Flow controllers

Optimal control

Optimal control is when the same amount of water passes through regardless of the water level, i.e. the pressure. When the head before the controller, H, is plottet as a function of the flow passing through, Q, the head-discharge curve or the controller characteristics is obtained, see figure 1. (H and Q are shown in figure 2). The ideal head-discharge curve is completely vertical and is shown in figure 1.

Mosbaek endeavour to keep their head-discharge curves are as close as possible to this ideal curve.

The customer's values of max. head and required constant flow serve as input for Mosbaek's selection of a suitable controller by means of an numerical design model.

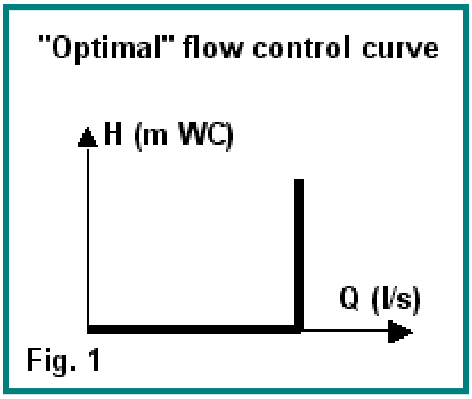

Fig. 1: "Optimal" flow control

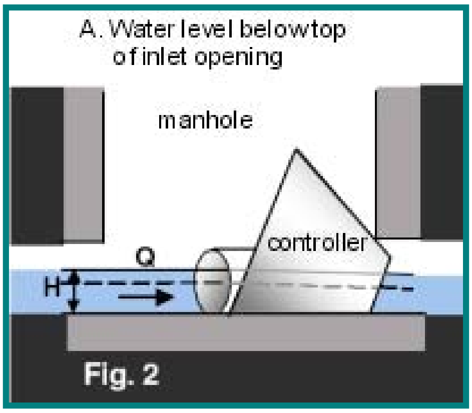

Fig. 2: Case A flow

Customer adjusted design

Mosbaek's range of controllers is designed such that they cover almost complete any perceiveable control need. The head-discharge curves are considerably steeper (i.e. closer to the 'ideal' curve) than those of e.g. throttle pipes or gates.

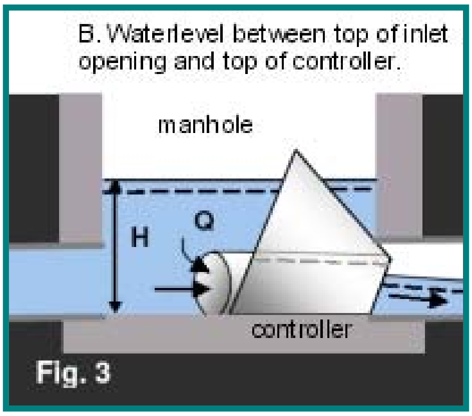

Fig. 3: Case B flow

This is how the vortex valve functions

When the normal, small flow - the dry weather flow - passes in the sewage pipe, the water surface is below the top of the controller inlet opening, and there is virtually no resistance to the flow (figure 2).

When it starts raining the feed flow increases - the water level in front of the regulator increases - and when the water surface is above the top of the controller inlet opening,

MeasurIT Technologies Ltd.
Craan, Craanford,
Gorey, Co. Wexford, Ireland

email: info@measurIT.com
www.measurIT.com

Phone: +353 (0) 53 942 8962
Fax: +353 (0) 53 942 8963

but is still below the top of the controller vortex chamber - air is trapped inside the vortex chamber, and the flow cross section is reduced. This increased resistance limits the flow through the controller (figure 3).

When the water surface in front of the controller rises to above the top of the vortex chamber, the head will make the water in the controller rotate. The entrapped air forms a core in the vortex valve and the flow cross section is heavily reduced at the outlet. The result is a considerable head loss, as intended (figure 4).

After the rain has stopped the feed flow decreases. The water level in the structure eventually falls below the top of the vortex chamber and due to the dropping pressure the vortex collapses. Air is drawn into the vortex chamber - with some delay - hence the hysteresis in the head-discharge curve, figure 5.

The collapse of the vortex produces a sudden increase in the flow through the controller whereby any deposited sediment in the upstream pipe system will be flushed out. See the characteristic 'bump' on the head-discharge curve, figure 4.

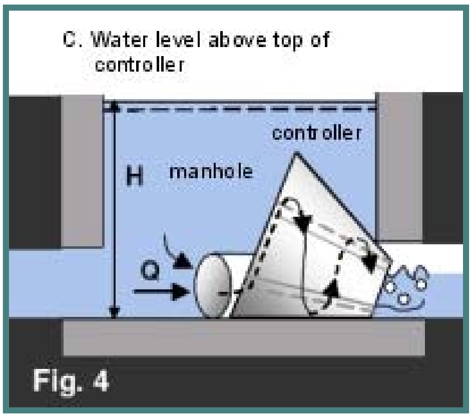

Fig. 4: Case C flow

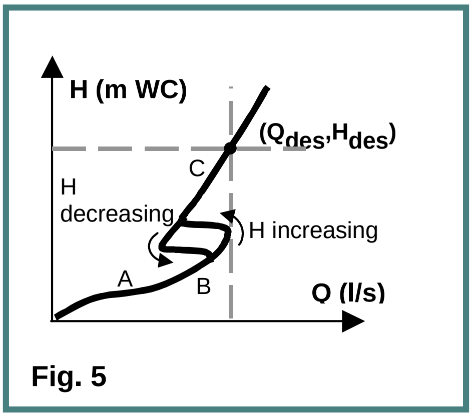

Fig. 5: Typical head-disch. curve

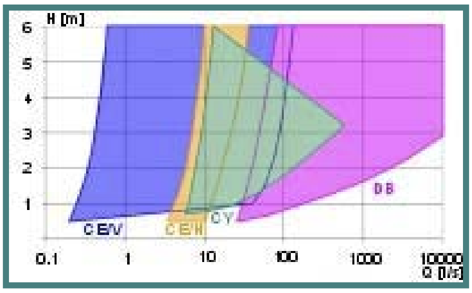

Fig. 6: Application diagram

Other flow controllers

The description above has dealt with the vortex valve. There is however another design in Mosbaek's product range which functions in a similar way but it is used for smaller flows than the vortex valve, namely the centrifugal valve. The vortex valve has - all else equal - a somewhat smaller passageway than a similar centrifugal valve. At small flows the passageway of a vortex valve might become so small that there might be a risk of blockages. Therefore, centrifugal valves are recommended for smaller flows.

MeasurIT Technologies Ltd.
Craan, Craanford,
Gorey, Co. Wexford, Ireland

email: info@measurIT.com
www.measurIT.com

Phone: +353 (0) 53 942 8963
Fax: +353 (0) 53 942 8963

There are two main types of Mosbaek's centrifugal valves:

horizontal (CE/H) which is used for combined sewage, and

vertical (CE/V) which is used for storm water.

The double baffle controllers (DB) es another design in the Mosbaek product range. They are used for larger and large flows. In those situations, the required vortex valve would simply be too large. The double baffle controller in general takes up only little space.

The diagram in figure 6 shows the application ranges for the various controller types.

The baffles of the double baffle controller yield resistance to the flow by blocking off part of the passageway. At higher water levels the flow pattern changes and the water mainly enters the controller from above. This increases the resistance.

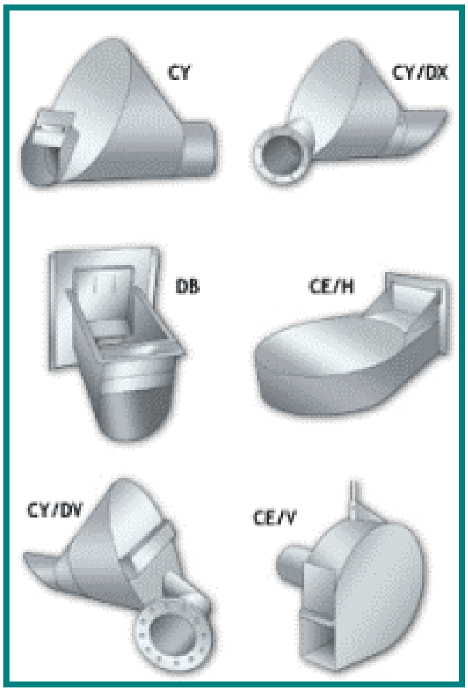

Fig. 7: Mosbaek flow controllers

Example

A vortex valve at the outlet from a detention basin. The housing structure consists of two chambers. A by-pass weir is mounted on top of the separating wall. I.e. at large water levels in the inlet chamber, part of the water by-passes over the wall.

Those amounts of water which are initially discharged by the detention basin typically cause the most severe damages downstream. The flow control creates the necessary delay.

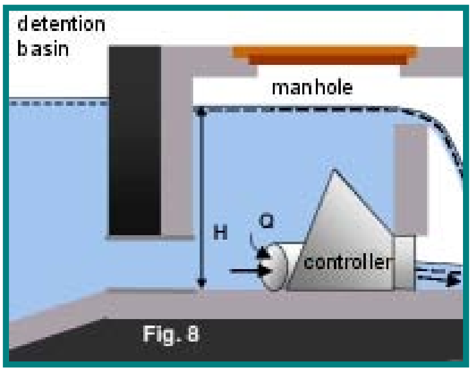

Fig. 8: Example: detention basin

Terms

Precipitation: Rain, sleet, snow and havel

Upstream: Against the flow

Downstream: With the flow

MeasurIT Technologies Ltd.
Craan, Craanford,
Gorey, Co. Wexford, Ireland

email: info@measurIT.com
www.measurIT.com

Phone: +353 (0) 53 942 8962
Fax: +353 (0) 53 942 8963