TOMOE®
Excellence through hydrodynamics

Wide Range Rotary Control Valve

DTM

Patent pending

NEW

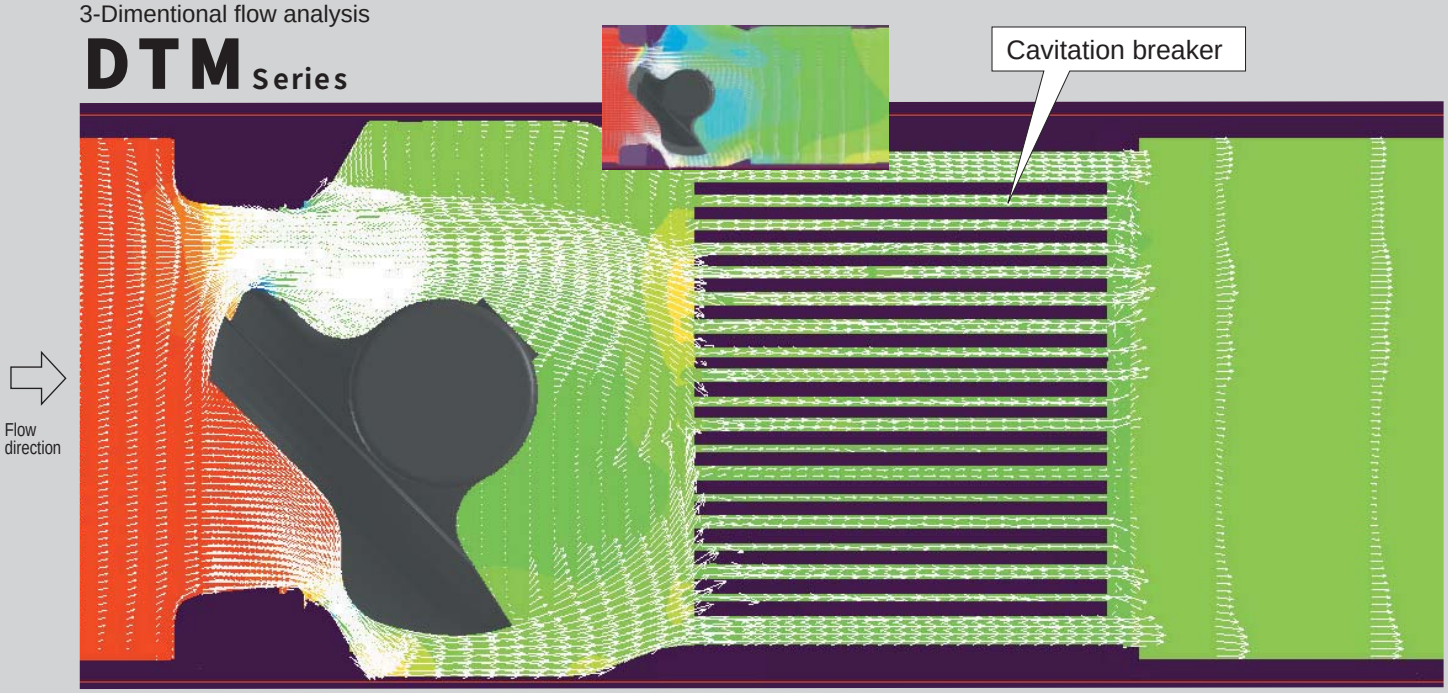
The DTM valve produces low noise levels at high differential pressure.

TOMOE VALVE CO., LTD.

The DTM rotary control valve is designed to
pressure, with anti-cavitation feature and lo

3-Dimentional flow analysis

DTM Series



(Note) Colours show the pressure distribution. Red means a high pressure and blue means a low pressure.

The anti-cavitation and low noise characteristics are realized by the physica

Theory of anti-cavitation and low noise characteristics:

Flow induced valve noise is caused by the vibration of bubbles at the cavitation areas such as, the valve disc edge where local pressure drop occurs. The explosion of bubbles down stream of the valve disc and pressure fluctuations in the turbulent flow area, introduce a downstream vortex flow pattern which is restricted in its pattern by the pipe wall. Flow induced valve noise can be expressed by the use of Lighthill and Navier-Stokes equations. The results which give the sound source are introduced into the right hand side of the Pawell equation.

$$\frac{\delta^2 p}{\delta t^2} - C^2 \nabla^2 p = \frac{\delta f_i}{\delta x_i} + \frac{\delta^2 T_{ij}}{\delta x_i \delta x_j} \quad \cdots\cdots (1)$$

$$\frac{\delta^2 p}{\delta t^2} - C^2 \nabla^2 p = -\rho_0 div(\boldsymbol{\omega} \times \boldsymbol{\nu}) \quad \cdots\cdots (2)$$

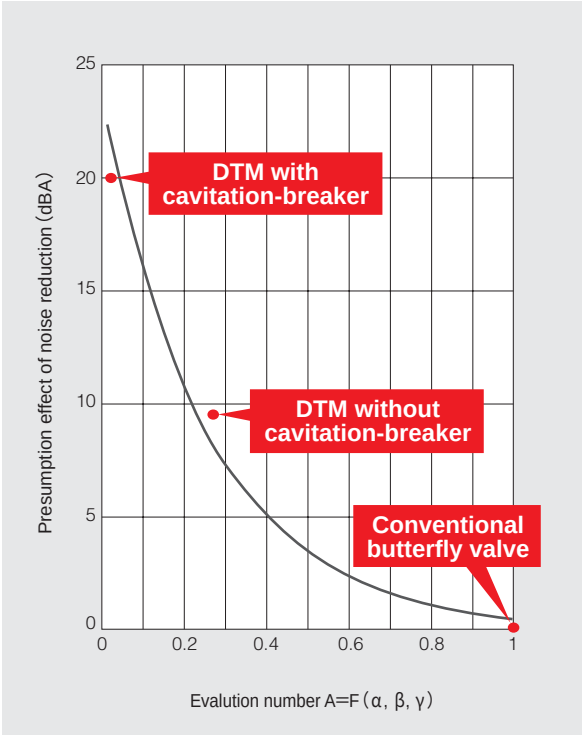
Here P is a sound pressure ρ_0 Is a density of fluid, C is a velocity of sound in the fluid, $\boldsymbol{\omega}$ is a vortex velocity, and $\boldsymbol{\nu}$ is a flow velocity.

To theoretically calculate the sound level by sole use of the Pawell equation (2) is extremely difficult. The distribution of the vortex velocity and flow velocity was analysed by Computerised Flow Dynamics (CFD).

The area of cavitation and the rate of fluctuation were calculated, and the final noise evaluation figure (3) was calculated by referring to the experimental test data expressed in the charts.

$$A = F(\alpha, \beta, \gamma) \quad \cdots\cdots (3)$$

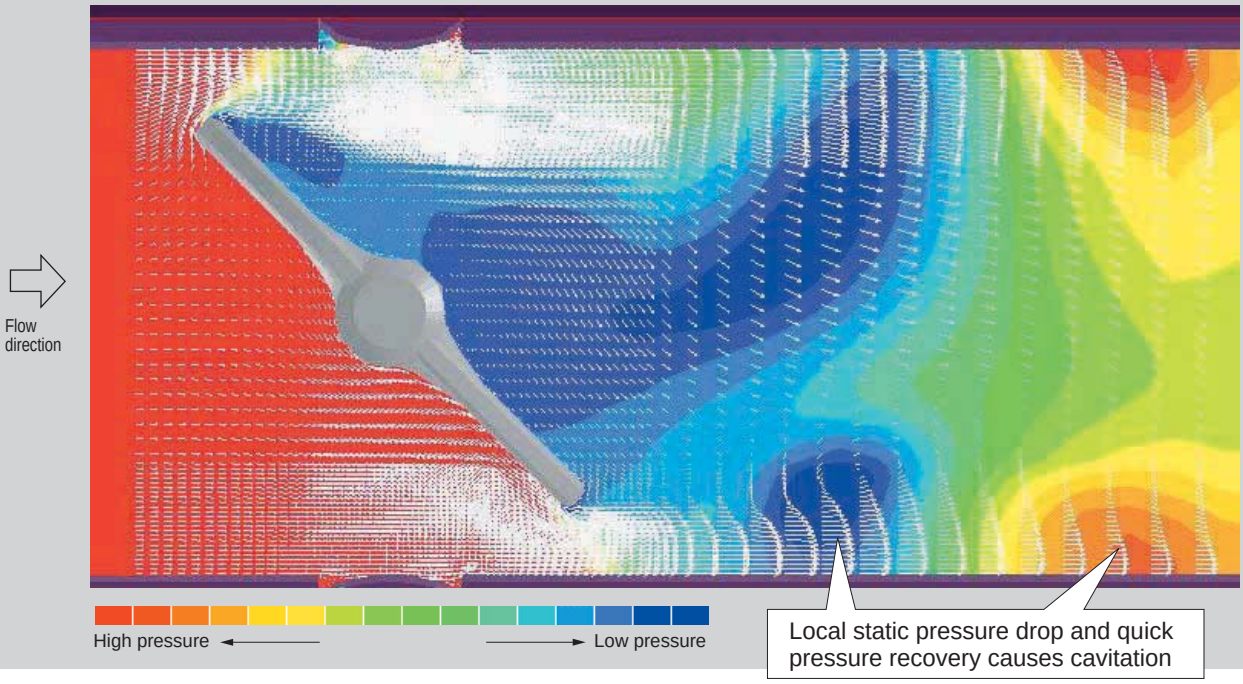
As a result the DTM Control Valve was successfully developed by TOMOE.



● Shape of valve

provide accurate control at high differential
w noise characteristics.

Conventional Butterfly Valve

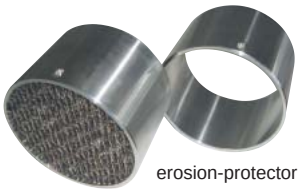


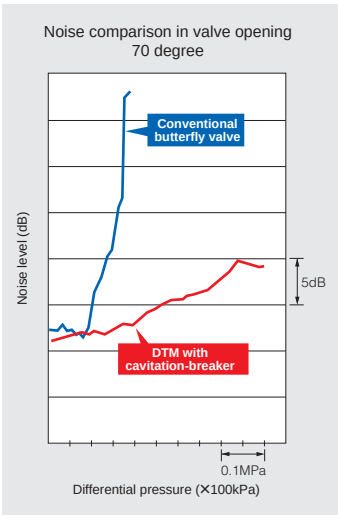
l analysis of Fluid Dynamics, Fluid-Flow parameters and practical testing.

Features

20dB Noise Reduction compared with conventional valve

Cavitation was suppressed by the built-in cavitation-breaker, originally designed by Tomoe. Consequently the flow induced valve noise decreased by 20dB or more. Anti-cavitation characteristics and structure configuration will protect the piping or the equipment on the downstream side from damage.





100:1 Rangeability

Wide range of control from close to full open becomes possible because of the range ability 100:1(with cavitation-breaker).
EQ% flow characteristics was realized by the unique disc shape. So the standard of control valve such as the globe valves can be replaced by DTM. Also, small sized valves can be used compared to the globe valve, so the cost and the piping space will be reduced.

High differential pressure

The best design of the cavitation-breaker and body were completed using our original fluid analysing programme. As a result control in the opening range of 30% with differential pressure 2MPa is achievable with the DTM control valve.

Excellent sealing capability

Seat leakage of Class V was achieved for metal seated valve and ISO 5208 Rate A for the soft seated valve.

Easy Maintenance

The structure is designed for easy maintenance. For example, the seat and cavitation-breaker can be easily replaced at site. Moreover if you do not require the Cavitation-breaker the exchangeable Erosion-protector is built in and the valve body and piping are protected from Cavitation-erosion.

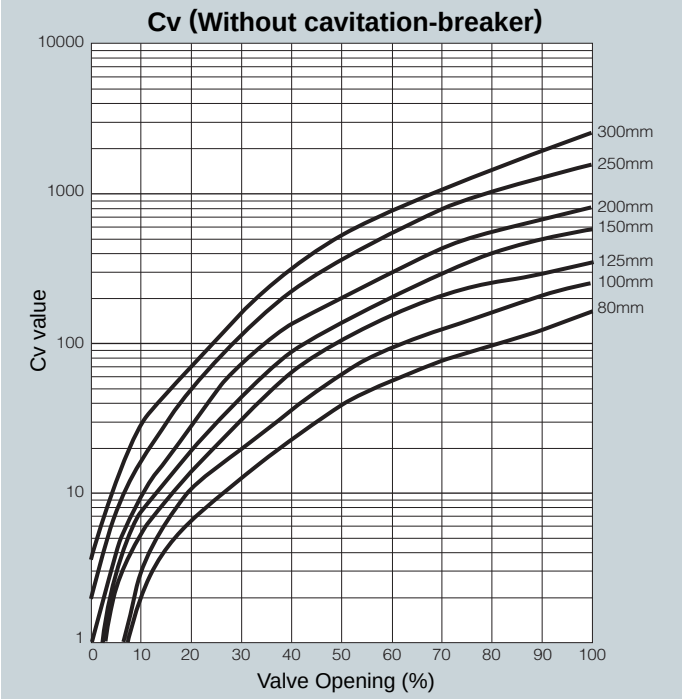
Extremely low fugitive emission

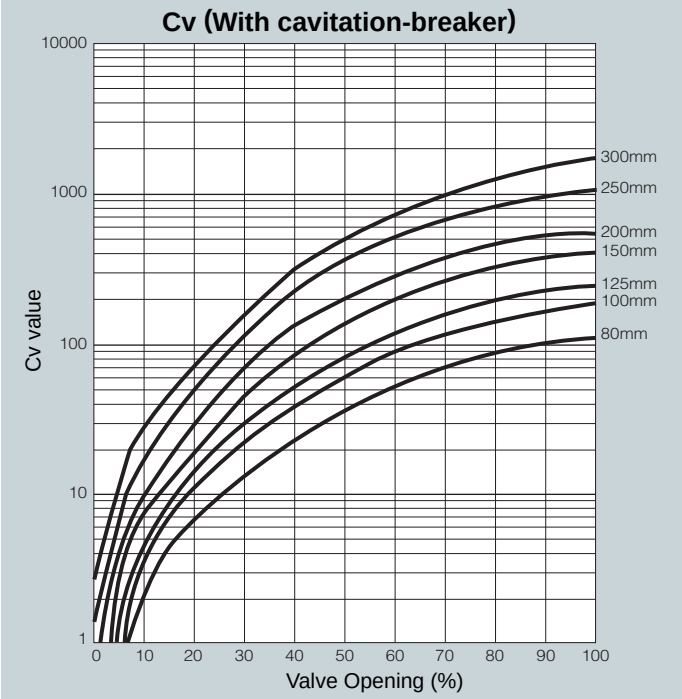
Fugitive emissions of less than 50ppm is achievable using the standard packing arrangement. (Exceed the guideline specified by EPA21.)

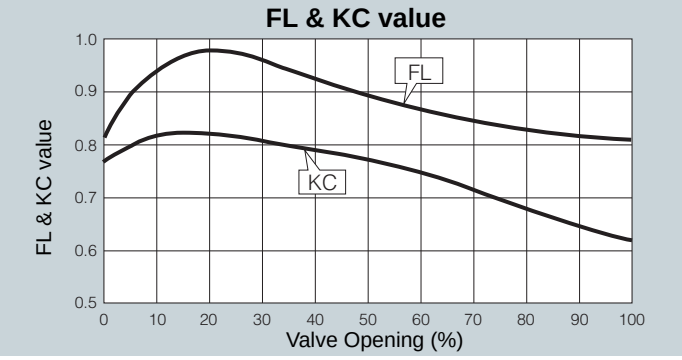
Standard specification

Valve Type		Rotary control valve	
Valve nominal size		80, 100, 125, 150, 200, 250, 300mm	
Pressure Rating		ASME B 16.5 Class 150, 300	
Applicable flange standard		JIS10, 16, 20, 30K, ASME B 16.5 Class 150, 300	
Body style		Wafer, Double flanged	
Face-to-face dimension		IEC 60534-3-2 (JIS B 2005-3-2)	
Flow characteristics		Equal percent	
Rangeability		100:1（With cavitation-breaker）	
Flow direction		Preferred flow towards shaft	
Max working pressure	**Shut off**	Class 150 : 2MPa, Class 300: 5.1MPa	
Max diffrential pressure	**Open by 30%**	Class 150: 0.8MPa, Class 300: 2MPa	
Seat Leakage		ANSI B 16.104 Class V (ANSI / FCI 70-2)	ISO 5208 Rate A (Zero leakage)
Materials	**Body**	WCB or CF8M	
	Disc	CF8M	
	Stem	Stainless steel	
	Seat	Stainless steel	RPTFE
	Cavitation breaker	Stainless steel	
Temperature range		−29 to 400 degrees C (WCB)	−10 to 230 degrees C (CF8M)
Piping gasket		■ In case of sheet gasket : Any standard can be used ■ In case of spiral gasket : • For ASME flange •••• Any standard gasket with inner / outer ring can be used. • For JIS flange ••••••• Use special dimension spiral gasket that be used .	
Actuator		Diaphragm actuator, Rotary pneumatic cylinder, Electric motor, Manual gear	

(Note) In case of double flange type, a flange outside diameter and thickness may differ from a standard.







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