Development of a Grease Lubrication Mechanism for a Two-Disk Contact Set-Up

Objective: Design and manufacture a device which enables the two-disk contact tribometer at Wright State University to test the performance of grease lubricants.

Requirements:
- Maintains grease on contact surfaces of disk, while machine is running at speeds up to 5,000 – 10,000 rpm
- Able to run tests with various sizes of disks ranging from 50mm to 100mm in diameter.
- Successful completion within given timeframe and budget

Additional Improvements:
- Minimizes wasted grease
- Easy to clean/keeps machine cleaner
- Allows user to easily monitor/add grease to system while test is running, if necessary.

Project Description:
In automotive and aerospace fields, the two-disk contact set-up has been widely used for the evaluation of friction and power loss, contact fatigue failures and thermal failures of rolling mechanical elements. The contact test rig in the lab at Wright State is only equipped with jet lubrication, i.e. the lubricant is pumped and delivered to the contact through the bronze pipe. Since grease cannot flow easily, it won’t be able to be applied through jet lubrication. A different mechanism that can be easily incorporated onto the machine has to be designed accordingly.

Initial Designs & Decision Matrix
Our group initially considered three different designs for our project; Fully Enclosed, Partially Enclosed, and Grease Pump/Nozzle. After comparing the designs we elected to go with a combination of two of them partially enclosed design with a grease pump. Some of the main parameters we used to compare our designs is shown below in the first table.

Our group also considered three different materials to construct our mechanism: Aluminum, Steel, and plastic (3D-printed). We ultimately decided to construct our mechanism out of Steel. Some of the main parameters we used to compare the different material options is shown below in the second table.

Construction:
- Welding/fabrication of main assembly (Indian Creek Fabricators Inc.)
- Machining of the (5) middle plates, each plate required two operations (Material Resources LLC)
- Cutting slot/drilling holes in top plate (Wright State Lab)

Testing Results/Future Improvements:
- Experiences minimal grease loss, even when machine is running at full speed.
- Modify grease gun to have 90 degree fitting to make it easier to pump grease while machine is running.
- Research incorporating an automated grease dispenser into our mechanism to eliminate manual grease pumping.

Contributors:
Devin Blankenship
Kevin Kemp
Alex Plas

University Advisor:
Dr. Sheng Li

Special Thanks:
John Lawless
Doug Yost
Indian Creek Fabricators Inc.
MRL, Material Resources LLC

Businesses Used
Alro Steel
Lowes
McMaster-Carr
Quest Lasercut