It's important for individuals at all levels of membership to engage in Professional Development. This is a good opportunity to build up your PD portfolio as certificates are awarded at the end of each year.

Cold Water Boosting Solutions

What is Water Pressure?

Pressure is the force that pushes water through pipes. Water pressure determines the flow of water from the tap. If pressure is not sufficient then the flow can reduce to a trickle.

What Causes Low Water Pressure?

Low water pressure can be caused by the customer's own system - damaged or leaking pipes, a partially closed internal stop tap or pipes that are old which can become corroded, restricting the water flow.

Other causes of low pressure can originate from water companies, such as:

- Short-term reductions in pressure caused by routine maintenance and improvements of water mains.
- Inadequate pumping facilities.
- Water main is too small.
- Reduced pressure from the water main caused by leakage, equipment failures or blockage of the service pipes.

Pressure can also be affected by location of the property for example if it is at the top of a hill it may receive lower pressure than if it was at the bottom of the hill.

Shared supply pipes from the water main can cause adverse effects too, especially if the pipe is too small, in poor condition, or if customers sharing a supply frequently use water at the same time.

Pressure varies during the day depending on the demand for water placed on the supply system. When demand is high, for example in the morning and early evenings, pressure can be lower than during the rest of the day.

Problems Caused by Low Water Pressure

Some modern heating appliances and showers will not work below certain pressure levels. Low and inconsistent water pressure can cause problems in many situations such as:-

- Unvented hot water cylinder applications.
- Combination boiler installations.
- Homes with specific taps and fittings that need minimum water pressures e.g. power showers, mixer valves, continental fittings with small diameter pipes etc.

What Standard are the Water Companies Legally Obliged to Meet?

Companies are required to supply water constantly and at a pressure which will reach the upper floors of houses. This does not apply to buildings that use commercial pumped systems, such as blocks of flats.

Booster Pump Selection

The installation of a pump internally to boost the pressure will allow appliances to work more efficiently e.g. combination boilers and unvented cylinders.

- **Break / Storage Cistern Supply**

The Water Regulations do not allow a pump to be fitted directly to the water company incoming mains supply, unless permission has been obtained from the water company and then the pump capacity may be restricted to 0.2 l/s. If the water is from a private water supply, i.e. from a spring / well, then there is an option to use a break cistern.

- **Sizing the Break / Storage Cistern**

Consideration should be given to the capacity of the mains supply to fill the cistern, and the volume of water consumed. The break / storage cistern needs to have sufficient capacity to meet demand requirements in between refilling. The cistern capacity is not related to the instantaneous highest flow, but to the volume used over a period. A rule of thumb for small installations is 100 litres per person. Current domestic water usage is approximately 150 litres per person per day. The range of pressure boosting products and combinations are many and varied, the main applications are described below.

- **Pump Arrangement**

There are a number a booster pump options to match price or specification, from a simple single pump and pressure switch arrangement to a comprehensive packaged multiple pump set with customised features. When specifying a booster set consideration must be given to the arrangement. A multiple pump layout is recommended for high specification developments or for vital services where loss of water pressure is unacceptable in the event of pump maintenance or failure.

- **Duty Standby**

Where there is a requirement for multiple pumps, the operation of the pump must be determined. In a duty-standby arrangement, each pump is sized to meet the full duty requirement. Therefore, there is no loss of pressure should a pump be unavailable for operation. In a duty-assist arrangement, each pump is sized for half the required flow, both pumps are required to run in order to satisfy the full duty requirement, should one pump be unavailable the water supply will continue, but with some loss in pressure. Where greater security is needed, the set operation can be extended to duty-assist-standby (3 pump set), so preventing a loss in pressure in case of pump maintenance, eg, a nursing home or hospital.

- **Operating Efficiency**

Today, it is important to consider operating efficiency, pump efficiency reduces at low flows, therefore operating two pumps as duty assist will be more efficient than operating one larger pump, but operating costs must be evaluated against the duty profile. A reduction can be achieved by using "Hi-Efficiency", automatic variable speed booster pumps. Hi-Efficiency pumps have a "soft start / soft stop" performance, and are inverter driven.

Booster Set Sizing:

- **Determine the Duty / Flow rate**

In order to be able to select the appropriate pump arrangement, the maximum likely flow rate and the minimum delivery pressure (the 'duty') must first be established.

The booster pump is not normally needed to supply all installed appliances and outlets simultaneously, it is therefore necessary to determine the highest likely flow. Determining this flow rate is more involved, as it depends on the amount of pipework / fittings installed, the arrangement / grouping of the fittings, and the number of people using the fittings. There are a number of methods to estimate the highest likely flow, some use loading units other use a flow rate with a factor. There may be a limiting factor, which can be identified to simplify the calculation. For example, combination boilers

will have a limited flow capacity and this is independent of the number of fittings / outlets installed. Perhaps a certain size of installed pipe will limit the flow based on a maximum flow velocity in order to prevent noise for example.

- **Determine Pressure**

It is a relatively simple matter to determine the minimum pressure requirement. There are three components that make up the total pressure required at the pump.

1. 'Static pressure' - this is the height from the water level in the storage cistern to the highest outlet. The height in meters divided by 10.2 gives the static pressure in bar.

2. To achieve a satisfactory performance, outlets/appliances require a minimum inlet pressure; this must be added to the static pressure requirement. Please note that the fittings with the highest individual pressure loss, may not necessarily lead to the highest pump pressure requirement.

3. Pressure loss in the distribution pipe work, can be sized as 1.5 m/s flow velocity a pressure loss of 4m/100m.

Example:-

An un-vented hot water cylinder requires a minimum cold water pressure of 3 bar. The cylinder is mounted 5m above the storage cistern. The pressure at the outlets is determined in this case by the cylinder pressure reducing valve. The total pipe run from the storage tank to the cylinder is 20m.

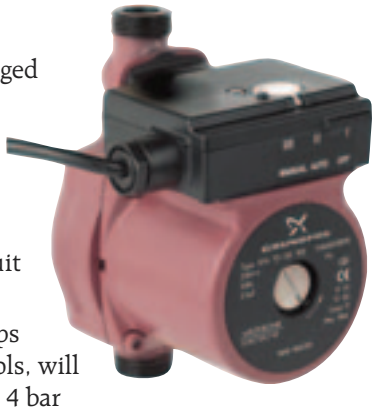
Therefore the total required pump pressure is:

3 bar to un-vented cylinder plus 0.5 bar static height plus 0.1 bar pipe loss

Total required pump pressure = 3.6 bar.

Product Application / Choice

For taps and outlets with very small diameter pipes, a low cost individual mini booster pump which incorporates a flow switch for automatic start / stop, can be fitted to the flow pipe. An additional 0.5 – 0.75 bar can be added to the existing pressure.



Whole house boosting can be achieved by installing a packaged unit directly on to the mains, and incorporates a built in break cistern, stainless steel booster pump, pressure vessel and controls. Pressure can be adjusted to suit the system requirements.

Alternatively, automatic pumps with inbuilt stop / start controls, will boost water pressure by up to 4 bar around the house. A suitable break cistern will be required.

To achieve an invigorating shower, shower booster pumps can provide pressures from 1 – 4 bar with single or twin impellers, in both positive and negative head applications.

Product selection and advice can be obtained from manufacturers such as: Grundfos Pumps Ltd, Grovebury Road, Leighton Buzzard, Bedfordshire. LU7 4TL - Telephone: 01525 850000 - www.grundfos.co.uk.

Training Courses are available, either as a 1 day course, or, on-line training at the Grundfos GPlus Ecademy, www.grundfos.co.uk/gplus.

Questions:

1. Give three causes of low water pressure that are not the responsibility of the water authority. .....

.....

2. What makes water pressure vary during the day? .....

.....

.....

3. What standard are the water companies legally obliged to meet? .....

.....

4. Which boiler installations require a constant water pressure to work efficiently? .....

5. Why do you generally require a storage tank when fitting a booster pump?.....

.....

6. What is the current domestic water use per person?.....

7. When is a multiple pump layout recommended? .....

.....

8. What must first be established in order to select the correct pump arrangement? .....

.....

.....

9. What are the three components that make up the total pressure required at the pump? .....

.....

10. What pump is recommended for taps and outlets with very small diameter pipes? .....

.....

Name..... **Membership number**.....

Either photocopy or cut out this section (attach an additional A4 sheet if necessary) and return to: Gary Evans, CIPHE, 64 Station Lane, Hornchurch, Essex RM12 6NB or fax 01708 448987. Certificates are awarded at the end of the year.