

## Mes (Manufacturing Execution System) System Development Functions

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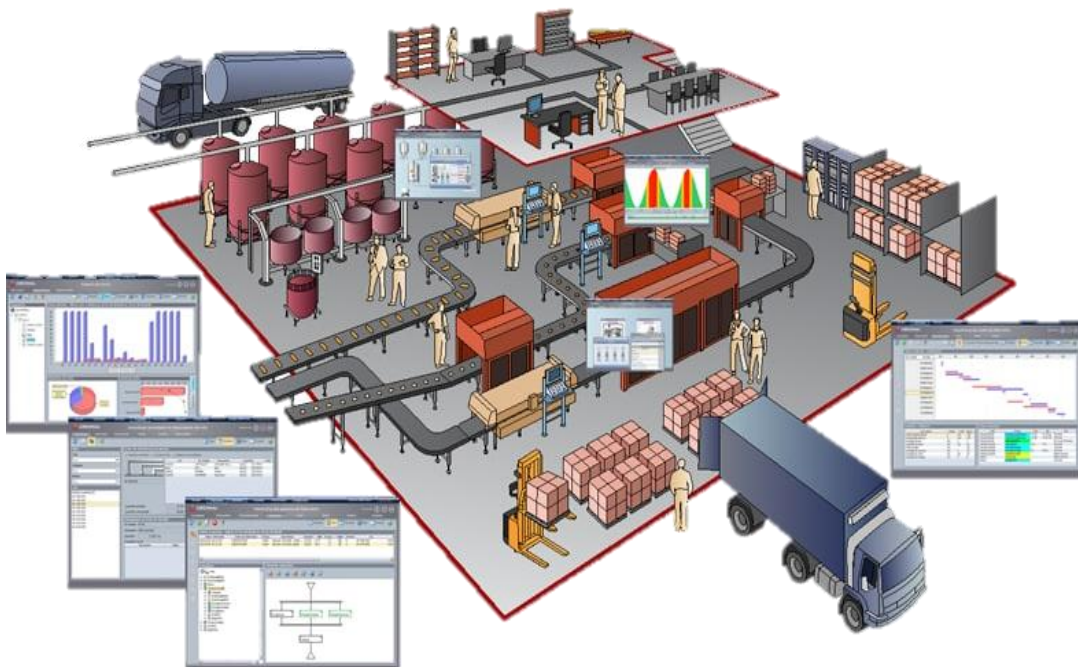
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**Abstract:** This article details and develops recommendations on the functions of the development of the MES system in enterprises supplying components to cars.

**Keywords:** Quality, planning, operator, operating resource, inconsistency, observability, marking, separation, retention, placement.

**Introduction.** Attention to quality is considered one of the priority and urgent tasks in our country today. The introduction of quality systems in accordance with the requirements of international standards increases the possibility of ensuring the quality, safety and competitiveness of products produced by enterprises in the environment of market relations.

**MES** is a program that helps to improve the efficiency of the production process by reducing downtime and defects.



**Figure 1. Overview of MES in the production system**

The purpose of using the MES system is to increase the efficiency of the production process. To achieve the goal, it is necessary to perform the following tasks:

1. Determination of the current efficiency of the production enterprise;
2. Determining the causes of stoppages and ways to eliminate them in order to optimize the production process.

**Materials and methods.** The MES system is intended for use at all levels of the workshop, site or production line. In it, departments perform the following tasks:

#### **Planning and dispatching service**

Planning the schedule in the store, operational control of production, formation of release documents.

#### **Masters**

Formulation of production tasks for workers, quick control of deadlines and performance of tasks and production operations, formation of production documents and salary amounts [1-3].

#### **Material and technical supply specialists**

Obtaining up-to-date graphs of the need for goods and materials, operational control of the level of reserves and their targeted storage.

#### **Department heads**

The program implements analytical work, as well as decision support mechanisms, to control the current situation in the workshop.

#### **Operators/ workers**

Rapid acceptance of production tasks in a shift, reflecting the execution of operations.

#### **Technologists**

Getting information about the actual process of the technological process.

Essentially a production management tool, the MES in the IT architecture of the enterprise is located between the SCADA automated process control system and the APS high-level planning system, or in its absence, an accounting system of the ERP class (Figure 2). However, the individual operation of these software products does not give the expected effect. To achieve a certain result, it is necessary to ensure their full interaction [4-8].

When implementing MES, it is necessary to pay attention to its 11 groups of functions. They consist of:

1. **Workflow planning.** This group refers to optimal sequence planning with respect to relevant key conditions (setup times, processing time, etc.) based on available resources.
2. **Resource management with state conservation.** Management and monitoring of related resources (personnel, machines, tools, etc.).
3. **Production block management.** Control the flow of production units based on orders, batches, etc. Incidents during ongoing production are responded to immediately and the plan adjusted as needed.
4. **Information control.** All information related to the manufacturing process (CAD, designs, test specifications, environmental compliance requirements, safety instructions, etc.) is available to employees at the right time and place. Employees can use the system to log exceptions.
5. **Operational data log.** Automatic or manual recording of all production-related operational data related to a production unit.
6. **Personnel management.** Record the possibility of editing during the working hours and absence of employees, on vacation, etc.

7. **Quality control.** Analyze production-related measurement data in real-time to protect product quality and identify problems and vulnerabilities in a timely manner.
8. **Process management.** Monitoring of the actual production process, including alarm control functions.
9. **Management of technical service.** Use of operating material and recording hours of use to start periodic and preventive works. The system also supports maintenance.
10. **Lot tracking.** Recording of all production-related information throughout the production chain to ensure traceability of each product produced.
11. **Performance analysis.** From production dimensions to downtime, downtime, piece counters, etc., key management numbers are generated instantly, in real-time, to enable simple production performance evaluation, problem identification, and more. chart formats are provided to the user.

**Results.** MES as a tool for the level of production management (level 3 in the ISA model) requires a complete definition of the product; The ERP system (company management level - level 4 in the ISA model) requires only its parts. The logical conclusion is that the complete management of product information can be transferred to MES. Through transparent structures and appropriate software technology, MES product definition data must be available to all other applications.

Basic data describes the basic features and parameters of the system, such as what production units are available and what measurement units are needed. We distinguish between simple (for example, m or kg) and complex (for example, m/min or kg/m<sup>3</sup>) units of measurement. Among the units, the main quantity unit plays a special role.

The data model for order fulfillment includes order data, production data acquisition data, and performance data derived from it.

**Conclusion.** Customer orders are usually displayed in an ERP or merchandise planning system. Production orders are derived from; production orders are generally referred to as orders in this book. A customer order can lead to multiple production orders. In addition, a production order can contain multiple customer orders (or orders from these customers). In the absence of an ERP or inventory planning system, the relationship between customer and production orders can be managed by MES.

An order is basically defined by the product (what needs to be produced), the relevant quantity (how much to be produced) and the delivery date (when the product needs to be produced). It is also possible to map orders to operations to facilitate the distribution of orders by equipment/machinery (work sequence) [9-10].

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