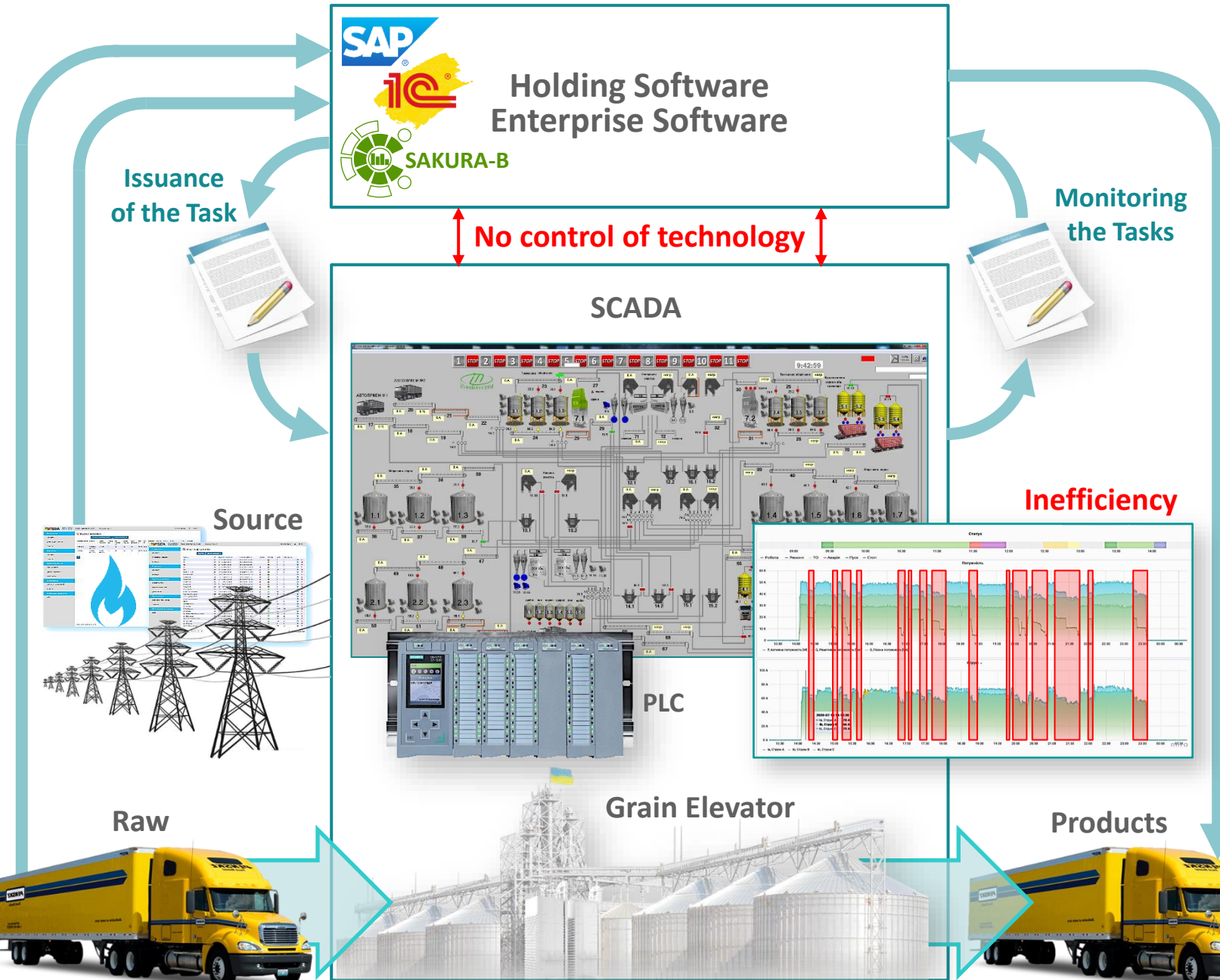


Operational Excellence
Maintenance & Repair

Asset Performance Management

SaaS “SAKURA-APM”

Problem Description



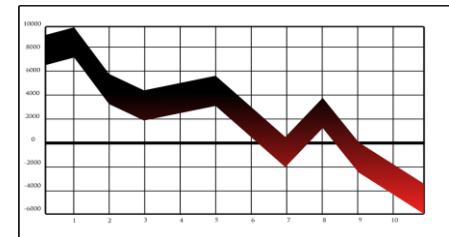
Currently, most elevators in Ukraine have SKADA, which are disconnected from production management and resource control systems. As a rule, automated transfer of tasks and control of their execution are absent. The SKADA operator, guided by its own experience, chooses a technological route from dozens of possible alternatives. Adjustment of technological timings depending on the quality and quantity of raw materials is not applied.

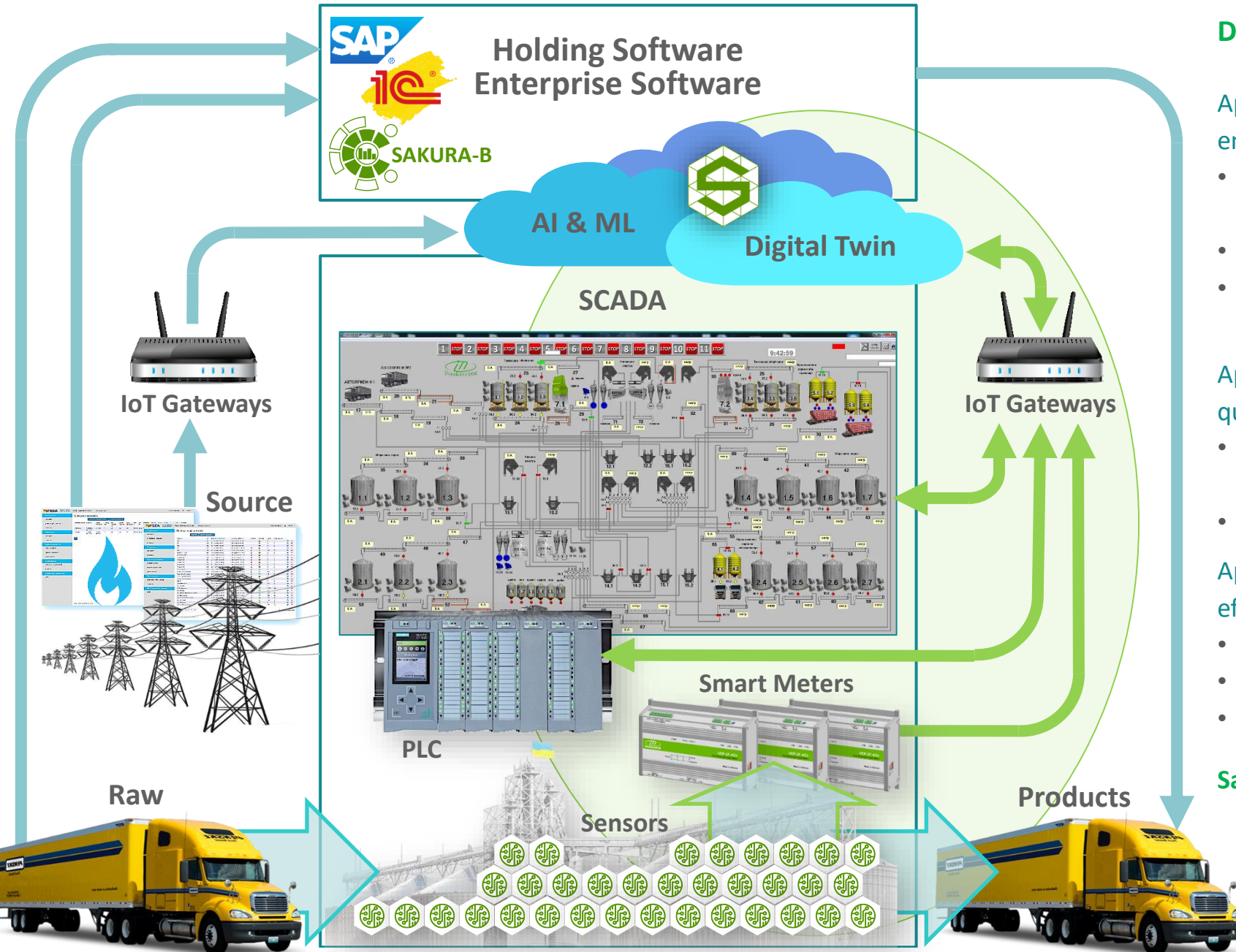
This leads to suboptimal use of mostly powerful equipment and to significant overconsumption of electricity and natural gas.

Tests of a pilot project on an elevator with a capacity of 100,000 tons of grain showed that about 17% of the time elevator equipment works with an efficiency below 40%.

At current electricity prices, financial losses due to irrational use of electricity alone amount to about €4,500 per month.

Related production losses significantly increase financial losses.





Deployment of SAKURA-APM:

Application of IIoT technologies for data collection on energy consumption by each equipment:

- Installation of additional sensors, smart meters, IoT gateways;
- Reading of additional data from PLC and SKADA;
- Deployment of cloud services based on the PaaS SAKURA-IIoT.

Application of Digital Twin technologies for product quality control at all stages of production:

- Adjustment of technological lines depending on product quality;
- Product life cycle control.

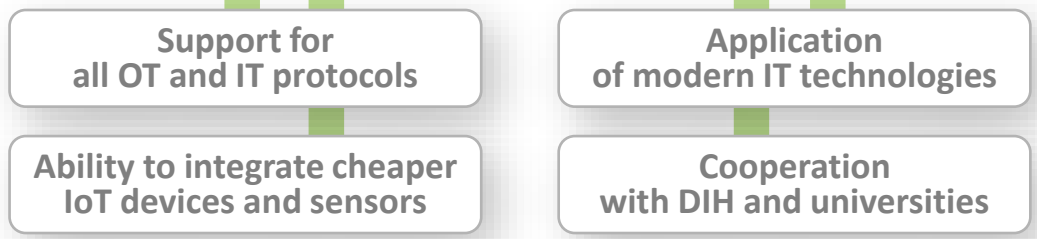
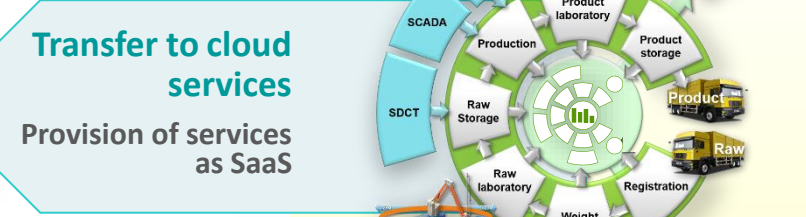
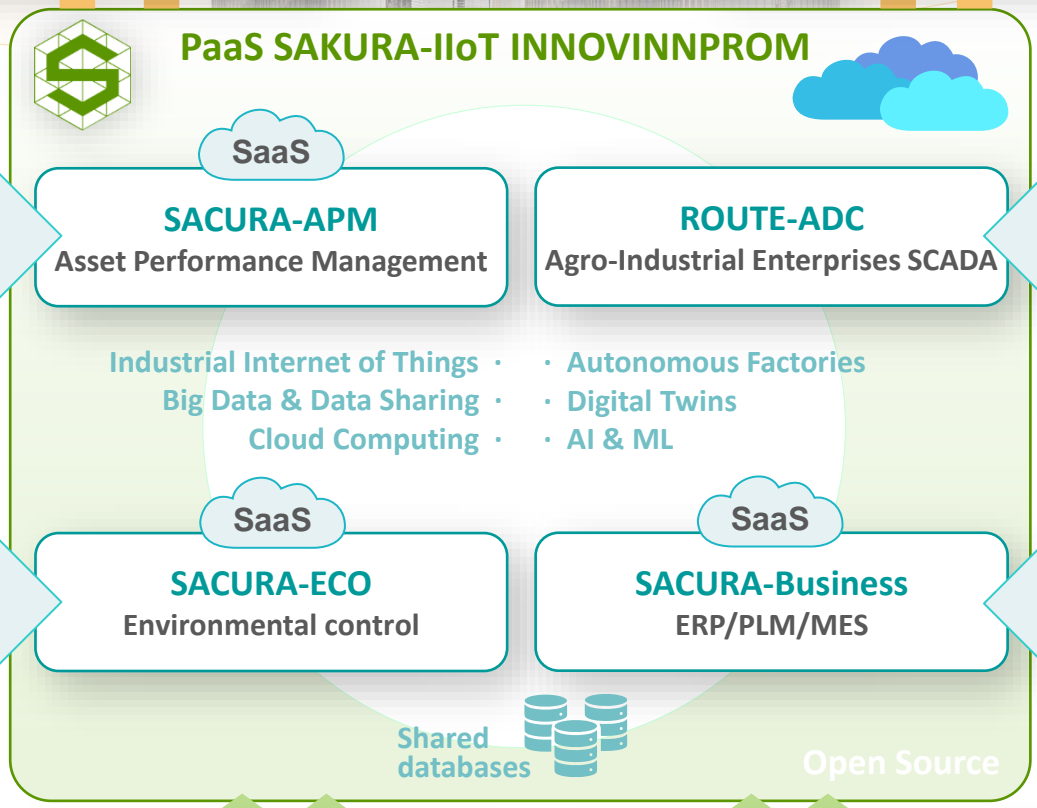
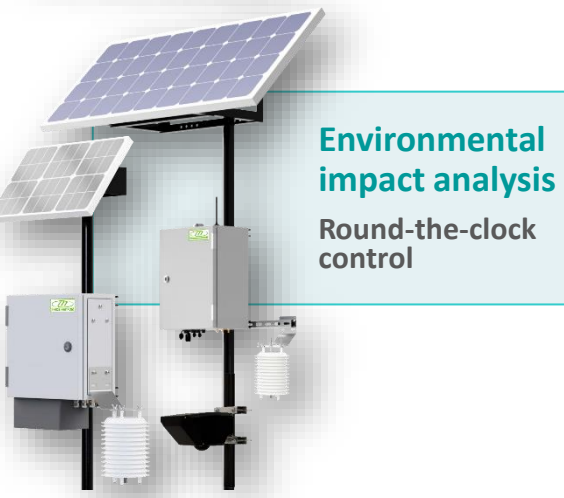
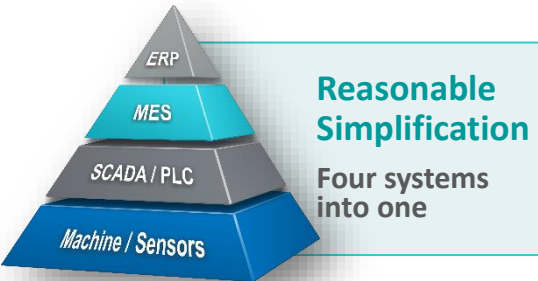
Application of AI & ML technologies to increase energy efficiency of technological processes:

- Optimization of technological delays;
- Forecasting the cost of energy resources;
- Correction of staff errors.

SaaS SAKURA-APM is based on the PaaS SAKURA-IIoT



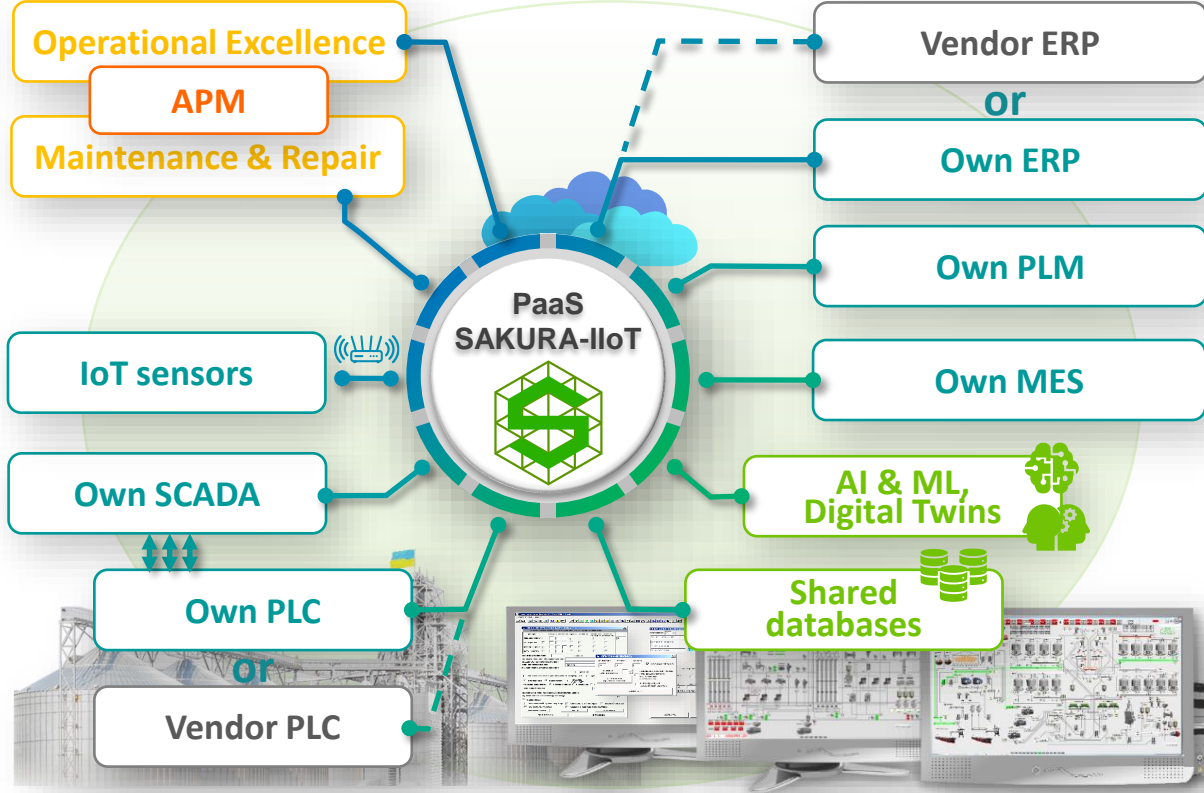
Customer Intimacy
 Innovations in better adaptation
 30 years of experience



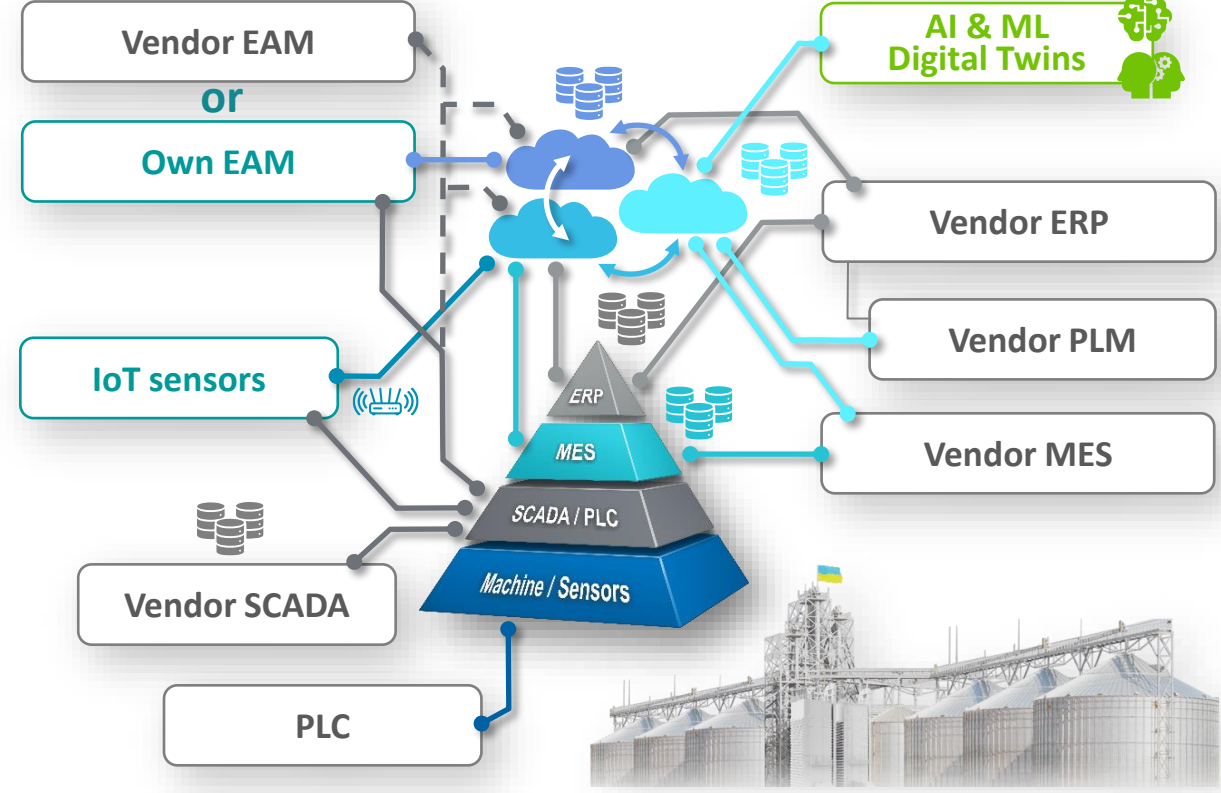
Quantitative and qualitative accounting system

The Best Industry Solutions
 of INNOVINNPROM are adapted to the conditions of the region

INNOVINNPROM – quality leap



Competitors – increased complexity



	INNOVINNPROM	Competitors
Architecture	Simplified: SCADA + Own Platform on a Cloud	Classic: SCADA + eclectically added ERP / PLM / AEM / MES
Industrial Internet of Things	As a component of the PaaS	Added solution
Data Sharing	Consolidated Enterprise Database	Disparate databases and systems
AI & ML, Digital Twins	As a component of the PaaS	Added solution
Technology ownership	Specialized PaaS, ADC SCADA, APM	Adaptation of vendor systems to customer requirements
Software implementation	SaaS	Hosted Software and applications

Full Control and Analytics at All Levels - Holding / Enterprise / Production Line / Equipment

Control and Analysis of the Enterprise

Analysis of Productivity and Energy Efficiency

Analytics of Production and Business Processes

Control and Comparison of Holding Companies

Control and Analysis of Equipment Operation

Control and Planning of Maintenance and Repairs

INDUSTRY 4.0



Internet of Things



Artificial Intelligence



Machine Learning



Edge Computing



Big Data



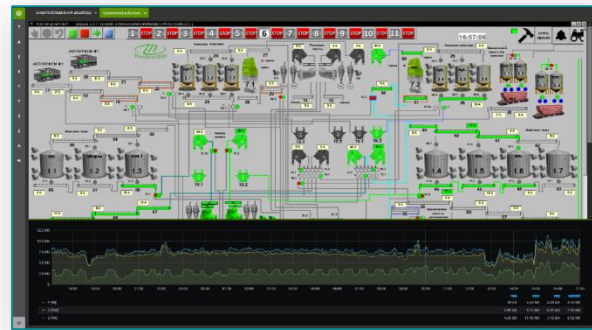
Cyber Security



Digital Twin

The Enterprise module

visualizes consolidated, comparative, detailed and analytical information coming from holding companies. This information is focused on quantity and quality of products, energy consumption and energy efficiency of technological operations of a holding's enterprises.



The Operational Excellence module

provides similar metrics as The Enterprise module, but for a particular enterprise.



The Maintenance and repair module (M&R)

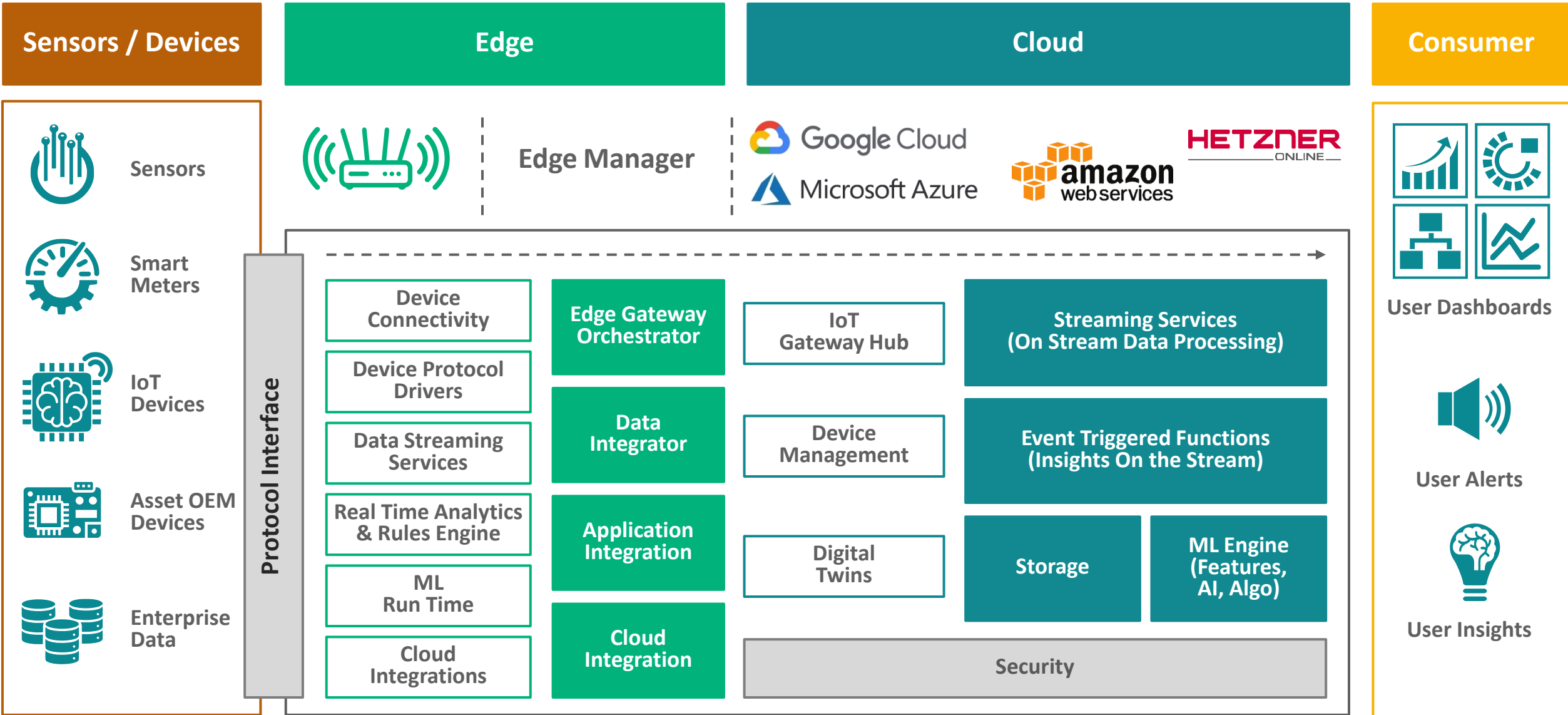
provides planning and control of maintenance and repairs at the holding companies. The main types of information are information on the operation of equipment, energy consumption, use of spare parts and materials during maintenance and repairs.



The Energy Efficiency module

provides low level metrics and analytical information on the consumption of the main types of energy by each unit of equipment, technological group and enterprise as a whole. Based on the obtained data, the calculation of energy efficiency of equipment and technological operations is performed.

SAKURA-IIoT Architecture in a Typical Manufacturing Scenario



Demo Project Implementation

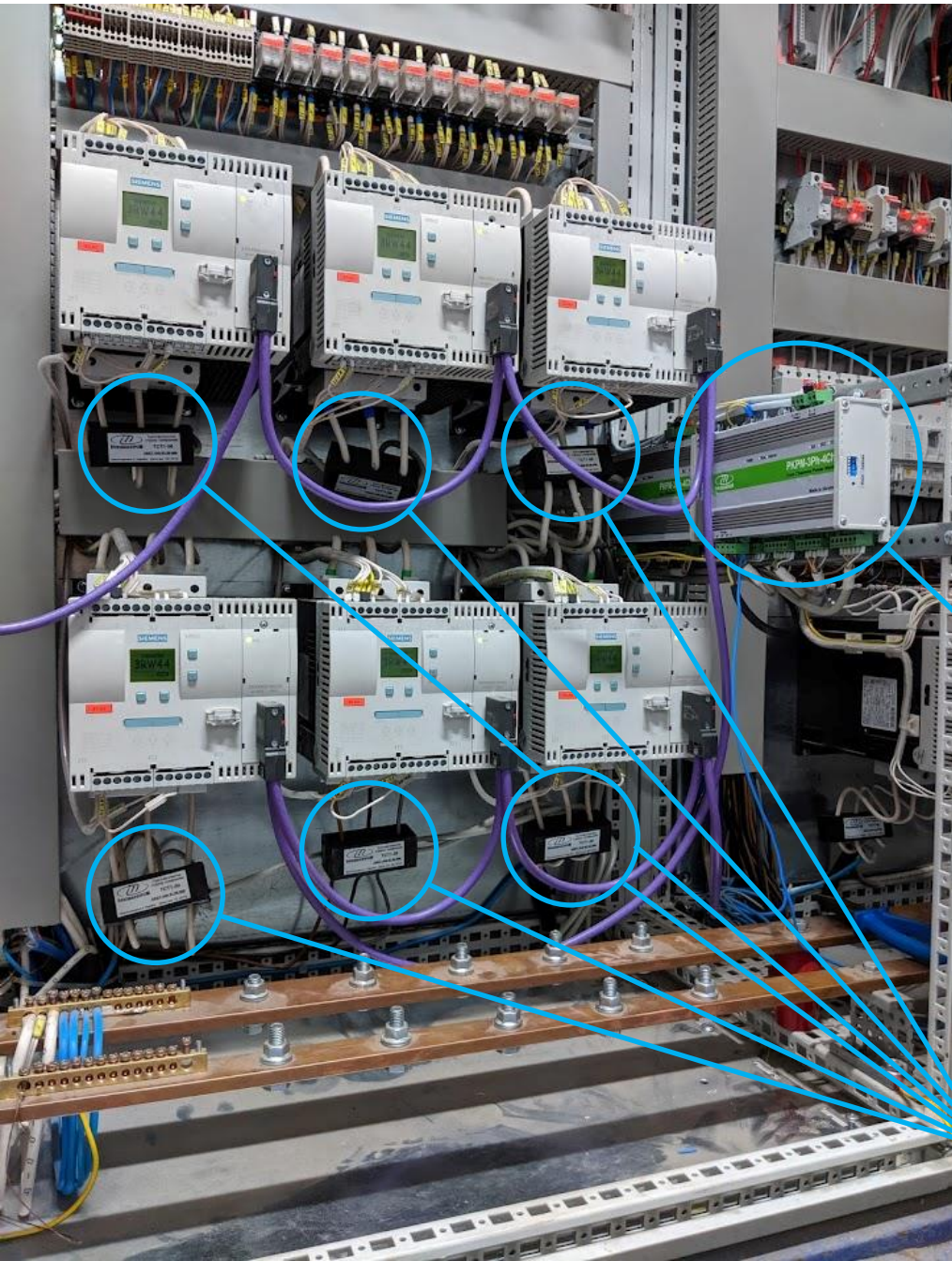
The volume of fully loaded grain storage is 100,000 tons

SCADA - Automated design system "Route" INNOVINNPROM

PLC – Siemens S7-1500, 1500 DI/DO/AI/AO



Installation of Equipment Without Reassembly



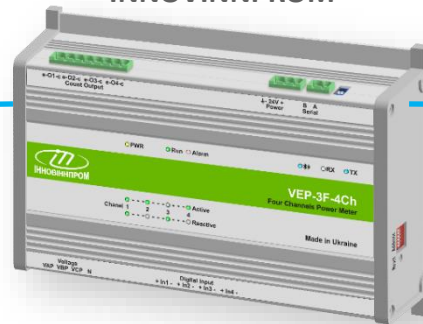
Installed:

Power Meters **17 units**
Transformers **65 units**
IoT Gateways **2 units**

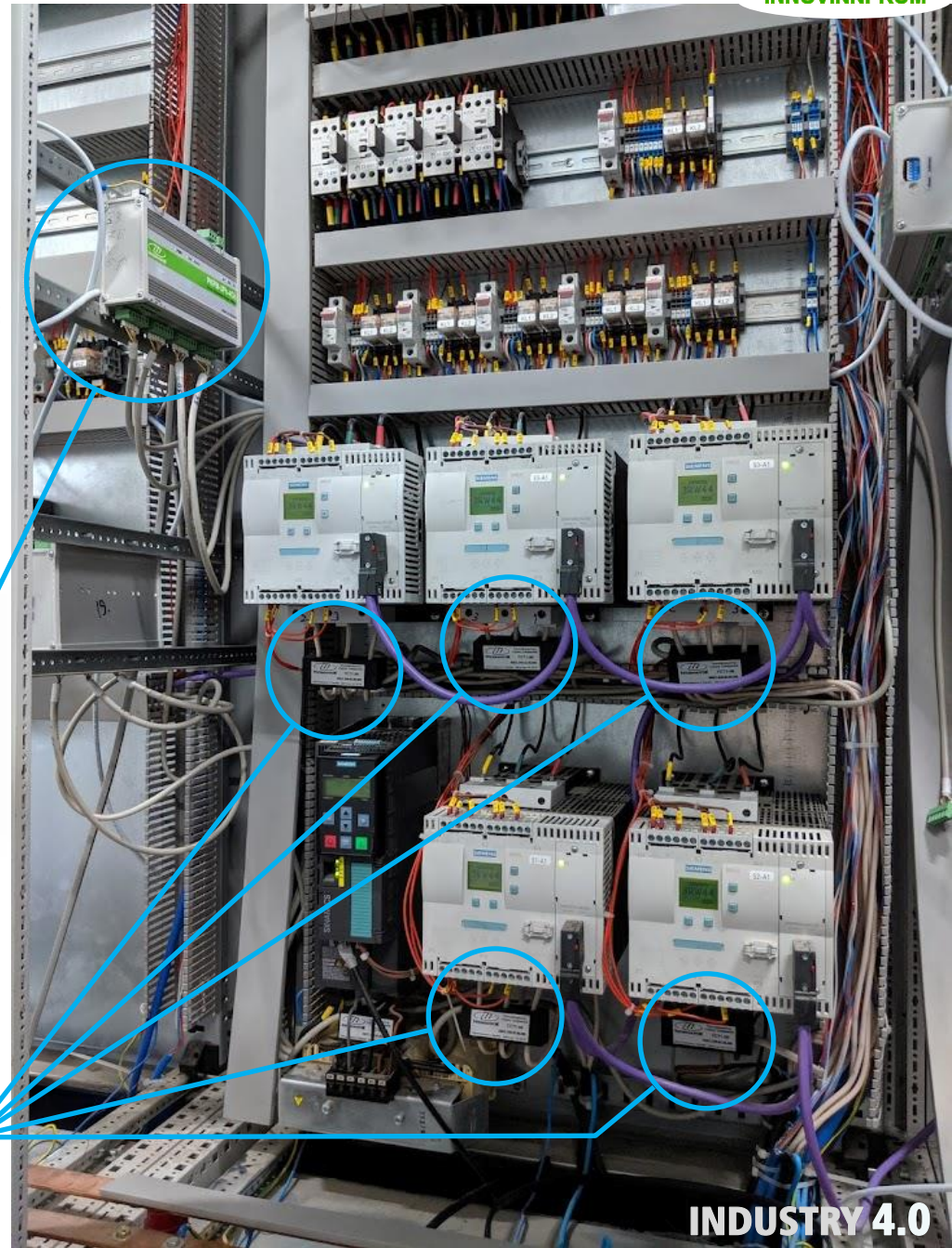
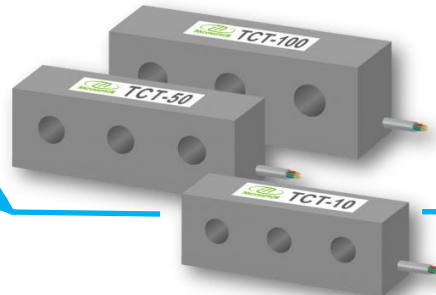
Total:

65 units controlled equipment
3,000 control channels per second

4 Channel Smart Power Meters
INNOVINNPROM

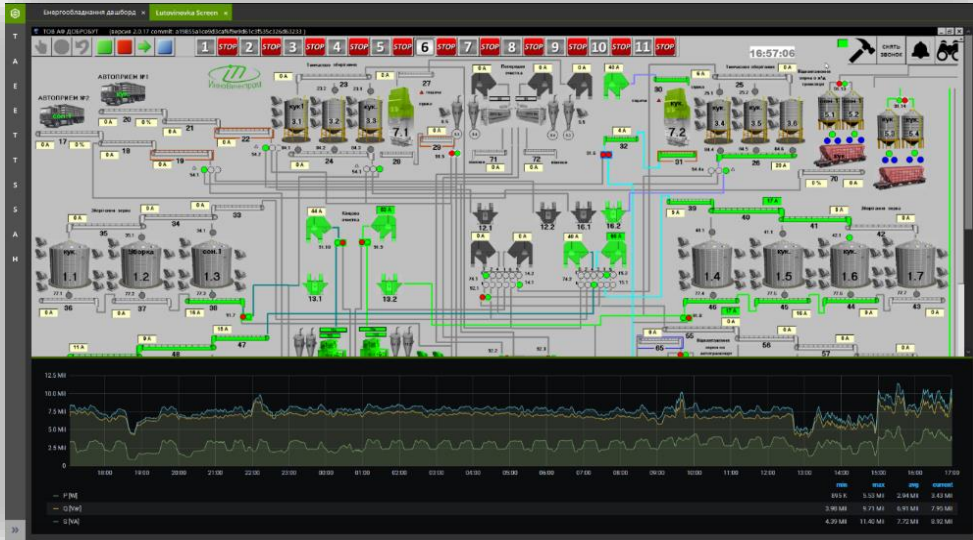


Innovative 3 Phase Transformers
INNOVINNPROM



Test Version of SAKURA-APM – SaaS SAKURA-T

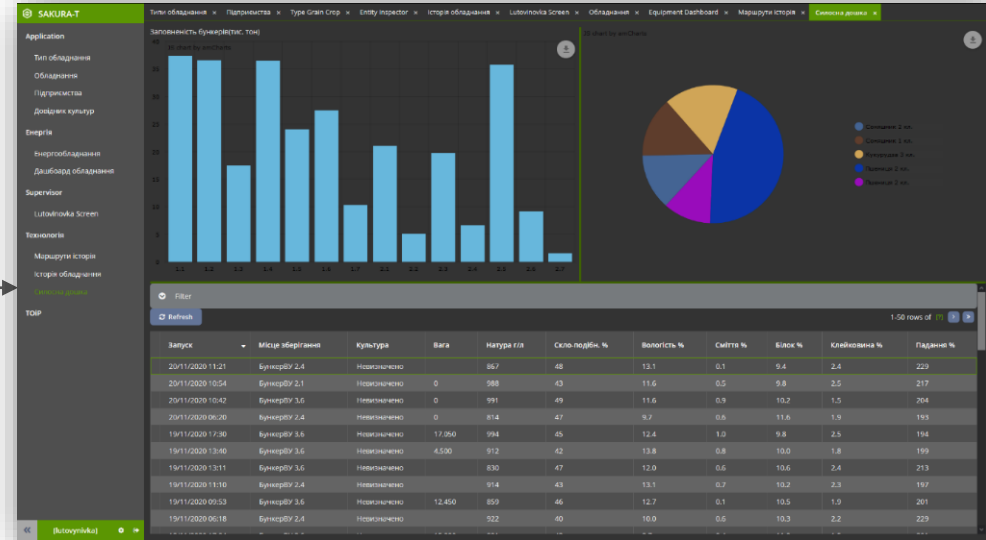
- Installed:**
1. PaaS SAKURA-IIoT
 2. SaaS SAKURA-T – Control of energy efficiency
- <https://cloud.innovinnprom.com/app/#login>



Technology control

Energy efficiency analysis
KPI calculation

Total energy consumption

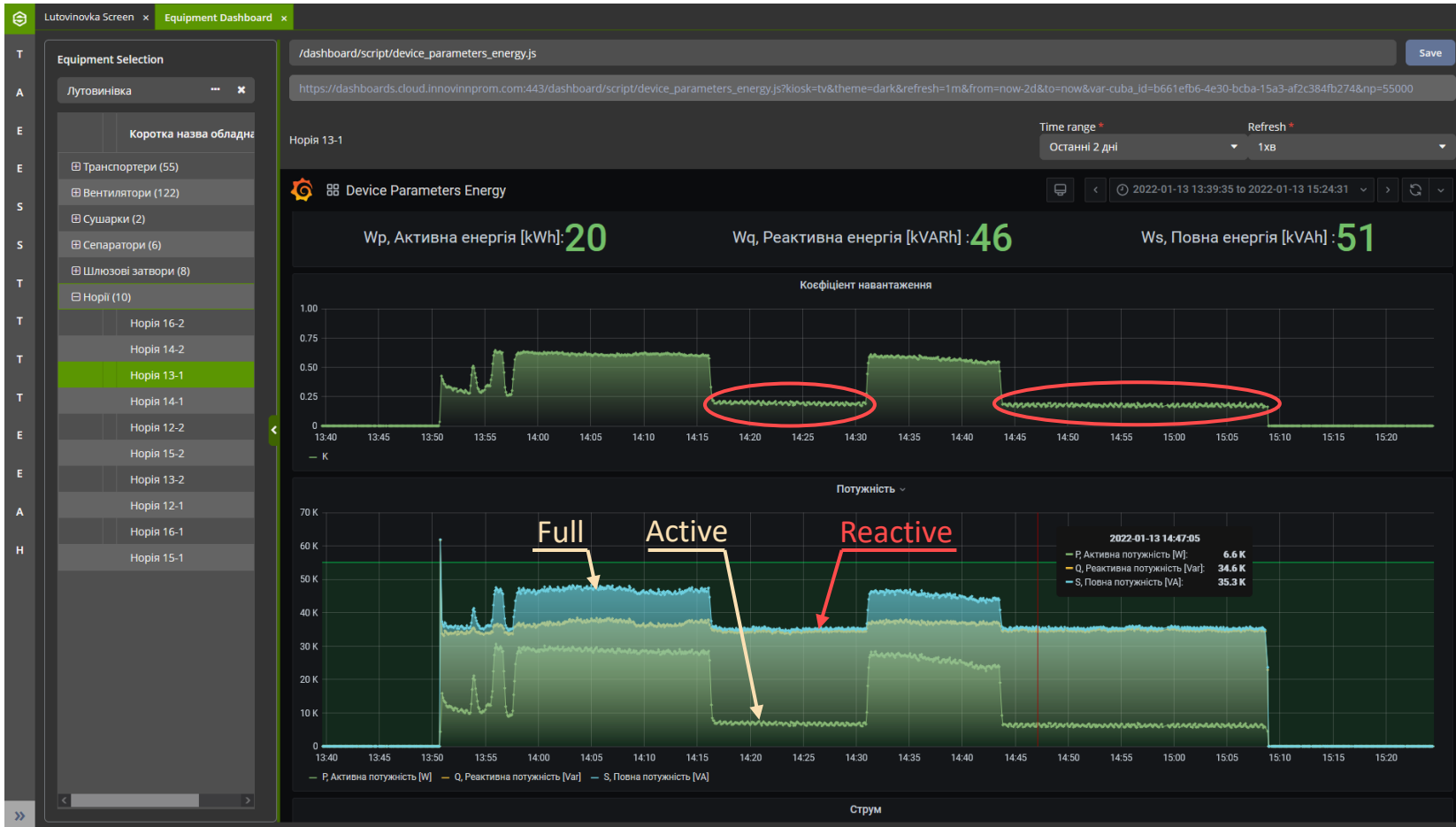


Analysis of technical processes

Control of equipment operation



Example of using one unit of equipment out of 65:



Test operation showed that more than 17% of the company's equipment was used inefficiently. Moreover, if electric motors were idling without load, the energy consumed by them dropped insignificantly. The reason is the high reactive component of energy consumption. As a result, energy is released into the air, contributing to cable lines over-heating. This is the main reason for excessive energy consumption by the company and excessive wear of equipment.

Equipment efficiency - 25%
during 50% of the
technological process

Electricity losses 37 kVA/h
prevalence of the reactive
component
direct electricity losses

Result:
More than 25 kVAh was lost during the technological process lasting 1 hour 20 minutes

The task of the SaaS SAKURA-T:
Using AI & ML, automatically detect cases of suboptimal use of equipment and provide appropriate correction commands to SKADA

The Results of Proof of Concept

The period of test operation - from July 2020 to January 2022, only 16 months

	Wp, Active energy [kWh]	Wq, Reactive energy [kVARh]	Ws, Full energy [kVAh]
Consumed during the trial operation	388 238	772 376	934 885
On average, daily	808,83	1 609,17	1 947,68
Inefficient operation at load <40%	66 000,46	131 303,92	158 930,45
Losses, Euros			31 786,09



The table takes into account **only electricity losses**, excluding:

- ❖ operation of ventilation, aspiration and lighting systems;
- ❖ gas costs for drying products;
- ❖ related operating losses.

Altogether, total losses can be 3 ... 5 times higher.

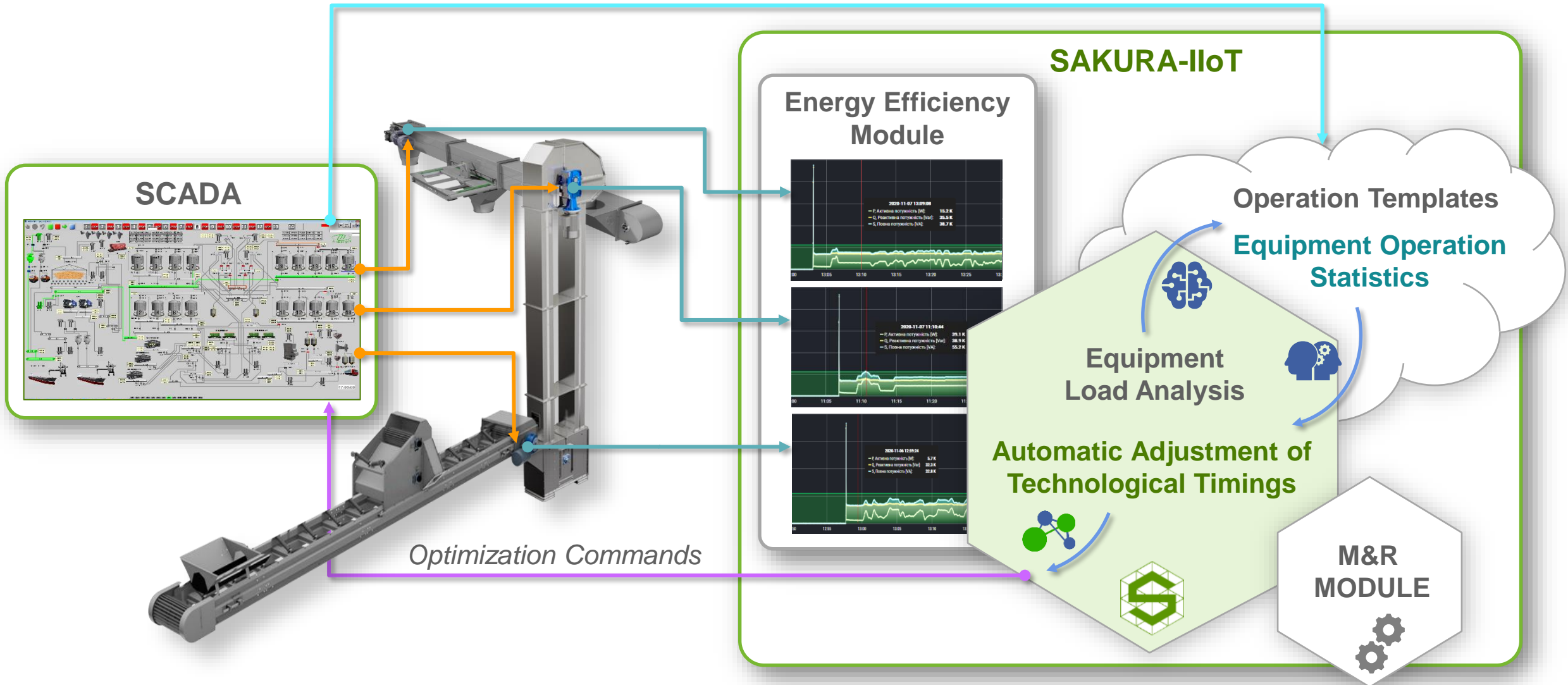
The task of AI & ML:

- ❖ Optimization of technological delays
- ❖ Product life cycle control
- ❖ Adjustment of technological parameters depending on product quality
- ❖ Forecasting the cost of energy resources
- ❖ Recognition and correction of human errors

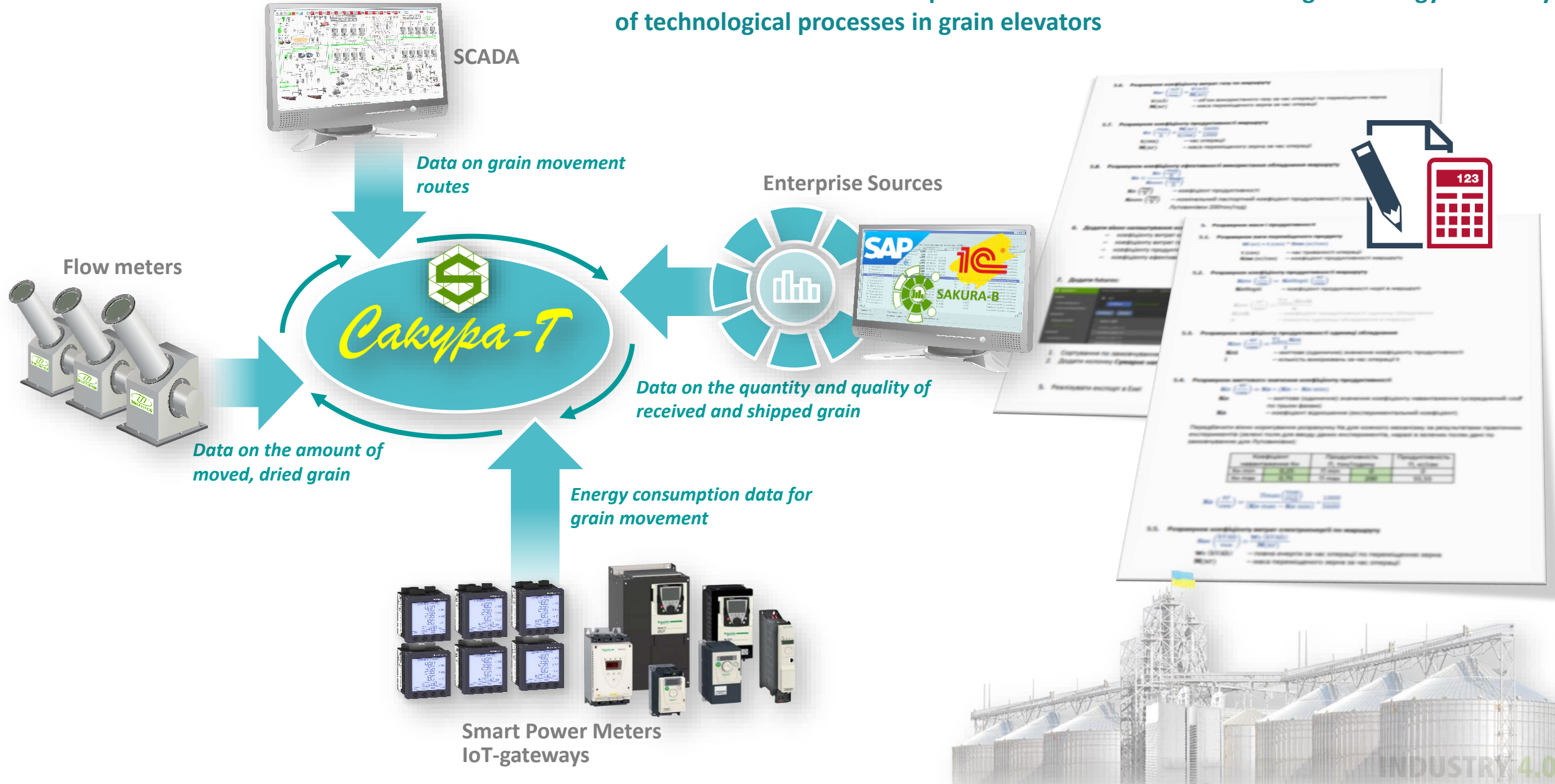
The result of the implementation of SAKURA-T in addition to financial costs will reduce emissions of pollutants.



Digital product passport



INNOVINNPROM has developed its own method for calculating the energy efficiency of technological processes in grain elevators





Reduction of energy consumption of technological equipment - up to 10%

Achieved by selecting and exploiting the most energy-efficient modes of operation of the equipment and optimization of technological delays



Reduction of technological losses - up to 15%

Made possible by preventing violations of established algorithms and standards at all stages of production, continuous monitoring of technological operations and personnel actions



Improving energy efficiency of production - up to 20%

Attained through continuous monitoring and analysis of energy efficiency of production, control of accuracy and timeliness of completing technological tasks



Extend equipment service life - up to 25%

As a result of planning and monitoring the maintenance and repair of equipment, quality control of spare parts from different manufacturers





INNOVINNPROM

Industry 4.0

INNOVINNPROM - Leader of Agro-Industrial Automation of Ukraine



Automation of grain elevators, port grain terminals, mills, sugar factories, feed mills, separate technological lines for processing of agricultural raw materials and products.



UKRAINE

KAZAKHSTAN

MOLDOVA



SCADA
> 1000 I/O



Car Samplers



Railway Samplers



SAKURA-B
MES/ERP/PLM



SAKURA-T
Energy Efficiency

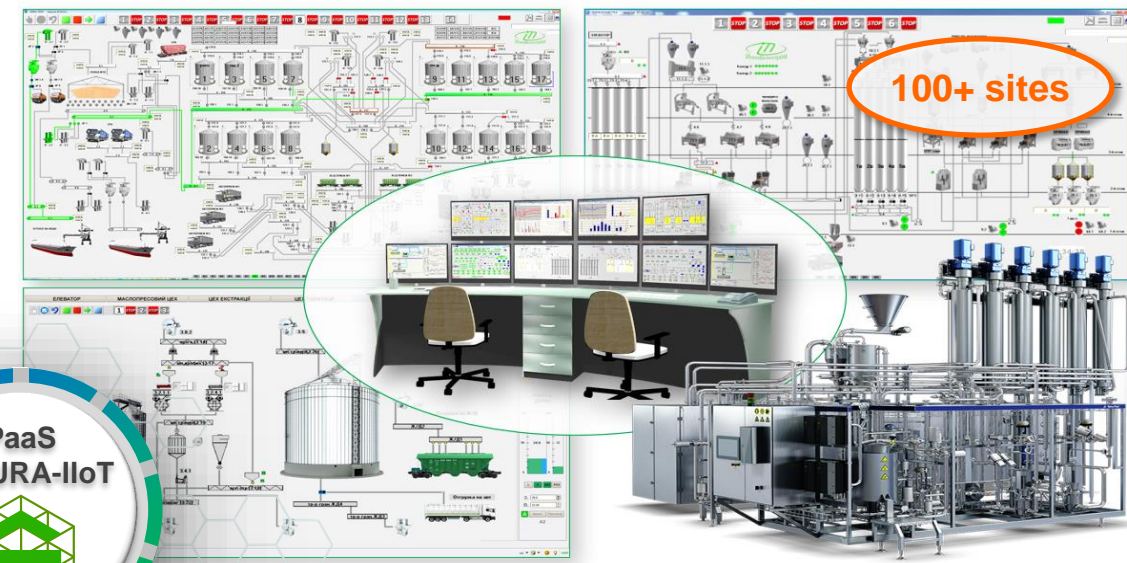


SAKURA-ECO
Environmental monitoring

APM/MES/ERP/PLM



Automated Design System "Route" / SCADA



Crystal Growing Systems



Car Sampling Systems



Hopper Railway Car Robotic Sampling Systems



Monitoring Systems



INNOVINNPROM: Company Landscape



Vendors

Suppliers

Designers

IT

Main Clients

DIH

АППАУ Асоціація «підприємств промислової автоматизації України»
Vinnitsya cluster of instrument making and automation:

Universities