Action-ready Analytics for Maintenance Management
Ramco DecisionWorks

White Paper

Background

Competitive markets are unforgiving to asset intensive organizations that cannot minimize breakdowns, resulting in loss of production. Maintenance managers must take control of their maintenance activities in response to these evolving pressures. The consequences of a slip are quite dire. Companies need to be far more proactive in their maintenance procedures.

We are, today, at a turning point in enterprise management. The new knowledge based economy has changed the economics of the business enterprise. The only thing constant is "Change". The known and usual management techniques are not appropriate anymore.

Hypothetical Case

This example elucidates the case of a Maintenance Manager "X" in Plant "Y". His past track record has been quite exemplary. Most of the maintenance tasks are as scheduled tasks and things have been brought under control. The Maintenance Metrics of the plant are considered as an internal benchmark. The Process Improvement Council often quotes the plant as reference. The plant has also been chosen as a pilot site for the implementation of the strategic initiative on Reliability Improvement.

Things couldn't be better!!

Unfortunately there has been a major upheaval in the market. The demand pattern has totally changed. The plant has added subcontracted labor to handle the increased demand. This has led to an increased incidence of maintenance issues. Every incident is being touted as a "Line Down" case. One has to indulge in a lot of fire fighting. Task allocation and scheduling is becoming extremely difficult to handle.

Additionally, the monthly review with the Process Improvement Council is due in a couple of weeks. Surely, the Maintenance Metrics will be hit. However, the exact impact is not known. Thanks to the continuous attention to operations, there hasn't been sufficient time for next month's planning. This might even affect the schedules for the next month.

To top it all, the month end also happens to be the quarter end. The quarterly review with the CEO's office is also coming up. All the efforts of the last one-year could be jeopardized, if this situation affects the Reliability Improvement initiative.

If only things were better!!!

How many of us face such situations in our day-to-day lives? There is enough and more material on the quantified benefits of focusing on key performance indicators, benchmarking, etc. Unfortunately, there is never sufficient time for planning.

Differing Requirements

What emerges very clearly in the above case is that, despite all the issues being managed by the same manager, the perspectives and their respective requirements are different.

From the operational perspective, the maintenance manager needs to be "On top" of the day-to- day operations in the shop floor. Any incidence should be intimated in "real time". The impact of these issues on planned activities and future plans need to be highlighted. Based on the impact, actions have to be taken to mitigate any "situation".

The perspective for the Process Improvement Council is primarily Tactical. Unlike the reactive role required for operations, the maintenance manager requires to play more of a proactive role. The maintenance manager needs a good mix of "lead" and "lag" performance indicators, which provide a clear picture of the maintenance process. In certain cases, he might even need to drill down into details and analyze the situation, along multiple dimensions and use some stochastic methods to perform some what if scenarios, to authenticate his judgment. Workflow processes also need to be in place, as planning generally has a specific approval and review mechanism in every organization.

Lastly, from the Strategic perspective, the requirements of the CEO's office would be to focus more on the processes in place for Reliability Improvement, rather than the execution. The tasks of planning and analysis are not required here, as they come under the purview of tactical planning. Evaluations of the processes in place for continuous improvement will provide more insight as to the general direction of the strategic initiative.

A Framework for Management

While the Strategic and Tactical perspectives are different, they are closely interlinked and influence each other. Operational issues can put tactical plans in jeopardy, which in turn will affect strategic initiatives.

Typically, people use methodologies like "Management by Objectives" or the "Balanced Scorecard" for Strategic Planning. There are different types of closed loop planning methods available for tactical planning. There are quite a few Business Activity Monitoring systems for operational execution, which talk of the "Zero Latency" enterprise.

Unfortunately as the actions impact each other, one needs to go from one system to another iteratively, to arrive at the right plan. This can be quite confusing.

A single framework, to address all these perspectives, would simplify matters and provide a lot of clarity.

Information and Action

Current business practices require that maintenance organizations employ measurement scorecards, to track and report company-wide operations and maintenance performance. Corporate operations and maintenance functions identify common measurements to track, by region and by plant. Placing most or all operations and maintenance management at the business unit or plant level enables companies to eliminate oversight costs.

These measurements provide high visibility to organizations. The common statement is "What is measured can be managed". Unfortunately, no organization has ever measured itself to excellence.

To convert visibility to action and to reduce/eliminate the latency in maintenance decisions, the information should be closely tied in with relevant actionable processes.

By actionable processes, we mean business rules, alerts, analysis and workflow processes. Typically, different business rules could be defined based on schedules or exceptional conditions to trigger alerts or workflow processes.

Maintenance analysis could then look at the relevant scorecards or drill down to details and perform multi-dimensional analysis or other 'what if' scenarios to arrive at the right action and initiate the relevant change management process.

Action Ready Analytics

While most maintenance management systems provide most of the above information and actionable processes in some form or the other, taking decisions can be quite cumbersome, as the quantum of information available is huge. Maintenance personnel need to go through multitudes of reports and metrics to find the relevant information they need.

The time period for actionable processes differs between tactical and strategic workflow processes. Hence, here again, one has to search for the relevant workflow process to initiate.

One advantage of a framework for Maintenance Management, for the strategic, tactical and operational perspective, is that it allows the maintenance manager to focus on the objective at hand, look at only the relevant information and choose from the few select actions.

This, in our parlance, is "Action-Ready Analytics".

Ramco DecisionWorks

Ramco DecisionWorks has been conceived as a one-stop shop for Maintenance Analytics. All relevant information required, to take decisions for a given objective, is provided in a single application.

Multiple performance frameworks are provided for the strategic, tactical and operational perspectives, while still maintaining a thread of commonality.

Ramco DecisionWorks is a workflow centric solution. It ties the information to relevant actionable processes, including business rules, scheduled triggers, rule based alerts and workflow.

The following objective specific information and actionable processes are mapped:

1. Metrics or Key Performance Indicators, to measure the performance of various facets of the goal. (Performance Management)

2. Relevant reports, drilldowns and cubes, to summarize / analyze the goal along multiple dimensions. (BusinessIntelligence)

3. Optimization models, to perform what-if/scenario analysis of decisions to be taken. (Business Analytics)

4. Workflow to handle flow of information and action, for the various business processes relevant to the given goal. (Business Process Management)

5. Business rules, to monitor critical events and initiate alerts / workflow for the given goal. (Event Management).

By associating the above information with the goal/objective, the information becomes actionable. Decisions taken on the basis of such relevant information can be more objective.

Maintenance Analytics

The Business Decision Framework forms the core of Ramco DecisionWorks. It consists of multiple views of performance management, from the strategic, tactical and operational perspectives.

From the strategic perspective, one can use the Balanced Scorecard (BSC) methodology, wherein a manager's sphere of control is split into four standard thrust areas, namely, Customer, Financial, Internal Business Process and Learning & Growth. Each thrust area, in turn, can have multiple Critical Success Factors.

The Reliability Improvement initiative can now be modeled as one of the Critical Success Factors, under Internal Business Process.

Reliability Improvement can be monitored, by reviewing a few Key Performance Indicators like:

• Asset Availability: This measures the business contribution of maintenance personnel, i.e., providing highly reliable equipment at the lowest possible cost.

• Maintenance Satisfaction Survey: Quarterly survey of attitudes towards maintenance, which measures the effectiveness of the communication on maintenance.

• Maintenance cost, as a percentage of plant estimated replacement value: A classic measure of maintenance cost, which drives cost reduction behavior without necessarily reinforcing the need for improved maintenance practices.

While there can be many more Key Performance Indicators, they need to be chosen, specific to the industry and the company in particular. The few select key performance indicators should capture, in a nutshell, the strategic intent for the given critical success factor for the company.

Additionally, reports and multi-dimensional drill downs specific to Reliability Improvement can be provided, to allow managers to access detailed information.

The above information, tied in with relevant actionable processes, would make for an excellent framework for strategic management of the given initiative.

Examples include:

• Scheduled Rules and Exception Conditional triggers, to alert the strategic process owner on any deviation, with the key performance indicators

• Workflow processes, for approval and review between members of the steering committee for Reliability Improvement

From the tactical perspective, the strategic critical success factor of Reliability Improvement can be broken down into a hierarchy of objectives, depending on the organization structure and the respective spheres of control. This hierarchy can be up to as many levels as existing in the given organization.

For example, in our case we can delve into more detail as follows:

• Reliability Improvement

  • Customer Service

  • Parts Management

  • Maintenance Effectiveness

    • Uptime Analysis

    • Downtime Analysis

  • Maintenance Efficiency

    • Maintenance Costs

    • On Time Delivery

Also, as we are now getting into more detail as compared to the strategic perspective, the time periodicity would also be more granular.

In the sample case, the periodicity of reporting Maintenance Metrics is monthly, when compared to the strategic review, which is quarterly.

For every single node in the above goal hierarchy, one can:

• Review the past performance with the help of scorecards, reports and multidimensional drill downs

• Improve the targets for the subsequent time periods

• Plan for the future, using multivariate stochastic techniques like forecasting, optimization, what if scenarios, etc

• Finally, execute the relevant transactions in the transactional maintenance management System

As Reliability Improvement has been broken down to more granular and meaningful objectives, it now becomes easier to analyze a particular objective.

For example, to analyze Maintenance Costs, typical key performance indicators could include:

• Maintenance cost to budget (by line): How are we doing in relation to how we said we would do? Variance reports show areas where problems might be developing.

• Maintenance costs per square foot: In an office, shopping center or apartment building, the maintenance cost varies with size rather than other measures. It is tough to relate maintenance costs to dollars sold in a department store or dollars of stock sold at a stockbroker's office. In these cases, the maintenance costs per size is the best item to track.

• Maintenance cost per unit output: In many industries, the maintenance cost is based on a single unit of output, for instance, it is calculated per car assembled or a hundred packages delivered or a thousand barrels of beer brewed and so on.

Similar to the balanced scorecard, even out here, one can define relevant reports, multidimensional drill downs and actionable business rules, alerts and workflows.

Additionally, at the tactical stage, there is a requirement to use multivariate stochastic techniques for planning. Ramco DecisionWorks, allows the Maintenance Manager to use methods like Forecasting, Optimization models and what if scenarios in the plan section.

Lastly, from the operational perspective, the execution in the transactional system on a near real time basis can be closely monitored. The Operational framework also utilizes the same goal hierarchy as the tactical framework.

Typical operation indicators for the objective of "Maintenance Costs" include:

• Overtime Emergency Hours / Emergency Hours

• Overtime DIN (Do It Now) Hours / DIN Hours

• Overtime Short Repair Hours / Short Repair Hours

Again, to manage things from the operational perspective, the time periodicity has to be more granular. Typically, maintenance managers would prefer to view operational indices on a daily or shift basis.

Bottom line

Enterprises, which are able to integrate their management processes, from the strategic to the operational level and vice versa, will not only be able to react faster to changes in their business environment and to execute strategies more successfully, they will also be able to make a quantum leap in operational efficiency and significantly reduce costs.