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Comparing Fault Tree Analysis methods combined with Generalized Grey Relation Analysis: A new approach and case study in the automotive industry

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ABSTRACT

The failure modes of products gradually show a diversified trend with the precision and complexity of the product structure. The combination of fault tree analysis and generalized grey relational analysis is widely used in the fault diagnosis of complex systems. In this study, we utilize a method that combines fault tree analysis and generalized grey relational analysis. This method is applied to diagnose the *Expansion Adhesive Debonding* fault of automobile doors. Then, we analyse and compare the differences in actual fault diagnosis results. The comparison involves three analysis methods: Fault Tree Analysis combined with Absolute Grey Relation Analysis (F-AGRA), Fault Tree Analysis combined with Relative Grey Relation Analysis (F-RGRA), and Fault Tree Analysis combined with Comprehensive Grey Relation Analysis (F-CGRA). Subsequently, we compare the findings with actual production results. This comparison allows us to discuss the differences between the three methods in the fault diagnosis of complex systems. We also discuss the application occasions of these methods. This study will provide a new method for fault analysis and fault diagnosis in the actual production of the automobile manufacturing industry. This method can eliminate faults effectively and accurately and improve product quality and productivity.

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Failure mode;
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Fault Tree Analysis combined with Comprehensive Grey Relation Analysis (C-GRA)

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