

**F2010-C-163**

## **FATIGUE LIFE PREDICTION METHOD OF WIRE HARNESS SYSTEM IN THE AUTOMOTIVE VEHICLE'S DOOR**

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**KEYWORDS** – Wire Harness, S-N curve, FEM, Equivalent wire model, Fatigue life

**ABSTRACT** - In this study, the wire, bundle and assembly level of a wire harness system are investigated to predict the fatigue life by using both finite element method (FEM) and experimental analysis. To obtain stress-life (S-N) histories of the wires of the system, AVSS wires are experimented subject to repeated bending motion using specially developed fatigue test equipment. An equivalent wire model from the rule of mixture theory is proposed to simplify the analysis. Various influence conditions such as contact between wires, taping holders, optimally composed wires, and the number of wires in a bundle are investigated through the bundle level test and numerical analysis. Wire and bundle level results are adopted for the assembly level analysis. For the assembly level analysis, real wire harness systems including bundle and gromat are numerically modeled with contact condition between composition elements as wire and gromat through simulating door opening motion. The fatigue life of the assembly was predicted using FEM more than 300,000 cycles found to be in a good agreement with the experimental result.