across the seat of the valve is a function of the differential pressure while the velocity through the valve inlet and outlet ports is a function of the quantity and area. It would be erroneous for a user to select a larger size valve in the belief that the velocity across the seat is thus lowered and the wear rate factor improved. A pressure reducing valve need not be any larger than actually necessary.

Sometimes it is required to place a valve in a large pipeline with the flow requirements not requiring a large valve. For instance, the requirement of placing a PRV in a 20″ line with a required flow of 1000 GPM and a differential pressure of 40 psi. Our chart would indicate a 4″ valve as adequate, and well it may be with reference to the information supplied. However, this valve size selection would have to be reviewed. The very fact that the main header is so large implies that the 4″ valve may not be large enough. Perhaps future demands or fire demands have been provided for in selecting the header size. The proper selection of a reducing valve size should also be made based on all of the special or future considerations.

In locations where a large pressure reducing valve is required to handle small flows, a practice that is quite common is to install a small reducing valve in a bypass around the large reducing valve. The smaller reducing valve, which is adjusted several psi higher than the large reducing valve, will open first and supply the smaller demands. When the demand increases beyond the capacity of the small reducing valve, the discharge pressure will of course drop bringing into action the large reducing valve.

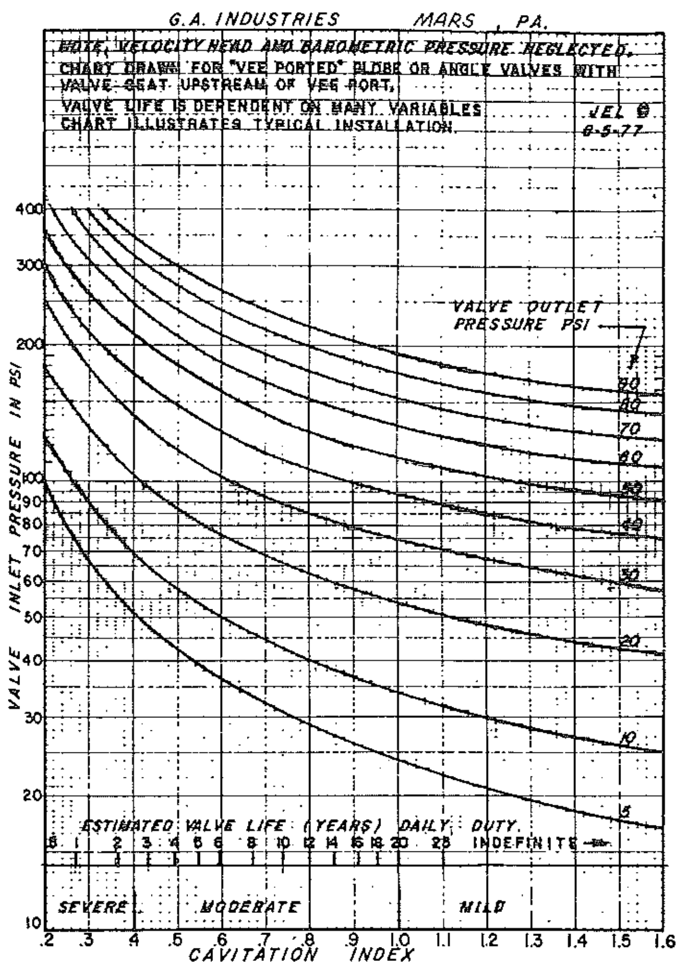
Cavitation

Before discussing valve types, we will discuss briefly on the severe operating conditions to which most any valve will be subjected. That being cavitation damage. Although appearing to some as an erosion or impingement damage, the cavitation damage is the result of a high pressure reduction with a low outlet pressure. For example, dropping pressure from 500 psi to 200 psi is not equivalent to dropping 350 psi to 50 psi even though both pressure drops are 300 psi. The conditions within the valve body are not the same. The lower the outlet pressure, the closer the fluid pressure approaches the vapor pressure at which point the cavitation will occur. The valve seat area produces a venture effect which by increasing the velocity, the internal valve pressure is lowered to where cavitation occurs. The resulting bubbles thus formed collapse again in higher pressure recovery areas and if in contact with the valve walls at that time the bubbles produce a very very high localized stress which will fatigue the metal causing a pit.

In installations requiring a high pressure reduction, it is possible to drop the pressure down in a series of stages rather than across one valve. This will save wear and tear on the valve by distributing the pressure drop across two or three valves. This application should be discussed with a valve manufacturer experienced in this type of control to properly select the most effective pressure setting as the load would be equally distributed across each valve.

Another method used for high differentials is a valve specifically designed to operate at high pressure drops. Usually, these valves are expensive as they employ special alloys, hard facing, etc. They are usually used where conditions permit just one valve. The arrangement should also be discussed with the valve supplier.

A chart illustrating the effects of continuous pressure reduction on GA Industries "Vee Ported" valves is included. Reading horizontally to the right from the scale representing the valve's inlet pressure to the curved line representing the valve's outlet pressure, and then vertically downward to a scale denoting the cavitation index number. This number indicates the severity of service for the valve, but does not include velocity head or barometric pressure effects. A second scale is shown which roughly equates the valve's life with severity of service. The valve life scale is to be interpreted as a guide more than exact representation, because there are many factors which affect valve life. Some of the principle factors are duration, frequency, and mode of operation.



Cavitation damage is only one of four principle types of damage which can occur to a valve. A valve can also sustain abrasive particle damage, impingement erosion, and sometimes a combination of these conditions. Many times impingement erosion is interpreted as cavitation damage. These problems will not be elaborated on at this time.

Most valves throttle with their seats; there are few exceptions. Gate valves, cone valves, ball valves, and butterfly valves for example, all throttle with their seats and a result cannot tolerate cavitation index numbers as low as the GA valve. The "Vee Ports" in a GA Valve are downstream of the valve seat and the "Vee Ports" do the throttling not the valve seat. Cavitation occurs directly downstream of the point of