ALMA SERVICES COMPANY

ASTRA Smart Monitoring System

A Smart System to Monitor Rotating Equipment

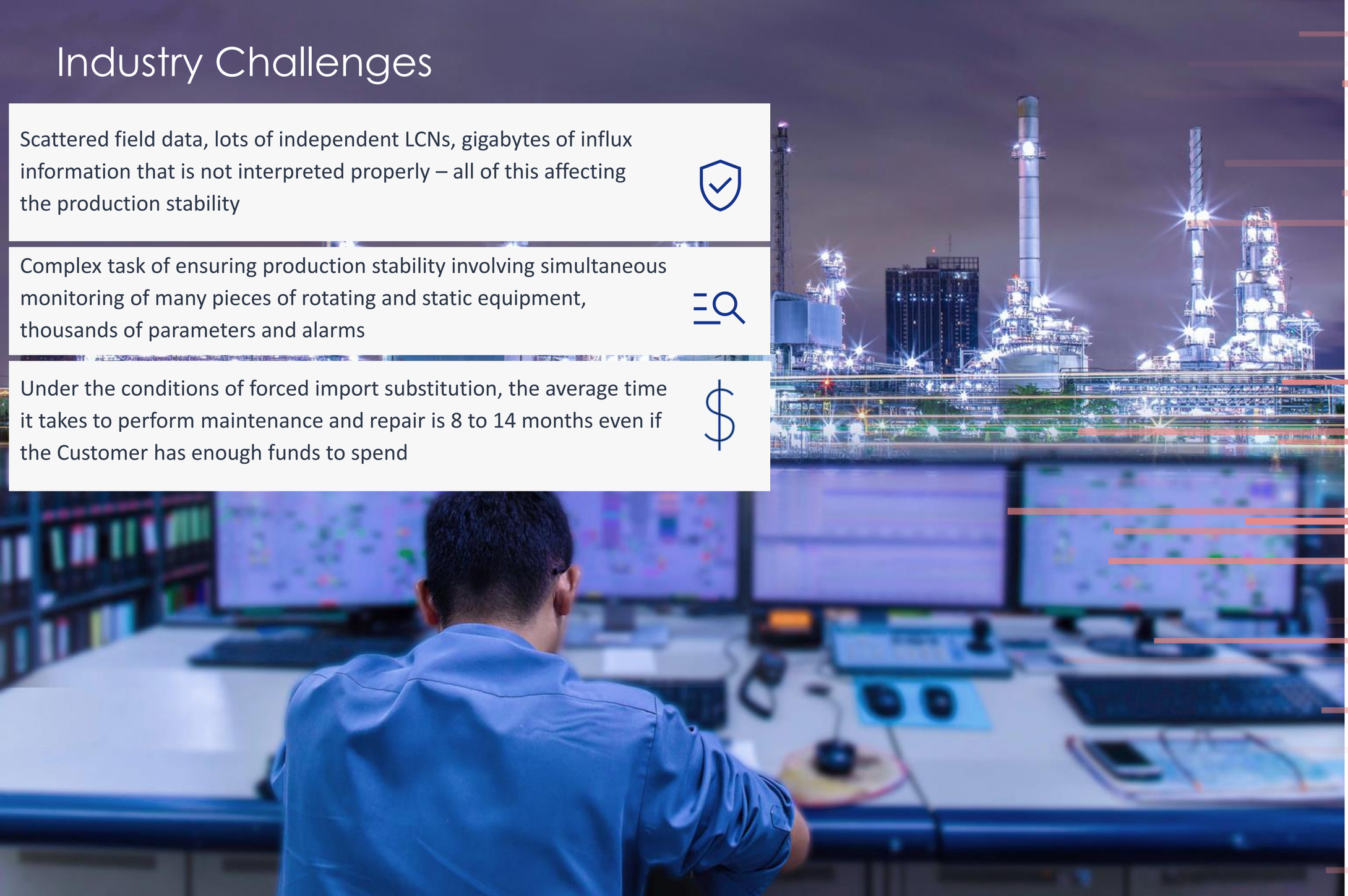
2024

Industry Challenges

Scattered field data, lots of independent LCNs, gigabytes of influx information that is not interpreted properly – all of this affecting the production stability

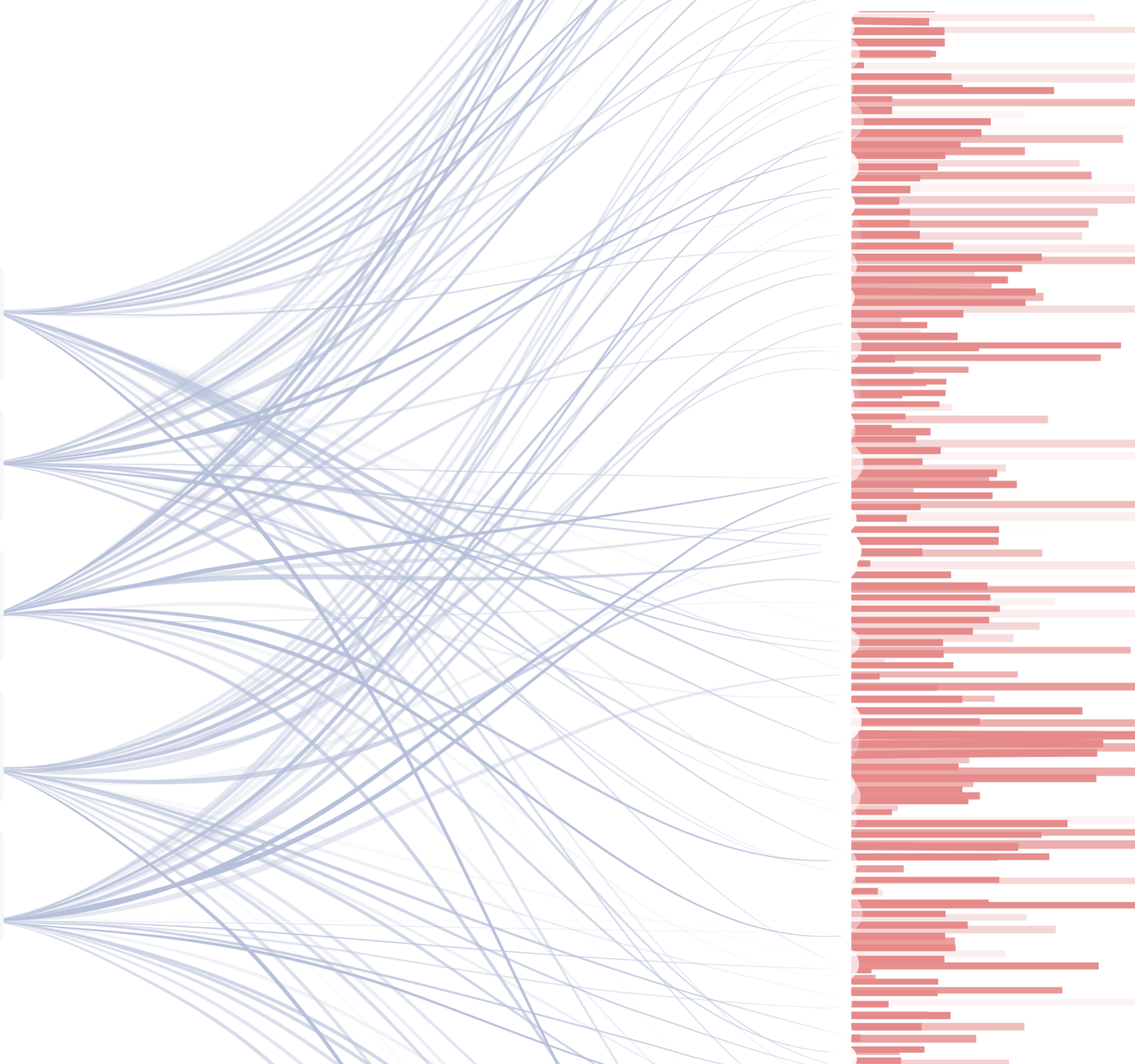
Complex task of ensuring production stability involving simultaneous monitoring of many pieces of rotating and static equipment, thousands of parameters and alarms

Under the conditions of forced import substitution, the average time it takes to perform maintenance and repair is 8 to 14 months even if the Customer has enough funds to spend



The ASTRA SMS Ensures:

- Analysis of data coming from thousands of pickup devices
- Easily comprehensible mathematical models
- Real-time customized reports
- Brand new optimization of your resources and time for decision-making
- Unique user-friendly interface



ASTRA SMS Data Flow Diagram

Readings of the equipment sensors

Level of APCS and Vibration Monitoring System

Sensors

Sensors

Sensors

1r/min

OPC

Backend

Influx DB

Database

AI

Predictive Models

PostrgeSQL

Visualization for users (Frontend)

React

Health Index

Online efficiency

Trend analysis

Monitoring

Registration of all deviations

Recording and registration of all events

Analytics

By deviations

By maintenance type

Working hours

Statistics

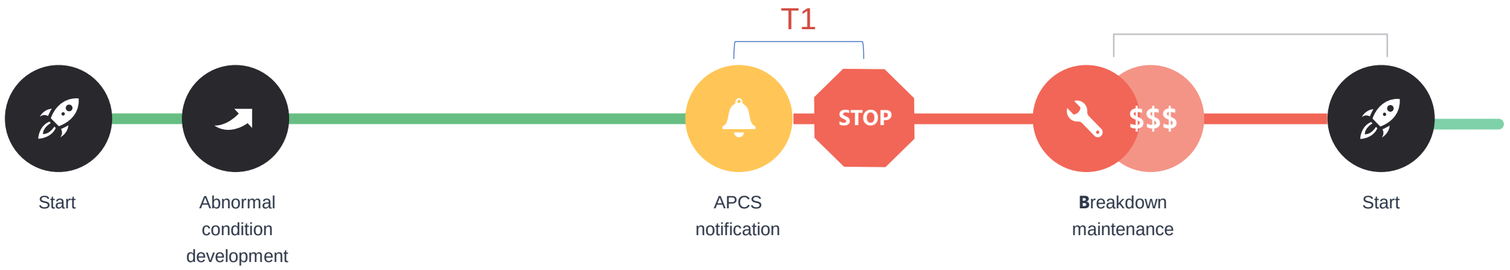
The Health Index (HI) is calculated based on the mathematical model considering the cumulative deviation of the equipment sensors' readings from the verified historic safe range for 3 or more years

Difference Between

the standard APCS and ASTRA SMS

Standard APCS (ESD, SIF)

Created to manage the process by firm setpoints and SIF requirements

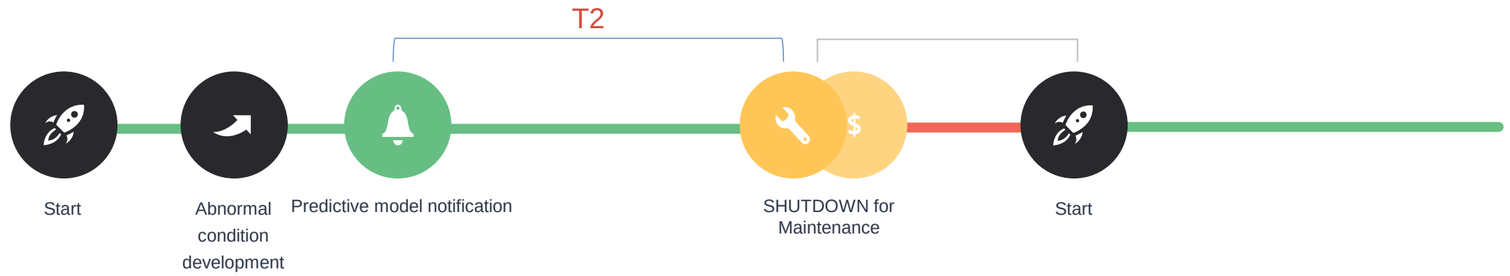


- Unscheduled shutdowns
- High and unbudgeted maintenance costs
- Extensive downtime
- Maximum deferment

T2 >>> T1

ASTRA SMS Physical and Mathematical Models (Analytics)

Created to ensure early detection of equipment performance variations and notification thereof



- Earlier notification compared to the APCS
- Cost-effective and controllable maintenance
- Reduced downtime
- The service companies can have access to the system to monitor the equipment they are in charge of
- Transition from scheduled preventive maintenance to condition-based maintenance
- Simple and effective analysis

Monitoring system notification

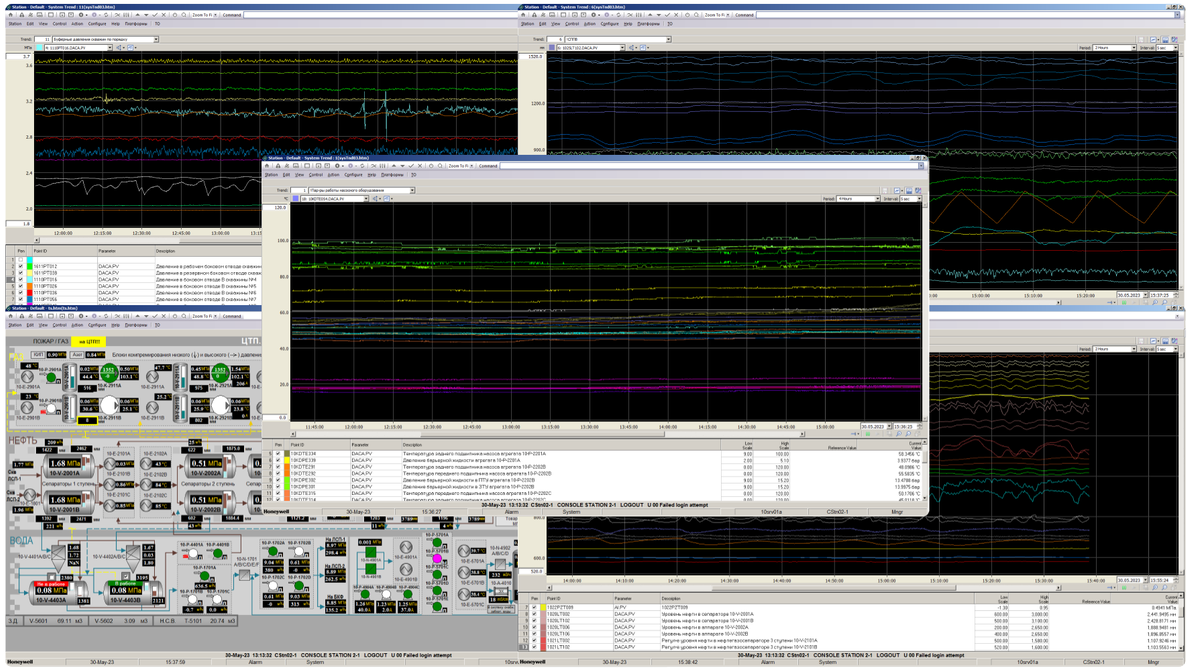
APCS (L, H) alarm

STOP — Tripping when a trip setpoint is reached (LL, HH)

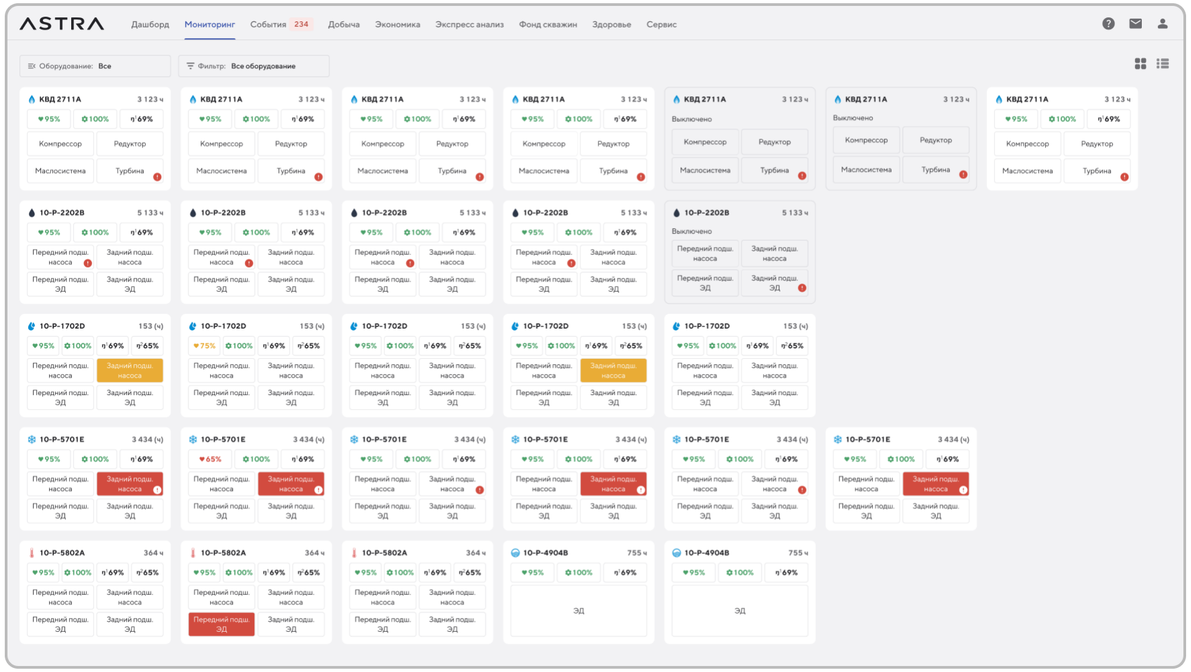
T — Monitoring system notification

A Fresh Approach to Equipment Monitoring with ASTRA SMS

APCS



ASTRA



Limited visualization area for trends and mnemonics

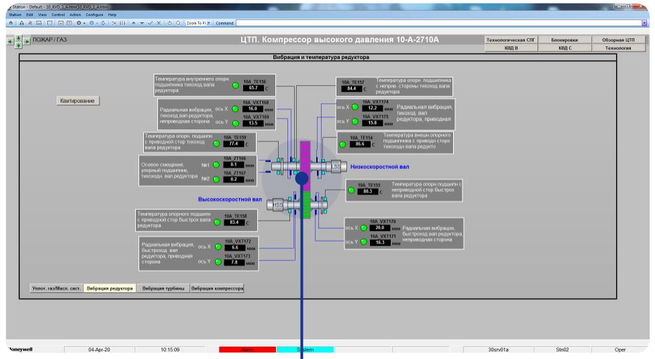
Focus on the issue by indication of the respective equipment unit

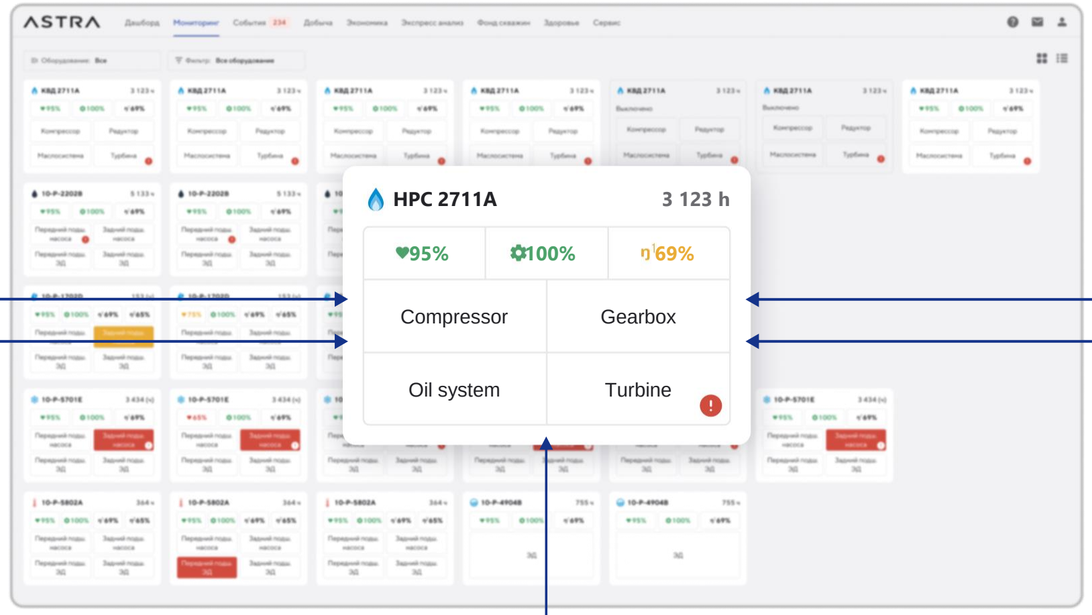
Hard to read the data

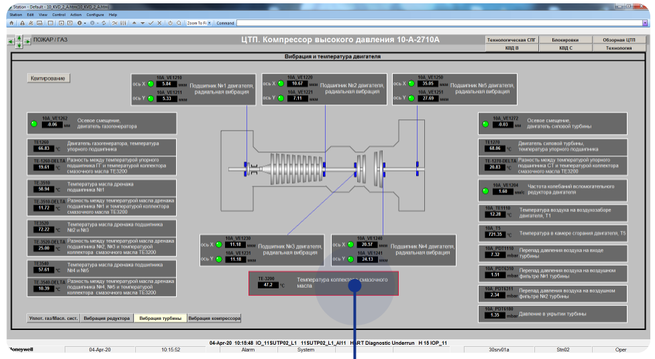
Early warning of deviations

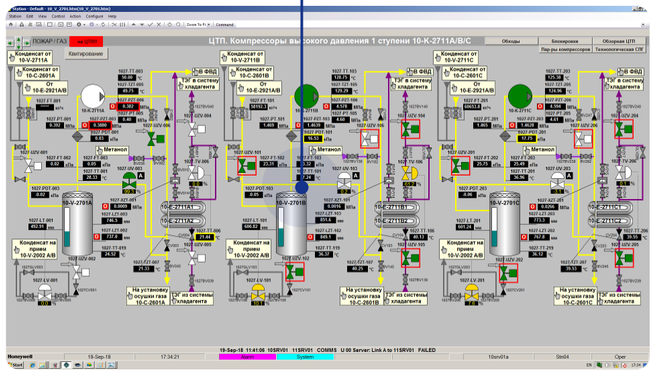
View of Complex Equipment within ASTRA SMS

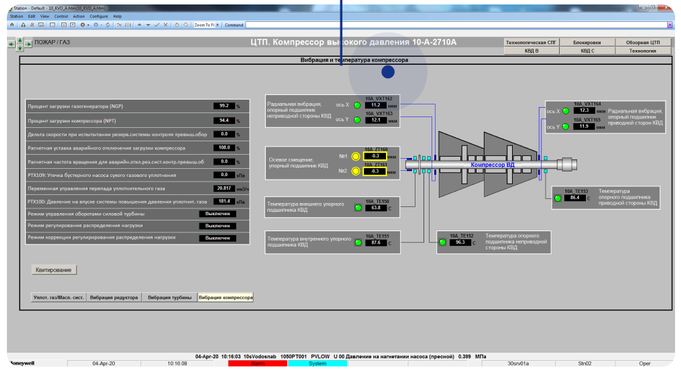
Example Case - HP Gas-Turbine Centrifugal Compressor

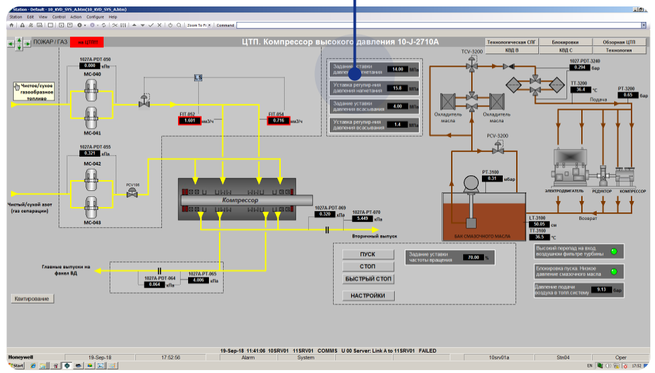








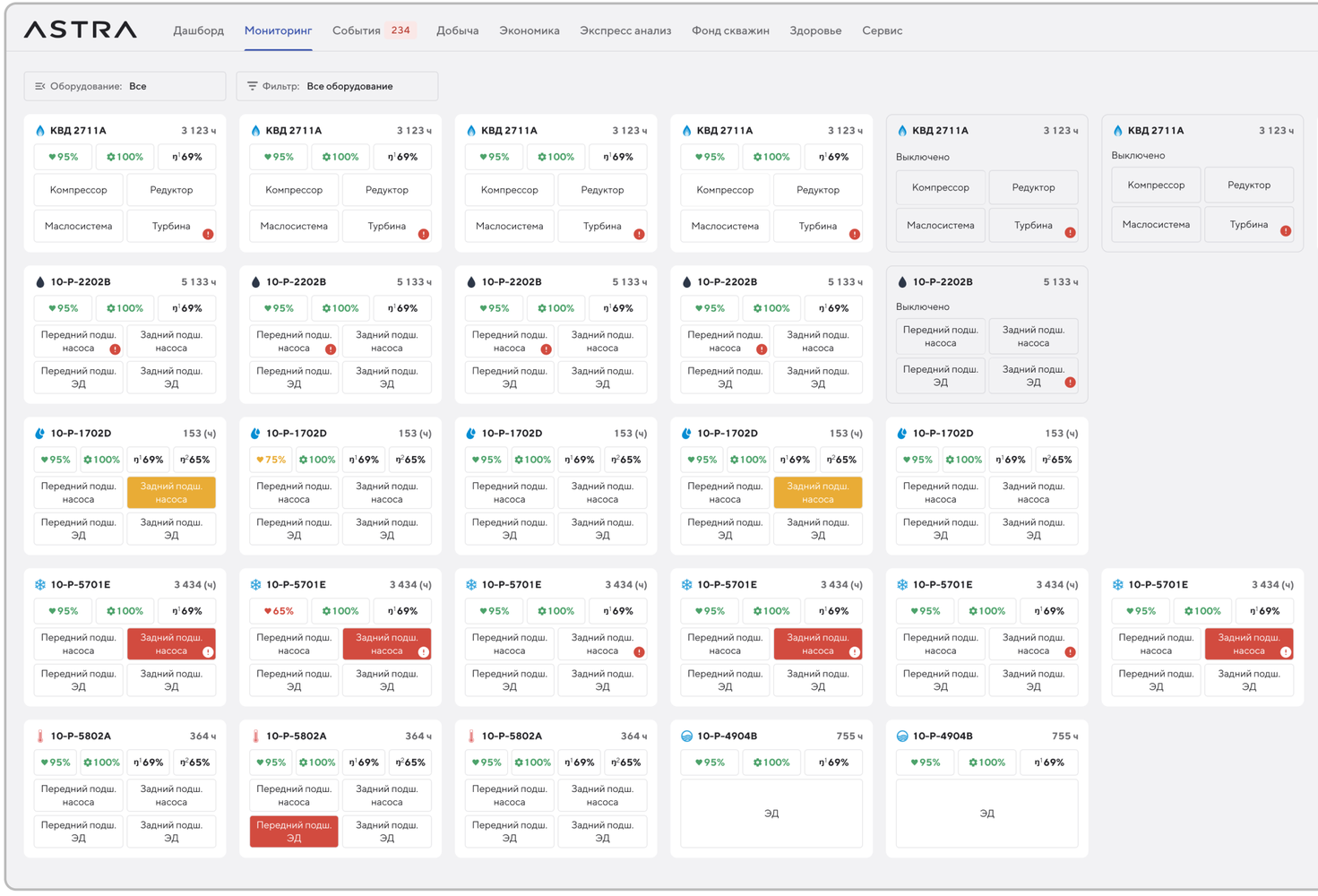




User Friendly Monitoring Tab

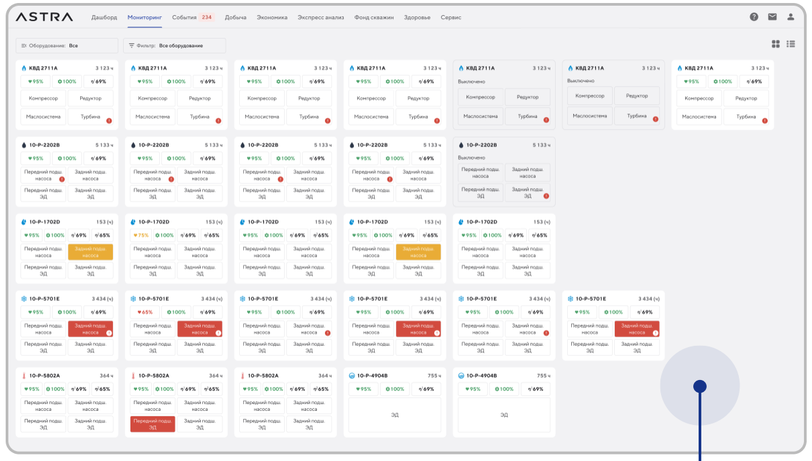
for Critical Equipment Put in the ASTRA SMS

- Full information related to critical equipment in one screen
- User-friendly and consistent interface
- Custom display settings
- Tailored display of multiple pieces of critical equipment
- Prompt indication of deviations

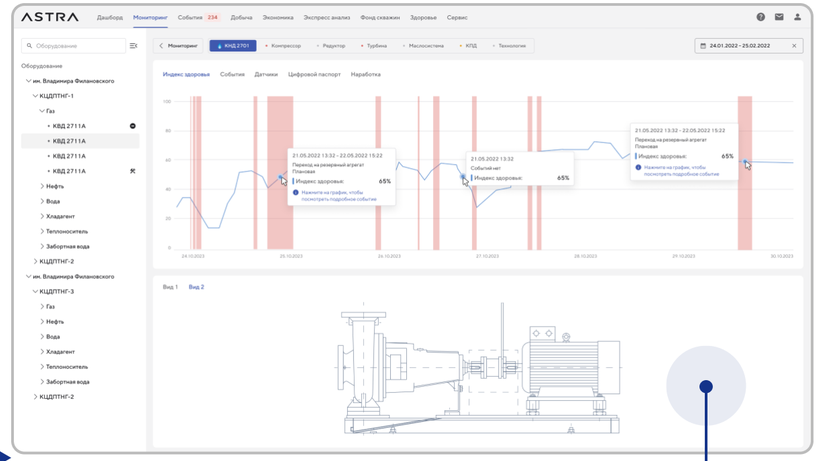


User Scenario. Monitoring

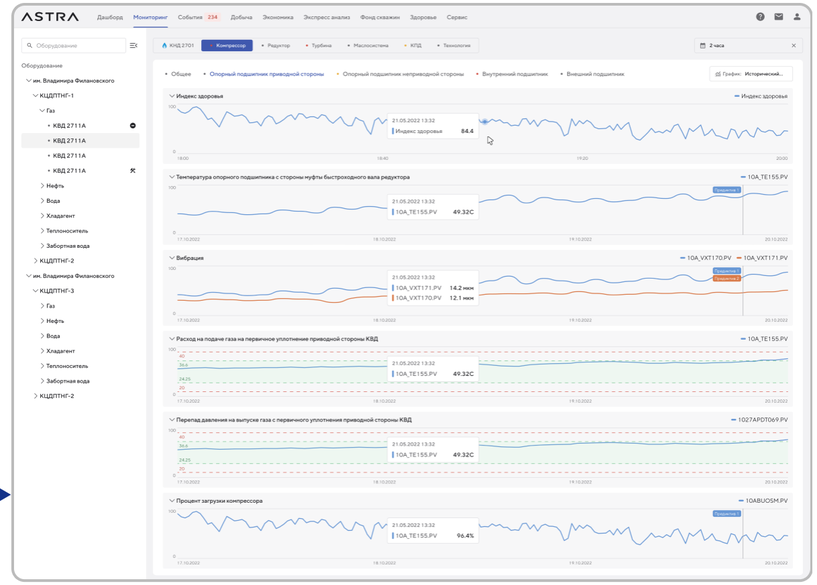
General monitoring tab. Issues detection.



Equipement piece page. Issue localization.



Equipment piece sensors page. Trend analysis.



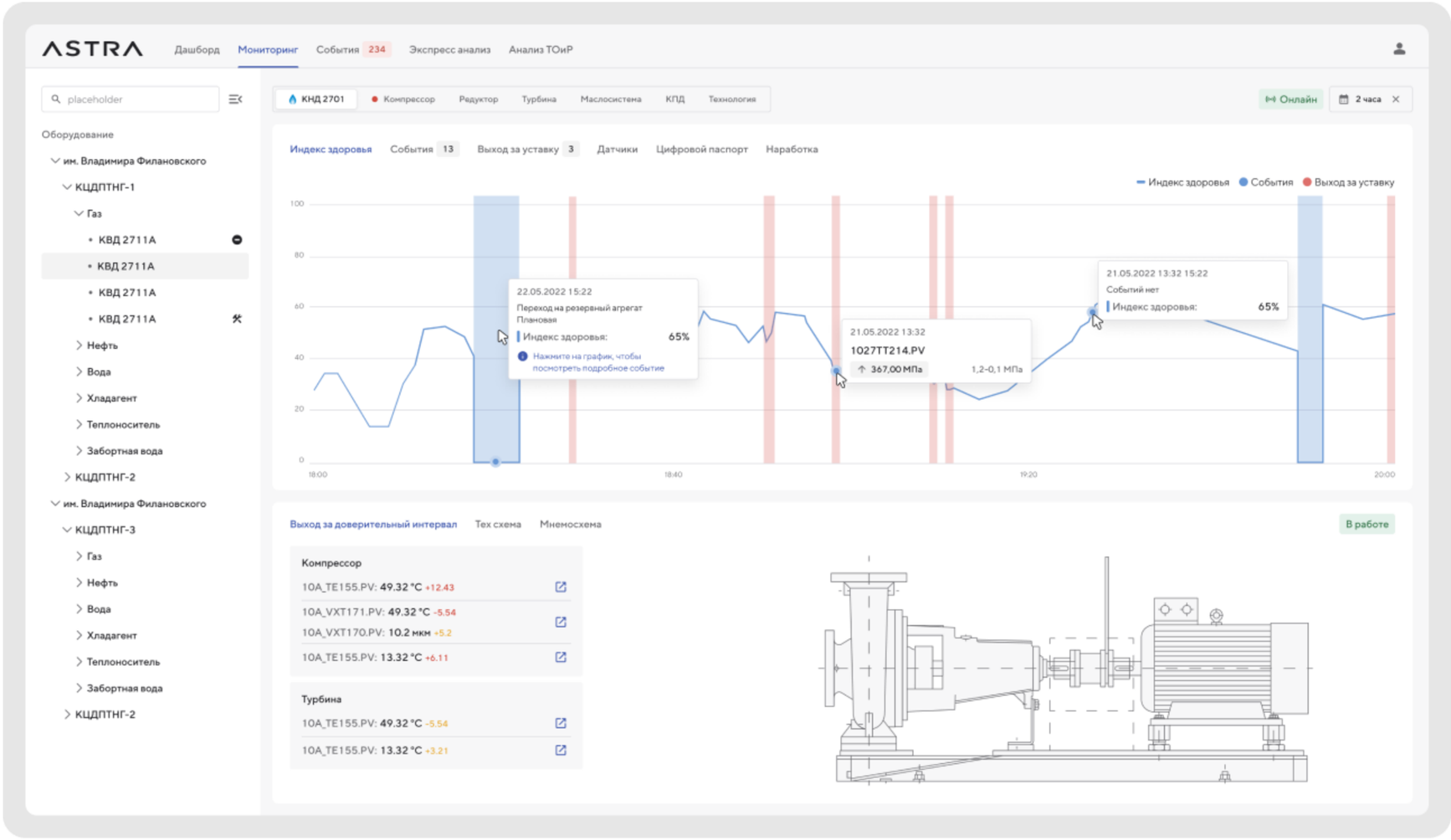
Equipment Piece Page

Interactive diagram of events related to the equipment

Quick view of the sensor readings deviation

Schematic diagram of the equipment

Graphic view of events and deviations

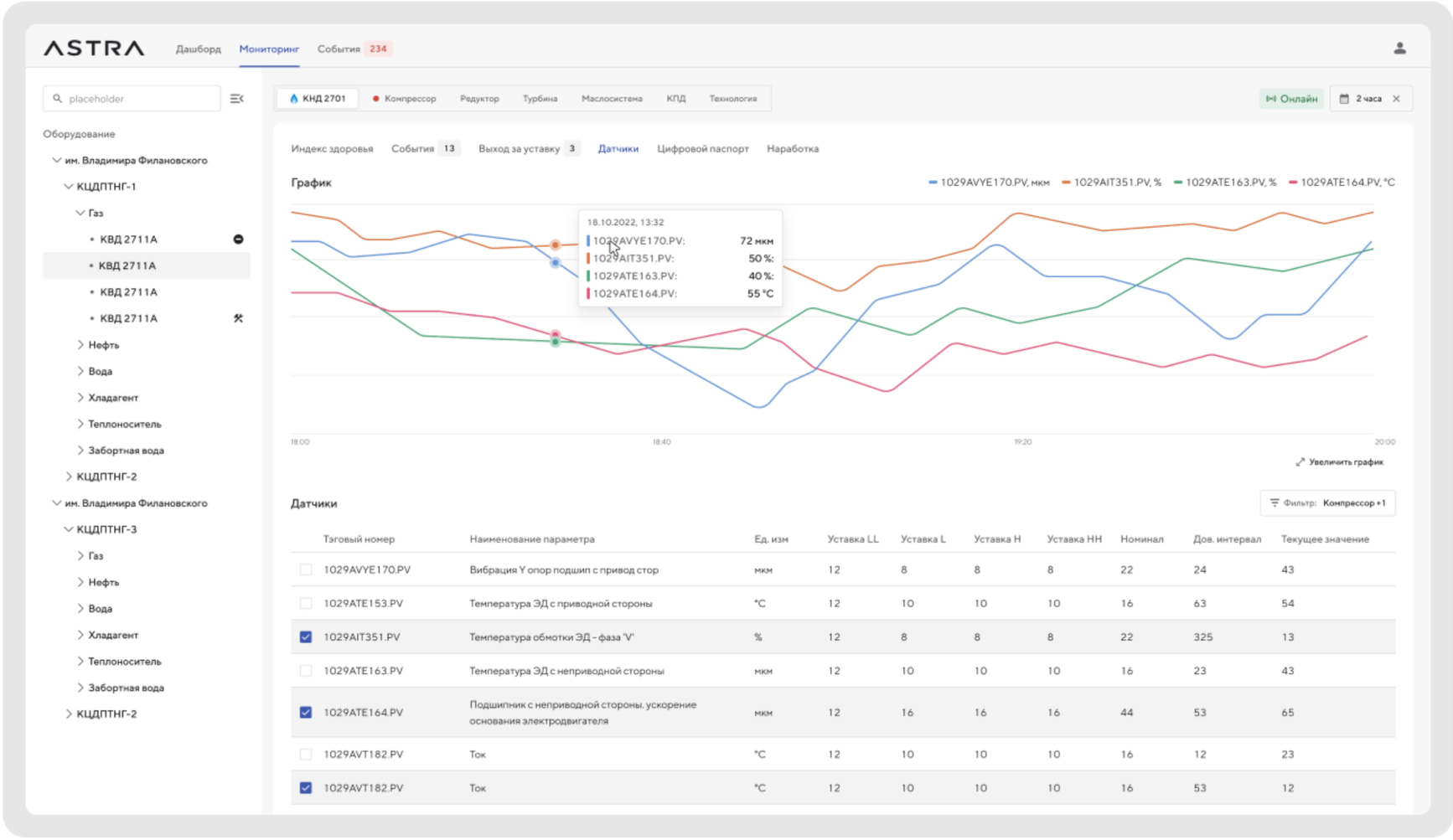


Operations with Sensors

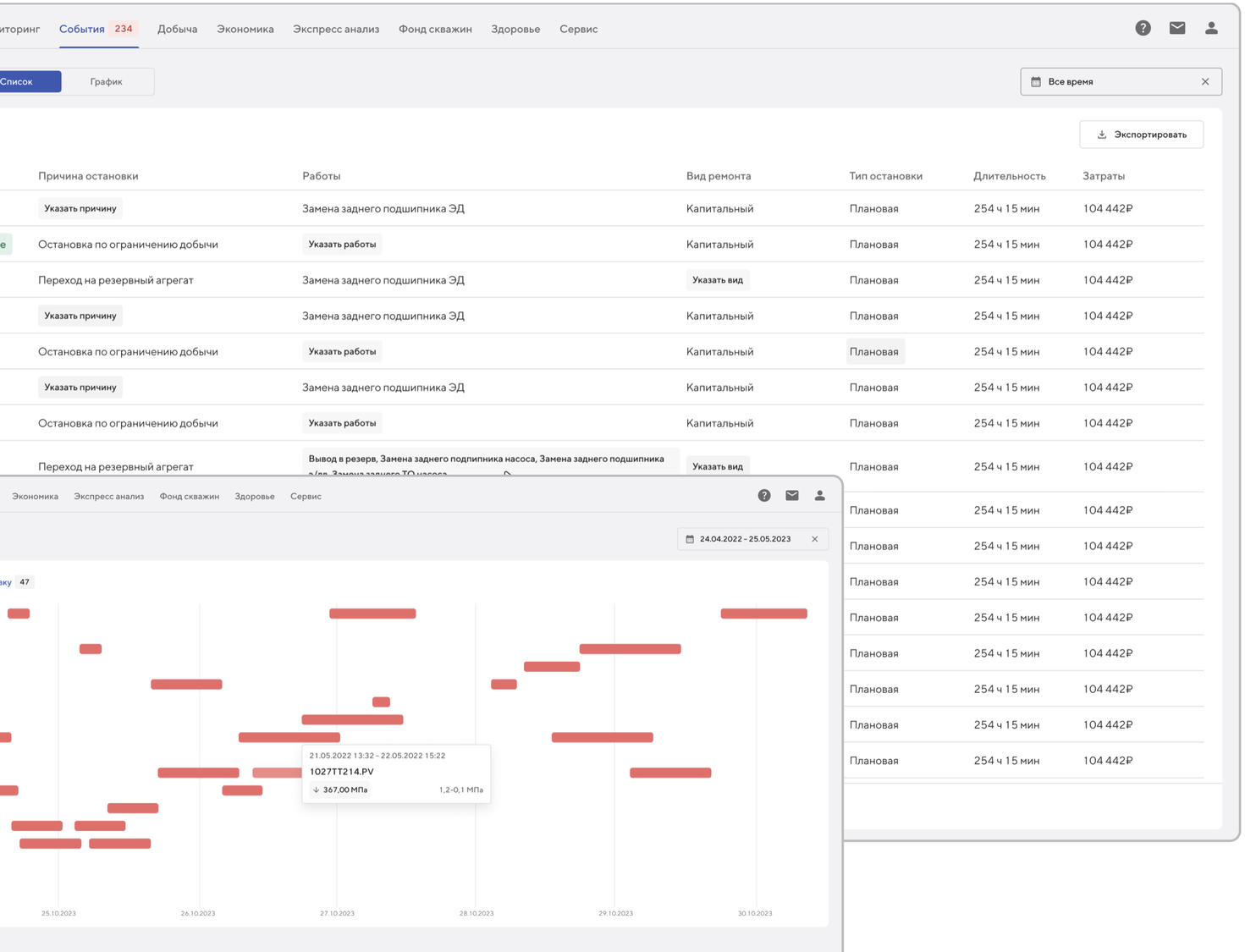
Statistics for all equipment sensors

View of sensor details

An option of creating multitrends for the selected sensors in the same chart area

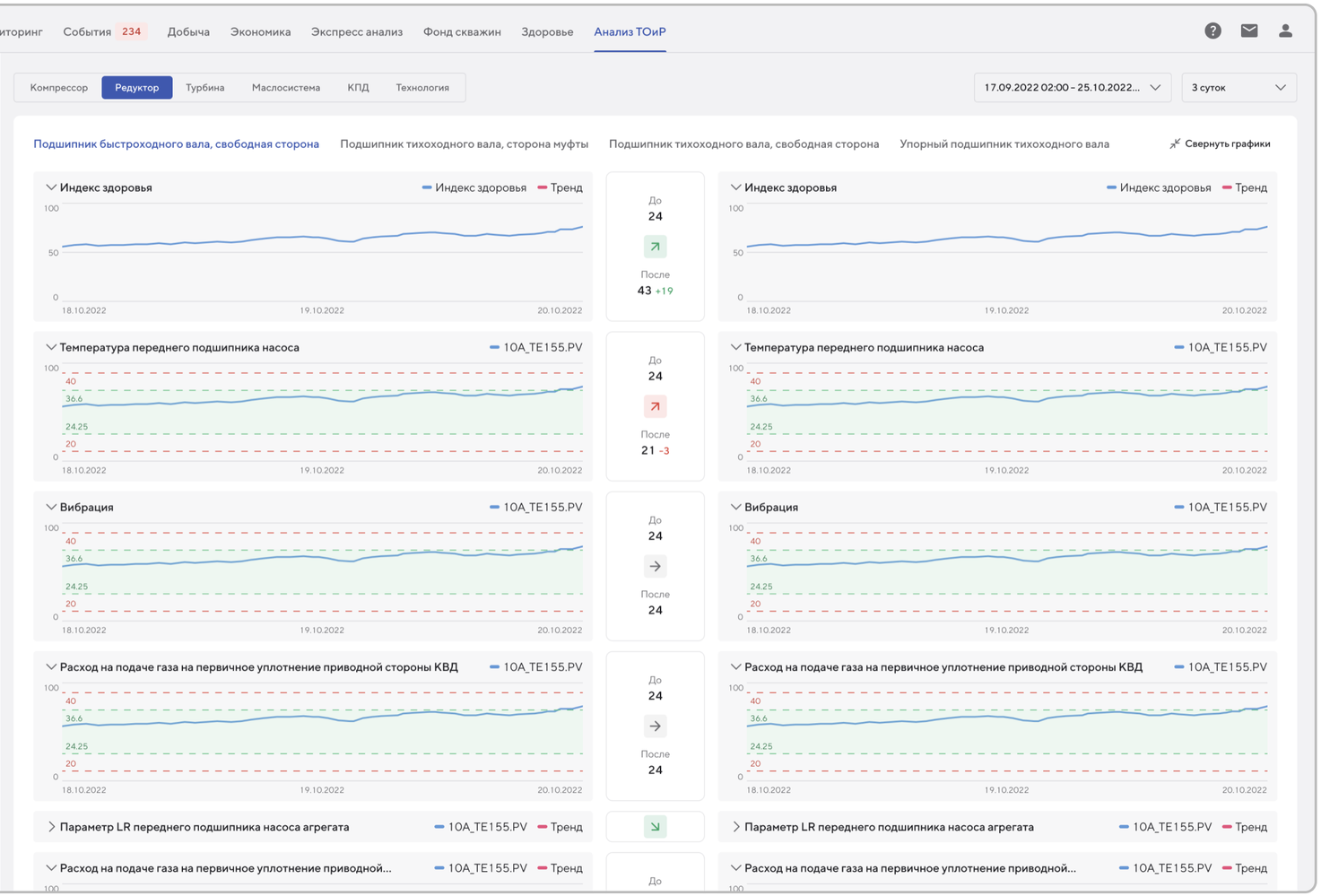


Automatic Creation of Event Entries



- Automatic creation of a shutdown entry
- Automatic creation of a setpoint overshoot entry
- User friendly and consistent interface
- Full information displayed on the same page
- Automatic creation of a shutdown entry

Maintenance Works Assessment Page (Maintenance Analysis)



Tailor-made interface to compare equipment condition before and after maintenance

User friendly and consistent interface

Fully automatic generation of the analytics

Easy to select the comparison periods

Automatic Statistics Calculation Page

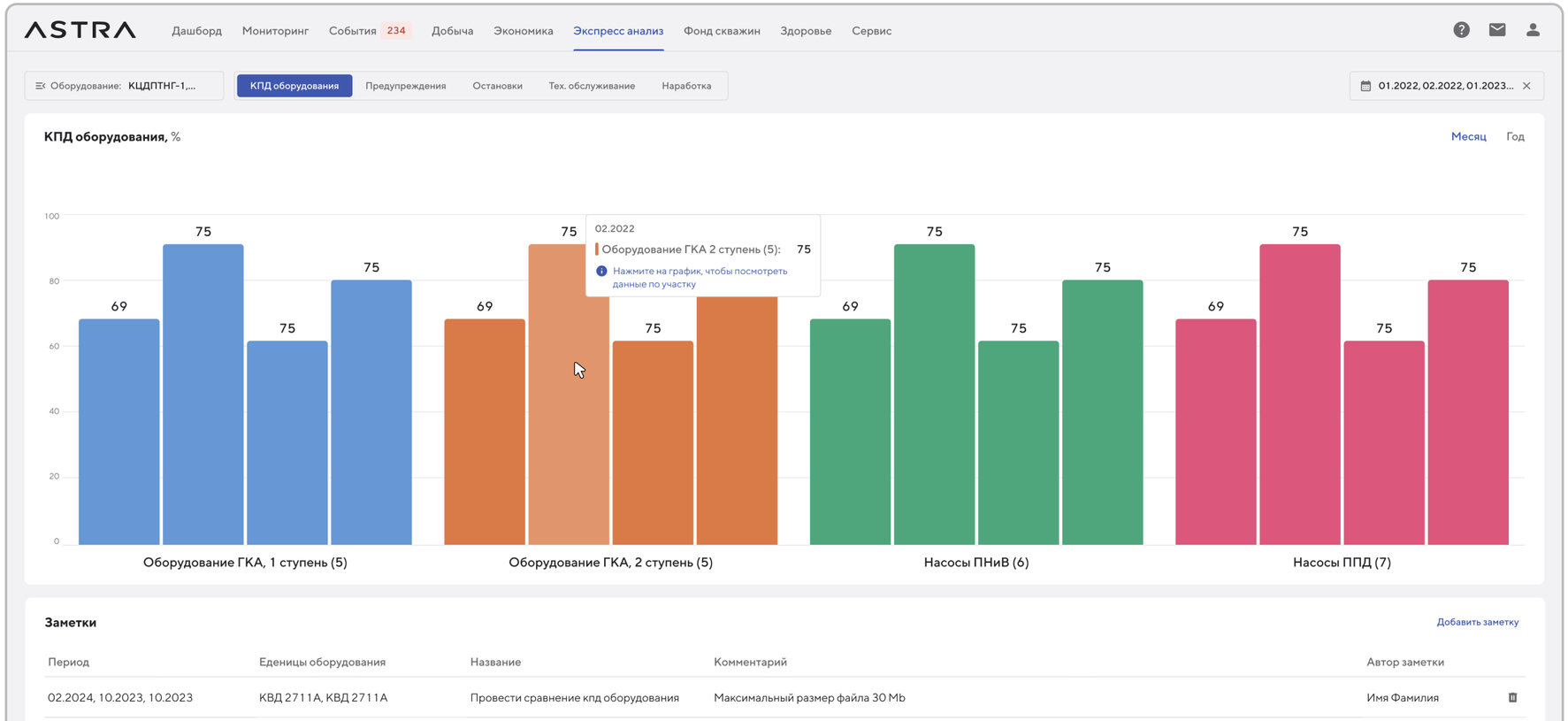
Automatic statistics calculation

Easy navigation

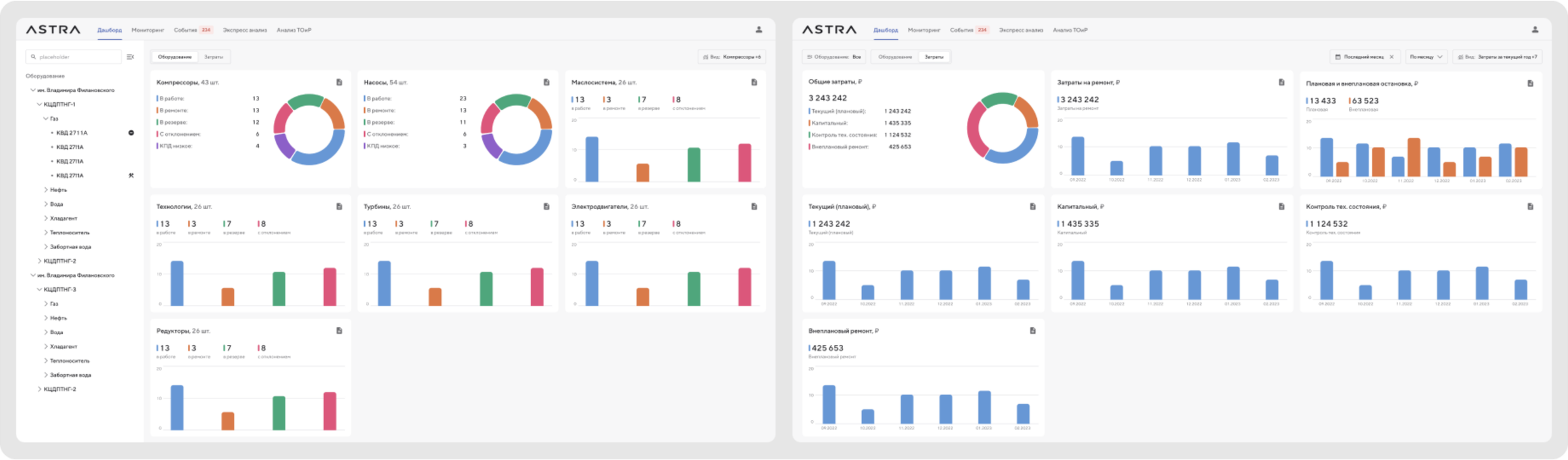
User friendly and consistent interface

Easy handling of pieces and groups of equipment

Full information displayed on the same page



Manager Dashboard



View of the equipment statistics

View of the expenses statistics

Equipment tree statistics filter

View of detailed statistics for the same-category equipment

Flexible System Allows for Adjusting and Creating New Dashboards

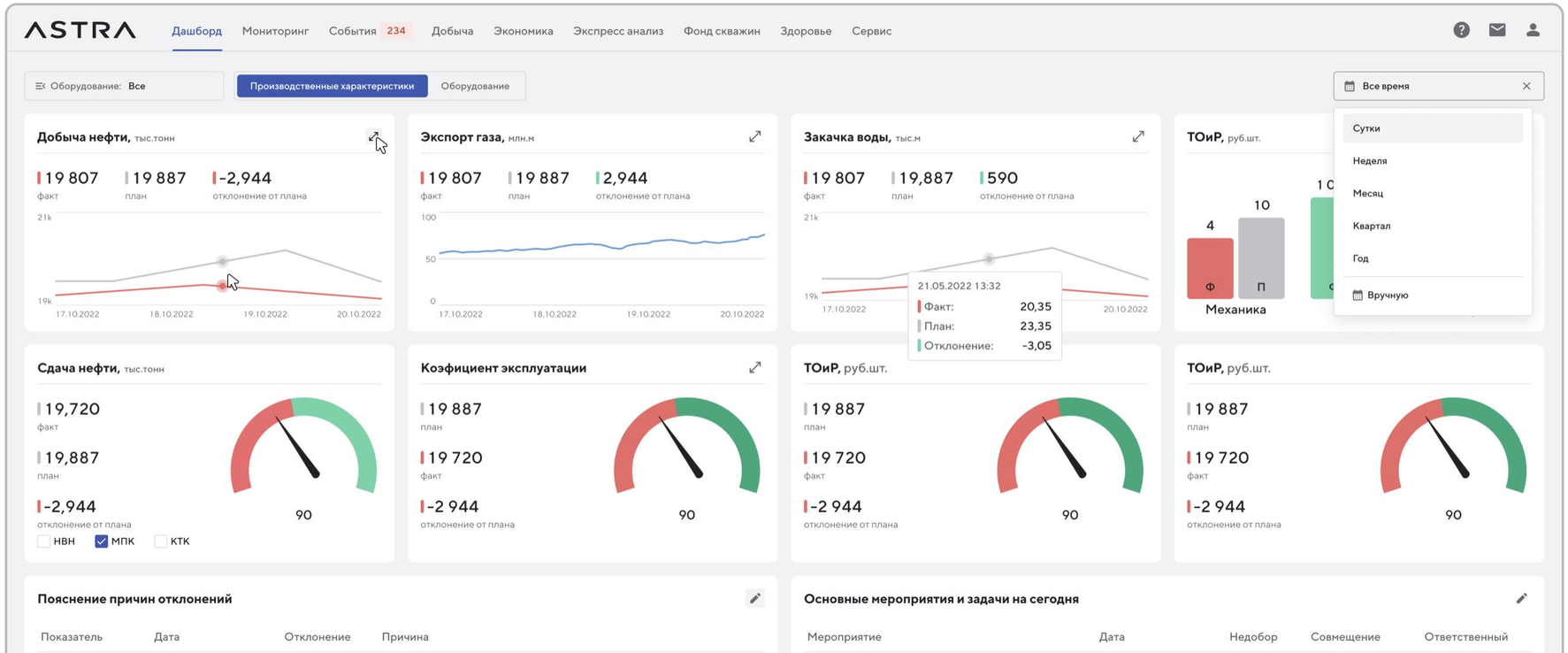
Custom settings

Multiple representation options

Flexible configuration

Full information on the asset on the same screen

Readily accessible information



Where Does Our System Fit in the Maintenance Business Process?

ASTRA

ASTRA covers the most part of the process of equipment maintenance scheduling and deciding on the maintenance strategy.
The system allows to switch from scheduled preventive maintenance to condition-based maintenance.

If necessary, you can still implement and run the scheduling strategy in the ASTRA system while enjoying the analytics functions thereof.

SAP, 1C, and other MESs designed to manage the company operations

Maintenance scheduling, equipment accounting and flow, disposal of materials/equipment, etc. and purchase requests, personnel salaries, personnel management, assets management, etc.

MES /ERP

ASTRA SMS

ASTRA SMS provides: monitoring and notification; integrated digital datasheet, registering and recording of the works performed, maintenance analysis, data analysis

Maintenance systems/CMMS/EAM

APCS

Process management and safe operation

Process management systems

Sensors

Reading and transmission of raw data from the monitored asset

Measuring tools and instruments

Assets Already Using the Software

Filanovsky Oil Field

The Caspian Sea, 2019

Yuri Korchagin field

The Caspian Sea, 2023

D33

Kaliningrad (2025)

Taneco Oil Refining Complex

Nizhnekamsk, 2023

Kandym Gas Processing Plant

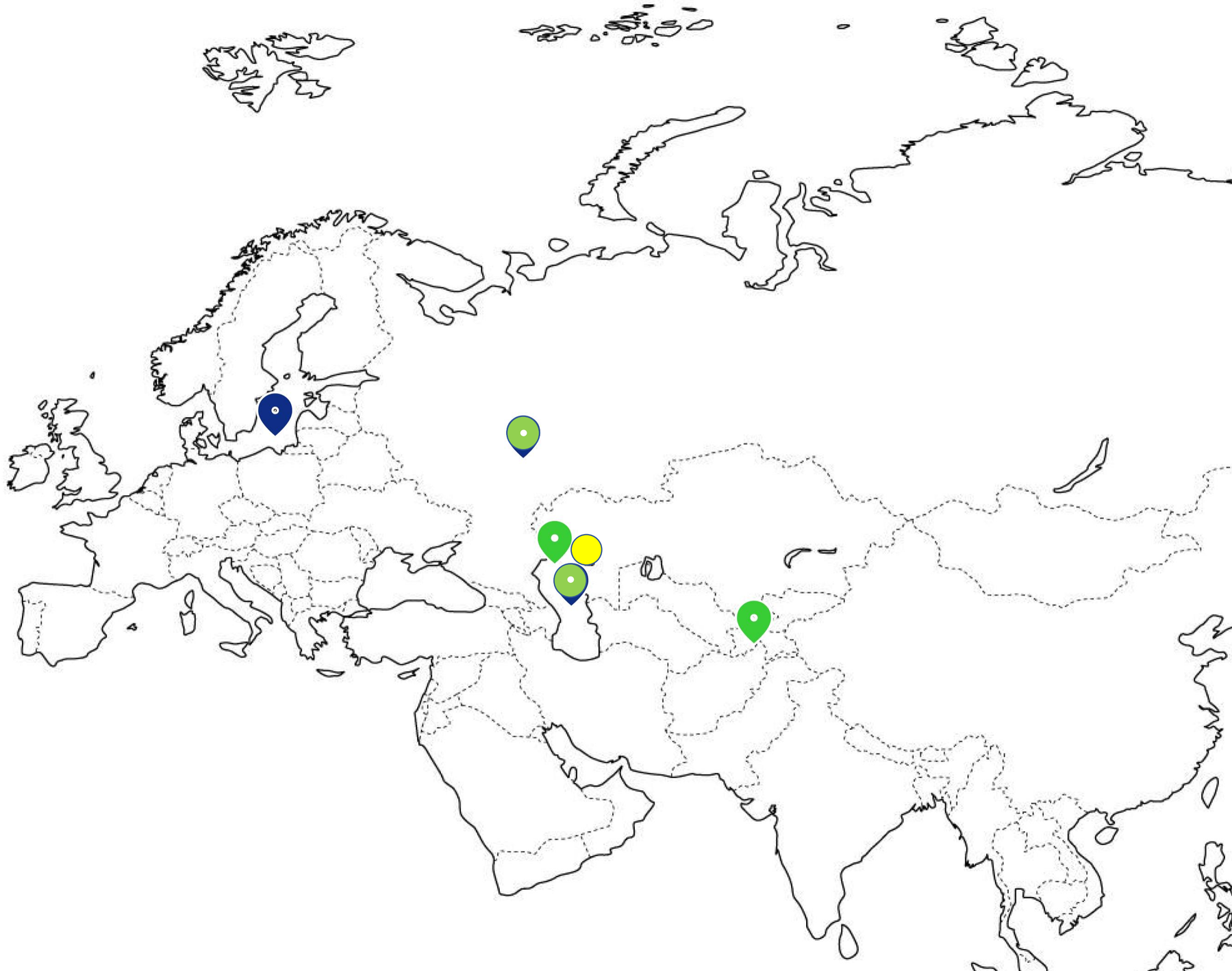
Tashkent, 2022

Ice-Resistant Fixed Platform (LSP) at V. Grayfer Field

The Caspian Sea

To be implemented in 2024

Brought into commercial operation



Standard Roadmap for Software Product Implementation

- Selecting the pilot assets
- Performing training with the use of the historical data
- Deploying the software and integrating it with the on-line data source
- Starting of the beta-version
- Scaling-up and replicating

Tailoring the Business Process

- Collecting the input data
- Interviewing the professionals
- Refining the performance indicators
- Developing the process model
- Updating the procedural regulations
- Updating the company regulations

Primary Users of the System

Production Facilities

- Enhanced safety of the process management
- Finding deviations in equipment performance at the early stages of anomalies generation
- Reduced frequency of unscheduled shutdowns
- Securing stable achievement of h/c production targets

- Selecting the equipment maintenance strategy
- Optimized maintenance timeframes
- Transparent operation of equipment
- Reduced costs of unscheduled repairs

Office-based remote expert support

Service Companies

- Optimized maintenance timeframes
- Remote access to the monitored equipment performance data
- SPTA procurement planning

- Maintenance scheduling and integrated schedule adjustments based on the actual condition of the equipment
- Short-term/long-term h/c production planning
- Selecting the strategy for equipment work load distribution based on its actual condition
- Equipment maintenance scheduling in response to particular events

Operations Manager Office in charge of equipment reliability

ALMA SERVICES COMPANY

You can contact us in any way that is convenient for you

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www.almaservices.ru

Thank you for your attention

Available Service Options for the Systems and Equipment Maintenance

	Software only	Software + remote monitoring*	Software + remote monitoring + maintenance*	Software + remote monitoring + maintenance + SPTA*	**Full package of services***
Software installation, user training, software support	✓	✓	✓	✓	✓
24/7 monitoring and recommendations to the operations departments		✓	✓	✓	✓
Annual service repairs			✓	✓	✓
SPTA procurement under the service contract				✓	✓
Guarantee of equipment safety and security during operation					✓
Service support with a 24/7 professional attending the site					✓

* - the service is provided in cooperation with our partner OOO AGS, compressor equipment servicing company

Software development strategy for 2024-2025

On-line monitoring of lube oil condition

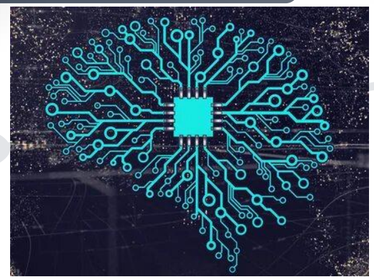
Alarm of lube oil condition deviation:
Grade of purity
Water content
Impurities

Lifecycle of bearings and end seals

Tracking from purchasing through replacement
Analysis of the use of bearings and end seals

Building up a neural network

Extending the forecast interval through application of failure patterns



Creating a 24/7 production support centre

Remote monitoring of assets
Expert support of the production process
Provifding recommendations and sharing the responsibilities with the Customer

AGS AUTOMATION GAS TECHNOLOGY SERVICE