

AESA Innovation Report

(Q1-Q3 2025)

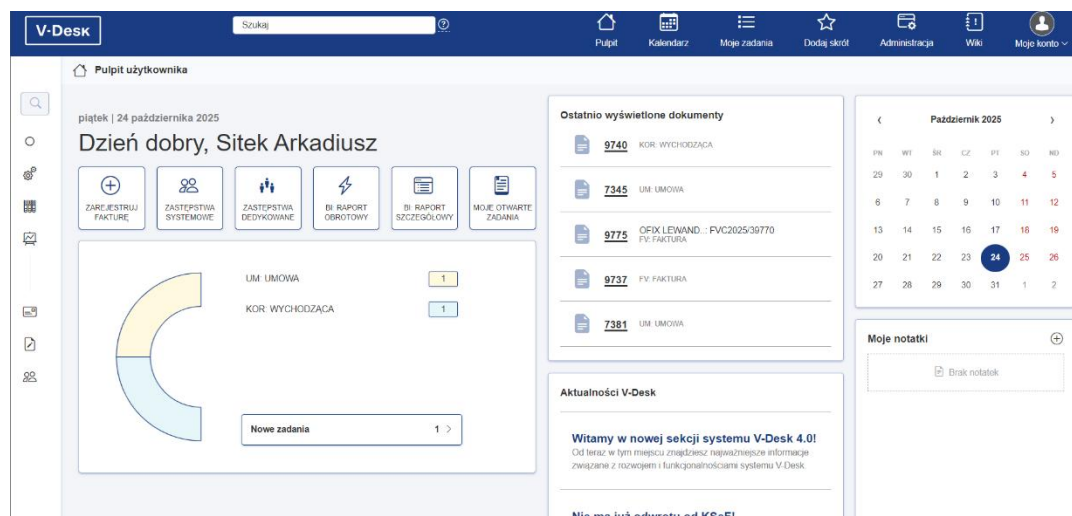
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Digital Platforms and Technological Independence

We have built internal development competencies, making our key systems independent from external vendors. This gives us control over development, security, and costs.

- Digitization of Field Operations (Events Database & Asset Model) We replaced all email and PDF-based work requests (RWN) with a 100% digital, mobile-first platform. The depth of this new system includes:
 - Advanced Planning Module: Staff can now schedule specific work types (e.g., manual mowing, sign straightening) and reserve all necessary vehicles and equipment directly in the app.
 - Automated Conflict Detection: A live engine calculates potential work conflicts and sends real-time alerts to mobile users (in both the Events Database and maintenance apps).
 - Full Subcontractor Integration: We granted subcontractors direct access to mobile apps (EMU/UMU, Service Lens) and forms, integrating them fully into our digital ecosystem.
 - Multi-Level Approval Workflow: A fully digital approval chain that replaces the PDF process, automatically generating and distributing work orders based on defined filters.
 - Enhanced Reporting & Integrations: Launched a suite of new automated reports (OPP Report, Brigade Work Card, Event Card, Collision Card, Maintenance Report with attachments).
 - Deep System Integration: The platform is connected to VoiceBot, ChatBot, Info A2, and Asset Model
 - Detailed Asset Mapping: Added the ability to map the specific number of lanes for any given roadway.
 - Future-Ready: The system is planned for integration with an SMS gateway for mass (SMS and/or email)
- Digital Office
 - We are finalizing the deployment of a comprehensive Electronic Document Workflow system. This platform manages the entire lifecycle of contracts, includes electronic signatures, and digitizes the full invoice and documents workflow.



- International Recognition (SOMA System)
 - Our in-house SOMA (Motorway Monitoring and Operation System) has been officially recognized and added to the European Road Safety Charter's list of good practices, validating its quality and impact on safety at an international level. <https://road-safety-charter.ec.europa.eu/pl/content/system-obslugi-i-monitorowania-autostrady-soma-0>
- Dedicated Equipment & Fleet Management App
 - We developed a separate application for managing equipment inspections (required by ISO 45001 compliance), integrated with our automatic fuel stations (automatic mileage retrieval) and QR codes generation and reading for equipment identification.



Lista sprzętu

PANEL BŁYŹNY

- [Sign up / log in](#)
- Kalendarz
- Drukuj kody QR
- Utworzenie i profil

ANALIZA

SYSTEM

Wszystkie 124	W owaril 0	Serwis pilny 0	Wymaga uwagi 0	Status OK 124	Archiwum 3
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Wyselec:


25 Szukaj: Wpisz frazę... / Archiwum

POSPYPARKA STRATOS B70-4ZVENS

Siła oddziaływań

Przebieg do 240 dni Status OK

2026-04-29



Pokaż więcej

Dodatkowe informacje:

Data odbioru: 2025-05-29

Numer homologacyjny: 1210


Użytko: Brak

PLUG TARRON HP

Siła oddziaływań

Przebieg do 240 dni Status OK

2026-04-29




Pokaż więcej

Sprężarka COMPAIR DTL 0405 P01270Y

Siła oddziaływań

Przebieg do 30 dni Status OK

2025-11-23




Pokaż więcej

VW CADDY P02LF54

Siła oddziaływań

Serwis N/A Status OK



Pokaż więcej

Dodaj nowy sprzęt

Podstawowe informacje

Nazwa sprzętu:

Numer sergii: Numer obwodowy:

Przebieżna serwis

☒ Przegląd 15dni (1500z km)

☐ Przegląd co 10 dni (10 dni)

☐ Przegląd co 1005 dni (1005 dni)

☐ Przegląd co 170 dni (170 dni)

☐ Przegląd co 180 dni (180 dni)

☐ Przegląd co 270 dni (270 dni)

☐ Przegląd co 240 dni (240 dni)

☐ Przegląd co 30 dni (30 dni)

☐ Przegląd co 300 dni (300 dni)

☐ Przegląd co 360 dni (360 dni)

☐ Przegląd co 365 dni (365 dni)

☐ Przegląd co 40 dni (40 dni)

☐ Przegląd co 45 dni (45 dni)

☐ Przegląd co 60 dni (60 dni)


☐ Przegląd co 730 dni (730 dni)

☐ Przegląd co 90 dni (90 dni)

Złóżcie

Maks. rozmiar jednego pliku: 5MB. Łącznie rozmiar wszystkich plików: 15MB.

Ułóż pliki tutaj lub kliknij, aby wybrać



Przebieżna serwis

Przeгляд 15дн

OK

Wymlana ieliec

Tyп иеларва

Wartość ielaruwa

Klometry

15000 km

Ostatnie wykonanie

Następny termin

Brak km

Brak km

Opis wykonanych czynności dla: Przeгляд 15дн

Przeгляд co 10 дни

SERVISY PILNY

Tyп иеларва

Wartość иеларва

Dni

10 dni

Ostatnie wykonanie

Następny termin

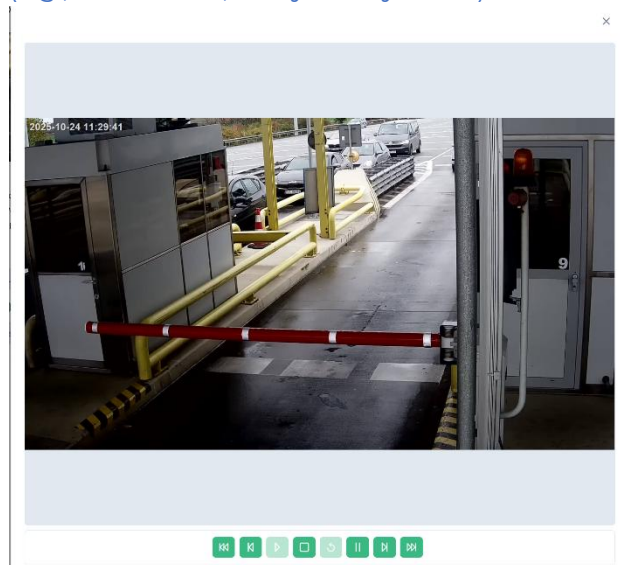
2025-09-29

2025-10-09

Opis wykonanych czynności dla: Przeгляд co 10 dni

[illegible]

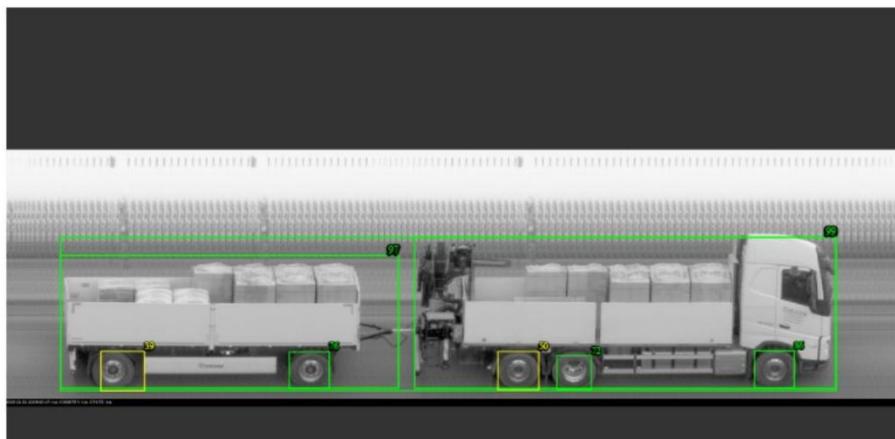
- Full Independence (In-House)
 - We migrated our VoiceBot and ChatBot to our own servers. We are independent of vendors, pay no per-interaction fees, and control 100% of the data.
 - We implemented a local (offline) audio-to-text transcription system (supports 100 languages), guaranteeing complete data security (nothing leaves the company).
- Intelligent Architecture (API)
 - We developed a universal, internal API for handling video camera recordings. This allows us to instantly connect a feed from any camera to any application (e.g., BackOffice, analytical systems) without costly case-by-case integration.



AI and Advanced Data Analytics (BI)

We use data and AI for business decision-making, system diagnostics, and proactive security.

- AI in Operations (Computer Vision)
 - We are conducting an advanced pilot of vehicle categorization using AI cameras. The goal is to verify the potential of replacing expensive classification systems (CAPEX/OPEX) with a much cheaper solution.



- BI for Finance (Budget Management)
 - We launched a PowerBI module integrated with our EOD (Electronic Document Workflow) and accounting systems. Management now has live access to detailed budget execution analysis, linked directly to the invoice workflow.

V-Desk

Szukaj

Pulpit

Kalendarz

Moje zadania

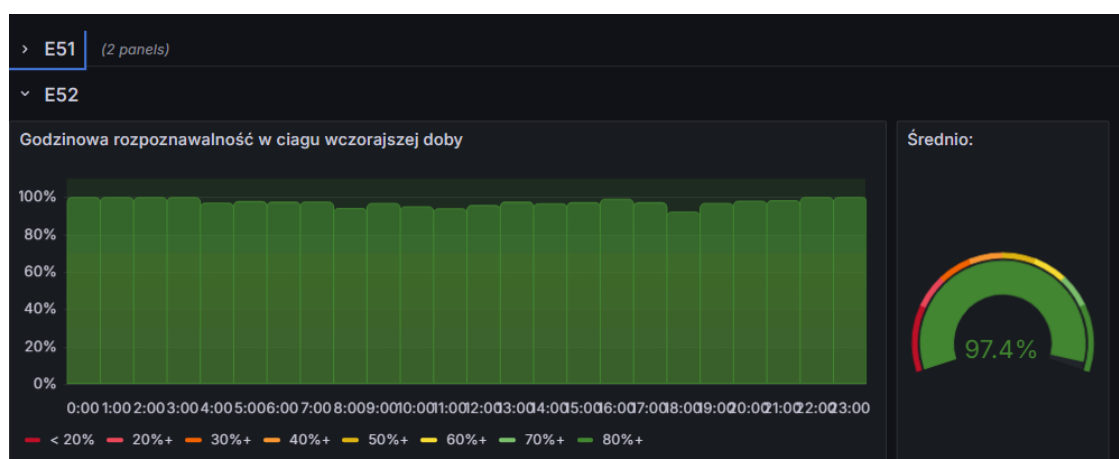
Dodaj skrót

Administracja

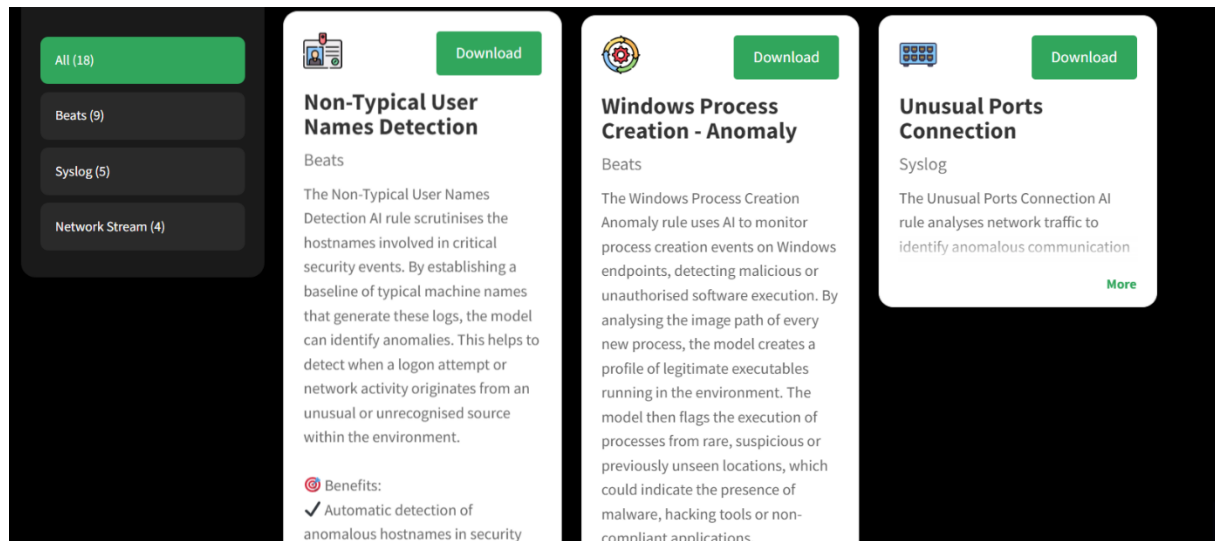
Wiki

Moje konto

- BI for Operations (Diagnostics)
 - We built a suite of advanced diagnostic dashboards in Grafana. This includes:
 - Detailed Traffic Visualization: Traffic on all lanes, broken down by vehicle category, plus cumulative traffic (total, by category, and hourly).
 - Interactive Charts: Users can intuitively "zoom in" on specific time ranges.
 - Instant Reporting: High-level reports (total motorway traffic broken down by entry/exit, cumulative annual traffic) are generated almost instantly because the data is pre-aggregated in the database.
 - Operational Stability Monitoring: We implemented monitoring for toll collection software versions, down to the individual executable file level, in addition to real-time LPR effectiveness analysis.



- We are implementing a SIEM/SOAR system integrated with AI, which proactively analyses logs from across the entire company to find advanced threats (in line with MITRE ATT&CK), rather than just reacting to incidents. It also has additional AI models dedicated to specific analysis.



- **AI Research & Development (R&D)**
 - We are actively testing local AI models for document analysis (RAG and Graph RAG) and querying databases using natural language,
 - We also completed a successful Proof of Concept (POC) using a local LLM to analyse customer interaction transcripts from our Voice and Chatbot. This will allow us to assess case resolution effectiveness and identify areas to improve the BOT's performance. The POC was successful, and we plan to proceed with a production deployment in 2026.
 - The long-term plan also includes applying Computer Vision models to analyze photos within the Events Database, the service module, and the Asset Model. The idea is to use it to check if the repair is done (automatically compare before and after photos).

Agile Engineering Solutions

We prove that innovation also means intelligently and creatively solving everyday operational problems at minimal cost.

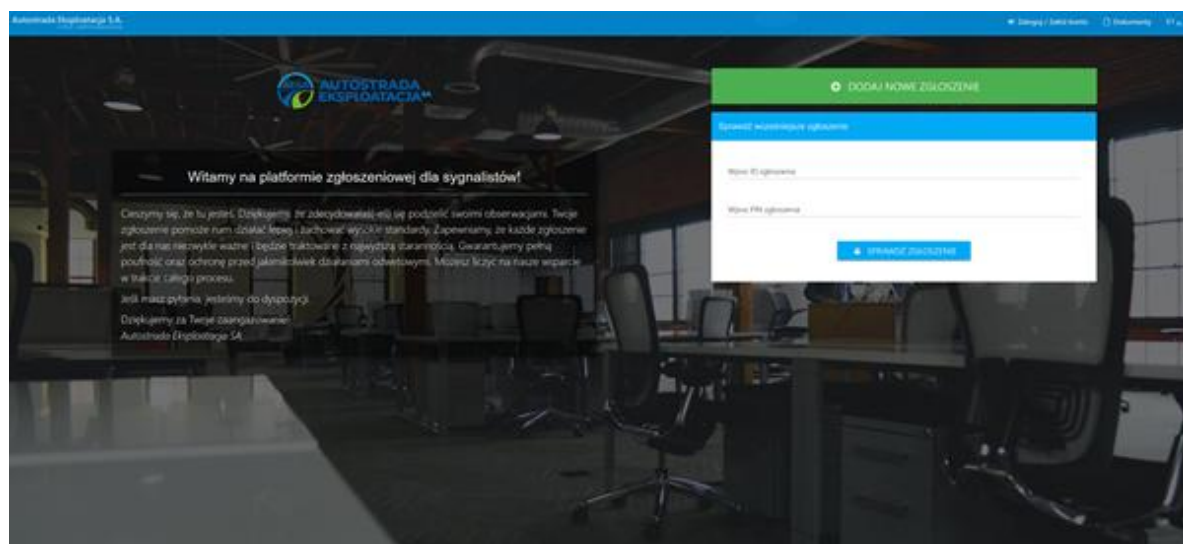
- **Rapid Prototyping (3D Printing)**
 - We use our own 3D printer to design and immediately produce non-standard components: mounts for payment terminals, spare parts for ticket dispensers, or cable organizers.
- **Smart Infrastructure (Smart IoT)**
 - We implemented network-controlled power modules that allow for the remote reboot of frozen devices (e.g., payment terminals in lanes). This eliminates 90% of service dispatches to the lane, reducing downtime and physical human intervention.

External whistleblower reporting platform

External whistleblower reporting platform – www.aesa.zalezymi.pl – allows users to submit reports either anonymously or under their name. Launched in March 2025, the platform is very easy to use. The drop-down menu enables whistleblowers not only to select the

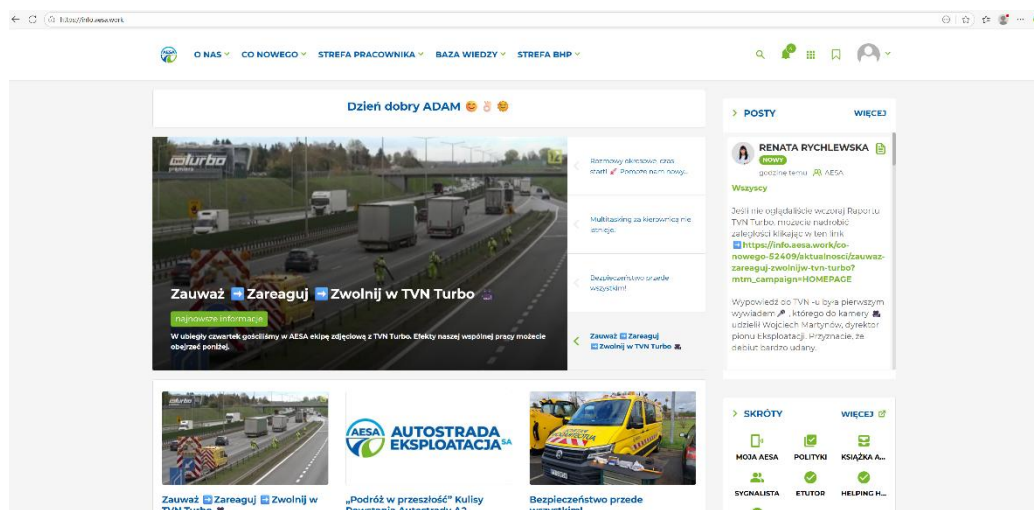
appropriate reporting form and topic, but also to decide whether they wish to report an issue anonymously or not.

Through the website, anyone wishing to report a violation can also schedule a meeting with the Compliance Officer. Additionally, employees can use the platform to submit improvement ideas and innovations.



Modern employee communication systems:

- o info.aesa.work and moja.aesa.work applications – available 7/24 on computers, tablets, and phones. Employees have access not only to the latest company news, but also to HR documents, employee benefits, health and safety videos, etc.



The Employee Portal

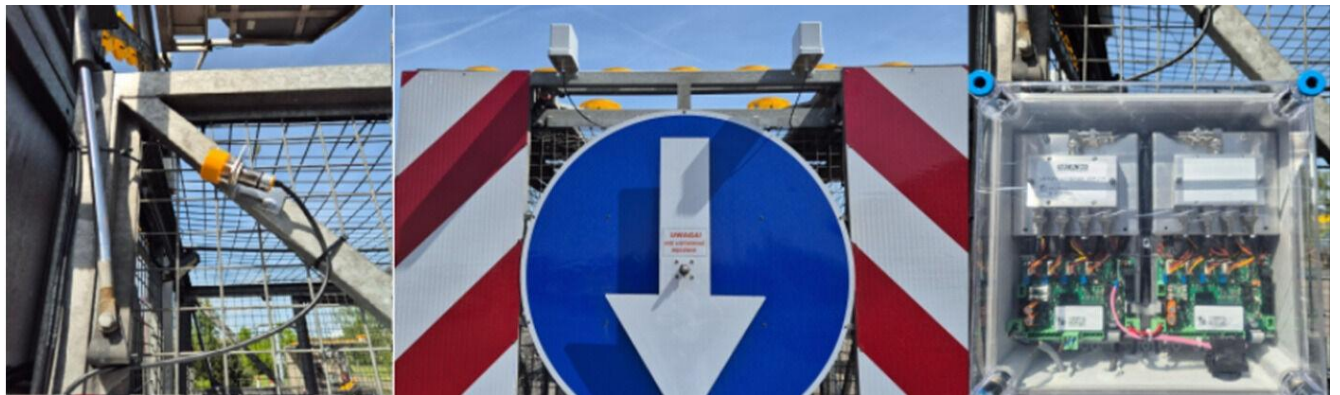
A modern digital tool that allows employees to manage their own HR data, access schedules and payroll data, and submit vacation requests. It is simply part of the existing Softlab computer program, to which all employees of AESA are assigned.



Warning message transmitter

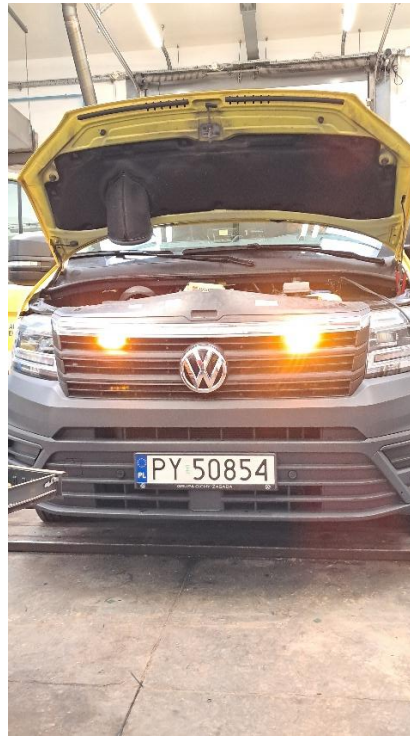
New communication tool for drivers

The use of directional antennas and low-power transmitters allows messages to be broadcast at the work site (without “cluttering” the airwaves) at a distance of approx. 300–500 m in the direction of oncoming vehicles. These modules are installed in vehicles securing road works (e.g., U26a and U27 trailers).



Retrofitting Patrol and Intervention vehicles with additional orange LED warning lights

They will be located at the front of the vehicle, in the radiator grille, similar to emergency vehicles. These lights will be clearly visible in the rearview mirrors of passenger cars and will enable drivers to react more quickly to vehicles approaching them on their way to an incident. This will make the highway operator's cars more visible to vehicles in front of them. Currently, after testing, the project to retrofit cars with warning lights has been referred for implementation to the OMC's.



Implementation of real-time road lighting level control depending on traffic (dynamic adjustment of lighting levels).

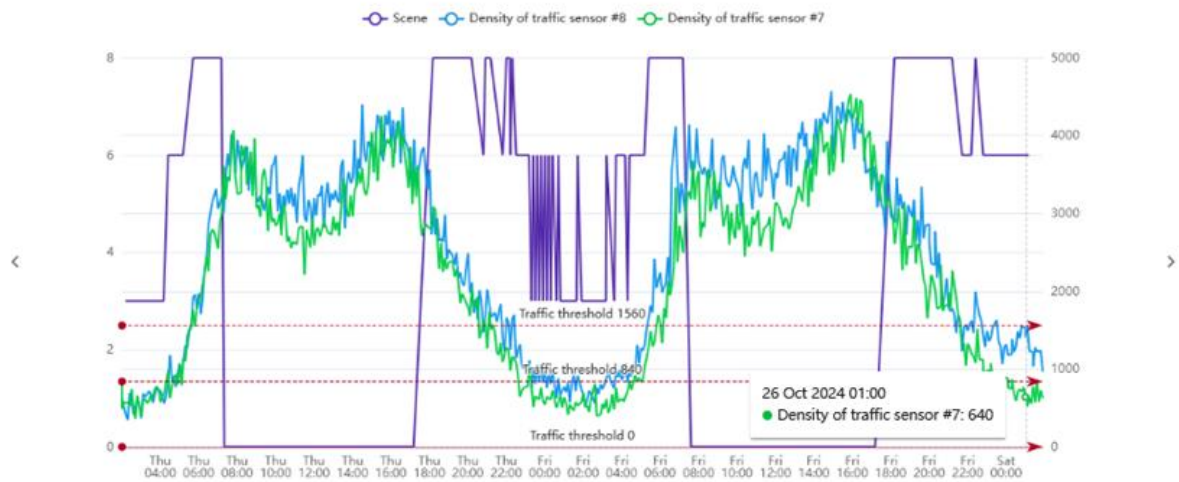
Implementation of **real-time** road lighting level control based on current traffic, achieving an **additional 42% reduction** in road lighting energy consumption (October 2024). It is probably the first such system in Europe.

Traffic flow data is collected from traffic counting stations every 6 minutes. The system processes the received data on the number of passenger cars and trucks, converting them into equivalent units [pu] and traffic intensity expressed in [pu/h]. These values are then compared with the maximum capacity of the given road section.

According to the PN-EN 13201:216 standard (Appendix A), if the calculated result is lower than 65% of the maximum capacity, the lighting level is reduced by one class (in our case from M3 to M4, by 25%). If the result is lower than 35% of the capacity, the lighting level is reduced by two classes (in our case from M3 to M5, by 50%).

The results and corresponding actions (lighting class changes) are recorded and displayed in the system in the form of charts. An example chart is shown in the figure below, where the scene number corresponds to the lighting class (lighting level), and the traffic thresholds represent 35% and 65% of the maximum capacity for the given road section.

Scene



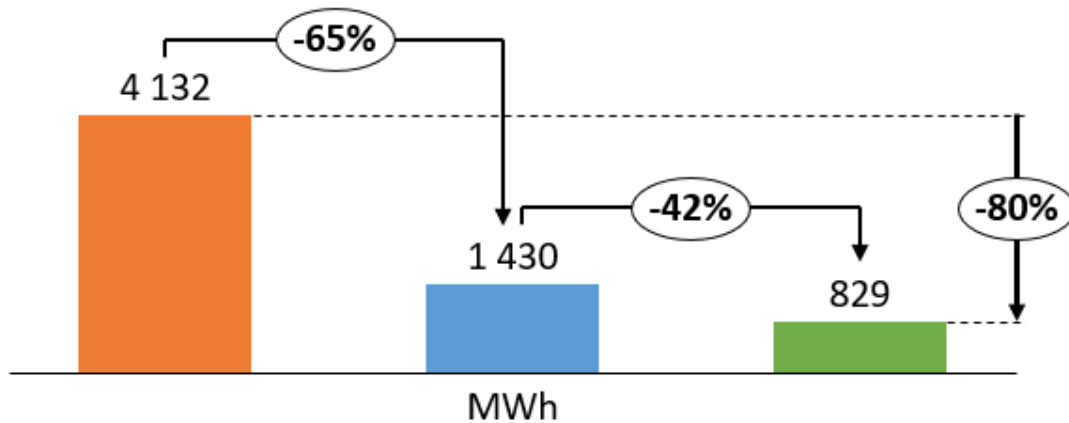
24.10.24 - 25.10.24

☐ Start from minimum value

Selected traffic sensors

Traffic sensor 8, Traffic sensor 7

Real annual energy savings from road lighting

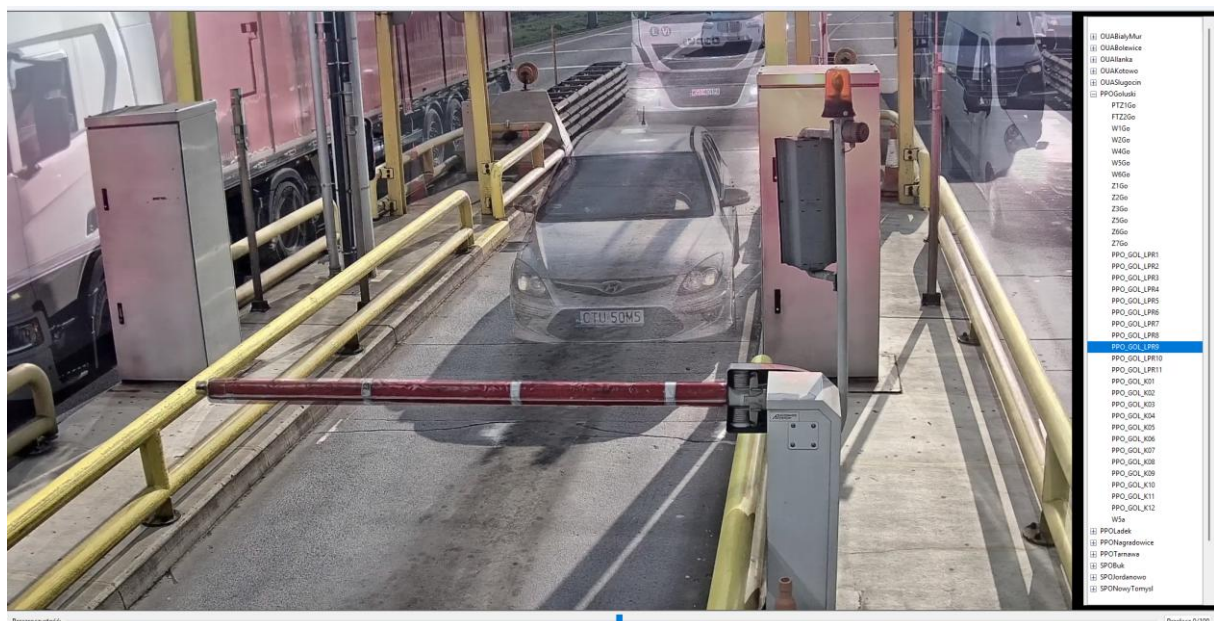


- Before LED (road)
- After the replacement to LED
- After the reduction depending on real-time traffic

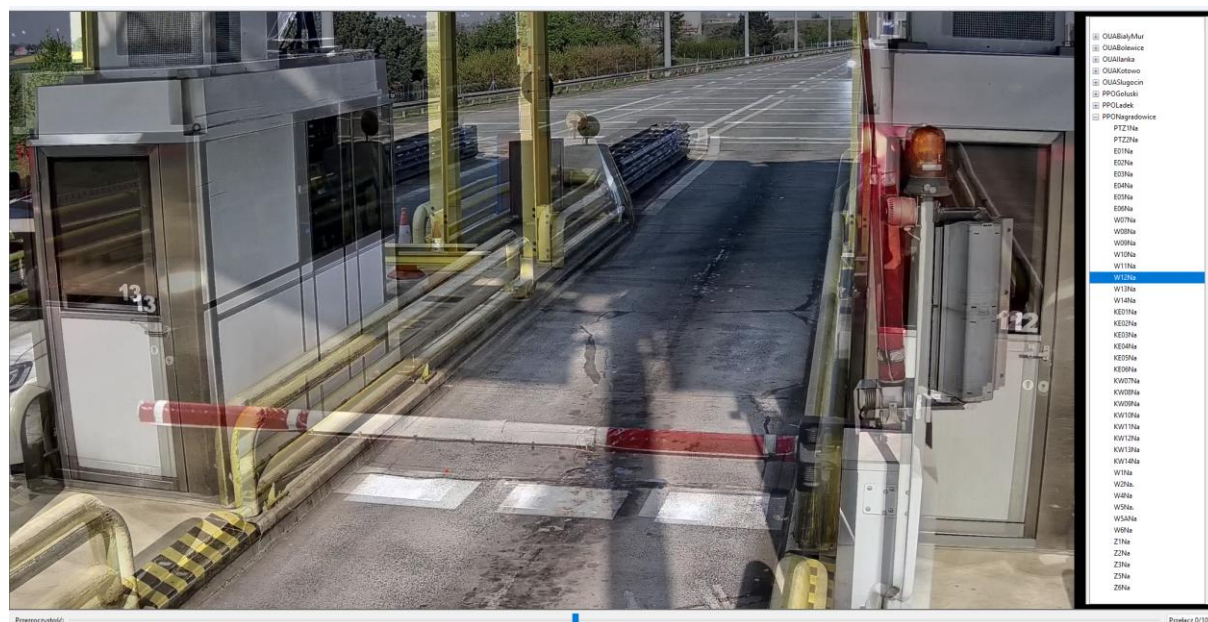
Cameras maintenance software “KamTest”

CCTV cameras and road incident detection system cameras operate in harsh weather conditions, which often causes changes in their viewing angles. Due to strong winds or vibrations of mounting elements — such as poles and camera brackets — the cameras may shift, altering the observed image. For road incident detection system cameras, proper camera alignment is crucial for the correct functioning of the system. Restoring the correct camera view without an appropriate tool is not easy — and certainly not optimal. Therefore, a program has been developed to compare the current camera image with a reference image to check whether the camera has shifted since installation. The reference image serves as a template with which the current camera image should always be identical. If noticeable differences are detected, it is necessary to adjust the camera's viewing angles on the bracket. This software facilitates the correction of camera viewing angles by allowing the reference image and the current image to be overlaid with adjustable transparency. Thanks to this feature, technical personnel can more easily and quickly restore the correct camera alignment.

The screenshot shown presents the current camera image overlaid on the reference image with 50% transparency. By observing fixed elements in the image, such as the traffic light or ticket machine, it can be seen that the camera is aligned according to the reference image. Using the slider, the operator can adjust the level of image transparency from 0% to 100%.



In the screenshot below, it is visible that the current camera image does not align with the reference image. Fixed elements in the image, such as the toll kiosk or traffic lights, appear “doubled.” Camera adjustment is therefore required.



In the case of thermal cameras used in road incident detection systems, the same tool is also applied.



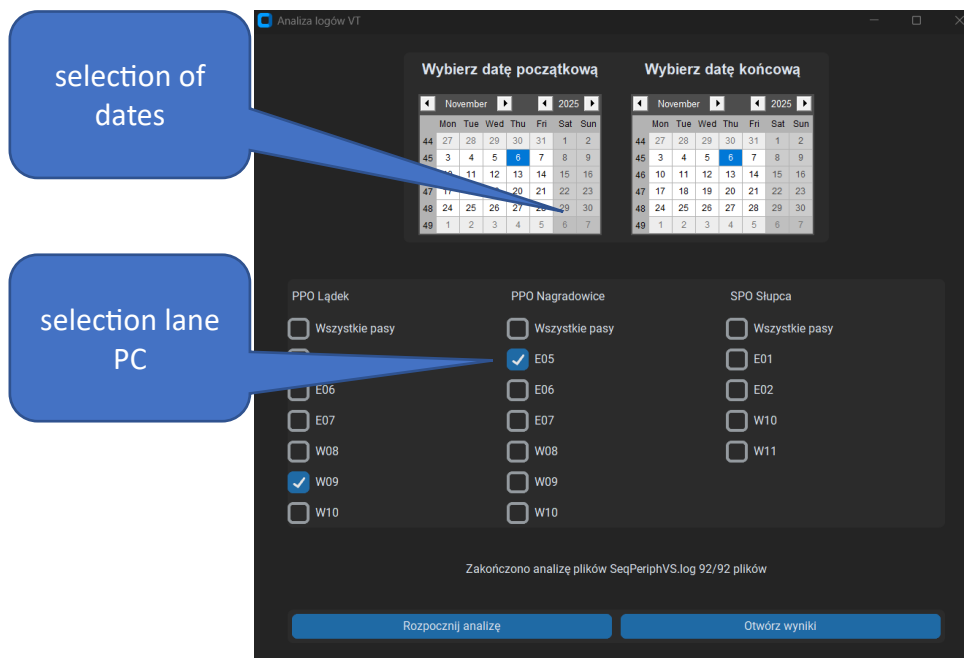
Log Analysis Program „AnalizaVT”

During the operation of the toll collection system, errors or anomalies in system performance occasionally occur. An essential aspect of maintaining proper operation of toll collection devices is fast and simple error diagnostics. The system records peripheral device events in text files — these are the so-called system logs. However, the problem is that these files contain dozens of lines per second. For example, 30 minutes of system operation may generate around 7,500 lines of log text. These numbers can be much higher depending on system activity. Manually finding useful information about a specific system error is both time-consuming and labor-intensive. Additionally, the content of the logs is not easy to interpret, as they include abbreviations, unfamiliar terms, and codes. Therefore, a log analysis program has been developed for the VideoToll system, which automatically searches log files, filters the relevant entries, and translates their content into language understandable to the system operator.

The software automatically connects to the specified VideoToll lane computer and searches the directory containing log files for the selected time range. This eliminates the need to manually open directories on the lane computer. The filtered and translated data are saved to a .xlsx file, which allows further analysis using Excel tools.

Thanks to this tool, technical staff can quickly locate information about the operation of the system's peripheral devices and analyze the source of errors. For example, finding all events related to the license plate recognition camera on a selected lane for a seven-day period takes only a few minutes.

Main screen of the software



The screenshot shows the main interface of the 'Analiza logów VT' software. It features two calendar widgets at the top for selecting the start and end dates. Below these are three columns of checkboxes for selecting the type of lane computer (PPO) to analyze: 'PPO Łądek', 'PPO Nagradowice', and 'SPO Słupca'. Each column has a 'Wszytkie pasy' (All lanes) option and a list of specific lane identifiers (E05, E06, E07, W08, W09, W10). The 'W09' option is selected in the 'PPO Nagradowice' column. At the bottom, there are two buttons: 'Rozpocznij analizę' (Start analysis) and 'Otwórz wyniki' (Open results). A status message at the bottom indicates that the analysis of 92/92 files is complete.

selection of dates

selection lane PC

Wybierz datę początkową Wybierz datę końcową

PPO Łądek PPO Nagradowice SPO Słupca

☐ Wszytkie pasy ☐ Wszytkie pasy ☐ Wszytkie pasy

☐ E05 ☒ E05 ☐ E01

☐ E06 ☐ E06 ☐ E02

☐ E07 ☐ E07 ☐ W10

☐ W08 ☐ W08 ☐ W11

☒ W09 ☐ W09

☐ W10 ☐ W10

Zakończono analizę plików SeqPeriphVS.log 92/92 plików

Rozpocznij analizę Otwórz wyniki

Simply workflow.

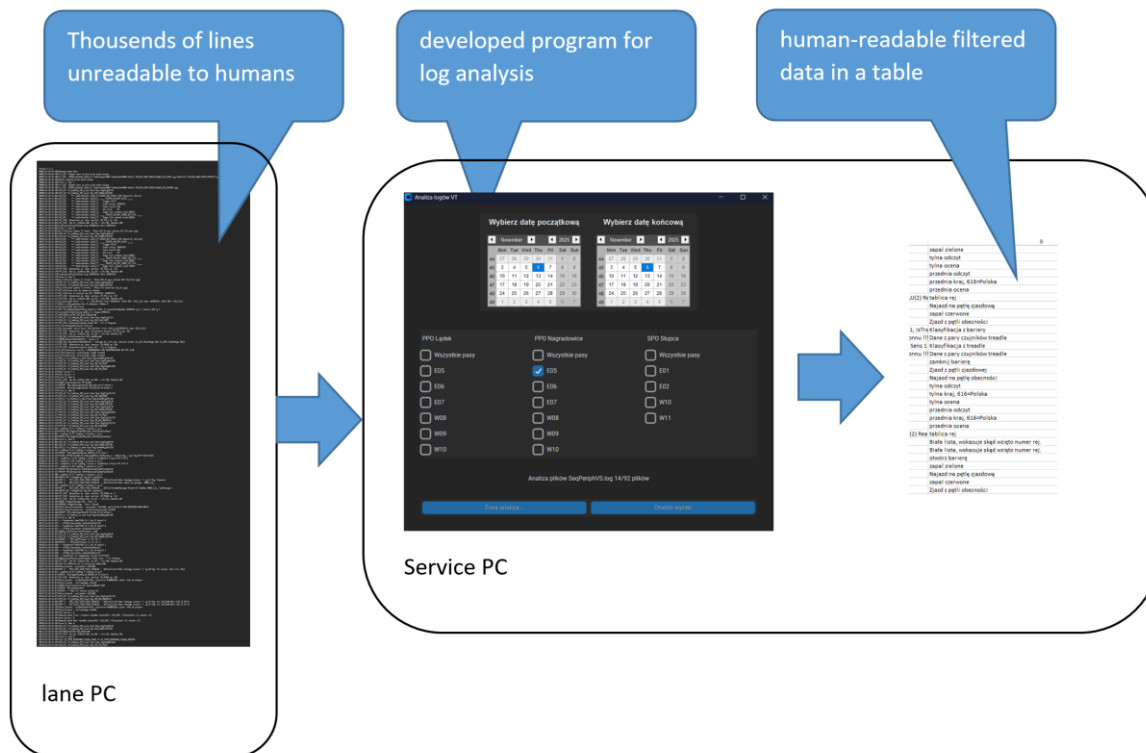


Photo Application “FotoNotatnik”

A simple application that allows users to create photographic notes with the ability to add text descriptions and draw annotations. To make identifying taken photos quick and easy, a mobile application for Android devices was developed. Using the app, users can take a photo that automatically includes the date, GPS location, highway kilometer marker, and a custom text description.

The application works offline and can also function without GPS; in that case, location data will not be recorded. Photos are saved locally in two versions — one with annotations and one as a clean, unmarked image. This tool enables effective identification of photos taken, for example, during system inspections along long highway sections, especially when a large number of photos are produced. Photos taken with this method can be attached as part of an inspection report without the need for adding additional written descriptions.

Main view



Examples photos



Roller Pressure Meter

The correct roller pressure in the ticket reader and dispenser affects both the reliability and the mechanical wear of the device's components. If the pressure is too low, the ticket may not feed properly; if it is too high, it accelerates the wear of mechanical parts. Therefore,

proper adjustment of roller pressure is essential — but to achieve it, a roller pressure gauge is required. While a traditional force gauge can be used, it is a more difficult and time-consuming method compared to the presented solution using a digital strain gauge meter. The strain gauge sensor is inserted under the rollers to take measurements, and the results are displayed on an LCD screen, indicating whether the measured pressure value is appropriate for the device. The digital meter is simple and easy to use, and the measurement results are clearly presented on the display.

