DRESSER-RAND
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NI SignalExpress
Program Setup and Options

Abstract:

The poppet valve test rig is controlled through the use of a SignalExpress program. This program both controls the timing of the intake/exhaust solenoid valves and collects pressure and vibration data. The program also creates a frequency spectrum of the vibrations measured during the equilibrium phase of the testing.

How To Run The Program

1) Open “Poppet Valve Test Rig.seproj” using NI SignalExpress
2) If needed, double click on the four “DAQmx Generate” steps in the “Valve Control Loop” and type 0.1 into the “Update Period (s)” field to make the signals active.
3) Click on the “Recording Options” tab to define what data you would like to have recorded for the duration of the test. Click on “Record While Running” to enable logging of the data.
4) Plug in the signal conditioner and the Tektronix or equivalent power supply (6.5-30 VDC) and run the program for at least 5 seconds to collect data for calibration. Be sure the accelerometers have “zeroed out” and are not changing over time.
5) Right click on the bottom graph and select Export to excel.
6) Average the voltage data for each input and adjust the “pre-gain offset” in each corresponding “Scaling and Conversion” step.
7) Plug in the solenoid relays and open the shop air supply.
8) Click “Run Once” to run the program.
9) After the “averaging done” light is bright green and remains lit, the program should stop. Note that the “averaging done” light will light up once for a few seconds halfway through the test.

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How To Adjust Number of Power Spectrum Averages

1) Double click on both “Power Spectrum” steps and change the number of averages to however many you desire. The time to run the test will be equal to 10*#averages/spectrum (sec). The number of averages must be greater than 5 in order to ensure no non-equilibrium frequency analysis.
2) Double click on the “Data Collection Loop” Conditional Repeat step and change the current iteration condition to twice the number of spectrum averages chosen. This ensures the program runs exactly twice thus removing the non-equilibrium phase of the testing.
3) Double Click on the “Valve Control Loop” Conditional Repeat step and change the duration condition to ten times the number of spectrum averages chosen. This ensures the pressure cycle will remain steady for the duration of the data collection.

Note: Changing the length of time that data is collected from 5 seconds to something else in the “DAQmx Acquire” step will change how long the “Valve Control Loop” must be active. In this case, use:

Duration = 2*DataCollectionTime(sec)*#averages/spectrum

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How To Adjust The Shape Of The Pressure Curve

1) Double click on the second sequence step in the "Valve Control Loop" Conditional Repeat step to adjust the intake time. This will increase the peak equilibrium pressure when increased. Default=130.
2) Double click on the third sequence step in the "Valve Control Loop" Conditional Repeat step to adjust the time during which only the poppet valves are open. This will increase the back pressure tank pressure when increased. Default = 350.
3) Double click on the last sequence step in the "Valve Control Loop" Conditional Repeat step to adjust the exhaust time. This will decrease the peak equilibrium pressure when increased. This will also increase the difference in the crest and trough of the back pressure tank pressure when increased so it is not recommended to change it. Default = 0.

Note: Due to a delay in the SignalExpress program, there is a consistent ~233 ms delay when repeating a loop. This is used as the default exhaust time setting which is why the default setting is set to 0 ms. This gives the tightest back pressure tank pressure possible by the system.