Extended inline vacuum degasser durability

Exploring the features of inline degassers

Figure 1. A stand-alone inline degasser from the DEGASi family, suitable for aqueous liquids and organic solvents at flow rates from 25 µL/min up to 1000 mL/min, depending on model and configuration

Inline degassing is the silent guardian of precision and reliability in fluidic systems. Installation of an inline degasser (see Figure 1) will drastically diminish the concentration of dissolved gases in the liquids passing through. This reduces variations, improves baseline stability, shortens startup times, and ensures more consistent results. By reducing the concentration of dissolved gases beyond the level where outgassing can occur, bubble formation will not be an issue despite changes in temperature, pressure, or compositions of the liquid managed throughout the flow path.

Degassers are important equipment components in laboratory analysis equipment such as liquid chromatography, HPLC, UHPLC, ion chromatography and mass spectrometry. Machines for semi-conductor manufacturing or assembly will also typically deliver more consistent results with a degasser included in the fluid path. The same is true for instruments in immunology, haematology, and in-vitro diagnostics.

An inline degasser assembly contains a purposedly designed vacuum pump connected to one or several degassing chambers through which the liquid with dissolved gases flows. Inside the degassing chamber (see Figure 2) there is an inert gas-permeable membrane that must be compatible with the liquid to be degassed. A control board with a vacuum sensor ensures that the vacuum level is kept at a constant level to minimise fluctuations in degassing performance and wear on the vacuum pump.

MAXIMISING DEGASSER LIFETIME

Modern inline degassers incorporated into instruments handling liquids with high precision and accuracy, are fortunately essentially maintenance-free. However, there are a few things to keep in mind not to shorten the lifetime of your inline degasser.

Firstly, one should use a degassing chamber compatible with the solvents that will be used. Organic solvents such as hexane, heptane, toluene, tetrahydrofurane (THF), and dichloromethane (DCM), typically demand specially designed degassing chambers. These degassing chambers are often labelled GPC to highlight their suitability in gel permeation chromatography, but they are equally suitable for normal phase and flash chromatography applications where such organic solvents are also employed. In addition, there are degassing chambers explicitly designed for hexafluoro isopropanol (HFIP) that are required when this aggressive organic solvent is used.

As with any fluidic component, it is advisable not to leave your degassing chamber with liquid inside when disconnected from use. This is especially important when there are salts or buffer components dissolved into the liquid since they may precipitate. Precipitates will block the flow path and are notoriously problematic to wash out again. In addition, buffered aqueous solutions exposed to open air may constitute an attractive environment for microbial growth, which can constrict the flow path.

Finally, it is strongly recommended to always suck solutions through the degassing chambers, rather than pumping or pushing liquids through them. The internal gas-permeable membrane material that allows gases to penetrate while blocking liquids, is designed to withstand a certain pressure difference. That limit may accidentally be exceeded if liquids are pumped too fast into the degassing chamber, which may cause irreparable damage.

REPLACEMENT OF PARTS

Should a degasser chamber malfunction, it is most often either related to use with incompatible organic solvents, or a blocked flow path. If this happens, the chamber needs to be replaced. Fortunately, this is a straightforward and quick procedure in most systems. Note however, that in cases where there has been a leakage from the fluidic line into the vacuum line, there is a high risk that the vacuum sensor on the control board has been impaired. In these situations, there are often so many damaged components that one should consider exchanging the entire degasser.

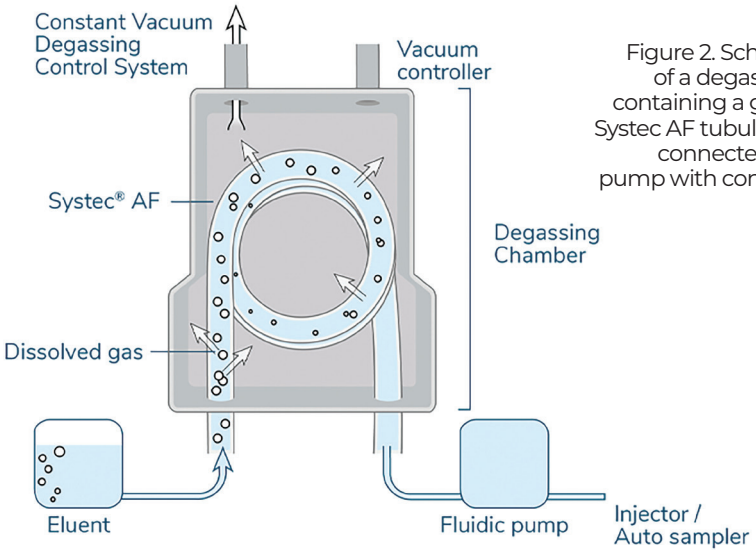

Figure 2. Schematic sketch of a degassing chamber containing a gas permeable Systec AF tubular membrane, connected to a vacuum pump with constant vacuum controller

Since modern inline degassers are highly robust equipment with a long lifetime, it may well be that if their internal vacuum pumps eventually fail, there is a risk the original part is no longer available from the manufacturer. The stepper motor driven vacuum pumps, with sensor and control boards to ensure constant vacuum, come in a range of variants for different degasser assemblies. These pumps may differ in capacity for various flow rate ranges, or in the vacuum setpoint, or in the control board design, or in the mounting orientation. Conveniently, Biotech Fluidics upholds an online vacuum pump replacement finder [1] that facilitates exchange of obsolete pumps and control boards in inline degassers from many different brands.

CONCLUSIONS

Inline degassers are robust equipment that require minimal maintenance to continuously safeguard precision in fluidic systems by reducing dissolved gases and eliminating troubles from bubbles. With proper handling, the user can ensure that their degasser will keep performing for many years, and if it eventually fails, replacements of parts will be rather simple procedures.

REFERENCES

[1] https://biotechfluidics.com/products/degassing-debubbling/degasi-inline-degassers/degasser-spare-parts/

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