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SEPARATION FAULT SCENARIOS IN INTRINSIC SAFETY CIRCUITS

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Abstract

The intrinsic safety type of protection significantly increased in complexity during the last decades. Thus, it even provides the opportunity to use highly complex electronic circuits without involving a significant explosion risk within the oil industry or in power plants, but not limited to those two. In order to achieve this performance, the type of protection is based on three pillars: limiting of energy, heat and also fault tolerance. The potential failure of components, connections, and separations are taken into consideration for intrinsic safety evaluations. This paper focuses on scenarios of separation faults in intrinsic safety circuits.
The introduction part of the paper provides a summary of requirements for the intrinsic safety type of protection. The separation requirements are also highlighted. This part also explains the „countable" concept regarding the separation faults. The second part of the paper is dedicated to the fault scenarios assessment. Also, this part shows the theoretical model which yields the magnitude of the fault scenarios group.
The built-up algorithm for effective localization of the separation faults on a real electronic board is presented in the second part of the paper. This algorithm was implemented using Visual Basic for Applications script and National Instruments Ultiboard software. In the third part of the article, the obtained results are reported and discussed. In order to have a comprehensive image, there was proposed a graph in which links are considered separation distances and elements conductive tracks. Another tool proposed and used was separation distances histogram. The influence of increased finesse on the number of non-countable separation faults was also discussed.
The main outcome of the paper is represented by the high impact of non-countable separation faults number over the number of separation failure scenarios. For example, the circuit analysis showed the potential for over sixteen million failure scenarios.

Key words: assessment, fault scenarios, intrinsic safety, separation distances

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