

Selecting key performance indicators for strategy

Measuring and using the right key performance indicators aligned with specific objectives, linked to overall corporate objectives, can improve reliability and asset performance work processes and strategies in the petrochemical industry

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Measurements are part of everyday life. In petrochemical facilities, many measurements, or key performance indicators (KPIs), may be captured and recorded routinely. These measurements may relate to subjects such as safety (number of incidents), environmental (number of releases), costs (% of maintenance budget expended), production (% of actual versus targeted production).

There are reliability or asset performance management measures that many companies also gather and routinely report. In gathering this data, three important questions come to mind: Why do we measure? What do we measure? And what is the source of the data? Answering these questions aids in developing a strategy focused on asset performance management.

If the goal is to use KPIs that will identify work process improvement areas that are aligned with corporate or company objectives, then the objectives must first be understood. Examine what is currently measured. Is it aligned with a company objective? A problem in many organisations is that business processes are segmented and many departments or groups are collecting silos of information that produce metrics used only for the sake of measurement, not as a catalyst for change or warning signal to identify ineffective or failed strategies.

Consider the basic closed-loop approach shown in Figure 1 to align KPIs with corporate visions and strategies. The three primary elements of this process are perspectives, objectives and measures and strategy map.

Perspectives are sets of viewpoints about a strategy. They can be categorised into four primary areas: corporate, equipment, process, and learning.

The specific objectives and measures for a KPIs are formulated based on a specified target or goal. Alignment with

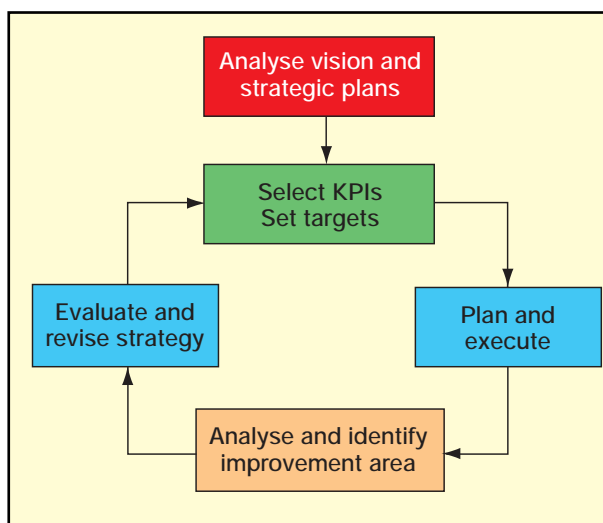


Figure 1 Key performance indicator closed-loop process

the corporate targets is critical. Each of these measures or KPIs should be items that are trendable, observable, reliable, measurable, and specific. A “champion” who can impact their outcome should also own them and be accountable for them because measurements are basically useless if there is no accountability or someone addressing the work processes that may have led to the missed targets.

The strategy map is a visual layout of all perspectives, objectives, and specific measures. If each measurement does not link directly to an objective, and an objective does not link directly to a perspective, then why measure it? Then you are measuring for the sake of measuring, and the measurement has no link or alignment to the overall company goals.

Perspectives

Corporations have basic high-level goals they want to achieve. They are usually related to operating safely and being responsible environmental stewards. Usually, the primary reason they are in business is to get a return on their investment, or profitability. So, for example, from the corporate perspective, the financial objective is likely to be related

to return on capital employed (ROCE). The safety and environmental objectives are to minimise or eliminate safety and environmental-related incidents. They are corporate perspectives with specific objectives.

From the equipment perspective, the objectives are usually related to reliability, availability, maintainability, cost, and downtime (or uptime). From the process perspective, the objectives are related to improving maintenance and operations work processes, and maintaining and operating assets. Additionally, from the learning perspective, the objectives are related to information

and personnel training.

So, why do we measure? One primary answer is to align key performance indicators with objectives, which can be categorised under corporate, equipment, process and learning perspectives. As mentioned, those items that have a direct link to specific objectives that are derived from the four perspectives are what should be measured. A strategy map serves as an excellent tool to view the four perspectives, specific objectives, and the measures or KPIs that are linked to the objectives. Note the example in Figure 2 (following page).

Note the four perspectives of corporate, equipment, process, and learning. The two corporate objectives in this example are “increase asset utilisation” and “minimise lost profits” (or perhaps better stated, “maximise profitability”). These are the two high level corporate objectives. Also notice how the objectives are listed in each perspective area and how they all are linked.

There are very specific measures for each objective. For example, in the equipment perspective area, there is an objective of “minimise repair time” and the specific KPIs is to measure mean time-to-repair (MTTR). This measurement alone

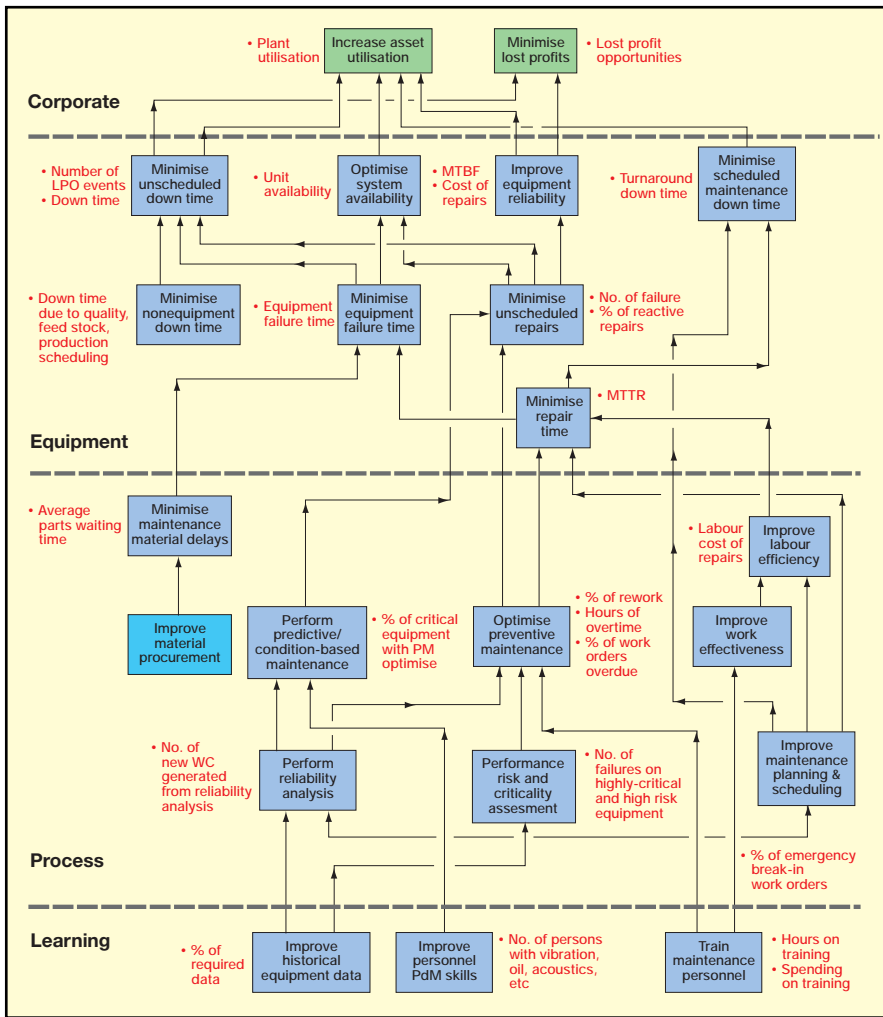


Figure 2 Strategy map. Four perspectives: Corporate, Equipment, Process, Learning

affects the outcome of eight separate objectives. And, ultimately, it is linked to the two overall, high-level corporate objectives. Using a strategy map can be a great planning tool and answers the basic question of what should be measured to achieve the desired benefits. It:

- Focuses on primary corporate objectives to ensure alignment
- Assigns resources to champion each objective and KPIs
- Assigns proper target measures for each objective
- Identifies work processes requiring improvements to meet expected targets and provides an overall view of items that may be most impacting the corporate objectives.

Source of data

Like most facilities, data is likely in hundreds of “silos” throughout the site, not to mention the entire enterprise: personal computer spreadsheets, manual desk files, central engineering, maintenance management systems, and many other stand-alone point solutions. And even if a great job has been done identifying the objectives linked to the corporate or company perspective, how is

data reasonably collected on a routine basis? Enterprise asset performance management systems can facilitate interfaces of the many point solutions and maintenance management systems. They also offer solutions on how to capture and integrate the process or operational and event-related data that drives the key performance indicator information.

Routine reporting and automation of the key performance indicators provide management, reliability engineers, or asset performance management analysts with the collective data. Less time is spent collecting and more time is spent applying the data to achieve the benefits discussed.

Without a central location to collect, store, and report key performance indicator data, it would be extremely difficult to perform these tasks. The data must be accurate, trustworthy, and

timely to make a difference in your site’s and company’s development of strategies aimed at asset performance improvement.

So, having a system that has all the data you need in one central location is an obvious recommendation. Otherwise, you will spend too much time collecting and verifying data and not enough time analysing it and getting actual value and use from your measurements.

APM and KPIs

Consideration should be given to how KPIs fit into an overall asset performance management approach. Asset performance management (APM) has three key components: strategy, execute and evaluate. If your business drivers are the corporate or company objectives, then your strategies should be developed around those business drivers. So APM can be described as:

- The creation of strategies aimed at maintaining and improving asset performance
- The execution of those strategies, including generation of key performance indicators
- Assignment of criteria to initiate a thorough analysis of the asset’s performance
- Selection of decision support tools for evaluating the performance of the asset
- Implementation of revised strategies when the initial or currently employed approach does not achieve a desired result

Key performance indicators are a primary part of any APM initiative. Selecting the proper measures to match the specific objectives can be a difficult process. Key things to address when selecting a metric include:

- What is the impact of this measure on the specific objective?
- Who, or what group(s), is accountable for the success or ineffectiveness of achieving the target for this measure?
- What work processes need to be in place to achieve the KPIs target?

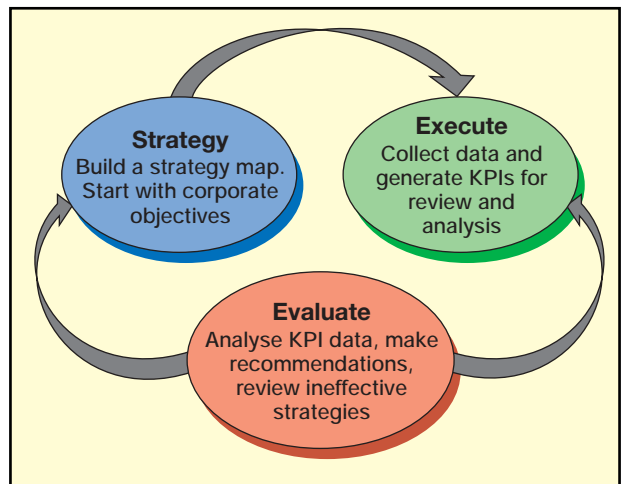


Figure 3 Strategy – Execute – Evaluate: using KPIs in APM

—What is the required frequency of measurement?

—Where is the data coming from? Is it accurate?

—How will the data be used to review and change ineffective strategies or work processes?

Accountability

“You cannot manage what you cannot measure” [Tom Peters, *In Search of Excellence*; Warner Books, New York, 1988].

If you have ever been involved in a corporate, company, or site initiative, you always want to know where to start. In reliability or asset performance management initiatives, the term benchmarking seems to always surface. What is the current status of our programmes? Where are we spending too much money? What assets are failing? How often are they failing? Where is the data?

And most importantly, how accurate is the data?

Measurements are needed to manage your strategies, execute your initiatives, and evaluate your performance. If you are not actively measuring, then chances are you are not being held accountable for your efforts or lack of achievement.

Accountability is another key ingredient to achieving success. Companies that do not hold employees accountable are probably not achieving the desired success. Key performance indicators drive behaviour and are the catalyst for success. Accountability usually drives successful performance.

Case history

A petrochemical facility with approximately 50 000 assets employed had a very rigid preventive and predictive maintenance programme in place. One primary corporate objective was to achieve a minimum return on net assets (RONA) of 12%, but the company had floundered around the 8% mark for the last few years. Preventable failures and lost production items were still prevalent.

The company initiated a focus on reliability to help achieve the expected RONA. A preventive maintenance programme was set up by functional location and scheduled in their maintenance management system. Predictive maintenance items such as vibration data collection and analysis, infrared switchgear inspections, ultrasonic thickness measurements, and oil sampling and analysis were routinely performed.

The facility developed subject matter experts and established programs. As a result, machine availability increased from poor performance to middle to top tier performance. However, critical machine failure still occurred randomly

and unexpectedly. Production targets were affected, and RONA targets were still not achieved.

Even though subject matter experts were in place, and a focus on implementing preventive and predictive maintenance programs was occurring, unexpected failures were affecting reliability and impacting production targets. This facility was recognised as a highly reactive work place. A common problem with mature maintenance programmes can be that they were never designed correctly in the first place, and that between 40–60% of the PM tasks serve very little purpose [J M Moubray, *Reliability-Centered Maintenance*; Butterworth-Heinemann, Oxford, 1997].

This poses a very significant issue for improving productivity as no amount of perfect planning and scheduling will make up for the inefficiencies of the maintenance programme itself. Achieving 100% compliance with a programme that is 50% useful and 50% wasteful cannot be good asset management [Steve Turner, *PM Optimisation – Maintenance Analysis of the Future*, www.pmoptimisation.com, 2001].

Preventable failures are still occurring. This was quickly determined to be the heart of the problem. But how could the use of KPIs assist this facility?

The production manager was given the primary responsibility to achieve the 12% RONA. In order to achieve this goal, she quickly realised that she could not achieve this just by including operations personnel only. Her goal was to include everyone in the process, and so she began to ensure that everyone had this metric on his or her individual departmental scorecards.

She accepted responsibility and was being held accountable to achieve the 12% RONA, but to achieve that end result, she needed all departments to buy-in to the goal. She quickly realised that the only way to do so was to make everyone else accountable as well. Within months, and after much discussion and many presentations to department heads, the KPIs began to show up on each department manager's scorecard. With accountability comes responsibility, and in this case, the responsibility to achieve the corporate objective. Alignment processes were in full swing.

A strategy was developed that employed KPIs to manage the effectiveness of the existing PM and PdM strategies. Knowing when to perform the PM and when to routinely capture predictive maintenance information on which assets is a must in order to be effective and eliminate the preventable failures that are occurring. If RONA was a key corporate objective, then how could this company align their PM strategies to

achieve the target? How can KPIs be used in this effort?

This company decided to incorporate an asset performance management strategy by first defining which assets were critical to achieving production targets. They decided to first focus on those efforts that had a business impact and were keeping them from achieving a 12% RONA. Only 8% of the site's 50 000 total assets, or 4000 assets, were identified. This included rotating, fixed, electrical, and instrumentation related assets.

After the highly critical assets were identified, specific PM and PdM schedules were put in place, rather than the once per month – “once per” – philosophy that was the previously employed strategy. KPIs were aligned in an effort to meet the corporate objective and included items such as the number of failures on highly critical equipment, and percentage of highly critical equipment with optimised PM study completed.

As you can see, these are not the typically employed metrics that many companies employ. The metrics were designed to focus on the population of the 4000 highly critical assets that were preventing the achievement of 12% RONA. The spotlight had now shifted from carrying out preventive and predictive maintenance efforts on all 50 000 assets to the 4000 highly critical assets.

Resources were aligned to employ methodologies to optimise PM plans for each of the 4000 assets. When failures occurred in the facility on non-highly critical assets, significantly less attention was given to those events. Operators, maintenance technicians, process engineers, and management were refocusing their resource allocations on the 4000 highly critical assets. KPIs dictated which assets would receive the most focus based on consequence and impact of failure. This practical, easy to implement strategy, using KPIs led to achievement of the desired 12% RONA.

APM benefits

The benefits of this strategy included an understanding of a common goal, or an objective, and alignment of strategies and resources. The 12% RONA was now not just some corporate objective, it had real meaning to the site's employees. Further, when targets were not achieved, a process was put in place to analyse the results and determine if the strategies around the specific failed asset needed to be changed. A continuous, closed loop business process was at work.

In order to accomplish the above tasks, an APM system was also implemented. Having data in one central location and detailing asset events to promote easy querying and reporting is required to spend the right amount of

time analysing asset failure events, especially highly critical assets. The APM system promoted:

- A closed loop process of defining strategies, executing the performance of those strategies, analysing failed assets in order to determine if the initial strategy was ineffective and required change
- Use of a central repository for all technical and detailed asset event data
- Use of KPIs to measure progress and reinforce positive behaviours
- Elimination of departmental barriers (everyone had a common objective)
- Use of statistical tools to evaluate asset performance and understand past failures and successes
- Delivery of corporate value (the RONA goal was achieved).

KPIs in APM workflow

When KPIs are used in an APM workflow, an interface exists between the enterprise APM system and the enterprise asset management system (maintenance management system). Data is automatically flowing between the two systems, generating key performance indicators. In one specific example, for a pump (PMP-101), the strategy employed takes the tasks developed in an enterprise APM system and automatically enters them into the maintenance management system.

Typically, they are scheduled as work orders. In this workflow, all work order data is captured and sent to the APM system and a detailed data capture is performed regarding any event associated with PMP-101. This data is used to routinely capture KPIs that can be used as a set of criteria to automatically notify the user that an analysis is required. In the example, this would probably occur when a highly critical asset experienced a failure. The implementation of the enterprise APM system made the initiative much easier to achieve and adjustment of strategies simpler to accomplish.

Conclusion

Key performance indicators impact on organisations by:

Helping key decision makers make informed decisions

Maintaining a continuous pulse on the business

Enabling greater accountability

Providing a continuous, comprehensive evaluation of people, processes and overall production performance.

Business drivers dictate the overall strategy. Depending on what the business driver is, the strategy will be different and sometimes significantly. The following summarises how KPIs can be implemented to align your strategies:

Start with a clear understanding of

the business drivers for your company.

Identify the primary perspectives: corporate, equipment, process, learning etc.

Define the objectives and match the KPIs with the objective.

Ensure there is a champion assigned to the KPIs and develop a sense of accountability to meet the desired targets.

When targets are not achieved, evaluate the ineffective strategy or work process employed, and define the resources required to change the ineffective strategy. (Some may be considered too costly and the target may need to be set to a realistic target).

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