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VLF Trendsetter AL Air Regulators

Principle of Operation – Old Regulator vs New Regulator

The VLF Trendsetter Autoloader (VAL) has recently been fitted with a new type of air pressure regulator to increase the reliability and functionality of the machine. The air consumption of the Picker is so great that several of the other VAL components do not achieve maximum performance due to the pressure drop during Picker operation. This leads to performance and reliability problems. This document explains the reasoning behind the replacement of the conventional type regulator, the Festo regulator, with the new regulator from SMC – the VEX1333. To fully understand this, the theory of operation of both styles of regulator is explained.

The diaphragm of a conventional style regulator is kept in balance by two forces: The upstream air pressure on one side of the diaphragm trying to open the valve, and a combination of spring pressure and downstream air pressure pushing on the other side of the diaphragm trying to close the valve. By adjusting the spring force, the regulated air pressure can therefore be adjusted to the desired level. The disadvantage of this system is that the valve opens proportionately to the difference in air pressure from one side of the diaphragm to the other. For example, for a differential of one PSI the valve only opens a little bit, for a differential of two PSI it opens a bit more, until at 20 SCFM the differential is approximately seven PSI. A seven PSI pressure drop from the static set pressure leaves insufficient residual pressure to operate the VAL, particularly after line and valve losses. In theory, this can be overcome by simply raising the regulator pressure. However, this is not practically achievable at most customer sites that are already running at borderline pressure limits. With an additional ten PSI being needed to push the air through the filters, the customer's compressed air tank must never fall below 100 PSI and would need to be dedicated for use by the VAL. The burden and extra expense of this requirement to the customer translates into CreoScitex losing the competitive edge and VAL marketability.

The VEX1333 regulator from SMC, operates differently. It uses pilot air to operate the diaphragm rather than air drawn from the main stream. The pilot air is supplied to a small stainless steel reservoir that only fully recharges when there is little or no air consumption. The pilot air is supplied through a check valve fed by the main stream at 90 PSI. A secondary diaphragm, controlled by downstream pressure, operates a small valve that feeds pilot air to the main diaphragm. The result is a one PSI pressure drop at 20 SCFM – far more favorable than the seven PSI drop of the Festo regulators. This improvement in dynamic pressure is crucial for the reliable performance of the VAL and better utilizes the customer's air supply.

By Don MacKay.