Thesis Picture

**Introduction**

**Chapter 1 - Literature Review**

Identified from literature that bearings are commonly modelled as dry without the effect of the lubricant film

**Chapter 2 – Experimental and Numerical Tribodynamic Analysis**

Operating conditions to simulate that of a high-speed electrified powertrain (speed and loading) were used. Displacements of inner and outer bearing races were experimentally obtained.

These were used as boundary conditions in a tribodynamic model that implicitly included the lubricant film at the roller-race conjunction. It was found that the magnitude of the deformation due to dynamic effects under electrified powertrain operating conditions were of the same order of magnitude and often much lower than the magnitude of the lubricant film.

Discovered that for future modelling of these powertrains, the lubricant film must be implicit.

Additional benefits include friction and durability modelling

**Chapter 3 - Flexible Lubricated Bearing Model**

Now that the need for lubricated modelling was established, the lubricated bearing model was developed.

This was created using a coupled simulation approach using AVL ExciteTM and MATLAB Simulink.

To capture the dynamic behaviour of the powertrains more accurately and to extend the scope of the analysis, flexible multi body dynamics must be used instead of modelling bodies as rigid.

**Chapter 4 – System Level flexible multi-body dynamics including tribodynamic bearing model**

**Chapter 5 – Durability Analysis**

**Chapter 6 - Numerical EHL predictions using Machine Learning**

**Chapter 7 - Conclusion and Future Work**