The Cause of Vapor Lock

Vapor Lock is a problem that results from ambient temperatures, vapor pressure of the product and the installation. It is not a characteristic of a pump.

Atmospheric Pressure of 14.7 PSI (Sea Level) presses on the liquid in the tank. See Figure 1.

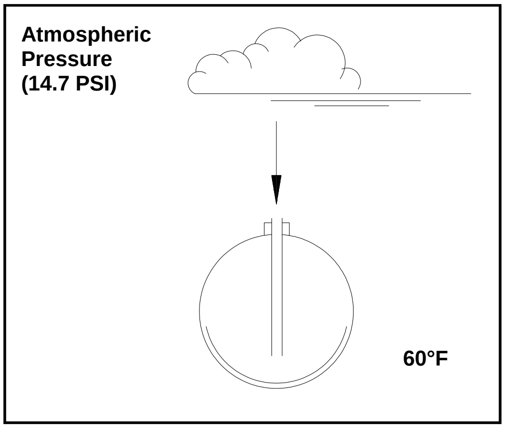

Figure 1

Vapor Pressure (the amount of pressure required to keep the product in a liquid form at 60°F) of today's product is approximately 10 PSI. See Figure 2.

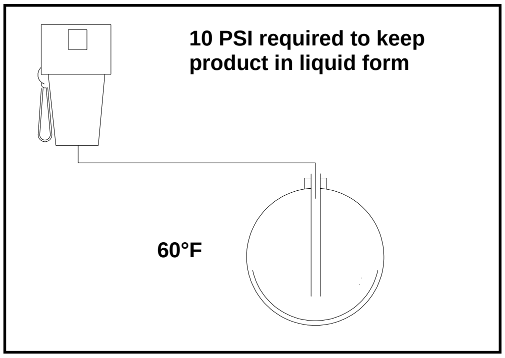

Figure 2

The difference between **Atmospheric Pressure** and **Vapor Pressure** is known as the **Working Pressure.** The Working Pressure is all that the pump can create without the product turning to vapor.

14.7 PSI	Atmospheric Pressure
-10.0 PSI	Vapor Pressure
4.7 PSI	Working Pressure

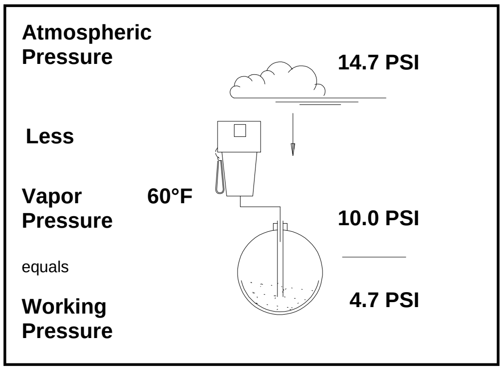

Figure 3

Bennett 1218 E. Pontaluna Road, Spring Lake, MI 49456
USA 800-235-7618 ~ Outside USA 231-798-1310
sales@bennettpump.com ~ www.bennettpump.com

The Cause of Vapor Lock

To measure a pump's suction, the Working Pressure must be converted to inches of vacuum. To do this, multiply the Working Pressure by 2. The result is the number of inches of vacuum that a pump can create before the product changes to a vapor. See Figure 4.

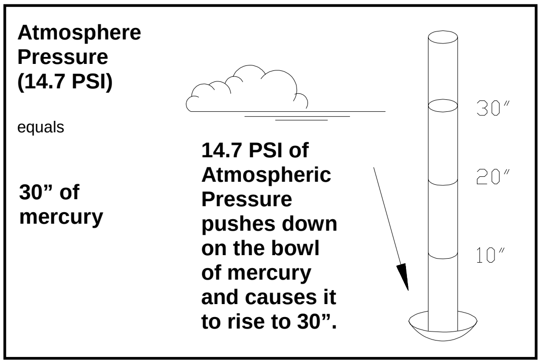

Figure 4

4.7 PSI Working Pressure = 9.4 inches of vacuum. See Figure 5.

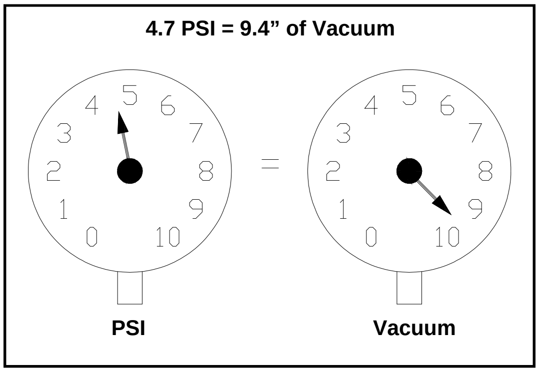

Figure 5

Installation is the Key

The condition of installation dictates how much suction a pump must create to pump the product.

A. It takes 1 inch of vacuum to lift gas 1.5 feet vertically. To determine the inches of vacuum required to lift the gas in a system, follow this procedure:

Measure the distance from the top of the product in the tank to the center of the pumping unit. See Figure 6. Divide the distance by 1.5 to obtain the inches of vacuum required by the pump to lift the product.

Example: 9 feet of lift requires 6 inches of vacuum by the pump. See Figure 6.

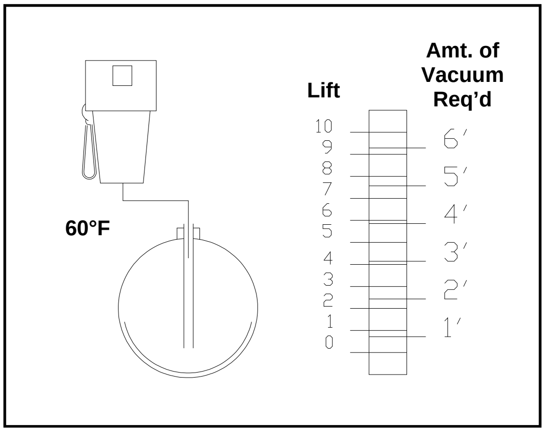

Figure 6

The Cause of Vapor Lock

B. It takes 1 inch of vacuum by the pump to overcome the restriction of an angle check or foot valve. (Not part of the pump, but a necessary part of the installation.) See Figure 7.

C. It takes 1 inch of vacuum by the pump to overcome the restriction of 60 feet of horizontal piping from the tank to the pump. See Figure 8.

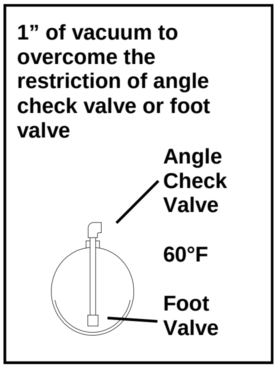

Figure 7

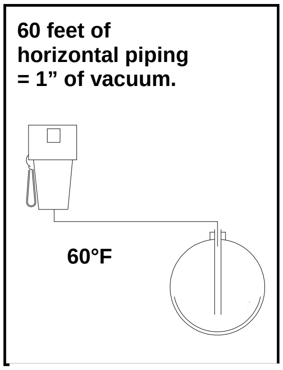

Figure 8

To obtain the inches of vacuum to deliver product, simply add A, B and C.

A. 9 feet of lift	= 6" of suction
B. Angle check or foot valve	= 1" of suction
C. 60 feet horizontal run	= 1" of suction
TOTAL	= 8" of suction

With 9.4" of suction to work with and only 8" of vacuum required, conditions are normal and the pump delivers product without vapor locking.

Remember this condition exits when the product is at 60°F.

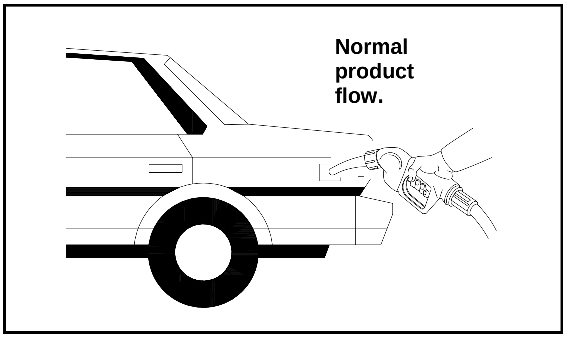

Figure 9

Vapor Lock Conditions

Using the same example as above, 8" of vacuum is still required to deliver product.

With higher ambient temperatures, the vapor pressure of the product changes. As mentioned above, the Vapor Pressure of today's product is 10 PSI at 60°F. At temperatures of 90°F or higher, it can go as high as 12 PSI.

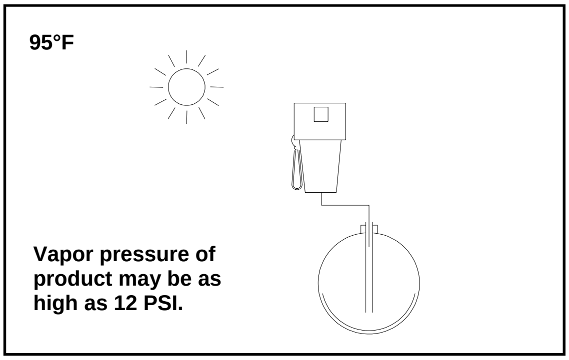

Figure 10

The Cause of Vapor Lock

Using the same formulas as above, the Working Pressure equal Atmospheric Pressure less the Vapor Pressure.

  14.7 PSI Atmospheric Pressure
- 12.0 PSI Vapor Pressure of the product
    2.7 PSI Working Pressure

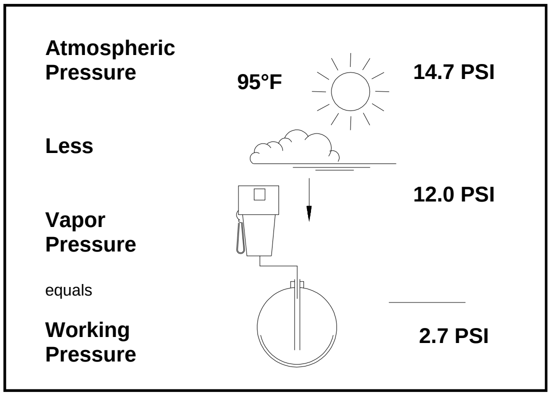

Figure 11

Multiplying the 2.7 Working Pressure by 2 equals 5.4 inches of vacuum that the pump can create before the product turns
to vapor.

It still takes 8 inches of vacuum to deliver product, but with higher temperatures there is only 5.4 inches of vacuum to lift
the product. **The result is Vapor Lock.**

As we have explained, the pump plays a very small part in vapor lock situations. Installation, the amount of product in the storage tank and the Vapor Pressure of the product are the main reasons for vapor lock.

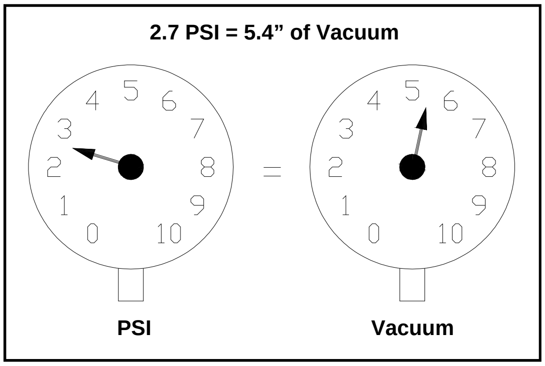

Figure 12

Example: Have you ever heard of vapor lock in a diesel pump? No, because the Vapor Pressure of diesel is approximately 8 PSI.

The only real cure for vapor lock in hot climates is to keep the installation and pump cool.

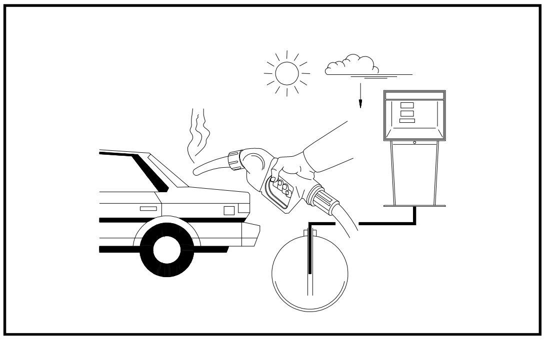

Figure 13