

## MANUFACTURING EXECUTION SYSTEM

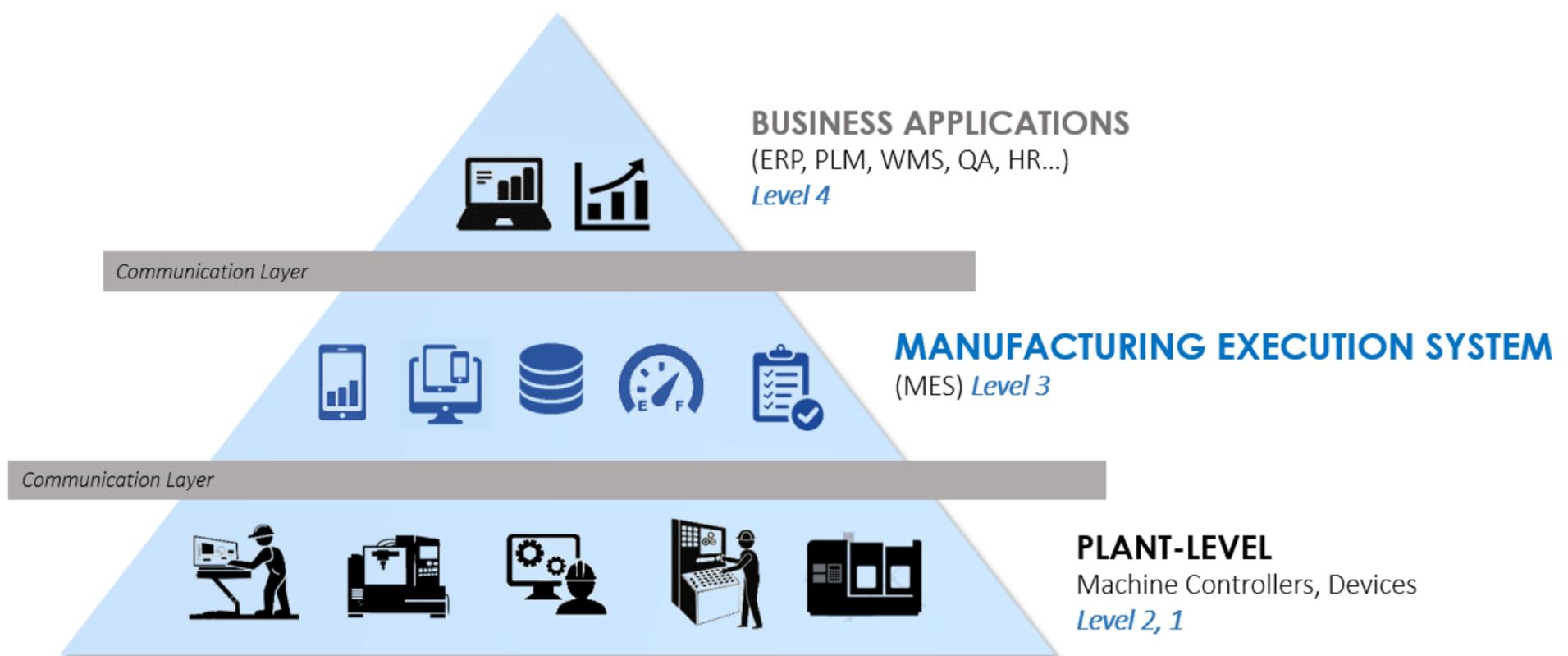


INDUSTRY 4.0 FOR ALL INDUSTRIES

## INDUSTRY 4.0

Industry 4.0 concept identifies the fourth Industrial Revolution, a technological innovation process that will allow manufacturing companies to produce in a more automatized and connected manner, through an integrated infrastructure composed of assets, machines, people, mobile devices and IT systems able to communicate each other, both inside and outside the company. This will represent a new plant Operating System able to manage and control the manufacturing operations in real time, by optimizing processes and resources, analyzing performances and reducing errors and wastes, for production process' continuous improvement.

In this new scenario, MES (Manufacturing Execution System) represents a fundamental tool towards the full plant digitalization. In fact, MES provides real time information for the management and the monitoring of the entire production process, from the Sales Order up to the delivery of the finished good. MES is the missing link between the decision level made of business applications (ERP-LEVEL) and the execution level (PLANT-LEVEL).



## MANUFACTURING INTELLIGENCE WITH OPERA MES

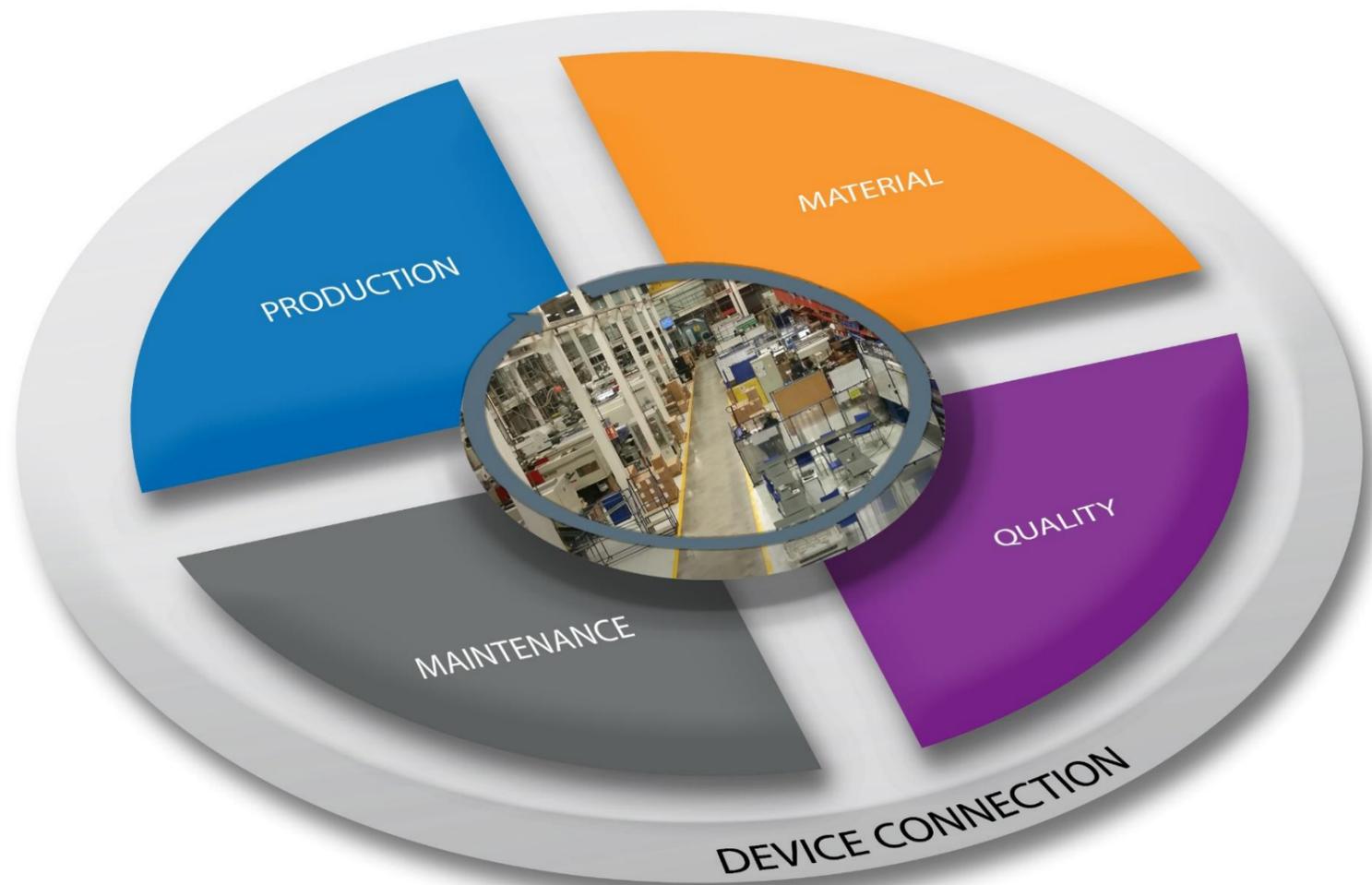
OPERA is a complete, engineered and configurable MES software product that fully covers the functional areas of Production, Quality, Material and Maintenance, as requested by the international standards. Its main task is to manage and deliver real time information about the progress of the production plan: for example, the operators can interact – through web-based interfaces – with the system to receive, in real time, instructions about the correct execution of a task, to monitor the production process, the process parameters, etc.; in addition to this, the system also delivers information about the job execution, lots consumed/produced, products conformities, maintenance data, in order to totally avoid paperwork, by digitalizing any information.

OPERA MES main strength is its high configurability and user-friendly profile that allow any need of any manufacturing company – belonging to both discrete and process manufacturing field – to be completely satisfied.

OPERA MES is a perfect “Visual Management” tool, supporting decision makers of all company levels (Production Manager, Quality Manager, Maintenance Manager, etc.).

OPERA MES provides real time data that allows situations to be analyzed and corrective actions to be promptly undertaken with the aim to reach results and to quickly react to unexpected events by minimizing losses.

OPERA MES allows factory supervisors to identify gaps and inefficiencies through dashboards, alarms, interactive charts, dynamic grids, real time KPIs that show in a graphic and intuitive way production process efficiency levels. This information, shown in an easy and clear way, makes operators aware of their duties and allows supervisors to carefully analyze data and to promptly implement corrective actions with the aim to improve manufacturing processes and increase company productivity.



## PRODUCTION MANAGEMENT

- Business model management
- Products management
- Work order management
- Advanced Planning & Scheduling
- Electronic dispatching of tasks/documents
- Production data acquisition
- Paperless factory management
- Real-time monitoring and supervision
- OEE calculation and performance analysis
- Web plant analytics
- Business applications interface
- (ERP, PLM, WMS, QA, HR...)

## MAINTENANCE MANAGEMENT

- Asset maintenance management
- Preventive maintenance
- Breakdown maintenance
- Autonomous maintenance
- Predictive maintenance
- Spare parts/materials consumption
- Maintenance performance analysis

## DEVICE CONNECTION

- Protocols and device connection logics management
- Automatic data acquisition from device
- Automatic dispatching of data to device
- Dashboard in real time

## MATERIAL MANAGEMENT

- Automatic identification of materials
- Warehouse/location/lot management
- Acceptance/Shipping of goods
- Management of material pickings
- Material handling
- Stock levels monitoring and analysis
- Electronic Kanban
- Interfacing of automatic warehouses

## QUALITY MANAGEMENT

- Test orders/quality checks management
- Instrumental/visual tests management
- Monitoring serial numbers/lots/quality checks
- Tracing/monitoring of lot/serial number
- Tracking/genealogy of lot/serial number
- Automatic identification of lot/serial number
- Process data management
- Automatic collection of process data
- Real time monitoring of process data
- SPC/Control charts analysis

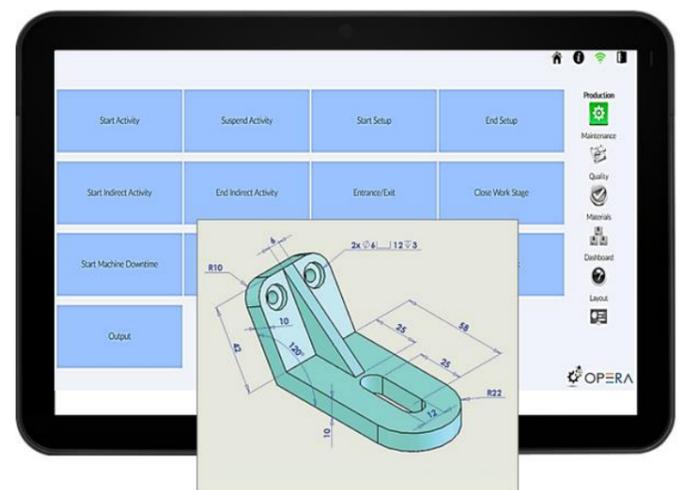


## PRODUCTION MANAGEMENT

OPERA Production is the heart of the MES system, where you can define the company model (plants/departments/cost centers...), the production model, the product (production cycle/bill of materials/articles ...), all the productive resources (employees, work centers, machines, equipment, tools, causals...) and all the automatic data acquisition procedures (direct and indirect activities, machine setup, machine downtime, quantity produced, scrap, reworks, etc.). OPERA Workflow Manager allows the management of all workstations and of the related collection procedures. OPERA Management Console allows the management and historical analysis of the acquired data in real time for a complete management and supervision of the production process. We can summarize the logical flow in 4 macro phases: Planning and Scheduling, Dispatching and Data Acquisition, Paperless Manufacturing and Real-Time Production Supervision. The "paperless" document management is a very important function for digitizing all the information related to the production process. In the production module, OPERA allows you to view and upload in real time any type of information such as documentation, images and photos, videos that the system can be associated with any procedure/activity/resource.

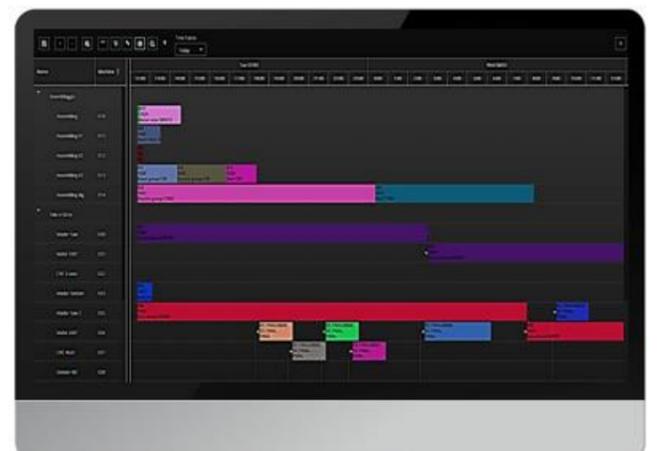
## DISPATCHING & DATA COLLECTION

The workstations within the factory are web-based, interactive and allow not only automatic acquisition of the production data, but also the online displaying of all the useful information for the operator, in order to execute activities as: setup instructions, technical drawing of the product, technical manuals, instruction on the article to be produced, digitized notes from the operator, certifications and much more. The workstations can be fixed and/or mobile, HTML5 compatible, mono-resource, thus linked to a single machine/operator, or multi-resource. In addition to data collection workstations, it is also possible to interconnect machines/equipment/production lines for an automatic data acquisition from the device (times, quantities produced, scrap, downtimes, energy consumption ...). All this through the additional functionality of the device connection.



## PLANNING & SCHEDULING

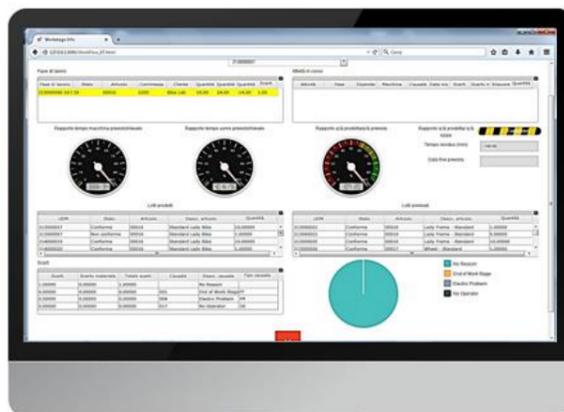
It is possible to elaborate a production plan thanks to the finite capacity scheduler and once the optimal scheduling has been defined, the activities to be performed will be electronically dispatched and displayed on the various workstations within the factory. Therefore, each workstation will be online and interactive for the management and execution of the work. In absence of a scheduler but with a simply manual production scheduler, the activities will be assigned automatically to the work center or to the single workstation on machine board and then starts the execution phase.





## PRODUCTION MONITORING & SUPERVISION

Monitoring in real time the production process means to analyze, aggregate and process production data that will allow you to have a very detailed overview of what happens in the shop floor, in order to proactively analyze the events and then take eventual corrective action on the process. Thanks to the simple and intuitive interface of OPERA, it is possible to analyze in detail the information related to all the resources involved in the production process, such as machines/equipment/work centers, operators/cost centers, orders/sales orders/materials, etc. in relation to a specific time or period, such as day/month/year. OPERA allows you to create charts, dynamic reports and customized dashboards to monitor the entire factory in a simple and intuitive way. Thanks to the web-based interface, it is possible to analyze the data also from the outside, ideal situation for the management that at any time can consult the daily production trend, check the progress of a specific order, rather than analyze the efficiency of a work center and the performance of a specific machine. OPERA MES is therefore a perfect analysis and decision support tool for all company levels.



## WEB PLANT ANALYTICS

The web technology allows you to view everything on any device with a web browser html5 (Pc, tablet, smartphone) enabling online monitoring of the production plant at any time and from anywhere.

- **PRODUCTION CONTROL AND SUPERVISION:** Performance analysis, OEE calculation in real time by resource, by department, by factory, production progress, machine downs analysis, scrap analysis, inefficiency analysis and trend control, recording and analysis of energy consumption...
- **MATERIAL CONTROL AND SUPERVISION:** Analysis of material stock levels, on-board dashboards with materials consumption, picked lots, produced lots, warehouse layout...
- **MAINTENANCE CONTROL AND SUPERVISION:** Maintenance performance analysis (MTBF, MTF, MTR, MTTW, MTD), maintenance operations progress, maintenance alarms...
- **QUALITY SUPERVISION - QUALITY AND PROCESS CONTROL:** Supervision and control of process values, statistical analysis, energy consumption, in-line quality control, control charts...
- **CUSTOMIZED DASHBOARD:** Configuration of dashboards created on the machine, process, customer specifications...
- **INTEGRATION WITH EXTERNAL BUSINESS INTELLIGENCE**





## QUALITY MANAGEMENT

In order to guarantee the quality and compliance of the products (such as raw materials, semi-finished and finished goods) it is necessary to execute in a precise and punctual manner a series of qualitative tests, both at the goods receipt and during the execution of the process, through easy procedures to be carried out in real time. Quality controls can be executed by operators or generated automatically by machines, according to organized and planned events (quantity reached, working times and tools calibration).

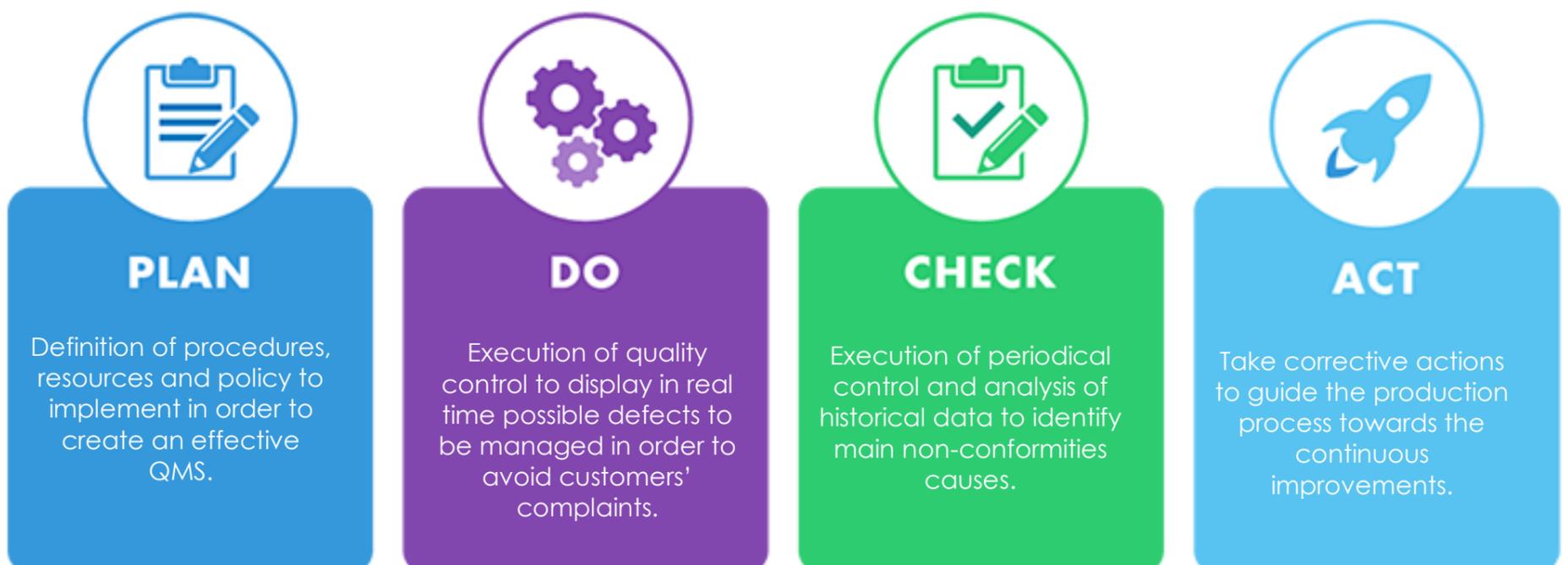
OPERA MES contains three key concepts in the Quality Control area:

- **PRODUCT COMPLIANCE, through production testing activities;**
- **PRODUCT GENEALOGY, through lots tracking/tracing functionalities;**
- **PROCESS CONTROL, through the real time monitoring of process parameters**

Quality Management strategies have evolved together with the transformation of the manufacturing activities and the manufacturing environments: operators now have more responsibilities about the quality of products produced, as well as machines and measurement tools are able to record process parameters – which influence the product final result – and deliver them in real time to other systems for analysis purposes.

The main objective of Quality Management is to guarantee high quality products to end users with the minimum economic effort. Its main functionalities are: collection of quality data like technical or functional control, definition of test frequency for the automatic acquisition of data, connection to quality tool (such as scales or calipers) or data acquisition from PLCs like temperature or pressure.

Therefore, quality is not an objective that can be definitively reached; it has to be constantly pursued by implementing quality internal procedures based on the products features or customers' requirements.



## QUALITY TESTS ACQUISITION AND MANAGEMENT (Product compliance)

OPERA guarantees the product conformity through the managing and acquisition of the quality checks in the production. The system allows the definition of quality tests on raw materials, semi-finished and finished goods; electronic tests dispatching and real time data acquisition and monitoring for an immediate reaction to possible problems. An accurate analysis of the results (lots status, tests results, tools used, operators involved, non-compliance reasons recorded, etc.) enables the determination of the main reasons affecting products defects and the identification of the best corrective actions to guarantee the quality of both products and manufacturing processes. OPERA MES manages both attribute tests (visual inspection) and instrumental tests (values measurement). The main functionalities are:

- Quality tests definition on raw materials, semi-finished and finished goods
- Dispatching and execution of the quality tests
- Real time quality checks data acquisition (manually and/or automatically)
- Quality data real time monitoring
- Quality data report and historical analysis



## PROCESS CONTROL (SPC)

With process control, for each production order/lot it is possible to set a constant control of the productive process values. Through a direct connection with devices, control systems and/or measurement tools, the system collects and records process values, highlighting the process variables, with the aim of promptly and quickly eliminating the 'special causes' that mostly affect the quality of the product, then trying to take corrective actions to remove them one by one.

For this purpose, OPERA uses control charts, allowing the monitoring of the chart values and the immediate identification in case the process is out of control, as well as triggering "errors" and events (plant downtime, quality control request, maintenance request, etc.), in order to promptly solve the process criticalities detected.



## LOTS TRACKING AND TRACING (Product Genealogy)

Tracking and tracing are procedures used by companies to recreate the genealogy of a product, recording every single component of the product, to guarantee its quality, while managing any non-compliance situations. Tracking makes it possible to track the lots of materials used in the production of the finished product, from the origin of the product to its distribution. Traceability, on the other hand, is the reverse path and allows, given a finished product, to trace the data of the compound detected during the production phases, to allow the recall of the product. OPERA allows to record, during the progress of processing, millions of records that report every moment of "life" of the product. The main features are:

- Monitoring of raw (or semi-finished) materials quantities consumed
- Collecting information related to the quantities produced in production
- Generating new lots to identify the material produced
- Monitoring of the components stock levels on the machine





## MATERIAL MANAGEMENT

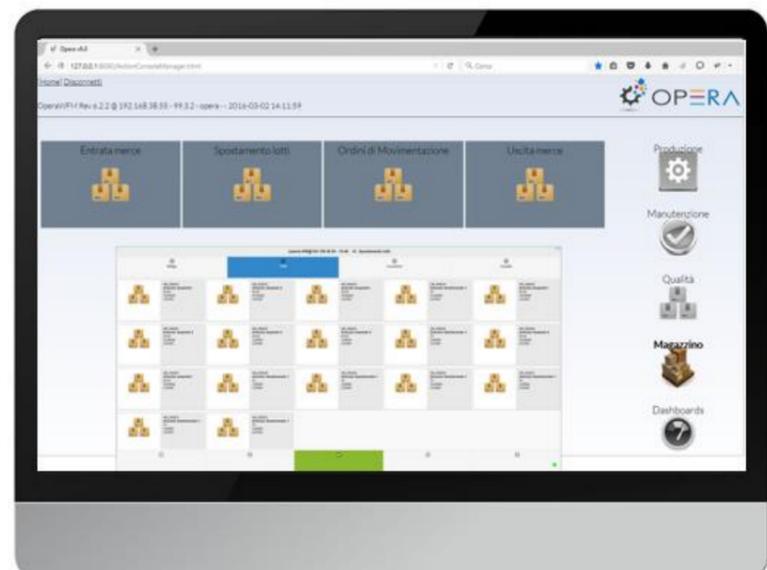
In manufacturing environments, the main objective for the material management is to guarantee a correct and punctual material supply to the factory, by minimizing material transfers' costs, and to physically organize and optimize the warehouse. This module manages in real time the inflows and outflows from/to the warehouse together with all material movements in production, with the aim to provide the user with an updated visibility of the material availability.

The main benefits of this module are:

- **Stock levels reduction:** the accurate knowledge of the real stock levels allows a reduction of the necessary stocks for the same needs; very often, in a not correctly managed warehouse, it is not possible to know exactly the remaining quantities due to the lack of knowledge of the real materials consumption.
- **Times reduction and increase of efficiency.** The exact knowledge of a lot position, allows material movements times to be reduced and guarantees a punctual material supply to plant departments.
- **Traceability.** The complete management of materials and the recording of material flows is necessary to track and trace products as well as lots.

Generally, warehouse transactions are executed by operators using portables terminals or industrial tablets. These material transactions deal with: goods receipt with material labelling and/or electronic identification, material stock and warehouse transfer with the assignment of a Handling Unit location.

Against a production order, the system can generate, manually or automatically, transfer orders to move the material produced to the warehouse, to return the unused material or to assign to the material a new location. This monitoring enable in any moment the verification of the actual stock level and the changing of the material locations, thanks to dedicated procedures.

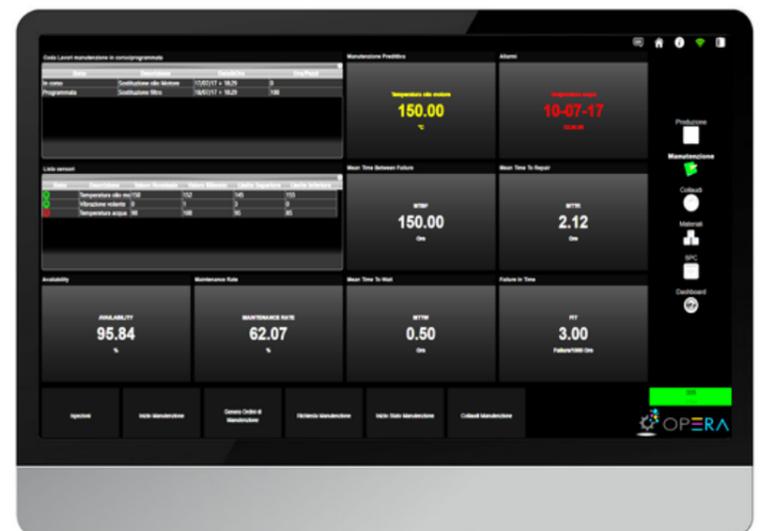




## MAINTENANCE MANAGEMENT

OPERA manages and controls all the maintenance activities performed on the company assets, in particular the assets involved in the production process such as machines/equipment/tools and other work instruments. The primary objective is to ensure the availability of production resources, trying to avoid breakdowns and/or incidental breakages that can affect the productivity, as well as maintaining a good technological level of the plants and above all reducing the losses for the management of the plant and related maintenance costs to zero.

**OPERA maintenance is managed on 4 different aspects in a transversal way with the other functional areas of production, quality and materials.**



- **Preventive Maintenance (or Ordinary Maintenance)**

It means the planning and management of the maintenance operations, with a "zero breakdown" approach. Preventive maintenance alarms can be set for quantities produced, machine/tool working time or date.

- **Breakdown Maintenance (or Extraordinary Maintenance)**

It means the management of maintenance activities related to an unexpected failure, which will be followed by a maintenance request that must be managed quickly, in order to allow the rapid resume of the activities. Generally, as a result of a machine downtime declaration, Opera generates automatically a maintenance request, a maintenance order and the precise detection of the maintenance activity performed by the operator, with an analysis of the waiting time, the time of repair, spare parts management and finally an analysis of the maintenance performance.

- **Autonomous Maintenance (or Daily Checks/Inspections)**

It means the management of the simple daily routine maintenance activities (eg. checks or inspections on the plants, safety standards, PPE, etc.) that the operators carry out in complete autonomy. The autonomous maintenance is managed through the generation of the inspections to be carried out, for which is recorded the execution as well as the positive or negative result of the performed check. It is often used in companies to check the general status of the machines and if they comply with the actual safety standards before the operator starts working.

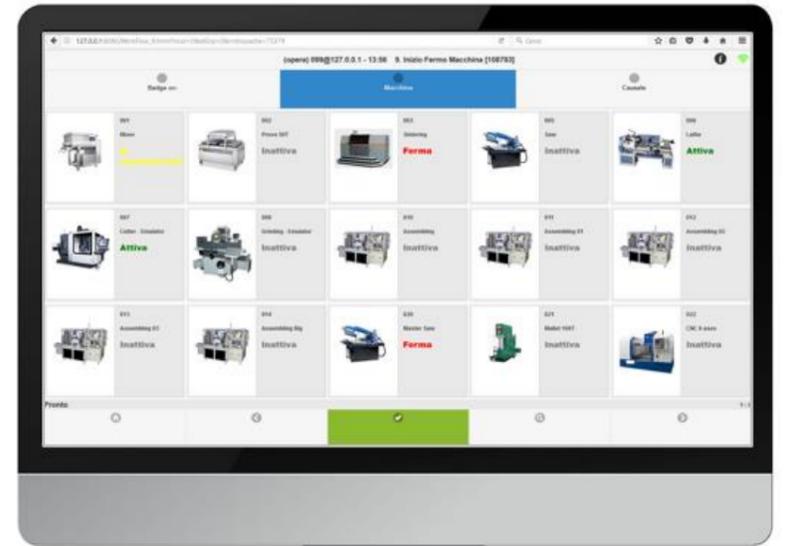
- **Predictive Maintenance**

It means the management of maintenance activities generated and programmed based on analyzes, that are carried out on significant values of the production process highlighting situations of process drifts. These values are recorded and displayed on control charts that allow a predictive analysis of irregular situations that could occur against these values registration, including unexpected failures and breakages. Therefore, specific alarms are generated which then trigger the generation of new maintenance activities.

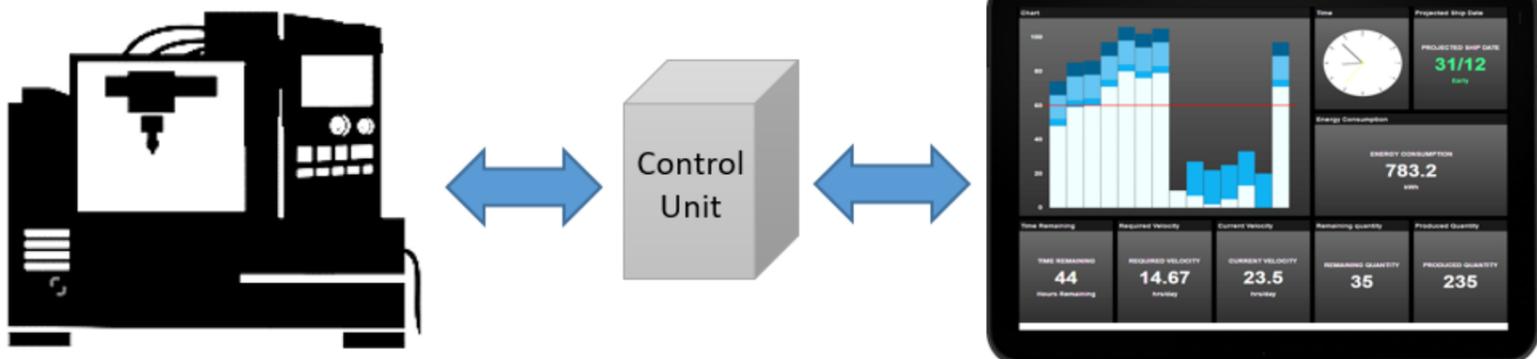


## DEVICE CONNECTION

OPERA MES in the "device connection" function allows the interconnection with all the online machines/equipment in the plant for the automatic acquisition of production data, quality data, process data, etc. Normally in companies, there are machines of different type, brand, model but the system is able to manage the connection to all, through standard interfacing procedures or machine-specific connectors. OPERA system acts as an operating system and communicates with the machine in a bidirectional mode: it allows automatic acquisition of data related to the production process (times, quantities produced, scrap, downtime, causal, energy consumption, etc.) and also allows sending to the machines the necessary data for the execution of the production process (e.g. process parameters, setup operating instructions, instructions on the article to be produced, etc.).



**Each machine or production line, thanks to OPERA MES, becomes intelligent and "Social" because it is interconnected with the factory computer system and is therefore able to communicate not only with the "factory" but also with the outside, to provide and receive information.** The so-called "intelligent factory" is realized through the complete interconnection of the machines, through a fluid and constant communication to coordinate the activities and react promptly to the events and unexpected events. The different entities such as machines, lines, operators, materials, must interact in synergistic and intelligent way to correctly feed the production process.



## OPERA MES ADVANTAGES

Opera MES main benefits, recorded in numerous projects, are:

- Reduction of takt time (by an average of 45%)
- Elimination/Reduction of data entry time (by an average of 75%)
- Reduction of WIP (by an average of 25%)
- Elimination/Reduction of paperwork between shifts (by an average of 50%)
- Reduction of lead time (by an average of 27%),
- Increase in products quality (reduction of defects by an average of 18%)
- Increase in productivity/efficiency (by an average of 20%)
- Optimization of primary/secondary resources
- Better process organization (Lean Manufacturing)



The implementation of a MES system can be a good occasion for the reorganization of business processes at all company levels by establishing improving objectives that shall be measured and verified in short times. Companies that have implemented OPERA MES have observed first benefits after 3-6 months from the implementation. In the fourth Industrial Revolution era, manufacturing companies must implement a MES system, to remain competitive on the market; the reaction quickness of a system like OPERA MES, together with the real-time monitoring and reduction of activities that do not bring any benefit, guide the production processes at the maximum efficiency.

**Thanks to its open architecture, its functional modules, communication drivers and modern technologies, OPERA MES is able to guarantee the maximum results.**

## OPERA MES KEY FEATURES



### INTERNATIONAL MES

Compliant with the international MES standards. Multi-plant and Multilingual - it is already available in 12 languages.



### INDUSTRY 4.0

Software technology of excellence for the realization of Industry 4.0 projects, for an interconnection of all productive resources.



### INTERNATIONAL DISTRIBUTION NETWORK

Certified partners worldwide realize OPERA MES projects in companies of any sector and dimension. Over 5000 licenses installed.



### MODULAR & CONFIGURABLE

Modular structure that allows the realization of customized MES projects according to the customer's needs. Easily configurable by the distributor and the expert customer.



### WEB TECHNOLOGY

Online on any device with a web browser html5 (PC, Tablet, smartphone). Modern, Easy and Intuitive Web Interface.



### EASY INTEGRATION

Designed for integration with any ERP system and other departmental systems (QA, APS, WMS, PLM) for bidirectional data exchange.



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