Matteo was born on December 29th 1982 in Parma (Italy). He received his B.Sc. and M.Sc. in Mechanical Engineering from University of Parma (Italy) in 2005 and 2007 respectively.

He is currently a Ph.D. candidate working at the Maha Fluid Power Research Center, under the supervision of Dr. Ivantysynova. During his studies, the design and modeling of fluid power systems has been his main research area, both at a system and a component level.

His Ph.D. research focuses on discovering the physical behavior of hydrostatic axial piston machines fluid film interfaces. This involves the coupling of fluid mechanics, heat transfer and continuum mechanics by developing advanced numerical simulation models. The experimental studies and models validation are carried out on special design test benches.

Agricultural & Biological Engineering

Dissertation Defense

Speaker:	**Matteo Pelosi**
Title:	An Investigation on the Fluid-Structure Interaction of Piston/Cylinder Interface
Major Professor:	Dr. Monika Ivantysynova
Date:	Wednesday, 15th February 2012
Time:	8:30 a.m.
Location:	Maha Fluid Power Research Center 1500 Kepner Drive, Lafayette

Abstract:

The piston/cylinder lubricating interface represents one of the most critical design elements of axial piston machines. Being a pure hydrodynamic bearing, the piston/cylinder interface fulfills simultaneously a bearing and sealing function under oscillating load conditions. An accurate prediction of the time changing tribological interface characteristics in terms of fluid film thickness, dynamic pressure field, load carrying ability and energy dissipation is necessary to create more efficient interface designs. The aim of this work is to deepen the understanding of the main physical phenomena defining the piston/cylinder fluid film and to discover the impact of surface elastic deformations and heat transfer on the interface behavior. For this purpose, a unique fully coupled multi-body dynamics model has been developed to capture the complex fluid-structure interaction phenomena affecting the non-isothermal fluid film conditions. The model considers the squeeze film effect due to the piston micro-motion and the change in fluid film thickness due to the solid boundaries elastic deformations caused by the fluid film pressure and by the thermal strain. The model has been verified comparing the numerical results with measurements taken on special designed test pumps. The model has been used to study the piston/cylinder interface behavior of an existing axial piston unit operating at high load conditions. Numerical results are presented in this thesis.

Application:

The results of this research show the impact of fluid-structure and thermal interactions on the piston/cylinder interface behavior of axial piston machines. The developed numerical model will be therefore used to further investigate the physical behavior of the piston/cylinder lubricating interface. The model will represent a guideline to discover the impact of novel material combinations and advanced surface design to improve piston/cylinder fluid film performance. These discoveries will lead to a new generation of axial piston machines, more efficient and more compact.