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MAINTENANCE MANAGEMENT

Managing and organizing maintenance

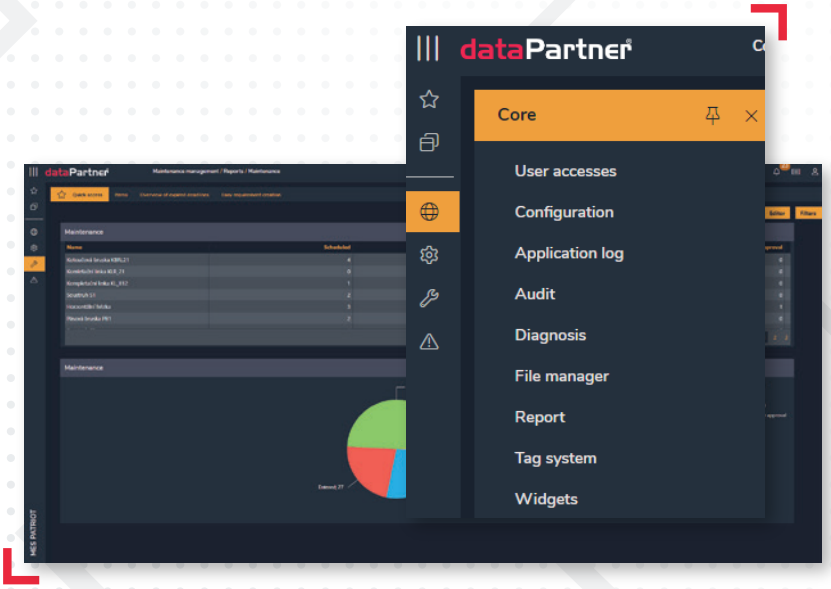
The maintenance management module is part of the MES PATRIOT system, but can also be supplied separately. It is a modular solution with an unlimited number of users, which enables maintenance management of both movable and immovable assets, manages technological units, individual machines and production equipment down to individual parts. It allows comprehensive recording of each maintenance object with a description of technical points and provides an overview of equipment criticality. Maintenance requests entered manually can be automatically generated by monitoring the current status data from the SCADA system or arise from specific requests from the FRS (fast reaction system).

It enables predictive maintenance and preventive interventions by technicians thanks to the possibility of connecting sensors for precise diagnostics but also predictive maintenance using advanced statistic methods. It distinguishes between the following **basic types of maintenance:**

- **Corrective (post-fault) ensures quick and efficient rectification of the fault**
- **Preventive (pre-fault), in the form of regular maintenance in a given cycle**
- **Diagnostic (no fault), based on the direct diagnostic read off of the machine**
- **Predictive (no fault), based on a mathematical model of recovery according to Weibull analysis or continuous evaluation of diagnostic signals**

Maintenance planning can be linked to, for example, OEE data and optimised in terms of cost, time and maintenance capacity utilisation. The implementation of the MMIS can be carried out according to the customer's requirements to an optimal extent. The basic functionalities contained in the system: Maintenance Object Register, Maintenance Management, Reports, Human Resources, **Tariff (hourly event tariff), and Code Lists.**
In addition, it can optionally contain modules:

- **Handy spare parts warehouse**
- **Notification and requirement escalation**
- **Maintenance outsourcing**
- **Mobile device access**
- **SCADA of automatically measured and recorded machine data**
- **Predictive maintenance in accordance with the Weibull analysis**
- **TPM Organization**
- **Maintenance planning**
- **MTTR, MTBF**
- **Widgets**
- **Work order**
- **Multi-lingual version**

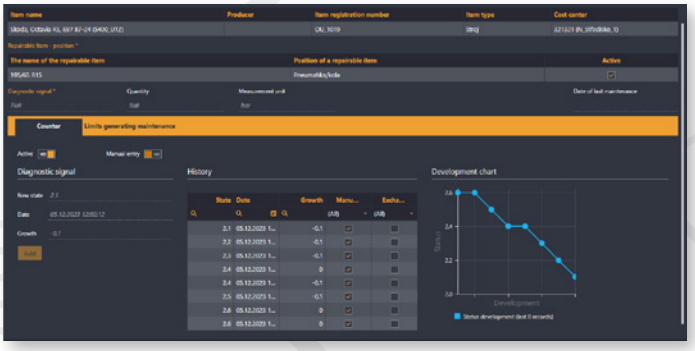


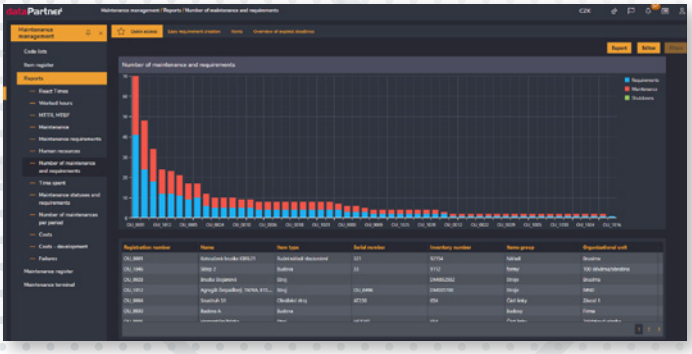
Maintenance optimization

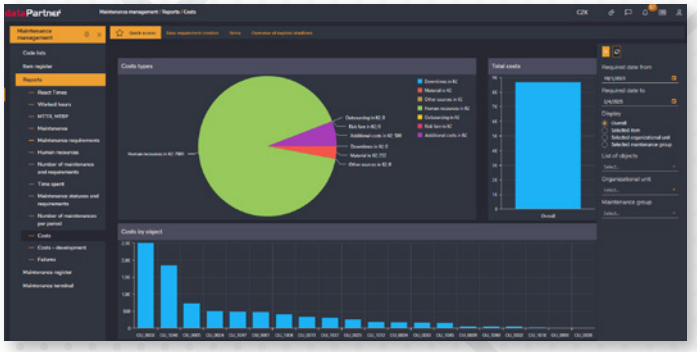
An important decision in maintenance planning is determining the appropriate time to renew the production equipment as a whole; determining its optimum useful lifespan. The criteria for this decision can be a number of reasons, e.g.: physical wear and tear, change of production programme, expansion of production, change of production technology, technological and economic obsolescence of production equipment, ecological unfitness of production equipment, excess or lack thereof own and foreign investment funds (finance), market situation of worn out production equipment, etc.

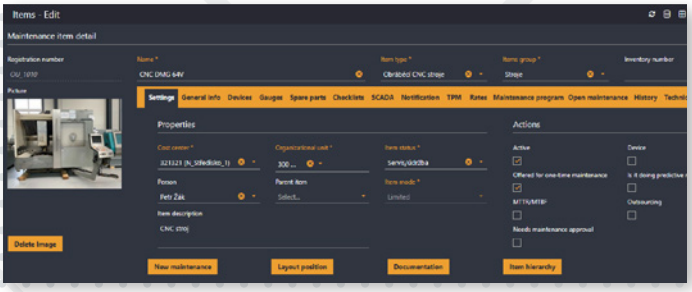
Modern preventive diagnostic maintenance (predictive maintenance) is based on monitoring of the technical condition (using diagnostic signals obtained from the SCADA system) whereby restoration will be performed after reaching the optimal value of the selected indicator of the technical condition of the object. Using Weibull analysis to optimise the interval of preventive periodic maintenance, it is possible to find the value of the diagnostic signal where the renewal will ensure the achievement of the minimum average unit cost of operation and renewal of the object over its useful life.

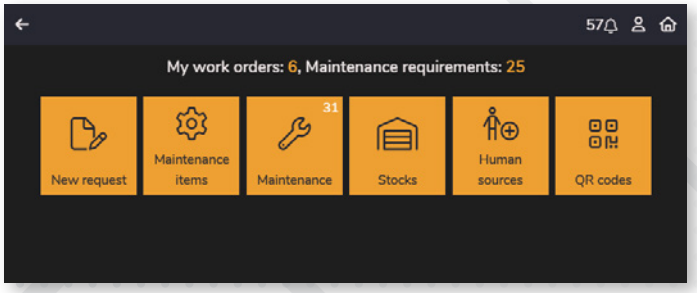
On the basis of automatic measurement of selected parameters which enter from the SCADA system into automatically repeating calculations of Weibull analysis for the purpose of determination of the reliability of characteristics such as the probability of fault-free operation R(t) and the probability of failure F(t); the values of the parameters of the Weibull distribution are continuously calculated. These values are crucial for calculating the optimal intervals for periodic diagnostic maintenance without unexpected failures. The production time of the equipment between maintenance downtimes can thus be used to the maximum possible length.











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