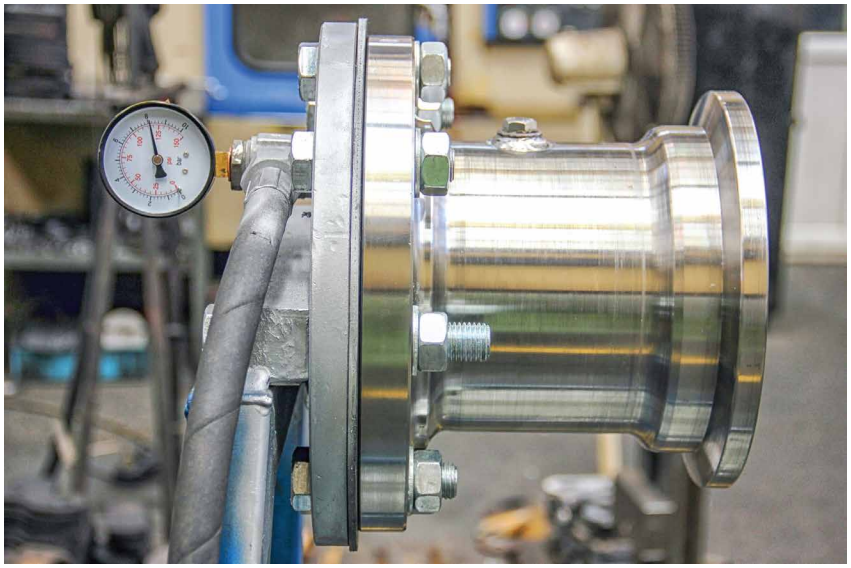
APPLICATION TIPS

Pressure Testing with Air vs. Pressure Testing with Water

Pressure testing with either air or water to detect leakage is a common practice in our industry. We are often asked why air testing must be done at lower pressures than water testing. To find leaks, a low pressure (30-50 PSI) air test is just as effective as a high pressure (150 PSI) water test. This is because the viscosity and surface tension of water are both greater than that of air. For example, the viscosity of water is about 89 times greater than the viscosity of air, viscosity being the internal friction of water making it resist the tendency to flow, particularly through a small opening. And, while the surface tension of a water to air surface is 0.005 lb. ft./ft., air has no surface tension. Both viscosity and surface tension are forces that will prevent water from escaping through even a very small hole, forces that do not prevent air from escaping through the same size hole. Therefore, many times systems show a leak with a high-pressure air test when in actuality no water is leaking.



Our experience has shown that on numerous occasions a high-pressure air test indicates leakage, but when water is introduced into the system, or a low-pressure air test is conducted, there is no leakage. Another reason high pressure air should not be used to locate leaks as opposed to low pressure air is it can be dangerous. Unlike water, which is incompressible, air is very compressible, making it hydraulically equivalent to a large mechanical spring. If something were to break or come free during a high-pressure air test, the released air could propel an object a far distance with a great deal of force. This is why the elimination of trapped air when initially filling pipelines can be so hazardous. Air tries to move things to relieve built up pressure. Water, because it is incompressible, does not.

The only reason to test anything with high pressure (150 PSI) air is to test a tank or pipe to determine if the pipe has structural integrity, i.e., if it will burst during its service life. The force experienced on the interior of a pipe is the same for either air or water at 150 PSI. However, this is not the purpose of a pressure test for leakage and low-pressure air or water testing is the recommendation in those situations.