

## Eliminating Recalls for Vehicle Electrification

**April 11, 2022** – NSERC Alliance/Engage grants and the Ontario Centre of Innovation's (OCI) Voucher for Innovation Productivity (VIP), is pleased to announce a collaborative research project between Kepstrum Inc., the inventor of Product DNA and Intelligent Reliability Risk Reduction Methodology (IRM), and Queen's University Electrical and Computer Engineering (ECE) Department.

This research project will leverage Kepstrum's proprietary "Digital Twin" enterprise software, to reveal product weaknesses before prototyping, currently being applied in various Advanced Manufacturing sectors (e.g. Automotive, Aerospace, and Industrial). Kepstrum's software is an enabling technology to boost the innovation in the Advanced Engineering, to eliminate costly trial and error with new product development, to reduce testing significantly.

In this research project, precise stress-life-failure models (i.e., digital twin) will be developed for brushless DC motors along with the required electronics. Brushless DC motors have been commonly used in many applications such as drones, water pumps, etc. Thus, the "Digital Twin" of this component will provide very valuable information for many industrial products. The engineers will generate comprehensive case-studies through Kepstrum's Digital Twin Software, to apply 'first principles' using analytical closed-form equations to predict Stress-Life-Failure Models for various components. The Project will be managed by Kepstrum's Director, Payman Kianpour, and Dr. Majid Pahlevani, Assistant Professor at Queen's University, Dept. of Electrical and Computer Engineering.

Dr. Pahlevani has conducted more than 20 industrial research projects in renewable energy systems, energy storage systems and electric vehicles. Coupled with the knowledge and expertise brought in by the Kepstrum

team, this has motivated Kepstrum to collaborate with Queen's in advanced research to increase the reliability of new components in Vehicle Electrification with limited field data.

Digital Twin Solutions, are projected to grow 10x in the next five years, which reinforces the importance of this digital transformation.

**"With the rapid changes we are experiencing in Automotive, it is dangerous to rely on prior field data. We must boil it down to first principles, to generate physics-based life models, which will increase reliability for new components in vehicle electrification, in order to eliminate recalls,"**

*- Payman Kianpour*

**"The concept of Digital Twin will be instrumental in modern design and manufacturing. Indeed, as we produce more and more electronics, this concept will play a crucial role in manufacturing reliable products."**

*- Dr. Majid Pahlevani*

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