

## SELECTING THE APPROPRIATE DIAPHRAGM SEAL SOLUTION FOR VACUUM APPLICATIONS

A well built diaphragm seal system should perform normally in most vacuum applications. However, as the system pressure approaches full vacuum, special consideration should be taken to assure a safe and reliable instrument assembly. In order to provide the best instrument assembly possible, REOTEMP recommends special attention to the following factors when specifying a diaphragm seal system for vacuum applications.

### 1) Fill Fluid Preparation

Diaphragm Seal fill fluids contain small amounts of dissolved air or “trapped gas”, which will expand rapidly as the pressure on the fluid approaches absolute zero. As the trapped gas expands a false pressure is felt within the seal system yielding a false and inconsistent pressure reading.

In order to guarantee the best performance from the fill fluid, thoroughly de-gassed fill fluid should be used. REOTEMP’s Hi-Vac filling technology warms and agitates the fill fluid while exposing it to a pressure of less than  $1 \times 10^{-8}$  mbara. The fill fluids best used in vacuum applications are held under this constant vacuum and whenever exposed to atmospheric pressure are then given a minimum of 24 hours of degassing before being used in an instrument assembly.

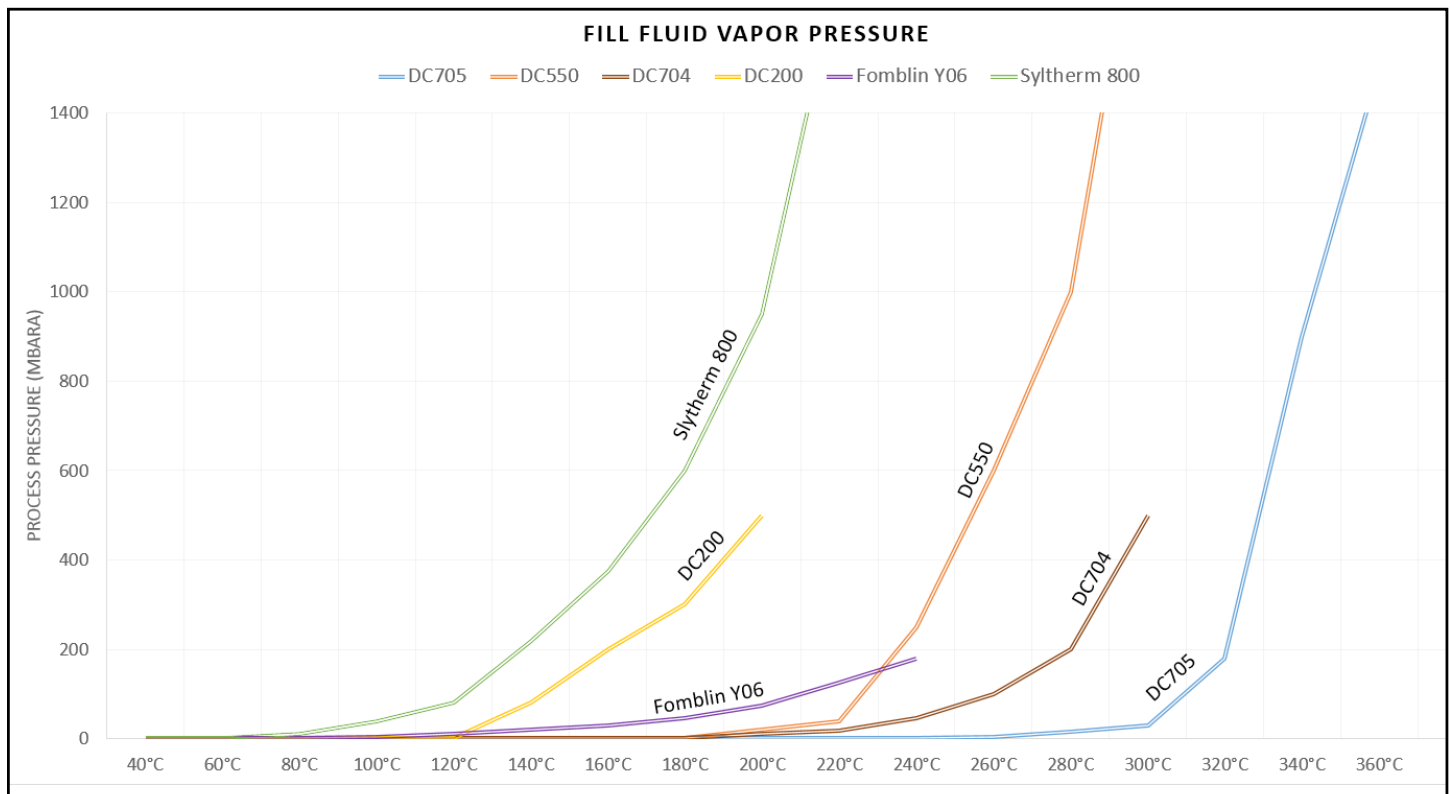


### 2) Fill Fluid Selection

As the pressure on the fill fluid nears full vacuum, the fill fluid will vaporize at a lower temperature. In applications involving vacuum and elevated temperature, it is crucial that the fill fluid selected maintain its liquid state and is not exposed in process to a temperature/pressure combination that moves the fill fluid from a liquid to vapor phase. When this does occur, the sudden expansion of the fill fluid leads to the diaphragm foil popping out backwards and often tearing. This effect is often called a “jiffy pop” or a “pop can”.

REOTEMP offers a number of fill fluids that are optimized to perform in deep vacuum and elevated temperatures. Refer to **Figure A: Fill Fluid Vapor Pressure**. Select your design temperature and pressure. It should be to the left and/or above the vapor curve for the fill fluid that you are selecting.

**Figure A: Fill Fluid Vapor Pressure**



See the Pressure Catalog fill fluid guide for specific details on all available fill fluids.

### 3) Minimizing Threaded and Gasketed Connections

Vacuum applications put an additional stress on threaded and gasketed connections as there is a risk of ambient air or gas trapped in threads being sucked into the filled system. In the event air is successfully pulled into the filled system the fundamental principle of the filled system is compromised and the instrument assembly will fail to function properly, especially at deep vacuum.



As a general practice, REOTEMP provides all-welded seal systems for all pressure transmitter assemblies. Not only is the diaphragm welded to the seal body, but all capillary and transmitter cover flange connections are welded and leak tested.

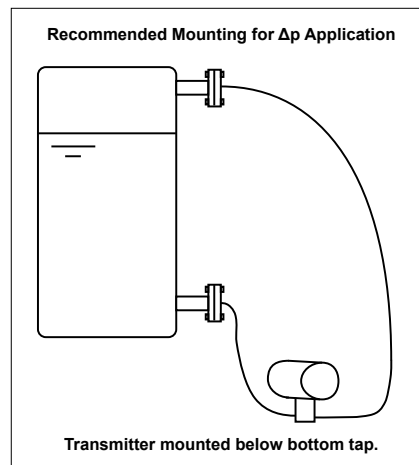
#### 4) Vacuum & Pressure Testing the Completed Assembly

Even the most exacting manufacturing processes are susceptible to the occasional error. Because of this, REOTEMP tests every dP transmitter in full vacuum. Whether or not the user has specified that the assembly will be used in vacuum service, REOTEMP QC tests both legs of a dP seal system under full vacuum and full pressure, verifying:

- A Balanced Fill
- Lack of Trapped Gas in the Fill Fluid
- A Durable Seal on All Potential Leak Points in the System

#### 5) Transmitter Mounting

It is a good general practice to always mount a pressure transmitter even with or below the diaphragm seal mounting position. In vacuum service, it is imperative to mount the transmitter below the diaphragm seal taps, in order to generate a positive head pressure on the transmitter sensor.



Specifying and building the correct diaphragm seal system for a vacuum application involves a number of complicated factors. REOTEMP is committed to providing the best assembly possible no matter the transmitter or instrument brand or model being used.



REOTEMP is a globally recognized ISO 9001-2008 manufacturer of temperature and pressure instrumentation. REOTEMP sells through a mature distribution network that reaches all 50 states and 30 countries worldwide. We provide bimetal thermometers, pressure gauges, diaphragm seals, RTDs, thermocouples, pressure transmitters, compost thermometers, and related accessories to a variety of process markets worldwide. Our reputation is built on high quality products, quick standard lead times, and exceptional customer support.

+1 (858) 784-0710

reotemp.com