



## AVL- PASSION AND RESULTS

*AVL is the world's largest privately owned company for development, simulation and testing technology of powertrains (hybrid, combustion engines, transmission, electric drive, batteries and software) for passenger cars, trucks and large engines.*

### Thesis work –Tribology Study of Gears Lubrication

#### Background

EV transmissions use electric motor as the input power. Rotational speed of E-motor starts at 15000 RPM and expected to increase to 25000 RPM in near future. Proper lubrication and cooling are critical to reliable operation of high speed helical gears. As pitch line velocities and gear tooth loading have increased, so have the lubrication and cooling requirements. The primary purposes of the lubricant are to prevent wear of the gear tooth surfaces and remove the heat generated by friction.

This study will provide deeper understanding of the gear lubrication under high rotational speed and make it possible to come up with requirement for lubrication and cooling of gears at different rotational speeds and loads.

#### What

The goal with the thesis is to use analytical method (1-D modelling) to evaluate the gear lubrication and cooling and provide requirements on oil flow and oil film thickness (forced lubrication system) as a function of rotational speed and loads on gears.

#### How

- Literature study on similar previous works
- Identifying key gear parameters like axial meshing velocity, pitch line velocity, pressure angle and gear surface stress and their effect on oil film thickness
- Identifying the lubricant properties like viscosity and pressure-viscosity coefficient and lubrication regime as a function of speed
- Calculating the heat generated in gear mesh
- Calculating the required oil flow for cooling and lubricating the gears and minimum oil film thickness as a function of loads on gears and rotational speed

#### Duration

Period: one semester, 30 ECTS points and will be performed at Vicura/AVL

Starting date: January 2018

Number of students: suitable for one student.

#### Tools

Matlab, Excel

#### Profile

- We are looking for a highly motivated student that have a genuine interest in cars, calculations and product development
- Background in fluid mechanics and heat transfer is required
- The student should ideally be familiar with powertrain system and machine elements
- Communication skills in English is required

#### Contact

For more information please contact

Peyman Jafarian

+46-(0)701-678244

[peyman.jafarian@avl.com](mailto:peyman.jafarian@avl.com)