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FMECA-Based Model for the Development of a Fault Diagnosis Interface – Case Study in Small Electric Vehicles

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Abstract

Some cities in Latin America seek to solve their environmental pollution difficulties using electric mobility solutions. One of the most important questions when applying electric mobility solutions is whether these types of equipment will survive the life period provided by the manufacturers due to the conditions of the Andes Mountains.
In this context, with the objective of to developing an interface that allows monitoring of the operating conditions of the equipment and its particular symptoms of degradation, based on an FMECA study, an instrumentation and indicator selection model is presented in this paper of operational performance that will allow the monitoring and recording of the operation data in an experimental process that leads to failure conditions in small electric vehicles.
The first stage of the method is the system functional analysis. We characterize vehicle systems by five subsystems: Electrical, Traction, Structural, Braking, and Accessories. As a result, we identified 16 critical components for vehicle operation. Subsequently, from literature databases, the failure rates are obtained for FMECA analysis. As a result of the FMECA analysis, we got the critical conditions, and the variables of interest were associated with these conditions. In this way, it is possible to characterize the variables of interest for real-time state-of-health monitoring of the relevant components. Finally, we made a fault diagnosis interface and selected an instrument system with the sensitivity and robustness necessary for real-time monitoring.

Keywords
FMECA, functional analysis, sustainable electric mobility.

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Biographies

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Dr. Fernando Jesús Guevara Carazas. is a full-time Professor at the National University of Colombia, in Medellín, director of the Asset Management, Operation, and Maintenance research group (GOMAC), and coordinator of the Machinery Diagnostic Laboratory. Leader of the Hydrometra research seedbed, oriented to the development of sustainable mobility solutions. He has a Ph.D. from the University of Sao Paulo in Brazil (POLI-USP), a master's from the same school, and a Mechanical Electrical Engineer by training. Has extensive experience in reliability studies, asset management, and the development of maintenance management strategies in various industrial sectors. He is a consultant in public and private companies. He is a lecturer and author of different technical publications; he is a member of the Reliability Laboratory of the University of Sao Paulo (RELAB- Brazil).