Born in January 22nd 1989 in Chihuahua, Mexico. He received his BS in Mechanical Engineering from the University of Texas at El Paso in 2011 and his MS in Mechanical Engineering from Purdue University in 2014. He is currently a Ph.D. Candidate at the Maha Fluid Power Research Center.

Agricultural & Biological ENGINEERING

Dissertation Defense

Speaker: Rene Chacon

Title: Virtual Prototyping of Axial Piston Machines of Swash Plate Type

Major Professor(s): Dr. Andrea Vacca and Dr. Farshid Sadeghi

Date: Wednesday, July 10, 2019

Time: 9:30 am

Location: 1500 Kepner Dr., Lafayette, IN. Room 117

Abstract:

Axial piston machines are widely used in the industry ranging from aerospace, agriculture, automotive, heavy machinery, etc. These applications require better pumps and motors to meet current market demands such as higher power density in hydraulic units, smarter pumps (diagnostics and prognostics), higher efficiencies, and compactness. The current state-of-the-art in pump design is mostly based on trial and error since the invention of this positive displacement machine until the present time. The numerical tools being used do not capture the physical phenomena in the thin fluid film between the rotating group components. The work presented in this dissertation aims to demonstrate the feasibility of virtual prototyping utilizing a combination of in-house developed multi-domain models and to propose a novel computational based design methodology for axial piston machines. The methodology is an iterative process between the virtual components in 3D CAD models and the function evaluations for the design requirements utilizing the numerical models which provide an accurate prediction to the behavior of the mechanical components working together. To validate the proposed methodology a case study on a 24 cc/rev axial piston machine was carried out. The machine was built virtually, simulated and optimized for desired performance. A physical prototype was built based on the case study and tested successfully.

Application:

The dissertation shows the feasibility of virtual prototyping of axial piston machines. This finding will significantly impact the time to market for new product development. It will also have the potential to improve existing machines to be more cost-effective, quiet, efficient and reliable.