PUMPS THAT EXPERTS SELECT.

Suction Design Process

<u>Suction Nozzle Design</u>

<u>Stepped Design Suction Nozzle</u>

This design has proved successful in pumping applications that have entrained air and where there is mixing required at the suction vessel to deliver the homogenous product required to the pump.

The fluid operational tests indicate that the sudden contraction continues to keep flow in the laminar region and, on some application, reduces friction loss across the suction piece as compared to the standard tapered eccentric reducer. The immediate increase in velocity keeps air in suspension, decreasing the probability of venting air at the eye of the impeller.

Please note that upon examination if a grab sample of product by the naked eye, reveals air bubbles forming in the product flakes. A loss of prime can be realized even with 4 to 8 feet static suction head, and 32 to 36 feet NPSHa out of the agitated proportioning chest. In the pumping system, air always collects at the impeller eye since it is the point of lowest pressure in the system. It has been seen that the build up of an air bubble may occur in a few seconds after start-up or spread over 30 to 60 minutes depending on the suction conditions.

Air entrainment due to turbulence, high velocities, high agitation exists in suction tanks. Here we must be aware of the chest draw-down in the tank. At low levels there will exist a decrease in capacity and/or loss of prime.

With emphasis on proper suction line design velocities, submergence, location of agitators, and baffling will keep air to a reasonable amount easily handled by a centrifugal pump. We advise velocities no greater than 3 ft/sec.

<u>Stepped Nozzle Suction Design is Effective in the Following:</u>

1. It sometimes decreases the friction loss across the suction piece compared with the tapered eccentric design.
2. The velocity increase at the step does not affect the suction laminar flow.
3. The velocity increase at the step tends to keep air in suspension and decrease the probability of air venting at the impeller eye.
4. The velocity at the step tends to provide additional mixing that minimizes “bird nesting” of solids at the higher consistencies.

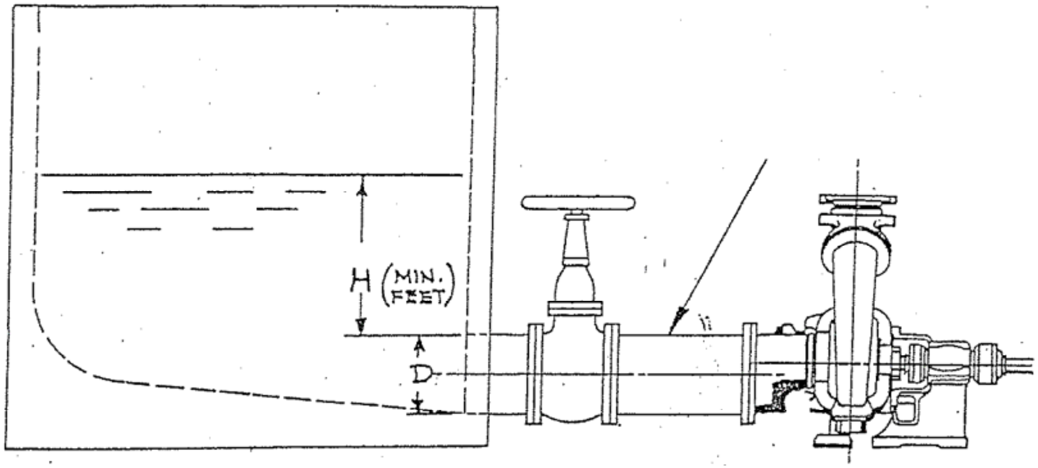
The Above considerations are important for a successful installation and reliable operation of entrained air pumping applications. Today many of these factors are either overlooked or misunderstood in the industry.

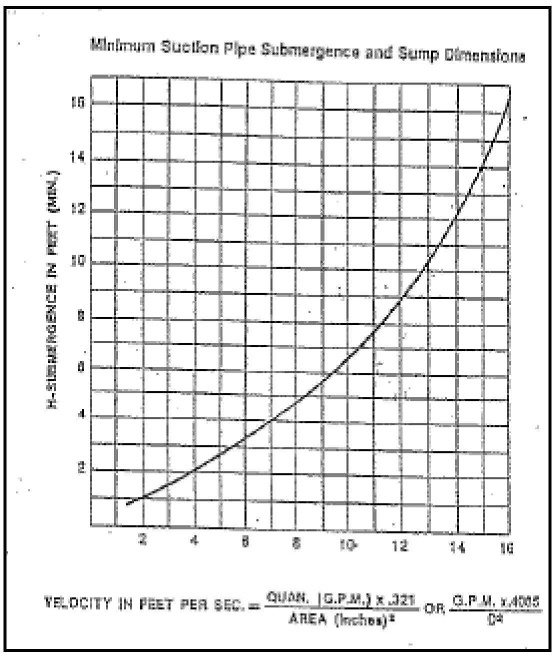
The bottom line is to know the system and define the critical components:

A. suction velocities
B. suction losses
C. air content
D. chemical additives
E. agitation factor
F. submergence level
G. NPSH and temperature
H. Minimum level to suppress vortexing

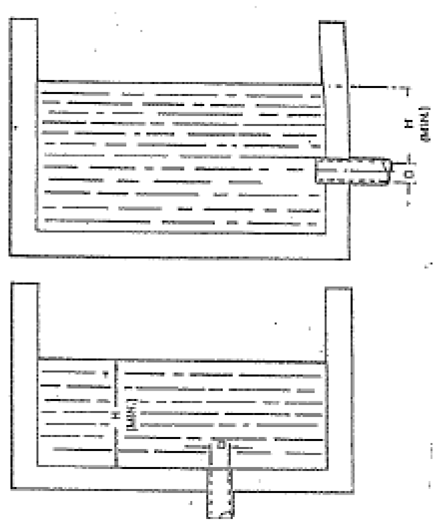
We can handle all of the above, provided that they are identified and the proper “derates” are applied to provide the required customer output of flow and head.

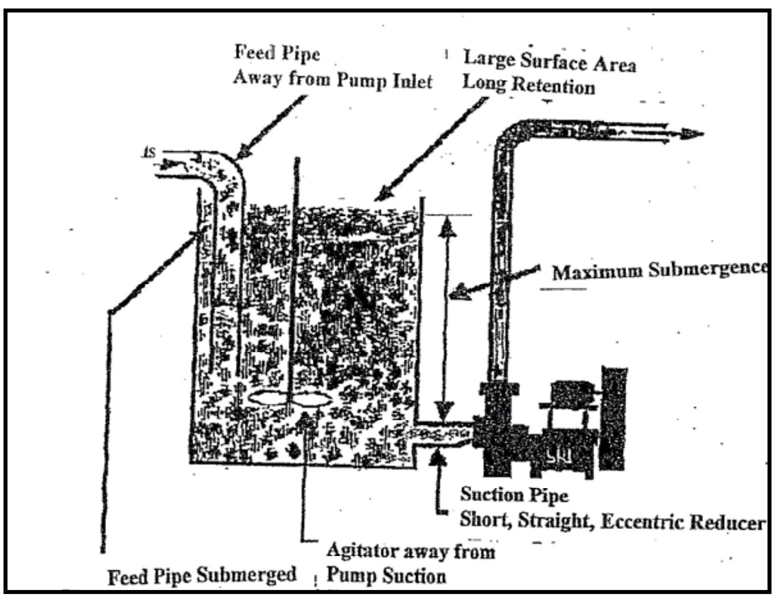
Minimum Submergence to Suppress Vortexing



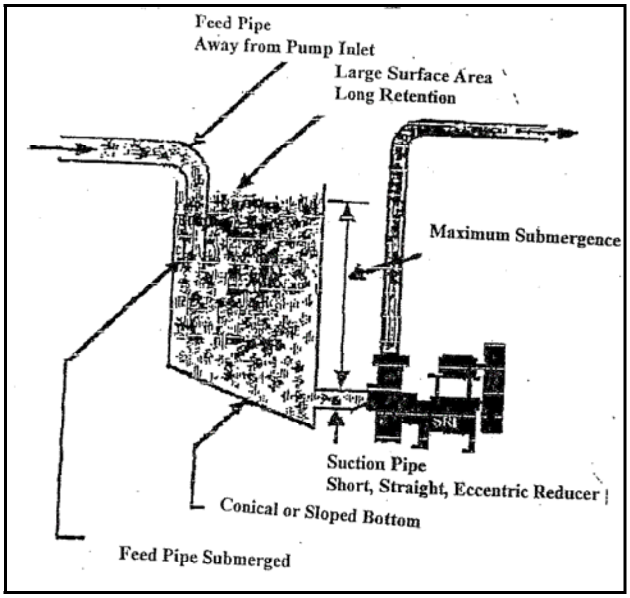


LaBour Taber





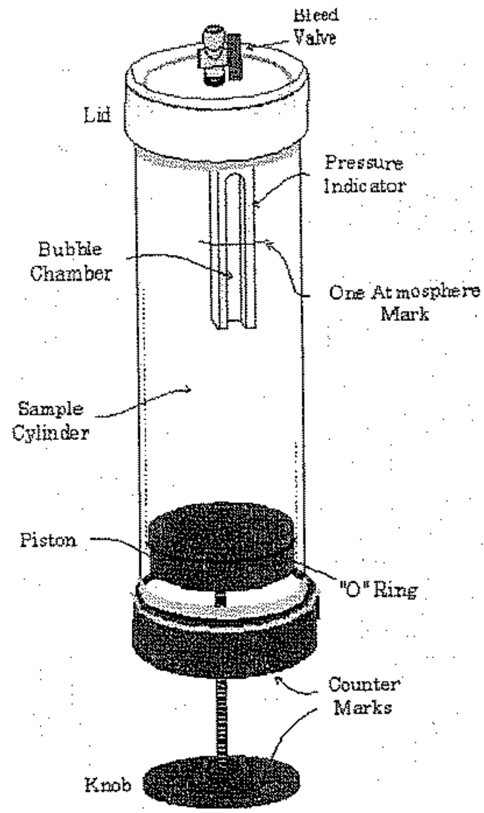
Agitated Pump Box



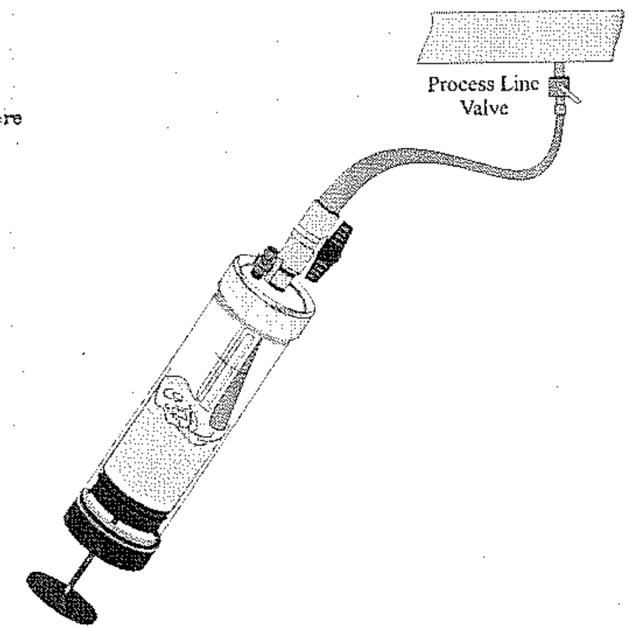
Pump Box and Suction Piping

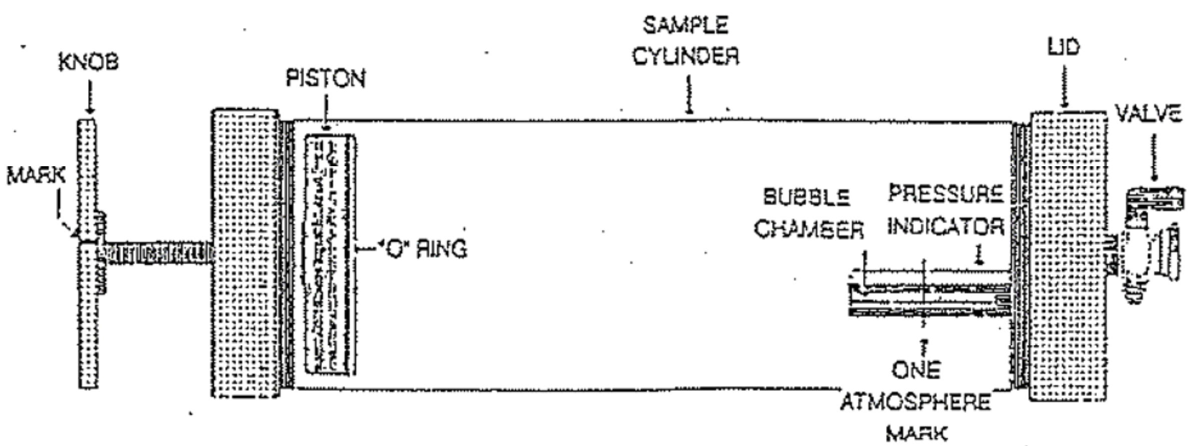
<u>The Entrained Gas Tester</u> is a 2” dia. ¼” wall, clear cast acrylic tube that has a sample volume of approximately 700 ml.

After the EGT is filled, a one atmosphere pressure (about 15 psi) is applied. This is done by a piston that is moved in when a knob is turned. One revolution of the knob equals about 20cc’s. The pressure is indicated by a trapped air bubble in the pressure indicator, and one atmosphere is reached when the bubble is reduced in size by one half. Since the EGT works on Boules’ Law for gases (P1 x V1= P2 x V2), it is compressing the volume of all gases in it by one half at this time. The actual volume of air displaced will be twice the amount that the piston is moved in, so that one revolution will equal 4 ml. Since the total volume of the sample chamber is known, there is just a percent air “constant” for each revolution the knob has turned the piston in. In summary, all you have to do is count the number of revolutions it takes to unscrew the knob after one atmosphere pressure is reached. Then subtract the correction factor (for the trapped air bubble and any free play in the knob), and then multiply by the “constant” to get the final answer in percent air.



Entrained Gas Tester





LaBour Pump Company – 901 Ravenwood Drive, Selma, Alabama 36701

Ph: (317) 924-7384 - Fax: (317) 920-6605 - www.labourtaber.com