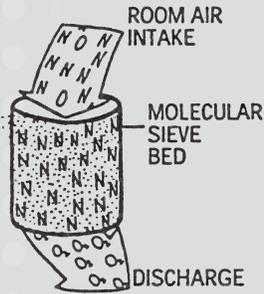




Humphrey's custom valve assembly enabled more reliable and consistent O2 delivery from the customer's home oxygen concentrator.



N= Nitrogen Molecules  
O2= Oxygen Molecules



- ① Special diaphragm valve design provided greater flow
- ② Custom port and mounting configuration
- ③ Low current consumption solenoid

## Custom High Flow Valve

*Assembly Improves Oxygen Concentrator Reliability*



**OXYGEN DELIVERY EQUIPMENT**  
SIC:3842

### THE CUSTOMER'S PRODUCT

- The customer was designing and manufacturing oxygen concentrators for in-home therapy to treat individuals with severe respiratory problems.
- The equipment utilized a 4-way spool valve, but it could not provide the precise timing required. In addition, the spool valve clogs readily when exposed to cooking fumes and other airborne particles found inside the home.
- Since lubrication is prohibited (oxygen must be delivered pure and dry), the only spool valve that would work was a lapped-type with some inherent leakage.

### THE REQUIREMENTS

- Design a valve assembly with high flow and more precise control.
- Significantly improve valve reliability and reduce leakage.
- Valve must work without lubrication and at a very low pressure.
- Provide custom port and mounting configuration.

### THE HUMPHREY ENGINEERED SOLUTION

- Humphrey designed a special diaphragm valve with deeper seats to increase flow for higher efficiency, while no leakage.
- The design required no lubrication and was inherently less susceptible to environmental conditions.
- The valve functions at low pilot pressure signals, enabling use of a low current consumption solenoid.
- Multiple Humphrey diaphragm valves allowed the manufacturer to achieve more precise control over valve functions at each stage in the concentration cycle.
- Custom 1/4" port orifices and special mounting holes

## THE SOLUTION

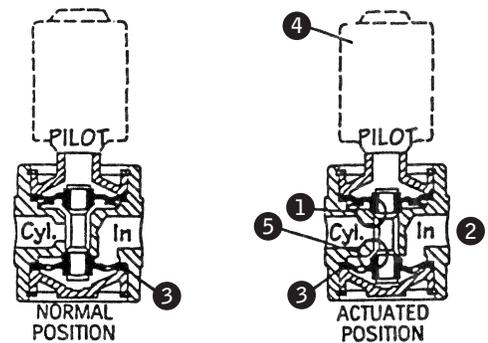
The customer, learning of Humphrey's experience with diaphragm valves used in an artificial heart, asked the Engineered Solutions team to develop a practical diaphragm valve assembly that would meet its application requirements: Room air is forced through a sieve bed filter in the oxygen concentrator, which traps most of the nitrogen molecules, but allows the smaller oxygen molecules to pass through. This results in a discharge that is 90+% pure oxygen. To complete a cycle the valves must pressurize, close, hold the pressure and then vent the discharge rapidly at precisely timed intervals.

The Engineered Solutions approach started with a Humphrey engineer working directly with the customer's engineering department to identify all the requirements and opportunities to improve the product. In this case, the customer wanted higher flow rates, no leakage, and no susceptibility to environmental conditions. Because of its design, the standard Humphrey diaphragm valve required no lubricating medium, was inherently less susceptible to environmental conditions and offered the high flow rates required for greater efficiency. Humphrey modified this standard, field proven valve to deliver the performance and reliability the customer required.

## THE PROCESS

Responding to the customer's concerns about valve performance, the Humphrey Engineered Solutions team evaluated the existing system, which consisted of a lapped seal 4-way spool valve with inherently low flow characteristics. Also, the valve was susceptible to clogging and leakage, resulting in erratic performance.

Humphrey engineers developed a special diaphragm valve to increase the flow rate and also operate at very low pilot pressure signals. This enabled Humphrey to employ a low current consumption solenoid. Even though the assembly utilized multiple 2-way and 3-way valves to replace a single 4-way spool valve, the new design delivered more precise control over valve functions at each stage in the concentration cycle.



- 1 Custom 1/4" orifice
- 2 2-way diaphragm valve (shown) and 3-way diaphragm valve (not shown)
- 3 Diaphragm designed to accept low pilot pressure
- 4 Low current consumption solenoid
- 5 Deep seats for enhanced flow

*Humphrey*

BUILD ON OUR EXPERIENCE

Humphrey Products Company • P.O. Box 2008 • Kalamazoo, MI 49003 USA • T.269.381.5500 • F.269.381.4113 • www.humphrey-products.com