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Deaton Engineering Helps Dell Quality Test 450 Cooling Fans Simultaneously



The Need: Part 11 Compliant Validation of an Automated Process Control System

Pharmaceutical companies must validate quality-affecting computerized systems in accordance with the FDA's ruling under 21 CFR Part 11. The high level of process control required for Good Manufacturing Practice compliance makes Automated Process Control Systems (APCS) one of the most critical applications of this requirement. Deaton Engineering performs validation services for computer systems and manufacturing equipment, and our work has repeatedly stood up to the scrutiny of FDA auditors. This case study was performed for a major pharmaceutical manufacturer headquartered in the US that specializes in the manufacture of sterile products.



The Challenge: Design and Build An Automated Computer Fan Tester

Dell and TyRex engaged Deaton Engineering to develop an automated fixture capable of simultaneously controlling and testing up to 450 fans for use during qualification of new computer cooling fan models. The data acquisition and control system necessitated independent control and monitoring of fan speed and input power. Additionally, the controller was required to recognize and disable a failed fan during testing.

Multiple fan sizes and blowers needed to be fixtured and connected to the test system; a common, flexible mounting fixture was required to accommodate fans from 50mm to 92mm in diameter capable of providing power and signal distribution to each fan.

The Solution: Automated Fan Test Fixture

Deaton Engineering developed designs for the fixture's circuit boards, fan mounts, power management and cable assemblies.

These components were used to create the test device, which was integrated with a standard thermal test chamber.

Performance testing included one week of continuous power cycling for all the fans at 70C. Parametric testing was performed at the end of the week, the fans were cycled through their range of speed, while monitoring the speed and power demand of each fan independently. This data was stored on the control computer and used to trend the performance of each of the fans in the test. This cycle of performance testing and parametric testing was repeated for 7 weeks.

The first article was built, installed and verified to demonstrate the final product met the design specifications. The designs, drawings, and procedures for building and installing the device were transferred to Tyrex for use with Dell components.



Engineering Highlights:



- Worked with Dell reliability engineers to develop fan tester requirements and specifications
- Designed custom test rack capable of handling signal and power requirements necessary to simultaneously control 450 multidimensional fans
- Created adjustable mounting bracket to accommodate multiple fan sizes/models without jeopardizing airflow
- Designed and developed power distribution which incorporated unique circuit protection, cable routing, and thermal considerations
- Assembled transfer documentation package for deployment to Asian manufacturers to meet client needs