

Focus on IFA's work

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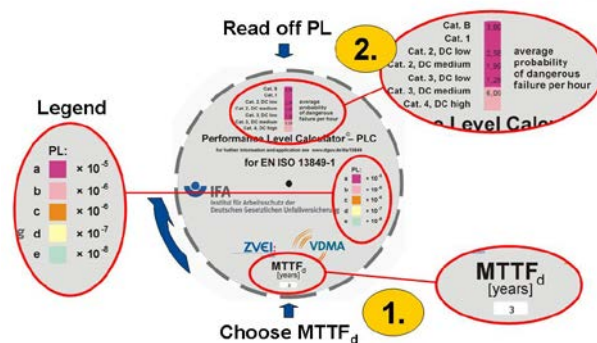
Simple assessment of safety controls

Problem

On a growing number of machines, operators entrust their safety to the control system: on presses, robots, or machining centres, a high risk of accident exists when, for example, a machine starts up unexpectedly whilst a safety door is open. Since 1996, safety controls on machinery have therefore been divided under EN ISO 13849 (EN 954-1) into five risk categories according to their susceptibility to faults. By 2000, however, a clear need had become evident for the addition of further variables to the assessment criteria: the quality of the components (mean time to dangerous failure – MTTF_d), quality of the tests (diagnostic coverage – DC), and the susceptibility to common-cause failure (CCF). For this purpose, the revised standard has defined “performance levels” (PLs) which are intended to replace the previous categories. Although PLs are probability variables which are derived by a complex algorithm from several parameters, this standard is intended to provide its user with practical methods of calculation which are within his abilities, yet permit a reliable estimation.

Activities

The IFA has contributed substantially to the development of practicable methods during standardization work. The range of machine controls encountered in practice was divided over five structure types, based upon the established concept of the categories.



Use of the performance level calculator (two counter-rotating discs) for calculation of the PL in just two steps: select and read-off

The complex dependencies of the probability aspects MTTF_d, DC, etc. were analyzed mathematically on the basis of these structures, and made accessible in graphical and tabular form.

Various studies and analyses, such as the evaluation of field data concerning the reliability of hydraulic valves, conducted by the IFA in conjunction with manufacturers provide a basis for the numerous simplified methods. In order to enable the PL to be found easily, a performance level calculator (PLC) disc was designed.

Results and Application

The simple calculation methods had a strong influence upon the draft revision of EN ISO 13849-1, and have been incorporated into it. With the aid of tables, diagrams, and simple summation formulae, complex control systems can now be reduced step by step to a single parameter of safety-related reliability, the PL.

The PLC disc, which is supplied to users as a supplement to the standard, explains the relationships from which the PL is deduced in a very simple manner to the user. It was developed by the IFA in co-operation with the automation association of the ZVEI (Zentralverband Elektrotechnik- und Elektronikindustrie) and the German Engineering Federation (VDMA). Once the discs have been rotated for selection of the key parameters, the PL can be read off directly.

Area of Application

The performance level calculator complements the standard and has a range of practical uses: for industrial developers of machine controls during the development process; for straightforward assessment of the reliability of controls in plants; during testing and certification; or by OH&S professionals during their routine work.

Additional Information

- www.dguv.de/webcode/e20892 (including facility for ordering the PLC disc free of charge)
- (Draft standard) DIN EN ISO 13849-1: Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design (12.08). Beuth, Berlin 2008

Expert Assistance

IFA, Division 5: Accident prevention, Product safety

Literature Requests

IFA, Central Division