Coping with component obsolescence

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The lifecycle of common electronics is getting ever shorter, and today many electronic components have an expected life of less than five years. This may lead to critical automation, control or navigation systems being rendered inoperable should a critical component fail.

The financial losses, in terms of lost operation, resulting from the failure of a simple component, may be quite out of proportion to its relatively inexpensive cost. It is, therefore, a clear economic risk to neglect the actual and potential problems caused by obsolete electronics. Unplanned replacements of such obsolete components may also become somewhat expensive, since the ad-hoc nature of the replacements may have unexpected effects when other components become obsolete.

Another challenge is the fact that it is also becoming harder to keep track of which systems are still supported, and to predict the remaining life-time of systems. Meanwhile, more components are being used in an installation, and the warning time is getting shorter. In practice, it may be close to impossible for the owner of an installation to implement efficient obsolescence management, and to keep track of even the most critical components to secure their availability.

This is where Wärtsilä’s modular upgrade solutions, as well as the company’s obsolescence management services, come in as ways to manage the risks. The modular upgrade solutions provide a cost-efficient way to upgrade and modernize the installation, while Wärtsilä can provide obsolescence management services for the complete installation adapted to the customer’s needs. With these services and solutions, the risk for unexpected component availability problems will be minimized, and the risk of severe operational outage due to obsolescence will be reduced.
Modular upgrade solutions

In order to retain high availability of the installation in a cost-efficient manner, Wärtsilä has introduced modular upgrade solutions. The solutions provide a model for obsolescence-driven modernizations that can be tailored to the owner’s strategic targets. Similarly, the owner is able to pro-actively budget and plan the actions needed, avoiding reactive and urgent fire-fighting. In addition, modular upgrades also allow the installation to be gradually modernized to meet new regulations, increase usability, and ensure safety. As the modernization packages for different equipment are planned to work together, an investment in modernizing one part of the installation will automatically make it compatible with other modernization modules, in line with a well-balanced long-term upgrade plan.

Modularity is not only motivated by the possibility to plan and spread investments over time, but is primarily motivated by the fact that components typically become obsolete in different cycles. Therefore, some components may already have been replaced several times, before other components are even getting close to becoming obsolete. Typically, machinery controls (e.g. engine, propulsion, generator, etc) as well as conventional automation systems (PLCs and DCS controllers) are supported by the availability of spares for at least 15 years from delivery. On the other hand, systems based on commercial computers (PCs) have a lifecycle of only a couple of years, while their operating systems (e.g. MS Windows) – although supported for up to ten years – will require regular updates several times a year in order to stay secure and stable.

The idea behind modular upgrades is shown in Figure 1. Here, the lifecycle of different types of components is indicated and the dependencies between different system levels have also been considered.

Typically, machinery controls (engine, propulsion, generator, etc) may be used for up to 10 to 15 years without anything other than normal maintenance and tuning before needing to be upgraded. When such a need occurs, Wärtsilä can upgrade the machinery controls, for example the engine controls, to meet the latest technical standards through a predesigned package that is easy to install and commission. With this upgrade, obsolescence is avoided for at least 15 more years, and the upgraded machinery controls also meet the latest requirements in terms of functionality and safety.

A generic automation system, typically based on PLCs, may require some minor upgrades after only 5 years, in order to replace potentially obsolete parts and to upgrade the functionality to modern requirements. And within 15 years, a need for a full replacement of the system becomes...
For these occurrences, pre-designed replacement packages can be supplied. Although based on the most recent developments, these packages are designed to match the plant in order to ensure fast installation and commissioning time with a minimum of interference to normal operations.

Computers, on the other hand, need upgrading every 5 years in order to stay safe and stable. For this purpose, replacement computers can be pre-configured to match the installation, while both the hardware and software are updated to the most recent standards. This is the most cost efficient solution, whereby existing software licences and configurations are re-used, while at the same time keeping the equipment fully updated.

One reason to keep computer based industrial control systems updated is the increasing cyber security threats. This has also been noted by authorities, and more stringent requirements are being placed on computers in critical applications. Critical patches and upgrades to the computer software are required to minimize such risks.

Because uncontrolled patching and upgrades may actually render the system inoperable, Wärtsilä is also introducing a programme whereby necessary upgrades and patches are pre-tested on supported computer platforms. This allows them to be applied at the installation with a minimum of testing. Through this programme, the installation stays safe and fully compliant with regulatory requirements.

Finally, the modularity in the obsolescence management programme allows the user with an upgraded computer system to upgrade the PLC system without needing to further upgrade the computers. Furthermore, by utilizing Wärtsilä’s obsolescence management services, the owner can ensure safety and reliability at reasonable cost.

**Obsolescence management**

In order to reduce the risks of obsolescence, an efficient obsolescence management (OM) system that covers the total installation needs to be implemented. A typical obsolescence management system requires some basic activities to be in place, most typically:

- Information on the existing installation needs to be collected and maintained as a source for deciding whether envisioned obsolescence risks may affect the installation.
- A system for obsolescence forecasting needs to be implemented. Information from suppliers on potential obsolescence should be continuously monitored.
- A mitigation plan needs to be put in place for every component under OM, wherein possible actions in case of obsolescence are planned and defined.
- A process for obsolescence resolution is needed. When obsolescence occurs, action to mitigate the risks related to loss of operation or reduced safety should be ready for implementation.

As these aforementioned activities can be quite burdensome, it is uncommon that individual owners implement a working OM system capable of keeping the risks at the desired level. This is where Wärtsilä’s obsolescence management services can help. Through good supplier relations, and an experienced insight into the obstacles and pitfalls, Wärtsilä can support owners with a management service to reduce the risks arising from obsolescence.

The Wärtsilä obsolescence management service is not limited to only Wärtsilä supplied equipment. The owner can define what critical equipment is to be included in the OM plan, which then releases the owner from the burden of OM.

**Information management**

Any working obsolescence management system requires information on the type of equipment installed. The Wärtsilä obsolescence management service starts, therefore, with a system of regular installation audits whereby all information and documentation on installed systems and components, as well as their condition, is collected. Through regular audits, this information is also kept up-to-date – both in case of modifications to the systems, and also to keep track of available spare parts. These records also document deterioration of the equipment.

Through this information, it is possible to identify the status of the installation, and also to understand the best way of mitigating the obsolescence risks.

**Obsolescence forecasting**

As Wärtsilä maintains close contacts with manufacturers, the company possesses good insight into the obsolescence status of main components. As new components are encountered, new sources of information are added to the monitoring. With this information on component availability, an obsolescence forecasting list is prepared. By cross referencing this with the installation information, potential obsolescence problems for any installation under OM can be detected. This allows orderly planning and budgeting of preventive actions well before the actual obsolescence occurs.
Mitigation planning
Another critical part of OM is to define the appropriate obsolescence management method approach for each critical component. The approach may, for example, be:

- Reactive, where no action is needed before obsolescence occurs.
- Pro-active where, when early warning signs are received, pro-active actions are taken in order to prevent obsolescence problems.
- Strategic, whereby the impact and complexity of the case is high, and strategic actions, like system or component redesign, will be deployed.

This means that the obsolescence approach may depend on the components, but also on the renewal strategy of the owner of the installation. In some cases, planned modernizations may be chosen, whereas for other situations a component repair or minor replacement may suffice.

Additionally, the mitigation methods for a component may vary depending on the complexity of the product, the ease of replacement, and other factors. Typical mitigation methods might include:

- Partial or full modular upgrades and modernization solutions whereby the systems are upgraded to current design, and where the performance and usability can be upgraded to meet modern requirements.
- Last time buying of components, where a stock of obsolete components secures availability long after manufacturing of the component has been discontinued.
- Re-design and re-manufacturing, where old designs are updated and the component can continue to be produced.
- Refurbishment of used components, including the repair of failed electronics. Wärtsilä can, through its own electronics laboratories, refurbish, repair, and re-manufacture specialized electronics to keep systems operable.

As the warning time in which to react may be very short (down to a matter of months in some cases), it is important that the method has been evaluated and decided on beforehand. This is so that the plan can be put into action immediately obsolescence occurs.

Obsolescence resolution
Through continuous monitoring of the obsolescence situation, Wärtsilä can inform the owner of upcoming situations, and suggest the most feasible actions in order to stay operative, even after components become obsolete. Wärtsilä also actively resolves obsolescence problems through re-design and last time buy activities so as to support its customers in the best way.

Case illustration
As a typical example of a modular upgrade, a power plant equipped with four Wärtsilä 32 generating sets that were commissioned in the mid 1990s, required an upgrade in order to replace the now obsolete PLC based controls and AVR. Upon failure, these could have rendered the plant inoperable as spares were no longer available. At the same time, the PC based HMI system based on Windows NT required an upgrade to stay secure and compatible with available hardware.

The modular obsolescence upgrade was designed utilizing the original plant design, but was based on recent hardware and software platforms. This not only ensured spare part availability, but also modernized the functionality to the same level as in modern power plants.

Due to accurate pre-design, the downtime for the PLC systems was able to be limited to approximately one day per each generating set for removal and installation. Commissioning required a further day or two, during which all I/O’s and safeties for the generating set were tested and verified.

The HMI system installation and commissioning took in all, approximately three days of work.

CONCLUSION
Wärtsilä has developed effective means for minimizing the risk of severe operational outages created by the obsolescence of critical components, and their future non-availability. Its obsolescence management services monitor the operation of the entire installation to ensure that it is maintained in accordance with the customer’s requirements. At the same time, modular upgrade solutions represent a cost-efficient means of modernizing the installation to the latest technical standards.