INNOVINNPROM

Industrial automation

- ✓ Thirty years of experience in complex automation of agribusiness enterprises
- ✓ The full cycle of automation - from design to commissioning
- ✓ Exclusively proven industrial solutions
- ✓ Own SAKURA-IIOT cloud software platform of the Internet of Things

Vinnitsa - 2023

INNOVINNPROM

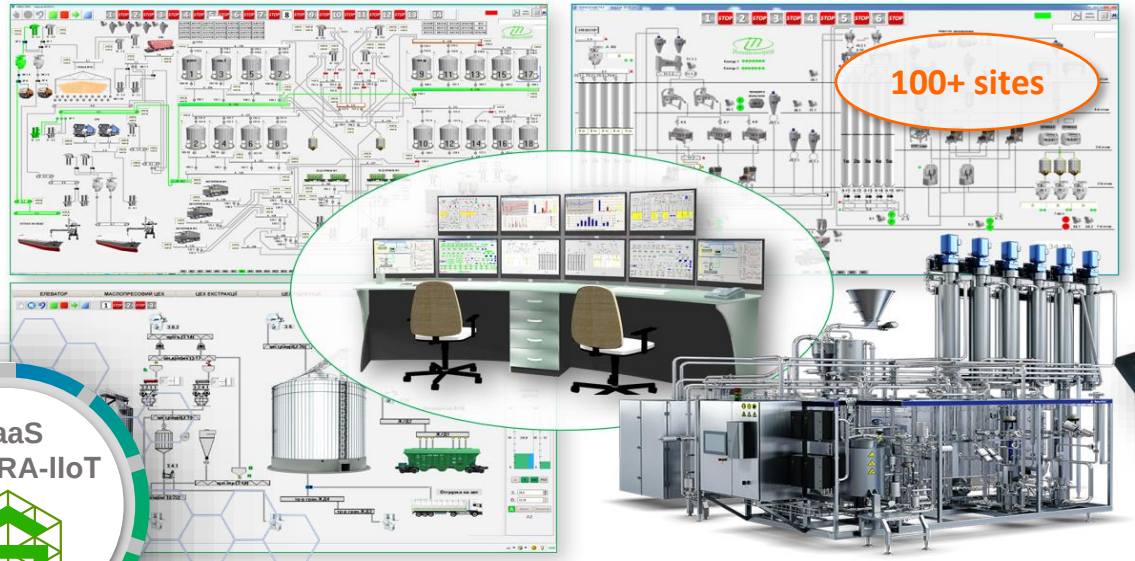
ABOUT US

PRODUCTS & SOLUTIONS

APM/MES/ERP/PLM

8 sites

Automated Design System “Route” / SCADA



100+ sites

Crystal Growing Systems

3 lines

PaaS
SAKURA-IIoT

Car Sampling Systems

45 sites

Hopper Railway Car Robotic Sampling Systems

4 sites

Monitoring Systems

50+ sites

INNOVATIONS

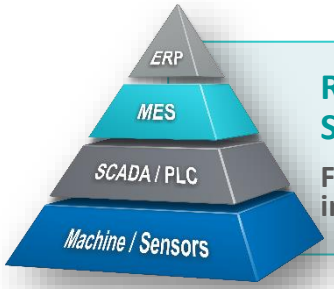
Operational Excellence

Reduction of air emissions

Energy efficiency

Digital product passport

PaaS SAKURA-IIoT INNOVINNPROM



Reasonable Simplification

Four systems into one

SaaS

SACURA-APM
Asset Performance Management

SaaS

SACURA-ENEF
Energy monitoring system

SaaS

SACURA-M&R
Maintenance & Repair

SaaS

SACURA-ECO
Environmental control

ROUTE-ADC
Agro-Industrial Enterprises SCADA

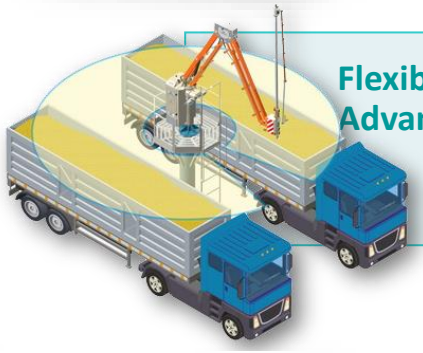
- Industrial Internet of Things
- Big Data & Data Sharing
- Augmented Reality
- Cloud Computing
- Autonomous Factories
- Digital Twins
- AI & ML

SaaS

SACURA-Business
ERP/PLM/MES

Shared databases

Open Source



Flexible robotics Advanced robotics

Robotic grain sampling

Environmental impact analysis

Round-the-clock control

Support for all OT and IT protocols

Ability to integrate cheaper IoT devices and sensors

Application of modern IT technologies

Cooperation with DIH and universities

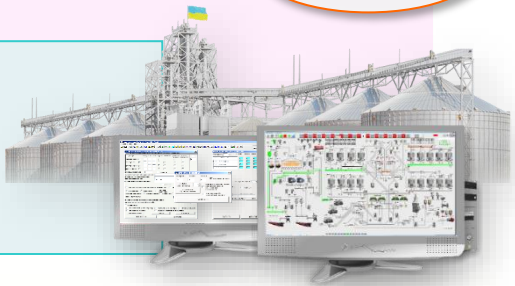
Customer Intimacy

Innovations in better adaptation

30 years of experience

Improving the system

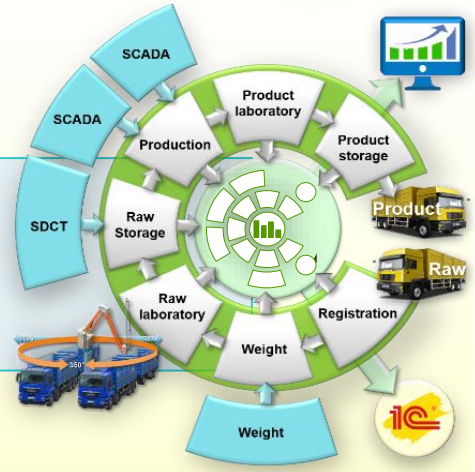
Adding new features and capabilities



Automated Design System “ROUTE” for SCADA

Transfer to cloud services

Provision of services as SaaS



Quantitative and qualitative accounting system

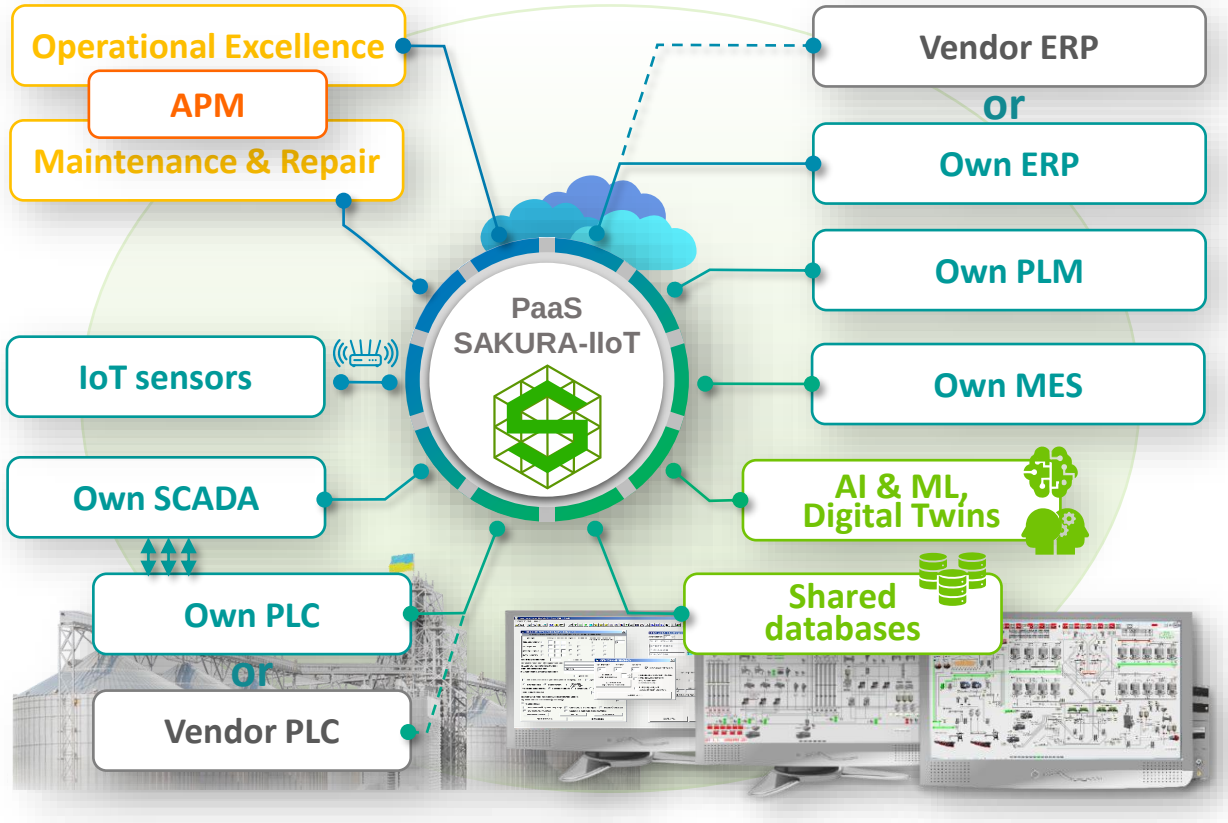
The Best Industry Solutions

of INNOVINNPROM are adapted to the conditions of the region

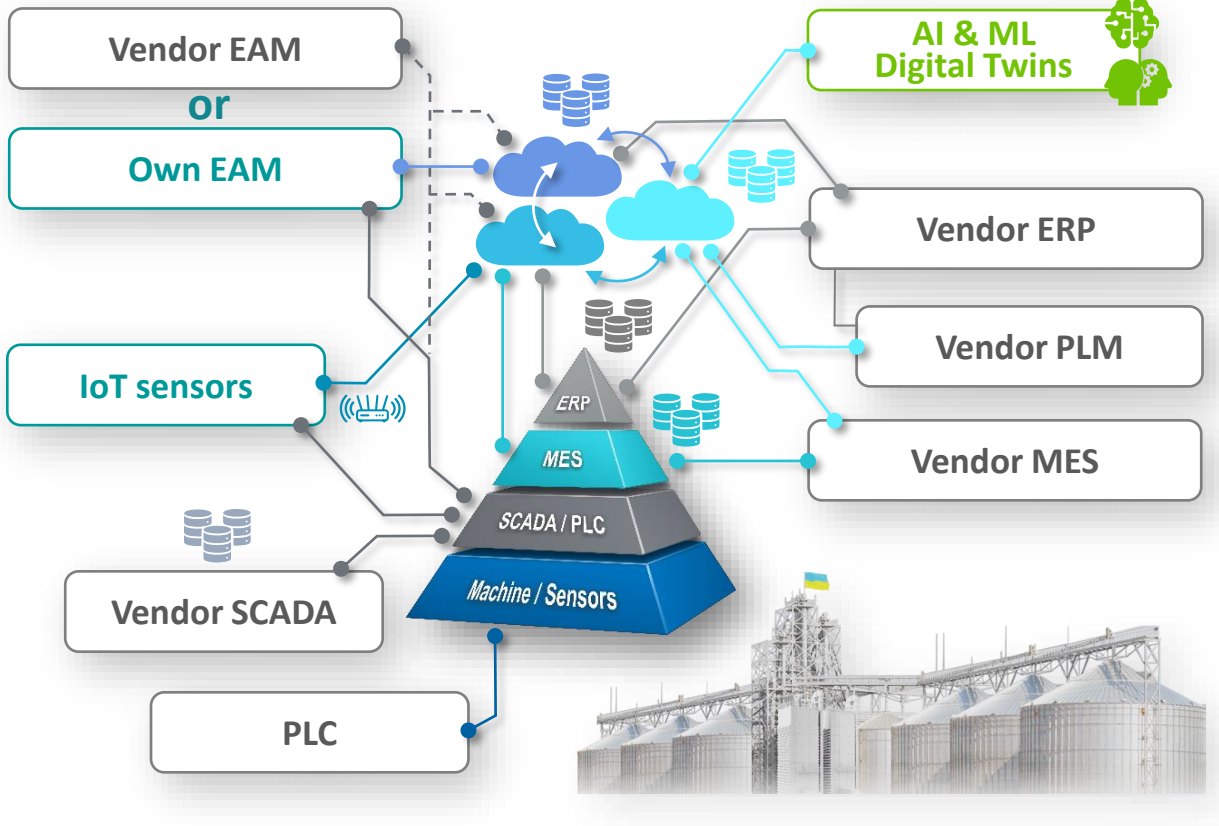
INDUSTRY 4.0

COMPETITIVE ADVANTAGE

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

Company Landscape

INNOVINNPROM

Vendors

SIEMENS
Schneider Electric
RITTAL
WAGO
CISCO
ZEMIC
CAMOZZI
ifm
PF ПРОМФАКТОР
ОДЕСКАБЕЛЬ
LAUMAS
FESTO
TELTONIKA
Klemsan
HYDRAULIC LINE ГИДРАВЛИКА ИЗ ПЕРВЫХ РУК
ОВЕН
electro cable GROUP
OMRON
MOXA
ETI
Weidmüller
PHOENIX CONTACT INSPIRING INNOVATIONS
УКРАЇНСЬКА ЕЛЕКТРОТЕХНІЧНА КОРПОРАЦІЯ АСКОУКРЕМ
DKC
EATON
IOT Solutions
LAPP GROUP
VIPA A YASKAWA COMPANY
MOELLER
DEGSON
OBO BETTERMANN
ABB
БКЗ БЕРДЯНСКИЙ КАБЕЛЬНЫЙ ЗАВОД
Develiot

Suppliers

СВ АЛЬТЕРА
galantpol
ALT UKRAINE

Designers

ПОЛТАВАГРОПРОЕКТ

IT

Google Cloud
Microsoft Azure
amazon web services
Grafana Labs
kubernetes
HAULMONT
spring
IntelliJ IDEA
Java
influxdb
chronograf
HAPROXY
PostgreSQL
MESH
PATRONI
APACHE HTTP SERVER PROJECT
Apache Guacamole
UltraVNC
HETZNER ONLINE
docker

Main Clients

МХП АГРОІНДУСТРІАЛЬНИЙ ХОЛДИНГ
UkrLandFarming Public Limited Company
RIOLA CONSTRUCTION GROUP
KERNEL GROUP OF COMPANIES
АгроСпец Сервис
КОРОЛІВСЬКИЙ СМАК
АСТАРТА-КИЇВ агропромхолдинг
ДЕРЖАВНА ПРОДОВОЛЬЧО-ЗЕРНОВА КОРПОРАЦІЯ УКРАЇНИ
НОВІ ПРОДУКТИ
cygnet AGROCOMPANY
НТТ Новотех-термінал
agrotrade
НІБУЛОН
агро прайм ХОЛДИНГ

DIH

АППАУ Асоціація «підприємств промислової автоматизації України»

Vinnytsia cluster of instrument making and automation:

ПРОМАВТОМАТИКА Our synergy is your energy
7 Med Levels
VTN vtnled.com
Viasoft
ТЕРМІЯ
Liana Company
ПОГ "Вінницьке УВП УТОС"
MAITEK
VINAERO
НВП "ГРЕМПІС" автоматизація обліку енергоносіїв
TIRAS

Universities

ВНТУ Вінницький національний технічний університет
ДонНУ
Донецький національний університет імені Василя Стуса

Our PORTFOLIO

INNOVINNPROM

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

SCADA
> 1000 I/O

Car Samplers

Railway Samplers

SAKURA-B
MES/ERP/PLM

SAKURA-T
Energy Efficiency

SAKURA-ECO
Environmental monitoring

Our TEAM

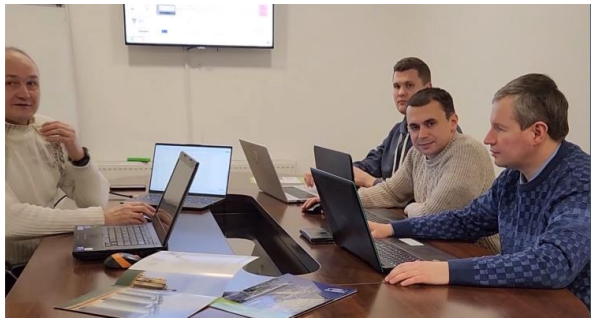
INNOVINNPROM

SAKURA-APM

INDUSTRY 4.0

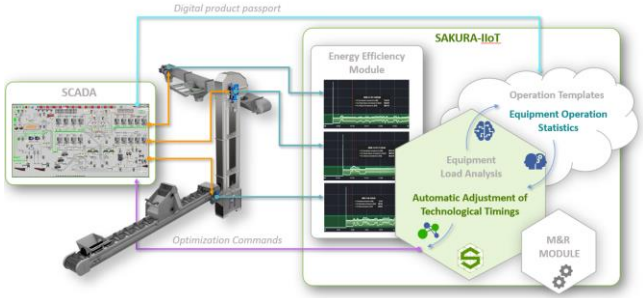
Purpose of Attracting Investments

Our team, together with the scientific team of the Department of System Analysis and Information Technologies (SAIT) of the Faculty of Intelligent Information Technologies and Automation of the Vinnytsia National University, headed by Vitaly Mokin (Head of the Department of SAIT, Doctor of Science, Professor) within the framework of Horizon 2020 grant funding (grant agreement No. 873155), investigated the feasibility of using AI&ML to optimize the energy efficiency of grain elevators.



The essence of the project is to add to the existing SCADA production management inexpensive IIOT systems that will monitor the operation and energy consumption of each unit of grain elevator equipment. At the same time, this equipment is small-sized and is installed without reassembling the existing control cabinets.

In the project, we investigated the feasibility of using AI&ML for forecasting the energy efficiency of technological routes for moving grain and analyzing the operation of routes. We got results in the range of 3...5% savings. However, the general control of all technological processes due to the optimization of the SCADA operation and administrative measures results in savings of up to 15%. That's not all, with the organization of productive M&R, the overall energy efficiency of the enterprise can be increased up to 25%.



We are looking for investments to continue our work in two directions:

1. Deep analysis of the impact of AI&ML on all technological processes, taking into account weather conditions, time of day, personnel shifts, logistics chains.
2. Initial implementation of technologies at enterprises in Ukraine, Moldova and Romania with the aim of their further commercial support.

SAKURA-ARM Asset Performance Management System

INNOVINNPROM

SAKURA-APM

Asset Performance Management is a system for managing the efficiency of production assets based on the technologies of the fourth industrial revolution (Industry 4.0).

The term "assets" means any production equipment - both equipment that ensures the vital activity of enterprises (power grids, substations, boilers, compressors, ...) and that which carries out processing and production of products (furnaces, machines, dispensers, bottling or assembly lines , etc.).

SAKURA-APM contains two main components:

- **Maintenance and Repair (MRO)**
- **Production management systems aimed at operational excellence (Operational Excellence).**

Reduction of operating costs is achieved due to better reliability of assets, extension of their service life (life cycle), reduction of the cost of implementation and operation.

This project received funding from the European Union's Research and Innovation Program Horizon 2020 within the framework of the BOWI project, financed under grant agreement No. 873155

INDUSTRY 4.0

SAKURA-APM Workspace

ІННОВІНПРОМ

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

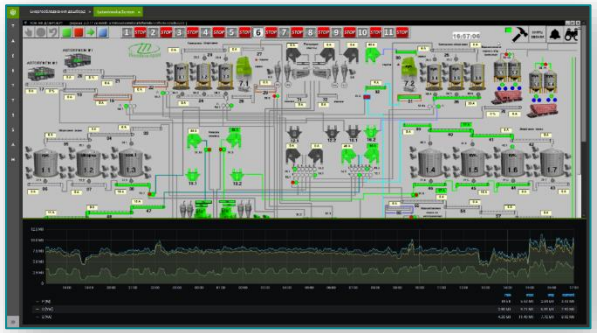
INDUSTRY 4.0

- Internet of Things
- Artificial Intelligence
- Machine Learning
- Edge Computing
- Big Data
- Cyber Security
- Digital Twin

SAKURA-APM Modules

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.

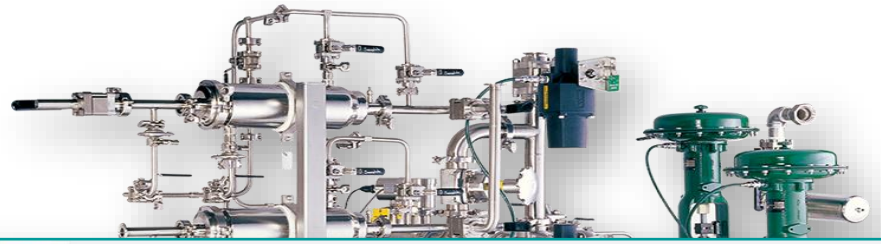
The Maintenance and repair module (M&R)

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.

Energy Efficiency of Production - SAKURA-Technology



- ✓ Total control of equipment operation
- ✓ Intelligent adjustment of technology
- ✓ A significant reduction in the impact of the human factor
- ✓ Increasing the efficiency of equipment use
- ✓ Increasing the energy efficiency of technology
- ✓ Significant increase in the efficiency of business processes

Internet of Things
Інтернет речей

Artificial Intelligence
Штучний інтелект

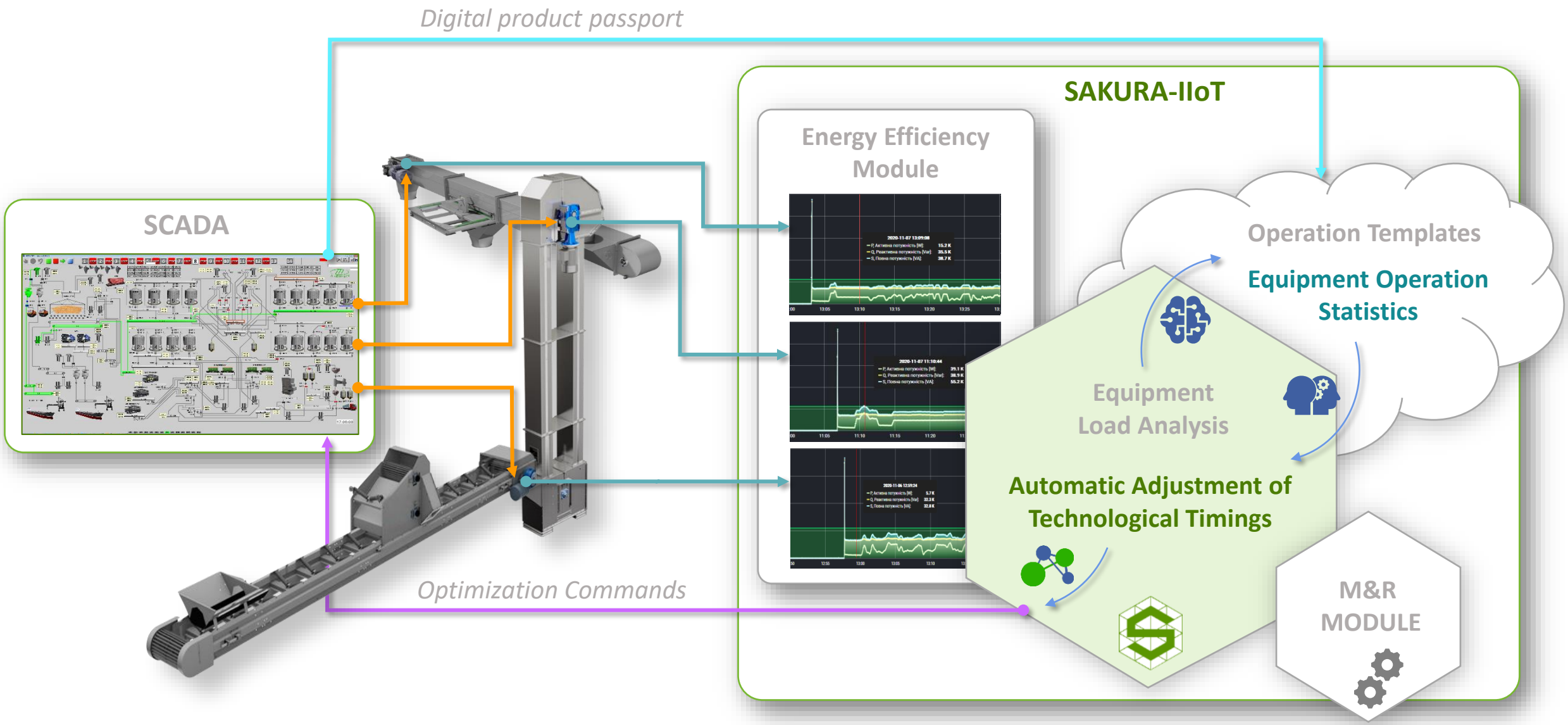
Machine Learning
Машинне навчання

Digital Twin
Цифровий двійник

Big Data
Великі дані

Cyber Security
Кібербезпека

Application of AI&ML



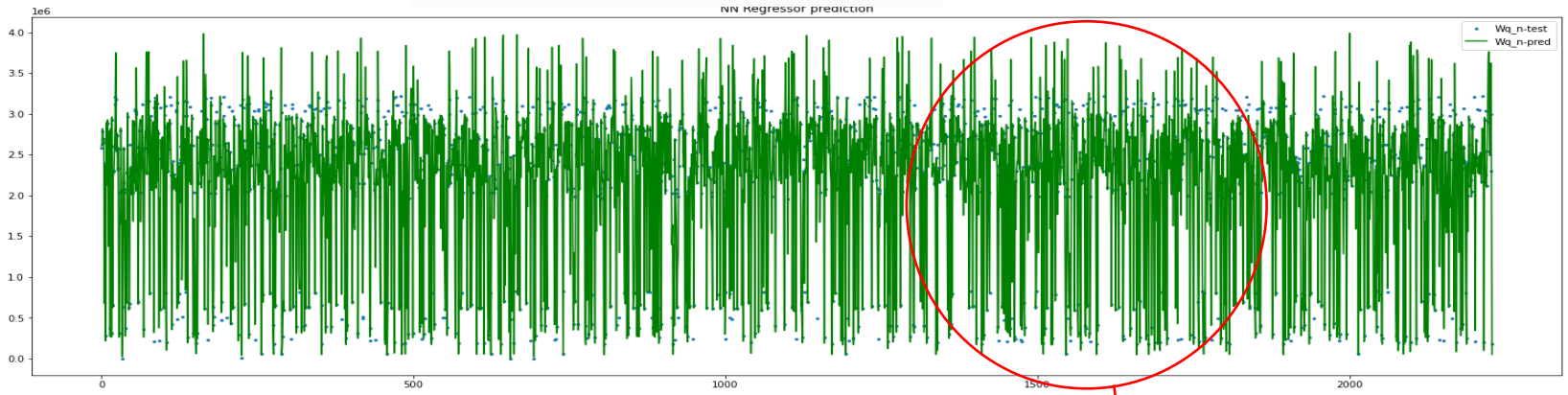
Creating Trained Neural Network Model for Grain Elevator Route Based on Real Data

ML of NN model:

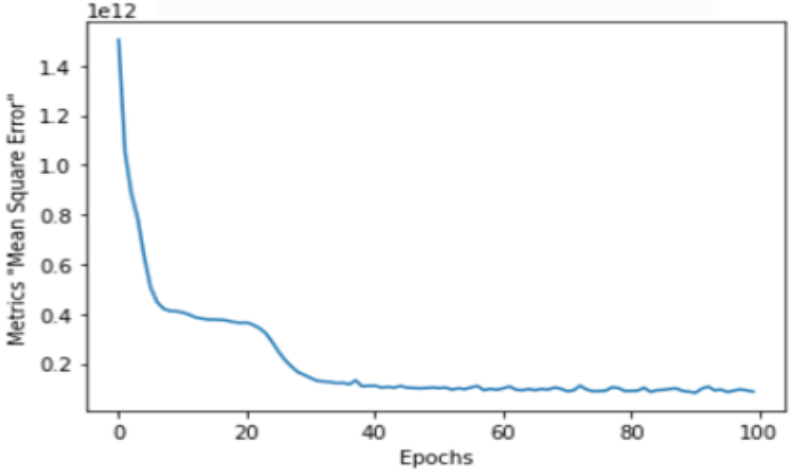
Layer (type)	Output Shape	Param #
dense (Dense)	(None, 256)	1280
dense_1 (Dense)	(None, 128)	32896
dense_2 (Dense)	(None, 64)	8256
dense_3 (Dense)	(None, 32)	2080
dense_4 (Dense)	(None, 3)	99

Total params: 44,611

NN Regressor predicting:



Metrics of NN model:

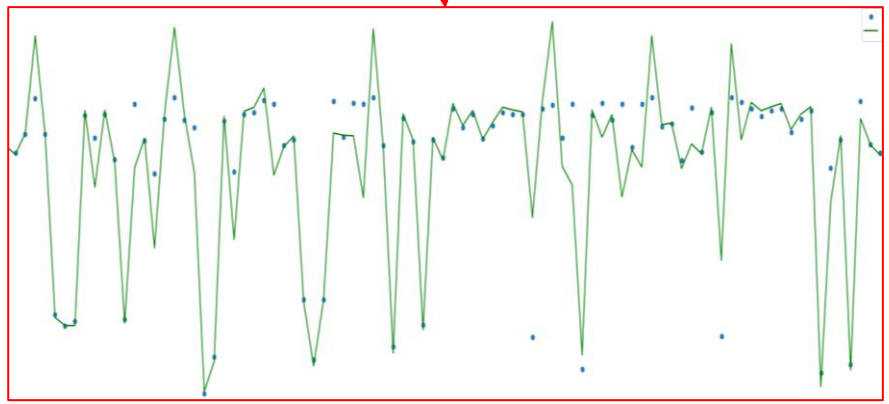


Accuracy:

Route 0 prediction
Wp_n Relative error: **9.646%**
Wp_n r2score : 0.8129453521752672

Route 1 prediction
Wq_n Relative error: **9.425%**
Wq_n r2score : 0.8476444593901902

Route 2 prediction
Ws_n Relative error: **9.447%**
Ws_n r2score : 0.8420825194985004

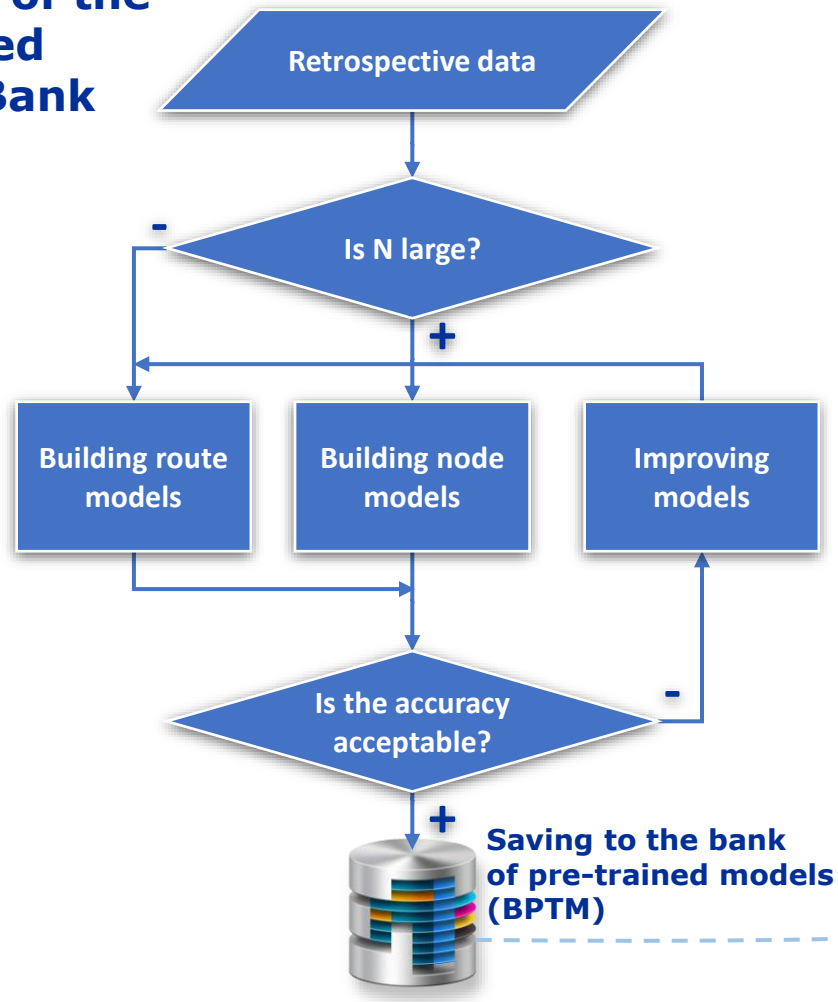


The BOWI project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 873155

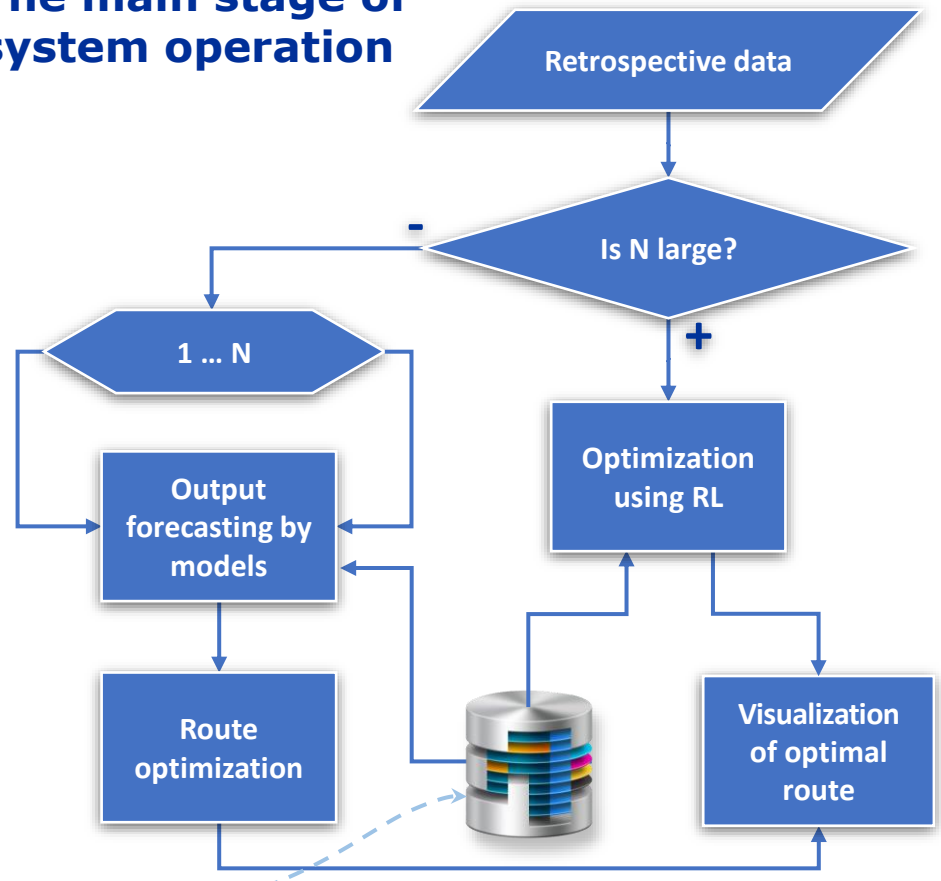
60 % Training	20 % Validation	20 % Testing

Construction of Algorithms for Optimizing Grain Elevator Routes Based on New Data Using Machine Learning Technologies with Reinforcement

Stage 1
Creation of the Pretrained Models Bank



Stage 2
The main stage of system operation



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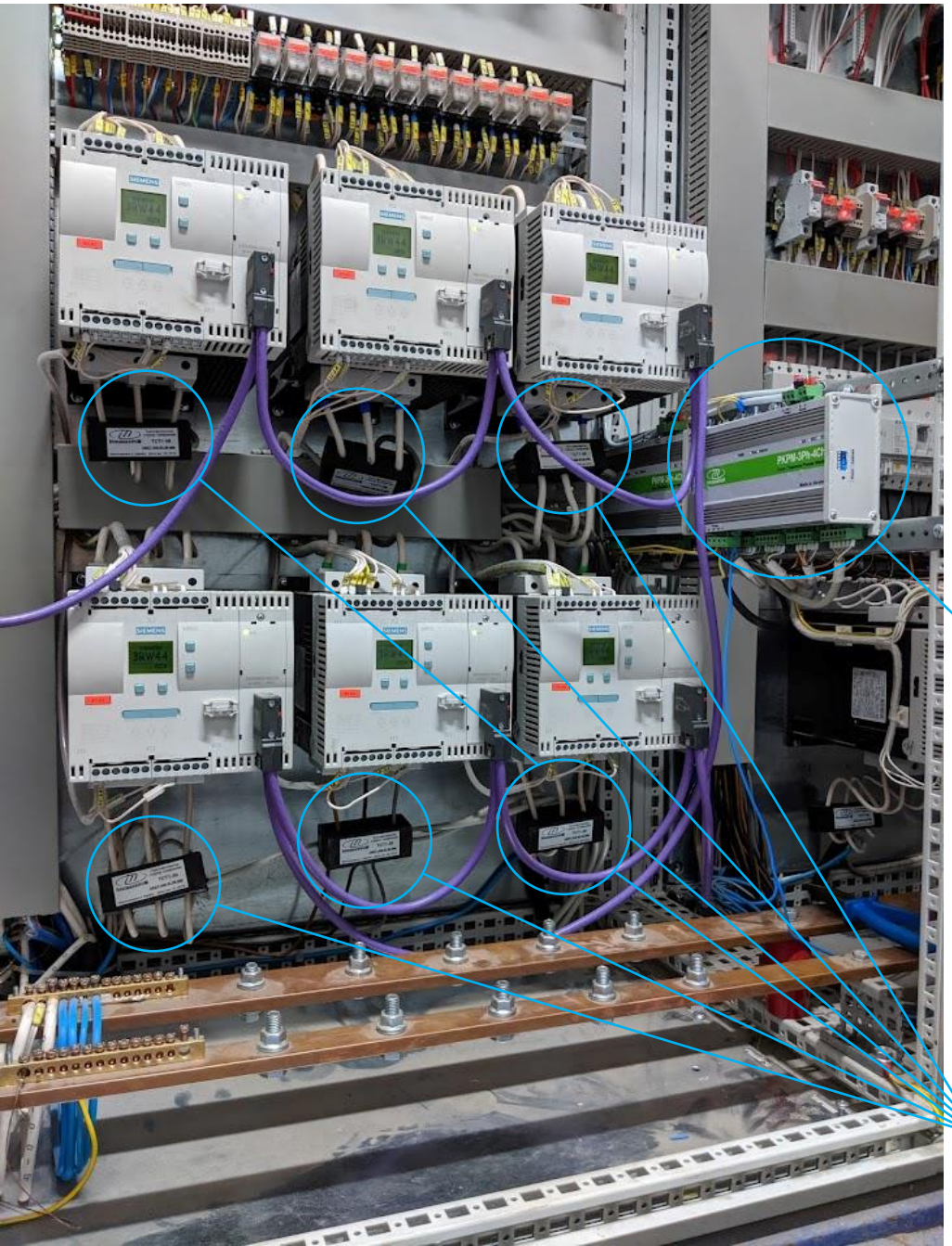
Installation of Equipment Without Reassembly



Installed:

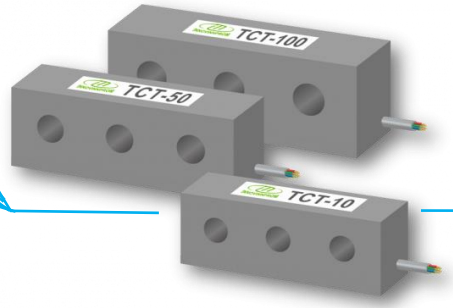
Power Meters	17 units
Transformers	65 units
IoT Gateways	2 units

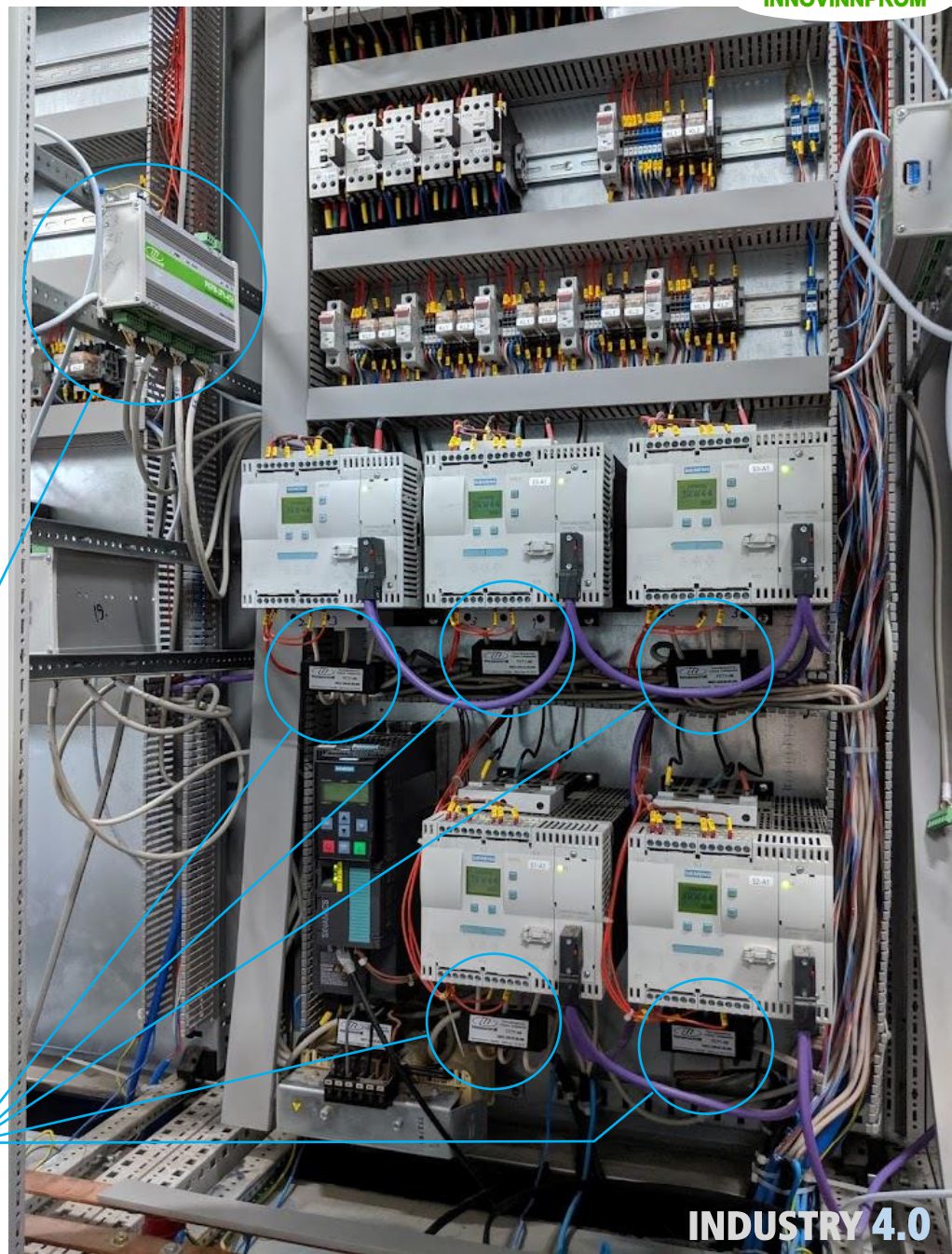
Total:

65 units controlled equipment
3,000 control channels per second

4 Channel Smart Power Meters
INNOVINNPROM

Innovative 3 Phase Transformers
INNOVINNPROM

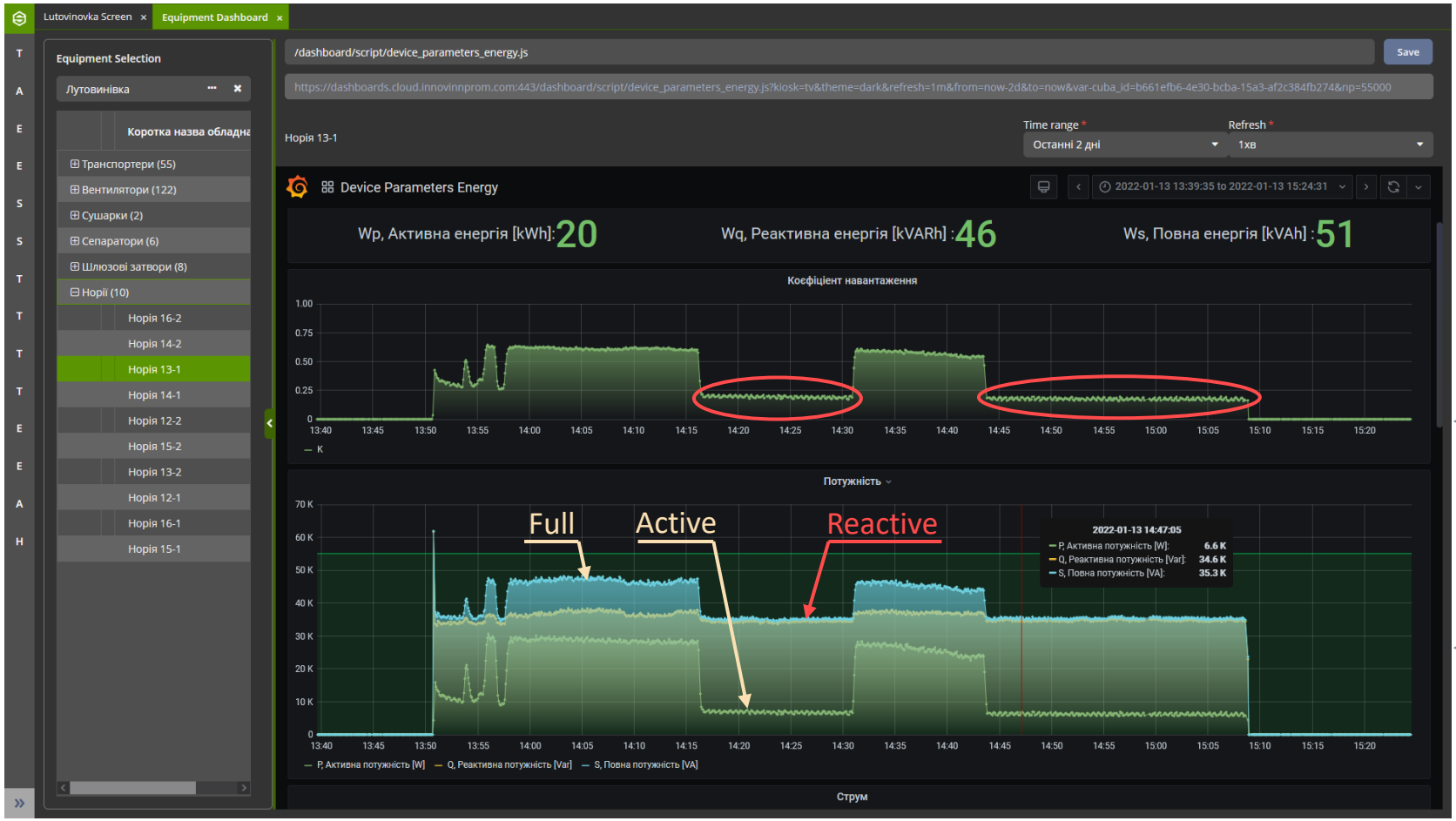




INDUSTRY 4.0

Problem Discovery and Diagnostics

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

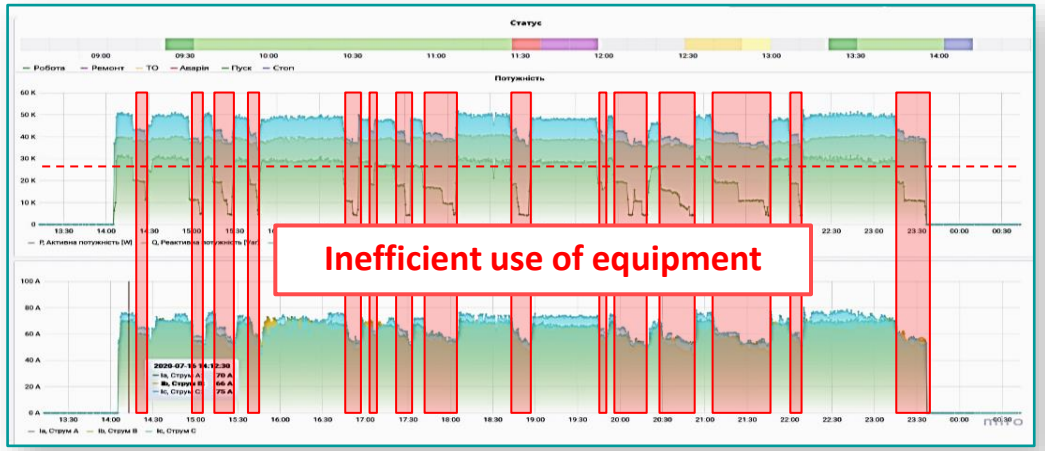
Result:
More than 25 kVAh was lost during the technological process lasting 1 hour 20 minutes

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.

Economic Advantages

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

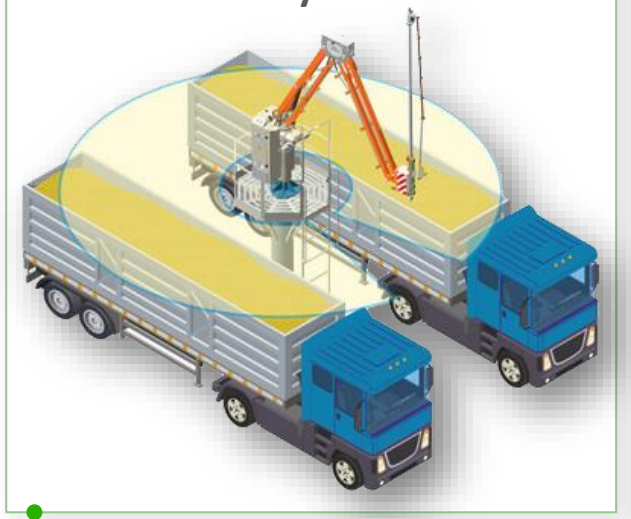
FLEXIBLE ROBOTICS

INDUSTRY 4.0

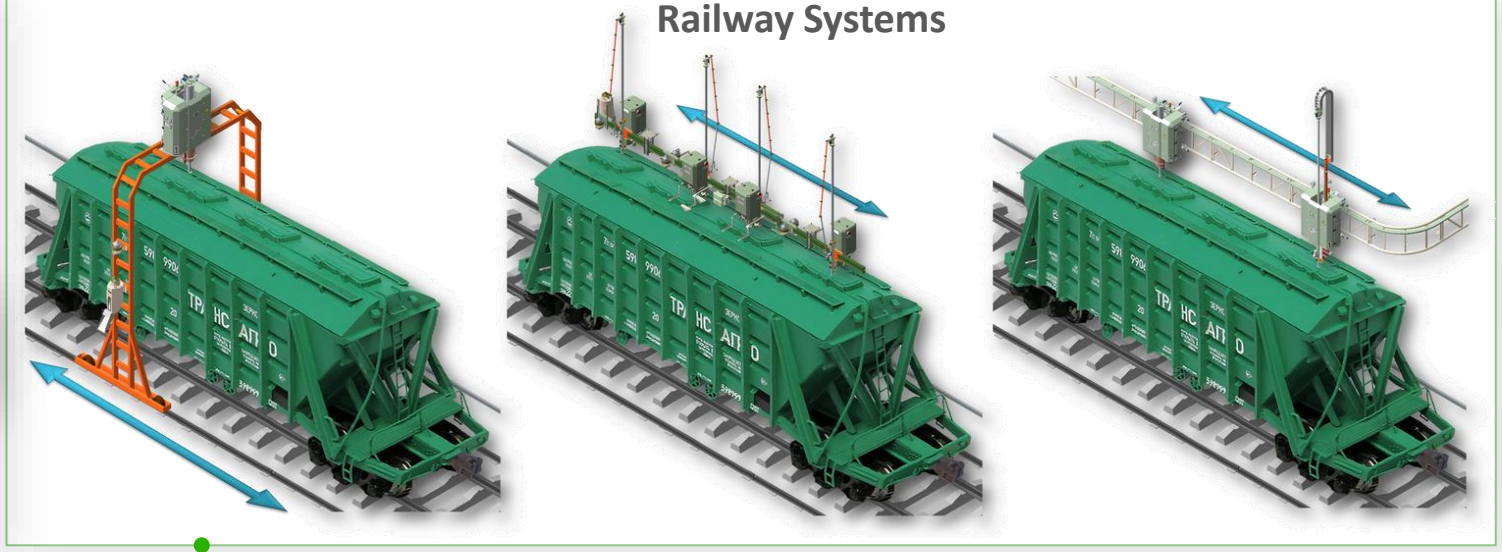
Purpose of Attracting Investments

We develop and manufacture three main lines of robotic systems that we want to make more modern and perfect:

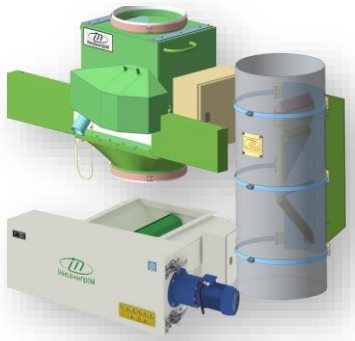
Car Systems



Railway Systems



Flow Systems



Currently, we have launched a project that will make the car sampler fully automatic - thanks to intelligent cameras, it will recognize car bodies, independently choose the program and sampling algorithm, and monitor the safety of personnel.

The railway sampler is currently fully automatic. Our solution has no analogues in the world. But we are looking for investments to complement it with a pneumatic logistics system with automatic loading and unloading of chipped capsules and an automated warehouse system for pneumatic capsules.

We are developing a new device - a flow scale with a grain sampling module. It should be a flexible robot that should automatically determine the type of grain crop, its weight, speed of movement and periodically send a grain sample to the laboratory.

We also have a project to implement a system of predictive maintenance of samplers with augmented reality.

Automobile Sampler

- ✓ Sampling from the bodies of two cars
- ✓ Sampling to the entire depth to the bottom of the body
- ✓ Automatic sending of the sample to the laboratory by pneumatic transport
- ✓ Radio control and video control

Video Control System

Radio Control System

СЕРТИФІКАТ ВІДПОВІДНОСТІ

Unique own solutions

Innovations

INDUSTRY 4.0

Engineering Achievement 2017 – Railway Sampler

INNOVINNPROM

National maritime rating of Ukraine

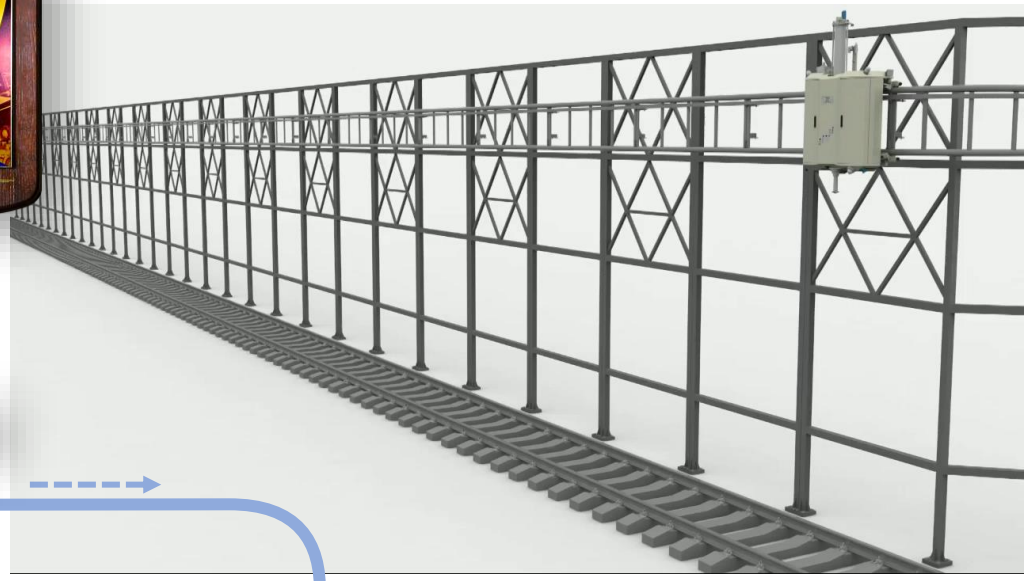
Commemorative sign for the development and implementation of a mobile module for grain sampling from hopper wagons – Engineering achievement 2017

Hopper Railway Car Robotic Sampling Systems

National Marine Ranking
Engineering Achievement 2017

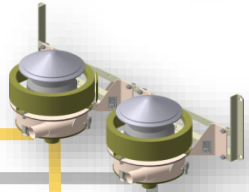
INNOVINNPROM

- ✓ Unique own patented solutions
- ✓ A unique telescopic probe
- ✓ Automatic search for wagons and open hatches

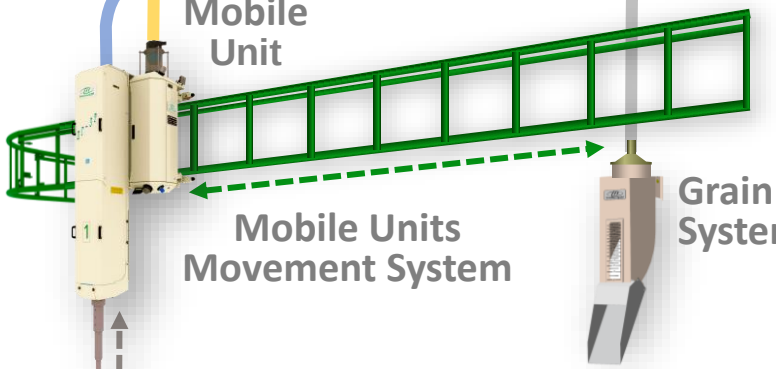


Video Control System

Pneumatic Transport System



Mobile Unit

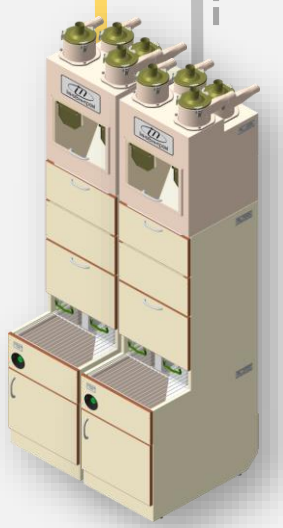


Mobile Units Movement System

Grain Return System

Radio Control System

Grain laboratory

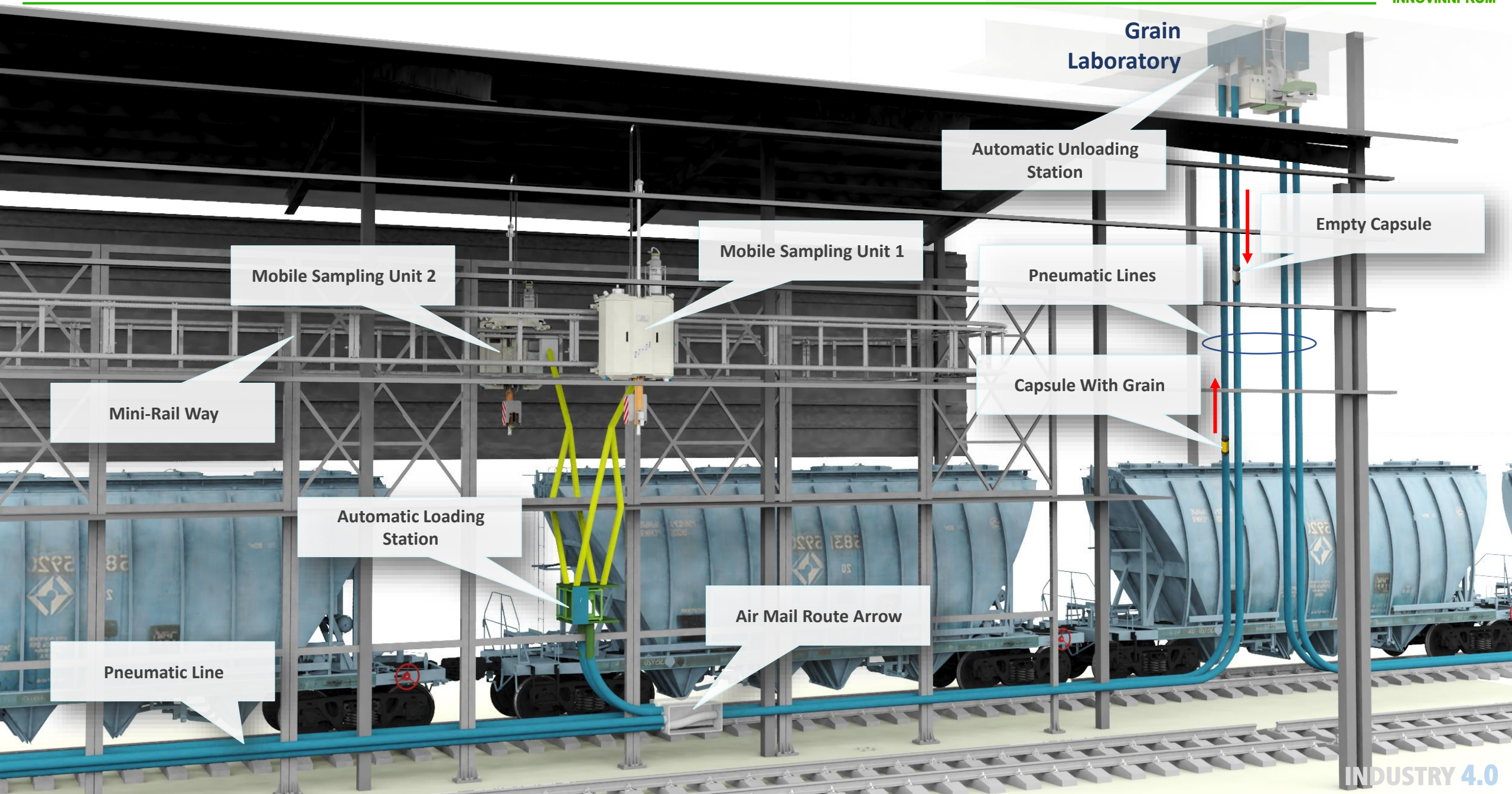


Laboratory Cabinet

Pneumatic Mail

Control System

Hopper Railway Car Robotic Sampling Systems



INDUSTRY 4.0

INNOVINNPROM

GROWING OF ARTIFICIAL SAPPHIRE CRYSTALS

INDUSTRY 4.0

Purpose of Attracting Investments

We have the technology for growing artificial sapphire crystals, we have the appropriate specialists, and we, together with our partners, have production facilities. We have a draft business plan for the construction of a crystal growing plant. The study of the world market shows the expected growth of the market for the sale of artificial crystals of several billion euros in the coming years.

Omega DM300
Omega PG350

Delta-K

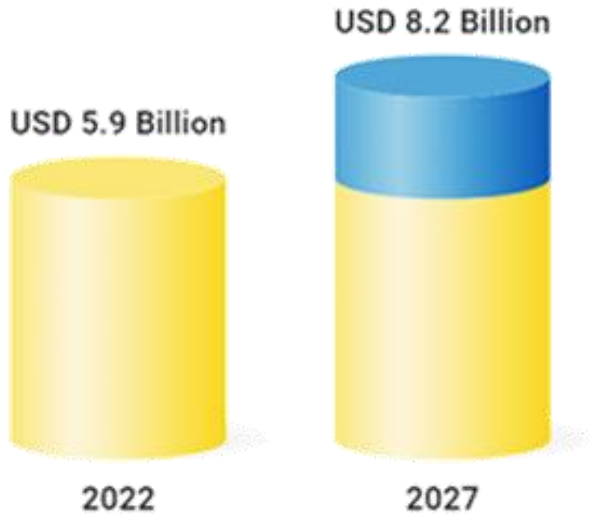
PromCrystal-S2

Innovations
Інновації

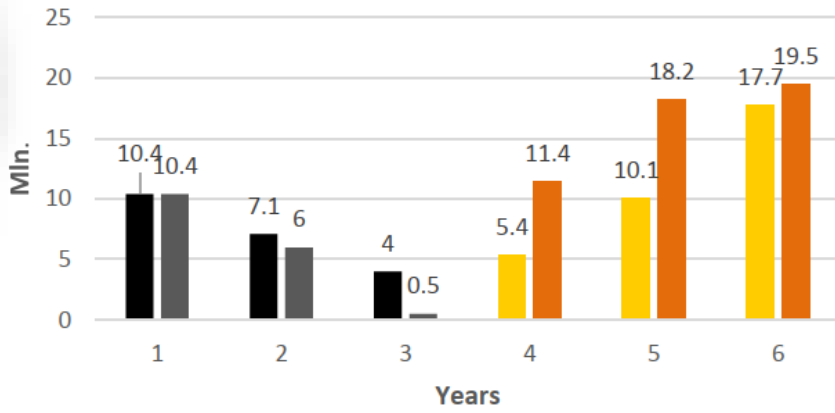
Hi-tech
Високі технології

Global Synthetic Sapphire Market

Market forecast to grow at a CAGR of 6.6%



Investments or Loan/Profit

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Industry 4.0