GET OUT OF THE DARK

USE LEADING KPIs TO SPOT TROUBLE BEFORE IT HITS THE BOTTOM LINE

BY RICKY SMITH, CMRP, CONTRIBUTING EDITOR

Does your plant have reliability issues and a hard time meeting production targets? If so, it's time to listen up! Metrics such as key performance indicators (KPIs), when identified and aligned properly, can save your plant, your job and your career. So grab a pen, open your mind and get ready to learn.

It's amazing that most companies in North America manage with very few metrics to measure the performance of their maintenance and reliability process. They come to me crying for help, seeking a solution for their lack of management control. I know the feeling, as I was once one of them.

The sad part is, these companies aren't even aware they need KPIs to know where to focus. They fight reliability, production and quality issues on a daily basis, and seem to be lost in a quagmire. Many are replacing managers so fast, the people on the plant floor aren't sure who is in charge from one day to the next. They're crying for help and don't know which way to go.

It doesn't have to be that way. "By aligning our KPIs properly and managing the right ones, Carpenter discovered, for the first time, profits in a down market," says Adonis Campbell, corporate reliability manager for Carpenter, a Richmond, Va.-based manufacturer of polyurethane foam. "We've seen profits continue to rise as cost continues to drop by simply managing using leading KPIs."

Measure the right things

Think about driving a car with the windshield painted black. You can't see where you're going, but the rear-view mirror gives you a glimpse of where you've been. You don't learn whether you were successful until either it's too late, or disaster strikes. Your car goes into the ditch (high costs, or worse), or you never reach your destination (business goals arn't met).

In the famous words of the late, great industrial revolutionary Peter Drucker, "You cannot manage something you cannot control, and you cannot control something you cannot measure."

Drucker also said, "The problem with management is they're measuring the wrong things." If management truly understood the power of KPIs, things would quickly change, but trying to manage without KPIs leaves them feeling lost without hope in a reactive environment. This is a serious problem and it costs companies around the world billions of dollars due to what I consider to be lack of management control.

"The number of companies with adequate, meaningful key performance indicators is extremely low," says James Nesbitt, reliability practitioner and KPI expert, Ivara (www.ivara.com). Managers seeking to measure organizational performance start by measuring too much. Without understanding where the opportunities are in their organization, they're left trying to translate data from a host of disconnected or misleading indicators, Nesbitt says. "This can lead to poor decisions or wasted effort trying to improve indicators that have marginal or no impact on business improvement."

Leading versus lagging

Let's get down to basics and define KPIs. Within maintenance, we must first define the performance we want to measure. Is it the performance of the equipment? Is it the performance of the spare parts warehouse? Is it the performance of the maintenance function? These may seem like simple questions, but I often see companies mix their KPIs, as they haven't defined the specific area of the business for which they are attempting to measure performance.

For example, we want to measure the performance of the maintenance function. There are really two kinds of KPIs for measuring any particular business function: leading indicators and lagging indicators, or leading KPIs and lagging KPIs.

We need leading indicators to manage a part of the business, while lagging indicators tell us how well we have managed. Leading indicators let us directly and immediately respond when a poor result is found. Lagging indicators tell us how well we performed, but they give opportunity to correct underperformance. Instead, when we see an unacceptable lagging indicator, we must drill down to the leading indicators to uncover the cause of the underperformance, and from there we can implement appropriate changes.

Leading KPIs for the maintenance function measure how well we are conducting each of the steps in the maintenance process. For example, a leading KPI for the work planning element of the maintenance process could be "the percentage of planned jobs that were executed using the specified amount of labor." If the planner is estimating labor correctly, we will see a high percentage of jobs completed using the planned number of hours. The maintenance manager who finds that the value of the KPI is lower than expected, can discuss with the planner how best to immediately improve the results – possibly for the remainder of that day.

With all KPIs, by definition, we're measuring past performance, so I'm not suggesting that leading indicators can be tweaked to improve upon past performance. But as you can see in this example, if we're managing by using leading indicators, we can respond immediately when needed.

A lagging indicator measures the results of how well we managed the maintenance function. For example, when the maintenance function is well managed, we expect an appropriate balance between the cost of maintenance and the plant availability. A lagging indicator could therefore be "the actual maintenance cost for a month as a percentage of the budgeted maintenance cost for that month." If the actual maintenance cost for last month is 110% of budget, there's really very little we can do to influence the performance of this KPI today. Instead, we need to look at the leading indicators, including those that measure the performance of our maintenance process, to determine whether those values give us a signal for managing the problem.

Table 1 lists some KPIs I prefer to use, along with the world-class level where applicable. Leading indicators such as "percent rework" and "percent of PMs executed on time" affect the overall performance of the maintenance process. The corresponding lagging indicators are "maintenance cost as a percent of budget" and "plant availability." At least one of these lagging indicators will suffer if there's sufficient underperformance in the leading indicators.

Close the loop

Leading indicators for the maintenance process can support capable management (Figure 1). Dofasco Steel in Hamilton, Ontario, calls this feedback loop the Asset Reliability Process (Figure 2). It represents the tasks required to support the maintenance function. "The Asset Reliability Process is a supply chain," says Ron Thomas, Dofasco senior reliability specialist and world-class equipment reliability project manager. "Leading metrics presented as KPIs provide a clear indication if the requirements of each element in the proactive asset reliability process are being satisfied."

If a step in the process is skipped, or performed at a substandard level, the process generates defects. "If those elements aren't satisfied, leading KPIs also will determine what action should be taken to correct the lack of maintenance process adherence," Thomas says. "The output of a healthy reliability process is optimal asset reliability at optimal cost."

We can use KPIs in other areas of the business as well. This approach is particularly interesting when multiple functional areas play a role in a given goal, such as plant reliability. Plant reliability is a shared responsibility of the maintenance, production and engineering functions. Leading indicators for each

Measure versus manage

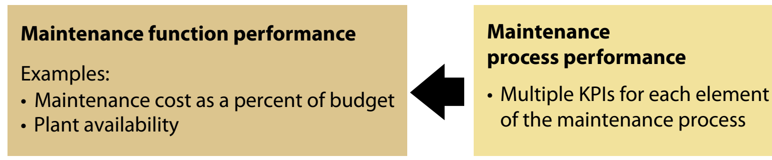


Figure 1: The levels of typical maintenance function metrics (lagging KPIs) depend on effective management using maintenance process metrics (leading KPIs).

The asset reliability process

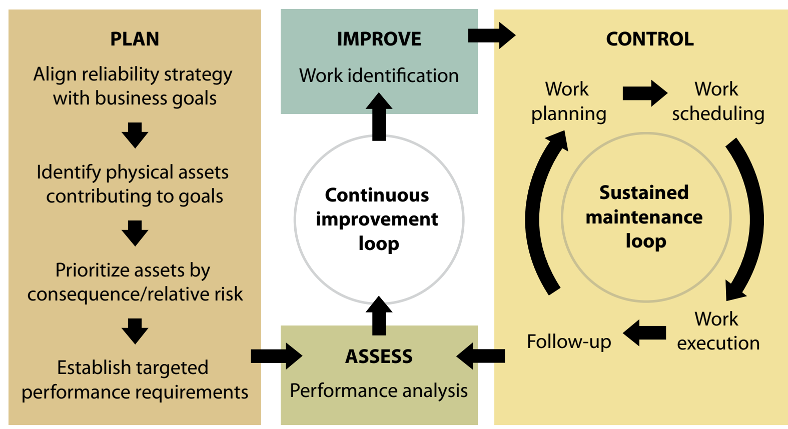


Figure 2: Leading KPIs provide critical management tools for the proactive asset reliability process.

Go interdepartmental

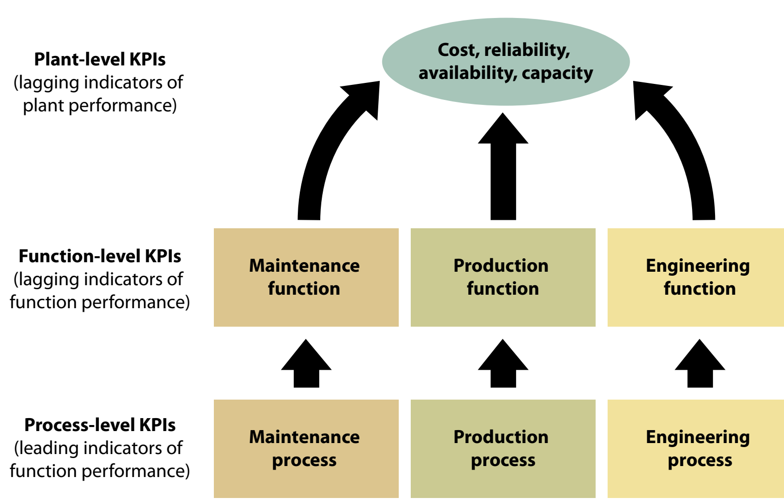


Figure 3: The power of process-level, leading KPIs shouldn't be reserved for the maintenance function alone – spread the concept to other departments.

departmental process feed the lagging indicators for the department function, which then summarize to the plant level (Figure 3).

It's really a simple concept, but most plants don't get it. "In studies, more than 90% of companies don't have corporate support for an enterprise-level KPI program for maintenance and reliability," says Terry Wireman, partner, Vesta Partners (www.vestapartners.com). Wireman is an

TABLE 1: EXAMPLES OF LEADING AND LAGGING KPIs

	TYPE OF KPI	MEASURING	KEY PERFORMANCE INDICATOR (KPI)	WORLD-CLASS TARGET LEVEL
1	Result/ lagging	Cost	Maintenance cost	Context-specific
2	Result/ lagging	Cost	Maintenance cost divided by replacement asset value of plant and equipment	2% to 3%
3	Result/ lagging	Cost	Maintenance cost divided by manufacturing cost	Less than 10% to 15%
4	Result/ lagging	Cost	Maintenance cost per unit output	Context-specific
5	Result/ lagging	Cost	Maintenance cost divided by total sales	6% to 8%
6	Result/ lagging	Failures	Mean time between failure (MTBF)	Context-specific
7	Result/ lagging	Failures	Failure frequency	Context-specific
8	Result/ lagging	Downtime	Unscheduled maintenance-related downtime (hours)	Context-specific
9	Result/ lagging	Downtime	Scheduled maintenance-related downtime (hours)	Context-specific
10	Result/ lagging	Downtime	Maintenance-related shutdown overrun (hours)	Context-specific
11	Process/ leading	Work identification	Percentage of work requests in "Request" status for less than five days.	80%
12	Process/ leading	Work identification	Percentage of man-hours used for proactive work (AMP plus AMP-initiated corrective work)	75% to 80% — with 5% to 10% of man-hours attributed to redesign or modification, this leaves about 10% to 15% reactive
13	Process/ leading	Work identification	Percentage of man-hours used on modifications	5% to 10%
14	Process/ leading	Work planning	Percentage of work orders with man-hour estimates within 10% of actual	Greater than 90%
15	Process/ leading	Work planning	Percentage of work orders with all planning fields completed	95% or more
16	Process/ leading	Work planning	Percentage of work orders in "Rework" for additional planning	Less than 2% to 3%
17	Process/ leading	Work planning	Percentage of work orders in "New" or "Planning" less than five days	80% of all work orders should be processed within five days
18	Process/ leading	Work scheduling	Percentage of work orders scheduled on or before the late finish or required-by date	95% or more
19	Process/ leading	Work scheduling	Percentage of scheduled man-hours to total man-hours	Target 80% scheduled work
20	Process/ leading	Work scheduling	Percentage of work orders delayed for manpower, equipment, space or services	Less than 3% to 5%.
21	Process/ leading	Work execution	Percentage of work orders completed before the late finish or required-by date.	90% or more
22	Process/ leading	Work execution	Percentage of maintenance work orders requiring rework.	3% maximum
23	Process/ leading	Work execution	Percentage of work orders with all data fields completed	95% or more
24	Process/ leading	Work follow-up	Percentage of work orders closed within three days	95% or more
25	Process/ leading	Performance analysis	Number of asset reliability improvement actions initiated	Context-specific: actions should be initiated when performance gaps exist
26	Process/ leading	Performance analysis	Number of equipment reliability improvement actions resolved	This is a measure of project success

accomplished expert in maintenance/reliability and author of the book, "Developing Performance Indicators for Managing Maintenance." He says, "Even at the plant level, maintenance and reliability KPIs aren't clearly defined and hence aren't used effectively. In most companies, KPIs have just become a numbers game." Using my earlier analogy, these companies are driving their cars with the windshields painted black.

According to Wireman, "The pitfall people encounter is they are trying to manage using too many lagging metrics, so they don't have sufficient resources to manage the business process metrics. These companies never achieve the target business results and never will as long as they are sub-optimizing their measurement system."

Get serious

The problem is management must learn to manage operations through KPIs (both leading and lagging). In my 30-year-plus career, I've seen many plants shut their doors forever. They blamed the closing on many reasons, but the one thing they had in common was that none had properly managed with leading KPIs. The metrics or indicators they manage with were ones like cost, asset availability, equipment downtime and OEE.

These metrics or indicators, while useful for measuring performance, cannot be used to manage the maintenance and reliability process. They are simply the results of all the actions that have taken place in the maintenance and reliability process. Again, you cannot manage results. You can only manage the processes leading to the results. If your company uses any of the above metrics to manage their operation, without using leading indicators, you should work to correct the situation.

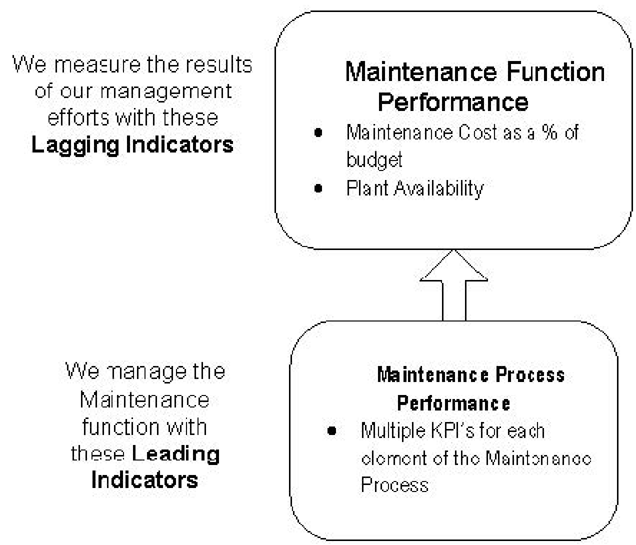
Ask some very basic questions:

• Do we differentiate between those KPIs that can be used to manage (leading indicators) from those that we can use to measure results (lagging indicators)?

• Do we measure performance of the maintenance process, where you can easily intervene when needed?

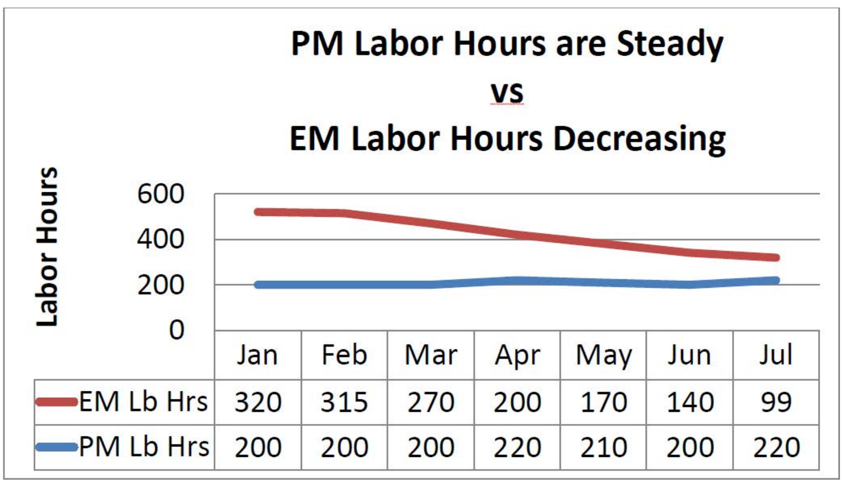
If leading indicators show underperformance, the underperformance will affect the lagging indicator, which could be reliability, cost and capacity. People must understand the relationship between a leading and lagging indicator and their effects on the maintenance and reliability function.

Wireman described a recent client that had a completely integrated, enterprise-level KPI system. This



company's managers are able to review their KPIs and monitor trends from corporate headquarters. As they see negative trends develop in their corporate KPIs, they are able to drill down to the plant causing the trend. They can then examine their plant-level KPIs and find the trend driver. This is usually a process indicator, such as PM compliance.

"One example clearly showed PM compliance was so low that it caused reactive work to increase," Wireman says. "This, in turn, generated more maintenance overtime and affected production schedule compliance. This increased the maintenance costs (per unit produced), and also the total cost per unit for the plant. These cost drivers cascaded upward, increasing the overall corporate costs."



An integrated view of its plant and departmental performance allowed this corporation to monitor its business performance and immediately take steps (manage) to improve the underlying process that would result in the desired increased profitability.

Most maintenance managers are told to control cost, improve reliability and increase asset availability with no idea where the problem may be in their maintenance process. Unfortunately, many lose their job as a result. The fact is you can't control cost, reliability or availability without managing the maintenance process.

Step-by-step

How much money do corporations lose every year by managing plants without good leading and lagging KPIs? You can stop those losses now by putting a plan in place to develop and align KPIs. This might save your plant or your job, but I warn you, don't look for shortcuts in the process, because there are none.

Step 1: Educate management, from the executive level to floor-level supervisors, on KPIs and how leading and lagging indicators should be aligned to meet business goals. You then must provide a similar education to the maintainers and operators.

Step 2: Define and assess your maintenance and reliability process against a future state consisting of known maintenance and reliability best practices. As part of this assessment, develop a business case with financial opportunities and cost of change. This step continues the education process and makes one aware of the opportunity at-hand.

Step 3: Develop a plan based on the assessment, with financial opportunities and cost on a timeline. This plan must include:

a) Definition of the elements of your maintenance and reliability process (work identification, planning, scheduling, work execution, etc.);

b) Definition of leading and lagging KPIs in each element of your maintenance and reliability process;

c) Definition of roles and responsibilities for each task; and

d} World-class benchmarks established against the defined KPIs.

Step 4: Implement the process. I would begin measuring only a few KPIs. Then allow people at the lowest levels to make the decisions required to ensure your maintenance and reliability process is proactive and effective. Using leading KPIs is a great awareness tool and brings everyone into the decision-making process.

Remove the black windshield and manage with leading indicators, not with lagging indicators. Use leading KPIs should be used to drive your decision-making process. Remember, leading indicators are manageable, while lagging indicators just tell us how well we managed. If you want to be the best in your business, step up to the plate and manage in the most efficient manner by following my recommendations.

If you would like additional information on KPIs, attend one of my workshops designed specifically to solve this problem. Send me an e-mail at rickysmith@comcast.net and I'll send you a schedule and locations. You can also contact me if you have problems with or questions about your KPIs.

THE LEGACY OF JOHN DAY

The Mount Holly, S.C., plant of bath enclosure and shower door manufacturer Alumax was rated as one of the best maintained plants in the world for more than 20 years. "Hundreds of companies visited our plant, paying $1,000 each to see our maintenance program up close, but only a few learned from their visit," says John Day, retired former engineering and maintenance manager at the plant. Day also was invited to visit more than 500 plants in the U.S., Canada and Australia.

"The one the thing more than 90% of them had in common was they couldn't effectively manage their plants because they had no leading KPIs in place," Day says. "Many of these companies were crying for help, but didn't know which way to go." Most managed only with lagging indicators, and made decisions based on metrics such as cost and reliability.

Day learned early in his career that without leading KPIs, you can't manage equipment maintenance and reliability. "Alumax had a system in place where we could measure everything in our maintenance process — from leading indicators such as identification of potential failures through to the lagging financial results of the actions performed by maintenance," he says. This separation of leading and lagging KPIs allowed him to make management decisions when leading KPI underperformance was identified, before cost and reliability (the lagging indicators) were affected. "For more than 20 years, I could see problems brewing long before they would become a serious issue," he says.

According to Day, there is a simple reason why most companies don't succeed: They don't know what information needs to be collected. In 1979, he worked with Alumax's accounting department to establish more than 60 financial accounts just for maintenance. These accounts were linked to leading KPIs in the maintenance process that provided the information needed to manage proactively.

In turn, these KPIs were linked to equipment performance (lagging indicators). Each lagging KPI used established benchmarks that told whether the maintenance process was in control. This approach may sound complex, but once you have it in place, management can truly manage the reliability of plant equipment.

Day shared 13 years of KPI data that was so impressive, it would bring tears to any maintenance and reliability professional's eyes. "Everyone from a maintenance person to the plant manager had KPIs they looked at on a daily or weekly basis to make basic and immediate management decisions," he says. "Each level in our organization used a small number of lagging KPIs along with a larger number of leading KPIs that were important to managing their part of the business."

During the 13-year period, maintenance cost (a lagging KPI) didn't increase. Maintenance cost as a percentage of return on asset value held at around 3%. Equally impressive was that the controllable plant operating cost was relatively constant over the same time period. This lagging-indicator data pointed to the obvious fact that equipment reliability directly correlates to operating cost.

Day's experience validates that managing with both leading and lagging KPIs is the only way to effectively control an operation to achieve the results expected to succeed in business.

By the way, more than 26 years ago I worked for John Day at Alumax, and enjoyed every day I was in his plant.