



AVEVAWORLD
PARIS

OCTOBER 2024

Tereos improves renewable fuel production with data-driven decisions

Presented by: Fernando Martins de Mello

Personal Introduction

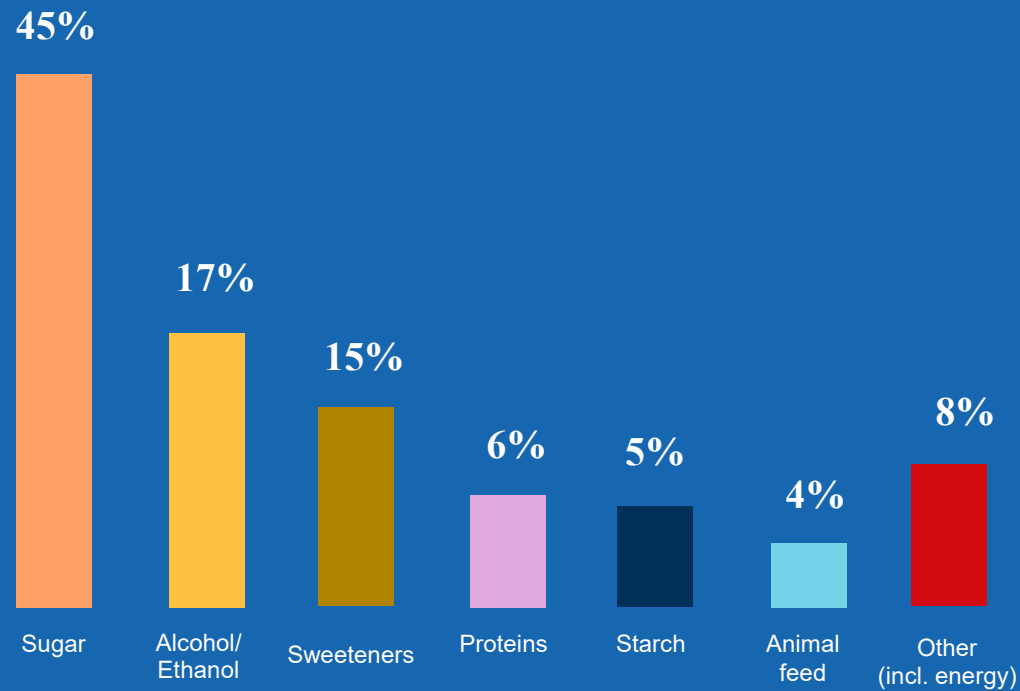


Fernando Martins de Mello







- Agroindustrial Project Manager
- Tereos
- fernando.mello@tereos.com

A diversified portfolio







Breakdown of revenues



Markets

-  Food
-  Energy
-  Animal feed
-  Green chemistry
-  Pharmaceuticals and cosmetics
-  Paper and cardboard

Product ranges

-  Alcohol and ethanol
-  Sugar and sweeteners
-  Starch and derivatives
-  Dietary fibre
-  Fibres and seeds for animal feed
-  Plant proteins

Our key figures

2023/2024

5

agricultural
raw
materials



10,700

cooperative grower
members in France



7.1

billion euros
in revenues



Sugar beet



Wheat



Alfalfa



Sugar cane



Corn

43

million tonnes
of raw materials
processed

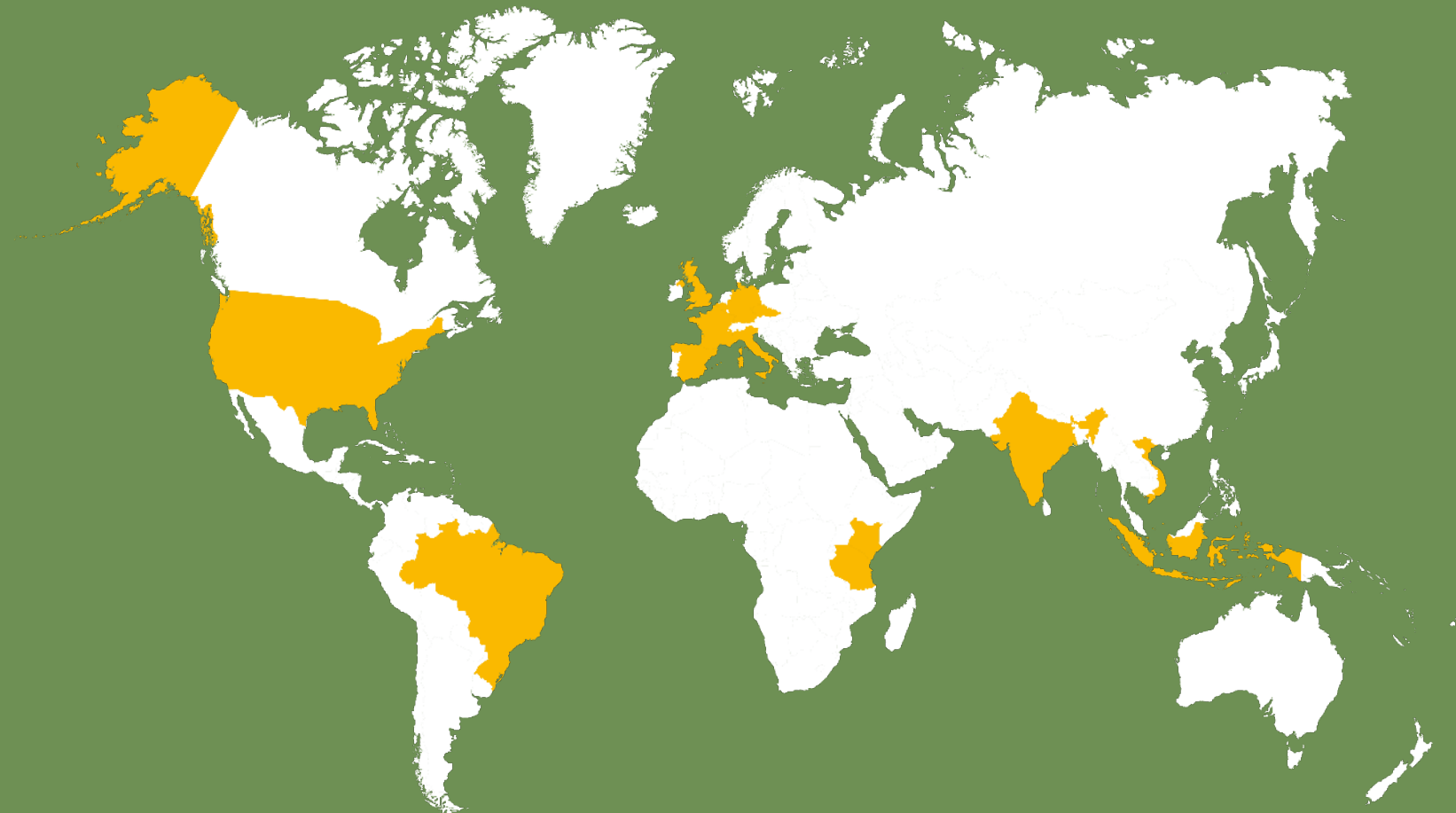


15,800

employees
worldwide



Our facilities around the world

**41**

industrial sites

Operations in

15

countries*

Europe

- 28 industrial sites
- 1 R&D centre
- Countries: Belgium, Czech Republic, France, Germany, Italy, Spain, United Kingdom

Americas

- 7 industrial sites
- Countries: Brazil and United States

Africa & Indian Ocean

- 5 industrial sites
- 1 R&D centre
- Countries: Kenya, Reunion Island (FR), Tanzania

Asia

- 1 industrial site
- 1 R&D centre
- Countries: India, Indonesia, Singapore, Vietnam

Taking action for the Earth and People

OUR COMMITMENTS FOR TOMORROW

1. Sustainable agriculture

Promote the development of regenerative and low-carbon agriculture that is favourable to soil and biodiversity.

Our ambitions*

1,000 growers in France will be assisted in moving towards low-carbon agriculture by 2025 (low-carbon label) + regenerative agriculture programme

20% of our beet cultivation areas will roll out regenerative agriculture by 2033

90% of our agricultural raw materials will be assessed or certified as sustainable (vs. 60% in 2018)

2. Protection of the environment

Conserve and integrate biodiversity into our production processes, implement a "zero deforestation" strategy and minimise our waste by making the most of our agricultural raw materials.

Our ambitions*

100% of our guaranteed supply coming from non-deforesting agricultural raw materials by December 31, 2025

100% of our raw materials utilised

3. Preservation of resources

Achieve net zero GHG emissions throughout the responsible value chain, from the fields to finished goods, by 2050.

Our ambitions*

65% reduction in greenhouse gas emissions from our European industrial sites by 2033

50% reduction in greenhouse gas emissions from our industrial activities worldwide by 2033

36% reduction in emissions from our agricultural activities worldwide by 2033

-20% water consumption in industrial processes vs 2017

4. Responsible consumption

Promote responsible products through our brands and by being a leading partner for our customers.

Our ambitions*

Develop our sustainable product sales
Increase the percentage of our revenues linked to products with positive Nutri-Scores

5. Employee and local development

Protect the health and safety of our employees and promote diversity, equality and inclusion. Make the regions in which we operate more attractive.

Our ambitions*

20% annual decrease in the lost-time accident frequency rate (vs. 2023/24)

40% women members in our Management Forum (vs. 14% in 2022)

* for 2033

Why is Bio-ethanol important?

Renewable fuel

Bio-ethanol is produced from agricultural raw material

Global production

Brazil is the second largest global bio-ethanol producer

Tereos operates in this market for almost 100 years

90% less emissions

Bio-ethanol (Brazil) is a clean fuel. Its entire cycle results in 90% less GHG emissions than gasoline, including Scope 3 emissions

Less 660Mt CO₂eq

In 20 years (2003 to 2023) the impact of bio-ethanol utilization was a reduction in 660M ton CO₂eq



Bio-ethanol represents 41,3% of transport matrix in Brazil (UNICA)

Every time the Tereos improves the production process of bio-ethanol, they are also making significant contributions to the energy transition journey

Tereos Sugar & Energy Brazil

23/24 Campaign Results

Sugar

- 21,1 million tons of sugarcane crushed (22% increase over previous crop)
- Sugar production mix of 67%
- 1,9 million tons of sugar

Energy

- 580 million liters of ethanol
- 1500 GWh electric energy generation from sugarcane bagasse



Our production chain in Brazil

Circular economy

Tereos pursues growth within a sustainable model that makes the most of our agricultural raw materials, and makes sustainability central to our activities

Tereos is certified by Brazil's RenovaBio program to sell decarbonization credits (CBios), by Bonsucro for sustainable sugarcane production, and to the I-REC standard for eligibility to issue renewable energy credits in the voluntary market

- 1 Sugarcane is sourced from our own plantations and partner growers
- 2 At our seven mills, harvested sugarcane is crushed to extract the juice from which we produce sugar and ethanol

- 3 Vinasse, a byproduct from sugarcane distillation, is used for fertigation in our sugarcane fields; filter cake from the sugar production process becomes a fertilizer that enhances sprouting of newly planted sugarcane; and boiler ash is also put to use as a fertilizer

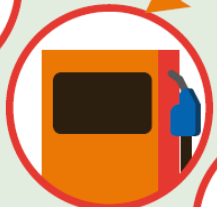
- 4 Organic waste from our cafeterias is composted and used as a fertilizer on our grounds and in seedling nurseries
- 5 Dry yeast, produced by drying yeast cream (a residue from the fermentation stage of ethanol production), is a valuable ingredient for animal feeds, including fish feed

- 6 Our biogas plant generates renewable electricity and biofuel, currently at pilot scale, for vehicles
- 7 Renewable electricity is generated using steam from boilers running on bagasse

- 8 The surplus electricity from our on-site requirement is exported to the grid
- 9 Part of the water used in our mills is stored in tanks for reuse within the production process or for fertigation in our sugarcane fields



Sugar



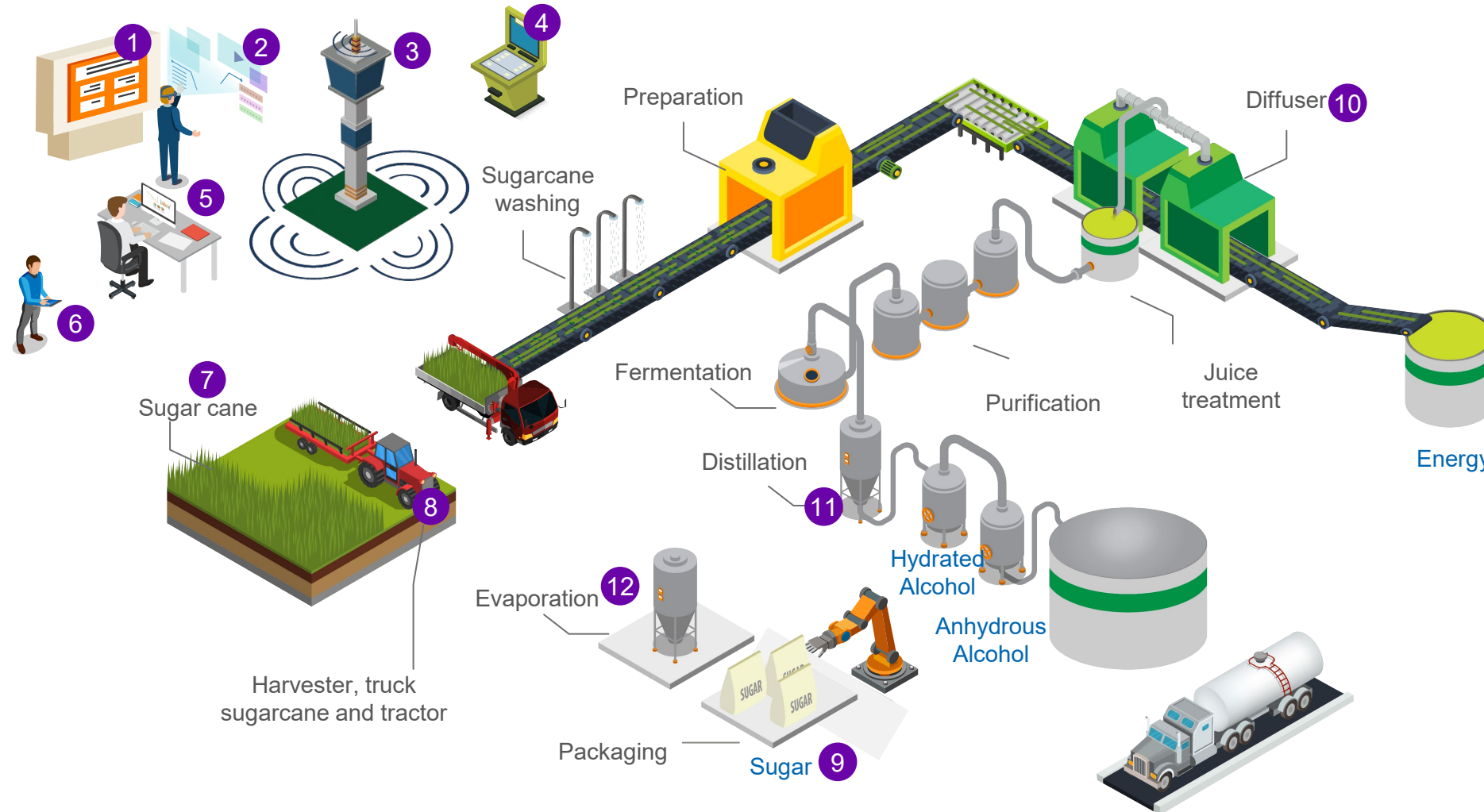
Ethanol



Credits

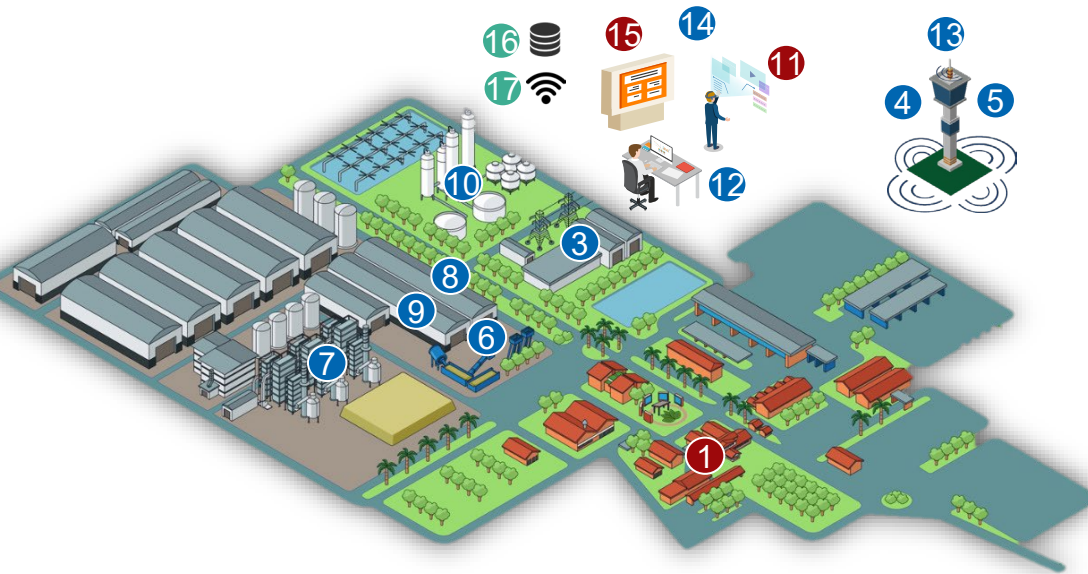
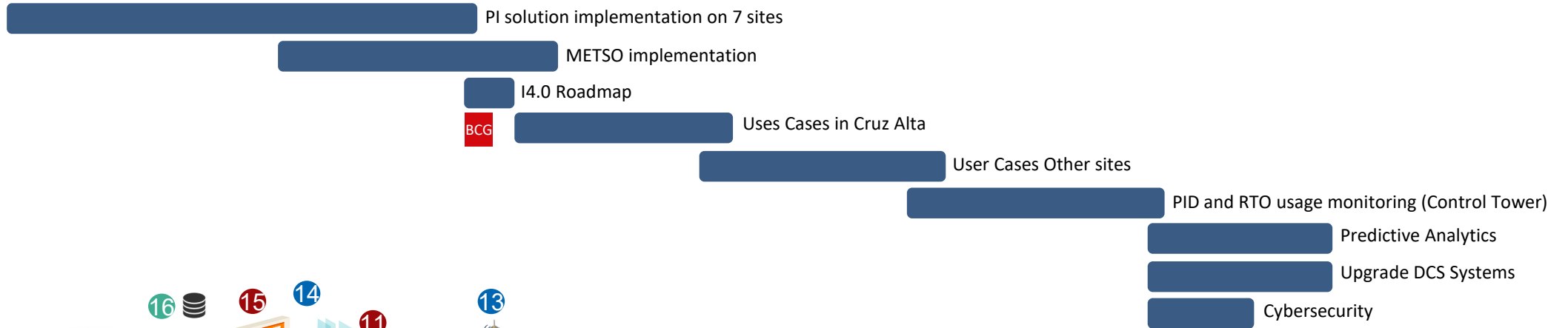


Integrated Data Framework: PI System's Impact Across Various Industry Areas...



- 1 Enterprise Integrated Vision
- 2 Digital Twin
- 3 Automation and Maintenance Control Tower
- 4 Monitoring the performance of the PI System
- 5 Analytics – Performance monitoring of PID controllers
- 6 PI Notification
- 7 Quality monitoring of the Raw material
- 8 Monitoring of harvesters, tractors and sugarcane trucks
- 9 Monitoring of production performance per shift
- 10 Real-time optimization
- 11 Monitoring the utilization rate and performance of advanced process controls
- 12 Tracking evaporation rate and campaign time

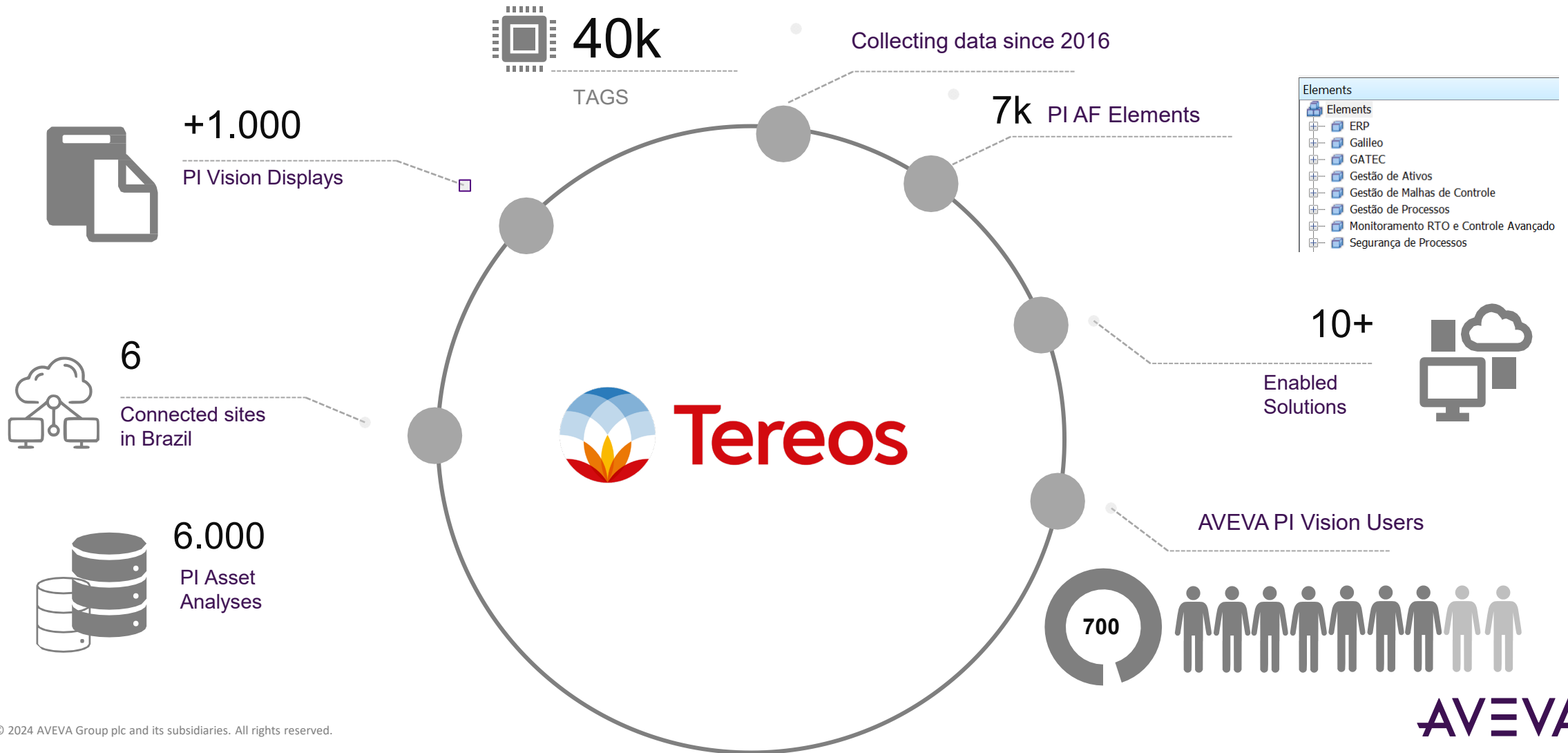
Digital Transformation Timeline: The Role of AVEVA PI System in Information Democratization



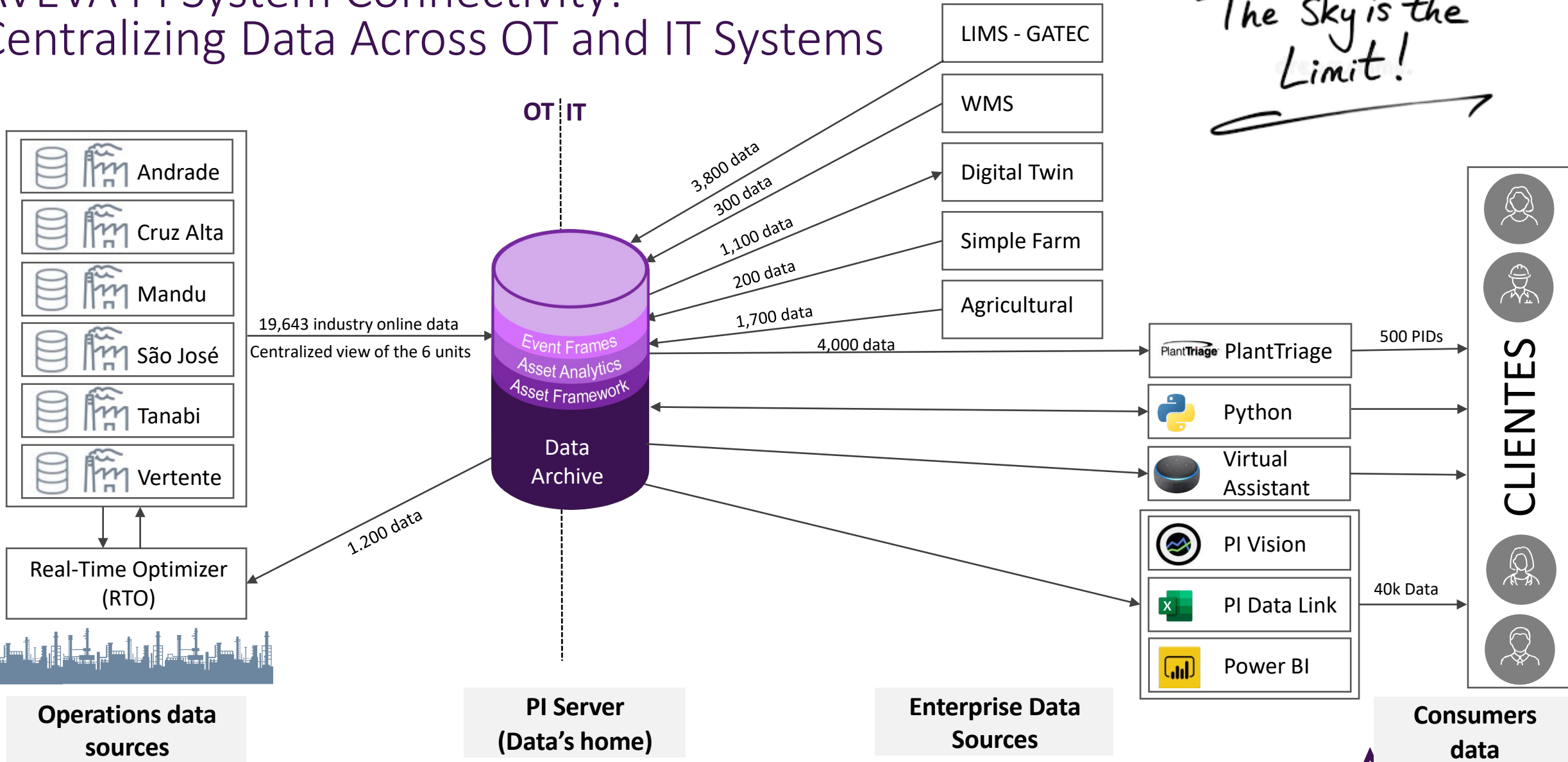
- | | | |
|---------------------|------------------------------------|---------------------------|
| 01 Access Journey | 07 Boiler 4.0 | 13 Plant data monitoring |
| 02 App Mobile | 08 High Performance Crystalization | 14 Real-time optimization |
| 03 Warehouse Go | 09 Evaporation 4.0 | 15 Paperless |
| 04 Asset Management | 10 Smart Ethanol | 16 Centralized Database |
| 05 Maintenance 4.0 | 11 Dashboards | 17 Network Refresh |
| 06 Extraction 4.0 | 12 Digital Twin | |



AVEVA PI System: Key Enabler in Tereos' Digital Transformation and Data Accessibility



AVEVA PI System Connectivity: Centralizing Data Across OT and IT Systems



Cases



Case - Automation Control Tower

Monitoring

5. Management



PI System – Online Monitoring

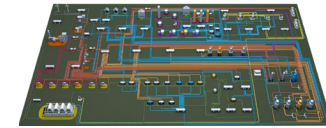


Control Processes

4. Real-Time Optimization (RTO)



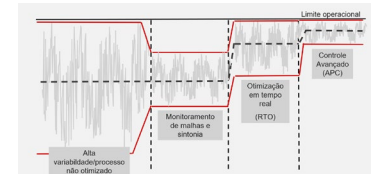
Real-time optimizer



3. Advanced Process Control (APC)



Advanced Process Control



2. Regulatory Control (PID)



PIDs Controllers



Sensing

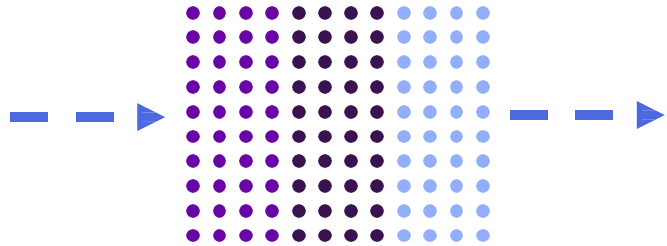
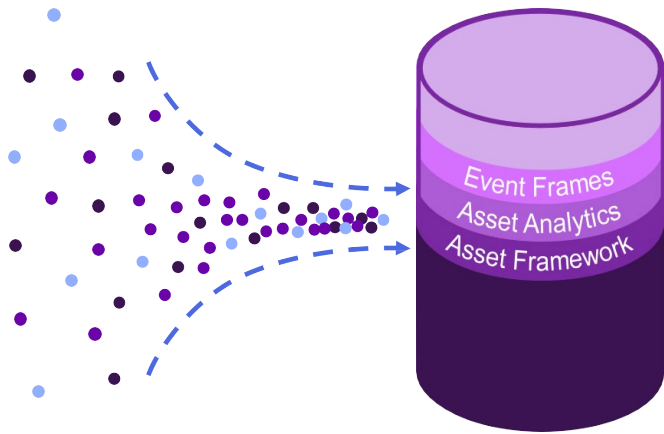
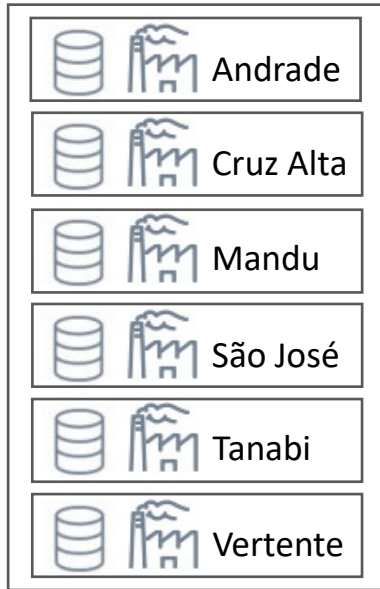
1. Field Instruments, IoT



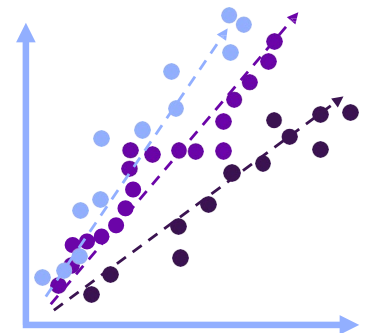
Actuator field sensors

Case - Automation Control Tower

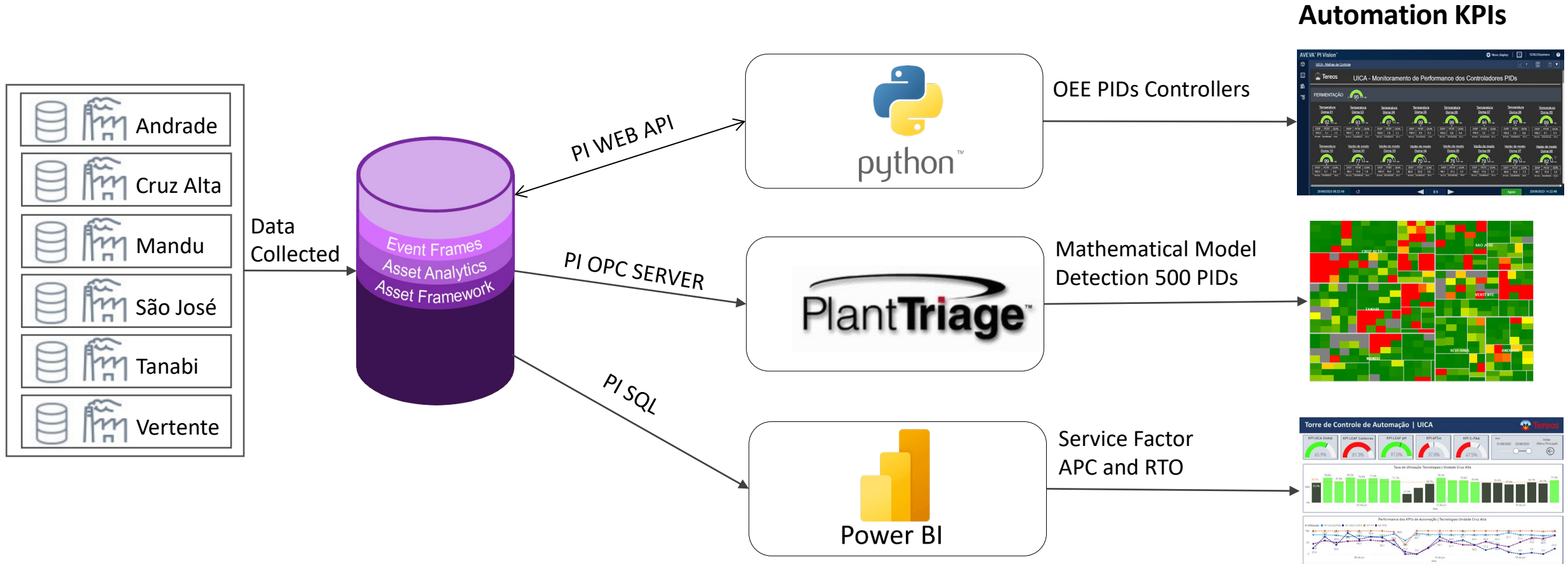
Turning data into operational intelligence



AUTOMATION CONTROL TOWER



Case - Automation Control Tower



Case - Automation Control Tower

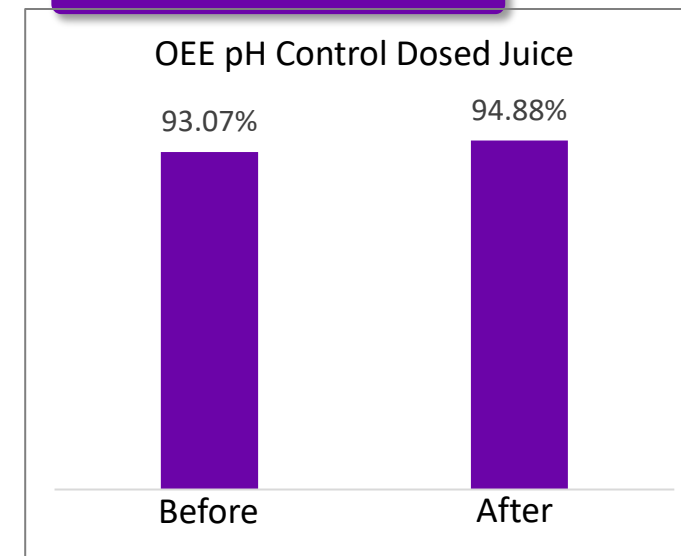
$$\text{OEE} = \text{AVAILABILITY} * \text{PERFORMANCE} * \text{QUALITY}$$

$$100 * \frac{\%Time\ on\ automatic}{\%Time\ able\ to\ operate}$$

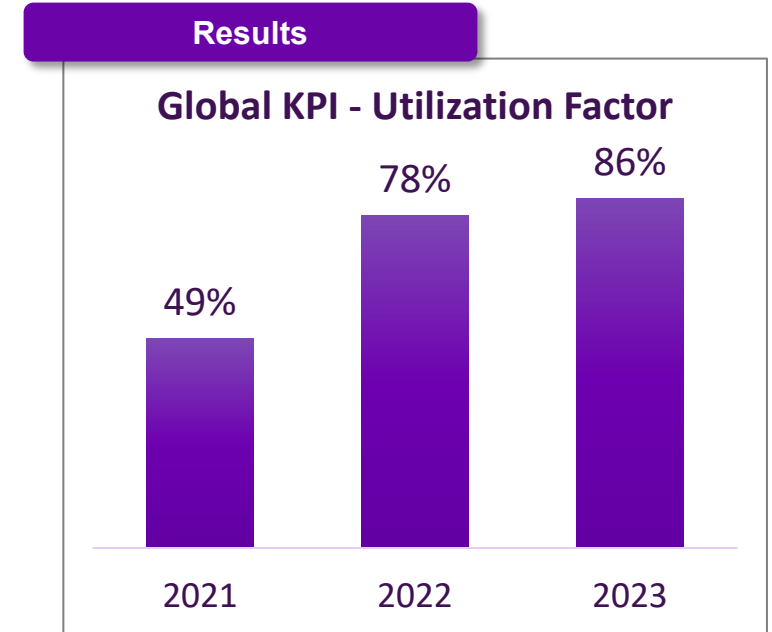
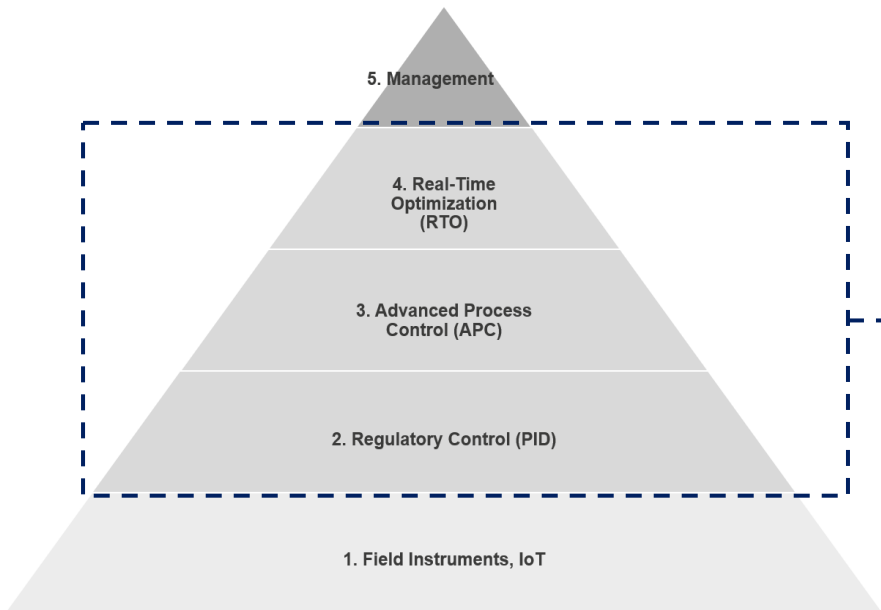
$$\left(100 - 100 * \frac{2 * \sigma}{\overline{PV}}\right)$$

$$\left(100 - 100 * \frac{Setpoint - PV}{Setpoint}\right)$$

Results



Case - Automation Control Tower



+0,3%
Industrial efficiency

+650 m³
Ethanol production increase (per year)

100 kt
Bagasse consumption savings

Case - Sustainability and Efficiency: AVEVA PI System in Biogas Plant Monitoring



Overview:

- **Monitoring Focus:** Utilization of AVEVA PI System to oversee operations in the Biogas Plant at the Sugarcane Mill.

Key Features:

- **Real-Time Data Monitoring:** Continuous tracking of biogas production and plant performance.
- **Efficiency Optimization:** Data-driven insights for optimizing biogas production processes.

Sustainability Impact:

- **Reduced Emissions:** Enhanced monitoring helps in reducing greenhouse gas emissions through efficient biogas management.
- **Resource Management:** Improved utilization of renewable resources derived from sugarcane processing.

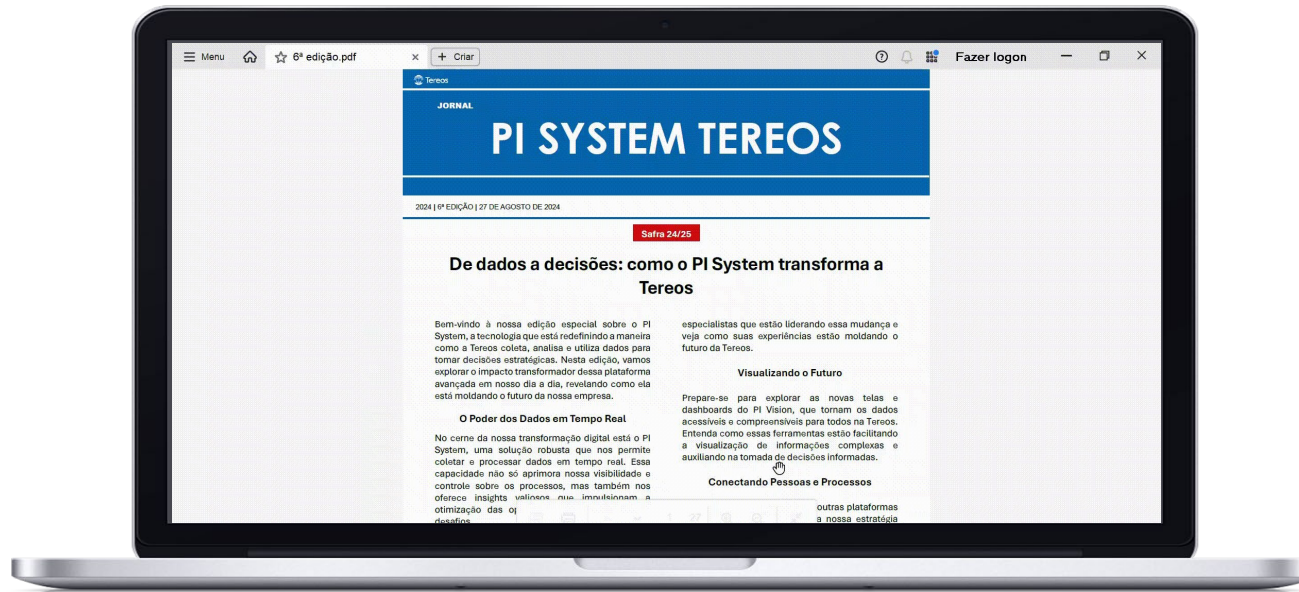


PI System News: Spotlight on Ongoing Projects and Success Stories

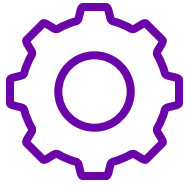
Inform and Engage: Keep users informed about current projects and developments to encourage effective use of AVEVA PI System.

Encouragement:

- **Increased Adoption:** Explore new features and enhancements to maximize the benefits of AVEVA PI System.
- **Collaborate and Share:** Engage with the PI System community to share insights and best practices.



Tereos improves renewable fuel production with data-driven decision



Challenge

- Information silos slowing down decisions to troubleshoot operations and manage and improve KPIs
- Multiple dispersed systems across all Tereos business units and lack of integration for various digital transformation initiatives



Solution

- Centralize industrial data from multiple systems
- Integrate digital transformation initiatives for consistent KPIs
- AVEVA PI System deployed, including a central cloud data server, enhancing data visibility across the organization
- PI Analysis to run Soft Sensors that allows low-cost monitoring
- PI Notifications integrated with Microsoft Teams



Benefits

- Data-Driven Decisions for debottleneck and continuous improvement
- Accelerate implementation of digital projects/solutions
- Increased team productivity, enabling data monitoring and insights at a corporate level
- Agility in replication
- **48% to 82%** increase on utilization factor for optimization technology
- **+0,3%** industrial efficiency
- **+650.000 liters/year** ethanol production in a single APC use case
- **100kt/year** bagasse savings in energy efficiency
- Fast and mobile notifications

“Every great Journey
begins with a single step”

Buda / Lao-Tsé



This presentation may include predictions, estimates, intentions, beliefs and other statements that are or may be construed as being forward-looking. While these forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could result in actual outcomes differing materially from those projected in these statements. No statement contained herein constitutes a commitment by AVEVA to perform any particular action or to deliver any particular product or product features. Readers are cautioned not to place undue reliance on these forward-looking statements, which reflect our opinions only as of the date of this presentation.

The Company shall not be obliged to disclose any revision to these forward-looking statements to reflect events or circumstances occurring after the date on which they are made or to reflect the occurrence of future events.

 [linkedin.com/company/aveva](https://www.linkedin.com/company/aveva)

 [@avevagroup](https://twitter.com/avevagroup)

ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com