Sample Concentration by Evaporation of the Solvent with Nitrogen

Market Application Publication

Background:

Solvent evaporation is used in a broad range of laboratories such as environmental, clinical and industrial testing facilities to prepare samples for analysis. In addition, solvent evaporation is an important step in many chemical syntheses; as the solvent used to generate an intermediate may not be compatible with the next reaction step. In many cases, a steady stream of gas is used to evaporate the solvent. Pure, dry nitrogen is commonly used to evaporate solvents, as it is a relatively non-reactive gas; in contrast air contains oxygen and water vapor, which could react with the compounds of interest.

In many laboratories, the nitrogen is provided by the evaporation of liquid nitrogen from a high pressure liquid nitrogen tank, a Dewar, or a high-pressure gas cylinder. While these methods are satisfactory, the use of an in-house generator to provide the nitrogen for solvent evaporation offers a number of significant benefits. An in-house nitrogen generator is completely automatic, more cost effective and requires minimal maintenance.

Features and benefits:

- Generates evaporation grade nitrogen from laboratory air with minimum user interaction
- Eliminates the use of liquid nitrogen Dewars and the need for periodic refilling of liquid nitrogen
- Safe, cost effective, produces only the amount of nitrogen that the system needs
- Eliminates acquisition and installation of bulky and hazardous high pressure nitrogen tanks
- Prevents running out of gas during evaporation of solvent
- Extremely low cost of operation, no hidden costs (demurrage, maintaining inventory)
- Minimum environmental impact, while fractional distillation of air and transportation of tanks has a significant impact
- Compact unit, fits on bench top or stored underneath lab counter
- Operates on a 24 hours/day, 7 days/week basis with minimum maintenance

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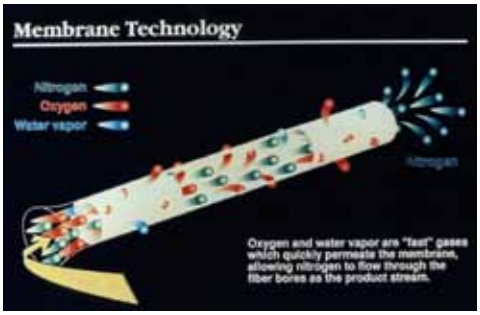
Application:

Dry, pure Nitrogen is provided by Parker Balston High Flow Nitrogen generators using a hollow fiber membrane that permits oxygen and water vapor to permeate the membrane and escape through the sweep port while the nitrogen flows through the fiber to the solvent evaporator. While each individual membrane fiber has a small internal diameter, a large number of fibers are bundled together to provide an extremely large surface area for the permeation of oxygen and water. The system is designed specifically to be the most cost effective solution for use with evaporation stations.

Case Study:

Environmental laboratories such as Belmont Labs (Englewood, OH) provide testing of drinking water, waste water, soils, and sludge for compounds such as polychlorinated biphenyls (PCBs), pesticides, herbicides, semi-volatile and volatile organics as well as for compounds derived from diesel fuels and gasoline. The laboratory which is accredited by the US EPA and the Ohio VAP (Voluntary Action Program) uses RapidVac extraction systems that are multiple-sample evaporators which use vortex motion and heat with either vacuum or nitrogen blow down to quickly reduce samples to dryness or an end point volume. Belmont originally used liquid nitrogen from Dewar or small compressed nitrogen cylinders to provide the stream of gas; these approaches required a significant amount of space, required constant monitoring to ensure that the gas supply did not run out and led to waste, as the gas was vented to prevent explosions (25% of each cylinder was lost to venting). In addition, replacing tanks was inconvenient and time consuming.



Belmont Labs investigated the generation of the nitrogen for the extraction systems and calculated that the use of a Parker Nitro-Vap 1LV system would pay for itself in less than 2 years, with annual savings thereafter of approximately $4,500. The generator provides up to 80 slpm of 95% pure nitrogen at a user selected input pressure of up to 105 psig, and includes a 0.01 µm filter to ensure clean and commercially sterile nitrogen. If a greater flow rate is desired, the NitroVap-2LV can supply up to 160 slpm.

Principal Specifications:

NitroVap Gas Generators	Specifications
Nitrogen Purity	Up to 95%
Nitrogen Dewpoint	Down to 20°F (-29°C, atmospheric)
Maximum Nitrogen Flow Rate	NitroVap-1LV: up to 80 slpm@100 psig input up to 140 slpm@125 psig input
	NitroVap-2LV: up to 160 slpm@100 psig input up to 287 slpm@125 psig input
Nitrogen Output Pressure	0-15 psig, user controlled
Inlet/Outlet Port	1/4" NPT (Female)
Shipping Weight	53 lb (24 kg)
Dimensions	10.63"w x 14.1"d x 16.5"h (26.92cm x 38.51cm x 41.91cm)

Ordering Information:

Model	Description
NitroVap-1LV NitroVap-2LV	NitroVap Nitrogen Generators
MKNITROVAP	Maintenance Kit (includes 1 each filter cartridge and 1 each membrane cartridge)
NITROVAP-1LV-PM NITROVAP-2LV-PM	Preventive Maintenance Plan
NITROVAP-DN2	Extended Support with 24 Month Warranty

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