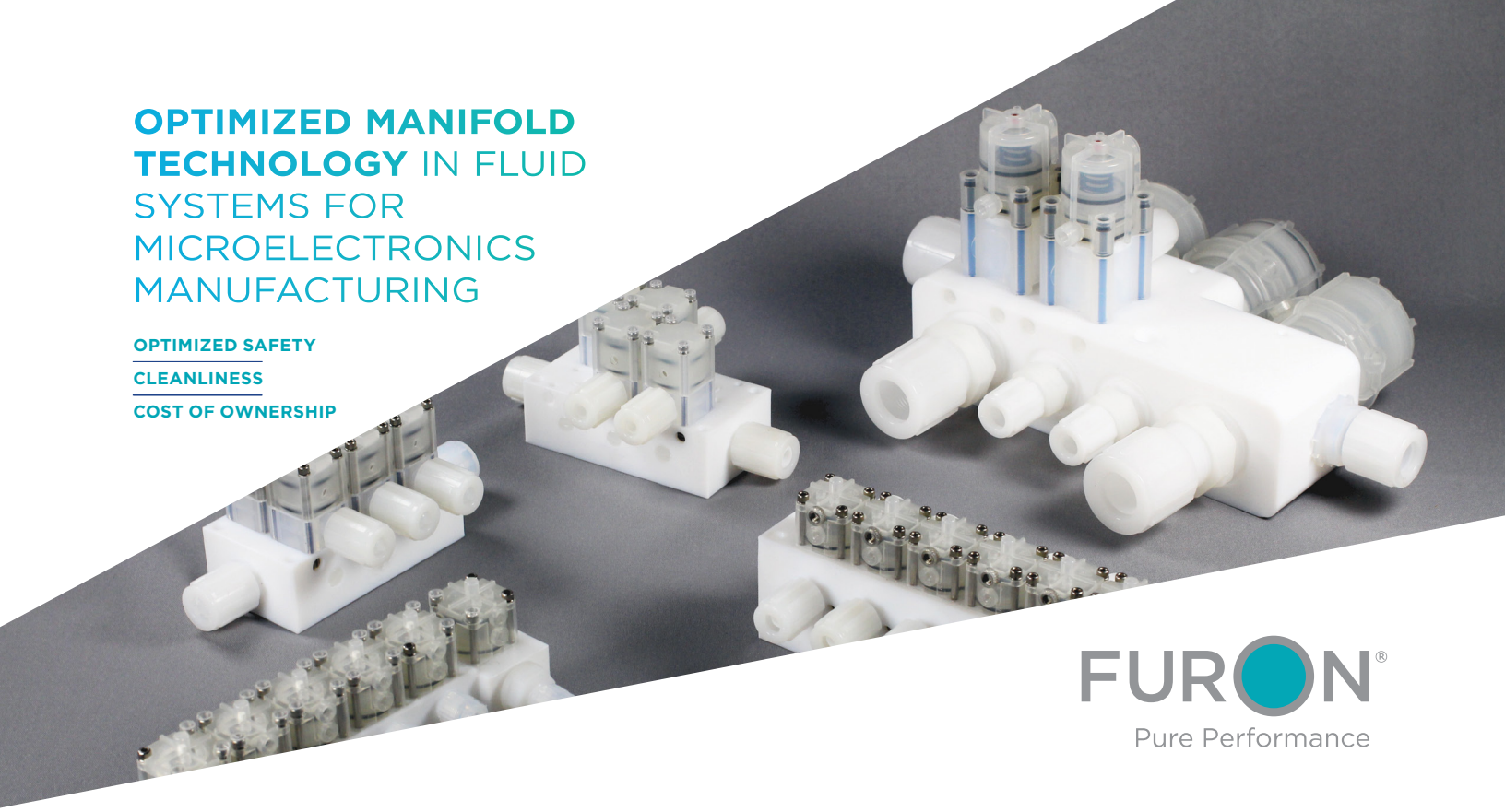
OPTIMIZED MANIFOLD TECHNOLOGY IN FLUID SYSTEMS FOR MICROELECTRONICS MANUFACTURING

OPTIMIZED SAFETY
CLEANLINESS
COST OF OWNERSHIP



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The importance of the various components within a fluid handling system is growing and adapting in tandem with the expansion of the semiconductor industry. We have transitioned from evaluating components as isolated entities, each possessing its own specifications and advantages for the fluid being transported, to considering the effects of a collective group of components, known as a manifold, on an overall installation or application. This shift is a pivotal factor in the micro-electronics sector, encouraging the industry to adopt a collaborative approach to product development, a practice that Saint-Gobain has acknowledged and championed for many years. This collaborative spirit is ingrained in our organizational ethos. To assess potential advantages that a manifold approach can offer to your installation or system, we categorized the benefits of manifolds into three primary areas: Safety, Cleanliness, and Cost of Ownership.

SAFETY

One direct impact is potential leak points. Manifolds provide a set of components in one block, reducing a number of leak points. On average you can expect a leak point reduction of more than 60%. On some occasions it can be significantly higher, but that percentage relates directly to what components you are manifolding. For example, in Figure 1 the simple manifold illustration, we move from 26 connection points down to six (All red connection points are removed and the green remain).

Figure 1: Connection Reduction

Another safety advantage, though less obvious than previously described, derives from the fact that when we design manifolds, with our component expertise, we select products that have the same level of performance and operating factor. Generally, this specific selection offers a longer lifetime for components as they are installed in proper condition of use.

CLEANLINESS

When designing a manifold based on a customer-specific requirement, we also ensure that from a cleanliness and SEMI standard point of view we are use components that belong in the same category. Cleanliness of a system is also directly related to the number of connections that are present in a design, as all connection points are equal to a potential entrapment point regardless of how good a fitting or a weld may be. Removing connection points turns your system into a cleaner system, even when using the best connection system.

Furthermore, given we are designing a custom component, we would know the installation orientation, its intended function, and the type of liquid it will handle. With this information, we can minimize entrapment zones, a common issue in slurry applications, since we anticipate the flow dynamic within the device. Applying similar reasoning to a different context, we design the manifold to reduce potential dead volume, which is especially critical for analyzer systems.

A final note on cleanliness, which becomes increasingly significant as we progress through the printing node, pertains to the potential for minimizing the surface contact area between the liquid and the component that transports it. This approach provides the most effective means of mitigating the leaching exchange phenomenon, achieved by reducing the contact area through a more compact component design.

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COST EFFECTIVENESS

The capability to minimize the design of a specific set of components offers a threefold benefit. Not only improving, safety and cleanliness, but allowing you to reduce your cost of ownership. At the facility level, this approach safeguards employees and the manifold itself by placing it within a compact valve box that is equipped with an appropriate sensing system and ventilation. In cleanroom environments, where every square inch is valuable due to high installation and operational expenses, this becomes particularly crucial. Referring to the earlier example of a basic manifold, we can observe a reduction of over 60%, but this time in terms of the component's footprint.

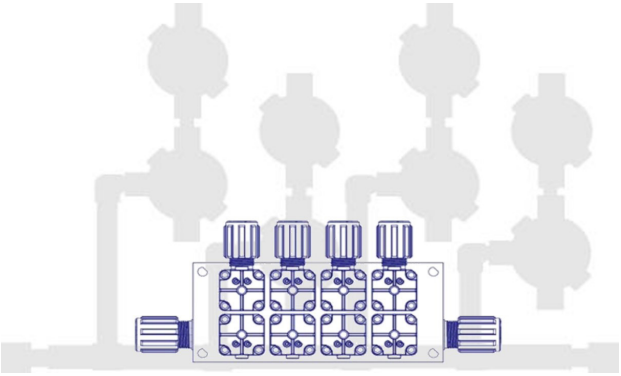

Figure 2: Manifold - System Size Reduction

Manifolds offer considerable cost advantages for both end users and original equipment manufacturers (OEMs). For end users, these savings primarily pertain to the maintenance and servicing of installations. Initially, one might assume that the manifolds prevent you from having discrete items, could lead to higher maintenance costs. However, when evaluating the total cost of ownership, utilizing manifolds can result in substantial savings. With fewer components to maintain in inventory, you can ensure the necessary parts are always available. In contrast, with discrete components, the part you need for replacement is often the one you do not have on hand. Furthermore, replacing a manifold effectively renews the entire subsystem simultaneously, minimizing the risk of multiple downtime for components that may experience similar wear and tear, potentially requiring replacement around the same time. For OEMs, the advantage lies in receiving a fully assembled and tested sub-unit, which streamlines the hookup and plumbing processes, ultimately saving both time and money. This efficiency allows for quicker installations, particularly in large-scale projects, where employing manifold designs instead of discrete components can lead to significant labor savings.

The advantage of utilizing manifold design lies in its ability to deliver tailored solutions that cater to your specific requirements. While the initial investment in manifolds may appear higher compared to discrete components, a thorough analysis of the total cost of ownership for both options reveals that manifold systems are ultimately more cost-effective. Additionally, they offer significant advantages, including enhanced safety and improved cleanliness. At Saint-Gobain we have encountered many clients who were initially hesitant to adopt this technology; however, once they made the transition, they recognized the comprehensive benefits that manifold systems provide.

By Stephane Domy
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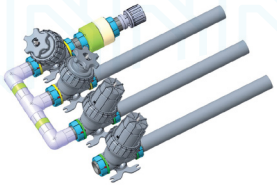
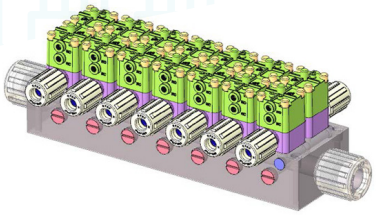
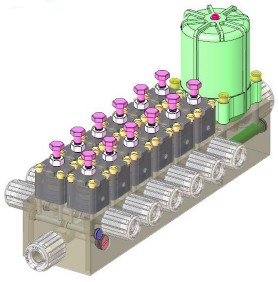
FURON MANIFOLDS



Stick Manifold



Surface Mounted Manifold



Integrated Manifold

Integrated and Surface Mounted Manifolds are built on a common base which provide completed compact systems, easy to install in one piece. Stick Manifolds are designed for high flow applications like bulk chemical delivery systems or wherever a higher flow rate is needed.