Spool Valve Optimization and Assembly: Using Signature Analysis to Ensure and Verify Symmetrical Flow Characteristics

Overview:

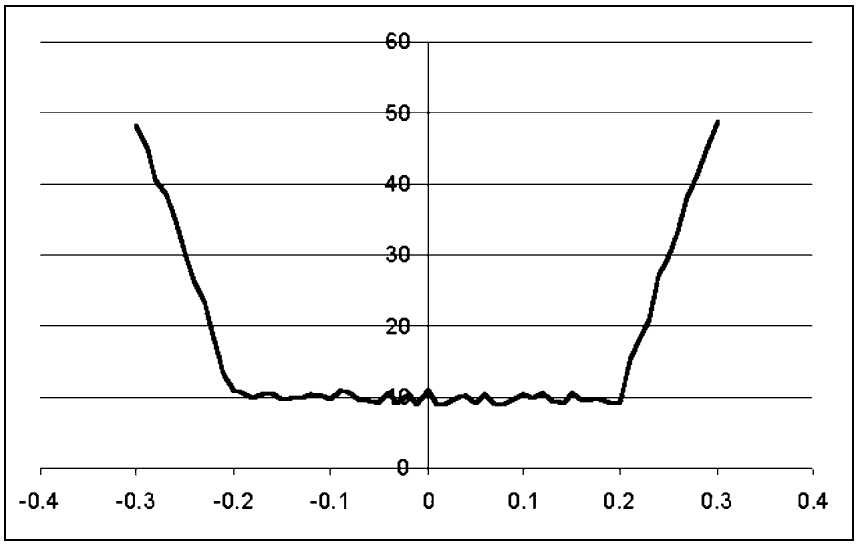
Spool valves require crimping at a precise location in order to ensure uniform and balanced flow characteristics. Before approaching Sciemetric®, a spool valve manufacturer had been attempting to solve this problem with another company. After spending about $30,000 and many months attempting to develop another system to do the job, they still could not get the system to work. A 30-minute discussion with Sciemetric® solved the problem: a simple five-line SigMETER® program was all that was needed to complete the task.

Highlights:

- Signature Analysis determines position of both cusps and optimum crimping point
- Post-assembly routine performs final QA test
- Immediate PASS/FAIL indication
- Minimal development time
- Built-in math routines simplify programming
- Production costs reduced by combining assembly and inspection functions

Since the normal spread of manufacturing tolerances makes a predetermined crimping position impractical, the first stage in the solution is to measure the flow characteristics of a spool valve. The graph shows the typical “V-shaped “ curve of flow versus spool position obtained when a motor advances the spool from one end to the other. The challenge was to determine the mid-point of the no-flow range, between the cusps. The second task was to program the assembly machine so that it would apply the crimp at the calculated position.

First, a single line signature step told “Get Data” to acquire the encoder based flow data over the length of the spool travel. Next, the built-in signature routines determined the positions of the left and right cusps. A simple math step calculated the mid-point between the cusps, and a serial output command sent the encoder data to the host controller. The machine backed the stepper to that position, and crimped the assembly. Finally, the SigMETER® scanned the flow data once more to confirm that the operation resulted in a perfect part. The total development time was less than a day.



The SigMETER® provided a simple, reliable and inexpensive solution to what appeared to be a complex and expensive problem. The solution was unique, since the SigMETER® did the double duty of being part of the assembly process, and performing the PASS/FAIL test. This is a powerful example of how signature techniques can dramatically reduce test development time, simplify production methods and produce a superior test.

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