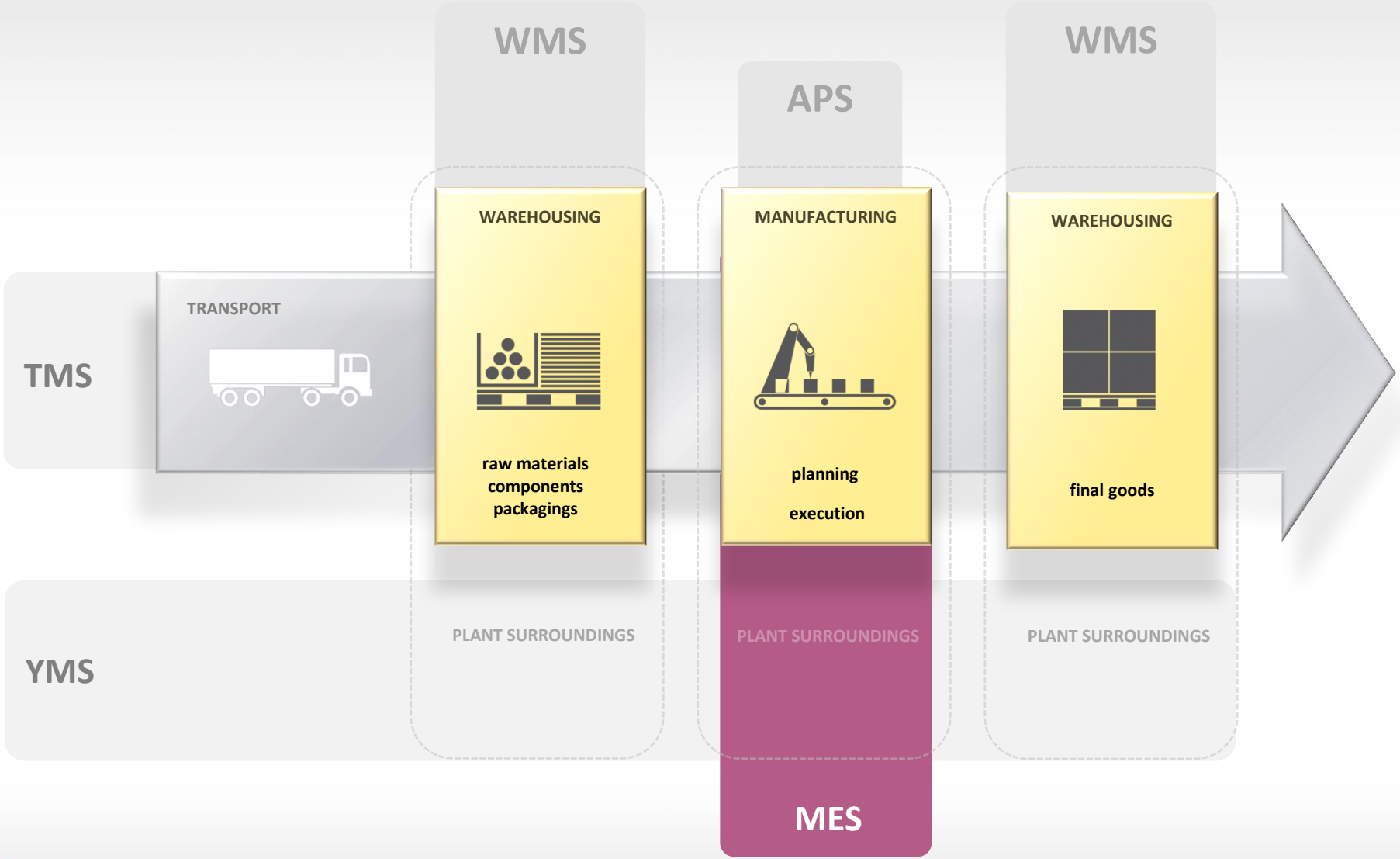
Qguar MES

Manufacturing Execution System

QGUAR MES - one of our many SCE systems

QGUAR MES

QGUAR MES - one of our many SCE systems



QGUAR MES

General QGUAR MES flow chart (divided into main processes)

MES

ADM
System administration

- Defining the manufacturing plant (machines, lines, cost centres etc.)
- Basic data.

WIP
Work in Progress

- Defining the production orders
- Defining the method of performing an order (production operations)
- Performing production orders
- Order progress

LP
Logistics of Production

- Production stations supply
- Storage of raw materials and intermediate products on the production floor
- Tracing the product movement during production.

GEN
MM – product management

- BOM – Bill of Materials
- Traceability
- Management of serial numbers and batch numbers
- Substitutes

LM
MW – Machine work

- Connecting machines
- Gathering data about machine work
- Gathering data about materials' work
- Calculating KPI indicators
- Alert module

QM
Quality management

- Definition of quality management
- Support of sampling and sample testing
- Tracing the quality status during production
- Control lists
- Support of Six Sigma, 5S, Poka-Yoke, etc.

TPM
Total Productive Maintenance

- Tool management
- Maintenance of repairs and inspections
- Failure handling

Qguar MES

Qguar MES

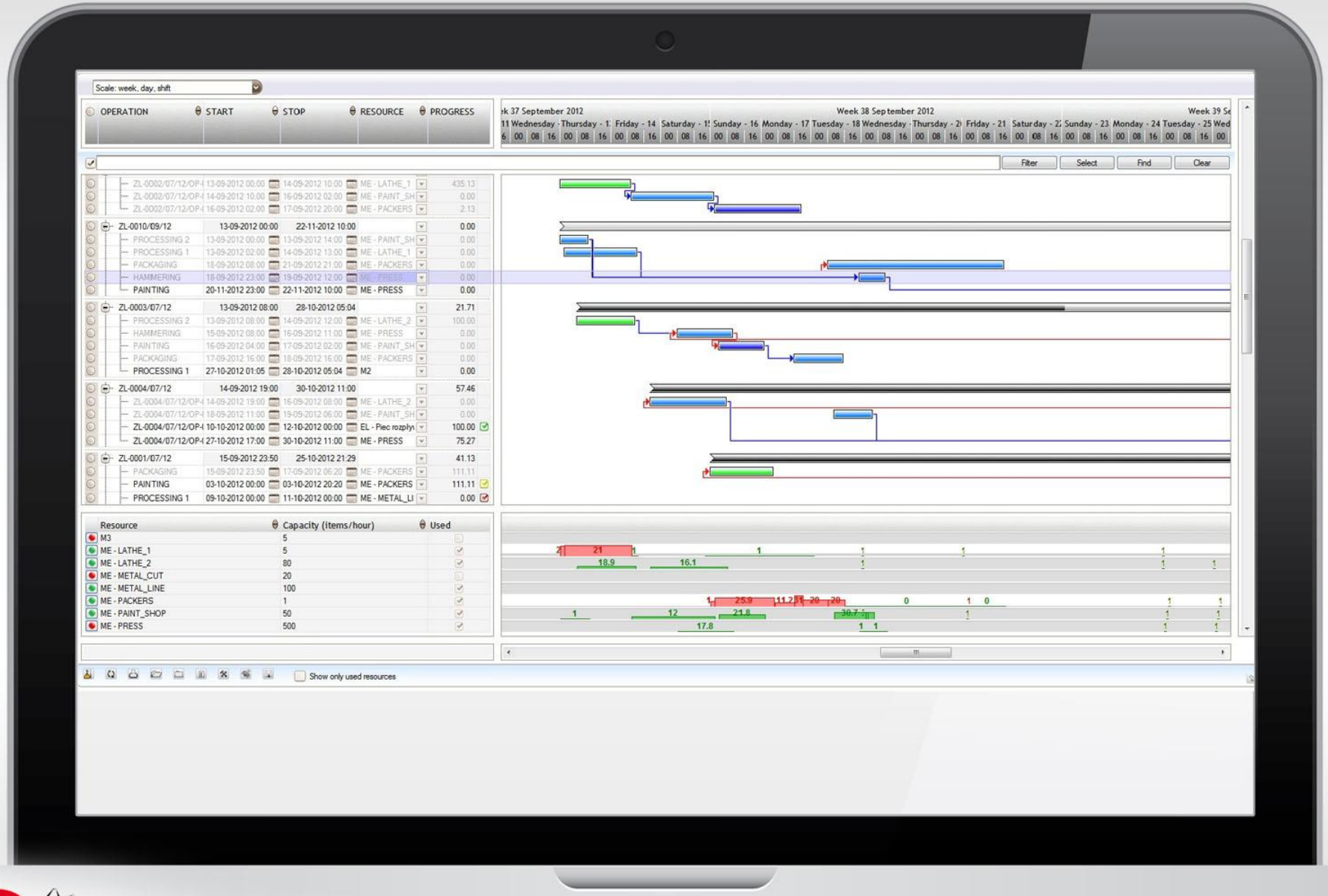
a specialised, modern and efficient tool for logistics support, charge management, local stocks and quality of manufactured items.

MES - Manufacturing Execution System

system of product process supervision which replaces all non-standard applications and provides many additional functionalities. Moreover, it supports information flow on the production floor by integrating company systems.

MES system is a next evolutionary stage for production companies who implemented the ERP system.

Qguar MES – sample screen



Qguar MES

Philosophy

- ✓ **Flexibility**

  easy adjustment to the client's needs, easy modelling of production processes

- ✓ **Module structure**

  possible implementation of single modules

- ✓ **Changes can be easily introduced**

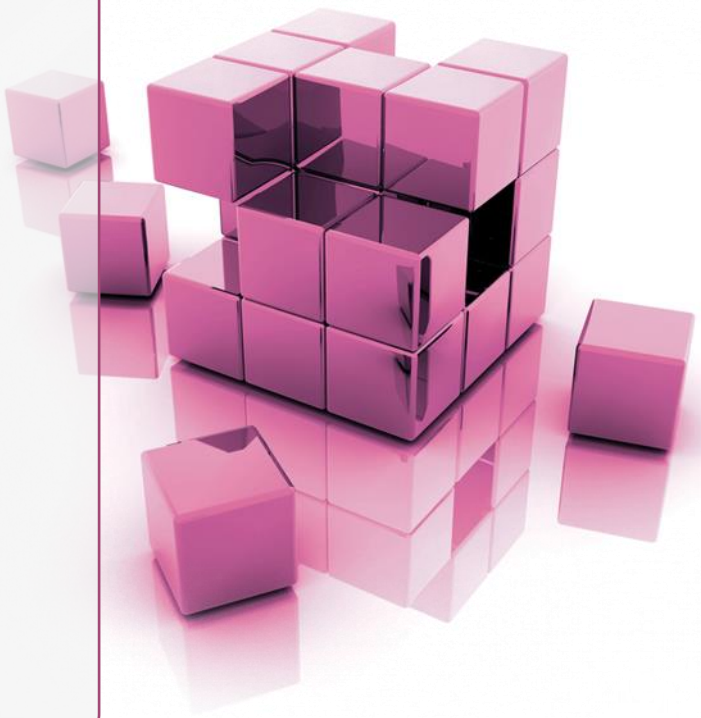
  process modification

- ✓ **Standard notation (BPMN)**

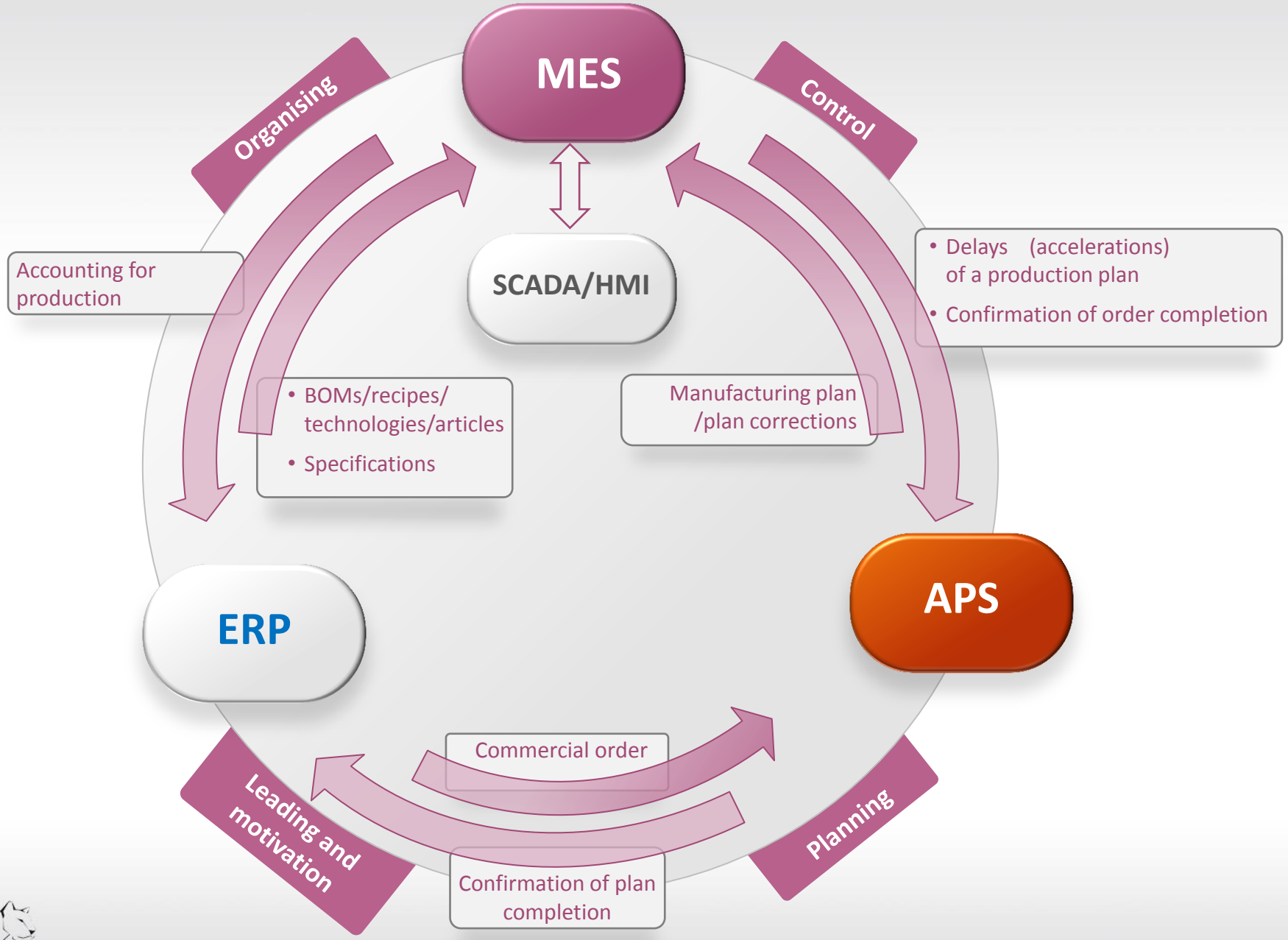
- ✓ **Three layer structure**

  no need to install workstations, remote access

- ✓ **Friendly user's interface**



MES in a manufacturing company



Data in Qguar MES

Static data

- ✓ Basic data
- ✓ Standard objects
- ✓ Screens for management of standard objects

Variable data

- ✓ Defining manufacturing processes
- ✓ Defining simple screens for operators

Structure of static data for the Qguar MES system

RESOURCES

ALERTS

Objects called from the system as a result of certain events (machine stop, stop of order performance).

Enable information flow between employees.

EMPLOYEES

People performing and reporting tasks assigned from the system.

Employees may be connected into employee groups (brigades for instance), employee shifts – according to the work time (e.g. morning shift).

Employees can be defined with abilities (for instance welder, turner).

MACHINES

Machines and/or workstations where production takes place.

Machines can be grouped according to their type (machine tools, welding units etc.)

Machines can be connected into production lines.

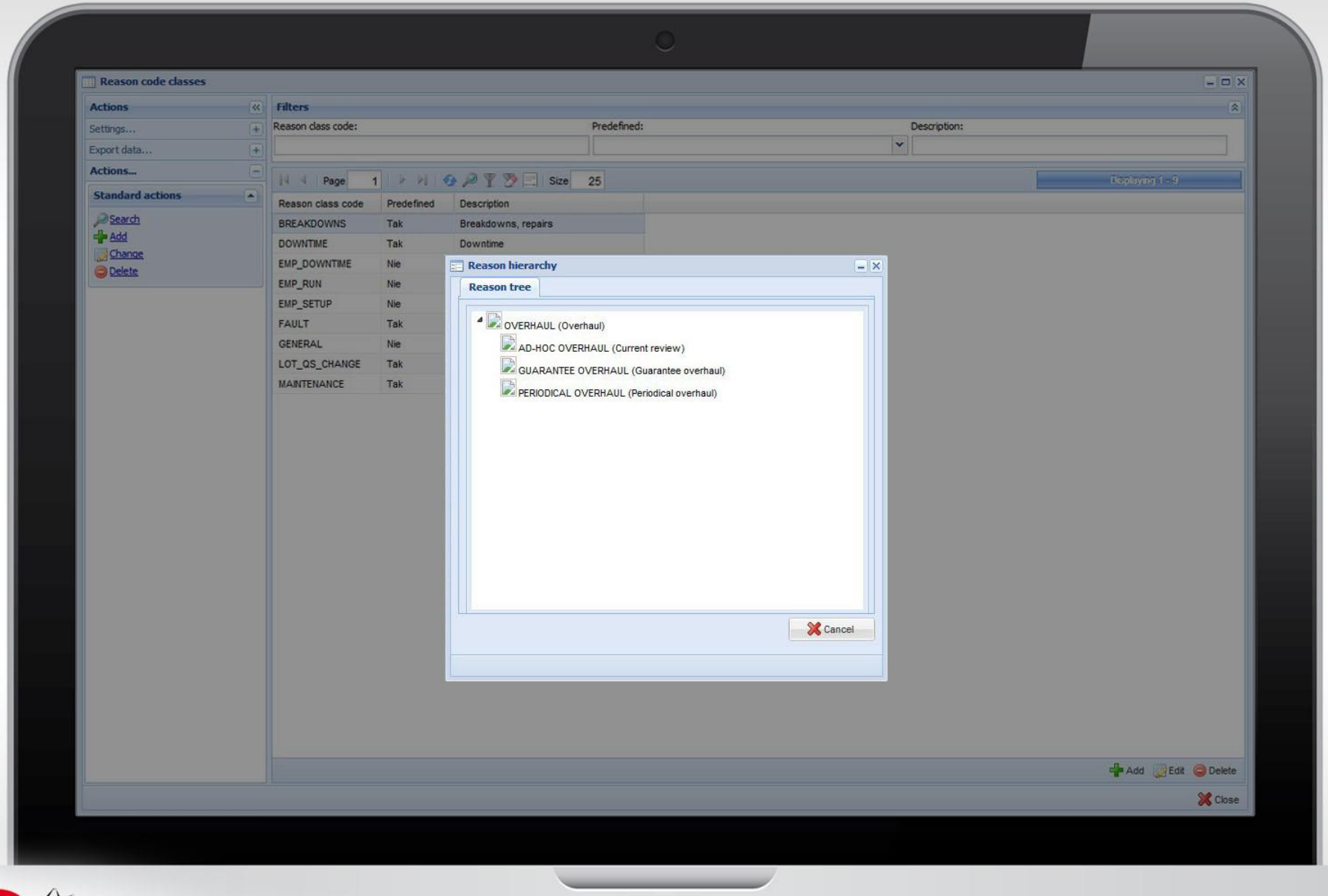
REASON CODES

Objects which make it possible to describe events which take place during production.

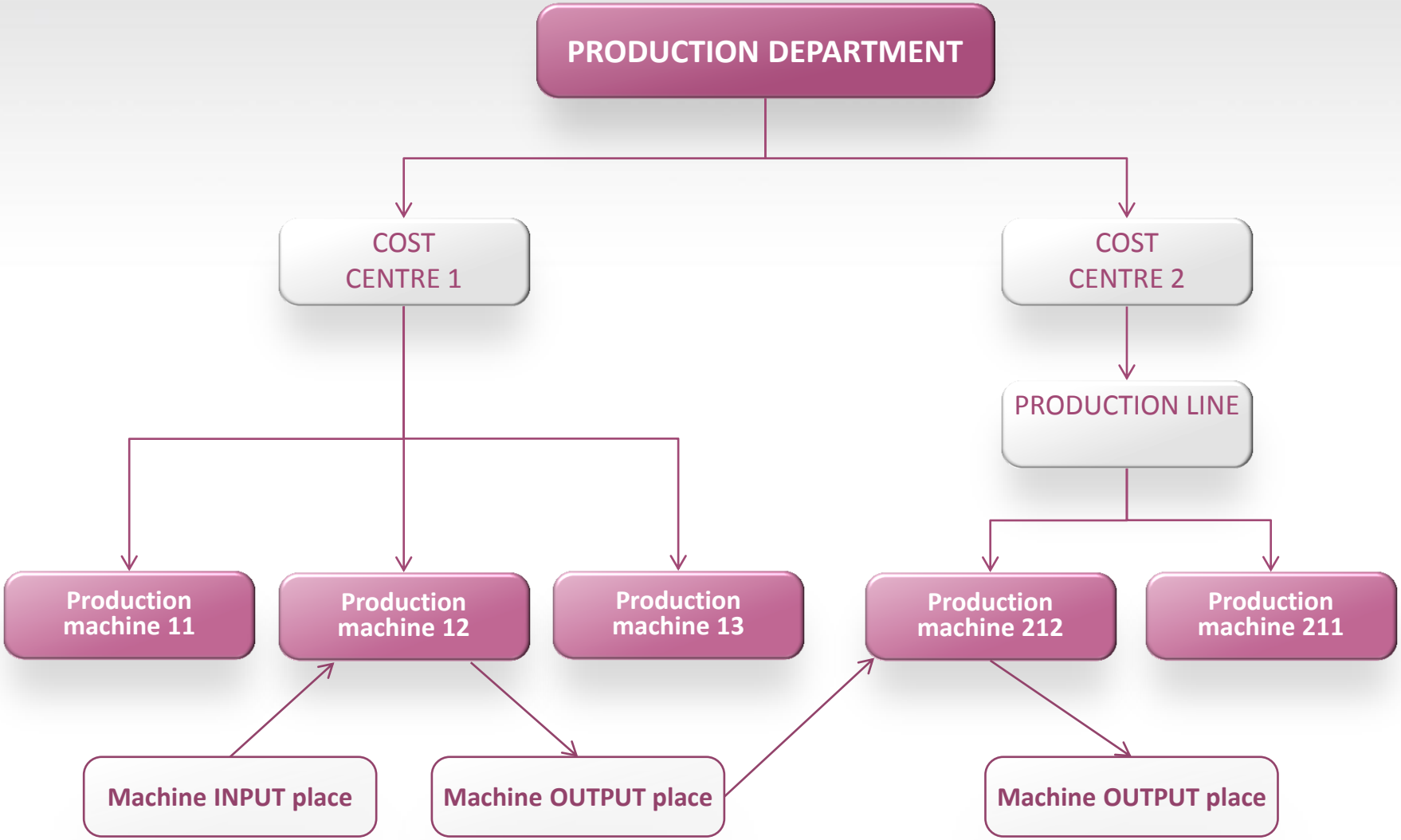
Reason codes can be grouped according to their class. Hierarchy of codes is possible. Reason codes at the same time may be superior to one set of codes and subordinate to the main code.

Qguar MES

Reason codes – sample screen

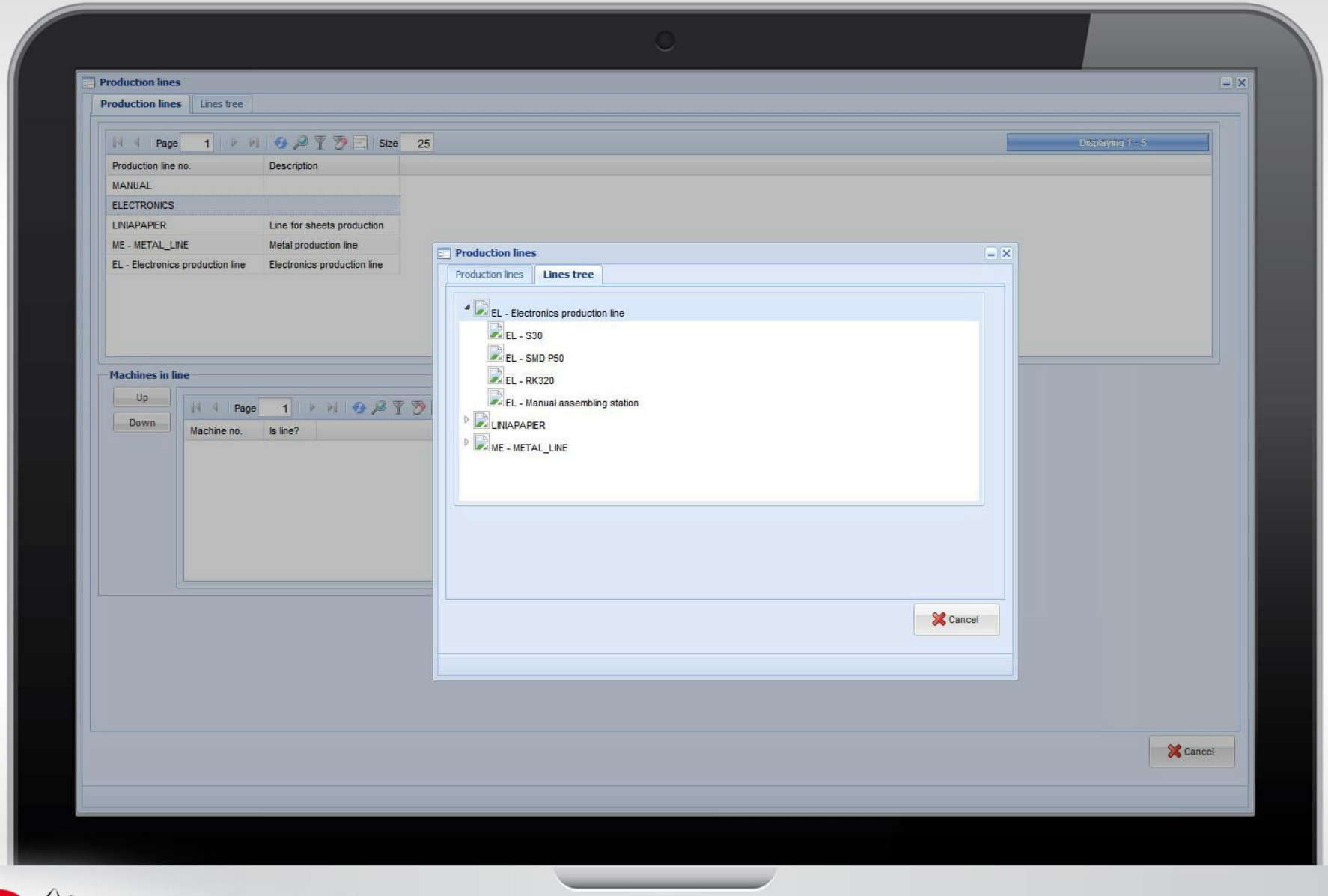


Organisational structure of the Qguar MES system production floor



Qguar MES

Production lines – sample screen



LP

LP - LOGISTICS OF PRODUCTION

- ✓ Supply of a production line with raw materials and components
- ✓ Tracing all the warehouse movements at the production floor
- ✓ Information about location of raw materials and intermediate products on the production floor
- ✓ Support of "lean manufacturing" philosophy

Qguar MES

Logistics of production process - LP

Calculating demand

On the basis of the BOM for the order and warehouse data, the system calculates the demand for raw materials / materials needed to complete each operation.

Supply of production machines

When the operation starts to be performed on a certain working station, the system delivers materials to the storage place assigned to this place. The system delivers materials in instalments according to the definition of a place assigned to the machine. When the amount on the place reaches minimum value, it delivers an instalment of materials until the place amount reaches maximum filled space.

First it delivers products which is located on the production floor, then (when it is not enough) it obtains products from the raw material warehouse.

Raw material consumption

The products are consumed from the place allotted to the machine when the operation is performed. Consumption may take place in two ways:

theoretically – on the basis of the BOM (the operator informs that the given number of products was produced which, (according to BOM) means that the given amount of raw materials was consumed.

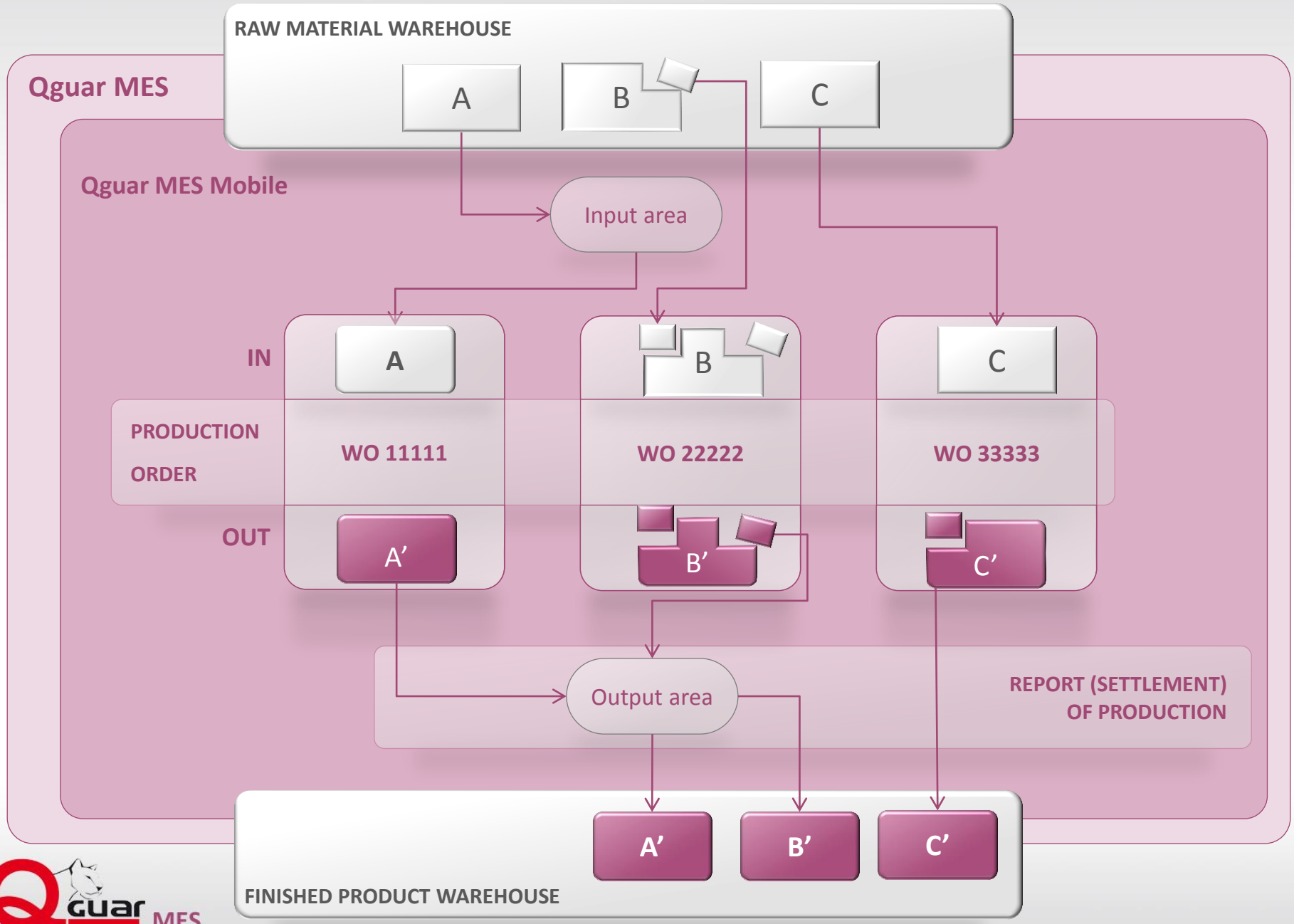
reporting – operator reports the amount of used raw materials.

Additionally, one can use the theoretical method and after the operation is completed, receive a report the amount of raw material which currently remains at the place by the machine.

Acceptance of finished product

In the moment the production operator files a report, a new carrier appears in the system (for a finished product) which is stored at the machine output. The system may generate a logistics label for the finished product, and next, the carrier, depending on the configuration, may be automatically moved to the ready product warehouse.

Logistics of Production – from raw material to the finished product



Qguar MES

WIP

WIP – Work-In-Process Monitoring

- ✓ Management of production orders
- ✓ Gathering information about the work performed for the order
- ✓ Monitoring completion of production orders
- ✓ Scheduling tasks on machines
- ✓ Management of production processes

Qguar MES

Work-In-Process process - WIP

Order

Production order for a particular product usually comes from a superior system.

Contains information about which product has to be produced and at what deadline.

Generating an operational production order

Based on the imported order and routes (technologies) an operational order is generated, which contains all the production steps (operations) necessary to complete the order.

Completing production

Operational order is carried out. Specific operations are performed and data gathering from production floor takes place, including:

- time: spent on production, downtime etc.
- quantity: produced good, produced bad, used up etc.
- who carried out the production and much more data specific for the production in question.

Accounting for production

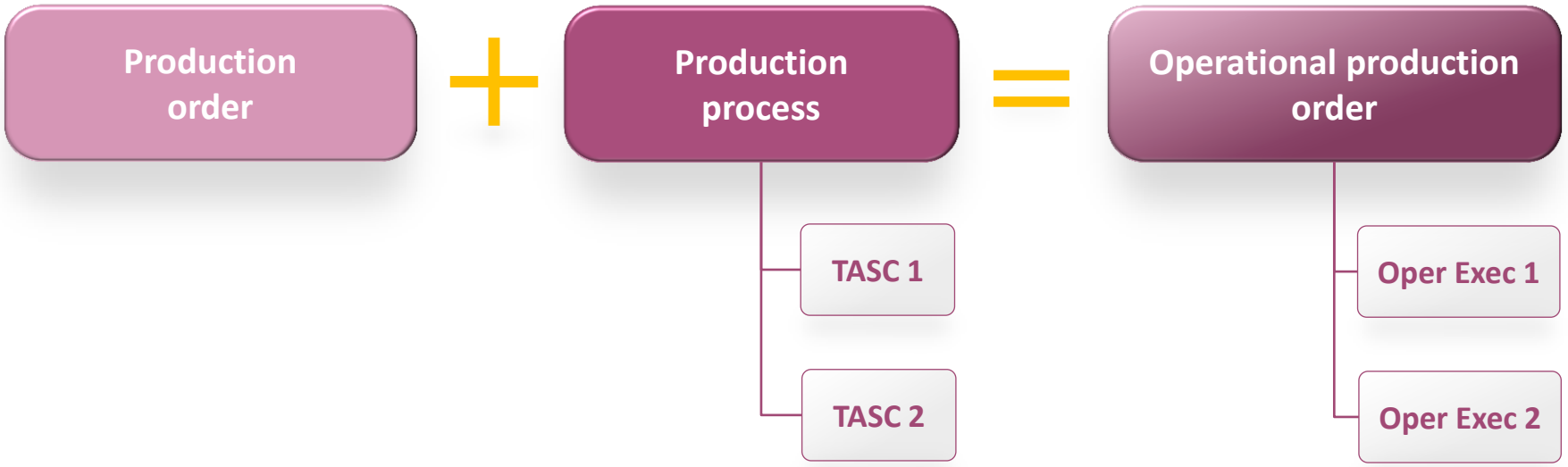
On the basis of the gathered data accounts for the production:

Calculates the production costs:

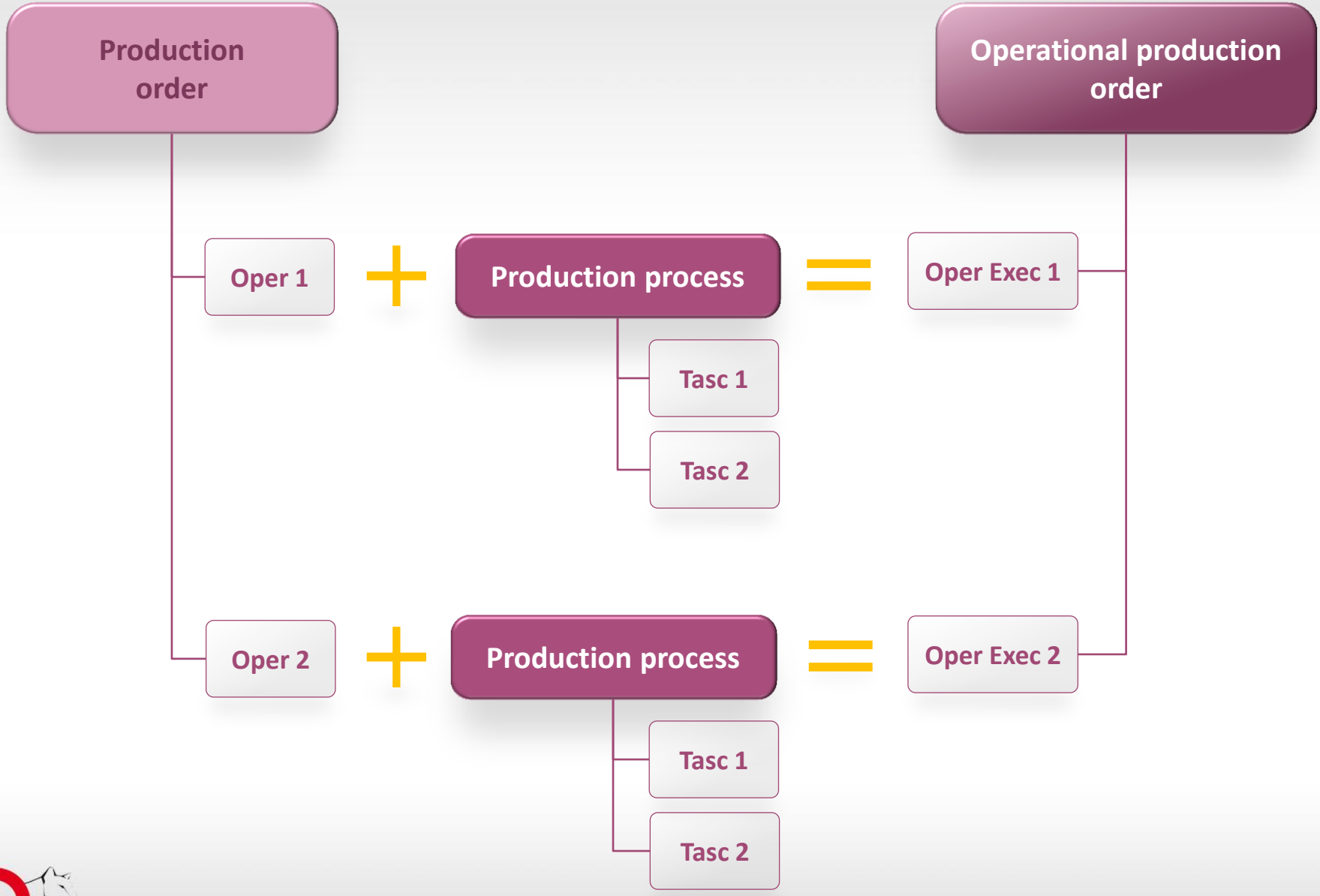
- materials used
- machine costs
- employee costs
- other specific costs for a given production (mould wear for instance)
- settlement may be sent to the superior system

Qguar MES

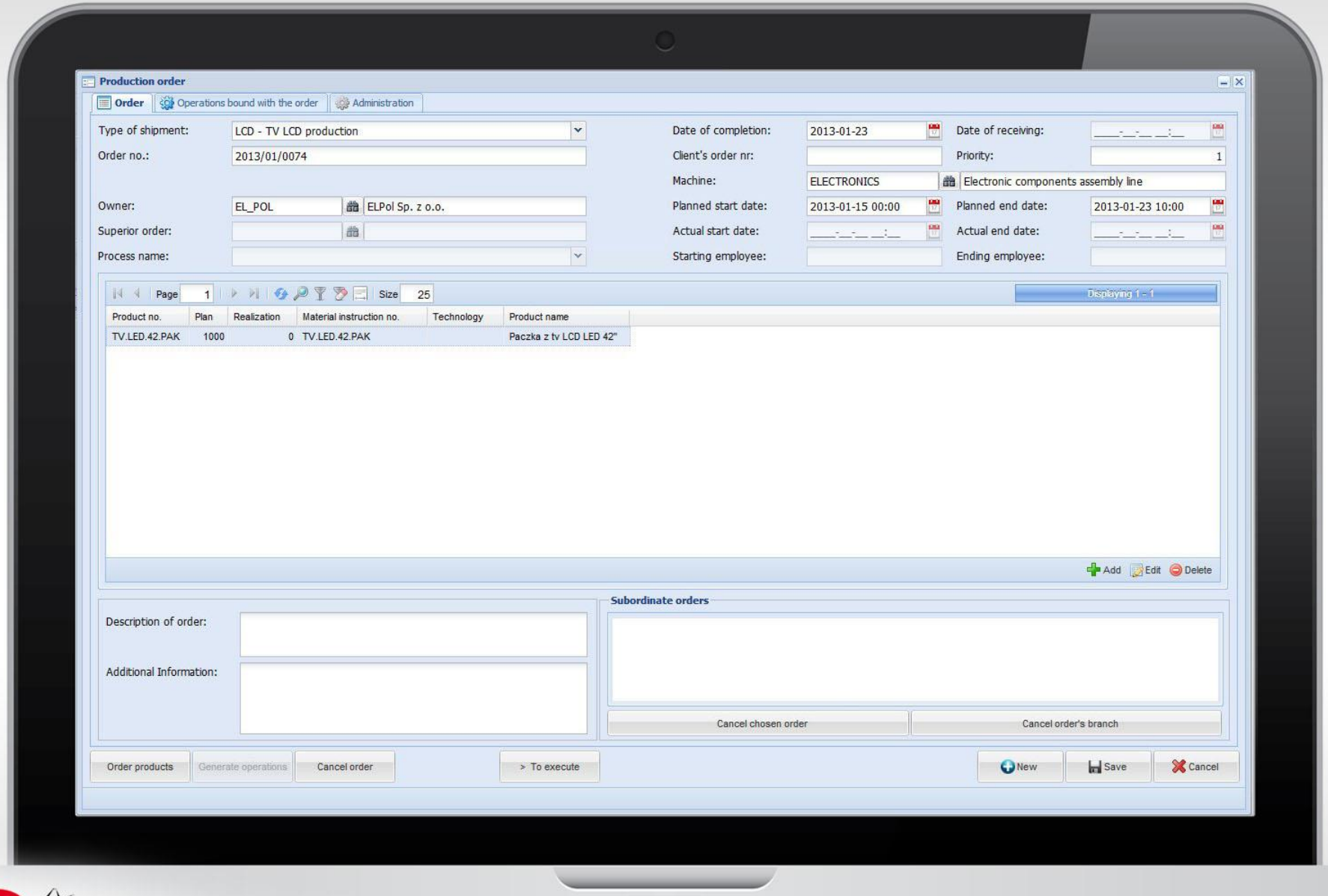
Process of creation of an operational order - 1



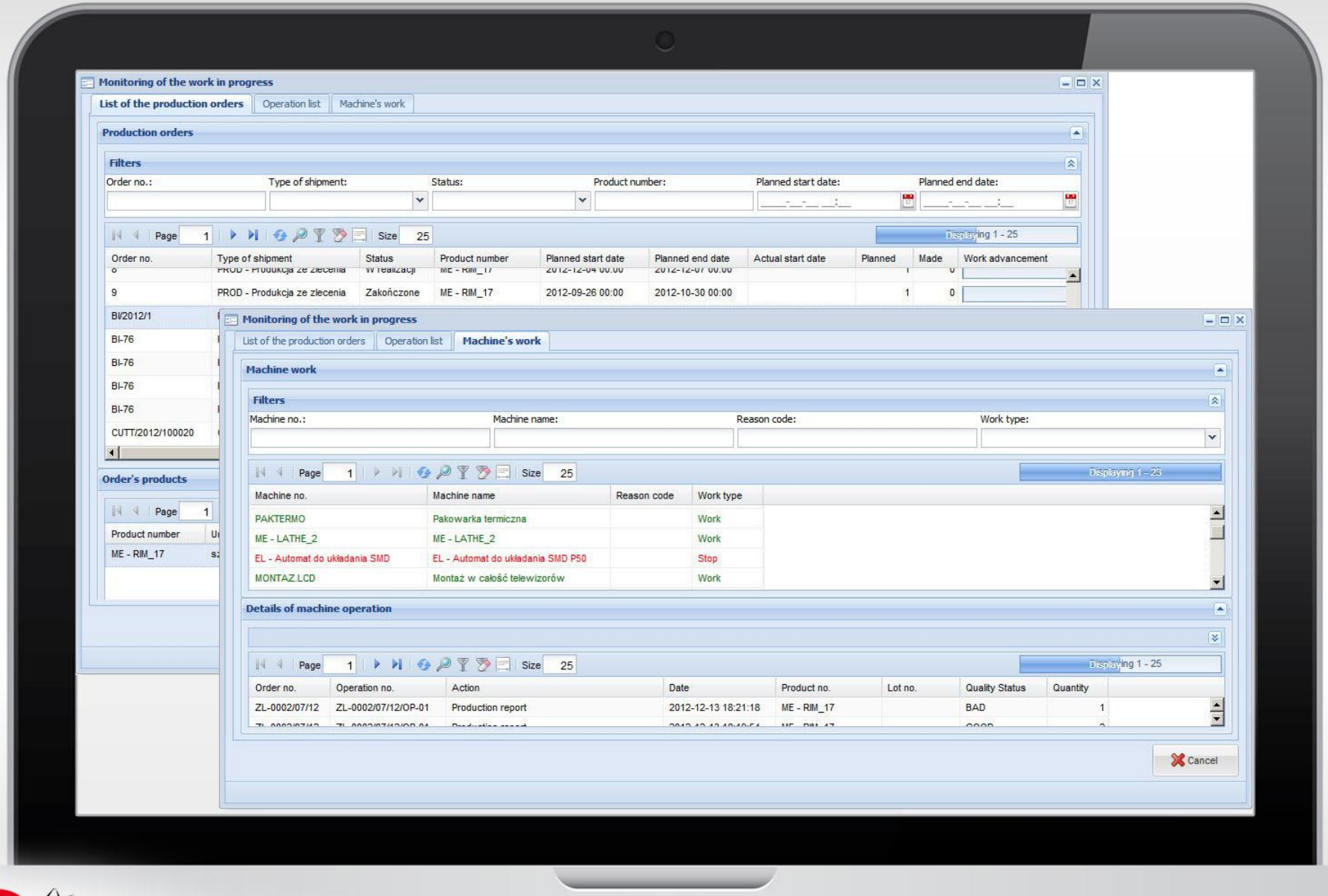
Process of creating an operational order - 2



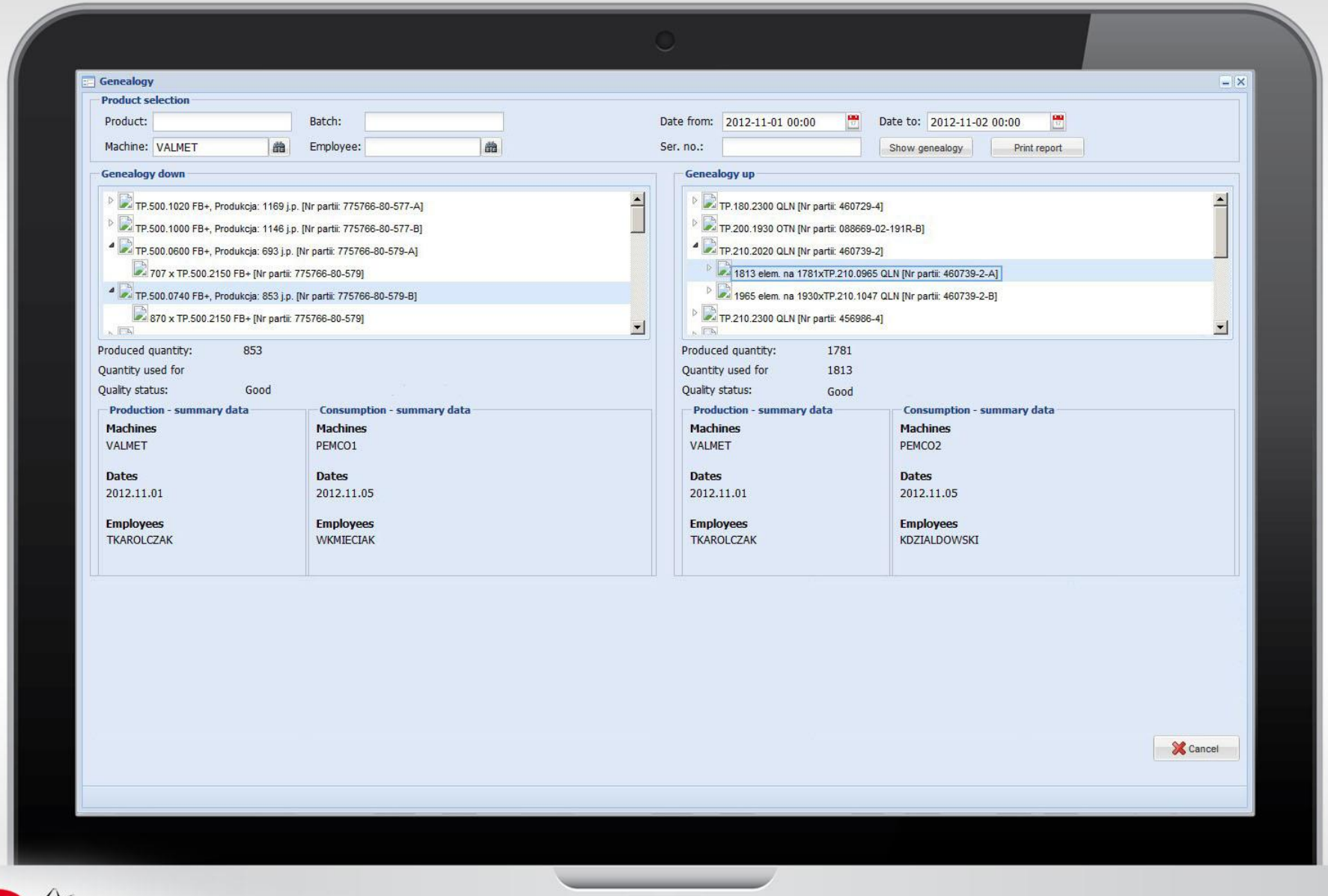
Production order – sample screen



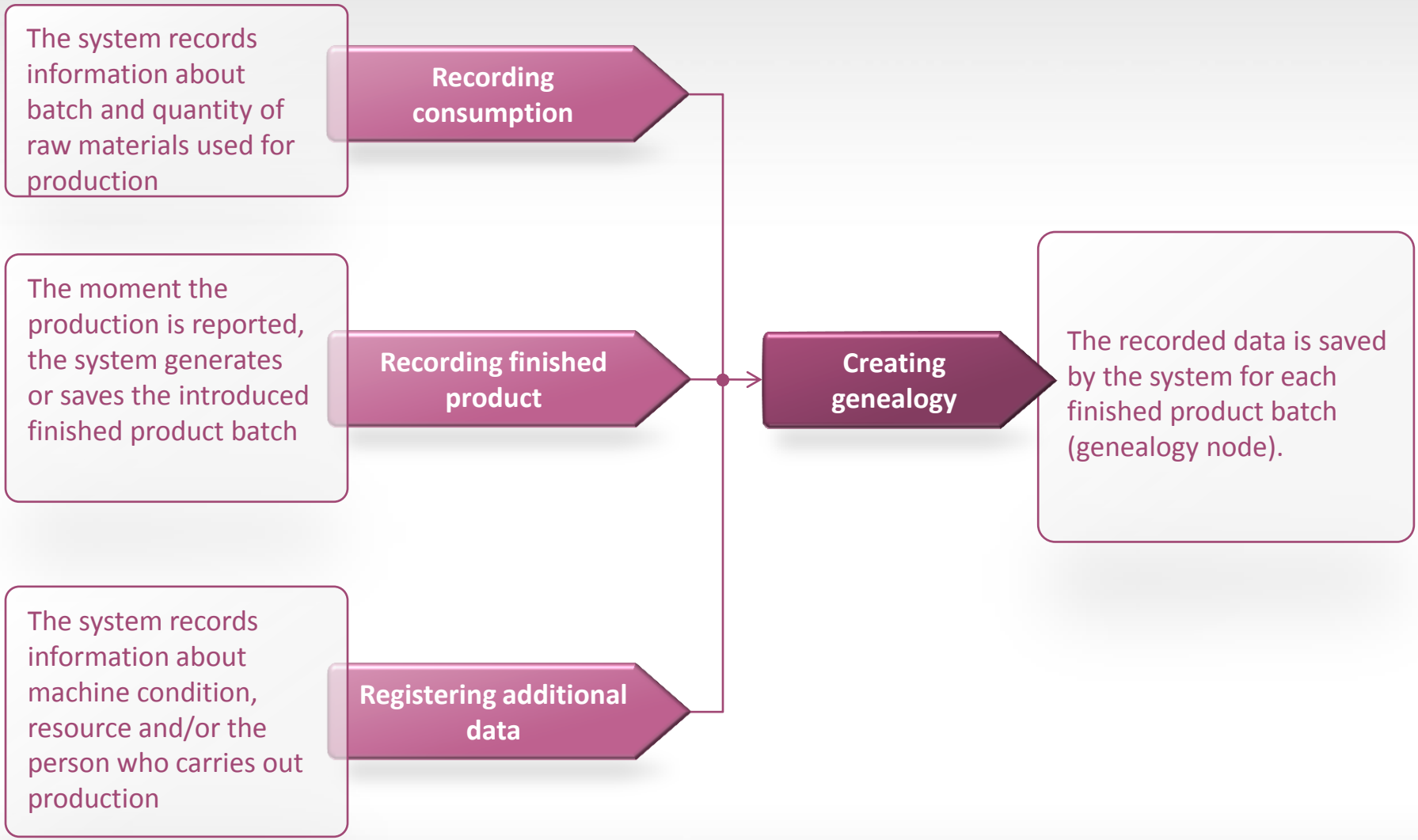
Production in progress – sample screen



Product management (MM) – genealogy – sample screen



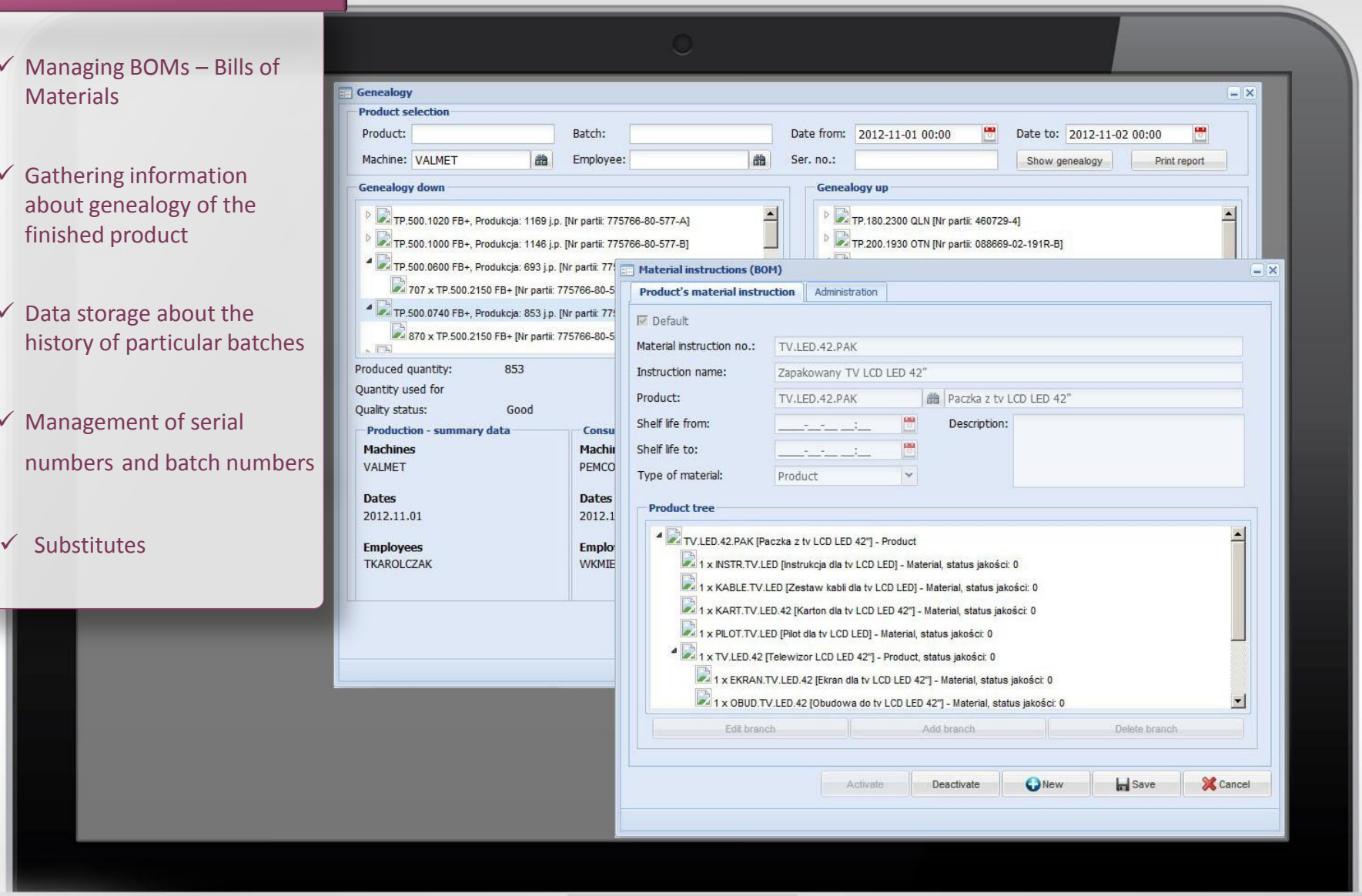
Process of creating a genealogy/ traceability of a product



Quar MES

Product management – sample screen

- ✓ Managing BOMs – Bills of Materials
- ✓ Gathering information about genealogy of the finished product
- ✓ Data storage about the history of particular batches
- ✓ Management of serial numbers and batch numbers
- ✓ Substitutes



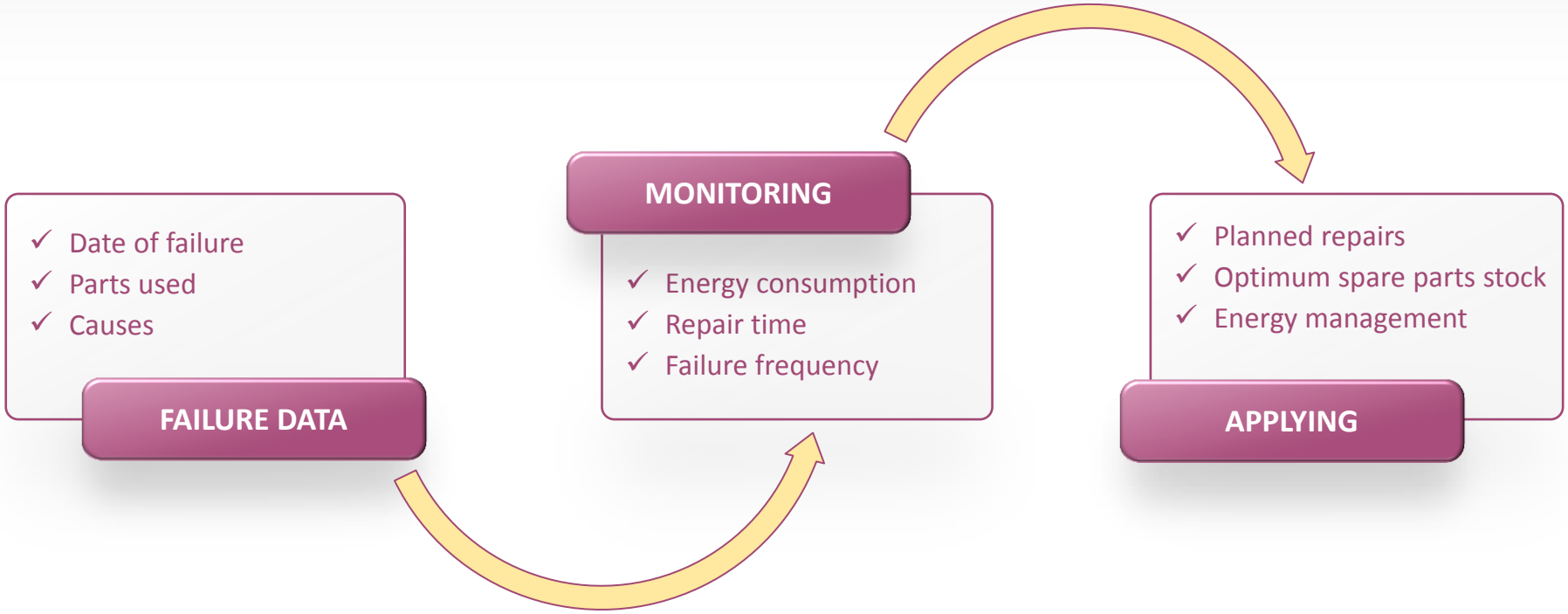
TPM

TPM - TOTAL PRODUCTIVE MAINTENANCE

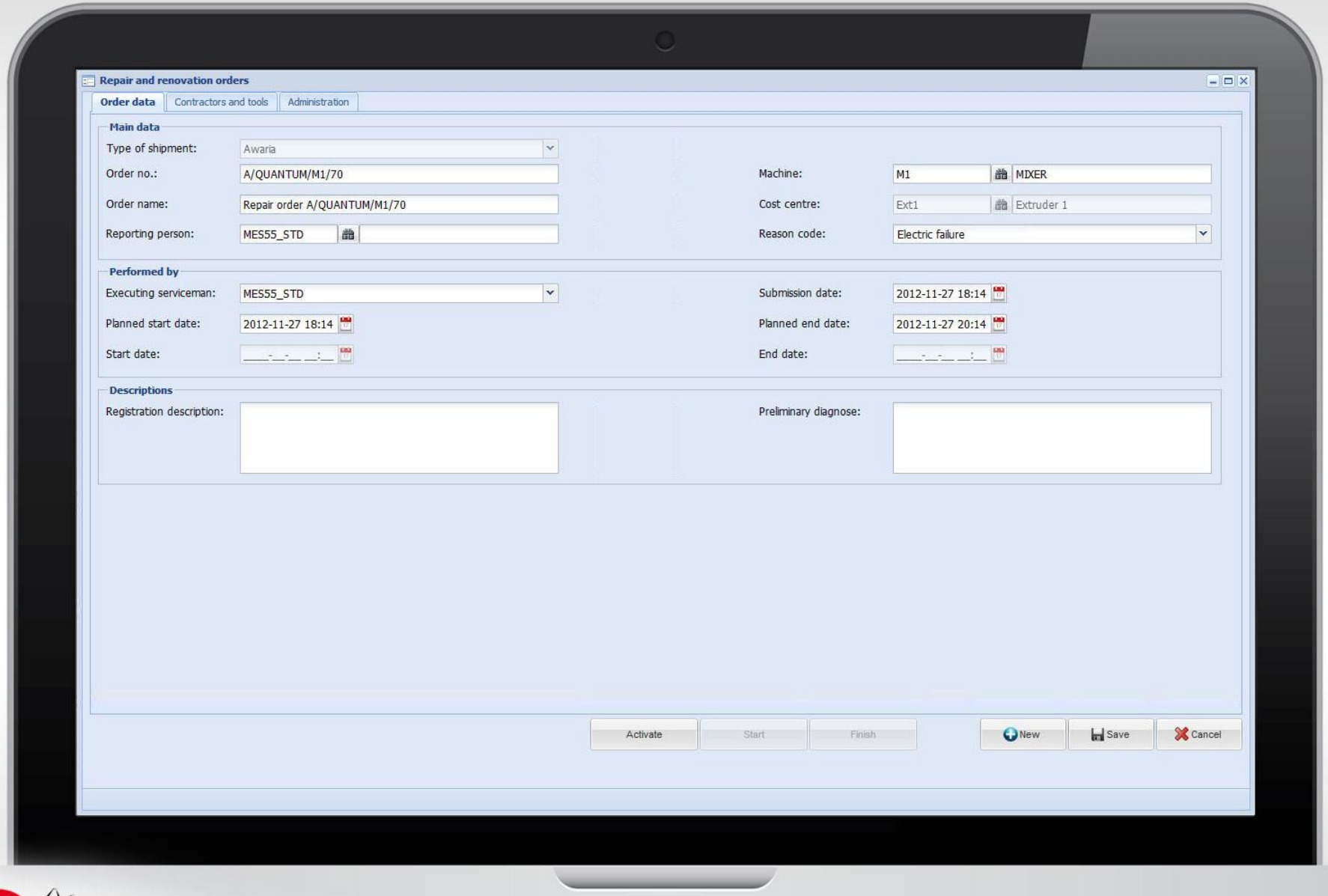
- ✓ Managing tools, forms, accessories
- ✓ Failure handling
- ✓ Management of repairs and inspection of machine park
- ✓ Defining machine structure

Qguar MES

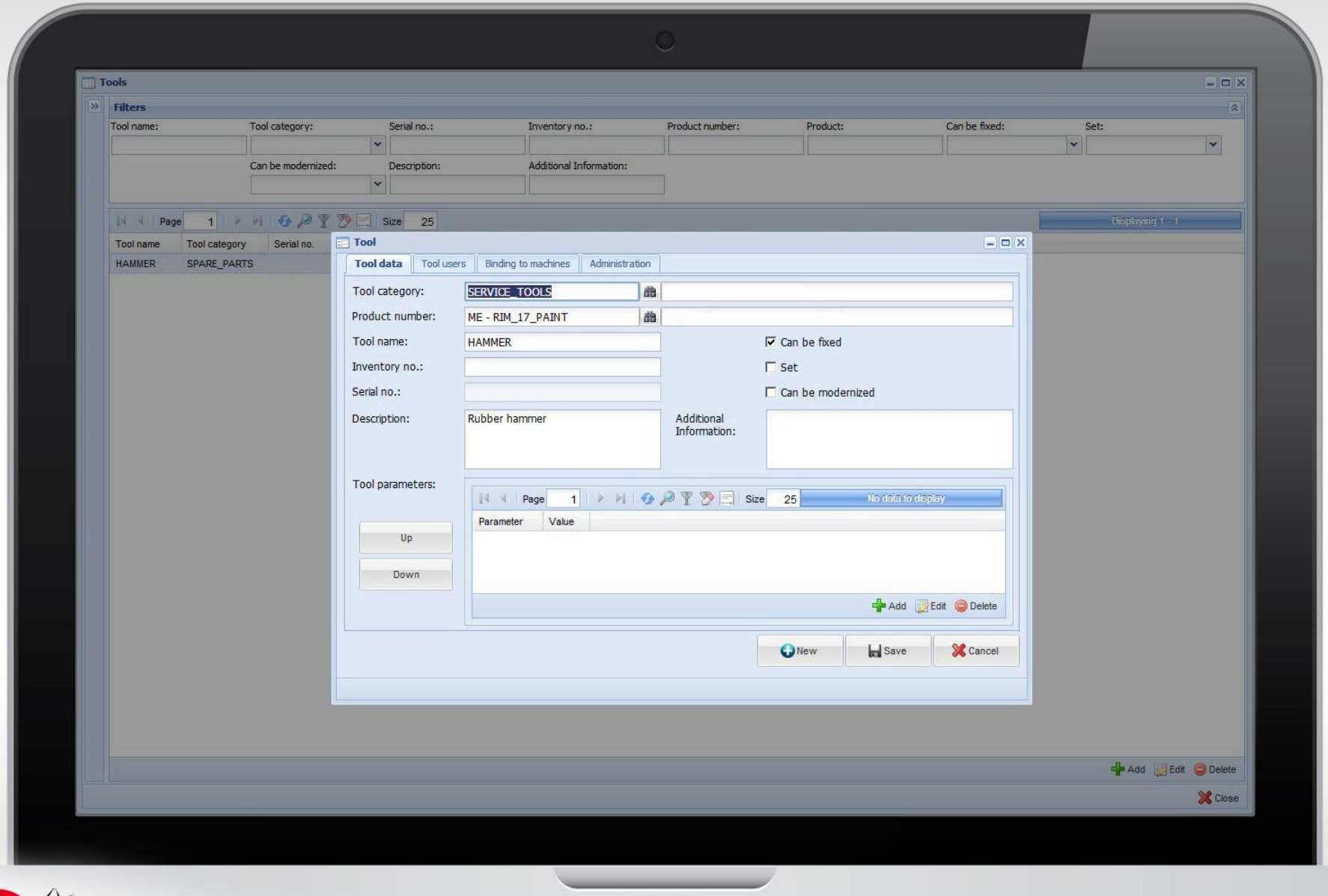
TPM


✓ Date of failure
✓ Parts used
✓ Causes
FAILURE DATA
MONITORING
✓ Energy consumption
✓ Repair time
✓ Failure frequency
✓ Planned repairs
✓ Optimum spare parts stock
✓ Energy management
APPLYING

Repair order – sample screen



TPM – sample screen



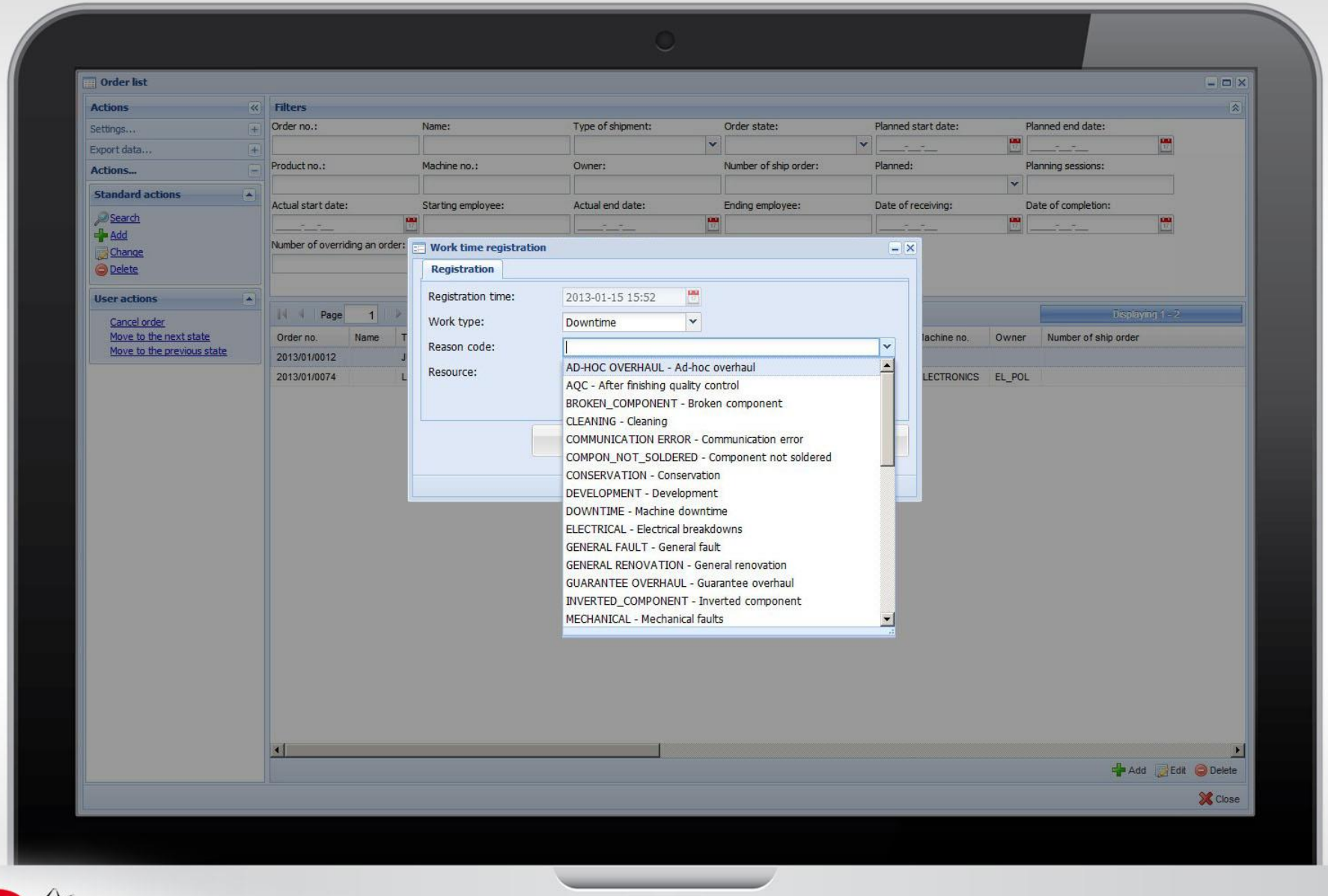
LM

LM – MACHINE WORK

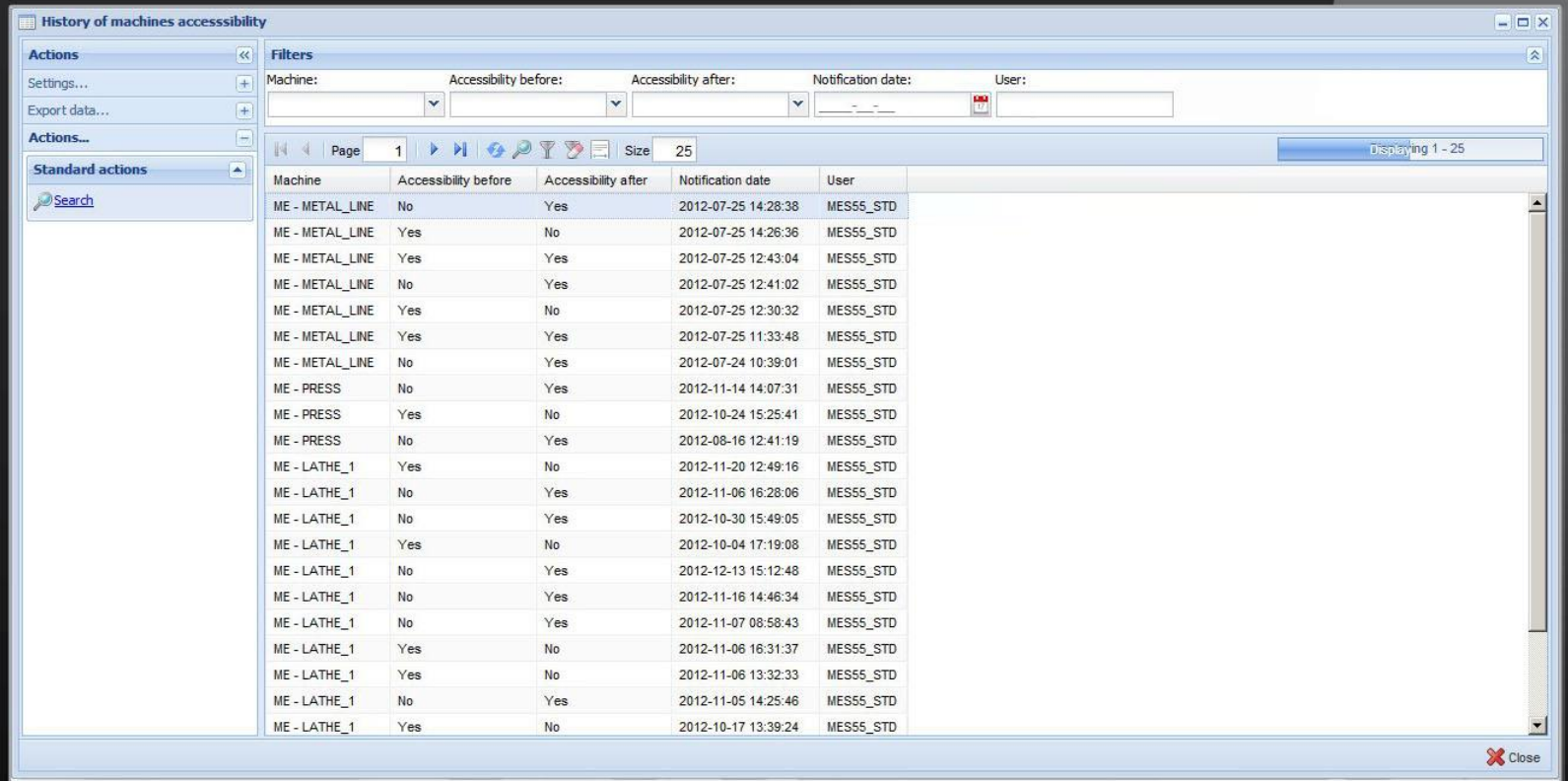
- ✓ Gathering information about reason codes for downtimes
- ✓ Gathering information from machines via an OPC server
- ✓ Tracing of order performance on a machine
- ✓ Calculating standard KPI – OEE
- ✓ Alert system

Quar MES

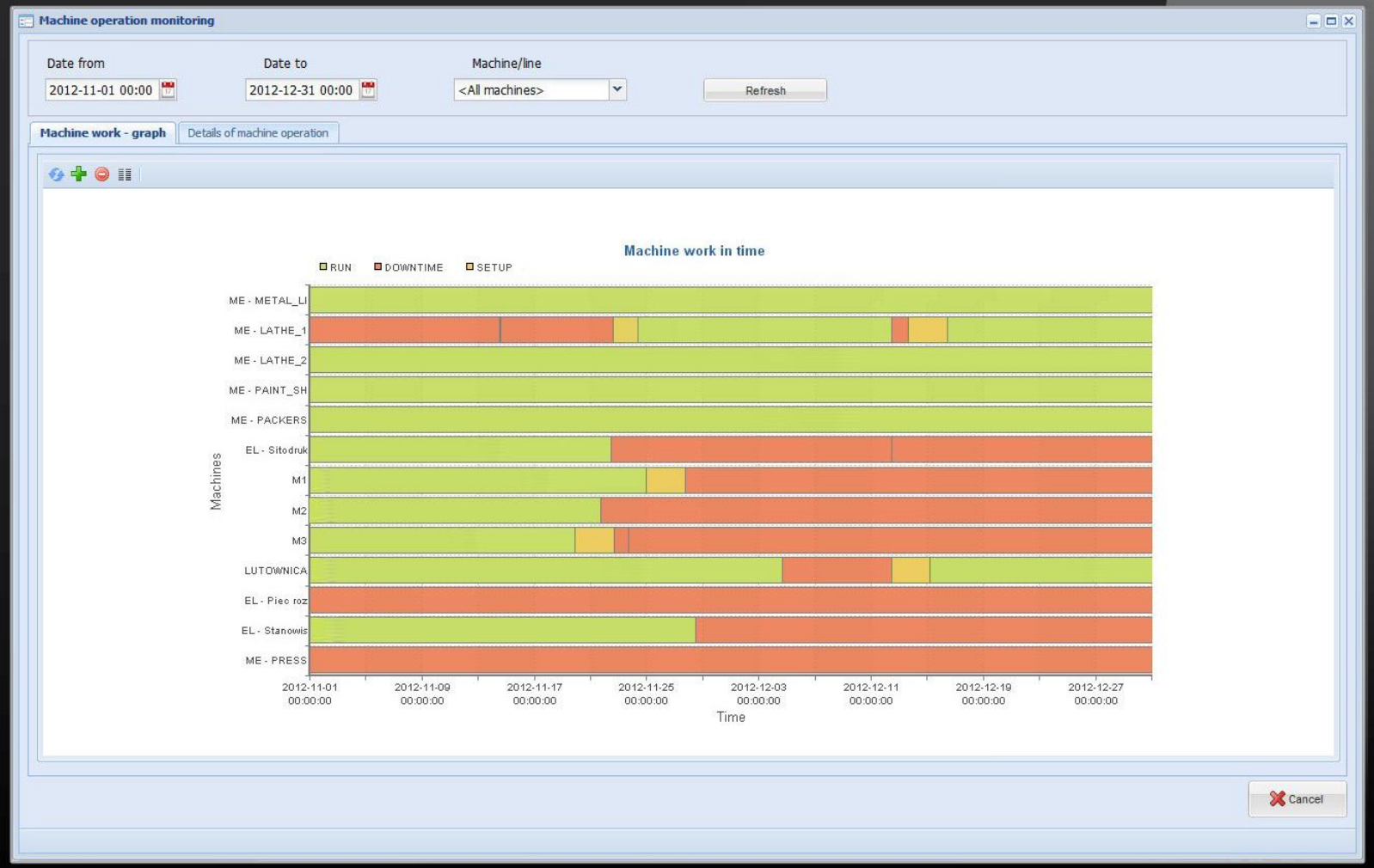
Recording work time – sample screen



Machine information – sample screen



Machine work – sample screen



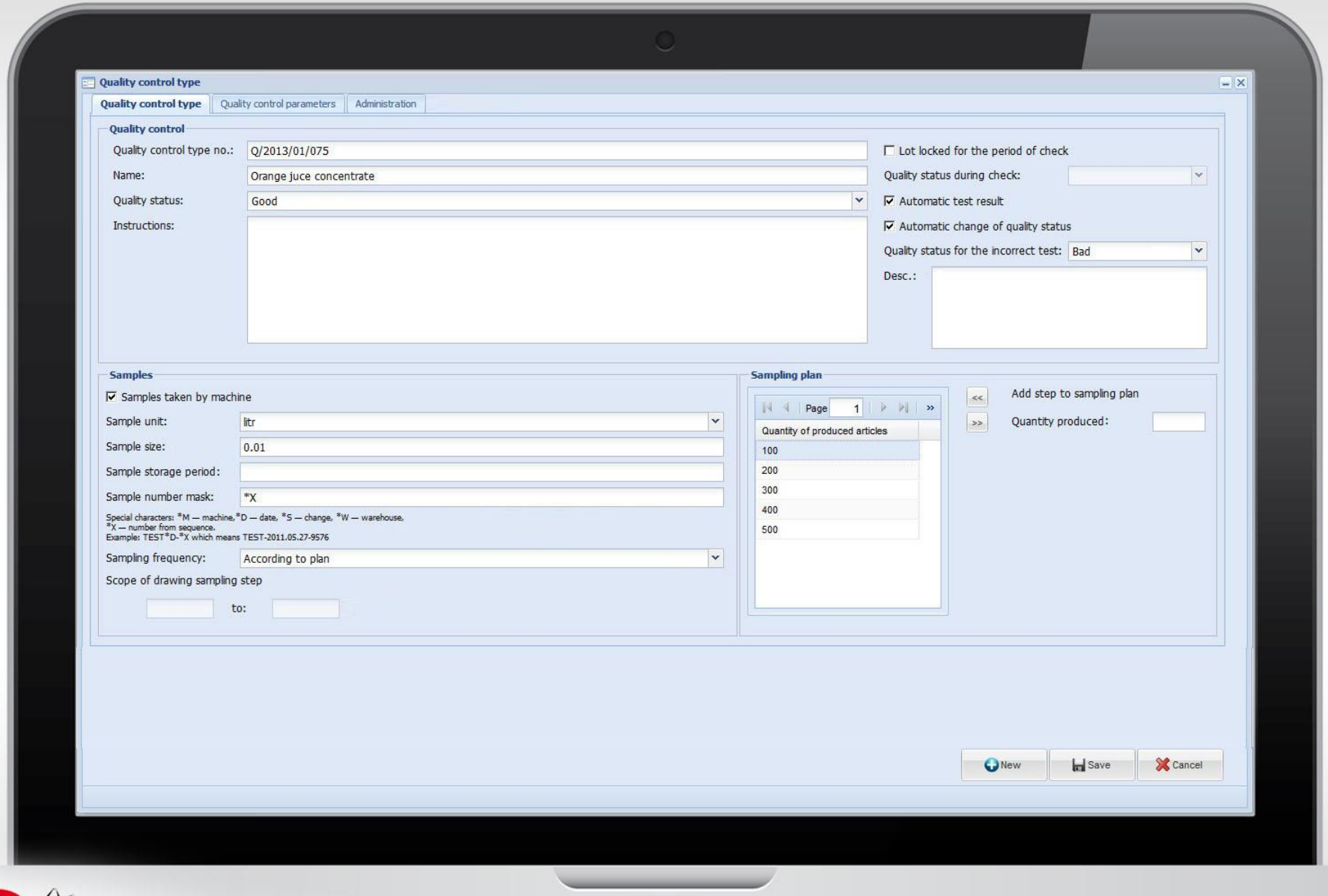
QM

QM – QUALITY MANAGEMENT

- ✓ Supporting gathered sample tests
- ✓ Possibility to trace quality statuses from raw material to a finished product
- ✓ Algorithm for determining batch status on the basis of sample control
- ✓ Automatic and manual sampling
- ✓ Control lists
- ✓ Support of Six Sigma, 5S, Poka-Yoke, etc.

Qguar MES

Quality management – sample screen



BPMN

BPMN

Business Process Modelling Notation

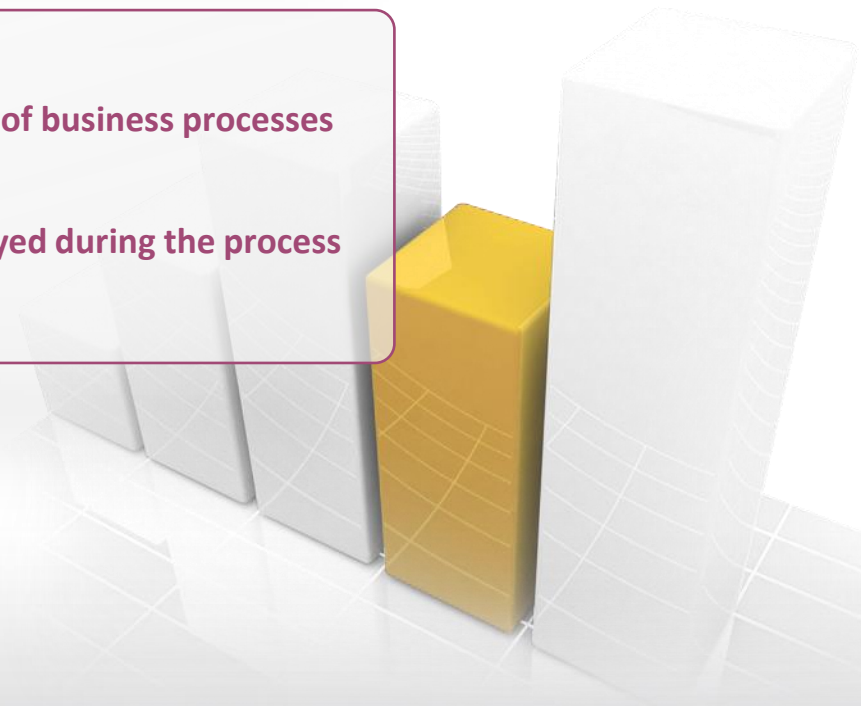
Guar MES

Business Process Modelling Notation (BPMN):

- ✓ Graphical notation for describing processes.
- ✓ Enables graphical representation of business processes which take place in the company.

Q - BPMN

- ✓ Software which enables graphical representation of business processes which take place during production at the plant.
- ✓ Also enables creation of screens which are displayed during the process performance.



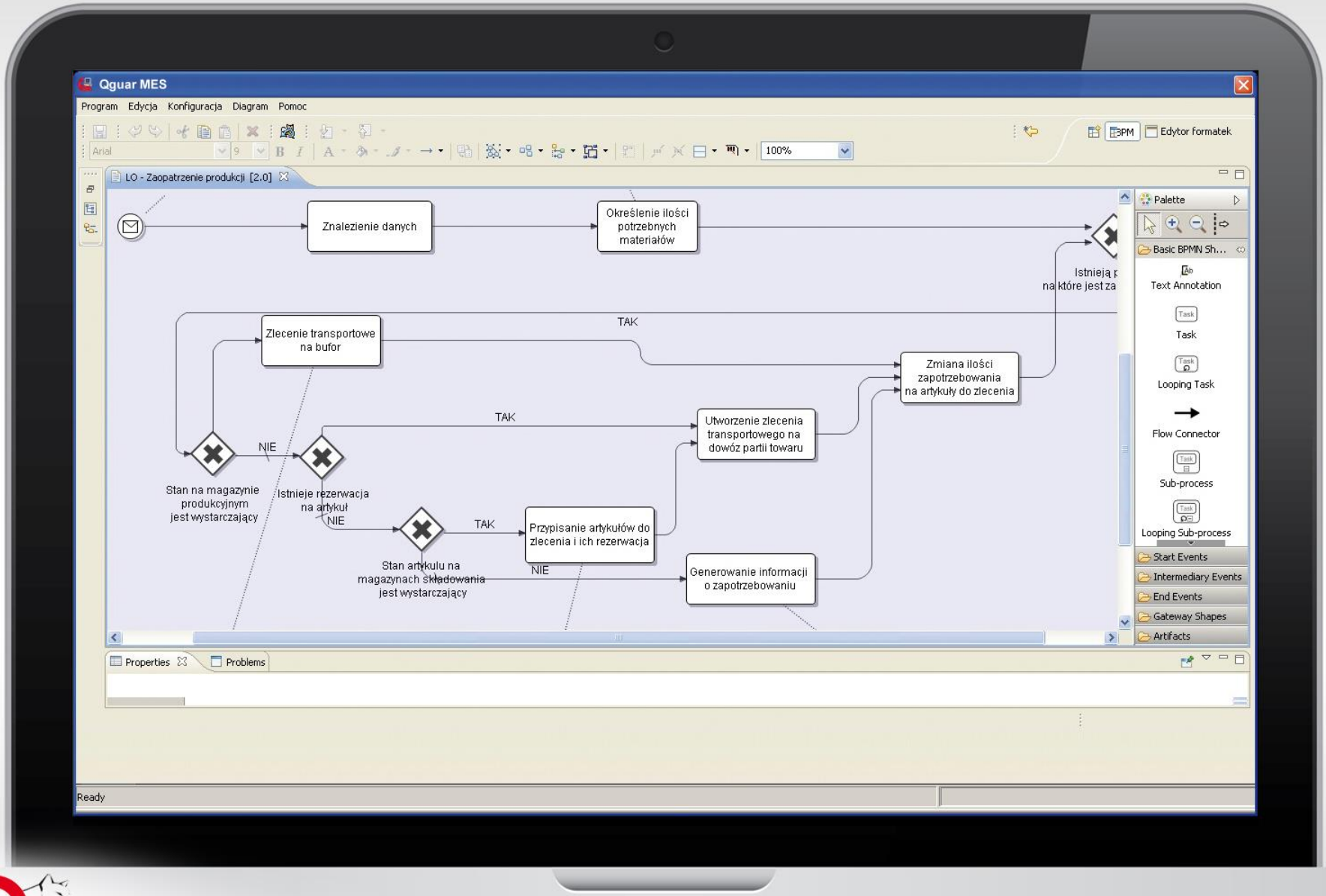
Why BPMN?

- ✓ Configuration of the course of business processes
- ✓ Uniqueness
- ✓ Access to the inner definition structure - additional user-defined functions may be written
- ✓ Can be used for describing processes for MES, WMS and ERP software classes.
- ✓ Established open standard
- ✓ Supported by the largest IT companies
- ✓ Promotion of BPMN on the world markets

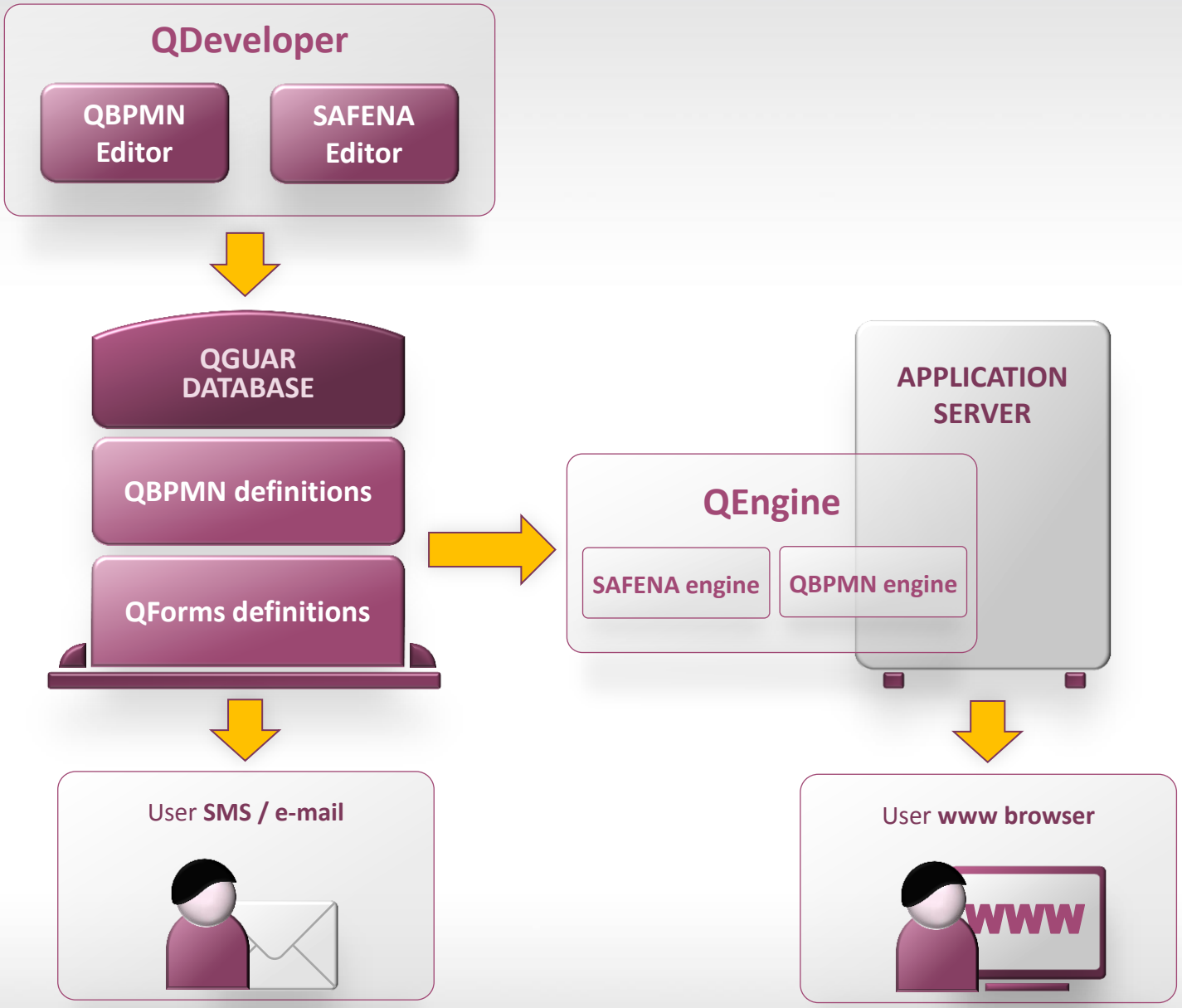
Process types

- ✓ Processes assigned to the production order (or operation) will serve as a routing; they will activate and be available to be performed as the status of an order or an operation changes.
- ✓ Processes of gathering information regarding the work performed on the finished product which are not directly connected to the order (servicing machine signals, for instance)
- ✓ Business processes which do not enhance the product value but they are necessary for the production flow to be easier, raw material delivery to the line, for instance
- ✓ Processes taking place automatically in the background on the basis of rules predefined during implementation, assigning machines to an operation, for instance

Application Q BPMN – sample screen

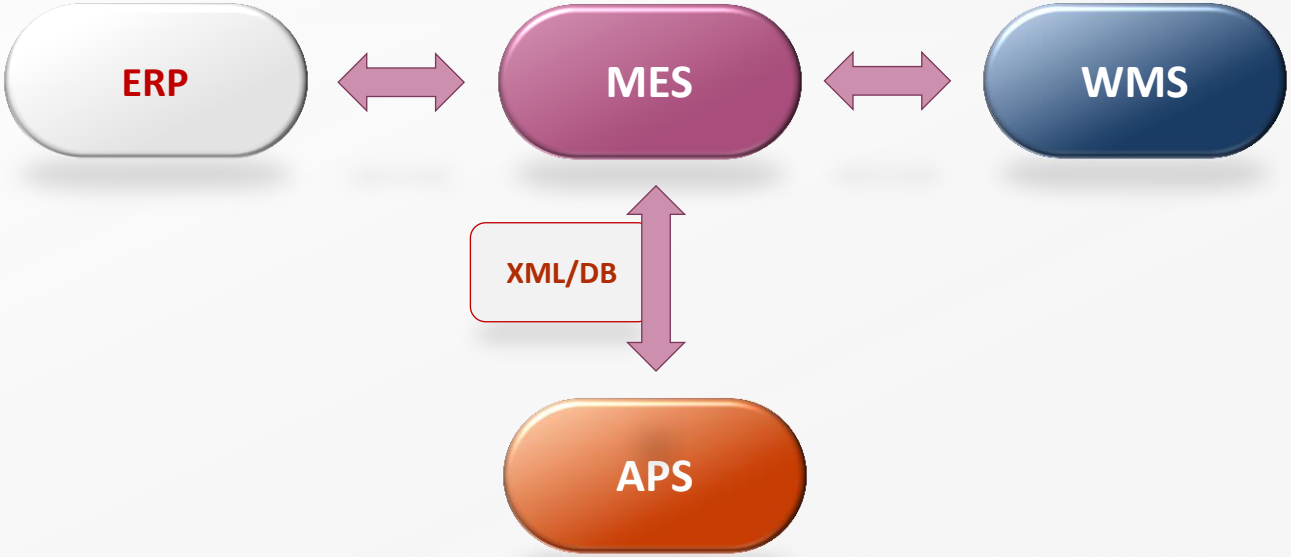


Architecture of Qguar MES system

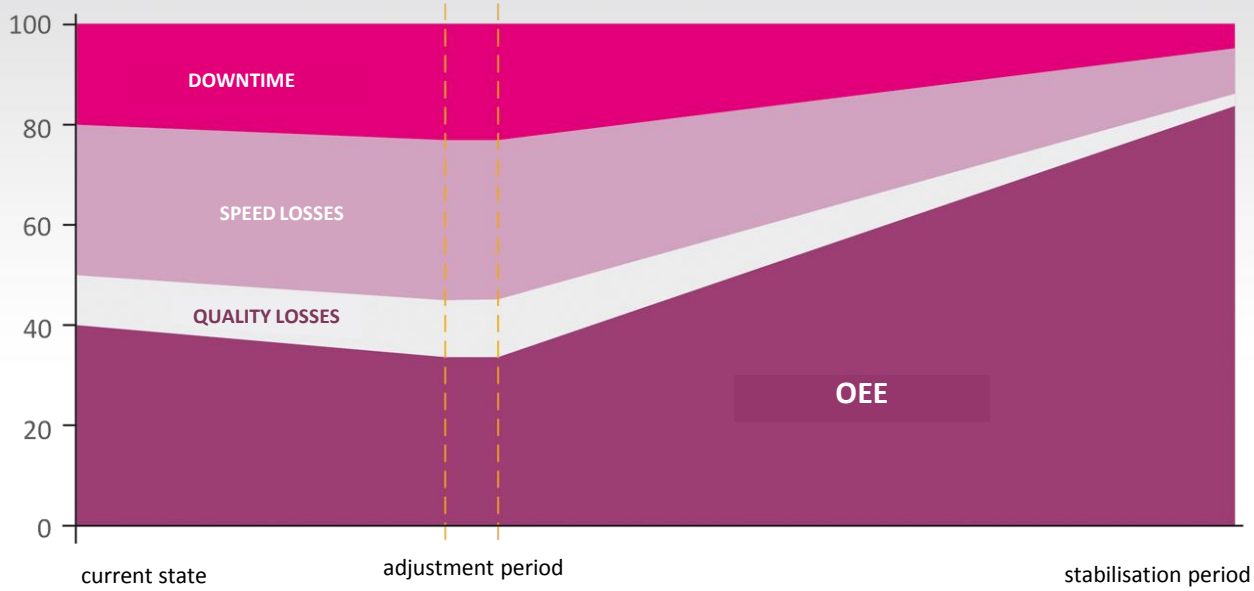


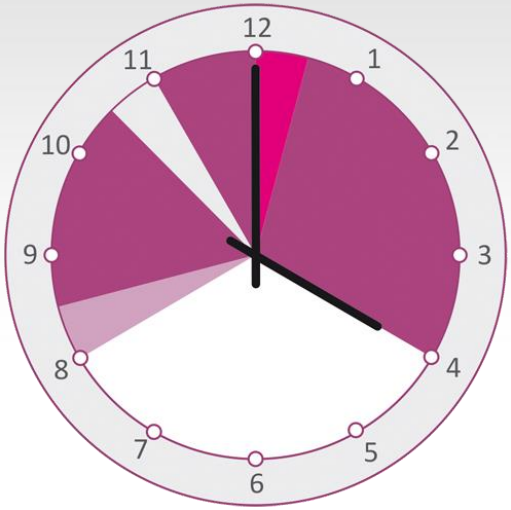
Qguar MES

Interface architecture



Qguar MES - What do you get from deployment?





According to the report of **INDUSTRY DIRECTIONS Inc.**, an analytical and consulting group and an authority in logistics and manufacturing, the average changes of key indicators for manufacturing companies which implemented MES systems are:

OEE	Increase up to 84%
Own costs	Decreased by up to 34% *
Company profit	Increase up to 400% *
Energy consumption costs	Decreased by 57% *
Production capacity	Increased by 15%
Duration of a production cycle	Shortened by 37%

* - data for 3 years

Qguar MES

MES – KPI examples

Sample indicators ...

- ✓ OEE
- ✓ Material consumption
- ✓ Production reliability
- ✓ Proportion of orders within deadline and delayed orders
- ✓ Production time
- ✓ Technical efficiency
- ✓ Plan progress

Qguar MES - Advantages

- ✓ Shorter and fully controllable production cycle
- ✓ Monitoring of production in progress, machine work, resources
- ✓ Shorter information flow, real-time information
- ✓ Shorter planned and unplanned downtime, elimination of failures and damage
- ✓ Lower production costs
- ✓ Increased indicators (productivity, OEE etc.)
- ✓ Origin of produced defective products, prevention of defects, increased production quality.
- ✓ Comparison of plant work before and after Qguar MES was implemented...

Qguar MES

Thank you for your time

Quantum OGUAR