Managing obsolescence in the rail industry

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Obsolescence is a subject that is of particular importance to signalling and telecommunications throughout the world. Stuart Broadbent, obsolescence director of Alstom, and a director of the International Institute of Obsolescence Management (IIOM), describes how the rail industry can mitigate the risk of component and software obsolescence.

The increased use of electronic systems in rolling stock and rail infrastructure has undoubtedly improved operational efficiency and safety for the rail operator (passenger and freight), as well as enhancing the passenger experience. For the rail engineer, however, these electronic systems come with the added challenge of managing obsolescence.

Latest technology vs legacy

There is a simple reason why the rail industry is vulnerable to obsolescence and that is because most electronic component and equipment manufacturers are focused on their next-generation products and on emerging technologies. Moore's law is the observation that the number of transistors in a dense integrated circuit (IC) doubles about every two years, meaning more processing power in less space and using less energy; a five-year-old IC will never be used in the latest consumer product. This reliance on R&D to provide new revenue streams means that today's hot new products quickly become legacy parts as the component manufacturers follow development cycles that are driven by fast-moving consumer markets.

Mobile phone users will expect to upgrade their handsets every 18 to 24 months, whereas the planned life-cycle for rolling stock is usually 30 or 40 years.

There is also a significant difference in the volume of units shipped to the consumer and rail industries. Global shipments of mobile smartphones reached 1.47 billion units in 2017; compare that to the 6000 main line vehicles planned for delivery in the UK between 2014 and 2020, and the difference in the component requirements becomes clear. The difference in the expected operational lifetimes and the production volumes means the focus for manufacturers of electronic components will always be on latest technology components for high volume markets rather than legacy, low volume parts.

The expected lifetime of software also falls short of the life-cycle needs of the rail industry. Microsoft withdrew support and automatic upgrades for Windows 1998 after just eight years and ceased support for Windows XP after 12 years.

As Figure 1 shows, the challenge facing rail engineers is to ensure the continued operation of electronic systems well past the point at which the manufacturers no longer produce or support the components within them.

There are two types of obsolescence that need to be managed: functional obsolescence and technical obsolescence.

Functional obsolescence

Functional obsolescence occurs when installed equipment cannot be adapted to meet new standards or regulations for issues such as quality of service and efficiency. Examples of functional obsolescence include updated regulations for People of Reduced Mobility (PRM); changes in the availability of the radio spectrum for voice and data communication; and the lower processing power of a legacy computer being unable to support greater demand for sensor inputs or system intelligence.

Technical obsolescence

Technical obsolescence means that the correct operation of the equipment cannot be guaranteed because spare parts or technical support is no longer available from the manufacturer. Technical obsolescence may occur when a component manufacturer withdraws a legacy part so that the equipment in which it is used can no longer be supported, or when a supplier no longer wishes to support a product range or goes out of business.

In addition to the obsolescence of electronic components, the rail engineer may also have to consider the obsolescence of materials (regulations such as RoHS and REACH have stopped or restricted the use of hazardous chemicals and some raw materials), changes in production tools and even workforce skills. As older employees retire, younger recruits may not have been trained on the legacy systems and technologies that are still operating in the rail industry.

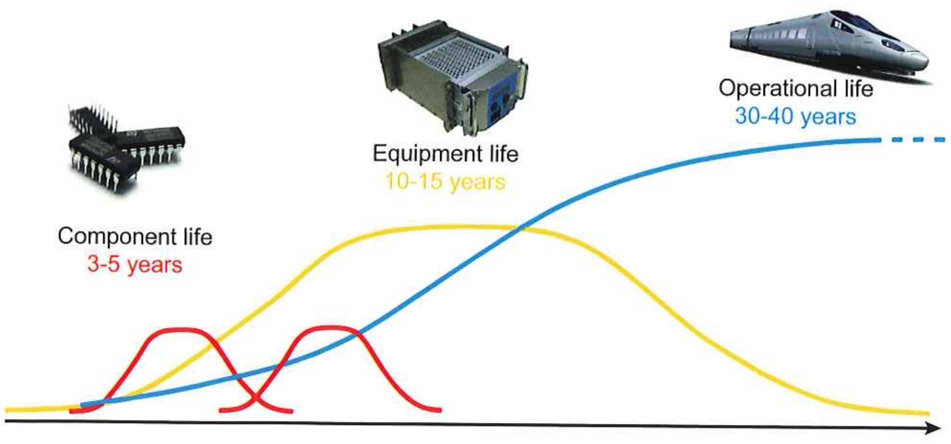

Figure 1 – Short component life-cycles make obsolescence inevitable in equipment with a long life-cycle.

GSM-R, the European standard for rail voice and data communication, and used in the UK for both voice communication and for ETCS, will only be supported by the manufacturers until 2030, and beyond this it will become increasingly difficult, and expensive, for infrastructure managers to maintain the same quality of service.

Managing obsolescence

In order to determine the obsolescence strategy for a product or system, the engineer needs to assess the likelihood and impact of obsolescence during the life-cycle. This assessment takes place at initial design stage and is reviewed periodically.

- If the combination of likelihood and impact of obsolescence is low, a reactive approach can be followed – in which nothing is done until the obsolescence materialises.
- If the combination of likelihood and impact of obsolescence is medium or high, a proactive approach should be followed – in which case there needs to be an obsolescence management plan to mitigate the obsolescence risks.

If the product or system includes software, the likelihood and impact of software obsolescence during the life-cycle also needs to be considered. Within the same product or system, there can be equipment and components that can follow a reactive approach, and equipment and components that requires a proactive approach. These strategies are described more fully in the new standard for Obsolescence Management, IEC 62402:2019.

A coordinated obsolescence management plan is essential for a proactive approach. It is also important to create a business-wide culture of obsolescence awareness, particularly in the R&D, engineering, maintenance, sourcing and supply chain functions.

Proactive obsolescence management should start during the initial stages of product design. At this stage, the risk of obsolescence can be mitigated by using techniques such as Preferred Parts List, obsolescence checks on proposed Bills of Material, dual sourcing, technology transparency (specification of interfaces) and by undertaking technology assessments and risk-mapping. Anticipating and planning for upgrades, and considering the road-map for each technology are also crucial.

When the system is installed and in service, obsolescence should be monitored at component, product and system level. This is achieved by periodically reviewing the market for emerging technologies and generating a watch list of critical parts. By monitoring the availability status of electronic components, the product manufacturer is able to make life-time buys of components based on forecast demand for production, spare parts and repairs when the end of production of components is announced. With good storage techniques, components can be stored for 20 years or more, helping to ensure that the product can be supported for its complete life-cycle.

A reactive approach is applicable to products with low or stable technology, or containing items with low likelihood of obsolescence such as mechanical or machined parts, and where the impact of obsolescence is assessed as low.

Sharing information and best practice

The International Institute of Obsolescence Management (IIOM) www.theiiom.org is the professional body for those involved in, or interested in, Obsolescence Management. The Institute is for professionals worldwide who wish to further their knowledge and understanding of the Obsolescence Management discipline, obtain professional recognition, and network with like-minded individuals from its global membership.

IIOM started in the United Kingdom as COG (Component Obsolescence Group) in 1997 and now has Chapters in Germany, India and USA as well as the UK. Members come from all industry sectors and all levels of the supply chain, and are located in countries around the world; members include asset owners and operators of systems and equipment, manufacturers of systems, equipment and components, and obsolescence solution providers.

Those joining the IIOM are able to network with people from other companies and industries on obsolescence management best practice in both obsolescence management and counterfeit avoidance.

The regular member meetings provide a mix of formal presentations and informal discussions at which obsolescence engineers, buyers and solution providers can exchange ideas on key issues such as REACH, conflict minerals and counterfeiting. The meetings also provide access to the latest tools and systems developed to reduce the administrative costs of obsolescence monitoring and management. IIOM members were heavily involved in the development of the new version of IEC 62402:2019, issued in June 2019, and IIOM has a series of guidance booklets on various aspects of Obsolescence Management.

Conclusion

Effective obsolescence management requires partnership between the asset owner, operator, system integrator and the equipment suppliers, built around a formal obsolescence management plan.

It helps rail engineers to ensure that the operational lifetime of equipment can be extended far beyond the timescales supported by the electronic component manufacturers and software suppliers. So, despite the throw-away culture of consumer markets, the rail industry should still be able to measure the operational lifetime of its equipment in decades rather than years.