

Obsolete Control System...?

PLC Obsolescence – What should you consider?

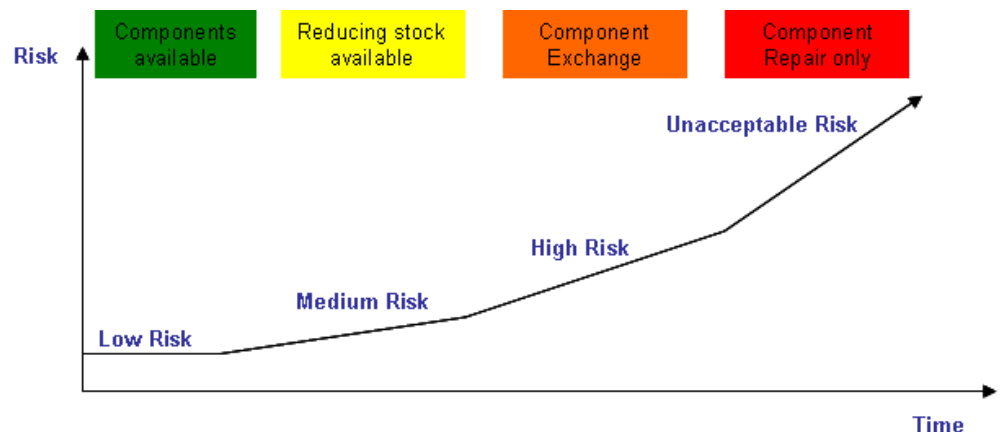
Programmable Logic Controllers have undergone considerable changes in recent years. As with most control technology the rate of obsolescence is much higher than that of the plant it controls. This has left many manufacturers with considerable headaches:

- Increasing difficulty in obtaining spares
- Increasing difficulty in maintaining software
- Difficulty expanding/modifying systems
- Inability to connect to other systems, especially MIS

Over the past few years, many of the large automation component suppliers such as Rockwell Automation, Siemens and ABB have embarked on a fairly aggressive upgrade path with many of the widely used older mainstream products being forced into obsolescence almost simultaneously.

Generally manufacturers will follow a path to redundancy giving End of Life (EOL) notice first which will define the timing of the following steps:

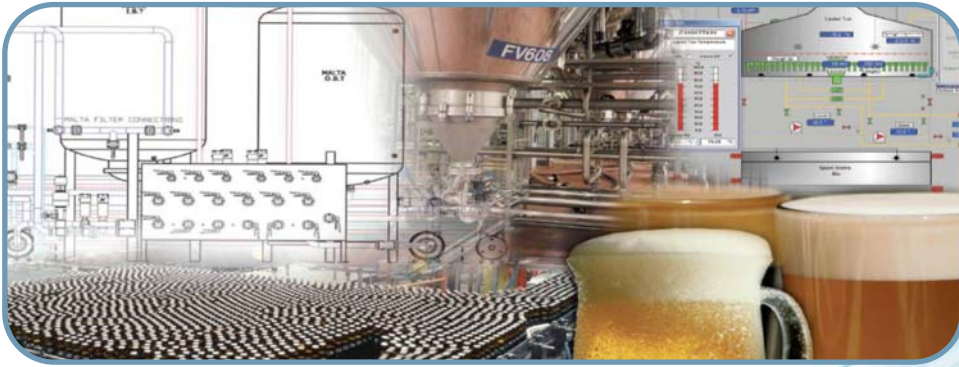
1. Ceasing component manufacture (spares stock only)
2. Component Service Exchange (refurbished stock, faulty hardware returned)
3. Component Repair only (return of hardware required)



Once a component has been included in EOL literature, the process of planning replacement should begin, this allows time for technical and budgetary planning. The longer this planning is delayed the higher the risk to production as illustrated above.



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PLC Obsolescence – Planning your Upgrade

When the replacement of obsolescent controls is considered there are several major issues that may need to be explored:

- The original manufacturer may not offer an upgrade path
- Even where such a path is available this may result in considerable risk and disruption to production
- Such an upgrade may lock the user in to an increasingly marginal technology

FMA have considerable experience with many control system replacement scenarios and this experience leads us to ask some structured questions when we find ourselves asked to look at a possible project.

What drives the project?

1. Business risk due to hardware failure only?

In this instance the major risk is likely to be the processor and/or the hardware platform supporting a visualisation system. The Client may not be concerned or have the resources to replace the entire hardware/software platform.

The simplest approach is to replace only the vital obsolescent hardware – this may mean that the Client is willing to retain the IO boards of the old system. These are usually much easier to find plentiful spares for or are easily repaired than the main processors. There are several scenarios for this:



- The old IO bus is supported by the new PLC.
- The old IO can accept new bus adapters to match the IO bus supported by the new PLC.
- An IO bus gateway is used to convert the old IO bus protocol to the new. This approach may not be possible if there are unacceptable time delays to data transmission introduced.

Hence only the PLC and/or visualisation hardware is changed.

The system software can be ported to the new system in one of several methods:

- Depending on the manufacturer/model it may run un-changed in the new hardware.
- There may be a manufacturer's or 3rd party's conversion package available. These are not usually 100% accurate so there has to be some manual intervention and testing thereafter.
- The software can be interpreted manually into the new format. FMA could consider using low-cost resource in Indian partners for this and then test the result in the UK.



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There are several benefits to this approach:

- This is likely to be the least costly option
- Changeover is normally just a matter of moving IO bus cables from the old to new PLCs. Likewise for visualisation. In both cases should there be issues there is an immediate and easy roll-back scenario.
- The expensive and irreversible change of IO itself can be put off into the future when resources or shutdowns are more available. In addition the IO could be changed out in a number of phases spanning possibly years.

2. Business risk due to obsolescence?

In this instance the Client considers that all the hardware/software is obsolete and poses a business risk. Here the critical decisions revolve around the changeovers.

If a long period of shutdown is possible then the entire system can be replaced and re-commissioned. If however continuous production is critical, then the IO replacement becomes the focus of planning.

In this later case the two options are:

- Replace the IO AFTER the PLC and software is changed over. The steps in this process are as in 1. above. This would be the normal approach but requires there be a method available for the old IO to be supported by the new PLC.
- Replace the IO BEFORE the PLC and software is changed over. This requires that the new IO bus can be run by the existing PLC. This approach is appropriate if the old IO bus cannot be supported by the new PLC, but the old PLC can support the new IO bus.

For both options the actual time to replace the wiring may represent a risk to production. Again there are several possible approaches:



- Replace the IO and re-wire the IO wiring adapters with the old wires. This involves the minimum disruption in the panel but runs the highest risk of making wiring errors. It also requires physical densities of new and old cards to be similar.
- Replace the IO and re-wire from terminal blocks. This can be made more efficient by making wiring looms up before-hand in workshop, but does mean that the internal trunking of the panel is disturbed. This is less prone to wiring errors than the previous method.
- Use 3rd party wiring arm adapters. This is normally expensive in hardware, but it is off-sets by the savings in wiring time. The old IO is replaced and the new IO is connected by plugging the old wiring arms directly into the adapters.

The last option is preferable in most cases because it vastly reduces the possibility of errors but is also considerably faster. Not least it presents a plausible roll-back strategy if the replacement IO does not function.



In this instance the Client can potentially have the bulk of the existing code converted and then “bolt-on” the additions. Good examples of this are where SCADA systems are added. If engineered rationally, there needs to be consistent well defined interfaces between PLC and SCADA elements – these may be defined in existing SCADA Client/Supplier standards. For this reason there may well be interpretative code between the old and new elements in the software. These have to be engineered carefully to maintain the integrity of the existing functionality.

There are limits however to the functionality that can be added without reaching into and changing the existing software. Beyond a certain point, particularly if there is no supporting up-to-date functional description or specification, there is no realistic choice other to discard the old software. In this case the procedure is as set out below.

4. Requirement for expansion?

In this instance the Client is usually considering significant changes to the physical plant at the same time or in the near future. Generally this requirement will mean that there will be a forceful argument for updating the software into a modern system to allow a more structured and flexible approach to this.

The hardware changes are as in sections 1 and 2 above, but the system software will have to be re-written. There are several key points to bear in mind:

- Unless the program is very well structured and documented it is not feasible to reverse engineer the new software out of the old.
- A combination of techniques should be used to develop a new Functional Specification for the control. These would include:
 - i) Existing Functional documentation.
 - ii) Existing visualisation, including perhaps videos of plant in use.
 - iii) Interviews with plant operators/engineers.
 - vi) Existing software
 - v) Process expertise from supplier.
- Once developed and accepted by the Client, the Functional Specification becomes the reference for the project.



There is a danger for both Client and Supplier that unless the new Functional Specification becomes the only reference then development and testing can become mired in discussions revolving around interpreting the scope.



For more information

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