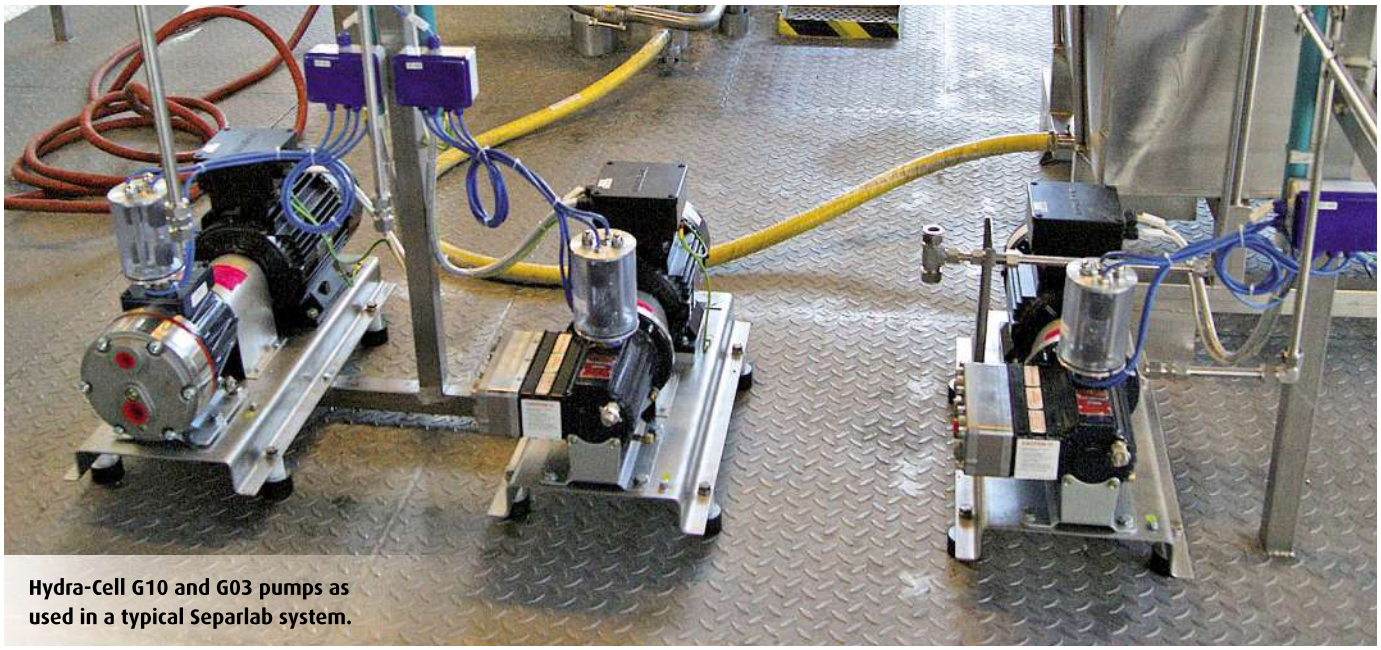
Choosing the Seal-Less Option

Industrial-scale preparative liquid chromatography specialist chooses multi-diaphragm pumps



Pictures: Wanner

Hydra-Cell G10 and G03 pumps as used in a typical Separlab system.

Separlab, a Czech specialist in high-performance liquid chromatography (HPLC), has standardized on Wanner seal-less Hydra-Cell multi-diaphragm pumps in its industrial-scale systems, using them to deliver solvents for the mobile phase and to inject sample mixtures. Learn why the company prefers such "specialists" over single-diaphragm and piston-plunger pumps in these applications.

Separlab, based in Prague, processes, designs, builds and supplies individual products and complete systems for home and export, with customers as far afield as Israel and India. It serves two main market sectors: laboratories and production plants. In both these areas the firm concentrates on preparative and process chromatography, rather than analytical chromatography. A common application is purification of a compound in sufficient volume for further work, for example quantitative analysis or use in a process.

In HPLC, an impure compound is injected into a high-pressure solvent stream (the mobile phase) and forced through a column packed with granular sorbent (the stationary phase). The technique exposes molecular and other differences between the components, and results in the progressive separation of its constituent materials.

Pump specification and performance can be critical factors in this process, confirms Separlab. Alongside high-pressure pumping capability the company cites, as essential features, resistance against corrosion and a pump's ability to produce precise flow with no pulsation. Consistency too is vital.

These requirements broadly apply at every level of HPLC, irrespective of the scale of the process, though scale does affect the type of pump available. Scale is also related to the width of the columns used in the process. For laboratory work and for small industrial preparatory systems using columns of up to 300 mm internal diameter, Separlab offers a series of purpose-designed high-pressure piston pumps. The highest capacity pump in this Separtrix range can deliver solvent at 70 bar pressure at flowrates from 100 ml/min to 3 l/min.

For HPLC on an industrial scale, flowrates are higher, but flow must still be pulse-free. Pressure requirements remain high, while ease and accuracy of pump control, reliability and easy maintenance are also important. It was to match and reconcile these potentially conflicting needs that Separlab turned to Hydra-Cell pumps.

Pulse-Free Flow

The company saw that the Hydra-Cell concept is based on a combination of features relevant to the demands of HPLC but not offered in alternative pump designs. Multiple hydraulically-balanced diaphragms, operating stress-free throughout the pump's wide pressure range, are incorporated in a single head; they flex in sequence to provide the

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pumping action, giving virtually pulse-free flow. This arrangement also reduces physical bulk, weight and footprint and can help to reduce overall system cost.

With no dynamic seals or packings in the pump, there is no seal wear, avoiding consequential leaks and sustaining performance at a consistent level. Other distinctive features include Wanner's Kel-Cell diaphragm position control system, which protects the diaphragms under abnormal inlet conditions, allowing the pump to run dry indefinitely without damage.

Atex-Compliant Configuration

Atex-compliant configuration, a common requirement in industrial preparative chromatography, is available on all models.

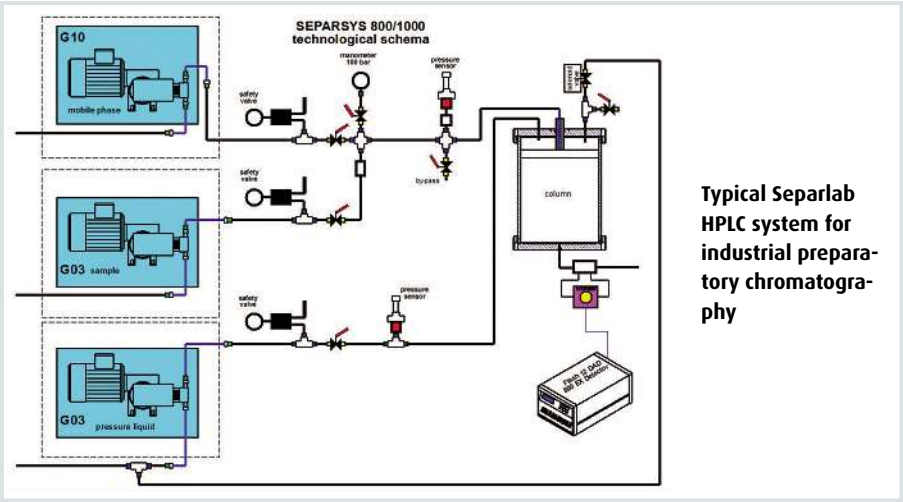
Two Hydra-Cell models are offered as standard equipment in Separlab HPCL systems: the G03 (max flow 11.3 l/min at 70 bar) and the G10 (up to 29 l/min at the same pressure).

"In our systems," says Separlab MD Stanislav Vozka, "the Hydra-Cell pumps are mainly used in the continuous delivery of mobile phase. At the moment we use low-viscosity organic solvents, both polar and non-polar, but we do not exclude aqueous solutions in future."

"Sample injection—once per run—was the next application, and we are now using the G03 to deliver special auxiliary liquid to a piston pump on the column."

G10 pumps are also employed on mobile phase delivery, with further expansion of the Separlab product range. Their higher flow is needed for columns larger than 500 mm ID.

The company's high-pressure industrial-scale separation units are usually built to bespoke design. The figure above shows a typical installed system where a Hydra-Cell G10 delivers mobile phase, while G03 pumps deliver samples for separation and pressurize the column. **KEM**



Typical Separlab HPLC system for industrial preparatory chromatography