Low pressure regulators in use with mixed acid

Taylor- made solution for nitrogen blanketing

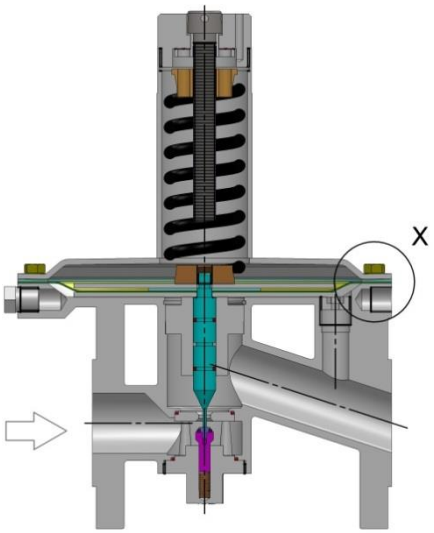
The Société Suisse des Explosifs (SSE) is an industrial group which produces explosives for civil use, fine chemicals and pyrotechnics. The industrial manufacture of explosives and their control requires special skills and long experience. The headquarters of the SSE are located in Brig, in the heart of the Swiss Alps.

The use of nitric and sulphuric acids and their mixture which is also called mixed acid, plays an important role in the production of explosives. Nitrogen is used as a blanket in order to prevent the ignitability/explosive properties of the blasting mixtures. This nitrogen blanketing is ensured by self- operating (without external energy) pressure regulators. The real challenge is not the process itself, but the condensate of the mixed acid (sulphuric acid / nitric acid) which results from the effect of solar radiation.

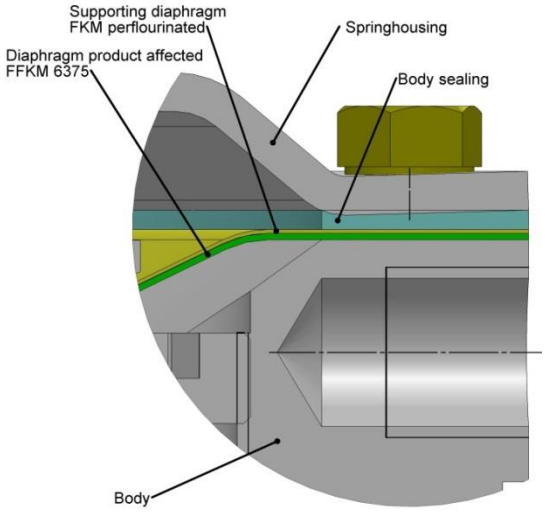
Mixed acid acts extremely aggressively towards all materials used that come into direct or immediate contact with it.
The aggressive acid mixture results in the pressure regulators having to be exchanged and completely overhauled at intervals of 2-3 months, since the conventional PTFE membranes that are normally suitable for chemistry cannot withstand the attack and become porous and thus useless. The consequences are obvious - production stoppages and additional costs. In particular, the problem is not so much the housing material used, but rather the originally utilised PTFE membranes. This membrane material becomes porous after a relatively short exposure to the mixed acid vapours and thus leaky. A leaky membrane causes failure of the regulator and simply means malfunction, interruption of production and costs.

In order to prevent these production interruptions and to significantly increase the operating time of the diaphragms, the manufacturer Zuercher Technik AG and the operator Société Suisse des Explosifs worked together to find an application-specific solution for this problem. The most different constructions and materials had been tested in the process. The tests resulted in a diaphragm material with a basic of a perfluorinated rubber (FFKM) and Kalrez® which is able to withstand the high demands.

Additionally the diaphragm construction had to be re- engineered for this application. The diaphragm material has to be stable and diffusions resistant, but at the same time also flexible and smooth in its regulating characteristics under the most widely-variable and changing external influences.
Especially the winter months with sub- zero temperatures put the highest demands onto the material used. The diaphragm which is in contact with the media (FFKM / Kalrez®) was supported by a further diaphragm made of fabric -reinforced Fluororubber (FKM) / Viton® on the opposite side. This double-diaphragm construction significantly improved the operating time of the pressure regulators. The pressure regulators are now in failure- free operation since more than one and a half years.



Detail X



Nice to know:
Amongst other things, the SSE is certified by the CNES Space Agency as supplier for the European aerospace project ARIANE. In this connection, SSE manufactures the detonation cord to open the capsule head.

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