Seeing the benefits of the Machinery Directive

The new EU Machinery Directive will undoubtedly bring benefits in terms of improved safety but will also increase the compliance burden for many companies. Paul Considine of Wieland Electric explains how new control technologies can make compliance more cost-effective, while also helping to drive cost from the business.

From 29th December 2009 owners and users of machinery, as well as machine manufacturers, will need to ensure they are compliant with the new EU Machinery Directive. It is vital, therefore, that anyone who is responsible for health and safety in these environments is aware of the implications of the Directive and how it affects them.

For example, although the Directive applies principally to new machines, any modifications to existing machines may also be covered by the same requirements as cover new machines. Therefore, just as a new machine should be accompanied by a Declaration of Conformity to the Machinery Directive from the manufacturer, so any company carrying out such modifications may also have to issue such a declaration.

This is because the requirement applies to any organisation that 'places a machine on the market' - and in this context modifying a machine counts as placing it on the market. So, along with the Declaration of Conformity, there needs to be a technical file that can be made available to the authorities on request.

For those machinery owners who are buying in new machines or sub-contracting modification work to another company, there is a responsibility to ensure compliance with these requirements.

Why the change?

The need for a new Machinery Directive has been brought about by the changes in technology that have been applied increasingly to ensuring and managing machine safety. Fortunately, new technologies are also the answer to achieving compliance cost-effectively.

Currently in the UK, the 'old' Machinery Directive 98/37/EC is implemented through the Supply of Machinery (Safety) Regulations 1992 to ensure compliance with EN 954-1. However, EN 954-1 hasn't kept pace with the changes mentioned above, so it has been necessary to update the regulations accordingly.

In particular, EN 954-1 focuses on calculated risk using a simple category system, whereby system behaviours are set against categories. The issue is that the wider implementation of programmable electronics in safety systems means that such a simple system is no longer appropriate. So essentially the new Machinery Directive brings the regulations into line with what is already current practice. In addition, the new system will be able to provide information on the probability of failure.

So, from 29th December 2009, the European Machinery Directive 2006/42/EC will be implemented in the UK through the Supply of Machinery (Safety) Regulations 2008. As such, it will require risk assessment in accordance with the new harmonised standards EN ISO 13849-1 (Safety-related parts of control systems, Part 1: General principles for design) and EN 62061 Functional safety of safety-related electrical, electronic and programmable electronic control systems).

It is accepted within the EU Machinery Directive that zero risk is not achievable in the real world, but that arriving at an acceptable residual risk is feasible. In practical terms, this means that safety control systems must either be designed to ensure the probability of functional errors is acceptably low - or that any errors should not bring about a loss of the safety function if the former cannot be achieved. And that's where the harmonised standards come in.

EN ISO 13849-1 takes its core from the familiar categories in EN 954-1:1996 by examining complete safety functions, including all the components involved in their design. However, it goes beyond this qualitative approach to include a quantitative assessment of the safety functions, based on a performance level (PL) that builds on the category approach.

The components and devices that make up the system require the following safety parameters:

- Category (structural requirement)
- PL: Performance level
- MTTFd: Mean time to dangerous failure
- B10d: Number of cycles by which 10% of a random sample of wearing components have failed dangerously
- DC: Diagnostic coverage
- CCF: Common cause failure
- TM: Mission time

The standard also describes how to calculate the PL that can be achieved when several safety-

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related parts are combined into one overall system. Any deviations from EN ISO 13849-1 are referred to IEC 61508.

As noted above, EN ISO 13849-1 will be operated in conjunction with EN 62061, which is a sector-specific standard under IEC 61508. Based on quantitative and qualitative examinations of the safety-related control functions, it describes the implementation of safety-related electrical and electronic control systems on machinery. It also examines the overall lifecycle from the concept phase through to decommissioning.

In EN 62061, the performance level is described through the safety integrity level (SIL) and the safety functions identified from the risk analysis are divided into safety subfunctions. As a safety-related control system is made up of several subsystems, these safety subfunctions are assigned to the actual devices (hardware or software) that are the subsystems or subsystem elements. The safety-related characteristics of these subsystems are described through the SIL and Probability of Dangerous Failure Per Hour (PFHD) parameters.

Cost effective compliance

There can be no doubt that the new regulations will make a significant contribution to improving safety in the workplace, in line with modern systems and working practices. At the same time, it's just as clear that they bring with them a higher level of complexity and potentially increase the workload of those who are responsible for managing safety. However, as mentioned above, there is an opportunity to deploy newer safety system technologies to ease this burden without compromising on safety.

For example, in ensuring that safety systems are operating properly at every level, higher efficiencies can be introduced by ensuring that all levels, or sub-functions, can be addressed through the same system. This is also more convenient.

In addition, such technologies can be very effective in ensuring that any downtime resulting from safety shutdown is kept to a minimum. This can be achieved by integrated fault diagnosis into the system that is responsible for safety-related control functions. So, rather than faults being traced manually by engineers before they can rectify them, the diagnostics can narrow down the search and often resolve the problem without calling in specialist engineers. And even when specialist input is required, the faster fault tracing means they spend less time on site, thus reducing costs.

Of course, electronic monitoring systems have been available for some time but they have tended to be expensive so that the return on investment calculation didn't stack up in many situations. Now, though, there are low cost systems employing advanced technologies that won't break the bank yet will provide continual monitoring of every aspect of safety - from post-top emergency buttons to light beams on conveyors - as well as facilitating fast location and diagnosis of faults. Furthermore, they operate from a centralised computer so that all of the information is readily accessible at any time.

Over and above these benefits, the same system can be used in the early design stages to simulate operation before the safety system goes live, so many potential problems can be designed out in advance.

All of which boils down to a smarter way of doing things that not only ensures legislative compliance but also offers ongoing time and cost savings. So it makes a lot of sense to take a fresh look at the technologies available and how they can be implemented to best effect.

■ For further information please visit: www.wielandinc.com

Free downloadable guide highlights new machinery safety directive

Available free to download is the newly re-written *A practical guide to machinery safety* sponsored by Laidlor Associates, one of the UK's leading safety and compliance consultants and Safety Systems Technology, the independent electrical safety system product supplier and provider of remedial services and project management. The guide can be downloaded from: www.laidlor.co.uk.

The easy to read guide covers legislation including the EMC and Low Voltage Directives, the ATEX Directive and the very latest information on the new Machinery Directive. It also covers risk assessment and hazard analysis; includes step-by-step advice on CE marking and the Provision and Use of Work Equipment Regulations (PUWER).

Commenting on the new guide Paul Laidlor, of Laidlor Associates said: "The guide is written to benefit both machine builders and end users. Both sides need a good understanding of the legislation and processes surrounding machinery safety and this guide will help bridge the gap in understanding between the two."

As well as featuring information about what to look for in a pre-purchase audit and a section on different types of electrical safety products the guide also features forms, charts and checklists that can be used to conduct a machinery safety inspection. An EN (ISO) 954-1 chart appears alongside an EN (ISO) 13849-1 equivalent as well as an EN (ISO) 14121-1 check list and CE and PUWER check lists.

Free to download and available to request as a hard copy via www.laidlor.co.uk, *A practical guide to machinery safety* provides suggestions and guidance for the best route to compliance.