PID Health Monitoring

Rohan Tuli

Solvay

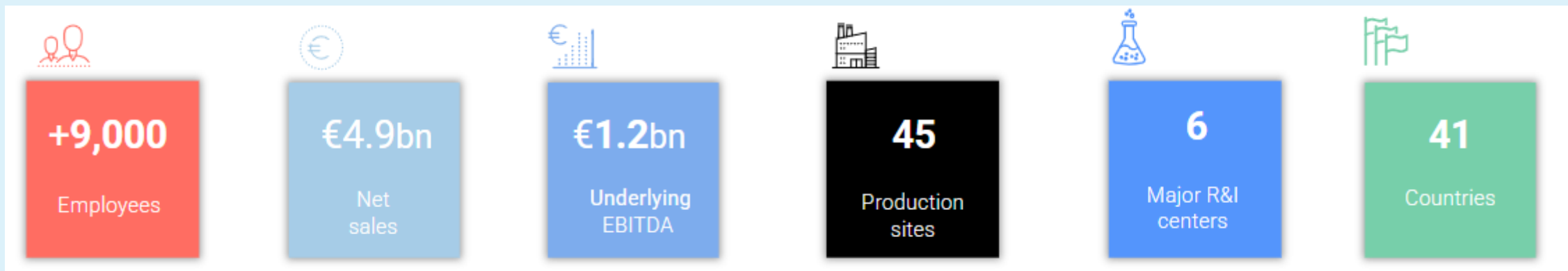Industrial Digital Transformation
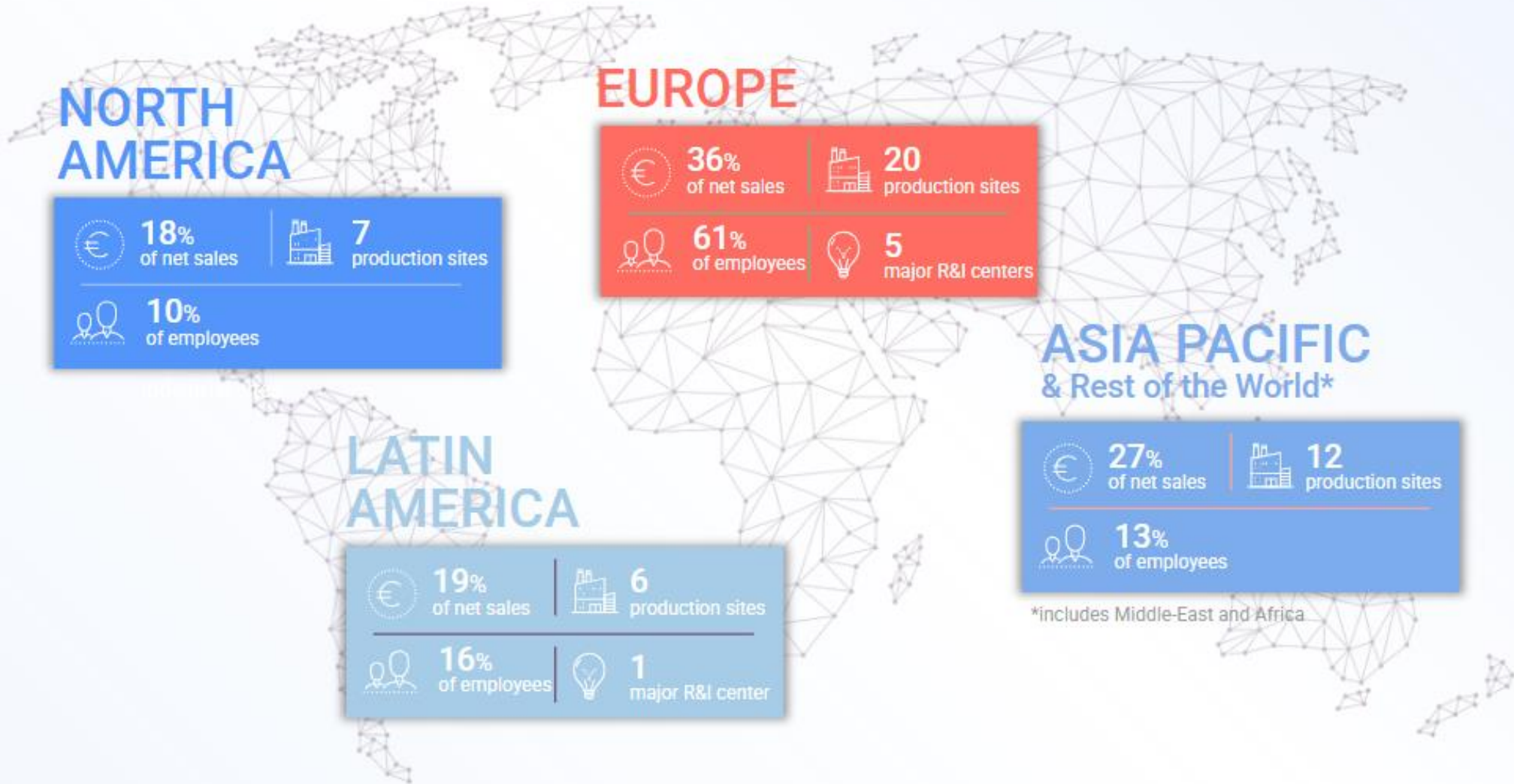Engineer – North America

We are Solvay

We are Solvay, a pioneering chemical company with a legacy rooted in the groundbreaking soda ash process innovation of our founder Ernest Solvay's. We master technologies that have proven essential to multiple end-markets.

Since 1863, we have harnessed the power of chemistry to create innovative, sustainable products that address the world's most pressing needs. These include purifying the air we breathe, the water we use, conserving our food resources, ensuring our health and well-being, producing eco-friendly clothing, enhancing the eco-sustainability of automobile tires and maintaining the cleanliness of our homes.

As a world-leading company, holding the number one position across all our markets, we are committed to driving the transition towards a carbon-neutral future by 2050.

+9,000	€4.9bn	€1.2bn	45	6	41
Employees	Net sales	Underlying EBITDA	Production sites	Major R&I centers	Countries

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Global reach, close to our clients

NORTH AMERICA

€ 18% of net sales	🏭 7 production sites
👥 10% of employees	

EUROPE

€ 36% of net sales	🏭 20 production sites
👥 61% of employees	💡 5 major R&I centers

ASIA PACIFIC
& Rest of the World*

€ 27% of net sales	🏭 12 production sites
👥 13% of employees	

*includes Middle-East and Africa

LATIN AMERICA

€ 19% of net sales	🏭 6 production sites
👥 16% of employees	💡 1 major R&I center

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Industrial Digital Organization

David Peig
Industrial Digital Transformation Manager
Torrelavega, Spain

David is responsible for delivering the digital transformation within the Industrial organization, leading the team, and developing a digitally enabled culture within Solvay.

Stéphane Michel Program Manager
Lyon, France

In DT organization, Stéphane is the PMO. He is instrumental in providing program governance, tracking progress, and facilitating communication across teams.

Julio Flores
Domain Lead
Barcelona, Spain

Julio, is key on the implementation of the data management principles, including data governance and data quality

Bruno da Silva
Data automation
Curitiba, Brazil

Alba Carrero
Domain Lead
Barcelona, Spain

Alba, with experience as Energy Optimization Officer, with main focus on energy efficiency & optimization projects.

Alvaro Martinez Lopez
Domain Lead
Torrelavega, Spain

Álvaro, with experience as Maintenance Excellence Project Leader, with focus on the Digital Transformation in the Maintenance field.

Tadeusz Dochnal
Dig.Transformation Maintenance Engineer
Warrington, UK

Tadeusz is key on supporting the rollout of the Digital Transformation Maintenance use cases on the Reliability and Work Order Management pillars.

Sandrine Cossement
Domain Lead
Brussels, Belgium

Sandrine, as Project Manager in GEC, with focus on data structuration in the industrial data lake and diverse "Digital Ways of Working" projects.

Rohan Tuli
Future maker
Green river USA

Rohan, part of Future-Makers program: Industrial Digital Transformation Engineer NA region

Zuochao Shen
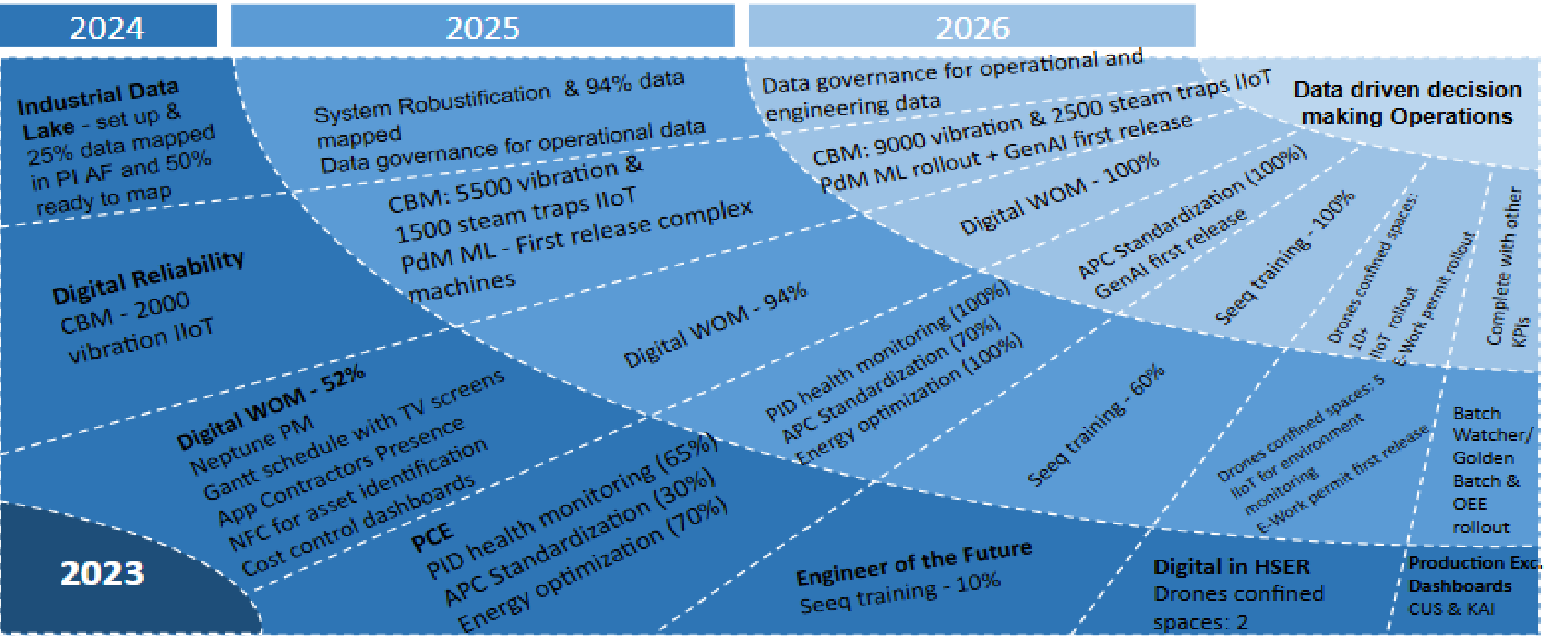Dig.Transf. Engineer
Quzhou china

Zuochao: Industrial Digital Transformation Engineer APAC region

These leads are responsible for driving the implementation of specific projects within the digital transformation portfolio, ensuring the acceleration and sustainability of value creation across the sites

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Digital Sunray chart

2024 | 2025 | 2026

Industrial Data Lake - set up & 25% data mapped in PI AF and 50% ready to map

Digital Reliability CBM - 2000 vibration IIoT

Digital WOM - 52% Neptune PM Gantt schedule with TV screens App Contractors Presence NFC for asset identification Cost control dashboards

PCE PID health monitoring (65%) APC Standardization (30%) Energy optimization (70%)

2023

System Robustification & 94% data mapped Data governance for operational data

CBM: 5500 vibration & 1500 steam traps IIoT PdM ML - First release complex machines

Digital WOM - 94%

PID health monitoring (100%) APC Standardization (70%) Energy optimization (100%)

Seeq training - 60%

Engineer of the Future Seeq training - 10%

Data governance for operational and engineering data

CBM: 9000 vibration & 2500 steam traps IIoT PdM ML rollout + GenAI first release

Digital WOM - 100%

APC Standardization (100%) GenAI first release

Seeq training - 100%

Data driven decision making Operations

Drones confined spaces: 10+ IIoT rollout E-Work permit rollout Complete with other KPIs

Drones confined spaces: 5 IIoT for environment monitoring E-Work permit first release

Batch Watcher/ Golden Batch & OEE rollout

Digital in HSER Drones confined spaces: 2

Production Exc. Dashboards CUS & KAI

CBM: Condition Based Monitoring
PdM ML: Predictive Maintenance Machine Learning
GenAI: Generative Artificial Intelligence

IIoT: Industrial Internet of Things sensors
NFC: Near-Field Communication chips
PCE: Process Control Excellence

APC: Advanced Process Control
PID: Proportional. Integer and Derivative control loops
CUS: Specific Consumption

KAI: Key Activity Indicator

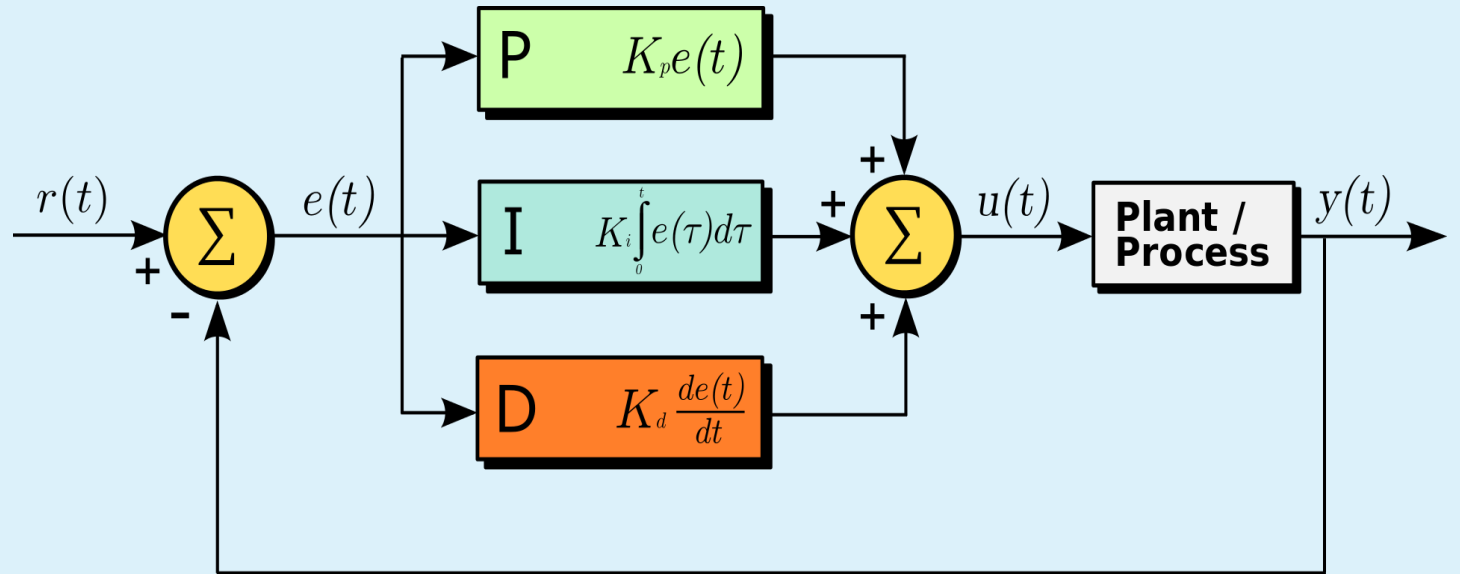**SOLVAY**

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First…What a PID is?

Purpose: Used to maintain a desired output by minimizing the error between a setpoint (SP) and a process variable (PV).

Key Concepts:

Process Variable (PV): The current value of the system being controlled (e.g., temperature, speed, flow rate).
Setpoint (SP): The desired target value for the process variable.
Output (OP): The control signal sent by the PID controller to adjust the system (e.g., heater power, motor speed).

$r(t)$ → Σ → $e(t)$

- P $K_p e(t)$
- I $K_i \int_0^t e(\tau)d\tau$
- D $K_d \frac{de(t)}{dt}$

Σ → $u(t)$ → **Plant / Process** → $y(t)$

Components:
Proportional (P): Responds to current error (difference between SP and PV). Larger errors lead to larger corrections.
Integral (I): Accumulates past errors to eliminate steady-state errors.
Derivative (D): Predicts future errors based on the rate of change of the error.

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Why I should monitor my PID?

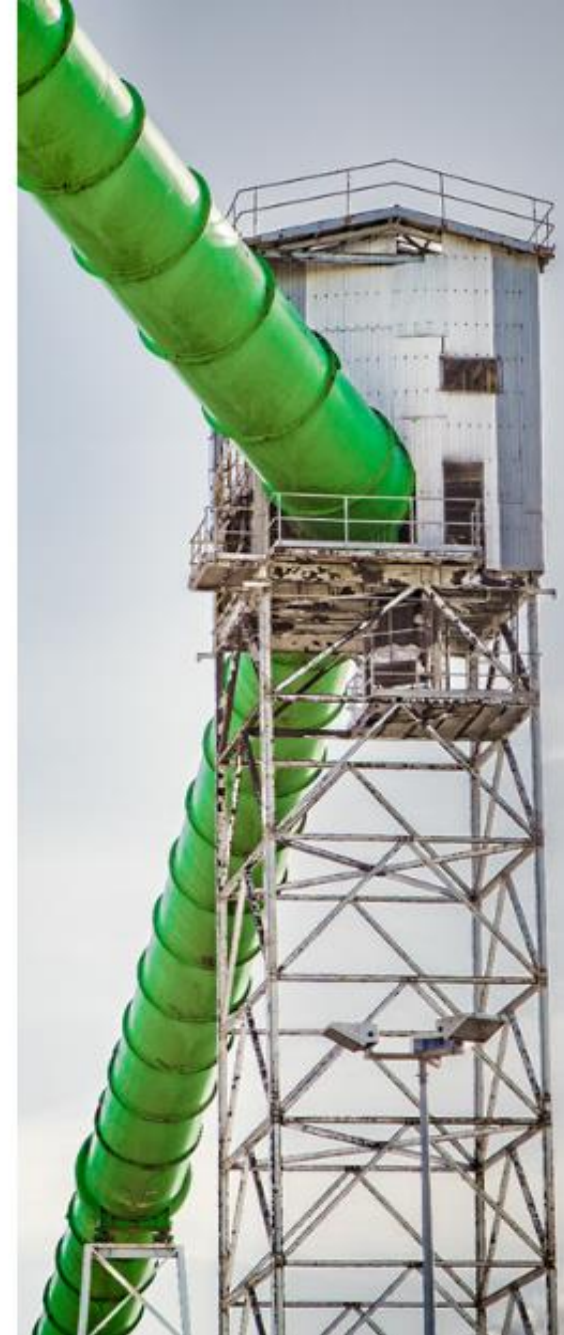Strategic Control Loop Management

The stability, reliability, and **optimal performance** of an **industrial process** are intrinsically linked to the **efficiency of its control loops**.

The stakes of poor performances of basic control loops have been evaluated from 2 % to 6% of production costs.
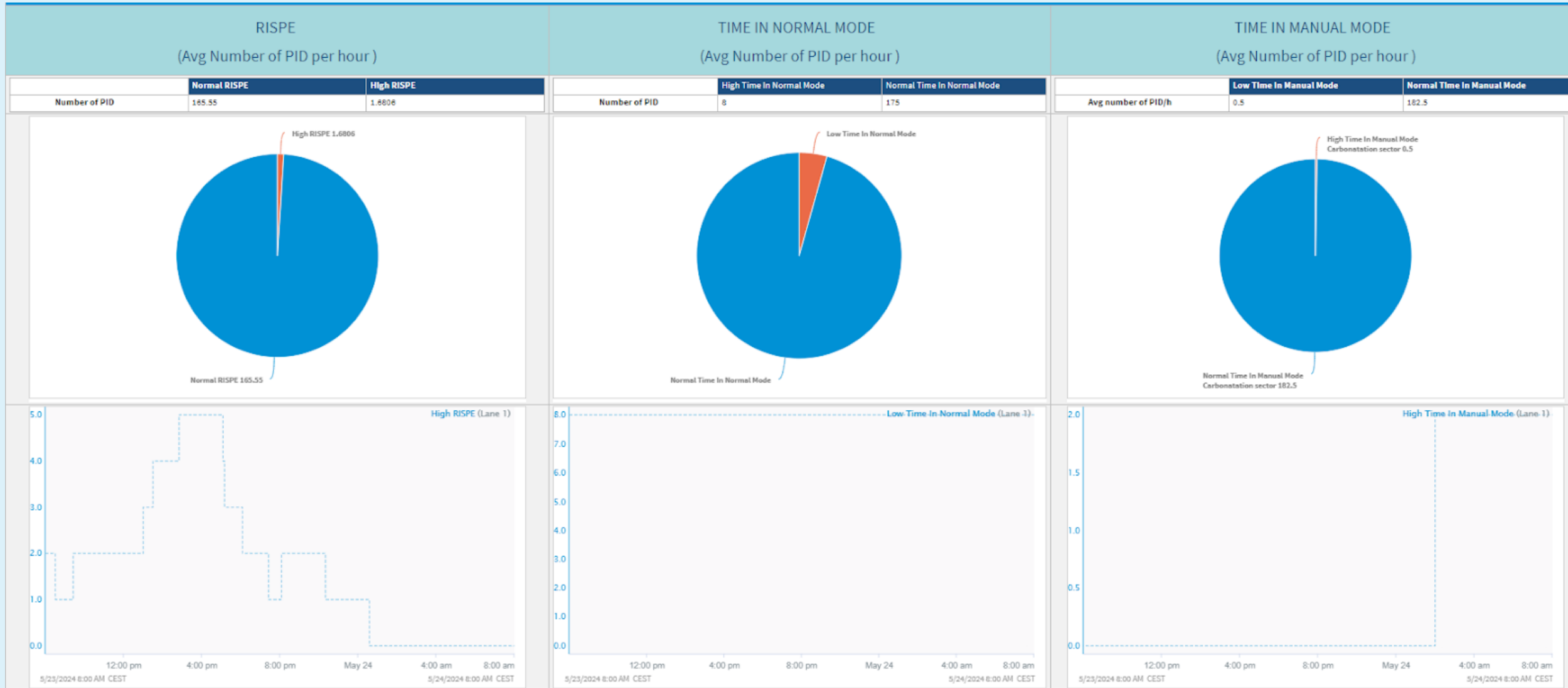
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What to Monitor?

- **RISPE:** PID control loop error. It can be considered as the PID performance index.
- **Time in Manual:** How much time (hours) the control loop is set in Manual mode.
- **Time in Normal Mode:** How much time the control is set in the expected mode (Auto/Cascade) in hours and within the limits of the controller (PV & OP limits) .

- **Number of SP changes:** When the control loop is on Auto mode how much SP change are done per day.
- **Valve Travel:** Is the travel amount of the final control element (or at least of the controller output).

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PID Monitoring Organizer: Area Performance

	RISPE (Avg Number of PID per hour)		TIME IN NORMAL MODE (Avg Number of PID per hour)		TIME IN MANUAL MODE (Avg Number of PID per hour)	
	Normal RISPE	**High RISPE**	**High Time In Normal Mode**	**Normal Time In Normal Mode**	**Low Time In Manual Mode**	**Normal Time In Manual Mode**
Number of PID	165.55	1.6806				
Number of PID			8	175		
Avg number of PID/h					0.5	182.5

PID Monitoring Organizer: Main Contributors

Who will use PID Monitoring?

Target Audience for Control Loop Management

- **Process Engineers:** Responsible for designing, implementing, and optimizing industrial processes.
- **Maintenance Teams:** Ensuring the reliability and lifespan of equipment affected by control loops.
- **Plant Managers**: Overseeing operational performance and efficiency.
- **Control System Engineers**: Focused on the design and maintenance of control systems.
- **Operations Teams**: Involved in day-to-day monitoring and management of industrial processes.
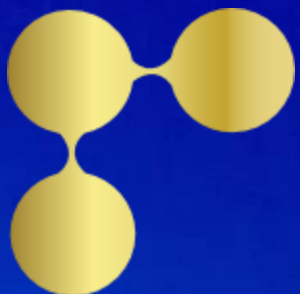
What's coming next?

- Deploy for all Solvay sites
Ensure usage of the tool

- Already starting to be deployed in Europe

- Ensure that all Solvay sites has the tool

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Have a weekly meeting to discuss PID Control Loops and see what actions need to be taken.

- This tool can help decrease 2%-3% the Unitary Consumption of energy and raw materials(as seen in sites like Dombasle France)

Q&A

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