

# ORACLE MANUFACTURING EXECUTION SYSTEM FOR DISCRETE MANUFACTURING

## KEY FEATURES

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.

Select Job Op	Ready	Action Name	Start Date	Assembly	Total Qty	Op	Prior	UOM	Exception	Customer	Shift	Complete	Scrap
2099216976.10	✓		25-Aug-2006 09:30:00	ZX10001	10	Ea				Imaging Innovations, Inc.	3		
2099216978.10	✗		25-Aug-2006 09:45:00	ZX10001	10	Ea		(Multiple)			3		
2099216979.10	✓		25-Aug-2006 10:00:00	ZX10001	10	Ea				SmartBuy	3		
2099216980.10	✓		25-Aug-2006 10:15:00	ZX10001	10	Ea					3		
2099216981.10	✓		25-Aug-2006 10:30:00	ZX10001	10	Ea				Bigmart	3		
2099216982.10	✓		25-Aug-2006 11:15:00	ZX10001	10	Ea					3		
2099216983.10	✓		25-Aug-2006 12:00:00	ZX10001	10	Ea				Imaging Innovations, Inc.	3		
2099216985.10	✓		25-Aug-2006 12:30:00	ZX10001	10	Ea				Bigmart	3		
2099216986.10	✓		25-Aug-2006 13:00:00	ZX10001	10	Ea					3		
2099216987.10	✓		25-Aug-2006 13:30:00	ZX10001	10	Ea				Bigmart	3		

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

- Reorder dispatch lists
- Report resource usage
- View Historical Transactions
  - Access Gantt Charts

**FLEXIBILITY AND CONFIGURABILITY**

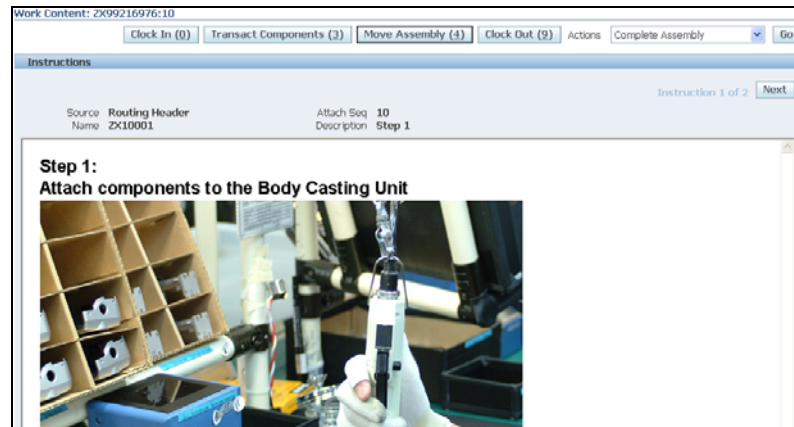
- Control UI layout, content, system behavior, and security through 36 parameters
- Configure at site, role, org, and department levels
- Hooks for custom business rules

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”.



**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.

**Move Assembly: Detail**

Job ZX99216976      Job Description Job for ZX 405 Digital Camera      Reported By Miller, Mr. James

Assembly ZX10001      Assembly Description ZX 405 Digital Camera

\* Indicates required field

**Transaction Detail**

**Manual Resources**

Select Time Entries:  |

Select All | Select None

Select Op Seq	Resource	Instance	Start Time	End Time	Total Qty	UOM	Charge
<input checked="" type="checkbox"/>	10	OPERATOR 1	Miller, Mr. James	26-Aug-2006 19:45:00	0.012777	HR	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	10	MFT		26-Aug-2006 19:45:00	13.74833	HR	<input checked="" type="checkbox"/>

TIP 26-Aug-2006 19:45:00

**Quality Plans**

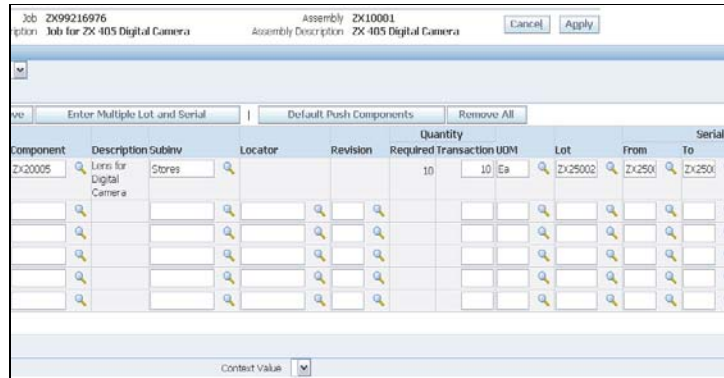
Expand All | Collapse All

Focus Plan Name	Information	Mandatory	Completed	Attachments	Duplicate	Update	Delete	Add Child Data
FINAL ASSEMBLY COLLECTION PLAN	Final Test Collection Data	No	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>

**Backflush Components**

Select Component:  |

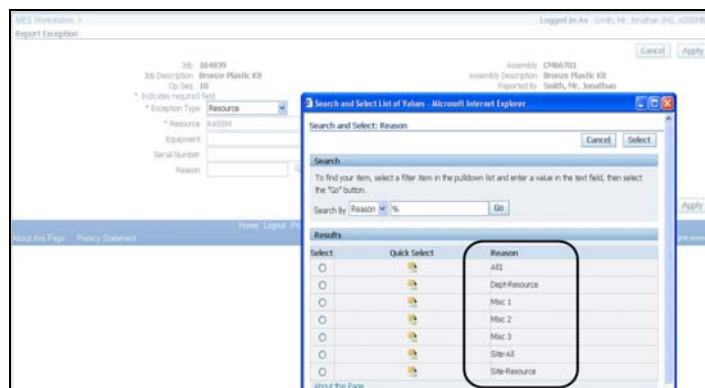
**Figure 5. Operators have the ability to report work hours, quality results, component backflush details all through a single screen**



**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

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

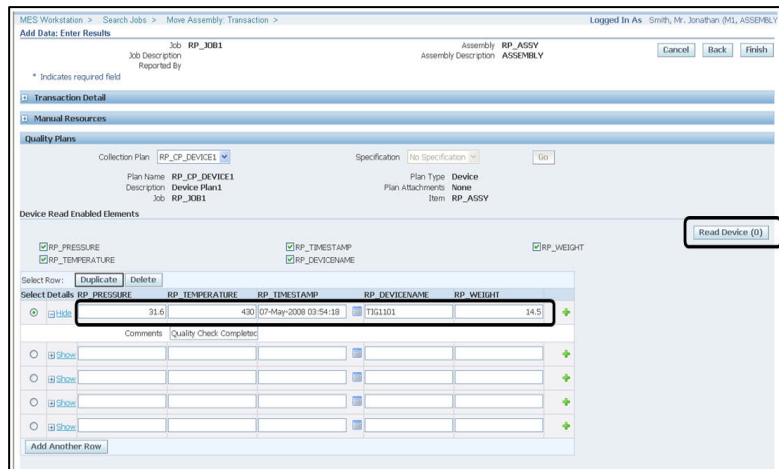
**Shop floor Device and Test Equipment Integration**

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

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.

Select Job Op	Serialized	Status	Ready	Action	Name	Start Date	Assembly	Total Qty	Prior
249769:10	↓	Released	✓	🔍		20-Mar-2008 05:00:00	IF-SERIAL1	8	Ea
249773:10	↓	Released	✓	🔍		20-Mar-2008 05:00:00	IF-SERIAL1	1	Ea
AD_J082:10	↓	Released	✓	🔍		21-Mar-2008 05:00:00	SB10299	10	Ea
AD_J083:10	↓	Released	✓	🔍		21-Mar-2008 05:00:00	SB10299		
AD_J084:10	↓	Released	✓	🔍		21-Mar-2008 05:00:00	SB10299		
ad_j086:10	↓	Released	✓	🔍		21-Mar-2008 05:00:00	SB10299		
ad_j086:20	↓	Released	✗	🔍		21-Mar-2008 05:11:00	SB10299		
AD_J081:10	↓	Released	✓	🔍		21-Mar-2008 05:00:00	SB10299		
nt-dupserasm1:10	↓	Released	✓	🔍		30-Mar-2008 22:00:00	nt-dupserasm		
nt-dupserasm2:10	↓	Released	✓	🔍		30-Mar-2008 22:00:00	nt-dupserasm		

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.

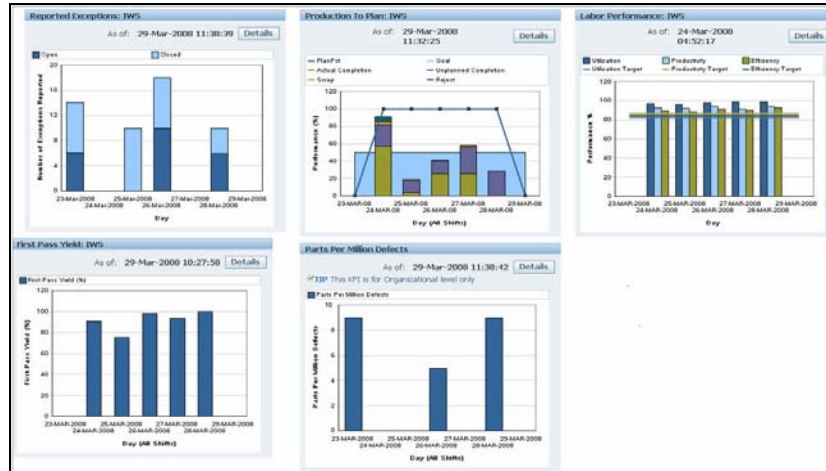
### Enhanced Shop floor Visibility and Control through the MES Supervisor Workbench

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

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

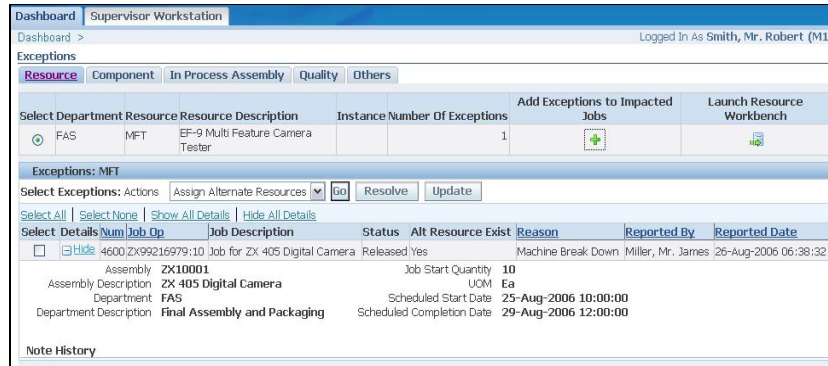
A typical production shop may have many metrics that are monitored for ensuring good productivity and quality, and for developing better processes. The MES Supervisor dashboard provides prebuilt shop floor metrics in a graphical format with drill-down capabilities to view details. This is one of the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

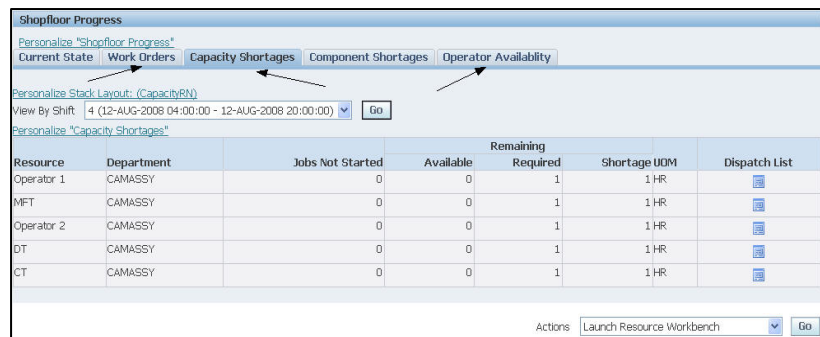


**Figure 11. Supervisors can undertake many actions for resolving shop floor exceptions**

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.

The screenshot shows the Supervisor Workstation interface. At the top, it displays 'Logged In As Smith, Mr. Robert (911)'. Below this, there are filters for Department (FAS), Resource, and Instance (All). A 'Dispatch List' dropdown is set to 'Current'. A date range is shown from 'From Date' (example: 25-Aug-2006 13:45:00) to 'To Date' (25-Aug-2006 14:00:00). Below the filters, there are buttons for 'View Options', 'More Options', 'Select Job Op: Badge', 'Move Assembly (4)', 'Expedite', 'Actions', 'View Work Content', 'Go', and 'Reorder List'. The main table displays the following data:

Select Job Op	Ready	Action Name	Start Date	Assembly	Total Qty	Prior	UOM	Exception	Customer	Shift	Status
ZX99216989.10	✓		25-Aug-2006 12:00:00	ZX10001	10	Ea			Imaging Innovations, Inc.	1	Released
ZX99216980.10	✓		25-Aug-2006 10:15:00	ZX10001	10	Ea				1	Released
ZX99216981.10	✓		25-Aug-2006 10:30:00	ZX10001	10	Ea			Bigmart	1	Released
ZX99216982.10	✓		25-Aug-2006 11:15:00	ZX10001	10	Ea				1	Released
ZX99216985.10	✓		25-Aug-2006 12:30:00	ZX10001	10	Ea			Bigmart	1	Released
ZX99216986.10	✓		25-Aug-2006 13:00:00	ZX10001	10	Ea				1	Released
ZX99216987.10	✓		25-Aug-2006 13:30:00	ZX10001	10	Ea			Bigmart	1	Released
ZX99216979.10	✓		26-Aug-2006 00:24:00	ZX10001	10	Ea			SmartBuy	1	Released
ZX99216970.10	✗		25-Aug-2006 09:45:00	ZX10001	10	Ea		(Multiple)		1	Released

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.

Job	Assembly Op Seq	Resource	Instance	Start Time	End Time	Total Qty	UOM	Charge
ZX99216976	ZX10001 10	OPERATOR 2	Stevenson, M	26-Aug-2006	26-Aug-2006	5.002777	HR	
ZX99216981	ZX10001 10	RG908				2	Ea	

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.

Date	Reported By	From Op Step	To Op Step	Dept	Qty	Overcompletion	UOM	Scrap Account	Reason	Updated
26-Aug-2006 06:45:00	Stevenson, Mr. David	30 Queue ZX03	FAS 30 To move	ZX03	FAS	9	Ea			MFG
26-Aug-2006 06:44:39	Stevenson, Mr. David	20 Queue ZX02	FAS 30 Queue	ZX03	FAS	9	Ea			MFG
26-Aug-2006 06:29:07	Miller, Mr. James	10 Queue ZX01	FAS 10 Scrap	ZX01	FAS	1	Ea	01-580-7740-0000-000		MFG
26-Aug-2006 06:29:53	Miller, Mr. James	10 Queue ZX01	FAS 20 Queue	ZX02	FAS	9	Ea			MFG

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,

## KEY BENEFITS AND RELATED PRODUCTS

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](http://oracle.com) or call +1.800.ORACLE1 to speak to an Oracle representative.

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