



VENT-O-MAT USA, Div. RF Valves Inc., Member DFC Group of Companies  
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## A quick assessment of the principle considerations when sizing air valves, scour valves and in-line isolating by-pass valves for water distribution pipelines.

It is so that air release valves are designed to release air from pipelines. It is also surprisingly so that the prime consideration when sizing air valves is the need to prevent negative pressures in the pipeline when it is drained or scoured. Negative pressures causes leaks or even breakages which is more costly than we can imagine and raises the maintenance budget to unaffordable levels.

The following assessment stems from research and experience of **Vent-O-Mat**<sup>®</sup> designers over a period of twenty years.

### Pipeline filling under controlled flow conditions.

Pipelines can only be filled as quickly as one can release the air from the pipe. Therefore, the design Engineer would select a reasonable time to fill a pipe, and based on a safe filling velocity of flow of only half a meter per second, he can calculate the required flow rate and hence size the air release valve. However, as we will see under Vacuum Break Sizing, Air Release Sizing is not required as if one has sufficient vacuum break capacity, the air release capacity will be sufficient. This statement only holds true for “Kinetic” air valves (Full Port valves with no restricted flow areas).

The **Vent-O-Mat**<sup>®</sup> **RBX** range of **Full Port** valves complies with this requirement.

### Pipeline filling under excessive flow conditions.

Should a pipeline be filled and the filling rate is not controlled or limited to half a meter per second velocity of flow, one is at dire risk of creating transient waves and pressure surges in the pipe. These transient waves can reach levels of ten times the pressure rating of the pipeline. In order to prevent this, a valve that has an inherent surge control device should be selected. This device should be designed to reduce the area of air flow as soon as the pipeline velocity reaches half a meter per second velocity of flow or more. Again, if the manufacturer has recognised design abilities and has performed sufficient tests to prove the operation, then sizing the



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surge control orifice is not necessary to be performed by the pipeline design Engineer.

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### **Pressurized air release from operating pipelines.**

Once all the air is released and the pipeline becomes operational, air in solution in the water will start separating and accumulate in the higher points of the pipeline. The valve should release the air under pressure without causing water hammer as a result of over sized nozzles. Again, selecting a reliable manufacturer, the design Engineer does not have to size the nozzle flow area.

The **Vent-O-Mat® RBX** range of **Anti-Shock Air Release** valves complies with this requirement.

### **Vacuum Break while discharging water from the pipeline.**

One has to consider the size of the pipeline, the slope or gradient of flow and the flow area of the exhaust port (scour valve or rupture rate of the pipe material) in order to calculate the rate of drainage. Once this flow is determined, then the air release and vacuum break valve size can be determined. Again by selecting a reputable manufacturer, all the functions above will be combined into one valve featuring only one chamber and hence common flow areas. Thus by determining the size of the vacuum break valve, all the other sizing functions will have been satisfied. **It is important to note that a valve placed on an apex point in the pipeline, will have to cater for drainage through both slopes descending from the apex point and not just the one side.**

The **Vent-O-Mat® RBX** range of **Anti-Shock Air Release and Vacuum Break** valves complies with this requirement.

### **Scour Valve sizing.**

From the vacuum break sizing principle, it is clear that scour valves and vacuum break valves work hand in hand. Should the size of one change, it will affect the size of the other. Again, the size of the scour valve is determined by how long one can afford to spend draining that section of

the pipeline for repairs. Experience have shown that by selecting the rupture rate first, (the percentage flow area of the rupture in the pipe to the pipe flow area) and then select the scour valve to have a similar flow area, and thirdly select the vacuum break size, one will satisfy all the criteria of preventing vacuum by draining the pipe, and have reasonable drainage times as a result.

The **Vent-O-Mat RBX** range of **Anti-Shock Air Release and Vacuum Break** valves complies with this requirement.

### In-line Isolator by-pass valves sizing.

The design Engineer will simply select his own scour valve sizing philosophy to duplicate on the by-pass valves. If not, the risk of having smaller by-pass valves than scour valves will create negative pressures every time the pipe is drained while the main in-line isolators are closed. The risk is even higher should both the in-line isolator and its by-pass valve be closed while draining. For this reason it is good Engineering practice to fit a vacuum break valve on the down slope side of every main line in-line isolator.

The **Vent-O-Mat RBX** range of **Anti-Shock Air Release and Vacuum Break** valves complies with this requirement.

### Conclusion.

The design Engineer will prevent having too many variables in his pipeline, as it can become a nightmare for the contractor building the pipeline, to select the different sizes of scour, by-pass and vacuum break valves at the various installation points. If the wrong size is installed at any point, negative pressures become a real risk to the pipeline. **It is the experience of Vent-O-Mat Engineers that 60% of pipeline maintenance budgets are spent as a result of ineffective and non-performing air release valves.**

The **Vent-O-Mat® RBX** range of **Anti-Shock Air Release and Vacuum Break** valves resolves the pipeline maintenance issue.

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