

# Mapping production losses

Exposing true problems and setting correct priorities with ABB Loss Map

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As process automation plants evolve and the equipment and technology becomes more complex, the number of problems that can occur in production escalates. Even with the best intentions of achieving world-class standards, progress towards best practice targets can be impeded or brought to a halt by plant personnel being overwhelmed by operational and maintenance problems. This is not an issue that affects just engineers or technicians – managers at all levels can become frustrated at the time it takes to achieve the benefits they are targeting.



Industry knows that firefighting – addressing problems as they occur – is very time consuming and costly. Not only is there a risk that the actual root causes are not addressed, but there is simply not enough time to fix problems one by one. Prevention is the only method to get long-term sustainable improvement. But before the prevention program can start, time has to be created.

ABB has investigated the reasons why customers run out of time and money when implementing proactive action plans at their plants, and has found two of the major contributing factors to be:

1. Not knowing what the real problems are – you can only address what you can see, so the problems that are not obvious remain unsolved
2. Insufficient or incorrect data on a problem – so plant personnel have to speculate what the true underlying issues are

By not having accurate information on production losses and how those losses are interconnected, a lot of time is wasted addressing the wrong or low-impact issues. This applies to all levels of the workforce, from managers to technicians and operators. For instance, maintenance personnel who are working on a particular machine may be focusing their efforts on, say, a scanner instead of the motor, without realizing that although the motor is not of great importance on that particular machine, motors are significantly more important across the site as a whole – they should postpone their work on the scanner and work on the motors instead. Similarly, management may be pushing plant improvements without understanding how much time is lost due to issues such as communication. A method is therefore required to identify and compare losses from different sources.

### Loss mapping – a unique ABB tool

One of the solutions offered exclusively by ABB is the “loss map,” which draws on ABB’s extensive industry expertise to determine which factors affect each of a plant’s key performance indicators (KPIs). The method enables those KPIs that are

critical to plant performance and business objectives to be detailed and understood in depth. It allows the KPI (or “branch” of the map **1**) with the largest potential improvement to be identified and focused on at an early stage of the loss review. As each branch is opened, a list of factors with the capability to cause poor performance of the KPI is revealed. Site data will identify which of these factors is contributing the most to losses at the site. When the data is compared to benchmark figures, plant personnel will be able to focus on those factors that will deliver the fastest returns to the business.

The “loss map” draws on ABB’s extensive industry expertise to determine which factors affect each of a plant’s key performance indicators.

**2** shows the branch for overall equipment effectiveness (OEE). The first question would be whether the underperformance of OEE is caused mainly by the availability of equipment, production rate (speed) or quality of the product manufactured. Hard data must be obtained to show which factor(s) should be focused on first. If the underperformance of OEE was caused mainly by availability, it would then

prompt the question of which factor(s) of availability were causing the largest loss – equipment failure, the time spent setting up and adjusting, or planned shutdowns. Again, data must be obtained to show the contribution of each factor to loss at the site. In time, all branches should be investigated as each may be contributing to the loss in plant performance

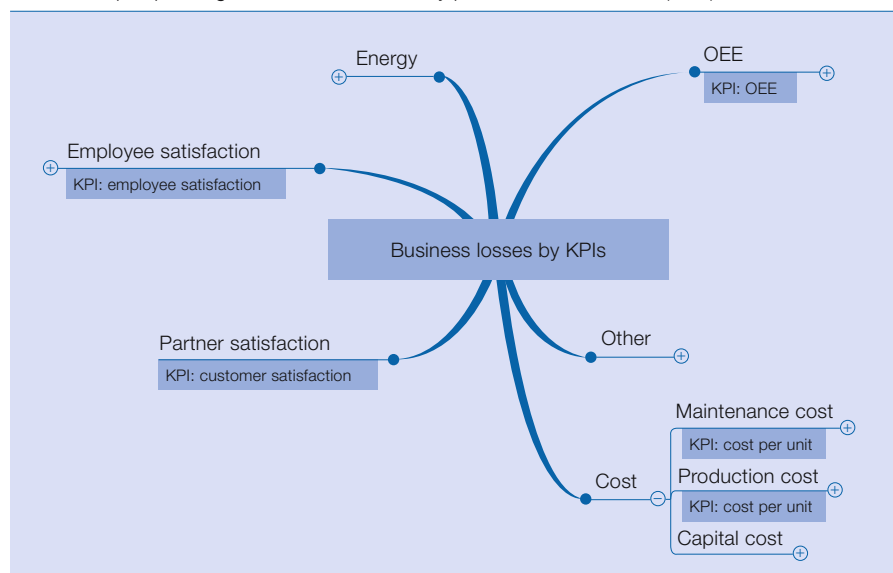
Importantly, a list of “counterbalances” is provided for each branch to prevent one KPI from being improved to the detriment of another. For instance, OEE should not be increased if it leads to a significant rise in costs, or reduces safety or impacts the environment.

### Contributing to plant strategy

Loss mapping is not just about identifying sources of loss, it also helps to determine plant strategy. Traditionally, maintenance is linked with availability, but if the plant data reveals KPIs such as production rate or quality to be the largest source of loss, it is in the customer’s interest for its maintenance and operations department to focus on them instead. Plant action plans should not just be a set of generic tasks, but rather a maintenance and operations program to address specific plant losses.

At each level, the map continues to challenge understanding by prompting

**1** Loss map separating business losses into key performance indicators (KPIs)



## Reliability

questions such as “If equipment failure is significant, is it the frequency of failure (mean time between failures, or MTBF) or the duration of repair (mean time to repair, or MTTR) that contributes the most?” Different losses are addressed by different tasks **3**.

While “reliability” is a good catchword, improving the operating life of something that has little impact on OEE or cost (current or future), or reducing the repair time of something that rarely fails, is not making good use of personnel’s time. Not only does the loss map encourage personnel to look for frequent, high-impact losses, it suggests the contributing factors behind those losses so that personnel can assess the most cost-effective measures to take.

Each branch in the loss map enables personnel to drill down to the problem’s roots – the fundamental issues that cause the plant’s losses. Identifying the root issues for each branch enables fast progress to be made. Any tasks or planned investments at the plant that are not shown to be a major source of loss on the map should be postponed. This will create time to address the root issues.

Loss mapping is not confined to equipment; it focuses on loss, wherever it may reside. Efficiency of people, for example, plays a significant part in the performance of the plant – and this includes everyone from the plant manager down. It poses questions like: Are issues of communication slowing down personnel? Are people

being distracted from their main tasks? Are management and personnel procedures adequate for efficient and quality work? Would addressing any of these give greater or lesser returns than addressing a particular equipment issue at the plant **4**?

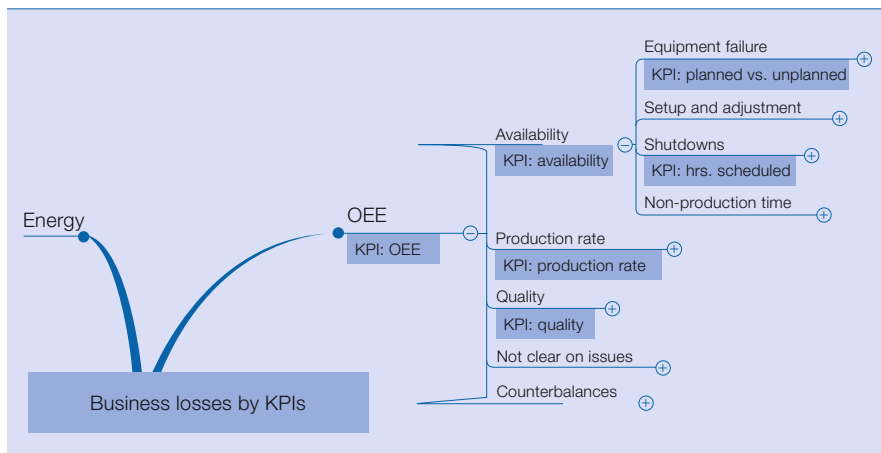
**Loss mapping is not confined to equipment; it focuses on loss, wherever it may reside.**

Often it is problems not recorded by maintenance or production databases that cause the greatest losses. Communication problems, for example, may add several minutes to a downtime repair but go unnoticed; in the long term, those several minutes will be added to every downtime incident, shutdown or refurbishment, leading to substantial accumulations in delays and losses. The map allows personnel to understand the issues that can slow their performance and highlight the ones most applicable to them. For instance, addressing a 10-minute-a-day problem for one employee creates one extra week of work time for that employee over the course of a year. A site improvement plan should not just include equipment improvements, but should prioritize and include these “soft” issues.

While the map is remarkably comprehensive in size and content (more than 1,500 factors are detailed), it



**2** Contributing factors affecting overall equipment effectiveness (OEE)



**Factbox** The ABB loss mapping process

The ABB loss – mapping process allows plant management to understand all the factors limiting the achievement of their business objectives. It considers equipment as well as personnel factors and is used across all industries. Sites using the tool rapidly recognize that the issues they are focusing on are not necessarily the most important sources of loss at the site. ABB Loss Map has been rolled out in more than 20 countries and at every site has resulted in a better understanding of plant issues by personnel and a refocusing of the site improvement plan to achieve faster gains.

should never be allowed to overwhelm personnel; it is a tool to understand losses and create a dialog about what is really causing problems at the plant. As a result of this dialog, plant management should select as many or as few tasks that can realistically be implemented. In addition, the map provides a simple and clear means to compare and prioritize future losses as and when they arise, providing essential detail and guidance for years to come.

**Quantifiable benefits**

Jacques Vosloo, improvement manager at Kinleith pulp and paper mill in New Zealand, found that the loss map was the best way to focus the site resources.

“By comparing the original plant action plans to the ABB Loss Map, we found that half of process improvement projects had no bottom-line impact and another 25 percent had a negative impact on the plant’s overall productivity. The ABB Loss Map helped to identify the major loss makers in the manufacturing process. Thereafter, it was just a matter of aligning maintenance, operations and engineering to eliminate or reduce the loss.”

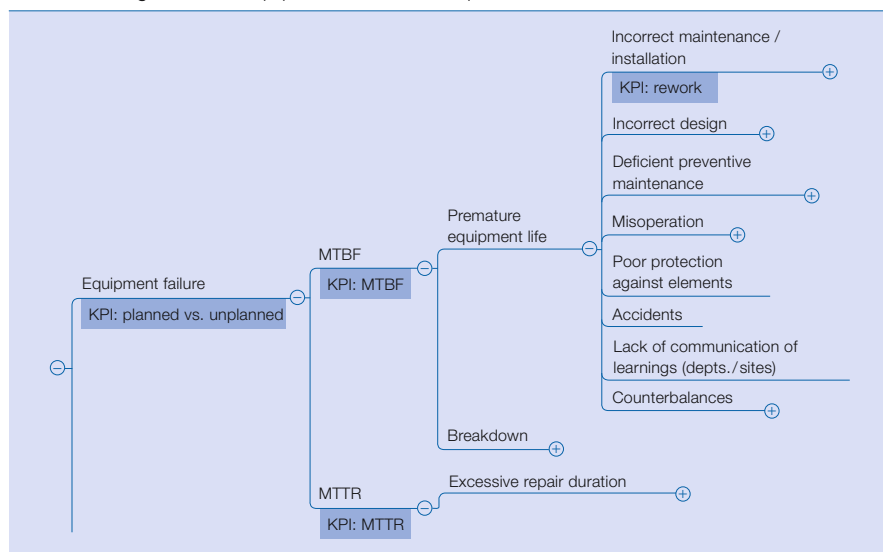
Over the last four years, Kinleith has enjoyed substantial improvements, including an increase in overall equipment effectiveness of 22.4 percent, a reduction in maintenance cost per ton of paper of 35 percent, and an in-

crease in employee satisfaction from 66 percent to 78 percent.

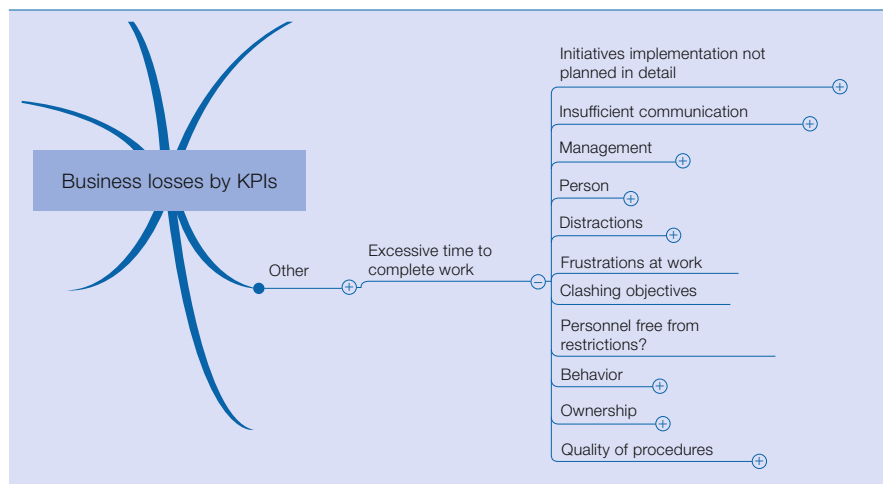
Jose Baptista, ABB Full Service® regional manager for North America agrees. “I think the use of this methodology is crucial to leverage the plant-performance improvement, helping to identify ‘the hidden plant.’ Mind mapping is an important technique that enhances creative problem-solving by identifying and understanding the structure of a subject and the way that pieces of information fit together.”

ABB Loss Map has helped Kinleith increase OEE by 22.4 percent, reduce maintenance costs per ton of paper by 35 percent and increase employee satisfaction from 66 percent to 78 percent.

3 Contributing factors to equipment failure that require different tasks when addressed



4 Non-equipment-related factors that contribute to KPI losses



Rapid and sustainable improvement of business objectives can only be achieved when all influencing factors are understood and compared. ABB provides the process and tools necessary to evaluate and prioritize site-specific losses that need to be addressed. The ABB Loss Map enables not only better understanding of what is happening at the site, but compares factors such as equipment losses with personnel losses. The agreed maintenance and operation plan that results has the additional benefit of achieving better teamwork and improving the level of confidence between disciplines. The loss mapping process is just one example of the global support our customers enjoy by choosing ABB.

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