

APPLICATION NEWSLETTER

PROBLEM: Flow Testing Liquid Flow Control Valves.

The production engineer and quality control manager for a major manufacturer of automotive valves needed a system to leak and flow test valves. The valves to be tested were used in automobiles to control liquid flows: window washer fluid; brake fluid; and gasoline. They were using hydraulic fluids to test the valves.

Flowing a liquid through the valves to test them posed a few problems. The testing was messy and required that the valves be cleaned and dried prior to shipping. The tests were slow. Several of the tests took ninety seconds or more to obtain three good flow data points. Therefore, the manufacturer had to build more test benches to ensure that the required production numbers were met.

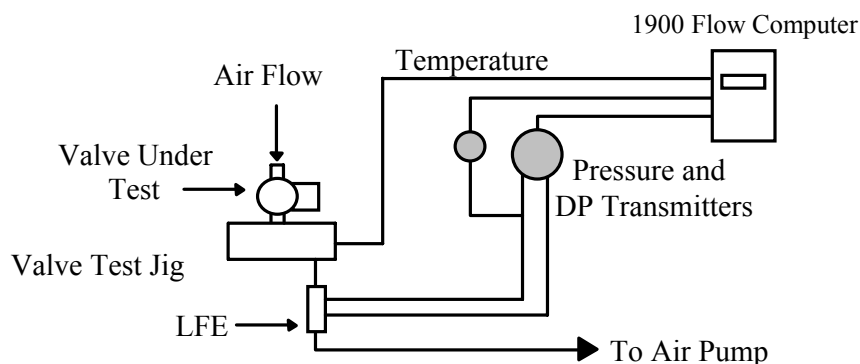
The engineers needed a fast, accurate test of the valves. They also wanted to use gases for the testing. This would allow them to package the valves without having to clean them. The test stand had to accurately measure the flow through the valves at two or three points. Finally, the valves would be tested for leakage when closed.

SOLUTION: The 1900 Flow Computer and Laminar

Flow Elements resolved this manufacturer's problem. LFEs measure air flow which eliminated the cleanup of liquids. The LFE and 1900 Flow Computer was also much faster. The response time of an LFE is 10 to 15 milliseconds for a 100% step change in the flow rate. This reduced the time needed for the three point flow test to 12 to 15 seconds per unit.

To determine which LFE to use a correlation had to be made between liquid flow rates through the valves, some at high pressure, and air flows at relatively low pressures. The customer accounted for the difference in specific weights between liquid and gas flows by applying a gas expansion factor to the specific weight formula for liquids. The volume of air required to simulate the liquid flow rates was then determined. The formulas and an explanation of this procedure are in the *ISA Handbook of Control Valves*, edited by J.W. Hutchison.

The large flow range that the LFE is capable of measuring allows one LFE to be used with a number of different valve sizes. The 1900 Flow Computer uses the DP, inlet pressure and temperature to calculate corrected flow rate. This is critical for the simulation to work correctly.



This depicts vacuum testing a valve. Testing a valve for a pressurized flow is done by simply reversing the flow direction. Standard LFEs are calibrated for flow in one direction only. If a test stand is to be used for both vacuum and pressure testing a bi-directional calibration should be requested.

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