Can You Handle the PRESSURE?

With baseball's regular season coming to an end and the playoffs about to begin, baseball fans will be on the edge of their seats rooting for their favorite team to bring home a championship. The playoffs are all about pressure, which makes even the most routine plays difficult. In the playoffs, heroes are made by coming through in the clutch, and careers are scarred for faltering under pressure. Fans never forget when you fail under pressure.

By Mark Unger

Take for example, a ball player with a bushy mustache playing on a cursed team in Game 6 of the 1986 World Series. You'd like to think that this player would be remembered for the 2,715 career hits he accumulated over 22 seasons. Instead, he is remembered for his error on a routine ground ball. Despite the fact that reversing his error would not have won Game 6 or that his team went on to lose Game 7, fans blame this player for losing the World Series.

In the sport of water treatment, the fans are called customers, the teams are the brands, the players are the products and the games are played every time a customer uses a product. The pressure seen by the products is the customer's water supply. Just like in baseball, the customer will never forget if a product falters under pressure.

Certification ensures customers that products will deliver under pressure

Putting Products to the Test

Pressure testing has been a requirement since the inception of the first performance standard for water softeners, the Water Conditioning Foundation's (WCF) S-100 Standard. The first version of this standard was issued in 1959 and contained structural integrity testing to ensure water softeners would not leak when installed in the field at the manufacturer's recommended operating conditions.

Specifically, the S-100 Standard contained the cycle test, which required water softeners to withstand 100,000 pressure cycles from 0 to 150 psi. In 1961, the S-100 Standard was revised to include a hydrostatic test that required water softener tanks to withstand pressures up to 300 psi. In that same year, recognizing the importance of the testing required in the S-100 Standard, the Federal Housing Administration (FHA) required that all water softeners installed in FHA-insured properties meet the requirements of the standard.

The WCF eventually became the Water Quality Association (WQA) when it merged with Water Conditioning Association, Intl. in 1973, but the structural integrity tests found in the early versions of the S-100 Standard still live on in the current NSF/ANSI 44 Standard. Today, each of the NSF/ANSI standards for drinking water treatment units (DWTUs) require structural integrity testing.

Triple Tests

The structural integrity testing requirements of the WQA and NSF/ANSI standards for DWTUs vary based on the type of product or components, but the acceptance criteria remains the same for all standards: the system must remain watertight during the test. The three main tests performed to verify structural integrity of a product are cyclic (or cycle) pressure, hydrostatic pressure and burst pressure.

Cycle pressure testing simulates water hammer (pressure surge) events that a product plumbed into a pressurized supply could experience in the field. The test typically consists of 100,000 pressure cycles from 0 to 150 psi (or the product's maximum working pressure, whichever is greater), but products designed for open discharge are tested with 10,000 cycles from 0 to 50 psi. For products such as water filters, UV systems and reverse osmosis (RO) systems, cycle testing is conducted using water that is between 63 and 73°F, and the pressure cycles must be greater than one second in length.

Water softeners and their components are cycle tested using water that is between 55 and 75°F, and the length of the pressure cycles depends on the size of the product's tank.

Water softeners with tanks greater than 13 in. in diameter must be tested using cycles less than or equal to 7.5 seconds, while softeners with tanks less than or equal to 13 in. must be tested with cycles less than or equal to five seconds. The cycle test is a difficult test on products and claims many victims over the course of its 100,000 painstaking cycles.

Hydrostatic pressure testing requires the product maintain an elevated pressure (usually between 240 and 375 psi, but it depends on the standard and product type) for 15 minutes.

It ensures products will remain watertight during periods of elevated pressures and provides a safety factor to the manufacturer's maximum working pressure. The hydrostatic pressure test is conducted anywhere between 1.2 and three times the maximum working pressure of the product (depending on which performance standard the product is being tested against and the type of product being tested), and uses water that is between 55 and 75°F. The product must also be pressurized at a rate of less than 100 psi per second and take less than five minutes to reach the specified hydrostatic test pressure. The temperature and pressurization requirements are consistent throughout WQA's and NSF's DWTU standards.

Metallic pressure vessels used by water treatment equipment are only required to undergo the cycle and hydrostatic tests but have additional parameters to meet during these tests. These metallic vessels must limit the amount of permanent deflection (growth of the vessel caused by pressurization) that can occur during the

test. Prior to the initiation of each test, measurements are taken of the vessel's top and bottom, as well as its circumference at the midsection and at 12-in. intervals from the midsection. Once the test is complete, the same measurements are taken and compared with the original measurements. The vessel's top and bottom permanent head deflection must not exceed 0.5% of the vessel's diameter, while the circumference must not exceed a permanent increase of more than 0.2%.

Burst pressure testing is only required on nonmetallic pressure vessels and components and pumped RO systems with components subject to pump pressure. The burst test is conducted at four times the product's maximum working pressure (or 400 psi, whichever is greater) for nonmetallic pressure vessels and components. For pumped RO systems, the test is conducted at three times the product's maximum working pressure. Like the hydrostatic test, the water temperature and pressurization requirements are the same across the performance standards: 55 to 75°F and pressurization to burst pressure in less than 70 seconds, but at a rate less than 100 psi per second. The product must hold the specified burst pressure for an instant to successfully pass the burst test.

The WQA and NSF standards actually state to hold the burst pressure for an instant and release the pressure, but there's no fun in performing a burst test without something bursting. If ran until failure, the burst test is the loudest and messiest of all the structural integrity tests—just watch out for the test unit shrapnel.

Choosing the Right Team

Wouldn't you like to know in advance that the players on your favorite team will deliver under pressure? While this would be great for the fans, it is impossible to know in baseball. However, in water treatment, your customers have the right to know that products and components on the market today can handle the pressure of being tested according to industry standards and obtain certification through the WQA, NSF or other certification body. If your products are not currently certified or do not utilize certified components, contact the WQA to begin the certification process or to locate certified components for your products. Your customers will appreciate you taking the extra step to ensure an independent third party has evaluated your products. *wqp*

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