

## Managing Shop Floor Chaos in Today's High Speed of Change

By Ralph Rio

### Summary

The future is unpredictable and getting more unmanageable as the speed of business continues to increase. The horizon for a viable forecast continues

Are you reacting or are you preparing? On the plant floor, there is more to track with a higher rate of change that is beyond the capability of many current systems. An object-oriented software architecture is needed to manage current conditions with a look into the near future for problem prevention.

to shorten which requires decomposition of activities into smaller pieces or agents. Ideally, each agent represents a resource or small group of resources similar to your actual manufacturing resources. The software agents can interact in a distributed fashion to respond to change quickly. Then, your MES application can improve, rather than thwart, your ability to respond to today's high speed of business.

### Increasing Speed of Manufacturing

Per a recent survey by ARC Advisory Group, the purchase of a MES (manufacturing execution system) is nearly always driven to relieve "pain" (i.e. solve a problem) rather than to achieve a financial return on investment (ROI). Usually there is deterioration in meeting customer promised delivery dates and a growing finished goods inventory. Essentially, the business changed over time and Work-In-Process (WIP) can no longer be managed with a plan based on a forecast or manual methods.

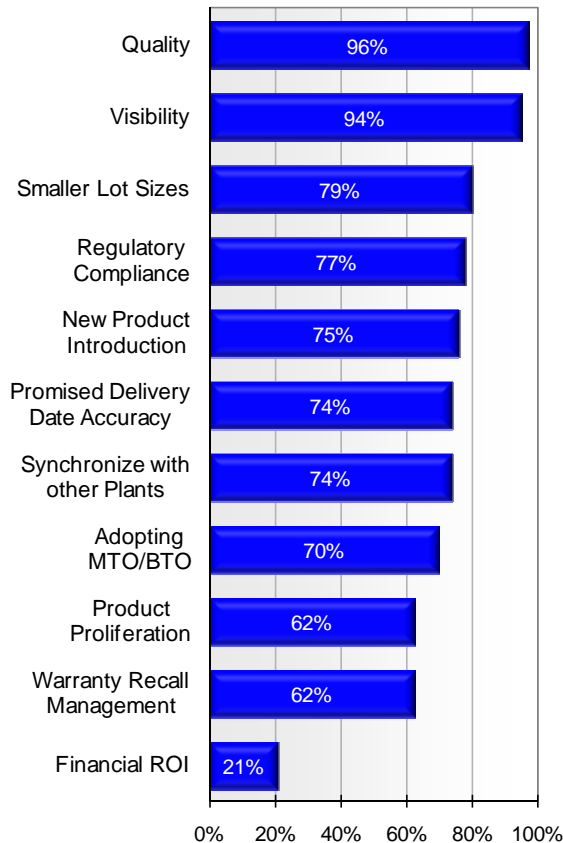
A combination of factors makes the life of plant management difficult. First, there is product proliferation with an expanding set of options and configurations to meet the needs of diverse and focused individual market segments. Also, to sell regionally and globally, there is part number and stocking unit (SKU) proliferation. Simple examples are packaging variations for size and promotions; or variations for government standards.

Second, is the increasing number of lots. Even though the overall business may be growing, the variety causes the volume for any one product or SKU to decrease. In turn, the lot or batch sizes become smaller while the quantity of lots and batches grows proportionately larger. Many are adopting a



Lean program which further reduces lot size while growing the number of lots. If the average lot size decreases by a factor of 10, then there is a 10 fold increase in the number of lots to keep track of.

A third factor is shortening lead times. Your customers are also experiencing these types of changes. They need shorter lead-times so they can respond to rapidly changing customer needs and mix.



### Key Reasons for Acquiring a MES

ARC Survey of 53 Discrete Manufacturers  
Q4 2007 to Q1 2008

These three factors combine to create an environment where there is more to track with a higher rate of change. Now, here is where these factors unite to become excruciatingly painful:

A) With more SKUs, there are more items to forecast. For each item, what was built based on the forecast and what is actually ordered are different. These forecasting errors accumulate and drive up finished goods inventory. Increasing inventory hurts management's metrics.

B) This difference between forecast and actual orders also reduces the portion of inventory available for delivery at the customer promised date. The corresponding lower on-time shipment also hurts management's metrics.

C) Shorter product lifecycles cause faster inventory obsolescence with write-downs or discounts to move the inventory caused by forecasting errors. As SKUs and inventory increase, this financial impact grows. The increasingly negative financial burden again hurts management's metrics.

This pain drives change in either executive turnover or business processes.

### Visibility

To help manage the increasing chaos and improve the internal processes, visibility into plant floor operations is needed. Visibility is a term that could easily become superficial and needs definition to provide the specific-

ity needed for guiding the purchase of a MES. The American Heritage Dictionary provides a good start and defines visibility as:

- a) The capability of being easily observed
- b) The capability of providing a clear, unobstructed view

For a MES, the "easily observed" includes exception reports that highlight issues. An example would be a list of orders that are behind schedule, or operations that are scheduled beyond their capacity. This kind of information

#### Visibility Timeframes

Real-time, i.e. within 15 minutes

Queue in front of the operator

A few shifts or days ahead

Historical data for off-line analysis

#### Visibility for MES - When

helps people identify an issue so they can take corrective action before it becomes missed customer deliveries.

This "easily observed" extends to ad-hoc queries. Not all issues can be anticipated. A custom set of information will be needed to aid in decision making for unusual issues. Report generation tools need to be easy to use for anyone, even an executive, can use them.

The "unobstructed view" includes real-time information, i.e. the current status. During ARC's research, end-users have told us that, for MES, "real-time" means current within 15 minutes.

#### Visibility for Resources

Materials, mainly Work in Process

Equipment capacity and capability

Tooling status and availability

Operator availability and skills

#### Visibility for MES - What

One can go beyond current data and peek into the future a little. Knowing the status along with the capability of the equipment, materials, people and tooling allows for anticipation of events that are about to unfold. The "unobstructed view" needs to extend into the future so that people can prevent problems from occurring. For an MES, this includes the queue in front of an operator and a few shifts ahead (more or less depending on cycle times).

This peak into the near future - a few shifts or days - has particular relevance for identifying the production bottle-neck for materials, equipment, tools and people. As conditions change (especially for high mix production), the bottle-neck moves. Many bottlenecks are temporary and not visible via traditional longer-term planning tools, i.e. ERP. The MES needs to look forward to anticipate the bottle-neck so it can be prevented. Production planners conduct what-if analysis by simply adjusting a resource to determine the schedule that removes the bottle-neck.

## Last Word

Are you reacting or are you preparing? Consistency is needed between your current speed of business and the ability of your production management software to respond, i.e. to manage the chaos. For businesses with high product mix and shortening lead-times, visibility has become critical for production management. This visibility is more than just information for reacting to an issue. It needs to provide a look ahead to anticipate issues so you can fix them before they become painful. An Object-oriented architecture for production management software provides the foundation to meet these dynamic needs. It allows manufacturers to move from deterministic model based on a forecast with set lead-times and routings, and to a responsive model based on real demand and resource availability that looks ahead to avoid issues.

## About nMetric

nMetric® provides software for production management that has the architecture needed to be responsive for the dynamics of a high mix production environment. nMetric has designed their software to represent the resources as objects. Each element - lot of materials, equipment, tooling and people - is optimized using a non-linear, probabilistic regression. For those of you who are not math majors, this is somewhat like how a GPS or Google Maps finds a route, but with the addition of real-time adjustments for traffic congestion. Imagine a GPS in your car that responds with a new route when an accident occurs or when rush-hour traffic is likely. Their Smart Jobs™ provides the objects with the information needed to route and execute a job or lot.

As high-mix production becomes more common and as your lead-times shorten, the associated dynamic complexity, i.e. chaos, is driving the need for a new approach to software for production management. nMetric's Smart Jobs provides the needed visibility into current conditions and anticipates the near future. This type of architecture helps high-mix production move to a make-to-order business model.

*This paper was written by ARC Advisory Group on behalf of nMetric. The opinions and observations stated in the paper are ARC's. For further information or to provide feedback on this paper, please contact the author at [rrio@arcweb.com](mailto:rrio@arcweb.com).*