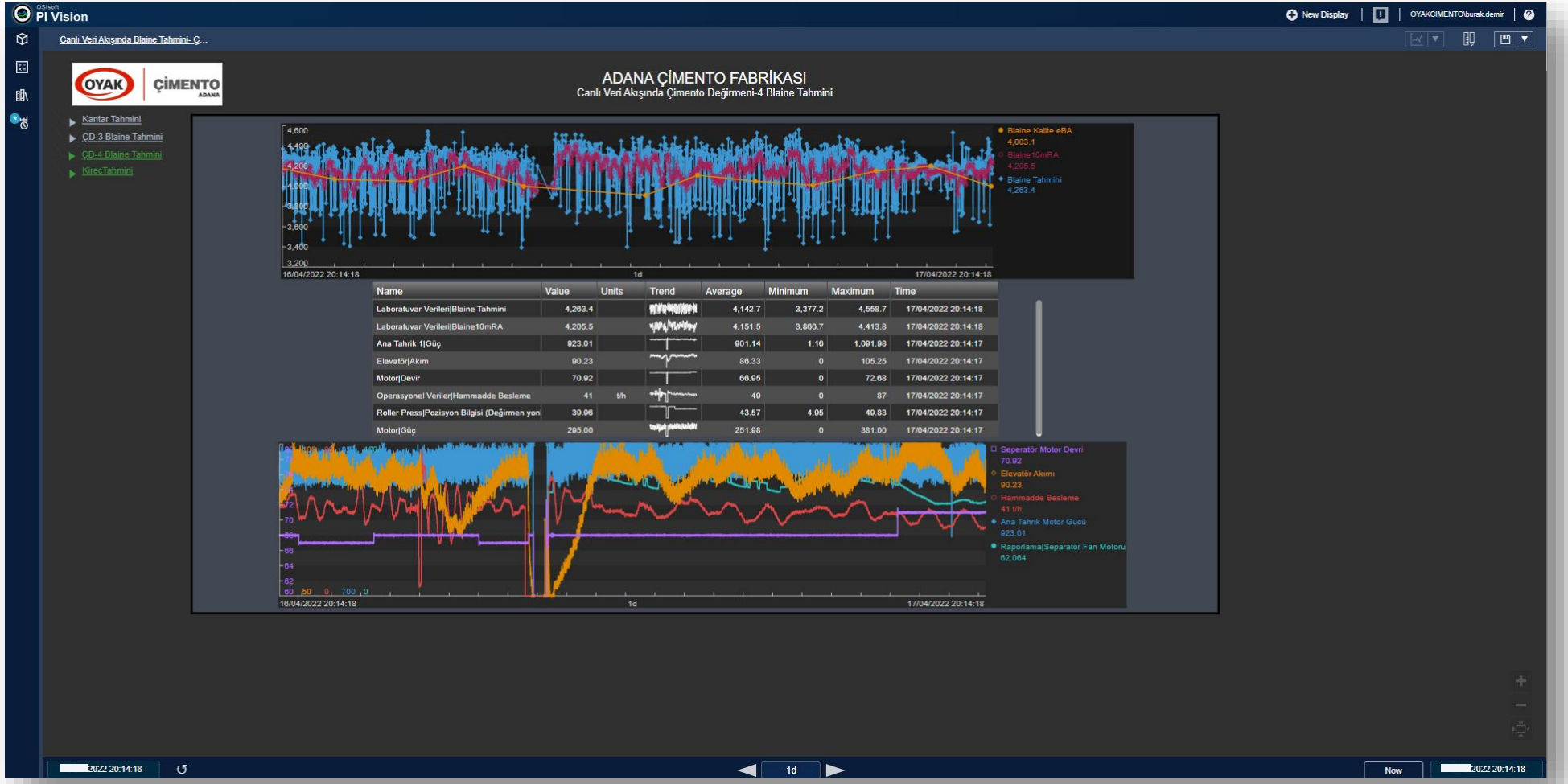
Boosted Energy Efficiency on Cement Grinding

Predicting Particle Size Characteristics



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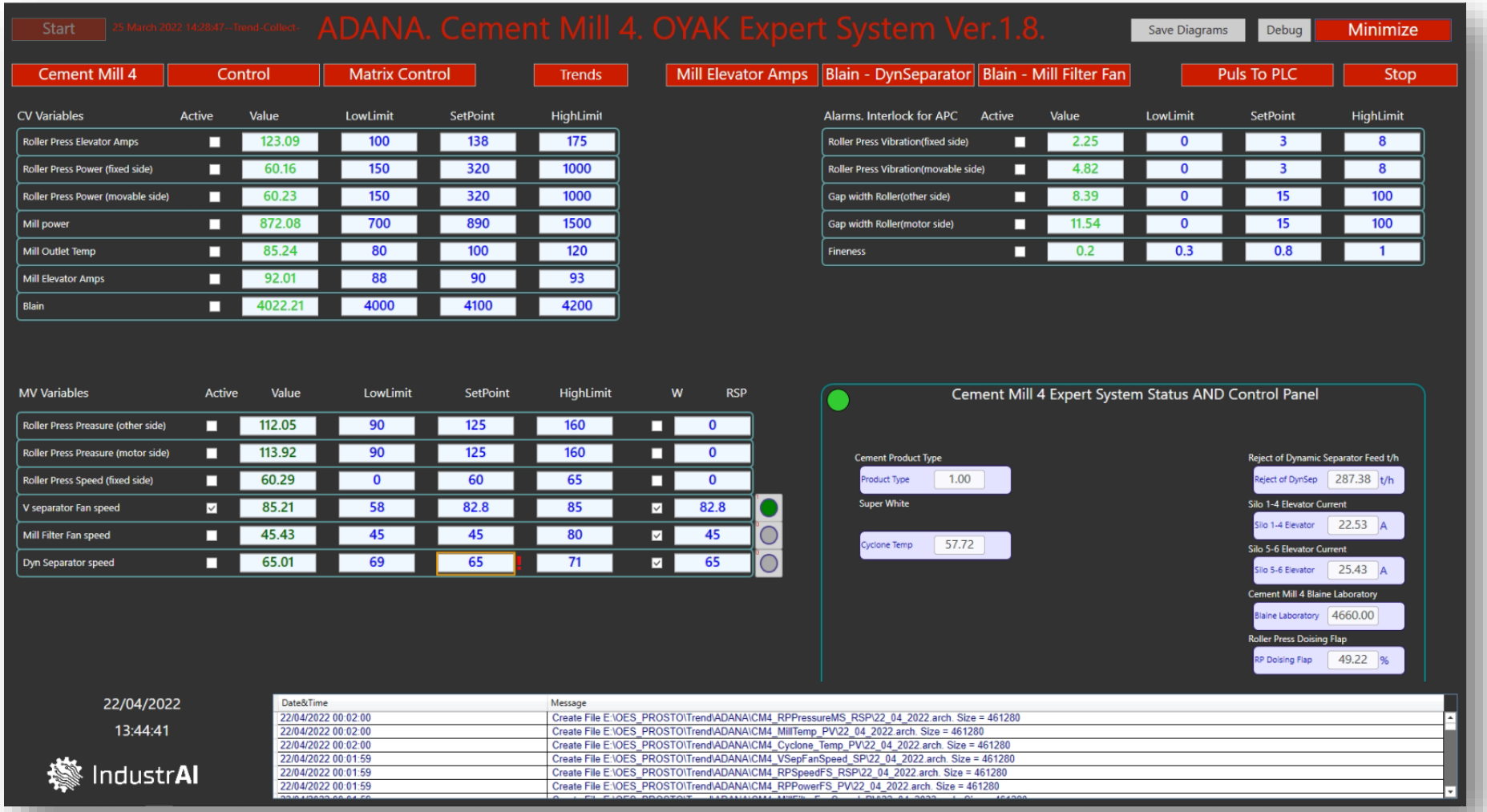
Boosted Energy Efficiency on Cement Grinding

Autonomous Cement Mill Process Control with Authentic APC Concept «IndustrAI»



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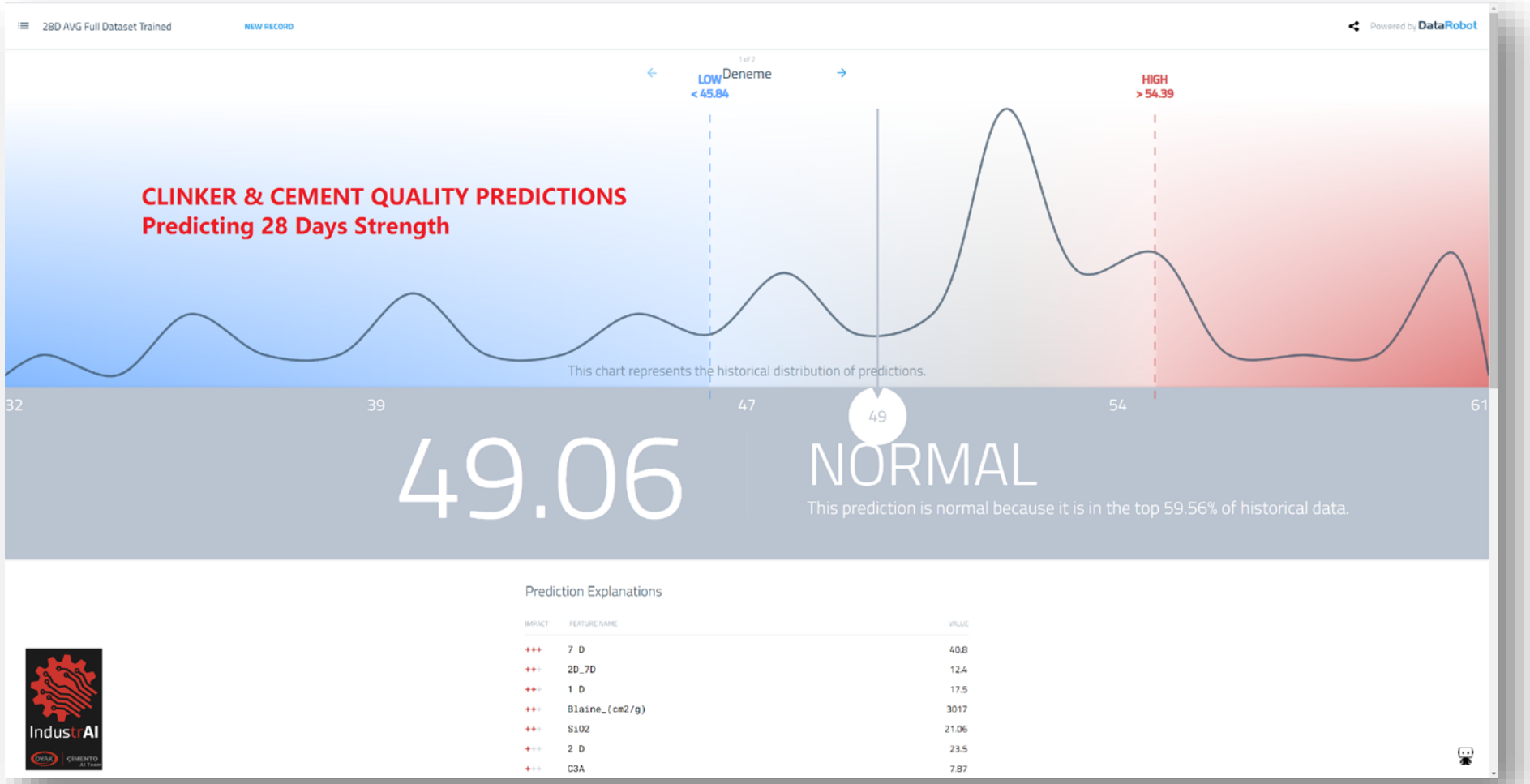
Reducing CO_2 Footprints with Improved Quality"

Predicting 28 Days Strengths on Clinker and Cement Production **«with high accuracy»**



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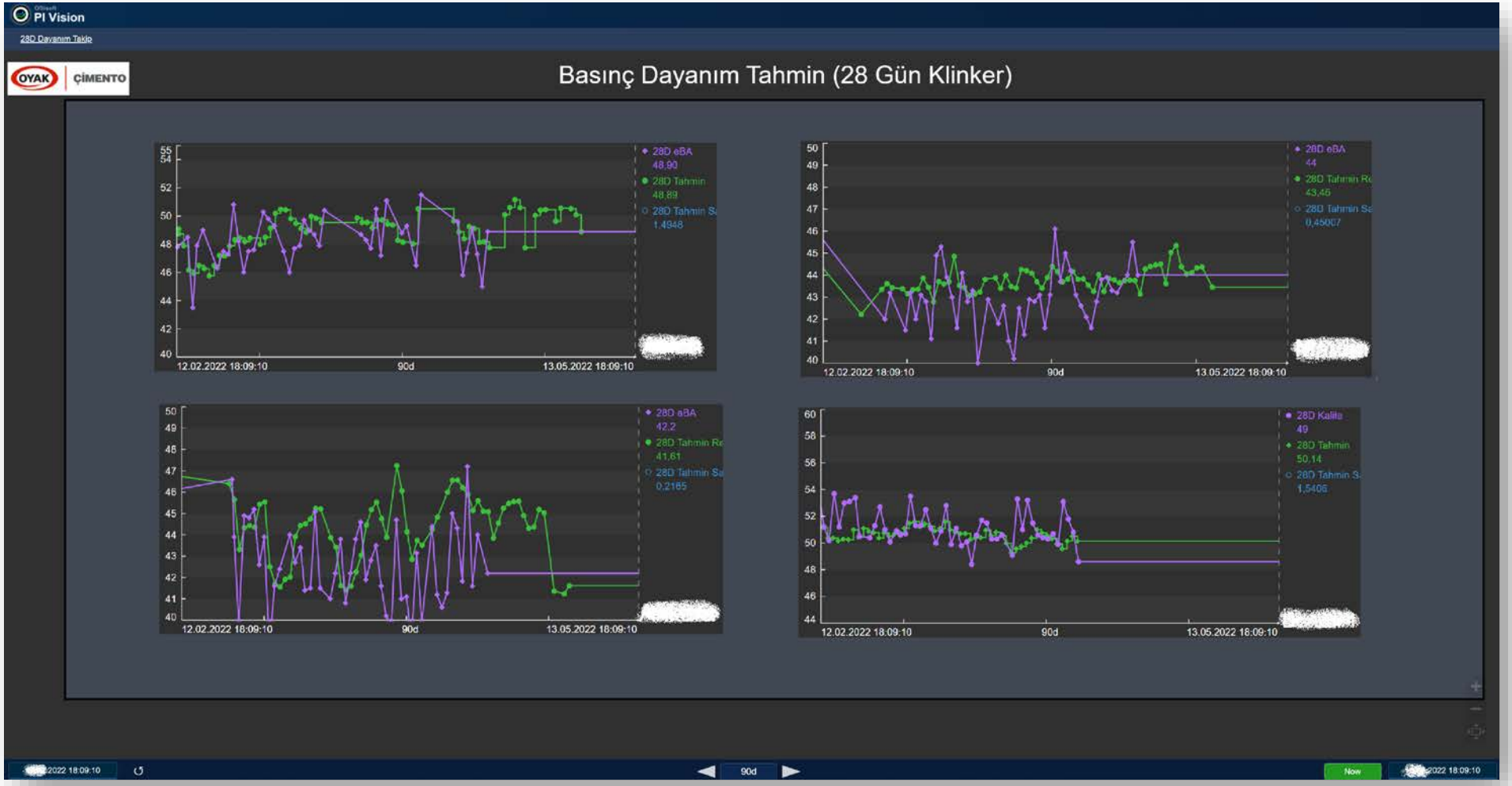

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High Productivity & Efficiency on Renewable Energy Units

Increased Efficiency with Detailed Monitoring of PhotoVoltaic Solar Energy Plants

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Wrap Up

Role of PI on Our Decarbonisation Strategies

- Visualization and Spontaneous Analyzing Capability
- Online CO_2 emission calculations and visualization
- Predicting NOx emissions – reduction & also high efficiency on SNCR process
- Online free lime predictions – stable kiln process, less heat consumption, minimized efficiency losses, higher thermal efficiency, stable combustion conditions, higher AF usage and less fossil fuels
- Higher quality on mid-product «clinker» and getting low CO_2 foot-printed final products as cement and also as concrete
- Fineness prediction to improve quality and specific energy consumption
- High efficiency on renewable energy sources WHRs and PV Solar Plants

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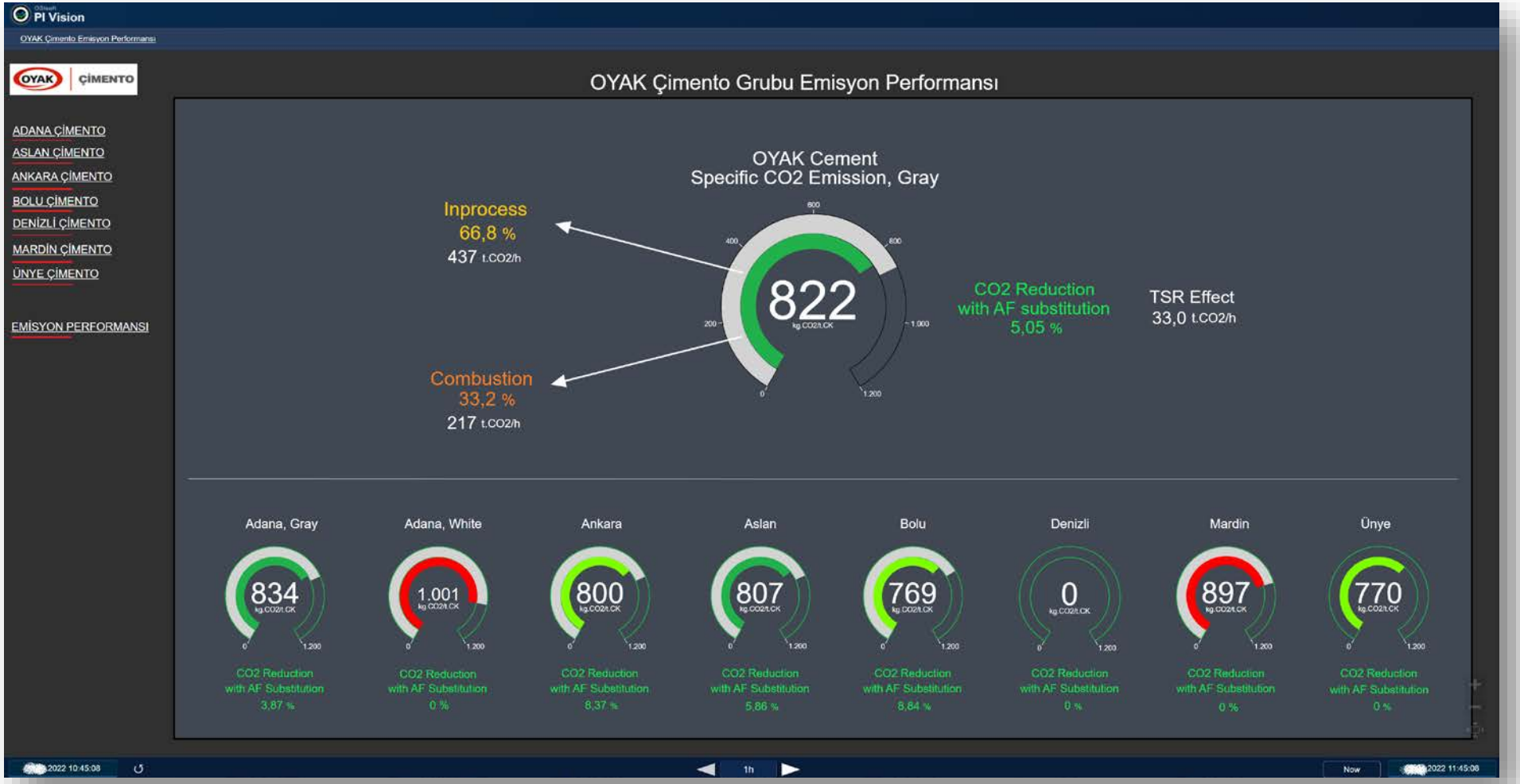
The Result: Visualizing and Monitoring CO_2 Actions

Following the Results Instantly to Take the Actions Instantly



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The Result: Visualizing and Monitoring CO_2 Actions

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Annual Effect of OYAK Cement 4.0 on CIMPOR Global

Decarbonisation with AI & Digital Transformation

- Each **1% of heat energy saving** equals to **17,500 tons less coal consumption** per year → **X 9,500/year**
- Each **1% of electrical energy saving** equals to **12,600 MWh less energy consumption** per year → **X 3,900/year**
- Each **2% increase on TSR** equals to **30,000 tons less fossil fuel consumption** per year → **X 3,500/year**
- Each **1% decrease on clinker incorporation rate** in cement means **nearly 110,000 tons of clinker saving**
- Each 3% reduction on maintenance costs equal to nearly **1,5 Million € saving** per year

Total financial effect of all those potential savings equal to more than
9 Million € per year

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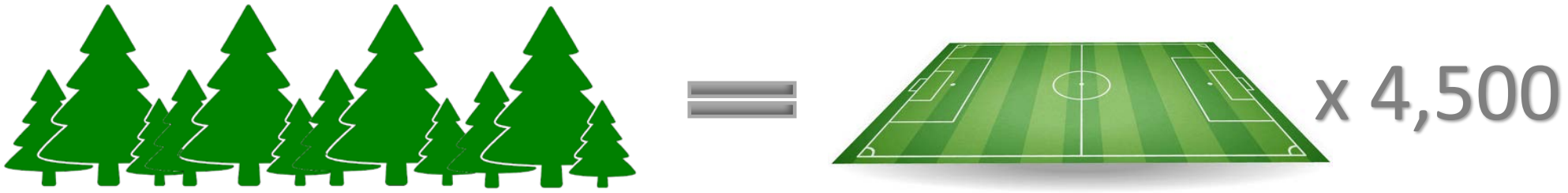
Annual Effect of OYAK Cement 4.0 on CIMPOR Global

Decarbonisation with AI & Digital Transformation

All those savings mean more than financial advantages

Nearly **140,000 tons of CO_2 reduction** in a year

which equals to carbon dioxide absorption of **6.5 Million trees** in a year.



Still additional use cases and potentials are available,

we are just in the beginning of **Digitalized and AI-Assisted Industrial Ops Transformation**

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Berkan Fidan

Performance & Process Director

- OYAK Cement Concrete Paper
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Questions?

Please wait for the microphone

- State your name and company

Please remember to…

Complete the survey!

- Navigate to this session in the mobile agenda for the survey

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“Digitalization is a strong and effective tool to achieve Low-Carbon products in cement & concrete manufacturing – its potential is much more than assumed”

B.Fidan

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