LIGHTHOUSE
WORLDWIDE SOLUTIONS

MANIFOLD MONITORING SYSTEMS EXPLAINED

Lighthouse Worldwide Solutions

Overview

Manifold systems play a crucial role in monitoring particle trends, particularly in applications focused on product yield. While not mandated by GMP regulations, these systems find extensive use in industries such as semiconductors and disk drives. The semiconductor industry relies on manifold systems to ensure that particulate levels remain within specified set-points, safeguarding product yield and quality. It's essential to understand that manifold systems operate sequentially, providing valuable insights for quality assurance in a range of applications.

Fig 1.0 Lighthouse Worldwide Solutions Universal Manifold

A Deep Dive into Manifold Systems

Manifold Systems

Manifold systems have been used for many years in particle monitoring in controlled environments. A manifold system uses one particle counter and a mechanical system to align the sample inlet of the particle counter to the sample line to be sampled. Manifold systems come in different sizes based on the number of sampling locations required. Generally the manifold systems can range from 5, 10,20 to 30 sampling points.

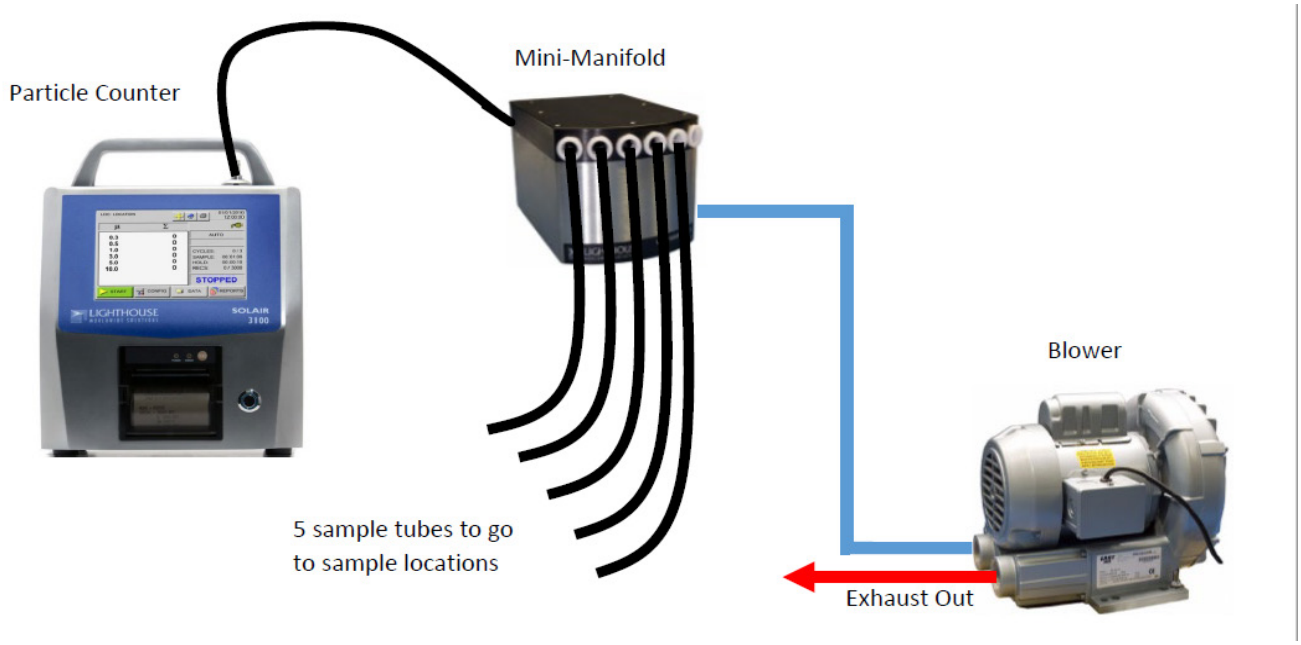
Manifold systems can be connected to particle counters with 0.1cfm (2.83lpm) or 1.0cfm (28.3lpm) flowrates. The key concept of manifold systems is coverage but the compromise is a manifold system is not a continuous system it is a sequential system.

Sequential Versus Continuous

A continuous monitoring system uses many particle counters to sample many locations. For example if a cleanroom required 5 locations to be sampled using a continuous monitoring system then the system could be designed to use 5 x portable or 5 x remote particle counters to monitor each sample location.

The term continuous in this context has two meanings. (1) Continuous samples are taken without any sampling gaps. (No missing sample data as the sample is continuous). (2) Continuous for the duration of the manufacturing process time.

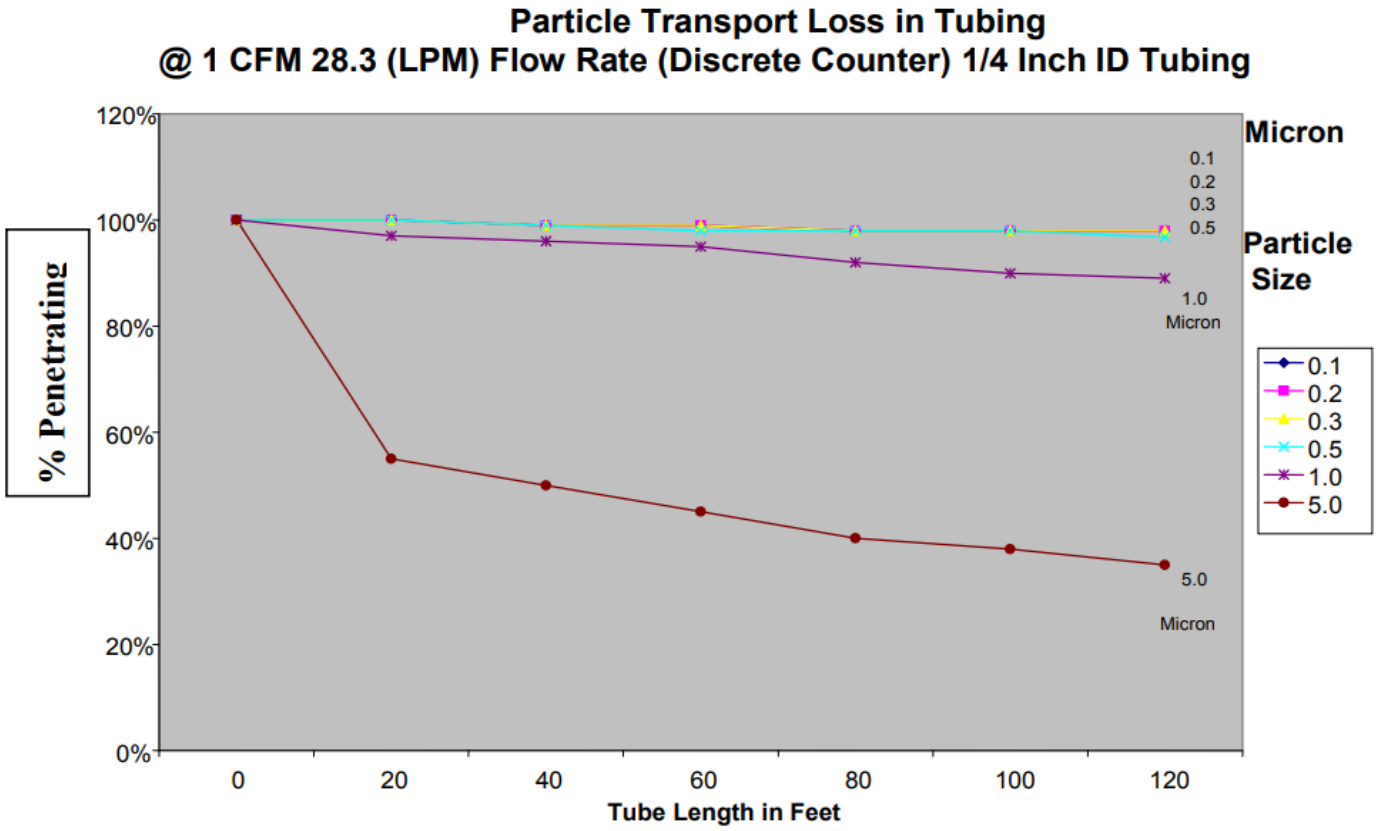
A manifold system, since it uses only one particle counter will not match the effectiveness of a continuous system but it has its advantages when coverage at a budget is required and the sampling is not in a critical manufacturing process zone such as an ISO 5 or Grade A/B environment when considering Pharmaceutical Manufacturing requirements for contamination control and current GMP regulations. Remember that sampling macro particles like 5um in long tubing can lead to significant particle losses and for that reason manifolds became obsolete in Pharmaceutical GMP applications. A manifold system used to monitor 5 locations will sequentially sample each location once every five minutes (if the particle counter sample time is set to one minute per location). See general manifold setup below. The blower connects to the manifold system to pull samples through the sample tubes.



Sample Tubing Lengths

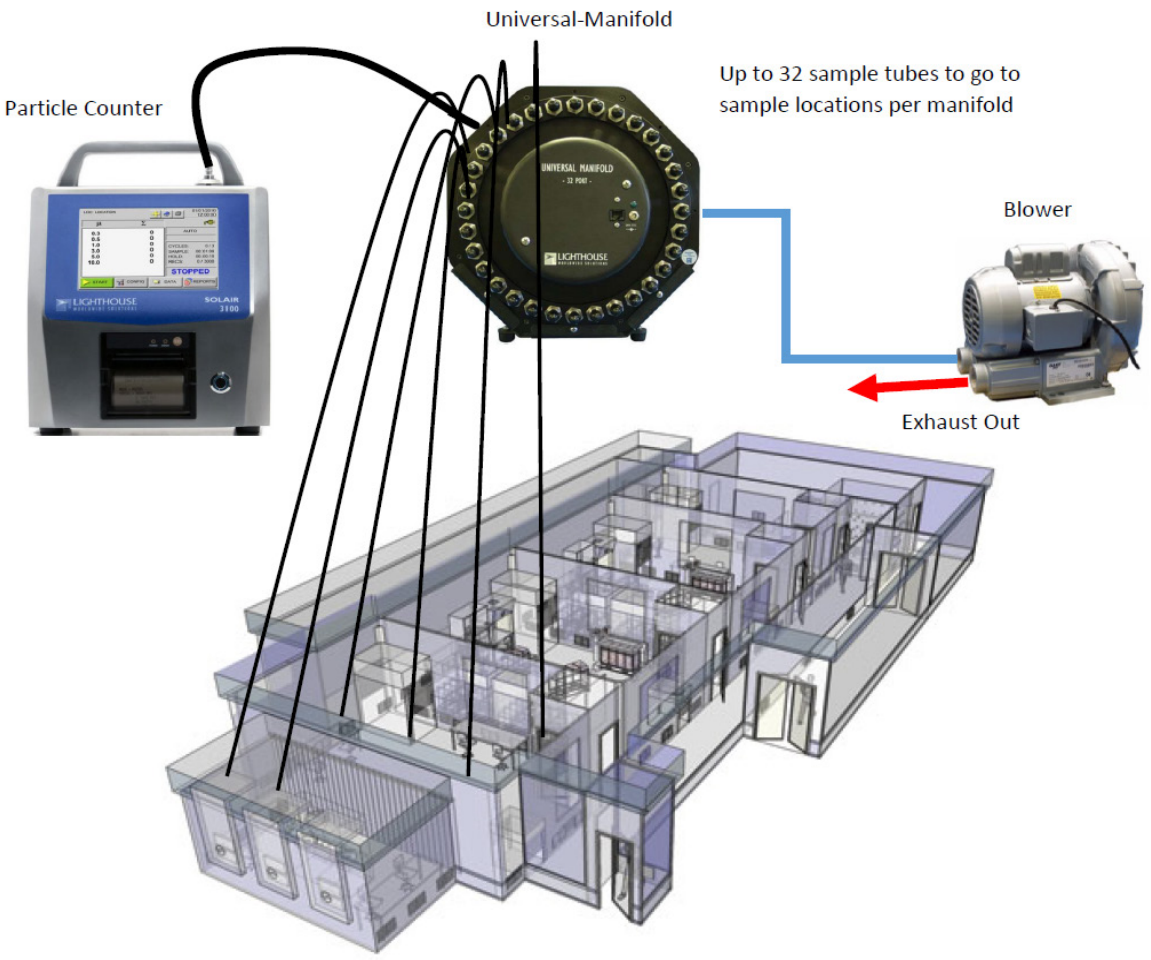
Manifold systems will have a limitation on the length of sampling tubing based on the ability of the blower to pull the samples through the tubing the system example illustrated on the previous page should not exceed 600 feet, total length of all runs and no single run should exceed 100 feet. There should be no kinks or sags in any run and angles should greater than 90-degrees. The blower input tubing should be limited to ten feet as well as the exhaust tubing (if desired to 'port' exhaust outside of blower location). Vibration dampening pads should be used if the blower will be installed where it may transmit vibrations into the particle counter; this will prevent spurious counts.

Looking at the table below for particle transport loss in tubing it is recommended that manifold systems monitor particle sizes 0.1um to <0.5µm for trending purposes in non-critical environments such as grade C/D. It is not recommended to use a manifold system in a Grade A/B environment in place of a continuous monitoring system where portable or remote particle counters can be used with shortest length of sample tubing used. The losses for particle sizes of 5.0µm and above are too much an impact to ignore especially when applying the results to verify cleanroom certification validation.



Manifold Systems for Particle Trending

Manifold systems work best when non-regulatory particle data trending is required for process quality. For examples in applications where contamination of products is more of a yield impact rather than a life threatening event then manifold systems are ideal as watchdogs in product yield management. Non Pharmaceutical industries embrace and use manifold systems to protect their product yield by closely monitoring the cleanroom environment and process 24/7. In some applications the manifold systems provide coverage of a few hundred sample locations and use several manifold systems. This type of setup is practical as the costs to implement a real-time continuous particle counter system versus a manifold system are a major advantage in favor of manifold systems. Lighthouse provides a universal manifold system which has up to 32-Ports per system and several universal manifold systems can be connected to Lighthouse Monitoring System (LMS) software so several hundred sample locations can be sampled per facility.



Conclusion

In Summary manifold systems provide great coverage for particle trending purposes for product yield applications where GMP regulation is not required. The semiconductor industry and disk drive industries use manifold systems to verify particulate levels do not exceed established set-points that may impact on product yield and quality. Manifold system are sequential and not continuous and offer a great way to trend data over long periods of time and are best for gathering data on particle sizes of <5µm.