

Manufacturing executive system in the **ETO World**

The engineer-to-order manufacturing plants have developed into modern service centres. In the rapidly changing environments, flexible MES giving control of production needs to be optimised...



Thomas R Cutler

Manufacturing execution system or MES is a technology solution of functions designed to ensure real-time control of the production processes. It also includes the transformation of logistic information into process control data.

According to Randy Richel, President of Trakware Systems, Inc., implementing ETO (engineer-to-order) MES (manufacturing execution system) is a first step in achieving benefits such as:

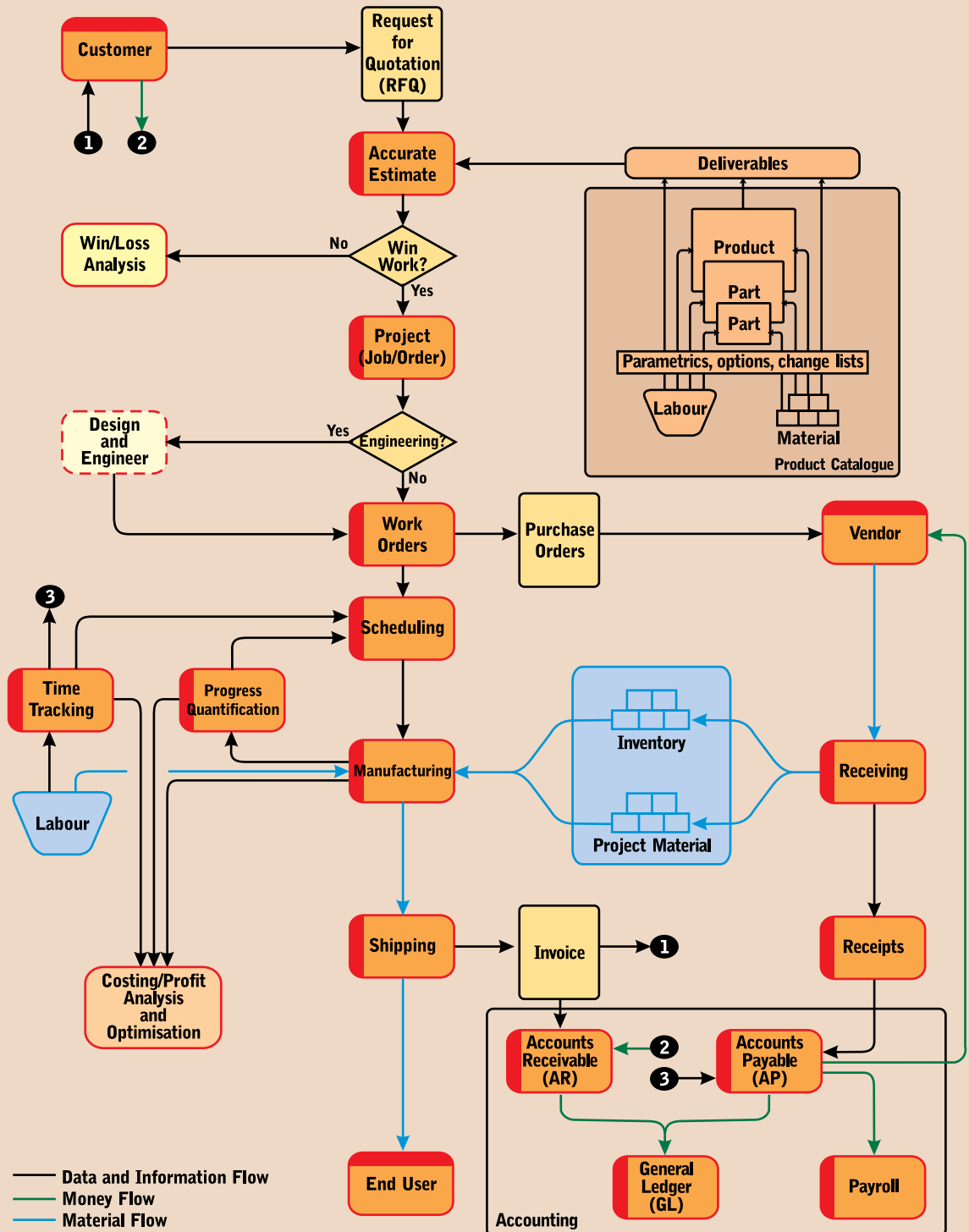
- Optimising asset utilisation
- Increasing overall equipment effectiveness
- Maximising Return on Investments (ROI)
- Improving product quality and operator empowerment
- Reducing costs, scrap, cycle time, lead time, work in progress and data entry time

The core value of MES technology is closing the control loop. This includes sending order-related data to the shop floor and receiving feedback from the shop floor data on how the production process is running. MES allows personnel to act on any interruptions in the production process and happens on every level on the factory floor, from the operator checking the quality sample of the current product being manufactured to the operations manager checking the weekly yield and performance. Real-time data is the key.

MES in the ETO world

According to the ETO Institute, the term engineer-to-order (ETO) denotes a style of manufacturing rather than a specific industry segment. Other synonymous terms are 'project-based' or 'custom' manufacturers. ETO companies typically have distinct characteristics about the

Manufacturing, Planning, and Control (Simplified)



way they conduct business that differentiate them from discrete or repetitive manufacturers.

ETO companies build unique products designed to customer specifications. Each product requires a distinct set of item numbers, bills of material, and routings. Estimates and quotations are required to win business. Products are complex with long lead times, typically months or even years. Unlike standard products, the customer is heavily involved throughout the entire design and manufacturing process. Engineering changes are a way of life. Material is purchased not for inventory but for a specific project. All actual costs are allocated to a project and tracked against the original estimate. Once complete, the product is typically installed at the customer's site. In most cases, aftermarket services continue throughout the life of the product.

These capabilities are the prerequisites for profit-yielding and customer-oriented companies. The ETO manufacturing plants of today have developed into modern service centres. Economic efficiency of modern added value is not a property of products alone but of the process. Decisive potential in business now is a question of process capability, rather than merely production capability. Process capability in the ETO environment requires real-time systems for optimisation.

Only modern Manufacturing Execution Systems designed for the ETO one-of-a-kind process offer real-time applications; generating current as well as historic mappings of production facilities can be used as basis for optimisation. Increasing complexity in production requires an integrated view of the production and service facilities: detailed scheduling, status collection, quality, performance analysis, tracing of material has to be recorded and displayed in an integrated way.

Standardisations for MES in the ETO process are already being developed, like ISA S95. Expectations regarding MES are high, related to TQM, Six Sigma, production scheduling or optimised material movements.

Integrated solution for Manufacturing, Planning, and Control (MPC) functions:

- estimating
- order entry
- project execution
- scheduling
- shop floor data collection
- purchasing/receiving
- shipping/invoicing
- job costing
- financial analysis
- accounting

The given simplified illustration represents a typical MPC process. Individual businesses will have variations on the processes outlined.

Richel noted that, "Manufacturing Execution Systems delivers on the promise of continually improving and controlling the shop floor functions. Rich in functionality, but low in complexity, MES system provides real-time control without excessive investment in consulting or IT resources. These MES solutions for project-based manufacturers are often integrated with the remaining manufacturing systems to ensure smooth, automated information flow throughout the organisation."

MES functionality often includes the following:

Shop floor scheduling

- Flexible calendars: By company, facility, plant, department; Schedule work time, holidays, shifts
- Optimise scheduling of work: Finite forward loading
- Real-time schedule management: Resolve problems and bottlenecks; Schedule change simulations; Commit changes in real-time

Electronic dispatch

- Dispatch jobs to work centres online: Prioritised work sequence; Authorised jobs only; Real-time control
- Improve shop floor communication: Immediate update of schedule changes in system
- Online job reporting: Paperless shop floor

Shop floor data collection

- Efficient shop floor data collection
- One-step on/off flexibility: Groups, multiple jobs; Automate routine transactions; Reduce employee clock activity
- Detailed punch history: Grievance resolution
- Open Device Interface: Utilise latest data collection hardware; High speed, high volume; Fault-resistant
- Unlimited user defined fields

Time and attendance

- One-step clock in/out
- Flexible grace periods
- Monitor long lunches and breaks
- Company Policy Enforcement
- Document tardiness and early departures
- Group/employee tracking
- Online review/approval process
- Automatic attendance points
- Feed information direct to Payroll
- Employee badge compatible
- Union rule compliance

Detailed expense management

- Detailed information capture: By job/work order; Labour hours/expense; Completed/Scrap quantities

- Detailed expense to General Ledger
- Productive vs. Unproductive time

Shop floor labour management

- Real-time inquiry/update
- Unlimited history
- Status inquiry/reporting: No-shows; Current task; Schedules
- Management by exception: Exceptions automatically identified
- Automatic reconciliation: Actual to schedule; Actual to tasks reported
- Real-time problem resolution
- Customisable warnings and halts: Advanced security; By department, supervisor, salaried versus hourly

The real value of MES systems is the data that is automatically converted into actionable information. MES benefits include:

- Reduces the cost to collect information
- Increases timeliness and accuracy of information
- Enables better production decisions and more accurate customer commitments
- Helps you better execute the production schedule
- Offers real time order status
- Allows you to respond to unplanned events
- Tracks the costs and reasons for scrap and rework
- Prevents excess WIP

Improved decision-making for all departments including operations, manufacturing management, sales, engineering, shipping, and purchasing are vital when ETO manufacturers operate on margins and billing based on manufacturing progress. Properly designed MES infrastructures provide a centralised and synchronised backbone for all plant information systems.

Richel asserts, “It is critical to promote the exchange of best-practices, strategies and innovation in managing manufacturing operations, manufacturing quality and in achieving plant-floor execution excellence. Providing flexible Manufacturing Execution Systems that give organisations visibility and control of production must also be optimised for the rapidly changing ETO production environments.”

ETO manufacturers are required to produce constant product yield improvements with so many business directives tied so closely to the bottom line; the availability of live information direct from the floor is critical to reducing re-processing rates and increasing the production of high-quality, deliverable product. Visibility of equipment usage and availability enables ETO manufacturers to make instant adjustments to maximise the use of existing resources. Real-time WIP (work-in-progress) visibility at each work center minimises set up; standardised process definition and management can substantially increase first-pass yield, and make it possible to quickly increase capacity with the same resources. **2.0**

Thomas R. Cutler is the President & CEO of Fort Lauderdale, Florida-based TR Cutler, Inc., the largest manufacturing marketing firm worldwide – www.trcutlerinc.com. Cutler is the founder of the Manufacturing Media Consortium of three thousand journalists and editors writing about trends in manufacturing. He is also the author of the Manufacturers’ Public Relations and Media Guide. He is a frequently published author within the manufacturing sector with more than 300 feature articles authored annually; he can be contacted at trcutler@trcutlerinc.com.