

Case study

Using Masterflex® L/S® and I/P® process pumps in ISO class 5 (class 100) cleanroom applications

Overview

As manufacturing processes in a myriad of industries are faced with increasingly strict regulatory requirements designed to protect the processes and the end products from being contaminated by foreign substances, companies around the globe are turning to cleanroom technology to facilitate the production of their products. In cleanrooms, the size and number of airborne particles are strictly controlled. Mitigating steps must be taken to ensure personnel and equipment integrated into the cleanroom environment do not add significantly to the particle load inside the space. For successful cleanroom applications, it is essential that any equipment used inside the cleanroom be tested and cleared for use in those environments. Recently, Masterflex L/S and Masterflex I/P process pumps underwent this evaluation and were proven to successfully meet or exceed requirements for use in a cleanroom environment.

Summary of the Testing Process

We recently submitted an Easy-Load® 2 pump head mounted to a Masterflex L/S process drive and an Easy-Load pump-head mounted a Masterflex I/P process drive to an independent testing agency (Acorn Industries, Inc., under the direction of Dr. Philip R. Austin) to certify the pumps for use in ISO Class 5 (Class 100) Cleanroom conditions. To achieve the certification, each pump had to undergo a rigorous evaluation process that involved multiple testing steps.

The primary focus of the testing involved evaluation of each pump for material shedding. After thoroughly washing the pumps with



ultraclean spectrographic-grade alcohol, random locations on the external surfaces of the pumps were rewetted with spectrographic-grade alcohol. The solvent was removed from each surface, along with any collected particles, using a membrane filter. A total of ten sets of filters were collected at twelve intervals over a 100-hour span and then analyzed for particulate load. In addition to the membrane samples, a continuous, automatic airborne particle counter was used at different positions relative to the pump head. During the 100-hour test period, the data of the particle counter was reviewed and reset every ten hours.

The results for both pumps showed no base material emissions from any pump surfaces

Conclusion of the Study

The Masterflex L/S and I/P process pumps submitted for evaluation were able to be successfully certified as "Acceptable for Use" in Class 100 Cleanroom conditions per Federal Standard 209E as well as in Class 5 Cleanroom conditions per ISO14644-1.

Head Investigator, Dr. Philip R. Austin, who authored the standard used globally for cleanroom environments indicated the following:

To realize the results achieved in the testing laboratory, it is essential that the pumps be thoroughly washed with ultraclean spectrographic-grade alcohol, as was used in the testing process, prior to use in the cleanroom conditions.

Because both pump systems tested were peristaltic pump systems, it is imperative that not only the hardware be washed and prepared as described above, but also the tubing must

undergo a cleaning process to ensure compliance with cleanroom environment requirements. The recommended tubing cleaning process is as follows:

1. Soak the tubing for two hours in a non-ionic detergent/surfactant. This will break the surface tension of any particles that may be clinging to the surface of the tubing.
2. Thoroughly rinse off the detergent/surfactant with 10 MOhm deionized water to remove all excess particles from the tubing surfaces prior to use.

If these cleaning and preparation steps are followed, both the Masterflex L/S and Masterflex I/P process pumps – when coupled with correctly prepared tubing – can be used safely in ISO Class 5 (Class 100) cleanroom conditions.

Study credit: Dr. Philip R. Austin, P.E. Acorn Industries, Inc.

For more information on the Masterflex L/S and I/P process pumps and for assistance in selecting the most appropriate tubing for an application, please contact your local representative.