

Automated Forklift Cylinder Tester

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NI Products Used:

LabVIEW 2011
cDAQ-9188
NI 9205
NI 9403

Categories:

Automated Test
Advanced Control Systems
Transportation

The Challenge:

The client needed to have an automated system to test up to eight hydraulic cylinders on a production line to assure the length of stroke and the jerk in different zones of the stroke. The tester also needed to record the results and store the test parameters.

The Solution:

Using LabVIEW, Data Science Automation was able to create an application that allowed the user to select the type of cylinder by part number then the desired fields of interest to test. Once the criteria had been selected the operator could test up to eight different cylinders at a time.

Introduction

Data Science Automation (DSA) is the premier National Instruments Alliance Partner. DSA integrates commercial off-the-shelf (COTS) components from automation technology vendors to create custom, adaptive automation solutions for a diversity of research, manufacturing, government and business operations to:

- acquire, analyze, present and manage data
- design, simulate, test and validate products
- monitor, predict, control and optimize processes
- invent, draft, prototype and build machines

for maximum productivity, quality, profit and understanding.

DSA is a certified member of the Control Systems Integrators Association (CSIA) and staffs multiple National Instruments Certified Training Centers with more certified LabVIEW Architects than other integrators.

Approach

The application that was created needed to be flexible enough to allow an operator to place one of many different types of cylinders into any one of eight stations on the test fixture. The operator would then select the part number of the corresponding cylinder in each station to load in the parameters the operator could skip stations in the test fixture by not assigning a part number to that station or by not setting the test control to true for that location. The system was also designed to allow for new types of cylinders to be added in the future by allowing the operator to enter the parameters. If no parameter for the cylinder existed the operator could use the "Zone Definition" tab Shown in Figure 1 to create the needed parameters for a new part number by entering the information into the provided fields. That information could then be saved to a file and could be used for testing of that cylinder part number in the future.

Once the operator has all the parameters for the types of cylinders entered into the Zone Definition tab and saved they can now set up the recipes for the testing that will be done. The operator can choose the part number and what type of testing is to be performed for each of the zones. The actions for the zones are based on time and jerk that is calculated from the measurements made during the extension and retraction of the cylinder. There are three zones in the extension and three zones in the retraction that can be tested along with the total time and maximum extension length. Most zones allow testing for the maximum time and the maximum jerk permitted while others may also include minimum time or position only. The screen shot in Figure 2 shows the "Test Recipes" tab for setting the zones. The station selection control allows the operator to select the station for each unit under test.

Before the test is started the lasers had to be calibrated by the user through the "Calibration" tab. This calibration would then be saved and loaded into the system for future testing. After the calibration and all the desired stations had a cylinder in them for testing the operator could then start the testing. The application would verify that the test button was selected and there were valid tests to be run before starting the test. If no tests were selected or no unit was set to test the operator would be informed that the test was not set up correctly to be run. Once the testing started the cylinder would cycle a preset number of times then start the data acquisition during the final stroke of the test to record the measurements and movement of the cylinder. The readings were captured by a laser measurement device and stored for analysis at the completion of the cylinder cycle. The system would work through all the stations that were set up and test each cylinder on by one until all the units were tested.

Once the test had completed the operator would be able to look at the test results for each of the cylinders that had been tested by using the "Test Results" tab shown in Figure #3. The results would also be placed in a file based on the part number and a unique serial number generated by the application. The records could be kept for failure tracking and to help improve the quality of the product being used and produced at that and other locations where the system was deployed. Each station has an overall pass or fail indicator to quickly allow the operator to see if that station passed. If the unit under test failed the operator could see what zone in the test did not pass.

This application makes it easy for the operator to apply the correct part number to the cylinders in the test station and have the correct parameters applied to each one. By allowing the code to guide the operator through the process and making decisions of what needed to be tested would allow for a very flexible testing system. This system would replace the older method of testing and save time during the testing phase of the process.

Summary

Overall the application designed by DSA using LabVIEW was able to fill the customer's need and provide them with a time saving and useful tool to get the task of testing cylinders for their production facility. And following the changing criteria based on the part number of the unit under test added ease of operation for the operator.

Contact Information

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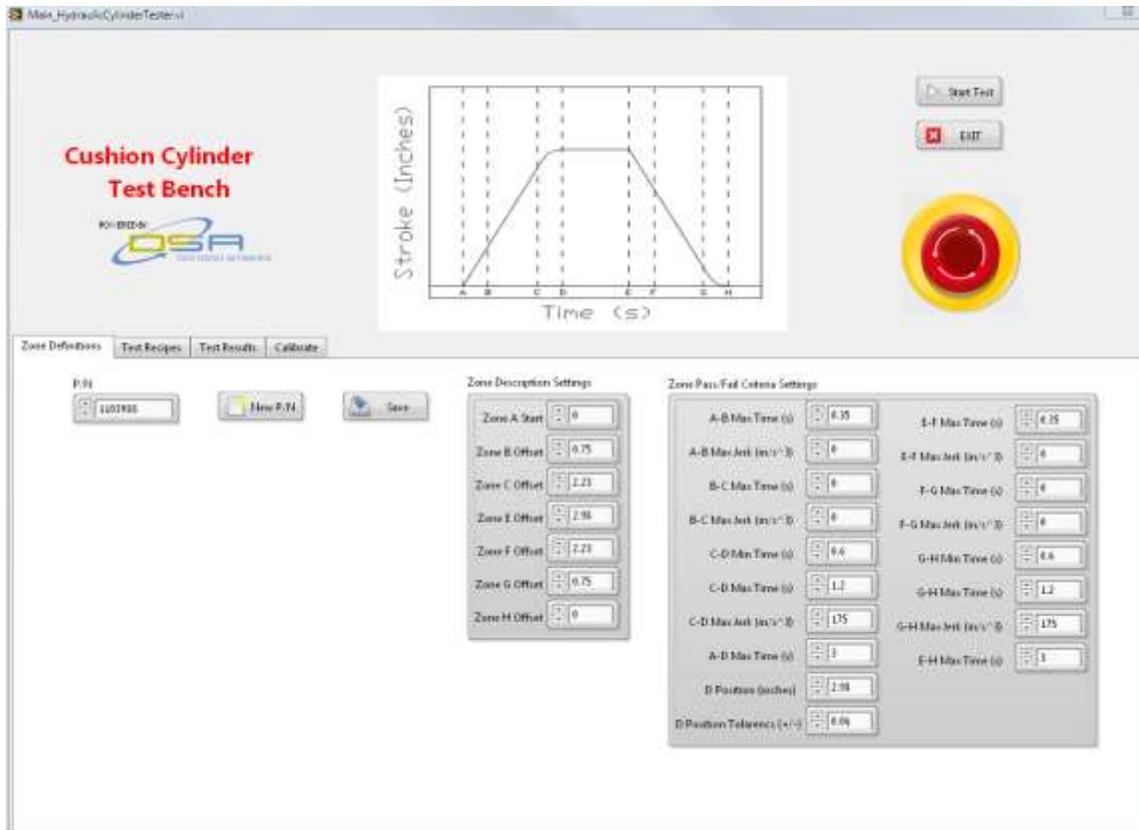


Figure 1. This is the main screen that allows the operator to select a tab for the process that needed to be performed. This tab allows the operator to set up the zone information as well as create new part numbers or modify existing part numbers.

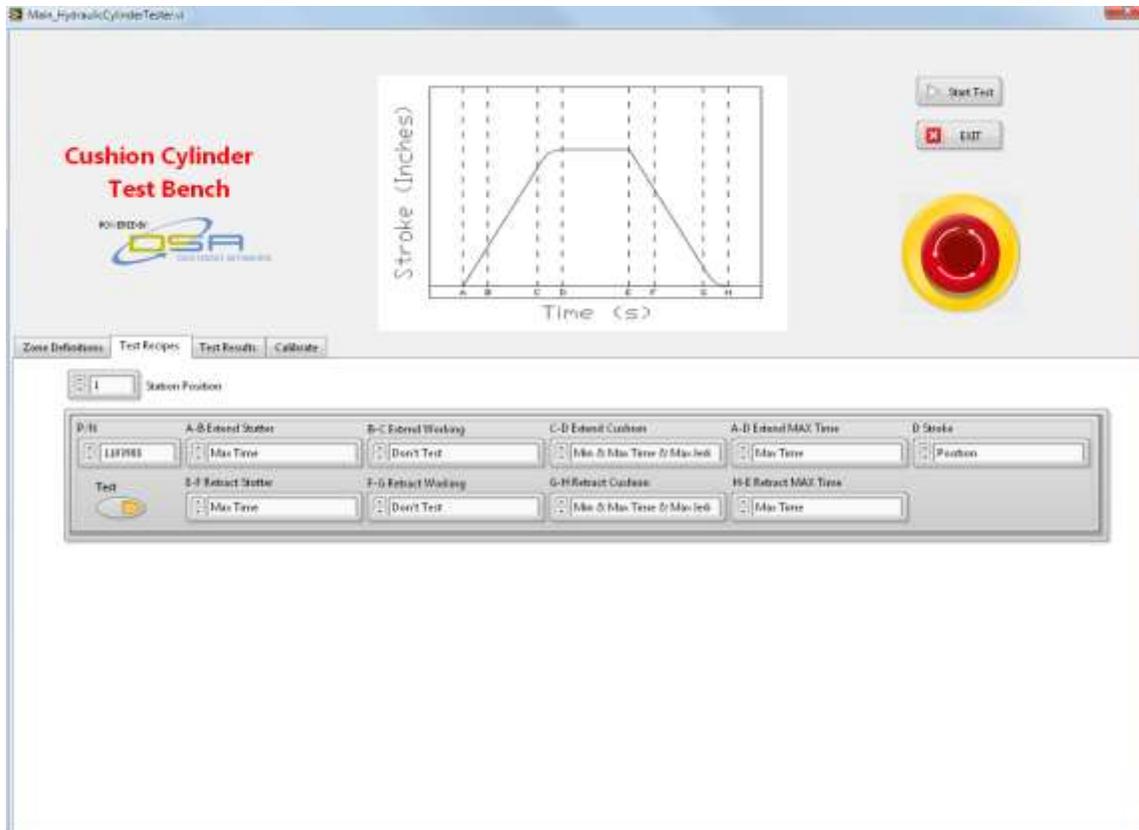


Figure 2. This tab is used to select the criteria of the test and allow the operator to turn on the specific stations to run the test on.

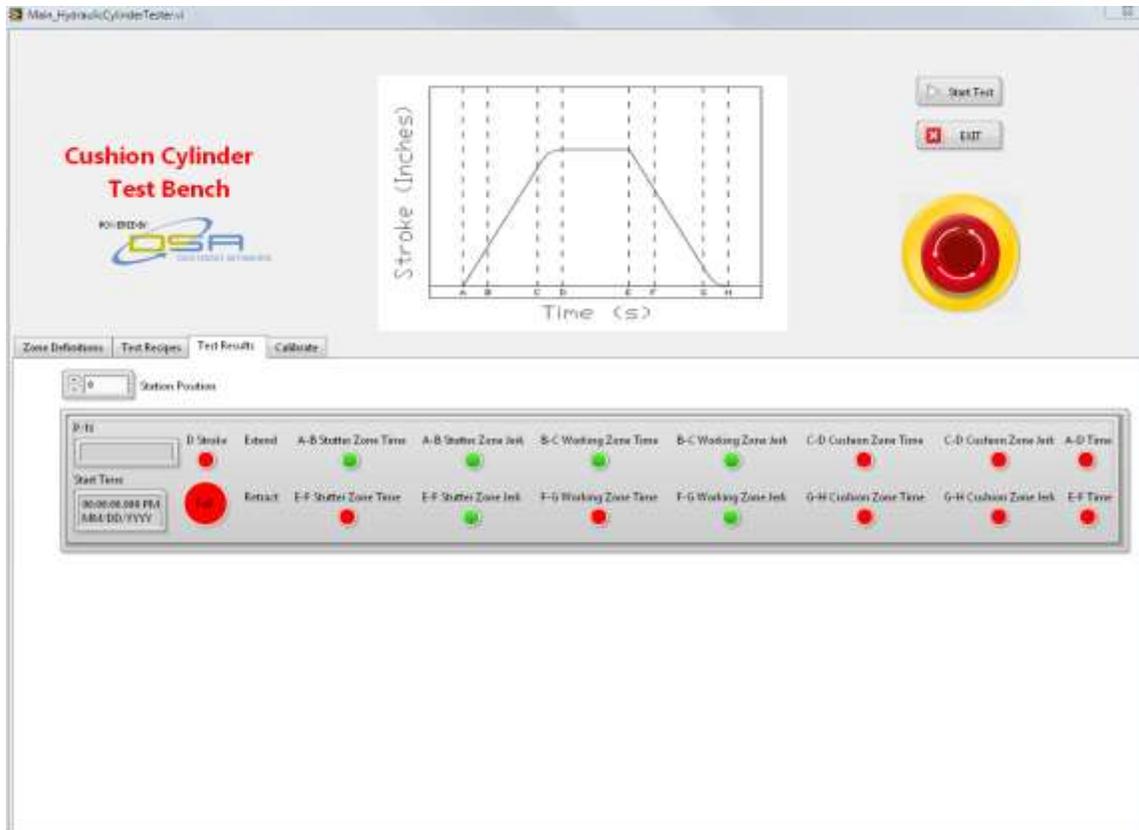


Figure 3. This tab displays the results for each of the stations that have been tested and if the cylinder has passed the test.