

Performance Indicators for Maintenance

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Many companies are trying to optimize the use of their assets, and that means they are taking a closer look at the best ways to manage maintenance and measure its effectiveness.

Companies' focus on optimizing their assets involves virtually all parts of their organizations. However, since maintenance departments have the greatest impact on the condition and ultimately the capacity of assets, companies are looking especially for the best methods for managing maintenance.

Using Performance Measures

Performance indicators, properly used, highlight opportunities for improvement. They pinpoint "soft spots" in a company and point to needs for further analysis and ultimately to solutions to problems.



As indicated in Figure 1, companies should use multi-level indicators: 1) corporate-level strategic indicators, 2) financial performance indicators for particular departments or processes, 3) efficiency and effectiveness indicators that highlight what affects the financial indicators, 4) tactical-level indicators that highlight the functions that contribute to the efficiency and effectiveness of individual departments, and 5) measurements of the actual functions themselves.

Properly conceived indicators are constructed from the top down, not from the bottom up. The corporate indicators measure what is important to top management in order to satisfy the needs of the stakeholders or shareholders. That is, the corporate level indicators help an organization focus its efforts on supporting a company's direction.

While corporate indicators set the direction, the subsequent indicators must focus on supporting that direction. If these indicators are not related to corporate level indicators, the overall organizational effort is less than optimized, endangering the corporation's survival.

In short, all performance indicators must be tied to long range corporate business objectives. If a corporate indicator highlights a weakness, then the next lower level of indicators should give further definition and clarification to the causes of the weakness. When the functional performance indicator level is reached, the problem function should be highlighted. It will then be up to the responsible manager to take action to correct the problematic condition.

When the problem is corrected, the indicators, correctly monitored and recorded, will result in improvement

at higher levels.

Selecting Performance Indicators

Companies need to put in place performance indicators that become ingrained in the culture of the business. This approach presents both opportunity and challenge. The opportunity is for each department to connect its operation to the overall business strategies of the company. The challenge is to find indicators that allow this to be accomplished easily.

Again, the correct way to develop performance indicators is to work from the top or corporate level and develop indicators at each subsequent level. If the indicators are selected at the bottom and then built upward, they may be conflicting rather than supportive.

Indicators at the Various Levels

Corporate indicators are the long-term strategic measures that upper management uses for business planning. The window of planning is typically three to five years. Such indicators might include the following:

1. *Total cost to produce(manufacture)*. This indicator is a compilation of all the costs that it takes to produce a product. It is used to figure the profit margin.
2. *Total cost of occupancy*. This is a facility measure that is a compilation of all the costs it takes to occupy a facility.
3. *Return on net assets*. This is the profit earned compared to the net value of the company assets.

All of these indicators are important to the maintenance function since each of them makes maintenance a percentage of the cost. Also, each of these indicators is highlighted in the financial indicators.

Financial Indicators are the monitoring points used to ensure that a department is meeting the financial goals set in the strategic plan. These indicators are typically monitored on a monthly basis with annual roll ups. If the indicators do not comply with forecasts, then the analysis should move to the next lower level in the hierarchy. A list of the indicators that would be used to financially monitor the maintenance department appears below. No organization will use all of these indicators but will choose the ones that support the selected corporate indicators:

1. *Maintenance cost per unit processed, produced, or manufactured*. This is the maintenance cost divided by the volume of production. This indicator is common for measuring maintenance performance, although it is not one of the best. Production volumes may vary for reasons not under the control of the maintenance department. If the maintenance department is held accountable for this indicator, then poor decisions may be made related to maintenance strategies. This indicator should never be the sole performance indicator.
2. *Maintenance costs as a percentage of total process, production, or manufacturing*



costs. This indicator is a more accurate measure because the costs of manufacturing is a total calculation, not a per-unit calculation. This makes the indicator reasonably accurate for the financial measurement of maintenance.

3. *Maintenance costs as a percentage of sales dollars* is also a reasonably accurate measure.
4. *Maintenance costs per square foot maintained* is a useful measure for facilities.
5. *Maintenance cost per estimated replacement value of the plant or facility assets* is quickly becoming a standard in many markets. It is a reasonably accurate measure for both plants and facilities.

Each of the last four of these indicators treat maintenance as a percentage of a specified, generally fixed cost. Thus, all four make it easy to trend any increases over time, and in each case, if the percentage of maintenance costs increases, then the efficiency and effectiveness indicators should show what maintenance area caused the increase.

Efficiency and effectiveness performance indicators highlight customers' needs and services.

Effectiveness emphasizes how well a department or function meets its goals or company needs in terms of the quality of the service provided--viewed from the customer's perspective. In the case of maintenance, it might be the overall company satisfaction with the capacity and condition of its assets.

Efficiency is acting or producing with a minimum of waste, expense, or unnecessary effort. Efficiency compares the quantity of service provided to the resources expended. Is the service provided at a reasonable cost? Efficiency measures concentrate on how well a task is being performed. They concentrate on the correctness of the process and the production of required results.

Following are some examples of the efficiency and effectiveness indicators that might be employed for maintenance:

- Downtime caused by breakdowns
- Total downtime (expressed as a percentage)
- Direct cost of breakdown repairs
- Total direct cost of maintenance (expressed as a percentage)
- Percentage of work distribution (by type of work order)
- Emergency orders
- Preventive work orders
- Corrective work orders
- Total work orders

Tactical performance indicators monitor the functional indicators in a longer-term window, a quarterly or 90-day time frame. This window allows time for trends to develop, but it is short enough to allow changes to the maintenance processes before the efficiency and effectiveness of the maintenance organization is impacted by the annual financial performance indicators. Tactical indicators focus on the individual processes within the maintenance function. Optimizing one process may have a negative impact on other processes. This is the reason for efficiency and effectiveness indicators. They evaluate the overall maintenance func-

tion. A tactical indicator evaluates only one of eleven maintenance-specific processes:

- Preventive maintenance
- Stores and procurement
- Work flow system
- Computerized maintenance management
- Technical and interpersonal training
- Predictive maintenance
- Operation's involvement
- Reliability-centered maintenance
- Total productive maintenance
- Financial optimization
- Continuous improvement

Functional maintenance indicators are function specific. Each indicates how one of the eleven maintenance-specific functions is performing. The functional indicators highlight how well the parts of the function are performing in supporting the tactical issues.

The scenario below, "Focusing the indicators," while simplistic, shows that indicators must be linked to performance—either to a higher or a lower level on the indicator pyramid (Figure 1). Developing performance indicators requires using only indicators that connect to the corporate objectives. The use of non-connected indicators will obscure the real problems and the solutions required.

Focusing the Indicators

When a company strives to be the low-cost producer in its respective market, the corporate mandate is to keep costs low while ensuring the long-term viability of the company's assets. Each company function that contributes to the cost to produce a product must be as efficient and effective as possible. The tactical focus is one of ensuring the optimizing of the overall maintenance costs on a quarterly basis. The functional support focuses on the optimization of each component of the maintenance process.

Here's a scenario:

1. The corporate cost-to-produce indicator increases.
2. The factors making up the indicator area are examined. These would be the individual financial indicators for each of the factors making up the cost-to-produce indicator. Upon examination, the financial indicator--maintenance costs as a percentage of total manufacturing costs--is checked and found to have increased over the last quarter.
3. The efficiency and effectiveness indicators for maintenance are examined. Upon examination, the desired equipment uptime is found to have declined. It is below an acceptable level. The maintenance department is working overtime to cover breakdowns and equipment malfunctions.
4. The tactical indicators impacting the desired uptime are examined. As the indicators are





checked, the preventive-maintenance-compliance (percent completed) indicator is found to be lower than acceptable and trending downward.

5. The functional indicators for the preventive maintenance program are examined. The preventive-maintenance-tasks-overdue indicator is high and trending even higher. Upon review, it is found that equipment is not being released by production for preventive maintenance. This is hindering the execution of preventive maintenance services and leading to increased equipment breakdowns, lowering the uptime, raising maintenance costs, and impacting the cost-to-produce indicator.

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