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FRICTION LOSS IN LD POLY PIPE

Friction loss is that factor or component that causes loss in pressure as water passes through a pipe. The size of the pipe and the length of the pipe are the two factors that have the greatest impact on friction loss. The type of materials that a pipe is made out of can also have an impact on friction loss along with the age of the pipe.

In essence, Friction Loss is resistance - the resistance the water is subject to as it passes through the pipe.

To explain this from another angle, think of an ice skating rink. The friction between the skates and the ice is extremely low. This enables the skater to glide easily across the ice. If that ice were concrete then the skater would find it more difficult due to the increase in friction and therefore their speed would be reduced or it takes greater effort to travel at the same speed.

By referring to the friction loss chart, copy attached, you will notice that:

- The bottom line of the graph is flow rate in litres per second.
- The vertical line is metre loss per 100 meters of pipe. A metre of head loss at sea level is 9.81KPA or 1.42PSI. This is the pressure at the bottom of 1m of water (known as head pressure)

This relates to the flow rate of 0.30 litres per second:

- ½" (13mm) pipe will experience 50 meters head loss per 100 meters,
- ¾ (19 mm) pipe will experience 8 meters head loss per 100 meters.
- 1" (25 mm) pipe will experience 2 meters head loss per 100 meters .
- $1^1/_4$" (32 mm) pipe will experience 0.7 meters head loss per 100 meters

You will notice that the friction loss through the system goes down as the pipe size goes up, ie – flow rate of 0.3 litres per second (LPS) the friction loss in meters per head is 50 while the same flow rate in 32 mm pipe has a friction loss factor of 0.7 meters head. Therefore, in order to maintain pressure it is better to use a larger pipe than a small pipe but which pipe you use is determined by the flow rate and the distance noting that as the flow rate goes up so to does the friction loss.

Note, you cannot increase the pressure by reducing the pipe size. You simply increase the friction loss if the flow rate remains unchanged**.**

- 13 mm pipe is only suitable for small micro irrigation systems with very low flow rates – i.e. 0.3 LPS
- 19 mm pipe is suitable for medium size micro irrigation systems with flow rates up to 0.5 LPS.
- 25 mm pipe is suitable for larger micro irrigation systems and small turf systems such as houses and small landscape systems.
- 32 mm pipe is used in situation similar to 25 mm pipe but where the water has to be transported over long distances from the valve to its place of use.

Conversions

By referring to the Conversion Table we note that to convert:

1. Meters head to kpa we multiply meters head by 9.83

2. Convert meters head to psi we multiply meters head by 1.422

In our discussion on friction loss we found that at a flow rate of 0.3 lps 13 mm poly pipe experiences a 50 meters head loss per 100 meters of pipe. To convert this to psi we multiply the meters head (50) by 1.422.

i.e. 50 x 1.422 = 71.1 psi

To convert this meters head loss to kpa we multiply meters head by 9.83

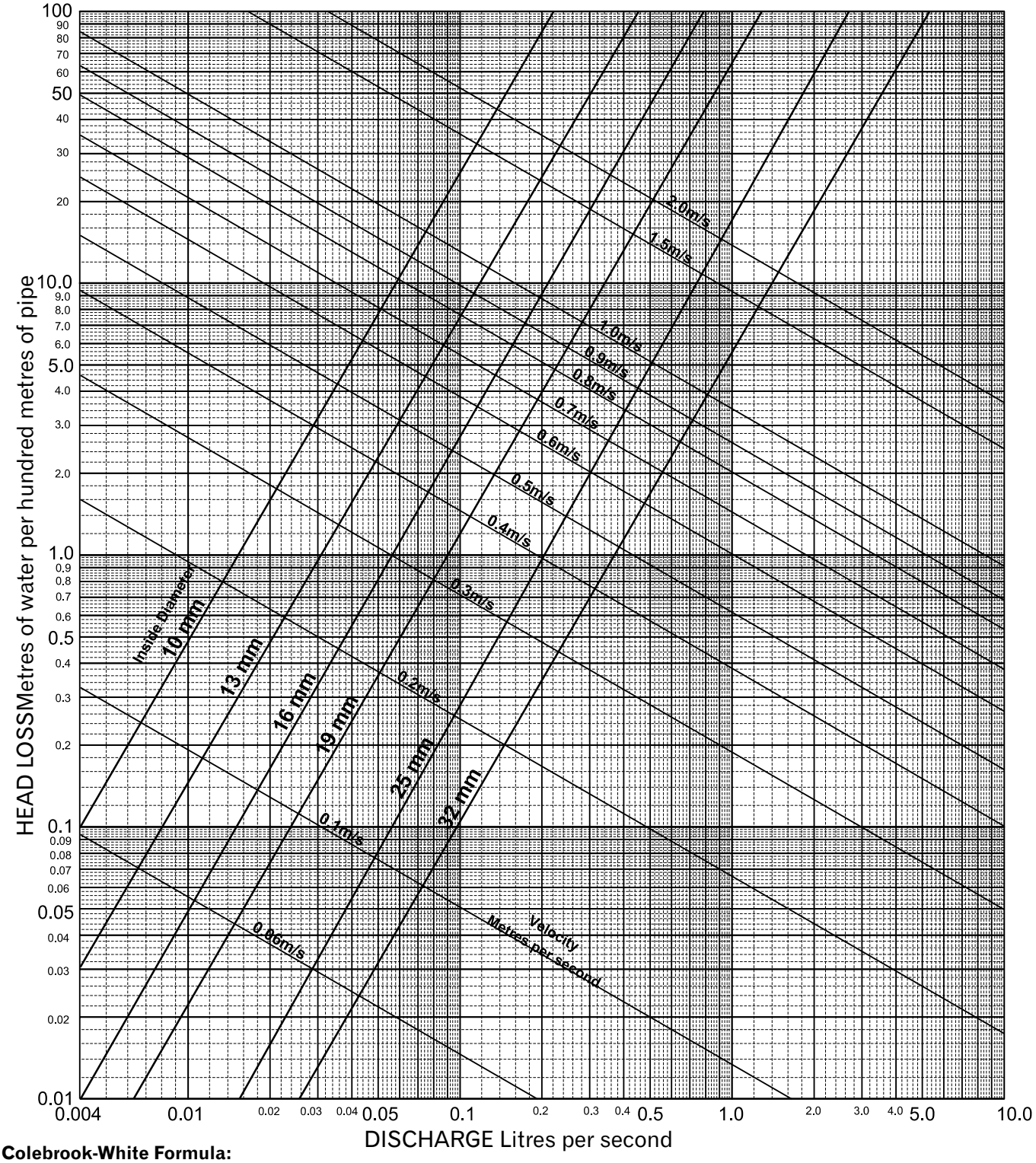
i.e 50 x 9.83 = 491.5 kpa

Thus, the flow rate of 0.3 lps through 13 mm pipe will experience a pressure loss of 50 meters head which is equal to 71.1 psi or 491.5 kpa over 100 meters.

Repeat these calculations for the 19 / 25/ 32 mm poly pipe at a flow rate of 0.3 lps per 100 meters.

Now it is time to carry out a practical experiment that involves calculating the flow rate from a garden tap at pre-determined pressure levels. This is the first step in the design of an irrigation system. The second step involves an accurate scaled drawing.

Micro Irrigation Pipe – Friction Loss



Colebrook-White Formula:

This chart was developed using the Colebrook-White Formula as quoted in AS2000 - 1978 "Design Charts for Water Supply and Sewage".

$$V = -\sqrt{32gRS}\ \log\left\{\frac{k}{14.8R} + \frac{1.255v}{R\sqrt{32gRS}}\right\}$$

A roughness coefficient of k=0.015 was used.

NOTE:

All care has been taken to develop this chart and to check its accuracy. However, PPI can not be held responsible for any design failures resulting from the use of the chart as design involves many inputs and decisions which are outside our control. Water Authorities, Departments of Primary Industries or Agriculture and Private Consulants provide excellent design services. The reader is encouraged to make use of their services.

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