

Equal Percentage Flow Characteristics Using A Butterfly Valve?

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INTRODUCTION

With the high volume of new brewers entering the brewing industry, cost control is key to sustainability in the market. Plant size does not matter...every production facility is looking for opportunities to cut their cost. It may be a double edged sword, but one way of cutting cost is to increase production through automation. Automation is typically an expensive option, so increasing production through automation, “at the lowest cost of entry”, is very attractive to all. With equal percentage flow being preferred in over 80% of all control applications, this type of control can now be achieved using a butterfly valve. Not only your goal of increasing production through automation can be met, but your total cost of ownership is also reduced due to less downtime for maintenance, reduction in weight/space requirements, and no additional spare parts being required. This technology is relatively new to the industry, and is gaining momentum for large and small brewers alike.

SANITARY AND SELF CLEANING

In addition to offering full control, the valve disc and liner can be sanitary and self-cleaning due to turbulent eddies. The unique disc design allows for extended liner life due to the valve not being torque seated like a standard butterfly disc and by elimination of the typical “break out” friction.

REDUCED ACTUATOR SIZE

Which in turn also reduces the size of the actuator needed for control.

FULL CONTROL

In regards to controllability, this new technology offers what is called “linear installed” flow characteristic due to the inherent equal percentage flow characteristic, which in the past could only be offered by using a globe style valve. Inherent flow characteristics can assure a constant “gain” of the control loop and thereby eliminates repeated controller tuning.

INCREASED CV’S

With near 90 degrees opening at rated travel, this technology offers a Cv, or flow capacity that exceeds that of equally sized Globe valves by up to two and a half times. Additionally, the lack of “break out” friction allows a rangeability (ratio of max. Cv to min. Cv) of more than 100/1, yet, tight shut-off is maintained.

Z-DISC CONTROL VANE Cv

SIZE	RATED CV	MIN CV	FACE-TO-FACE
1”	25	.5	1.125
1.5”	50	.6	1.187
2”	71	1	1.625
3”	180	2	1.750
4”	320	4	2.000
6”	720	8	2.125
8”	1280	15	2.500

*Consult factory for larger sizes.

Z-DISC CONTROL VANE TORQUE DATA

SIZE	TO OPEN	TO CLOSE	TO CLOSE AT 100 PSI	TO CLOSE AT 180 PSI
1”	5	10	12.5	25
1.5”	5	10	26	50
2”	5	10	36	57
3”	17	34	92	138
4”	40	82	200	295
6”	136	172	488	568
8”	320	450	1000	1450

All torque in inch-pounds (unlubricated).

BIOGRAPHY OF DR. HANS D. BAUMANN, P.E.

Hans D. Baumann, PhD, P.E. is widely recognized as one of the foremost experts in control valve design and related technologies. He is credited with over 200 U.S. and worldwide patents and has published 118 papers (many peer reviewed) plus articles in addition to co-authoring seven hand-books on valves, instrumentation, and noise. His book, “Control Valve Primer – A User’s Guide”, published by ISA, is considered the “textbook of valve selection and implementation”. Lilly Engineering is proud to have Dr. Baumann serve as its primary technology consultant in the Design and development of the Z-DISC Control Vane technologies.

UNAFFECTED BY FLUID INDUCED DYNAMIC TORQUE PROBLEMS

Conventional butterfly valves are subject to severe reversing dynamic torque, effecting the stability of the operating system. This is caused by suction effects by the fluid passing over that half of the vane pointing downstream (much like an aircraft wing). Such torque peaks typically at 70° after which the torque reverses suddenly. Such effects are eliminated in the Z-DISC vane by having a rim intersecting and stopping a jet from producing suction. Thus, it can open all the way to 90° with a low and stable operating torque thereby avoiding actuator instability. Inherent flow characteristics can assure a constant “gain” of the control loop and thereby eliminates repeated controller tuning. When using this new control vane technology, this effect is eliminated by having a rim intersecting and stopping a jet from producing suction. Thus, it can open all the way to 90 degrees with a low and stable operating torque thereby avoiding actuator instability.

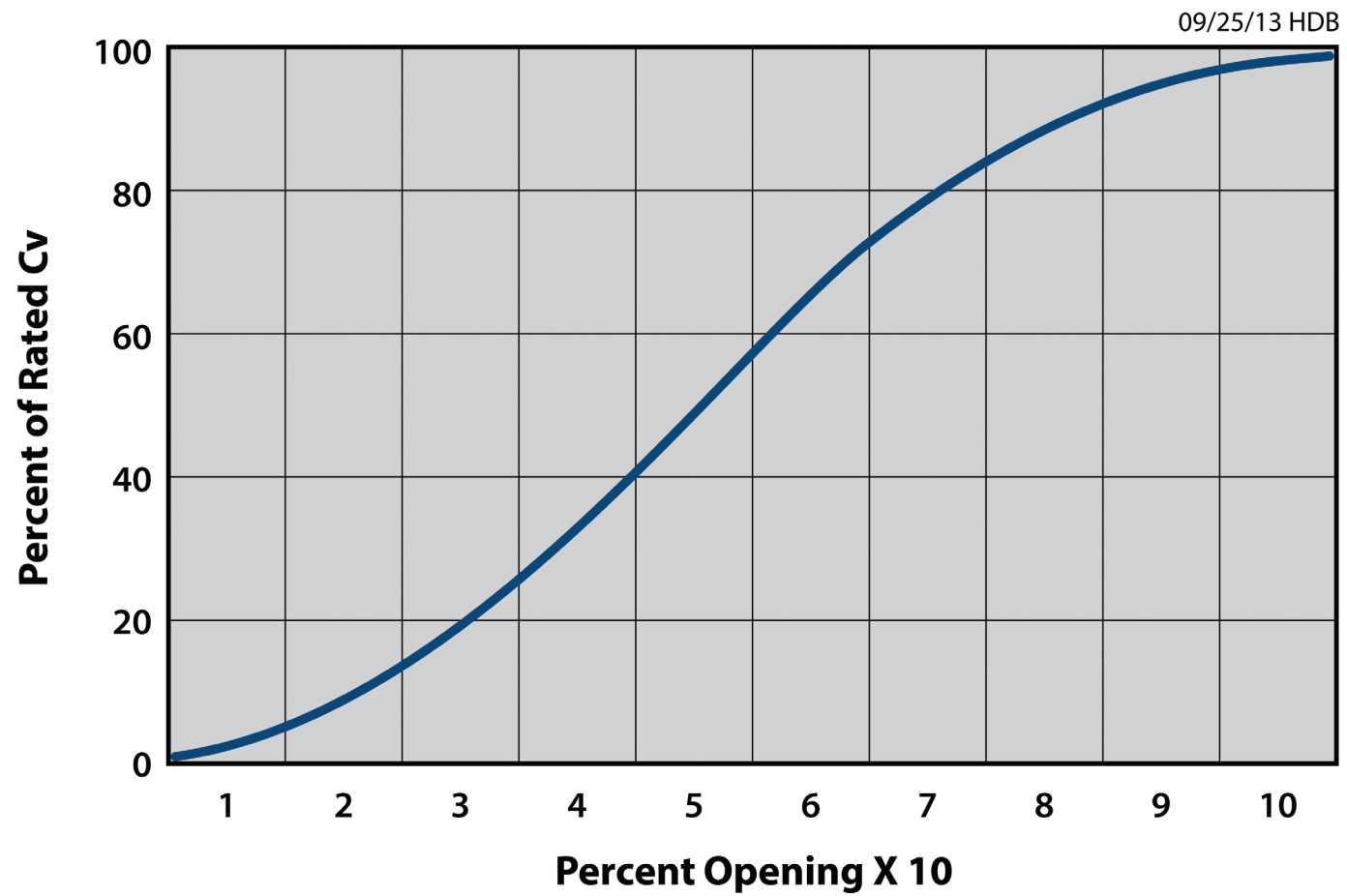
SPACE SAVING FACE TO FACE DIMENSIONS

With a face to face dimension of less than 15% of equally sized globe valves. Z-DISC control valves reduce pipe length and together with their low weight are much easier to install and to maintain.

VERY LOW BREAK AWAY FRICTION

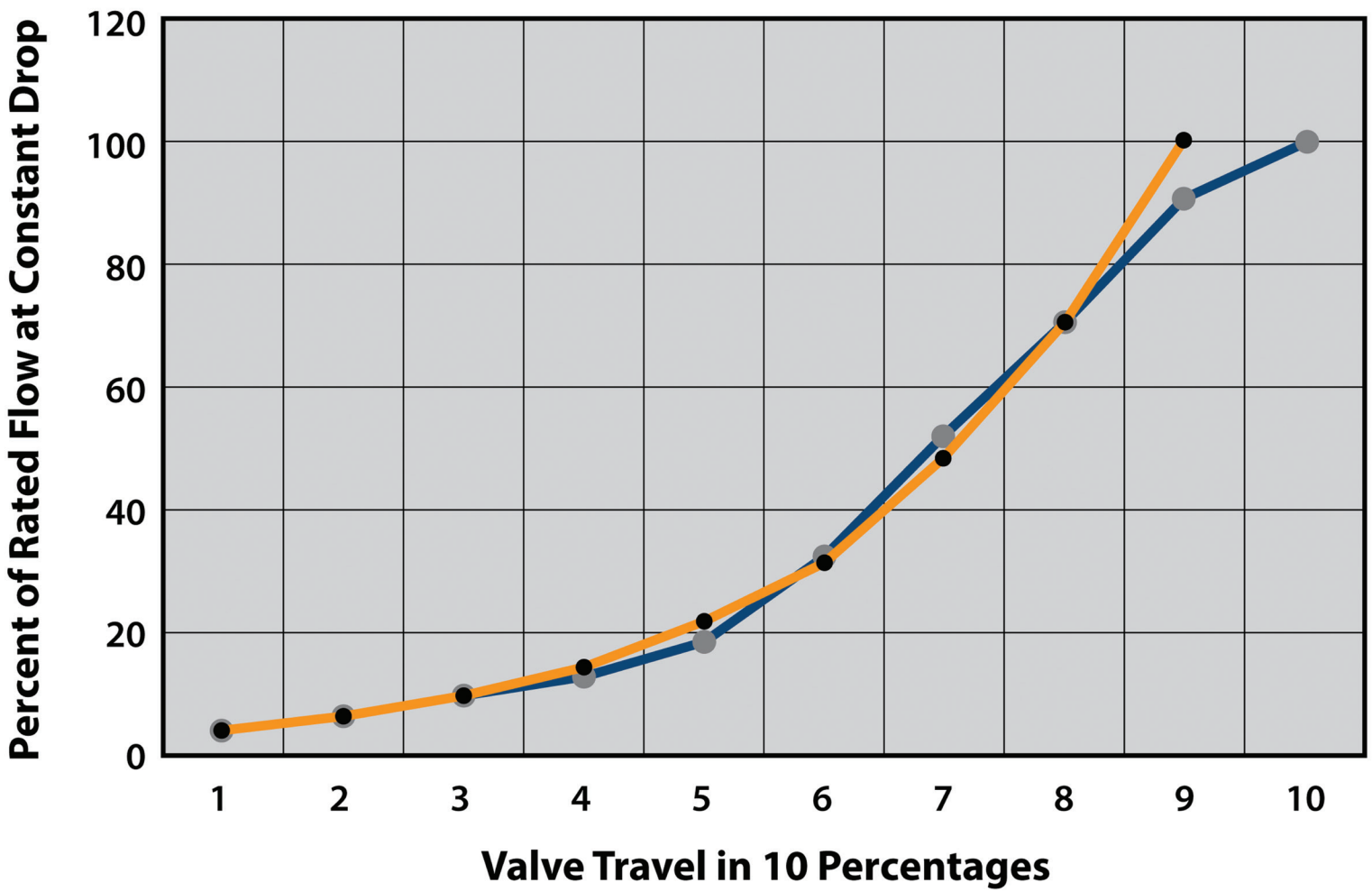
Opening of a conventional flat vane causes a shearing effect when squeezing out of the rubber liner. This creates high break away torque and typically leads to loop instability at low flow rates. The Z-DISC vanes unique shape gently compresses the liner bore upon shut off at an angle. The result is a very gentle opening where the only torque experienced is that caused by friction between the inner rim and the adjacent rubber. This allows effective control at flow rates of less the 0.1% of max rated flow.

TYPICAL FLOW CHARACTERISTIC Standard Resilient Seated Butterfly Valve



COMPARISON IDEAL TO TESTED CHARACTERISTIC

— Characteristic Base on Test Data
— Ideal Equal Percentage Characteristic per ISA



Z-DISC CONTROL TYPE BUTTERFLY VALVE WITH LINER

