AQUARIUS TECHNOLOGIES PTY LTD
WATER QUALITY CONTROL

Unit 1, 23 Richland Avenue
Coopers Plains Q 4108
PO Box 71 Coopers Plains Q 4108

T: +617 3274 4750
F: +617 3274 4736
W: www.aquariustech.com.au

Quality Endorsed Company ISO 9001 Lic 5403

# How to ensure a flow switch functions properly

## 1. Pressure drop and its effects on flow

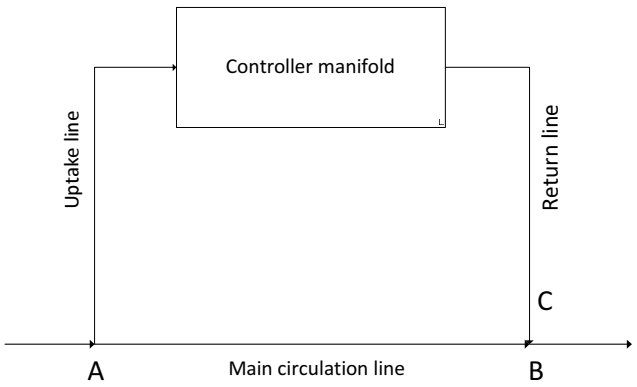
Pressure drop is decrease in pressure from one point in a pipe or tube to another point downstream. Pressure drop occurs with frictional forces on a fluid as it flows through the tube. The main determinants of frictional forces are characteristics of the fluid flowing in a pipe (density, viscosity and velocity) and pipe characteristics (roughness, diameter and length).

In long pipelines most of the pressure drop is due to the friction in the straight pipe, and the pressure drop caused by the fittings and valves is termed the "minor loss". As pipes get shorter and more complicated the proportion of the losses due to the fittings and valves gets larger.

The flow of any liquid or gas will always flow in the direction of least resistance (less pressure). Pressure drop increases proportional to the frictional shear forces within the piping network. A piping network containing a high relative roughness rating as well as many pipe fittings and joints, tube convergence, divergence, turns, surface roughness and other physical properties will affect the pressure drop. High flow velocities and / or high fluid viscosities result in a larger pressure drop across a section of pipe or a valve or elbow.

The following physical properties cause about 0.7 – 1.0 bars pressure drop in all types of manifolds.

- Straight pipes
- Pipe entrances
- Change of sections
- Brandings of current
- Elbows
- In/Out valves
- Check valves
- Probe holder and strainer bowls
- Injection points




Manifolds with bowls for probes are more susceptive to pressure drop.

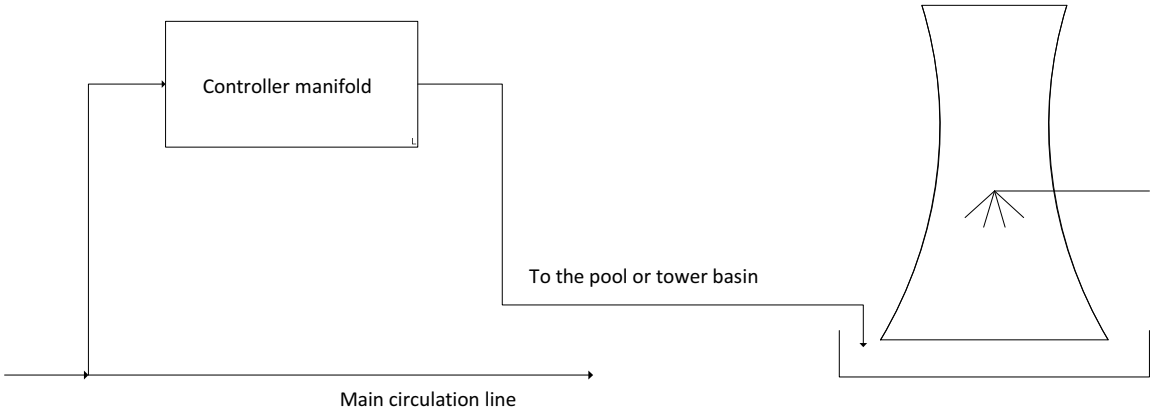
The following example shows how pressure drop prevents flow in a manifold:
If pressure at point A is 3.5 bar, the pressure at point B will be about 3.45 bar (0.05 bars pressure drop because of the tube length) while it will be approximately 2.6 bar at point C (due to about 0.9 bars pressure drop in manifold and uptake and return lines). As the water always flows from higher pressure toward the lower pressure, there will be NO FLOW in the above manifold. Plumbing the manifold outlet to further downstream of the main circulation line will not resolve the problem as there will be more pressure drop in low diameter piping.

AQUARIUS TECHNOLOGIES PTY LTD
WATER QUALITY CONTROL
Unit 1, 23 Richland Avenue
Coopers Plains Q 4108
PO Box 71 Coopers Plains Q 4108
T: +617 3274 4750
F: +617 3274 4736
W: www.aquariustech.com.au
Quality Endorsed Company ISO 9001 Lic 5403

**Solution:**

There are two methods to create enough flow in a manifold and activate the flow switch:

1. Apply a proper circulation pump
2. Plumb the manifold outlet to a low pressure stream, such as after side stream or sand filter and preferably to the pool or tower basin as indicated in the following diagram.




To achieve optimum mixing and measurements, general Hydraulics dictates the minimum flow velocity between 1-3m/s in pipes which corresponds to the flow rates indicated in the following table:

| Pipe diameter (mm) | Recommended flow (L/min) |
|---|---|
| 20 | 18 - 55 |
| 25 | 30 - 90 |
| 50 | 110 -330 |

Visit http://www.pressure-drop.com/Online-Calculator/index.html for online pressure drop calculations.