

## Computer Aided Design Solution Based on Genetic Algorithms for FMEA and Control Plan in Automotive Industry

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**Abstract :** The automotive industry is one of the most important industries in the world that concerns not only the economy, but also the world culture. In the present financial and economic context, this field faces new challenges posed by the current crisis, companies must maintain product quality, deliver on time and at a competitive price in order to achieve customer satisfaction. Two of the most recommended techniques of quality management by specific standards of the automotive industry, in the product development, are Failure Mode and Effects Analysis (FMEA) and Control Plan. FMEA is a methodology for risk management and quality improvement aimed at identifying potential causes of failure of products and processes, their quantification by risk assessment, ranking of the problems identified according to their importance, to the determination and implementation of corrective actions related. The companies use Control Plans realized using the results from FMEA to evaluate a process or product for strengths and weaknesses and to prevent problems before they occur. The Control Plans represent written descriptions of the systems used to control and minimize product and process variation. In addition Control Plans specify the process monitoring and control methods (for example Special Controls) used to control Special Characteristics. In this paper we propose a computer-aided solution with Genetic Algorithms in order to reduce the drafting of reports: FMEA analysis and Control Plan required in the manufacture of the product launch and improved knowledge development teams for future projects. The solution allows to the design team to introduce data entry required to FMEA. The actual analysis is performed using Genetic Algorithms to find optimum between RPN risk factor and cost of production. A feature of Genetic Algorithms is that they are used as a means of finding solutions for multi criteria optimization problems. In our case, along with three specific FMEA risk factors is considered and reduce production cost. Analysis tool will generate final reports for all FMEA processes. The data obtained in FMEA reports are automatically integrated with other entered parameters in Control Plan. Implementation of the solution is in the form of an application running in an intranet on two servers: one containing analysis and plan generation engine and the other containing the database where the initial parameters and results are stored. The results can then be used as starting solutions in the synthesis of other projects. The solution was applied to welding processes, laser cutting and bending to manufacture chassis for buses. Advantages of the solution are efficient elaboration of documents in the current project by automatically generating reports FMEA and Control Plan using multiple criteria optimization of production and build a solid knowledge base for future projects. The solution which we propose is a cheap alternative to other solutions on the market using Open Source tools in implementation.

**Keywords :** automotive industry, FMEA, control plan, automotive technology

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