Assessing Obsolescence

Evaluating and managing the risk of obsolescence across the enterprise can help manufacturers mitigate plant downtime and perform more timely systems upgrades.

Executive Summary

For many manufacturing entities, obsolescence management is a missing piece of their overall asset-management strategy – an oversight that can have a profound impact on business continuity. Failure to proactively address asset obsolescence often results in costly, belated technology refreshes. A study conducted by ARC confirmed that nearly 58% of participants had no formal plan for managing the life cycles of their systems assets and manufacturing equipment. The same study found that over 90% of process manufacturers acknowledged the use of industrial automation systems beyond prescribed obsolescence timelines. Also, more than half of the participating companies stated that they found it difficult to find the right people to manage old systems.¹

Typically, obsolescence comes to light only when an outdated asset fails. When companies seek help, vendors’ responses vary – from discontinued product support to a lack of replacements. Without a fallback option, manufacturers typically find themselves in an emergency situation that has a cascading impact on the business. The absence of services and resources – also known as diminishing manufacturing sources and material shortages (DMSMS) – plus rapid advances in technology, are the major causes of obsolescence.

This white paper proposes an approach for assessing the risks associated with managing manufacturing assets, and offers a way to prioritize spending in mitigation and maintenance budgets. Importantly, it shows organizations how to take an objective view of obsolescence risk – a rising concern across the manufacturing space.

Defining Obsolescence Risk

Obsolescence can be categorized in two ways: planned and unplanned. Planned obsolescence is designed into the asset by the manufacturer; asset performance deteriorates with use. Unplanned obsolescence refers to a lack of service, support and spares – typically due to changes in the IT infrastructure, technology and functionality, as well as evolving business needs. Many manufacturing plants struggle with obsolescence brought about by the latter.

Further complicating the situation is the constant state of flux associated with managing the risk of obsolescence – making it vital for manufacturers to monitor the life-cycle stages of all equipment, collect sufficient information to perform a comprehensive audit of the installed base, and plan for risk management and mitigation. A clearly defined, holistic obsolescence policy – covering all aspects of assessing and managing risk – is a must. Such a policy, when complemented by scheduled audits, can better support maintenance budget decisions, including allocation of spares, training costs (to support legacy equipment) and re-engineering expenses.
In light of these factors, and to ensure the continuity of operations, unplanned obsolescence must be properly assessed, managed and mitigated through proactive obsolescence policies, or alleviated completely with alternative solutions.

Assessing Risk
It is vital to perform an objective assessment of obsolescence risk on a rolling five-year horizon. To achieve this, we recommend an all-inclusive framework that takes into account multiple factors that often contribute to the likelihood and potential impact of obsolescence. (See Figure 1, above). This approach helps manufacturing enterprises prioritize investments against these high-risk assets.

The First Step: Identifying Critical Assets
A typical plant has hundreds of assets comprising process control systems (PCS), standard and configurable software packages, instruments and bespoke systems. Figure 2 illustrates the asset hierarchy at the site level for a typical discrete manufacturer.

The Asset Hierarchy: An Illustrative View
When assessing obsolescence, assets must be viewed from two perspectives:

- **Operational.** Issues that are critical to operations, redundancy and business requirements (product demand and mix, etc.) must be considered. However, not all assets are equally prone to obsolescence. For example, an electric motor or pump may be crucial to operations, but replacements are easily available off-the-shelf and can be quickly installed in case of failure.

- **Functional.** Assets with software and electronic components (including both COTS and bespoke products) are the primary candidates for obsolescence assessment. This is because they are prone to frequent technology changes and updates. Also, any retrofitting/refurbishment/new installation of these systems typically requires time-consuming configuration and validation, which impacts business continuity.

### Developing an Objective Assessment Framework

An assessment framework can be implemented as an engine for computing the risk of obsolescence associated with a given asset. A reference framework that defines risk as a function of impact and likelihood is illustrated in Figure 1 on the previous page.

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\text{Impact} = f(\text{Operational, Revenue, Reputation})
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\text{Likelihood} = f(\text{Obsolescence, Reliability})
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### Performing the Assessment

When assessing the risk of obsolescence, relevant qualitative and quantitative factors must be considered. For example, “average downtime” can be defined as the time an asset is unavailable. Approximating downtime takes into account any possible redundancy and workarounds in the event of a breakdown. “Failure-to-recovery” costs refers to expenses incurred in rescheduling, setting up a parallel line operation and re-allocating resources, for example. “Revenue impact” is determined by gauging the unavailability of an asset and average demand. “Brand impact” can be assessed by the type and duration of unavailability. An incident that can be managed internally (locally) by the organization (maintenance and engineering) will have a low impact on the brand and the reputation of the organization compared with an incident that could impact distributors and/or end-customers.

### Quick Take

**Rules to Enhance Asset Risk Management**

We have developed a rules-based engine that assesses the risk of obsolescence of manufacturing assets. The engine considers multiple factors (as documented in Figure 3) to compute risk scores. It can be customized to specific business requirements and obsolescence policies. The engine computes the risks based on more than 200 defined rules, and can be configured to create a holistic picture of obsolescence risk at a component, system or line level.

We helped a pharmaceuticals manufacturer assess its obsolescence risk using our proprietary rules engine. This allowed the client to map more than 700 assets across different site areas and production lines, and evaluate risk per asset. The manufacturer was able to identify site areas that required immediate attention, and plan mitigation accordingly. With the help of the engine, the client can now review risk on a rolling-horizon basis.

In assessing “obsolescence likelihood,” Tier-1 suppliers play a crucial role. “In-house capability” refers to the ability of an organization to manage a system, which depends heavily on tools, skill sets, and the availability of back-ups and spares/stocks inside the manufacturing site. “Reliability likelihood” typically refers to both asset reliability (data is usually gathered from the maintenance logs or from enterprise systems) and the reliability of the supplier (in terms of SLA adherence, communications, service and support).

Both asset and system data must be gathered and fed to the risk-computing engine. Normally, details such as vendor information, system part
number, technical features, installation dates, software versions, availability of application back-up, etc., reside with maintenance and engineering teams. Interaction with the supplier base (vendors) is needed to gather information on their future manufacturing plans, as well as spare and repair support plans.

**Analyzing Risk and Impact**

The computed risk scores for all the assets can be mapped on an impact vs. probability matrix for interpretation. Figure 3 illustrates a sample matrix based on the output of our rules engine. To prioritize mitigation planning, the matrix can be represented in three zones:

- **Z1** (high risk, high impact)
- **Z2** (medium risk, medium impact)
- **Z3** (low risk, low impact)

In this matrix, 163 assets are mapped; each bubble represents a cluster of assets that have the same risk value. For example, in Zone Z1 (in red), a bubble with size “13” represents a cluster of 13 assets with the same obsolescence risk score of nearly 0.70. Although the matrix illustrates a broader clustered view, with the help of our rules engine, each asset can be individually analyzed.

Additionally, components with very high (VH) scores in either dimension (impact or likelihood) must not be ignored. They can be designated as uni-dimensional, high-risk elements, and should be considered as Priority 2 after Zone Z1 components.

**Mapping Obsolescence Risk and Impact**

A plant-wide view is also possible using our rules engine to examine the quantum of risk associated with each department and operating line. The distribution of high-risk components across departments can also be computed. For example, in Figure 4, “Process Site 2” has the highest number of “high risk” components, followed by “machining shop.”

**High-Risk Components Across Departments**

**Analyzing Sensitivity**

Figure 5 illustrates a sample sensitivity analysis, based on factors considered within our rules engine. Risk is highest with low SLA adherence and high downtime (Z1); risk declines with reduced failure rates, installed base and improved supplier score (Z2); risk declines further with reduced downtimes and improvements in spare support provided by the supplier (Z3). Note: The factors highlighted in Figure 5 are representative and not exhaustive. Moreover, an asset risk can change over time and across zones, depending upon these factors.
Looking Ahead: Maximizing Returns, Minimizing Risk

Planning for and managing obsolescence with the correct information helps to maximize investment returns (e.g., maximum availability and business continuity) for specific systems and assets. In this way, companies can:

- **Understand the risk across departments and production lines.** Organizations can objectively understand the severity of obsolescence risk using comparison figures across departments, and plan risk-mitigation actions and budgets accordingly.

- **Become aware of vendors’ end-of-life (EOL) plans.** Manufacturers can raise their awareness of supplier support plans and act proactively in the event of discontinued support or technology upgrades.

- **Reduce the risk of system unavailability caused by equipment breakdowns and improve equipment support.**

A similar assessment can be conducted and systems put in place at numerous sites — creating a broader, global view of obsolescence. Multiple-candidate mitigation strategies can then be considered to either manage or mitigate risk — taking into account feedback from vendors, functionality and the efforts involved. Other factors that impact mitigation strategies include costs, returns, business criticality, planned life of operations and technical obsolescence.

With a clear obsolescence policy and objective assessment methodology, organizations will be in a better position to develop improvement plans and engage in a continuous risk-mitigation cycle.

Footnote


About the Authors

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