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Driving Forces and Key Benefits of Control System Migrations

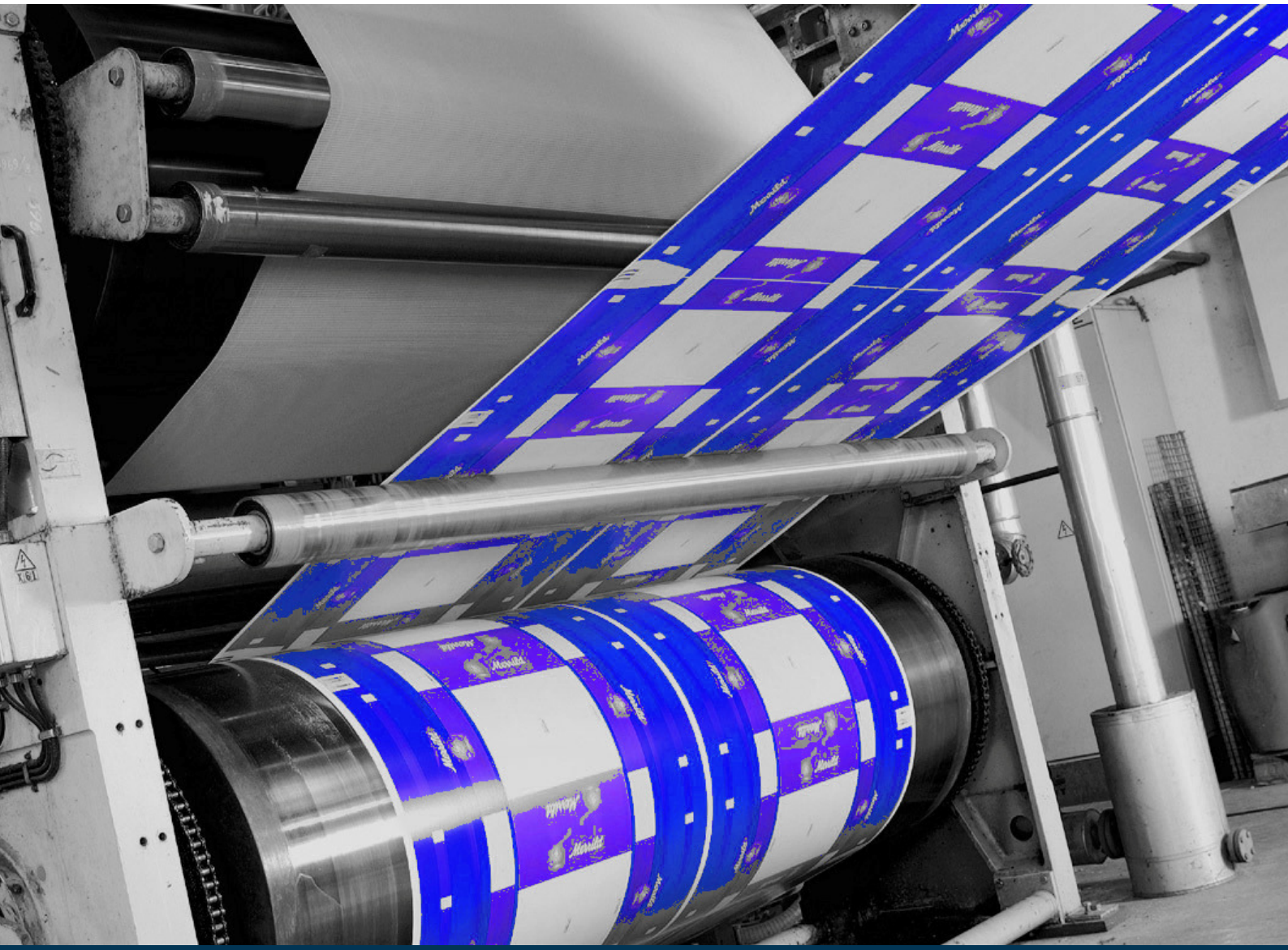
Driving forces of control system migrations

Migrating a control system from one technology to another implies using different fundamental technologies at the heart of the control system. For example, using new AC motor and drive technology rather than an existing DC, or acquiring sensor data over Fieldbus networks rather than relying on long-distance hardwired interconnectivity.

Most new machines already include the latest technologies in their control systems. This is expected from an OEM in order to maintain a competitive market offer. End users have different criteria to consider when compared to the OEMs'. It is generally accepted that an end user will face the question of whether to embark on a machine control system at some future point during the lifetime of machine, if, indeed, it has not already.

The common driver behind the affirmative decision to upgrade being that the existing control system's reliability has diminished so far that it impacts significantly on the businesses commercial performance, or its vulnerability to failure and the consequential effects are considered too risky. In such cases, a controlled replacement is the answer.

Upgrading the ageing control system of any machine involves the full or partial replacement of the existing control system with new control equipment, re-designed using modern control techniques and naturally with the option of using the latest, supportable technologies.



Why should companies migrate their systems?

In business most questions must satisfy a commercial rationale. Any monetary investment needs to have justification with a confidently predicted return on that investment. So what improvements can be reasonably expected from the decision to migrate?

We consider a few of the more frequently undertaken migration projects:

1) **Analogue control equipment to digital control equipment.**

The widespread introduction of low cost microprocessor technology revolutionised not just industrial equipment development but domestic too. Every reader who can remember tuning a radio in with a rotating dial is probably familiar with the attention needed of continually adjusting the tuning dial for an optimum signal quality. With digital systems that activity is a thing of the past.

The speed holding performance of a variable speed motor is just the same. Variability of analogue control systems due to temperature, for example, means that the best speed holding one can hope for is +/- 0.1% of maximum speed (with a high quality analogue tachometer feedback device, well-coupled with a good quality motor controller). Digital technologies improve this rate by at least 10 times. The impact on product quality and rate of production is obvious.

2) **Obsolete PLC to Current PLC**

PLC systems have now been commonplace since the 1970s. They have moved on significantly in their capabilities and performance.

As development occurs, manufacturers tend to introduce new product ranges; periodically, but not too frequently. When they do in fact release a new range, the old one has 2 limited support lifetimes. One, the official one, is provided by the manufacturer direct, the second one - by independent means which has no defined time span. The latter generally outlasts the former, particularly for main brand equipment where second-hand units find their way onto the general spares market.

Some obsolete PLC equipment is seen more often than others as a direct result of its original popularity and evident reliability. Siemens S5 equipment, for instance, is still in use in a large number of companies despite it ceasing to be manufactured since the early 1990s. The spares and support requirements for this equipment has dwindled to dangerously low levels with increasingly difficult support strategies needed and very high risk consequential recovery scenarios. Given the vulnerability of companies to significant disruption in the event of a failure, a planned PLC migration is highly recommended for consideration.

There are several benefits of employing the latest PLC technology:

A. Efficiency – recent PLC models have greater memory capabilities and less space requirements. Depending on the machine's specifications, the PLC size will vary from nano to large.
B. Flexibility – A single PLC may run several machine sections concurrently.
C. Cost efficiency – Most PLC manufacturers offer controllers with varying capabilities. Some machines can be successfully controlled by lower cost, higher performing PLCs, thus eliminating the need for more costly investments in high-end models.

3) **DC motor control technology to AC technology**

From around the mid 1970s, until the advent of AC Vector motor controllers, the most common options available to provide industrial variable speed control involved one of a small number of methods. Namely, variable gearboxes (e.g. PIV), PWM inverter controllers with AC squirrel cage motors, DC drives and motors or servo drives and motors. Each option had its shortcomings, whether it be cost, upkeep, reliability, accuracy, performance or complexity.

With the availability of the high-speed microprocessor the development of AC vector control became possible. Possessing inherent flexibility and being fundamentally digital, accurate motor control improves dynamic performance and peer-to-peer communication protocols (to name the most salient features) uplift both the performance and reliability of control systems. Also, they dramatically improve the breadth and depth of process data that could be extracted from the system. All these facilities influence product and process improvement and add to the production efficiency of any manufacturing plant.

4) **Traditional copper cable machine wiring and distributed Fieldbus networks**.

There is a well-visited argument behind such migration. Whilst remote I/O hardware comes at a higher price than the centralised version, the cost of installation (from cabling and manpower perspectives) is reduced dramatically and in most cases outweighs the increased hardware costs.

Added to this is the much-improved reliability that comes with lower numbers of wire ends and the diagnostic data available from the technology and the argument is a compelling one.

Migration for Migration's sake?

Migrations are only ever implemented when some or all of the gains expected are deemed necessary. So, if you experience any of the following, it may be time to consider migration:

1) My process is difficult and time-consuming to setup reliably

2) My product quality drifts due to the control system

3) The reliability and downtime of my machine are an issue

4) The range of product required from the process has broadened beyond the capabilities of the original system

5) The control equipment that I have is obsolete and unsupportable

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