Currently the conventional mineral based hydraulic fluids thin out at high temperatures and sludge up at low temperatures. This issue directly relates to a loss in system efficiency and an increase in operating costs. The objective for the Penn State BioBlend team was determine a way to test different hydraulic fluids to demonstrate how the high viscosity index (VI) fluids, provided by BioBlend, do not thin out at higher temperatures and maintain the system efficiency and therefore reduce operating costs.

The final report explains, in greater detail, what will be overviewed in the next paragraphs. After discussing customer needs with John Peters from BioBlend, it was decided that the device that should be used must be small enough to bring to the showcase, yet still remain applicable to industry. Portability was not a real issue from the teams’ perspective, but remaining applicable to industry was. This is solely due to the cost of the equipment. The hydraulic equipment that would have needed to be purchased would have well surpassed our budget. Knowing this, we were then put in contact with The Bosch Rexroth Group, a well-known hydraulic equipment producer, for their assistance. A preliminary site visit was planned where the team met with Kerry Mickley, an Engineer from Bosch Rexroth, to discuss designs for a hydraulic system that would be donated for our use. A few weeks later, after the design was finalized, the team traveled back to Bosch Rexroth to learn how to operate the system to be donated. The system is primarily composed of a 5 horsepower electric motor, 5 gallon per minute axial piston pump, flow meter, pressure relief, heat exchanger, and a 10-gallon reservoir. Figure 1 shows what this system looks like.

The next step for the team was to begin testing of the five different hydraulic fluids. The original testing procedure had to be updated to account for an issue that was discovered. Again, the final report explains what the issue was and how the team overcame the problem it caused. Each fluid was tested under the same system settings and the system efficiency was determined for temperatures of 80, 100, 120, and 140 degrees Fahrenheit. The efficiency was calculated by dividing the flow power produced by the electrical power that was supplied to the system. Figure 2 shows the graph that was created. It can clearly be seen that the both BioFlo and Enviromax, both BioBlend fluids, maintain system efficiency at higher temperatures very well compared to the mineral based competitor. For, that reason it can be concluded that the BioBlend fluids are indeed more efficient and offer a method to reduce operating costs of hydraulic systems.

Figure 1: System donated by Bosch Rexroth

Figure 2: Graph of Efficiency vs. Temperature