vanessa
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Solutions for Steam Service

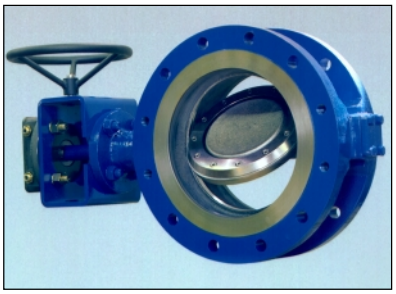
Japan Valve Association Test on Vanessa Valve

Steam Service Solutions

The Vanessa Series 30,000 rotary process valve (quarter-turn, metal seated, zero leakage) is especially designed to provide solutions for steam service applications. Traditionally, gate and globe valves have been the valves of choice for steam control; however, these same valves regularly leak.
Vanessa has taken the position that accepting valve steam leakage is costly and unproductive for the end user. Rotary process valve technology developed with the Vanessa product line provides the zero leakage solutions required for steam service. Each Vanessa valve design is engineered and manufactured to exceed existing shutoff capabilities of gate valve designs. Additionally, Vanessa's high flow capability provides superior performance when compared to many globe valve applications.

Steam Test

Vanessa maintains an active product testing program which is supplemented by various independent customers and/or associations seeking solutions for tough valve applications. A typical example of these types of tests was conducted by the *Japan Valve Manufacturers Association*.
The tests were conducted at the request of several Japanese engineering firms, all of whom were looking for new solutions and technology in the handling of steam.



Test Objective

The objective of the defined test was to publicly and independently test the ability of the Vanessa Valve products to provide zero leakage on high temperature-high pressure steam service. The tests were designed to compare the performance of the Vanessa valve product to a typical gate valve. The following is a summary of the test procedures and results obtained. Please note that a detailed results description of the 27 tests conducted are found on Tables 1.1 and 1.2.

Test Dates and Locations

Two series of test were conducted over a two day period at the Japan Valve Association, Tamagawa Test Room located in Kawasaki. The product tests were conducted publicly on November 18th and 19th, 1992.

Test Methodology

Test equipment and set-up process used are illustrated in Figure 1. Each test was witnessed by direct employees (engineers) from five constructions engineering firms located in Japan.

Products Tested

Twenty-seven tests were conducted over a two-day period on product supplied to the test facility by Vanessa, Italy. Product supplied was of a standard Vanessa design. Materials selected for the test were chosen by the engineering firms represented at the test. The only exception from standard product materials was the request for the seal-ring to be supplied in 17-4ph material rather than the company standard material.

Valves supplied were ND 12 inches, ANSI Class 600 Double Flange body designs. Body material was ASTM A216 WCB, seal ring was 17-4ph and the seat material was Stellite®, grade 6.

Parameters

Tests were conducting using air, saturated steam and super-heated steam. All tests were bi-directional (in both the preferred and non-preferred directions).

Test Results

The Vanessa valve tested by the Japan Valve Association was proven to exceed existing valve standards. All Vanessa test results out-performed existing leakage standards. Each test conducted was designed for bi-directional zero leakage performance utilizing air, saturated steam and super-heated steam (test results are summarized in Tables 1.1 and 1.2). Each test resulted in no measurable leakage with an exception on two tests, which had minimal leakage occur from boiler scale that had formed in the flow media. The consensus of the companies witnessing the tests was that the Vanessa Series 30,000 far exceeded their expectations in performance. When it comes to providing dependable steam service flow control, Vanessa does provide the solution to the unacceptable level of performance currently found with other valves designs and concepts.

Shut-Off Capability

Steam leakage, whether through the seat or packing, has long been tolerated as inherent in steam applications because a gate or globe valve cannot be made to consistently provide zero leakage shutoff. In recent years, many companies have conducted studies on energy loss due to steam leakage and discovered that substantial dollar savings can be achieved by eliminating these leaks.

The Vanessa Series 30,000 offers an all-metal seating design, including a flexible metal member (seal ring). Flexibility of the seal ring allows it to form itself perfectly to the valve seat as the valve is torqued into the closed position. The valve shaft torque created a radial flexing of the seal ring, therefore the shut-off capability is maintained regardless of the system pressure. The flexibility of the metallic seal ring provides insurance of tight shut-off, even at very low differential pressure, by generating a uniform compressive contact pressure on the entire seat surface.

The seal ring, located in the valve disc, DOES NOT wipe or rub the seat during the closing operation. A lack of rubbing on the seat allows no appreciable wear and ensures long cycle life. In addition, the seat will not become galled in normal operation, even with solids present.

The Vanessa valve is a rotary quarter turn valve as opposed to a linearly operated valve found in gate and globe valve designs. In a linear operated valve, the stem is exposed to the service media and moves in and out of the packing during normal operation. This movement of the stem, with dirt and foreign matter dragged through the packing, causes the packing to deteriorate. In a rotary valve, the stem is protected from the service media and rotates within the packing which preserves the integrity of the packing.

Applications

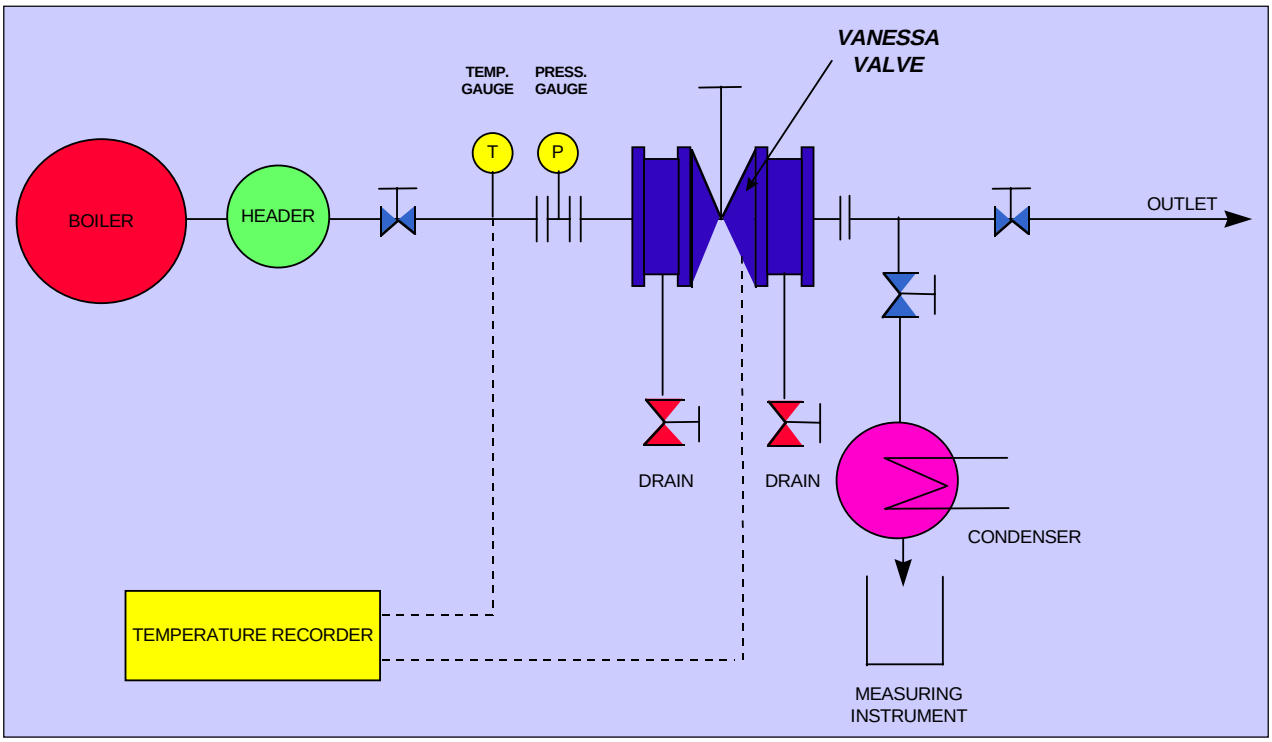
The Vanessa Series 30,000 can be used in almost any application in which gate, globe, ball or plug valves are currently applied. Due to the valves all-metal construction, the Vanessa valve has the same pressure/temperature rating as a gate valve. Furthermore, there are no temperature limiting elastomers associated with the Vanessa valve.

Typical steam service applications for Vanessa valve include: turbine throttling, trip valves, block valve applications, condensate in vacuum, turbine bypass, emergency bypass, main transfer lines, curtain block valves, vacuum and brine, line isolation, saturated steam, superheated steam and geothermal steam. All valves are designed to exceed ANSI FCI 70-2-1991 Class V and VI shutoff, by testing to the zero leakage requirements of API 598 for resilient valves.

Maintenance

Vanessa valves are designed to keep maintenance to a minimum. Since the valve design is based around a non-rubbing concept, the friction and wearable parts found in other valve concepts are simply not required in the Vanessa valve. The seating principle, with its non-rubbing surfaces should provide thousands of cycles before wear could be measured on either the seat or flexible seal ring. Obviously, when compared to the rubbing characteristics of other valve designs, the maintenance requirements of the Vanessa valve is far less and superior in repeatable dependable service.

It is recognized that although a valve in steam service is designed to require no maintenance, a good design must provide the ability to be maintained. The seal ring for the Vanessa Series 30,000 can be changed in only a few minutes. There is no need to remove the stem or disc from the valve to replace a seal ring. Seal rings are



interchangeable and require no special tools for alignment.

The Vanessa valve product line is generally a cost-effective alternate to gate and globe valve designs. This cost-effectiveness is multiplied when the user anticipates the costs savings derived from the tight shut-off and maintenance free design. These considerations reflects a “true cost of ownership”.

Leak Rate Examples (ND 12” valve at 600 psi)

The Japan Valve Association test was set up to try and observe if any steam leakage was present in the Vanessa valve. To accomplish this, a clear mirror was held up to the outlet of the test unit. If any steam fogged the mirror, then it was determined that the valve was leaking steam. The Association considered this form of test to be far superior than those normally used for gate and globe valves designs. According to API Standard 598, *“for the liquid test 1 millimeter is considered equivalent to 16 drops. For the gas test, the leakage rates are based on an approximate ratio for gas, as observed, and liquid observed, of 6:1.”*
The allowable leakage rate for this test, according to API 598, could result in a valve which would pass the test with 1.25 ml or a minimum of 20 drops per minute of air leakage.

ANSI FCI 70-2-1991 Class V allowable leakage rates would equal 9.9 ml per minute, which would be equivalent to 158 drops of liquid or 948 bubbles of air.

The Vanessa valve exceeds the requirements of these standards by producing ZERO LEAKAGE from the defined test. The Vanessa Series 30,000 valve, when tested to either of these accepted standards, dependably produces zero leakage with air and water as the test media.

The Product

Vanessa specializes in the engineering and manufacturing of unique metal-to-metal rotary sealing valve technology utilized throughout the process industries on critical service applications. The Vanessa product line is available in ANSI Class 150, 300, 600 and 900 configurations, with temperature ranges from -254°C/-425°F (Cryogenic version), up to +815°C/+1500°F (High Temperature version). Product sizes are available in 3” to 84” (mm 80 to 2100).

First Test - Day 1: Table 1.1

Test no.	Fluid	Valve Direction	Press. (psig)	Press. (barg)	Temp. (°C)	Temp. (°F)	Test Date	Cycles	Total Nr of Cycles	Test Results
1	Air	Regular	85	6	Atmosphere	Atmosphere	Nov 18, 92	0	0	No Leakage
2	Saturated Steam	Regular	427	30	233	451,4	Nov 18, 92	0	0	No Leakage
3	Saturated Steam	Regular	427	30	233	451,4	Nov 18, 92	5	5	Leakage 24.3* cc/min
4	Saturated Steam	Regular	427	30	233	451,4	Nov 18, 92	5	10	No Leakage
5	Saturated Steam	Regular	284	20	233	451,4	Nov 18, 92	1	11	No Leakage
6	Saturated Steam	Regular	142	10	233	451,4	Nov 18, 92	1	12	No Leakage**
7	Superheated steam	Regular	114	8	370,4	698,7	Nov 18, 92	5	17	No Leakage
8	Superheated steam	Regular	71	5	370,3	698,5	Nov 18, 92	1	18	No Leakage
9	Superheated steam	Regular	43	3	370,3	698,5	Nov 18, 92	1	19	No Leakage
10	Superheated steam	Regular	14	1	370,3	698,5	Nov 18, 92	1	20	No Leakage
11	Superheated steam	Regular	114	8	370,3	698,5	Nov 18, 92	1	21	No Leakage
12	Superheated steam	Regular	114	8	370,3	698,5	Nov 18, 92	15	36	No Leakage
13	Superheated steam	Regular	142	10	367,4	693,3	Nov 18, 92	1	37	No Leakage
14	Superheated steam	Regular	284	20	366,9	691,4	Nov 18, 92	1	38	No Leakage
15	Superheated steam	Regular	427	30	366,3	691,3	Nov 18, 92	1	39	No Leakage
16	Superheated steam	Reverse	142	10	372,2	701,9	Nov 18, 92	1	40	No Leakage
17	Superheated steam	Reverse	213	15	372,8	703,4	Nov 18, 92	1	41	No Leakage
18	Superheated steam	Reverse	284	20	371,5	700,7	Nov 18, 92	1	42	No Leakage
19	Superheated steam	Regular	142	10	370	698	Nov 18, 92	0	42	No Leakage

Second Test - Day 2: Table 1.2

Test Nr.	Fluid	Valve Direction	Press. (psig)	Press. (barg)	Temp. (°C)	Temp. (°F)	Test Date	Cycles	Total Nr. of Cycles	Test Result
20	Air	Regular	85	6	Atmosphere	Atmosphere	Nov 19, 92	0	0	Leakage 33,0 cc/min
21	Saturated Steam	Regular	569	40	250	482	Nov 19, 92	10	52	Leakage 9.8 cc/min*
22	Saturated Steam	Regular	569	40	250	482	Nov 19, 92	1	53	No Leakage
23	Saturated Steam	Regular	569	40	255	491	Nov 19, 92	10	63	No Leakage
24	Saturated Steam	Regular	569	40	249	480,2	Nov 19, 92	10	73	No Leakage
25	Saturated Steam	Regular	427	30	250	482	Nov 19, 92	10	83	No Leakage
26	Saturated Steam	Regular	569	40	250	482	Nov 19, 92	60	143	No Leakage**
27	Saturated Steam	Regular	569	40	250	482	Nov 19, 92	1	144	No Leakage

Notes

* = Boiler scale caught between valve disc and seat.
** = Mirror was clouded a little.

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