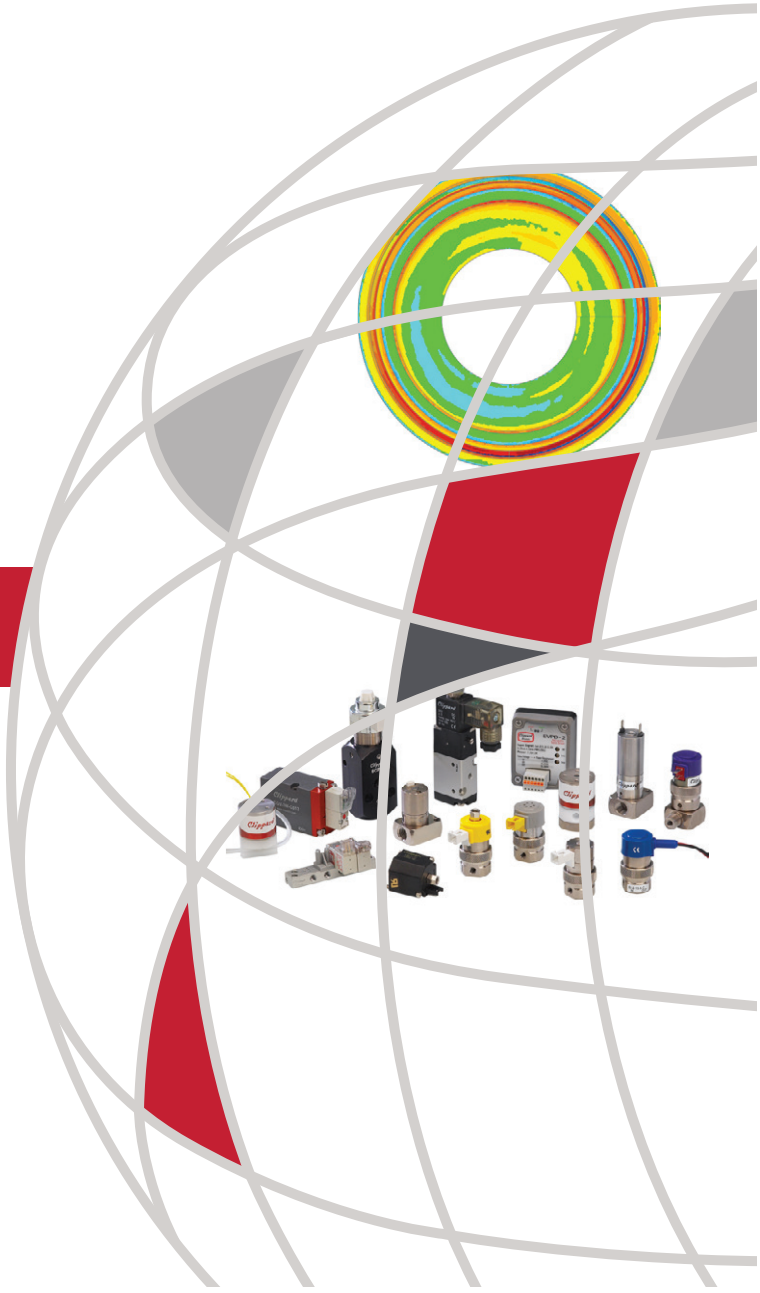
VALVE SPRING SIMULATION

CLIPPARD REDESIGNS AFTER SIMULATION REVEALS MANUFACTURING PROCESS DEFECT

Clippard Instrument Laboratory, a community-oriented company near Cincinnati, specialize in miniature pneumatics. So, when the team encountered a proportional valve that was not delivering consistent performance, they knew they needed to take a closer look at the valve components and design. Clippard initially partnered with AweSim to segue into the world of high performance computing (HPC) modeling and simulation by predicting the performance of a proportional valve spring. Early on, however, the test data on the prototype valve showed a nonlinear trend for flow versus electric current. This was inconsistent with the flow analysis of the computer-aided design (CAD) files of the valve. After a CT scan and finite element model, the team found that the issue was in the manufacturing process.

"There's no doubt we're sold on simulation. I'm not sure if we ever really would have put our finger on (the problem) as specifically as we were able to without that simulation in our hands."

— Doug Robertson, director of engineering, Clippard



VIRTUAL DESIGNS. REAL BENEFITS.

As an AweSim partner, Kinetic Vision was able to provide Clippard with complete imaging of the entire valve, every piece down to a micron-level view. Thanks to the results provided through modeling and simulation and a quick turnaround, the Clippard team was able to make changes in their computer translation to correct the issue and manufacture a better product.

ADVANCED MANUFACTURING

ADVANCED MANUFACTURING

Clippard Minimatic®

2016

THE CHALLENGE

Initial test data on Clippard's prototype valve showed a nonlinear trend for flow versus electric current, meaning the valve was not performing as efficiently as it could be. However, the flow analysis on the computer-aided design (CAD) files of the valve showed no defects from in the initial design. "It became obvious that our machine surface was not the shape that we thought it was and that we had asked our computer-controlled machines to (manufacture) for us," said Rich Humason, engineering manager at Clippard.

THE APPROACH

In collaboration with AweSim partner Kinetic Vision, a Cincinnati-based engineering service provider, the team took a two-pronged approach to finding what was causing the discrepancies between the performance of the physical valve and the computer model.

By first performing an industrial computed tomography (CT) scan of the assembled valve, the team compared the prototype with the computer model of the valve. They then built a finite element model from the industrial CT scan. From this model, they found that the problem was not with the computer design of the valve, but in the manufacturing process Clippard was using. Because the CT technology scans the entire assembled valve, Kinetic Vision was able to provide Clippard with complete imaging of the entire valve, every piece down to a micron-level view.

THE SOLUTION

Thanks to the results provided through modeling and simulation and a quick turnaround, the Clippard team was able to make changes in their computer translation to correct the issue and manufacture a better product.

Since the valve solution, Clippard has developed new methods to measure their material surface, improving processes from initial computational design to the finished product. According to Robertson, modeling and simulation has saved the team valuable time and resources.