

Manufacturing's Five Golden Metrics

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One widely discussed aspect of lean manufacturing is performance measurement. This makes sense because it is probably the most important element of manufacturing management. You get what you measure. Because most companies measure performance by metrics based in traditional accounting principles, they get traditional -- that is to say, not very lean -- results.

The accounting system is usually built around standard costs with labor or machine hours as the driver, so labor efficiency and machine utilization metrics are the norm. The accounting system rewards production volume with "earned hours," which in turn earn labor, material and overhead dollars in flexible budgeting schemes. This leads to good direct labor efficiency, high machine utilization and a lot of production -- and a lot of inventory, high overhead expense and not necessarily very good quality.

The flaw in most performance measurement schemes is a failure to differentiate between metrics that measure overall process or value stream outcomes, and metrics of events and activities at isolated points along the value stream.

For example, in traditional manufacturing measurement, most of the emphasis is put on labor efficiency. Companies track labor efficiency or productivity in great detail, and monitor the numbers closely at the highest levels of the company. However, labor efficiency is a meaningless number by itself. Although it is often treated as the primary driver of overall cost and is measured as a surrogate for cost, it is not the total cost. There can be no substitute or surrogate for measuring total cost.

Management focus must be on total cost, and metrics such as labor efficiency and machine utilization should only be data points that shop-floor managers can use or not as they see fit to help them attain lowest total cost.

The same is true with many quality metrics. First-pass yield, rework percentages and scrap rates are all potentially useful pieces of information for shop-floor managers. None of them, however, can stand as substitutes for the final quality performance of the value stream. Only quality metrics from the eyes of the customer can do that.

Even the most basic manufacturing operation is extraordinarily complicated. Factories have thousands, perhaps millions, of variables moving around at the same time. Just about every event has multiple drivers. Actions taken to optimize one variable often come at the expense of another. Performance metrics at the activity level can be traded off against other measures of performance. Labor efficiency can be increased to the detriment of quality; machine utilization can be maximized in the short term to the detriment of the life of machines; delivery performance can be increased to the detriment of inventory levels and overhead expenses.

Management cannot possibly measure thousands of variables with equal attention and diligence. When one or two are elevated to the top -- treated as overall process outcome metrics rather than event metrics -- the motivation to optimize those few variables is created, usually to the detriment of variables not elevated to high-level status.

There are five golden metrics that really matter: total cost, total cycle time, delivery performance, quality and safety. All others are subordinate. Activities and efforts in manufacturing that result in improving one or more of these performance measurements, without degrading performance to any of the others, support good performance. Actions resulting in improvements to subordinate metrics but not to any of these five are meaningless.

Total cost

The only meaningful measurement of total cost is on a cash basis. All money spent on manufacturing must be summarized and the total compared to the previous period -- not to a flexible budget or a plan. What matters is whether the total cash spent on manufacturing was more or less than it was in the previous period. It is important that this cost figure is exclusive of all allocations, and does not exclude sales, general and administrative expense.

The only exceptions are that major capital investment spending is excluded, and expenses are adjusted for accounts receivable and payable. While these amounts must be added back in to create a total lean-accounting-based income statement, manufacturing performance should be measured as if payment were made at the time materials and services were delivered, and payment were collected at the time finished goods were shipped to an outside customer.

Total cycle time

Total cycle time is calculated by studying major purchased components and determining the total days on hand of each one. The total days on hand is the sum of all of such components in the plant regardless of form -- still in its original purchased state, embedded in assemblies or subassemblies, in a modified state in work-in-process inventory, or embedded in a finished product.

That total days on hand figure is divided by the planned shipments per day for all products that require that component. For example, if there are 5,000 of a component in the plant in all its various forms, and it goes into two final products that are each projected to ship 100 per day, the cycle time for that component is $5,000/200 = 25$ days. The total cycle time for the plant or for an individual value stream within the plant is the cycle time of the component with the greatest cycle time.

It is important to note that only low-cost, bulk items can be excluded from this calculation, and that the total cycle time is not an average cycle time, nor is it weighted in any way for the cost of the component. This is a measure of manufacturing performance -- not financial inventory.

Delivery performance

Delivery performance is the percentage of customer orders shipped when the customer requested them to be shipped. It should not be modified to accommodate company policies or shipping promises. It is purely a metric of manufacturing's ability to meet customer requirements.

Quality

What is meant by quality will vary by company, but it must be quality in the eyes of the customer. As a result, customer returns or warranty claims are typically the basis for this metric. It is not a summary of internal quality metrics. It is important to realize that those metrics are only important to the extent that they provide information management can use to minimize cost, improve flow and meet customer quality requirements.

Safety

The standard metrics of accident/incident frequency and severity are sufficient.

These five measurements are manufacturing's bottom line. All efforts must be aimed at improving one or more of them without degrading performance of any of the others. All other performance metrics are subordinate and useful to management only to the extent that they help improve performance of one of the golden five.