Abstract

MTH Pumps is a commercial and industrial pump manufacturer based in Plano, IL. Our Senior design group was tasked with improving a leak detection system for pump housings for MTH Pumps. Their current system is inefficient and unreliable.

Some components for our project were provided by MTH while others needed to be sourced by our group. All materials were funded by MTH.

Our group's design demonstrates a proof of concept which utilizes a Decay type leak detection system. We paired this new testing method with PLC automation and pneumatic control. Additionally, our revised system provides a quantifiable result as well as simple LED light indicators. Lastly, we verified the accuracy of the testing procedure by monitoring the results of known passing and failing parts provided by MTH pumps.

Our system, when compared to the current, will more efficiently identify leaks and limit operator interaction, therefore reducing waste in the workplace.

Methods and Materials

☐ The pump housing utilizes the air leak test: Decay Method
  ○ Measures loss of air pressure
  ○ Three phase timed format
  ○ Charging, Balancing, Detection

☐ PLC Automation
  ø Pneumatic Solenoid
  ø Pressure Monitoring

Results

The proof of concept is automated by a P2000 series PLC from Productivity Suite. Based on ASTM standards, we run our test at 1 bar, or 14.5 psi gauge pressure. The fixture has two holes at its center, one for the pressure sensor and one for the air line. The housing will be bolted onto the fixture over these holes. All cavities in the housing are plugged before commencing the air leak test. A solenoid automates the pneumatic system which will allow air in for a set duration. A PLC monitors the pressure during operation which will then activate a corresponding pass/fail light.

Discussion

MTH pumps current system for testing their pump housings and covers is inefficient. Being primarily a manual system, each housing and cover is tightened down by hand and the amount of pressure often differs greatly between parts.

The leak detection system we have designed is a pass / fail system focused on PLC automation. Our proof of concept demonstrates function for the pump housing only. The system will be monitored by testing the pressure inside the cavities of the housings and covers. This system will ensure that consistent and repeatable pressure is applied throughout the system.

Conclusions

Our proof of concept utilizes a fixture capable of testing a singular housing. The entire system is contained within the provided shop cart and fully automated. The proof of concept requires a duration of 15 seconds to complete a test, while accurate results are displayed to the LED lights. Future teams will have enough resources to build onto our prototype and configure the hydraulic system for the hydraulic clamps.

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