Achieving Top-Quartile Performance via an Enterprise-Wide Value Chain

This document describes how the implementation of an Enterprise-wide asset reliability strategy like the Value Chain can provide measurable positive results.

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Introduction

Abstract

Studies have shown that to achieve top performance, global enterprises must find the resources they need to implement asset management systems consistently across their global fleet of assets.

The Reliability Value Cycle provides a systematic approach to optimizing asset reliability in top-performing enterprises such as PolyOne, Bunge, and Corbion. Global businesses should strive for consistent, standards-based reliability practices throughout their plants and their enterprise. ISO 55000, the newly published international standard for asset management, is also well aligned with this approach. The short-comings of ad-hoc or laissez faire approaches that allow inconsistent practices at different plants are well documented. Nevertheless, finding the resources to support a consistent global implementation can be a daunting challenge. Emerson's Reliability Consulting has solved this problem for clients such as Bunge, PolyOne, and others.

> ***"Every 1% gain in availability is worth $8.4 million of additional margin capture per year in a typical 200,000 bpd refinery."***
>
> *Doug White, Emerson Industry Expert – Based on Current Refinery Economics*

Your individual facilities and your global enterprise possess hidden significant opportunities for operational and maintenance improvements that will improve profitability, availability, and safety. The improvements center on reliability and availability.

A Solomon Associates global study of reliability practices measured maintenance costs as a percentage of the replacement value of the assets. Results showed that if a top-performing site spends10 million dollars per year on maintenance, a poor performing plant of the same size will spend about 3.5 times more. Further, the value of operational benefits is three to seven times the value of the maintenance-spend reduction. The value of moving into the top-performing quartile is high.

According to the same study, top-quartile plants also experience very little downtime as a result of equipment problems. Fourth-quartile (poorest) performers experience disruptive levels of down time that is almost 15-percent greater than top performers. Big difference.

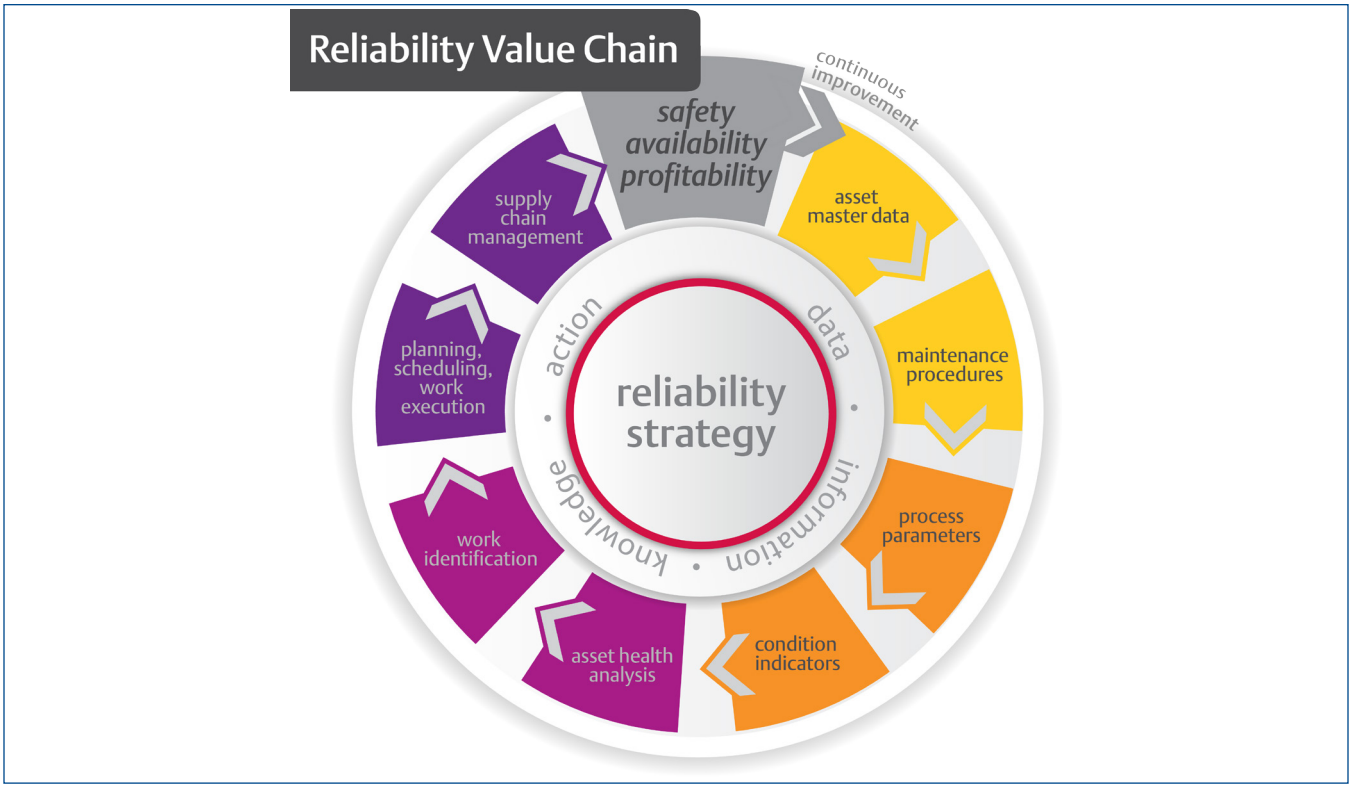

***Figure 1**. A complete, accurate, and well-connected Reliability Value Chain is present in top-quartile performing companies.*

Reliability Value Chain Elements

Research also shows that top-quartile performing organizations possess a set of well-linked elements (figure 1) called the Reliability Value Chain that consists of four categories: data, information, knowledge, and action. Ultimately, the ability to achieve top performance status depends on the robustness of each element and on the effective connections between them to form a continuous improvement cycle. For example, the asset master data characteristics and classifications (figure 1, upper right) are driven by the requirements of the central reliability strategy — analyses used to understand and catalog failure modes. Further, mitigation of failure modes drives the selection of maintenance procedures, process parameters, and condition indicators.

Data elements form the foundation of a successful Reliability Value Chain. Asset master data, a complete and accurate equipment list, includes physical attributes, criticality to the process, and appropriate failure codes. Maintenance procedures are used to monitor and maintain the assets' healthy condition and are developed based on analyses such as Reliability-Centered Maintenance (RCM). For top performance, consistent procedures must be applied to the same equipment performing similar functions across all plants.

Information includes process parameters and condition indicators. Asset condition indicators monitor and analyze asset health and come from predictive and condition-monitoring capabilities such as machinery health monitoring. Top-quartile performers leverage process data (temperature, pressure, etc.) for maintenance purposes. And all data come together in a robust view that cross-references asset data.

Knowledge, the union of asset health analysis and work identification, is essential to understanding normal conditions. It is the result of interpreting data and information then drawing conclusions. Monitoring technologies alert analysts when abnormal conditions exist, then an expert reviews information and diagnoses the problem.

Action translates knowledge into planning, scheduling, and work execution/supply chain management. When top-quartile performers find and diagnose abnormal conditions, a corrective work order can be generated automatically. Low-quartile performers operate in reactive environments where costs result from emergency failures and repairs.

The top-down influence combined with the bottom-up influence is necessary and eventually is very effective in terms of organizational cultural transformation. Individual habits that need to change start to change.

Enterprise-wide Standards Consistently Applied across the Global Fleet of Assets

The establishment of a strong Reliability Value Chain is important in each facility. Yet the value increases many-fold when applied to an entire enterprise.

Consistency is a critical part of the philosophy in enterprise-wide implementation. The importance of consistency in maintenance of physical assets can be viewed in much the same way as the importance of consistency in the presentation and analysis of financial information across an enterprise. If a dozen locations in an enterprise each use a different way to report financial information, the work to analyze the data and create a quarterly report is greatly magnified.

Same idea with asset data: If each location has different standards for maintenance and reliability practices and for foundational data taxonomy, the engineers from the various plants cannot look at information from other plants to learn lessons and share best practices. Without standards, the work to be done is orders of magnitude greater and opportunities are invisible.

Figure 2 shows a real-life reliability journey for four plant sites within the same enterprise. The graph shows maintenance spending as a percentage of replacement asset value. Note that each site began its journey from a different point of performance. All the sites attained the 2% benchmark as they put in place asset data standards and began a consistent application of predictive and preventive technologies, sound work management, and shared lessons learned. And, although the project time could have been greatly reduced by using certain techniques, all the sites arrived at the benchmark together.

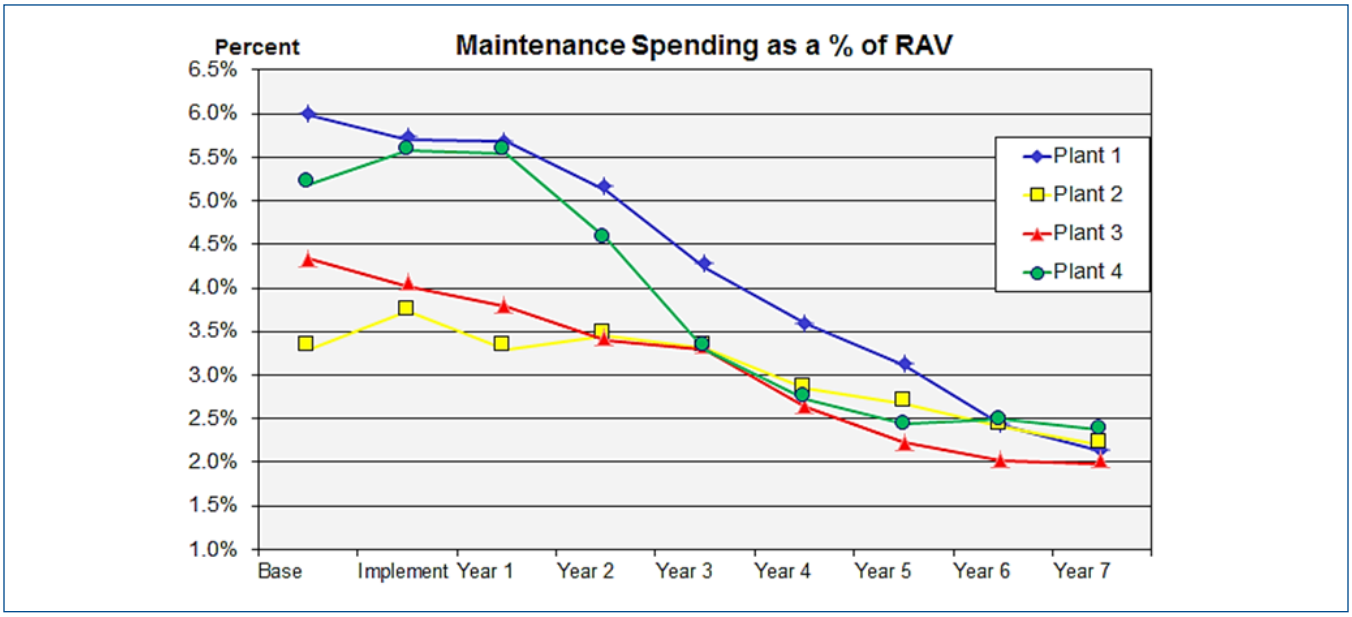

Figure 2. *With proper techniques, percent goal can be achieved independent of the starting point. (RAV = Replacement Asset Value)*

The project shown in figure 2 was successful, but it required seven years to complete — more time than if the team had leveraged expertise, experience, and existing intellectual property. They created their own standards and self-implemented their roll out. They lacked the advantage of having experienced consulting partners who have done the work before and are familiar with the pitfalls and traps. The team obtained no assistance with cultural change in the organization.

One of the biggest accelerators that comes from an experienced expert partner like Emerson is an advanced starting point. Creating standards from scratch is very time consuming. Emerson's Reliability Consulting, for example, has invested over 120 thousand work-hours creating libraries of intellectual property, technical content, standards, and tools that are designed to accelerate and optimize the process of rolling out best reliability practices at a single plant or a large-scale enterprise.

This intellectual property can be leveraged for just about any industrial process company to significantly accelerate a consistent and effective global roll out of best reliability practices, speeding the arrival at the achievement of the business benefits that initially drove the desire to improve in the first place.

The PolyOne Success

At Emerson, our work with clients such as PolyOne has shown the profitable results of strong enterprise-wide standards. PolyOne recently earned an award from Uptime magazine for being the best emerging reliability program of the year. As we worked with them, PolyOne leveraged our standards, set their own, and applied them consistently worldwide — including how they perform maintenance work, how they ascertain equipment conditions at sites, and how they measure performance. In a three-year roll out across more than 50 sites so far, results show the following:

- Reduced maintenance spending by 12%
- Safety incident rate is nine times better than industry benchmark
- Planned vs. corrective work orders: After the project at 64%. Previously at 45%
- On-time delivery reached an all-time high of 95.4%
- Wave implementation strategy has allowed for a quick and successful integration of recent acquisitions

The Reliability Program is part of PolyOne's transformation that has contributed to a stock appreciation of over 13 times since 2009.

These results translated into significant financial and other benefits that were meaningful at the highest executive level of the enterprise, not to mention among the shareholders. PolyOne could not have achieved those results without enforcing consistent, best-practice standards across the corporation for their global fleet of assets. And they took advantage of Emerson's wealth of already developed knowledge standards to accelerate their implementation.

Existing Standards

Once the strategic value of standardization is understood, the question arises: Which standards? Of course there are technical and roll-out standards available from sources like Emerson, but a great deal of public work has been done in this area and several international standards codify asset management practices, consistency of application at the enterprise level, and top-quartile results.

Completed in early 2014, ISO 55000 is a series of standards for asset management. The series has several sections that can be used as guidelines to develop corporate standards. The sections on asset information requirements, asset management plans, resource competencies, management of change, and outsourcing of asset management activities can serve as templates for an organization's own standards. Emerson's Reliability Consulting professionals (including Mr. Hawkins, one of the authors of this article) actively participated in this ISO standard development, and all of our standards align with this new international standard.

ISO 14224 is a standard for structuring asset master data. Guidance from this standard includes the number of levels to include in a hierarchy of assets, effective coding structure, and recommended class attributes. Although this standard was originally developed for the oil, gas, and petrochemical industry, many other industries have adopted it internationally. Properly structured asset master data is key in enabling good decisions going forward. Here again, Emerson's standards, developed over nearly 30 years of practice, are fully aligned with this ISO standard, and in fact partly guided the development of this standard.

Areas Needing Standardization

Across an enterprise, the master data sets the stage for success. Master data standardization encompasses spare parts. As Emerson works with clients, we find a great deal of duplication of spare parts. For example, taxonomy (how you name things in the store room item catalog) can lead to duplication of parts and bloated inventories: 6 “bearings for the big green gear box” and 6 “bearings for the crusher” could mean 12 of the same type of bearing. But if you are looking for a specific bearing by its number, and the bearing number was not entered into these 12 bearing records in the catalog, you might wrongly conclude that you have none of this bearing in stock and buy more.

Standardization does not end with master data; it continues into every element of the Reliability Value Chain. The way an enterprise analyzes pieces of equipment and identifies the ways they fail is important and benefits from standardization. If one facility uses one failure code and another facility uses another code, the two sites will never recognize they could be dealing with similar issues. That means the enterprise needs consistency in the method by which it determines how and why equipment fails. Standardized codes help ensure consistency so that patterns can be seen more easily.

Consistent criticality rating is key in helping to determine what failures are important. Facilities across an enterprise need to base criticality on a core set of priorities rather than opinions of the person on duty that shift, or recent history fresh in the minds of the plant workers. This enables enterprises to deploy resources where there will be the most benefit.

Developing and Rolling Out Corporate Standards

Many techniques exist to roll out enterprise-wide corporate standards. In all cases leveraging already existing standards and technical content, versus creating them from scratch, is considered best practice. In our experience, organizations must start by spending time and effort carefully planning the roll out and creating a play book that defines the corporate standards – the “rules” that all sites will use going forward. This is best done by selecting an already existing set of best practice standards and then gathering representatives from each site in facilitated sessions to gain understanding and acceptance and to ensure each site’s special needs are considered.

In large enterprises, best practice is to roll standards out in a “wave” approach. We select sites to be in the first wave. Later waves — done by employees within the organization — learn from previous wave employees.

At Bunge, for example, a 50-billion dollar global company with 88 plants worldwide, Emerson’s Reliability Consulting was engaged by Bunge’s top-level executives to study the current state of practice in the company and develop the potential business case for business performance improvement through reliability best practices. The goal of the project was a $200 million annual profit enhancement.

Before the first plant began the change, Emerson Reliability consultants spent four months with a carefully selected team of Bunge leaders reviewing and modifying our previously developed standards library. We considered what a state-of-the-art project looks like, and we carefully planned the global roll out. While Bunge leaders were at first dismayed at the amount of time we suggested would be needed for the planning phase, in retrospect they value that time spent on planning. They now say that it was wise to spend the extra time planning such a significant endeavor. We refer to this planning phase as “going slow to go fast,” meaning in the long run the roll out will be more effective and will be completed sooner with proper planning up front.

At Bunge, we divided the 88 sites into world regions and divided regions into “waves.” At the start of the actual roll out, reliability consultants provided significant support in consulting and additional resources to implement the first of the wave-one plants in each world region (the “accelerated” plant). People from other wave-one plants were brought to the accelerated plant and were used as implementation resources. Then those individuals went back to their plant and led the implementation at their own wave-one plant.

At those wave-one plants, people from wave-two plants helped as implementation resources. Then those individuals went back to their plants to lead. Eventually, the final wave plants needed very little consulting assistance. They had the knowledge to implement the programs, they were equipped with the Emerson's standards, libraries and tools, and they became fully qualified, self-sufficient "Consultants" themselves. Emerson's support waned as the waves progressed, which was by design.

Over the complete roll out, standards remained consistent. Years later, Bunge sites are still using the techniques and standards, and there is no tolerance for deviation from standards. Reliability has become a strategic priority with non-negotiable standards – much like standards of financial reporting and safety had been for years at Bunge.

Other companies that have partnered with Emerson Reliability Consulting have achieved consistent and significant results across a global fleet of assets. Corbion, Inc. is another example, with non-negotiable corporate reliability standards rolled-out across similar assets in the United States, the Netherlands, Spain, Brazil, and Thailand. Despite the varying cultures of these geographies, the company has raised reliability to a strategic advantage in their marketplaces, having driven maintenance spending at all plants down to half of what it was at the outset, and having increased Overall Equipment Effectiveness (OEE) significantly. This has enabled the company to stay competitive in tough markets and enhance its ability to win and keep customers because of the reliability of the manufacturing assets.

Conclusions

While implementing standard maintenance practices is a large task that requires solidarity of purpose, standards, tools, and experienced partners, the return on investment is large and long-lasting. Further than that, without non-negotiable enterprise-wide standard practices, an enterprise can bleed costs and chase solutions that have little effect. Reliability, much like financial reporting and safety, should rise to a strategic level of importance and priority in any industrial company, and executives should insist on consistent standards of practice to drive meaningful business results.

Emerson's Reliability Consulting work is driven by the business case and is based on experience, intellectual property, standards, software, and tools. Our experience and our advanced starting point assists enterprises roll out best practices consistently and see the stunning results.

Our goal is to move our clients to top quartile performance so they can stop wasting time and money on ineffective reliability programs.

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