ORACLE MANUFACTURING EXECUTION SYSTEM FOR DISCRETE MANUFACTURING

The Manufacturing Execution System for Discrete Manufacturing is comprised of the MES Workstation for Operators and the MES Supervisor Workbench, to allow shop floor personnel to, record, and monitor shop floor activities in a highly efficient and effective manner. Key features include:

MES WORKSTATION

• Configurable dispatch list driven execution

• Configurable work content and sequential display of work instructions

• Clock In / Clock Out for actual time capture

• Enhanced shop floor transaction reporting

• Support for serialized and non-serialized jobs tracking

• ERES support

• Shop floor data acquisition

• Integration

• Prints Label / Job Traveler

• Streamlines material transactions with lot and serial entry

• Shop floor exception reporting

MES SUPERVISOR WORKBENCH

• Dashboard

– View Exceptions summary and performs resolution with drill down capabilities

– Review performance metrics through DBI

– View anticipated capacity or resource shortages

– View current shop floor

– Production to plan metrics

– Labor performance metrics

– View material shortages

• Supervisor Workstation

– Expedite jobs

Oracle Manufacturing Execution System for Discrete Manufacturing (MES for Discrete) provides "enhanced" shop floor execution capabilities to enable discrete manufacturers to deploy directly as the Manufacturing Execution System (MES) on their shop floor. Focusing on improving the productivity of the shop floor operator and supervisor, MES for Discrete provides rich, out-of-the-box capabilities to perform their daily tasks. The product enables shop floor operators and supervisors to perform, record, and monitor shop floor activities in a highly efficient and effective manner in addition to providing key performance and status indicators for the shop floor. More importantly, the MES for Discrete Manufacturing application facilitates the removal of non value-added activities on the shop floor and helps maximize shop floor productivity.

Enhanced Operator Productivity and Efficiency

The MES Workstation is an integral part of the MES for Discrete Manufacturing application. It has a simplified user interface, which provides necessary information to operators to perform their daily activities easily. This minimizes the system interaction time and significantly improves the Operator's productivity and efficiency.

Configurable Dispatch List Driven Execution

The MES Workstation is dispatch list driven, enabling shop floor operators to perform jobs in a desired order of priority.

Figure 1. Operators are presented with dispatch lists that are highly configurable

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– Reorder dispatch lists

– Report resource usage

• View Historical Transactions

– Access Gantt Charts

FLEXIBILITY AND
CONFIGURABILITY

• Control UI layout, content,
system behavior, and security
through 36 parameters

• Configure at site, role, org,
and department levels

• Hooks for custom business
rules

filtering, ordering, and grouping to improve production efficiencies. Many filter
parameters are provided for enhanced configuration of displaying information seen
in the dispatch list. Columns in the list display information on a job, such as
scheduled start and end times, customer, setup, indicators of job readiness, clocked-
in jobs, and expedited jobs. The columns can also be configured to display or to be
hidden based on requirements.

You can perform many actions related to a job in a dispatch list, such as recording
work start and end times, reporting moves recording, completion and scrap
transactions, viewing work requirements, and reporting exceptions. The dispatch
list thus serves as a starting point of a day for an operator.

Configurable Work Content and Sequential Display of Work Instructions

The detailed work content can be configured to display the information necessary
for a job operation, such as sequential display of work instructions, information on
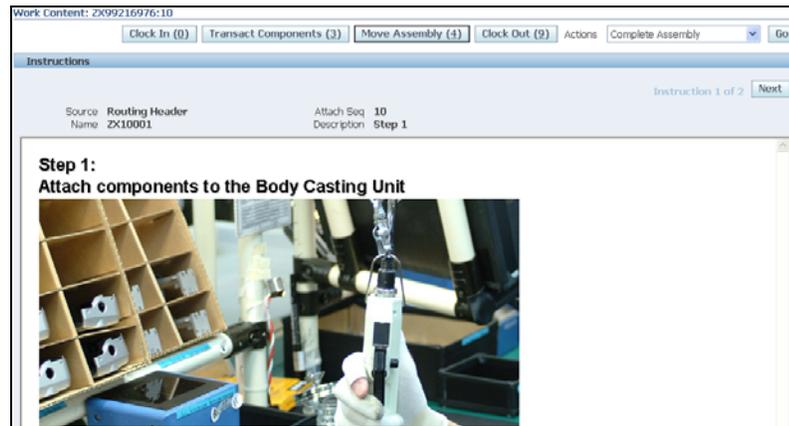components, and resources required to perform the operation.

**Figure 2. Sequential display of instructions in the work content page guides operators in
performing their work**

The online presentation of work instructions guides the operators in performing their
work efficiently and enables companies to go "paperless" on the shop floor. On
completion of a job, detailed work instructions for the next job display for the
operators, without the need to navigate back to the Dispatch List.

Shift In / Out and Clock In / Out for Actual Time Capture

The MES Workstation can record and report the start of the shift activities and
actual times spent on job operations, taking away the need to manually report
resource transactions, thus maximizing shop floor productivity.

The actual attendance hours are calculated based on the difference between times
registered through Shift In and Shift Out. Users also have the ability to perform
"Undo Shift -In".

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Figure 3. Shift in and Shift out buttons can be used to record attendance

Reporting actual times spent is simplified through the use of Clock In and Clock Out buttons available in the MES Workstation. An Operator Clocks In to indicate work start on a specific job operation and Clocks Out to report work stop. The difference between start and end times reported on Job Operations can be automatically recorded as resource transactions in the backend.

Figure 4. Clock In and Clock Out buttons can be used to record actual start and end times on a job operation

Streamlined Shop Floor Transaction Reporting

The MES Workstation enables operators to perform multiple transactions in one instance, and reduce the time an operator spends in performing transactions. For example, a single user entry can report move transactions on multiple job operations, or report both good and bad assembly units for an operation through a move transaction, combined with an assembly scrap or reject. Operators can also report time spent on job operations, submit quality results, and enter backflush component details while performing a move transaction on a job operation using a single page.

This significantly improves an operator's efficiency in reporting shop floor transactions by saving time to perform value added manufacturing activities.

Figure 5. Operators have the ability to report work hours, quality results, component backflush details all through a single screen
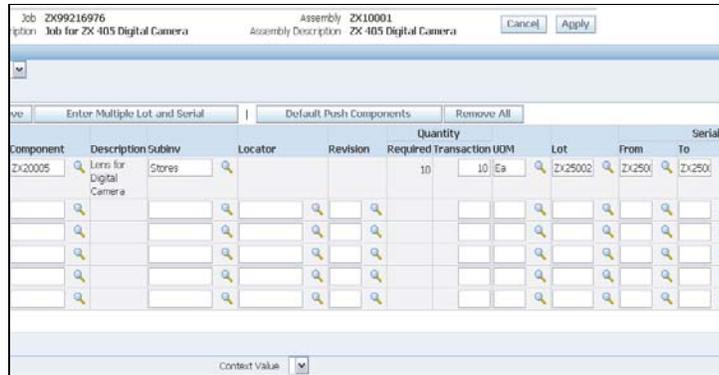
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Figure 6. Multiple component transactions with lot serial details can be reported from a single screen

Shop Floor Exception Reporting

Operators can report events and occurrences that prevent them from performing work on a job operation through the MES Workstation by logging an exception. For example, an exception can be due to a physical lack of components, partially finished assemblies from a prior operation, non-availability of a regular labor resource or an inoperable machine, or in-process production quality problem. Operators can also record the reasons for an exception and supervisors can be notified to resolve exceptions.
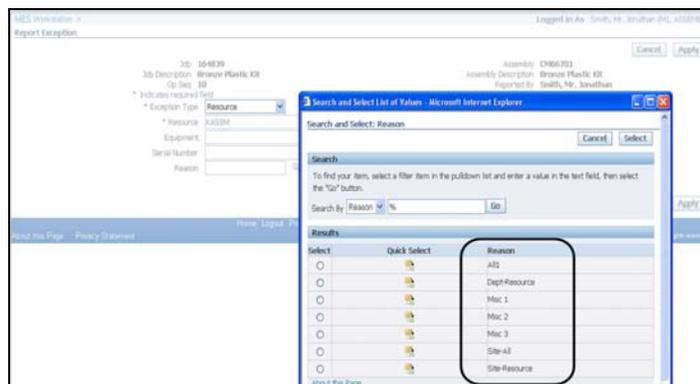

Figure 7. Operators can report exceptions that prevent work progress and also record reasons for exceptions

Serialized Manufacturing

Serialized jobs are discrete jobs that have pre-defined and associated assembly serial numbers, and Serialization Start Operation (SSO) in the operation identified in the routing from where the assemblies are tracked and transacted using the specific assembly serial numbers.

The MES operator is able to view and transact both serialized and non-serialized jobs from the MES workstation. The operator can search and transact on serial numbers, and also enter details of quality results as a part of the serialized manufacturing transactions. The key advantage of using serialized manufacturing in

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the MES Workstation is to maintain complete traceability and maintain the "as-built" information.

Shop floor Device and Test Equipment Integration

Most shop floors have automated systems that control the various parameters and working of resources ranging from lowest level devices, such as sensors and actuators to automation systems, such as a DCS, SCADA, and or PLCs. These control systems have data related to equipment parameters and information on the production and quality. Recording this information from devices into the Manufacturing System is very important to perform analysis and capture real time information.

The device integration function provided as a part of the MES Workstation helps in automatic capture of these parameter values and data directly into quality collection plans. This is a valuable feature for real time capture of shop floor information since considerable amount of shopfloor data is generated in devices and test equipments. Presently, this information is entered manually which can be error prone, cumbersome, and costly. Also manually input data is many times historic.

The device integration feature overcomes these issues by providing data accuracy, automates data collection and updating data.

Oracle partnered with Kepware to provide direct device connectivity and leverage so KepserverEx™ to collect, aggregate and feed real-time data into Oracle.
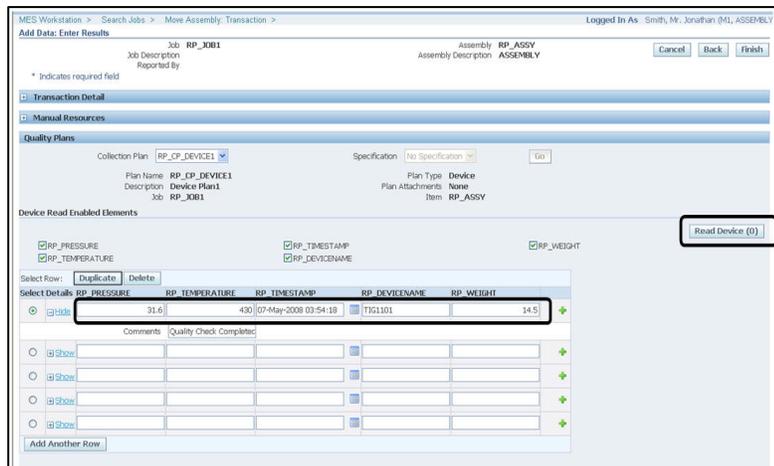

Figure 8. Operators can capture device and test equipment readings directly into Oracle Quality collection plans

Print Job Traveler and Labels

Operators need detailed instructions and information of a job to perform, including BOM, routing number and version, components to use, routing sequence, resource, item serial numbers, attachments, and notes. A Job Traveler contains all this data and can be printed and move with the job.

The Job Traveler feature provided as a part of the MES workstation lets an operator

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print and view job details enabling improved productivity. The Job Traveler is a configurable XML template with seeded information and can be modified to include relevant information for users. Similarly, the shop floor operator can also select a job-operation in the MES Workstation and choose to print the associated label from the actions list.

Figure 9. Operators can print the Job traveler from the MES Workstation

Regulatory Compliant MES Workstation

The MES workstation enables electronic records and signatures and meets the 21 CFR part 11 regulatory requirements. Electronic Records and Electronic Signature (ERES) capabilities are provided for move, completion and material transactions in the MES.

Labor Skills Validation

ISO quality standards and also regulatory requirements for specific industries mandate companies to execute and document employee competencies. These requirements ensure that employees understand their duties within the company and are familiar with the industry guidelines and the operator who performs an operation or a quality inspector who performs a quality inspection has the right skills to carry out the assigned functions.

The MES for Discrete Manufacturing supports this need for having certified operators perform certain operations. Skills required for operations will be validated against Operator Skills and competencies mentioned in HRMS while performing transactions in MES. Operation competencies validated can be stored in eRecords.

Enhanced Shop floor Visibility and Control through the MES Supervisor Workbench

The MES Supervisor Workbench in the Manufacturing Execution System for Discrete Manufacturing application enhances shop floor visibility by presenting a variety of information to reflect current shop status and issues requiring resolution. Through the support of several managerial functions in the workbench, supervisors can enforce stricter controls on manufacturing activities and resolve issues that prevent work progress. The MES Supervisor Workbench has two components, the Supervisor Dashboard and the Supervisor Workstation.

Shop Floor Status Visibility through the Supervisor Dashboard

The Supervisor dashboard is a single window of information of the shop floor. It

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provides real-time analytical information of various activities of the shop floor. Supervisor Dashboard of the MES Supervisor Workbench provides supervisors with a summarized view of exceptions along with their resolution status and a snapshot of the current shop floor progress for review on a single window. The Supervisor Dashboard is the starting point for a day of a supervisor.
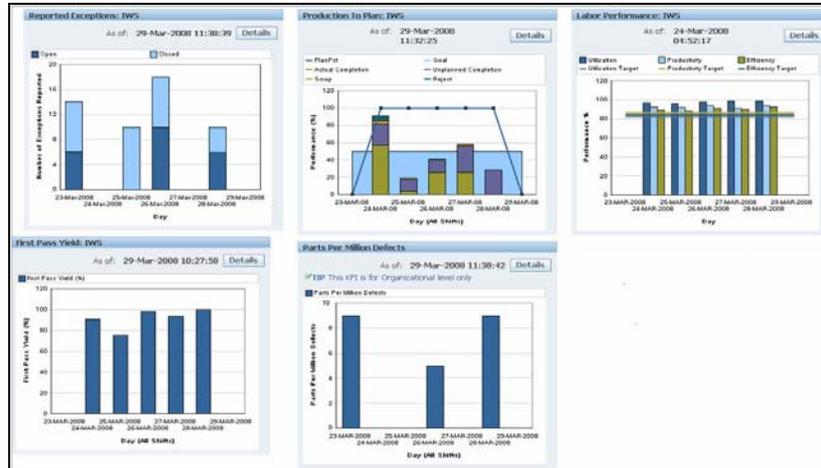

Figure 10. Supervisor's Dashboard in the MES Supervisor Workbench provides complete visibility into exceptions statuses and current shop floor progress in a graphical format

Key Shop Floor Metrics in the Dashboard

A typical production shop may have many metrics that are monitored for ensuring good productivity and quality, and for developing better processes. The MES Supervisor dashboard provides prebuilt shop floor metrics in a graphical format with drill-down capabilities to view details. This is one of the most powerful tools that the shop floor supervisor can use on a daily basis.

The key metrics that are available for a supervisor are:

- Production to plan – helps in viewing progress of production

- Labor performance metrics – helps in managing labor effectively

- First pass yield – helps in checking quality of products

- Work order shortages – helps in taking actions based on shortages

Exceptions Summary and Resolution Capabilities

Information presented in exceptions on the Supervisor's Dashboard is a summarized view and a graphical representation of open and closed exceptions that were logged in the past. The supervisor can drill down to the specific details of an exception and resolve it by taking appropriate actions, such as assigning alternate resources, rescheduling job operations, placing problematic jobs on hold, and assigning shop floor status.
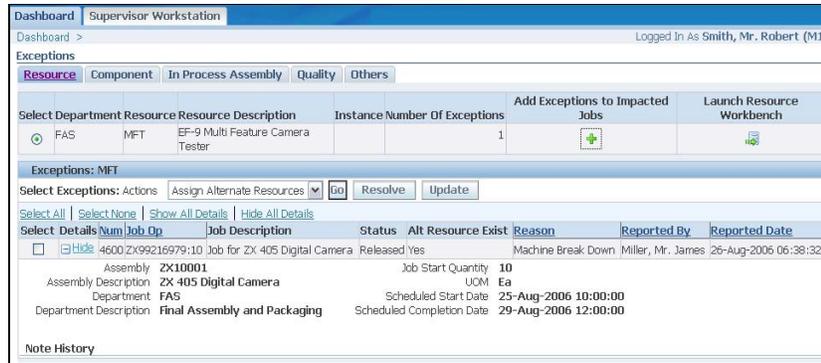
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Figure 11. Supervisors can undertake many actions for resolving shop floor exceptions

Supervisors have the ability to resolve several related exceptions at once, and also on a case-by-case basis. In addition, the supervisor can associate an exception with all the jobs that may be impacted by it.

Capacity, Component, Labor availability / Shortages

The Capacity Shortage view in the dashboard highlights available versus required resource capacities and shortages by shift and at-risk job operations for which projected completion time exceeds shift end or scheduled completion time.

Figure 12. Shop floor progress information based on Operator, Work order, component availability / shortage

Supervisors also have the ability to navigate to specific tabs providing information on Component shortages, labor availability as well as work order status.

Component Shortages – The supervisor is provided with a material centric view of the shop floor. Shortage of components is displayed for an upcoming shift. The supervisor also gets to know the impacted jobs because of the component shortage.

Labor availability – Operator Availability tab in Supervisor dashboard provides information about availability of operators for a shift. MES for Discrete manufacturing integrates with time and attendance systems and displays operator availability based on attendance reporting. The supervisor can look at the availability based on a department, resource or employee. This helps the supervisor to schedule work based on available resources.

Work Order status – The supervisor gets a work order centric view of material and resource availability from this tab. He can then plan his schedule according to availability.

This helps the supervisor to proactively manage shortages by taking appropriate actions.

Current Shop Floor State View

An alternate view in the Supervisor Dashboard displays the status of current jobs running, the machines on which they are running, operator's name, and projected completion time.

MES Supervisor Workstation

By logging into the MES Supervisor Workbench, supervisors can access the Supervisor Workstation to perform activities, such as reviewing and reordering dispatch lists, expediting a "hot" customer order, reporting resource usages for multiple jobs en-masse, and reviewing historical transactions. The MES Supervisor Workbench is similar to the MES Workstation for operators, with additional privileges for supervisory functions.

Figure 13. Many supervisory functions such as expediting and reordering the dispatch list can be performed in the Supervisor's Workbench

Expediting Jobs

Supervisors can expedite a job operation to the top of the dispatch list using a simple button to react to situations such as a rush order. Expedited jobs are indicated in the dispatch list by a specific icon.

Reordering Dispatch Lists

Supervisors can also exercise the reordering capability to specify the order in which the jobs must be queued for manufacturing, based on several criteria such as schedule group and build sequence. The criteria for reordering can be chosen and configured through the workstation parameters.

Reporting Resource Usage

Supervisors can report time based and non-time based resource usages for multiple jobs through a single user interface. This is beneficial in situations where resource usages are reported in specific intervals of time and only authorized personnel such as supervisors can perform such transactions.

Figure 14. Reporting resource usage enmasse through the Supervisor Workstation

Viewing Historical Transactions

Supervisors can review all job transactions performed to date, at a single place without navigating to multiple screens.

Figure 15. All transactions related to a Job can be reviewed from a single screen

Flexibility and Configurability for Deployment Needs

Manufacturing Execution System for Discrete Manufacturing is flexible and configurable depending upon the deployment needs of an enterprise. Thirty-six parameters can be set at the site, responsibility, organization, and department levels to control the user interface layout, content, application performance, and security.

For example, the criteria for ordering jobs in the dispatch list for a particular plant could be different from another. Or, it may be mandatory for operators to use a badge ID while performing move transactions in one department, but another may choose not to enforce this restriction.

Since customers utilize different methods to perform validation outside of Oracle MES, custom hooks has been provided, where they can plug in their custom logic and the status is communicated to Oracle MES.

Since there is no "one-size-fits-all" MES solution, the Oracle solution provides flexibility and configurability to meet the needs of various manufacturing environments. It is best suited for, though not limited to, manufacturing environments that have low to medium production volume with high product mix,

Deploying Manufacturing Execution System for Discrete Manufacturing as your shop floor execution system helps you to achieve the following:

- Improved productivity and efficiency
- Increased shop floor visibility
- Fulfill regulatory compliance needs
- Reduced costs of ownership
- Reduce integration cost and complexities

RELATED PRODUCTS

- Discrete Manufacturing
  - Work-in-Process
  - Quality Management
  - Project Manufacturing
  - Inventory
  - Bills of Material
  - MRP
  - Cost Management
  - Configure-to-Order
- Advanced Planning and Scheduling
- Production Scheduling
- Daily Business Intelligence

have relatively light machine automation layer, and are in the process of going paper-less on the shop floor.

Reduce Costs and Integration Headaches

Enriched with deeper execution capabilities, the choice of the Manufacturing Execution System for Discrete Manufacturing as the shop floor execution system eliminates the need for most customers to opt for a 3rd party or a homegrown MES system. In addition to satisfying the basic manufacturing execution requirements, it also helps in removing manual processes and non-value added activities for shop floor supervisors and operators. Since the Manufacturing Execution System for Discrete Manufacturing is an integral part of the E-Business Suite, there are no additional costs associated with implementing, integrating, training, and maintaining a third party MES product. This reduces the total cost of ownership and helps in standardizing your plant systems.

Conclusion

Oracle Manufacturing Execution System for Discrete Manufacturing helps discrete manufacturing businesses by providing enhanced shop floor execution capabilities, improving productivity and efficiency, enhancing visibility into shop floor processes, managing exceptions proactively, and providing high degrees of flexibility and configurability.

With the addition of Manufacturing Execution Systems, discrete manufacturing companies will now find Oracle Applications as a one-stop-shop for managing their manufacturing operations with an integrated solution that is readily deployable and available off-the-shelf.

Contact Us

For more information about Oracle Work in Process, please visit oracle.com or call +1.800.ORACLE1 to speak to an Oracle representative.

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