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A study on reliability of the auxiliary power supply for railway vehicle

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Electric railway vehicle is constituted by various components which have an important role associated with safety. However, reliability information is not enough for timely maintenance. In fact, in 2014, one-third of South Korea's railway accident was caused by a vehicle component (part defects and poor maintenance). Therefore, the critical railway components associated with the safety require efficient management and maintenance based on reliability. This paper presents a reliability evaluation process of the auxiliary power supply system that plays safely important role of the operation, such as control power supply of the vehicle. Because the whole system reliability requires combinatorial model, auxiliary power supply system is separated by the appropriate category and preferentially performed the accelerated life test for reliability estimation of the critical and weak category. Main category is divided into the HV (high-voltage)/LV (low-voltage) part in accordance with the electrical environment in the auxiliary power supply system. And sub category is divided by function and role. Quantitative reliability indicators (i.e., failure rate and MTBF) of sub category are predicted by approximately 4500 units modeling based on MIL-HDBK-217. Sub category with the lowest MTBF is controllers (including GDU) category which is mainly configured to the PCB. Because this means that controller's category is a critical and weak category, it needs reliability estimation. For reliability estimation, only controllers which passed the performance and environment test are considered for the accelerated life test, taking into account the critical accelerated stress factor and the railway properties. Developed processes will be utilized for the improvement of railway maintenance efficiency and the expected life calculation of railway vehicle parts.

Biography

Jae-won Kim has received his BS and MS degrees in Electrical Engineering from Korea University, Seoul, Korea in 2006 and 2008. He is currently working for his PhD degree at the same University. He has joined KRRI (Korea Railroad Research Institute), Korea in 2011. He is presently a Senior Researcher. His research interests include voltage stability of electric power system, analysis of railway electric power grids and reliability of railway vehicle components.

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