Give your vacuum **handling system a lift**

Irina Hermann, Product Manager, SMC Germany, talks about smart vacuum solutions and the often-overlooked components that can cause a system to underperform or fail.

Left: ***SMC´s ZP2V series vacuum saving valves automatically stop air consumption on pads that are not holding the workpiece.***
Right: ***A diagram showing how the vacuum saving valves work.***

The centrepiece of any vacuum system is the application and system layout, typically involving the method of vacuum generation and thus whether you use ejectors or pumps to generate the negative pressure needed to transfer the workpieces. However, there are many more important system components which, if overlooked, could mean that the vacuum handling unit fails to perform at its optimum level.

Arguably top of the list are smart vacuum solutions, thanks to the capabilities they bring. For instance, smart manifolds can leverage real-time distributed control via a fieldbus system, making it possible to control components through integration with a PLC, while facilitating the introduction of condition monitoring and predictive maintenance strategies. Further advantages include remote control of the vacuum ejector, vacuum generation on demand (depending on the pre-set vacuum level to be maintained) and vacuum break flow, which increases the speed of the vacuum application.

A vacuum handling system will also benefit from correctly specified fittings. In the first instance one should always check that any pneumatic fittings can work with negative pressure to avoid breakage and leaks and ensure the system runs perfectly. The selected fittings should also allow the necessary flow without introducing significant pressure drops.

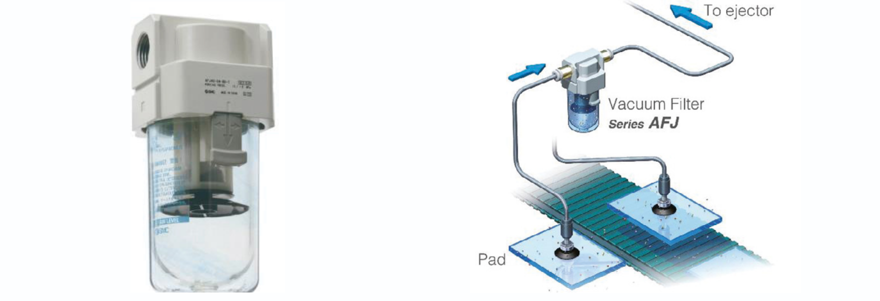
With these thoughts in mind, fittings should be selected with a sealing contour that lies against the tube surface in such a way that it makes a seal regardless of whether negative or positive pressure is being used. Here, the fitting's sealing design is the influencing factor. As a rule, keeping the pipework as simple as possible will reduce energy loss throughout the system, while another good tip is maintaining short tube runs to reduce cost, the risk of leakage and cycle times.

Filtration is a further important system element relating to the reduction of maintenance time and cost, as it helps to preserve the vacuum system. Installed in the ejector, it is also advisable to install filter units between the vacuum pad and ejector to prevent particles of dust or powder from entering the system during the adsorption process. Any penetration of contaminants can easily clog or damage the ejectors, compromising overall system life.

As a further thought, engineers should consider the centralised or decentralised system debate. A centralised vacuum system consists of one ejector or vacuum pump for several pads, usually mounted on the robot arm and connected to the pads via tubing. This type of system is a common solution that is easy to integrate and install.

Decentralised systems see one ejector operating one vacuum pad, usually placed directly at the pad. The typical vacuum source is an ejector, which produces vacuum by routing compressed air through a venturi nozzle. An attractive option here is an integrated vacuum pad/ejector solution. A two-stage SMC ejector, for example, increases suction flow by up to 50% and reduces air consumption by up to 30%. Notably, the design features of these single compact units allow for daisy-chain piping, while mounting with lock rings makes for easier maintenance as it reduces the steps required for pad replacement.

Also easy to integrate and install, decentralised systems are often preferable in vacuum handling applications where you do not need to operate too many vacuum pads as they can boost productivity through quicker response times. Simultaneously, decentralised systems increase safety by using several vacuum circuits for the transfer of one workpiece, since one specific ejector operates every single pad. In case of operational failure of one vacuum circuit, the other vacuum systems that remain operational secure the workpiece.



Left: ***SMC´s AFJ series vacuum filters protect the vacuum generation equipment.***
Right: ***A diagram showing how the vacuum filter works.***

Vacuum-saving valves

This is an element often forgotten but one that can bring great optimisation to your vacuum systems. In applications where vacuum ejectors are operating multiple pads, some of which are not holding the workpiece, a vacuum-saving valve serves to restrict the reduction in vacuum pressure to ensure the workpiece remains held by the rest of pads.

Another benefit of using a vacuum-saving valve is eliminating the need for a tool-switching operation when changing workpieces, thus saving time and simplifying the control circuit.

If we are talking about optimisation, we need to talk about size. Small and light components will not only result in direct cycle time benefits, but also enable more compact, lower weight machines to be built, which in turn reduces cost. Smaller components can fit into narrow spaces, which meets demand from a growing number of machine and robot manufacturers responding to customer requests for more compact solutions. In all cases, SMC is a total solutions provider and can advise on and address all aspects of a vacuum handling system to optimise performance, cost, energy efficiency and reliability.

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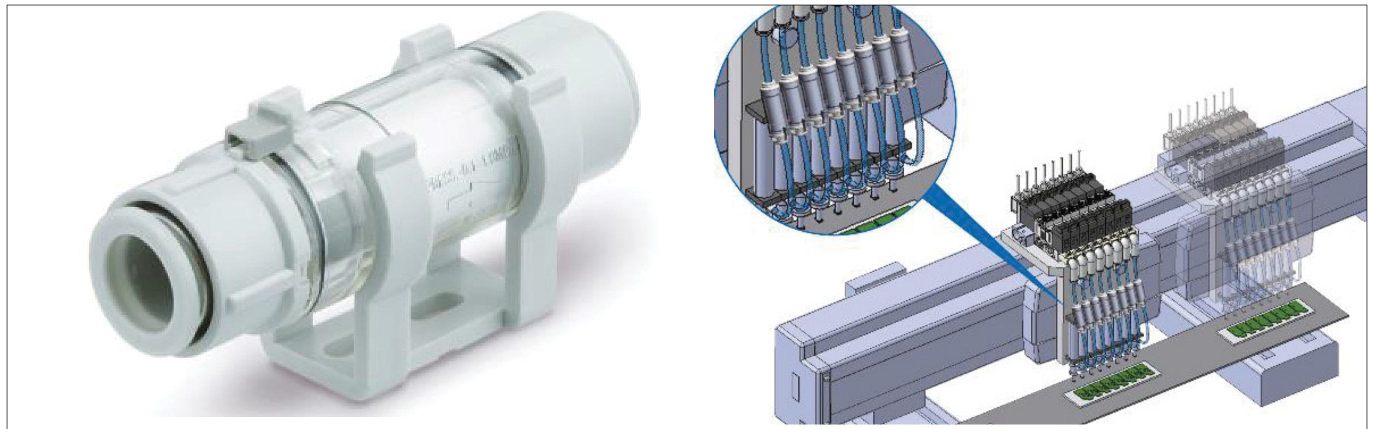

Left: ***SMC´s ZFC Series in-line air filters can handle positive and negative pressure.*** *Right:* ***A diagram showing how the ZFC in line air filter works.***