What is reliability?
Changing the reliability paradigm
Barry Kleine

Concepts used throughout the world to describe improvements to production throughput are often termed “reliability.” But just what does the term really mean? What tasks that a plant’s staff perform are considered “reliability” and how do these tasks actually improve the profitability of a company? Who, if anyone, should be involved in the reliability project?

If a plant decides to introduce a reliability plan, the actual steps agreed on are affected by the definitions used. One definition can lead the site in a totally different direction than another. It is therefore important to challenge and agree on the definition used. The absence of such a challenge may very well limit the potential of the improvements made.
What is reliability?

Maintenance for productivity

This challenge is faced by ABB’s manufacturing customers across the world. ABB is, however, also itself a manufacturer, and so often faces challenges and decisions similar to those of its customers. Within ABB, the refinement of these challenges has totally changed the direction the company’s sites are taking – not only re-prioritizing what actions they take first, but aligning their sites through the adoption of common definitions to be able to better provide mutual support. The combined effects of these two principles have helped ABB achieve comfortable double-digit growth continuously over the last five years. In this article, ABB Review looks at some of the lessons learnt.

Paradigm 1:
Reliability means fewer breakdowns.

A common definition of reliability explains this in terms of equipment causing fewer breakdowns. Improving reliability is about having the ability to identify issues and repair equipment before the operations department notices anything is wrong. The operations department certainly appreciates the shift from unplanned stoppages to planned outages, but the maintenance actions themselves still incur the cost of components and labor required to reinstate the equipment’s functionality. There is therefore little overall benefit on the plant level. As a result of this definition, condition monitoring takes center stage, unplanned stoppages decrease, but frustratingly, maintenance costs and labor requirements changes little, if at all.

Further analysis of this situation shows that the equipment still needs to be replaced or repaired at the same frequency; so while production reliability does benefit, no practical equipment reliability has been achieved. Labor and material required for repairing the equipment stay largely unaffected, and any savings in reduced consequential damage is usually offset by in the additional inspections required. This shows that a more refined definition of reliability is required: one that not only includes reliability of production between shutdowns, but reliability of equipment – ie, less “need” for the shutdowns to fix the equipment. Maximizing the life of equipment not only means fewer breakdowns, but fewer required planned shutdowns, lower maintenance costs, lower labor requirements and lower required stores of spares.

In such a definition, the reliability concept should encompass actions that increment the current life being attained by the equipment (ie, actions such as lubrication, cleanliness, alignment, balancing, cleanliness) so increasing the mean time between failures (MTBF). It becomes apparent from this definition that actions such as condition monitoring are not related to reliability, but to the minimization of mean time to repair (MTTR).

New definition 1:
Reliability means less need for intervention.

Paradigm 2:
Reliability is used to determine equipment performance.

Site management teams are quite aware that equipment is not the only consideration for maintenance: Health and safety, environmental concerns, information management and planning and scheduling are just some of the other issues that need to be considered as part of normal business. When all the other aspects that need to be managed are taken into account in maintenance planning, it becomes apparent that reliability is not just the ability to maintain the functionality of equipment, but the requirement for all maintenance processes to function properly.

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Every time a process needs intervention from employees, cost is incurred. Labor is valuable, so a lower labor requirement in any of these processes is desirable and this is achieved by making the process more reliable. Reliability therefore advances from referring just to equipment to referring to the entire business.

When it is realized that a task taking ten minutes a day adds up to one working week per year, it becomes more important that intervention is measured instead of just production impact. Ten minutes of avoidable attention a day is one week lost per year, which that person could be using to address other issues.

An ABB plant in Kinleith, New Zealand, for example, realized that the two engineers in one department did not both need to attend the half-hour
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The most common reason that rotating equipment fails is bearings, so how much loss results from bearings compared to a specific equipment type? A gap in the site-planning process may result in each job taking 10 minutes longer than required, so how does this loss – which results in less work being done – compare to the production and cost loss from bearings? How does communication loss compare to planning loss, and if this is an issue, what actions are currently underway to address it?

When there is no way to compare the losses for the above examples, or the site has not tried comparing them, confusion and disagreement set in. Different people will have different passions and the result is multiple initiatives clashing for the same limited resources and money. When this happens, progress in all initiatives slows down.

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scribe the most obvious availability losses, but is the most frequent equipment-type failure known? People typically focus on what they know, which is normally equipment failures, while missing the major contributors to loss such as the notoriously unreliable communication. For every ten minutes per day of unnecessary or inefficient communication, one week per year of labor is lost. How much improvement has that cost on a given site?

Before anything gets addressed on a site, it generally becomes apparent that the documentation of loss is unreliable. Improving failure codes and understanding what is slowing people down will give a far greater understanding of where focus should be directed.

**Successful sites**
The most successful sites are the ones with a systematic approach to improvement:

Start with a business need
Key financial variables that affect the site should be identified – these are the ones that will make the largest difference to the profit margin. It is important to understand clearly, for example, whether maintenance cost that needs to be decreased, or in fast the maintenance cost per unit produced. Many examples are available showing a reduction in spending that led to a loss several times that amount in lower production due to decreased reliability. The site strategy needs to emphasize the few variables where the focus should be kept.

Improving reliability reduces both time and cost to repair.

Develop management support for the concept before it is started
Many processes are scheduled to be implemented on sites because other sites are doing it, or because someone believes they will add value. Unless the senior managers are sold on the fact that these processes are critical to achieving the objectives, little focus will be put on them and they will take many times longer than necessary to implement.

Excessive time to implement is a loss on a site as it means people are not available to work on other initiatives. It is for this reason that fewer initiatives should be implemented simultaneously, and the ones chosen should be the ones that the managers drive and show a personal interest in.

Establish how reliability can satisfy the business needs
As mentioned earlier, there is a distinct difference between reliability (reducing the need for intervention) and consequence minimization (fixing it faster). Many people are passionate about repairing, so focus can easily turn to these issues and reliability gets neglected. It is critical to understand that improving reliability reduces both time and cost to repair. Most other initiatives address only one or the other at a time.

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Select reliability improvements based on their ability to deliver quantifiable business benefits
Many good reliability topics are chosen, but when a given task is selected, often little or no data is provided in terms of a business case or the return on investment predicted. Reliability initiatives are best focused on the most frequent issues, as these are the ones that will give the fastest evidence of improvement. Addressing an issue that only occurs every five years will need another five years to see any benefit.

Sustain momentum by publishing improvements
It is generally accepted that interest in an initiative will halve if no improvement is seen within three months. As the results are observed, these need to be published across the site to maintain commitment, not only by the team members but also by senior management. Lack of evidence will result in people looking for alternative initiatives before the current ones gain traction.

Maintain quality
If a process is agreed upon, it is important to then follow the process. When things get busy, there is a tendency to try and shortcut the process – the consequence is lower results, fewer published improvements and a drop in interest. It is important in this area that managers show interest in the quality of work to maintain the standard. People always get the behavior they accept.

Reliability is one topic whose implementation falters due to not having enough time. Time is created, however, by understanding that a lot of the current tasks are not getting as many results as the reliability initiatives can achieve, and that some of the reliability initiatives being pursued are focused on issues with too long a payback. Time can be created simply by reprioritizing with respect to the business needs.

Further reading