

Flow Coefficient of Butterfly Valve: Cv Value

$$Cv = Q \sqrt{\frac{G}{\Delta P}}$$

Cv Value has an expressions to calculate and definition as follow

- Note: Q---Fluid Volume that pass the valve per minute(Us gal/min)
- P---Pressure Difference between import and export of the valve(psi)
- G---Density of Fluid

With the above expressions, You may calculate the flow volume that pass the a valve or pressure loss between the two end of a valve.

Example1)A 6" butterfly valve is at 70° opening, and a kind of fluid, which density is 0.8, pass the valve with volume 1200 Us gal/min then the pressure loss between the two end is $P = GQ^2 / Cv^2 = 0.8 * 1200^2 / 958^2$

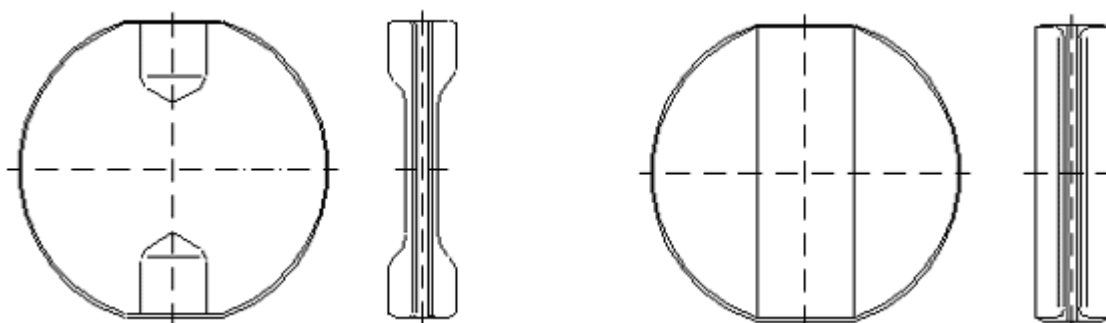
$$\begin{aligned} \Delta P &= GQ^2 / Cv^2 \\ &= 0.8 * 1200^2 / 958^2 \\ &= 1.26 \text{ (psi)} \end{aligned}$$

Example2)10" butterfly valve is at 90° opening, and there is a pressure loss 0.6 psi between the two end of the valve when a kind of fluid, which density is 0.8, pass the valve then the flow volume that pass the valve is

$$\begin{aligned} Q &= Cv \sqrt{\frac{\Delta P}{G}} \\ &= 958 * \sqrt{\frac{0.6}{0.8}} \\ &= 958 * 0.866 \\ &= 830.6 \text{ (Us gal)} \end{aligned}$$

Cv Value is closely related with disc structure. Two regular type of disc are listed as below for reference when selecting Cv Value.

Fig.1 Split Stem Design Fig. 2 Taper Pin Design & Throughout Stem Pinless Design



Cv Value for Split Stem Design (Fig. 1)

Valve Size		Cv Value when valve in different opening angle									
inch	mm	10 °	20 °	30 °	40 °	50 °	60 °	70 °	80 °	90 °	
1 1/2	40	0.1	3	6	14	20	38	53	62	73	
2	50	0.2	5	9	17	27	53	70	115	145	
2 1/2	65	0.4	8	15	26	42	83	105	175	225	
3	80	0.6	12	22	38	63	125	160	260	325	
4	100	0.8	17	42	73	120	235	305	510	590	
5	125	2	45	88	155	250	490	625	1000	1125	
6	150	3	89	145	250	410	800	1030	1650	1950	
8	200	4	148	250	420	700	1300	1750	2725	3250	
10	250	5	232	390	670	1150	2150	2750	4300	5000	
12	300	6	342	550	1000	1600	3100	4050	5000	7500	

Cv Value for Taper Pin Design & Throughout Stem Pinless Design (Fig. 2)

Valve Size		Cv Value when valve in different opening angle									
inch	mm	10 °	20 °	30 °	40 °	50 °	60 °	70 °	80 °	90 °	
1 1/2	40	0.06	3	7	14	25	36	51	70	76	
2	50	0.1	5	12	24	45	64	90	125	135	
2 1/2	65	0.2	8	20	37	65	98	144	204	220	
3	80	0.3	12	22	39	70	116	183	275	302	
4	100	0.5	17	36	78	139	230	364	546	600	
5	125	0.8	29	61	133	237	392	620	930	1022	
6	150	2	45	95	205	366	605	958	1437	1579	
8	200	3	89	188	408	727	1202	1903	2854	3136	
10	250	4	151	320	694	1237	2047	3240	4859	5340	
12	300	5	234	495	1072	1911	3162	5005	7507	8250	
14	350	6	338	715	1549	2761	4568	7230	10844	11917	
16	400	8	464	983	2130	3797	6282	9942	14913	16388	
18	450	11	615	1302	2822	5028	8320	13168	19752	21705	
20	500	14	791	1674	3628	6465	10698	16931	25396	27908	
22	550	17	965	2042	4426	7887	13052	20655	30983	34048	
24	600	22	1222	2587	5605	9989	16528	26157	39236	43116	
26	650	26	1434	3036	6578	11723	19397	29263	46047	50600	
28	700	30	1663	3522	7630	12599	20036	30482	46899	58696	
30	750	35	1912	4050	8142	13152	20411	31226	47562	63328	
32	800	45	2387	4791	8736	13788	20613	31395	48117	68250	
34	850	51	2697	5414	9872	15580	23293	35476	54372	77123	
36	900	60	3021	6063	11055	17449	26086	39731	60895	86375	
40	1000	84	4183	8395	15307	24159	36166	55084	84425	119750	
42	1050	93	4601	9235	16838	26575	39783	60592	92868	131725	
48	1200	121	5981	12001	21890	34548	51718	78770	120728	171243	

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