

# Papa Pump®



**the pump that uses no fuel!**

# TRAINING MANUAL

August 2016



[www.waterpoweredtechnologies.com](http://www.waterpoweredtechnologies.com)

# Glossary of Terms

<b>Flow</b>	Measurement of water flow
<b>Catchment</b>	Water taken from the natural watercourse to supply water held in a catchment tank or a weir
<b>Catchment Tank</b>	A vessel to hold the water diverted from the natural watercourse. In the U.K. this is usually made from concrete rings but could be any tank able to hold up 1m <sup>3</sup> of water
<b>Weir</b>	A dam or barrier on the natural flowing watercourse to create a stable pressure to feed water to the supply tank
<b>Feed Pipe</b>	The pipe carrying the water from the catchment to the supply tank
<b>Feed Length</b>	Measurement of the <b>distance</b> from the catchment to the supply tank
<b>Supply Head</b>	Measurement of the <b>drop</b> from the supply tank to the pump The greater the supply head → the greater the pressure of water going into the pump → the more efficient the pump
<b>Supply Pipe</b>	The pipe from the Supply Tank to the Pump, sometimes called the Drive Pipe
<b>Supply Length</b>	Measurement of the <b>distance</b> from the supply tank to the pump chamber
<b>Delivery Head</b>	Measurement of the <b>height</b> from the pump to it's destination, e.g. a storage tank at a higher elevation
<b>Delivery Distance</b>	Measurement of the <b>distance</b> from the pump to it's destination, e.g. a storage tank at a higher elevation
<b>Pump Body</b>	The main body of the pump
<b>Supply Port</b>	Where the supply water enters the pump
<b>Exhaust Port</b>	Where the depressurised water is expelled from the pump
<b>Delivery Port</b>	Where the pressurised water leaves the pump for delivery
<b>Venturi Valve</b>	The flexible rubber valve between the exhaust port and the delivery port
<b>Internal Non Return Valve</b>	The flexible rubber valve at the delivery port
<b>External Non Return Valve</b>	The valve on the Delivery Pipe
<b>Pressure Relief Valve</b>	A safety valve on top of the pump
<b>Pressure Vessel</b>	Using a pressure vessel will reduce pulsing of the delivered water
<b>Shut Off Valve</b>	Sometimes called a 'Ball Valve', the valve to turn on/off the water supply to the supply port
<b>BSP Adaptor</b>	An adaptor fitted to the Supply Port (see 'Adaptor' on page 4)
<b>Exhaust Extension</b>	The cup placed in the exhaust port
<b>Off Take</b>	Excess water at the point of delivery

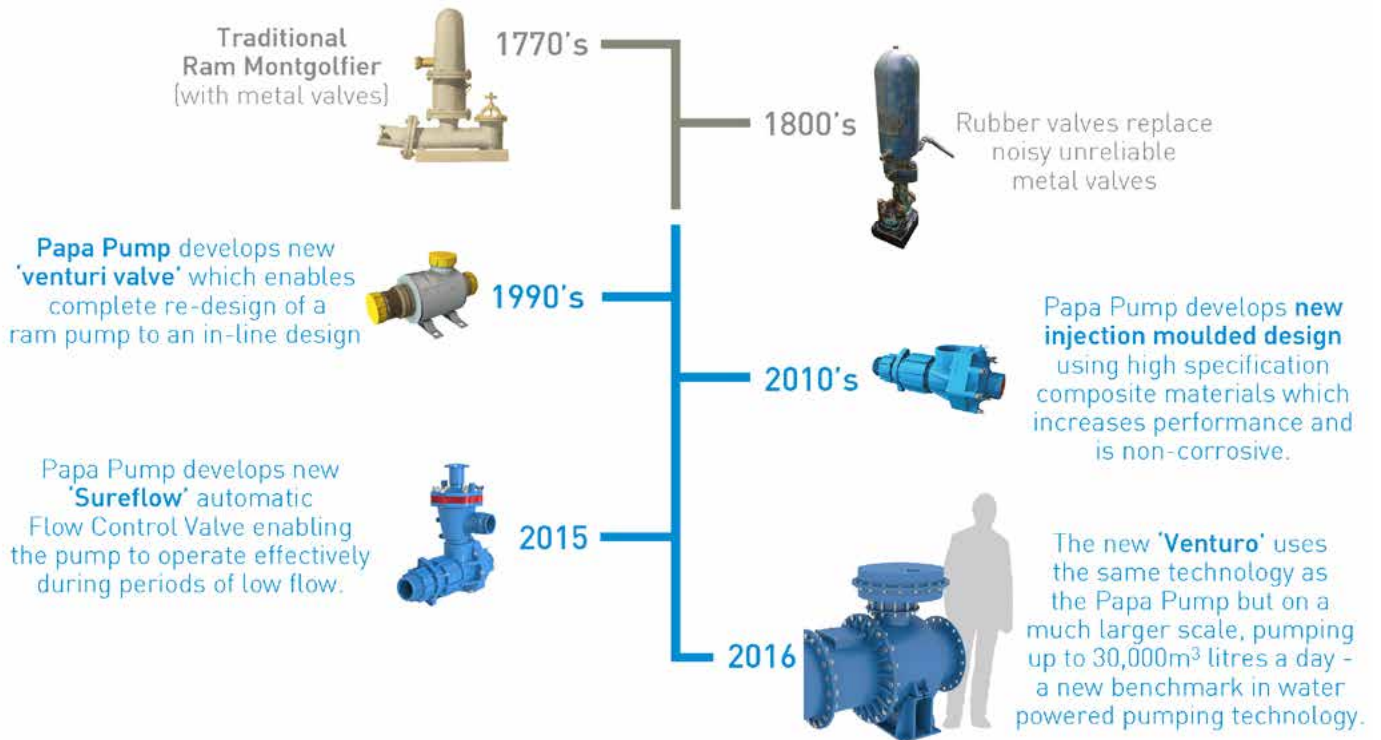
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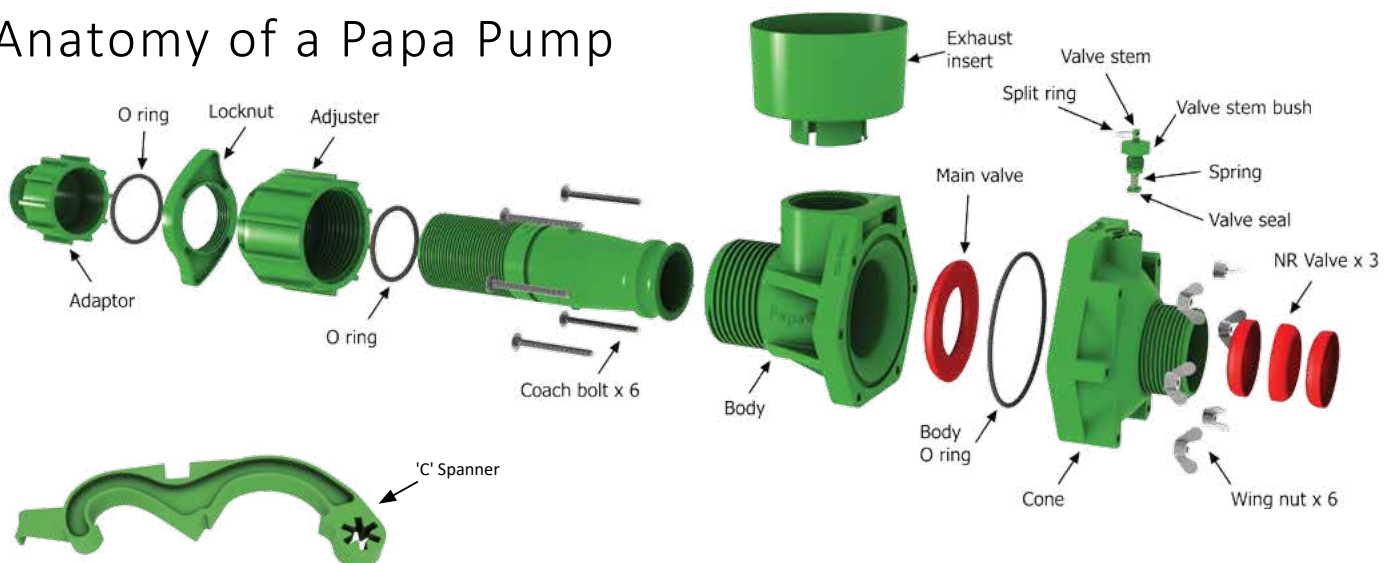
# The History of Ram Pumps

The principles of the Papa Pump technology are not new, it is based on 300 year old ram pump engineering. Unfortunately the technology developed very slowly and the traditional units remain very large and heavy. Then Water Powered Technologies developed the 'Papa Pump' and by using a unique new valve and the latest composite materials, produced a smaller, lighter, stronger, more durable and more flexible product. And due to new innovative production practices, the Papa Pump is much more cost effective than traditional ram pump designs.

## Ram Pumps Timeline



## Anatomy of a Papa Pump



The only moving parts are the rubber valves and these are the only parts that should need replacing every few years. The diagram above shows how the Pump is assembled. A special 'C' spanner is included within the kit for loosening/tightening the wing nuts.

**The wing nuts should be tightened to 'finger tight' and then a further 90° with the spanner. For best results tighten the nuts in diagonally opposite order (similar to a car tyre)**

# Papa Pump Principles

## The Supply Head

**The Greater the Supply Head,  
the More Efficient the Pump**

## The Pump

**The pump will operate without manual intervention  
when at least 50 litres of water per minute  
is supplied to the pump through its supply port**

**A minimum of 70%\* of the water is depressurised and  
ejected out of the exhaust port and returned to the  
watercourse via the overflow pipe**

**A maximum of 30%\* of the water is pressurised and  
delivered to high elevations or long distances**

## Water Delivery

**The distance and the height the water can be delivered  
depends on a combination of the supply head height  
and the amount of flow into the pump (*see overleaf*)**

\*the actual amount is dependent on operating conditions

# Water Delivery - How Much and How High?

The amount of water your Papa Pump System will deliver depends on many variables but the main factors are:

How much water is supplied to the Pump

The height of the Supply Head

The height of the required Delivery Head

The following Pump Performance Chart shows an indication of the amounts of water you can expect based on 60 litres per minute being supplied to a Papa Pump.

## Papa Pump Performance Chart

Delivery Flow (litres per day)

(based on 60 litres per minute through the Papa Pump)



Supply Head (Fall)	feet	metres	Figures shown are amounts of water delivered (litres per day)										metres	feet					
			6	7.5	9	12	15	23	31	46	62	77	92	123					
100	31									25,920.0	20,736.0	17,280.0	15,120.0						
75	23									25,920.0	19,008.0	17,280.0	15,120.0	11,232.0					
50	15									25,920.0	17,280.0	15,120.0	12,096.0	10,368.0	7,776.0				
40	12									20,736.0	16,416.0	12,096.0	9,504.0	8,208.0	6,048.0				
35	11									24,192.0	18,114.0	14,668.0	10,368.0	8,208.0	6,912.0	5,184.0			
30	9									20,736.0	16,416.0	12,096.0	9,072.0	6,912.0	6,048.0	4,320.0			
25										25,920.0	17,280.0	15,552.0	10,368.0	7,776.0	6,048.0	4,752.0	3,456.0		
20	6									25,920.0	20,736.0	14,668.0	12,096.0	7,776.0	6,048.0	4,752.0	3,888.0	2,592.0	
15										25,920.0	19,008.0	14,668.0	11,232.0	8,640.0	5,616.0	3,888.0	3,024.0	2,592.0	1,728.0
10	3	25,920.0	20,736.0	17,280.0	13,824.0	11,232.0	6,912.0	5,184.0	3,024.0	2,160.0	1,728.0	1,296.0	1,296.0	864.0					
9		23,328.0	19,008.0	15,552.0	12,096.0	9,504.0	6,048.0	4,320.0	2,592.0	1,728.0	1,296.0	1,296.0							
8		20,736.0	17,280.0	13,824.0	10,368.0	7,776.0	5,184.0	3,456.0	2,160.0	1,728.0	1,296.0	864.0							
7		18,114.0	15,120.0	12,096.0	8,640.0	6,912.0	4,320.0	3,024.0	1,728.0	1,296.0	864.0	864.0							
6	2	15,552.0	12,096.0	9,504.0	6,912.0	5,184.0	3,456.0	2,592.0	1,728.0	1,296.0	864.0								
5		12,096.0	10,368.0	7,776.0	5,184.0	4,320.0	2,592.0	1,728.0	1,296.0	864.0									
4		8,640.0	6,480.0	4,752.0	3,888.0	2,592.0	1,728.0	1,296.0	864.0										
3	1	5,184.0	4,320.0	3,456.0	2,592.0	1,728.0	864.0	432.0											
2		3,456.0	2,160.0	1,728.0	1,296.0	864.0	432.0												

Of course this chart only shows the performance when you are getting 60 litres supply to the pump but it is useful to show the principles. The chances are the supply figure will be different so you will need to work out the delivery estimates for a supply of 40, 80, 100 litres, etc. This calculation is a difficult one to get your head around, but you will need to be able to use the Performance **Percentage** Chart on opposite page to give accurate delivery estimates.

The following Pump Performance Chart shows the percentage that can be applied to the supply flow to work out an estimate for the delivery amount.

Supply Head (Fall) in Metres	20						28%	22%	20%	17%	13%
	15					30%	24%	18%	14%	11%	9%
	12					24%	21%	14%	11%	9%	7%
	10				28%	20%	17%	11%	9%	7.5%	5.5%
	8			30%	20%	18.5%	15%	10%	7%	5%	4%
	6		30%	24%	20%	14%	11%	7%	5.5%	4%	3%
	5		27%	19.5%	15.5%	10.5%	9%	6%	4%	3%	2%
	4		24%	15%	11%	7%	6%	5%	3%	2%	1.5%
	3	30%	19%	13%	10%	6%	4%	2.5%	2%	1.5%	1%
	2	17%	10.5%	6%	4.5%	3%	2.5%	1.5%	1%		
	1	6.5%	4%	2%	1.5%	0.5%					
	5	10	15	20	30	40	60	80	100	120	
	Delivery Head (Lift) in Metres										

If you take an example where the supply head is 8 metres and the required lift is 60 metres, you can see by the above table that the amount of water you can deliver is 10% of the supply amount.

**Therefore, if there are 80 litres per minute going through the pump, the delivery amount will be 8 litres per minute. (80 x 10% = 8)**

Be aware that these are just estimates and there are other factors that can influence the flow rate, such as friction.

## What about the delivery distance?

Sometimes it's more about distance than height. The good news is that the water delivery amounts diminish very slightly over long distances, mainly down to friction. The loss is so low that it is not measurable but bear in mind a slight loss may occur over very large distances.





# Site Layout Principles

A good initial assessment of a site can highlight positives and negatives early, and save a lot of time and effort later on.

These are essential requirements for Papa Pump to work efficiently:

## A Natural *Flowing* Water Source is Required.

For example: A Spring, a Stream or a River.

(Ponds and Lakes can be used but there must be a fall away from the pond/lake to create a Supply Head from which water will flow into the pump)

The water source must have a fall of at least 1 metre on the property to create a Supply Head.

**The higher the supply head, the more efficient the pump.  
Always use the maximum supply head available.**

### PLEASE NOTE:

**✘** THE PUMP IS NOT DESIGNED TO BE PERMANENTLY SUBMERGED IN WATER  
(This will not harm the pump but it will not work properly)

**✘** THE WATER SUPPLY SHOULD NOT BE FED DIRECT FROM A STREAM OR RIVER  
(The flow must be regulated at least by the Supply Tank)

**✘** YOU SHOULD NOT USE WATER FROM A NATURAL WATER SOURCE  
WITHOUT FILTRATION  
(There are 2 Seradisc Filters included in Papa Pump Kit - These will filter any debris and particulates that would interfere with pump efficiency)

# The Site Visit

Your initial contact by phone should sort out the good prospects from the unsuitable sites.

Once you have identified a good site you will need to measure the Supply Flow and the Supply Head. These, with the intended delivery height, will give you all the figures you need to work out the delivery amount. (See pages 6 and 7)

## Measuring the Flow of a Stream

You can measure the flow rate from your stream or spring by the following method:

You can use a wide board to dam the stream.

Before you place the board across the stream, cut a 'V' shape into the top of the board.

When water flows through the 'V', time how long it takes to fill up a litre jug. E.g., If it takes a second to fill up a litre jug then this equates to 60 litres per minute, which is the recommended 60 litres per minute minimum to operate a Papa Pump.

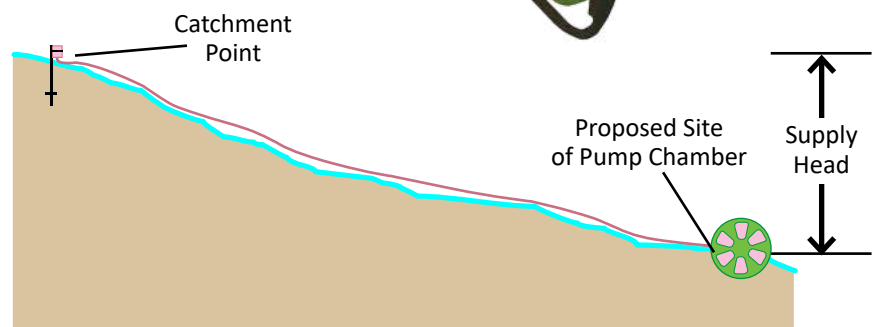


## Measuring the Supply Head

**The minimum supply head required for the Papa Pump to operate effectively is 2 metres.**

If you don't have a level to hand, you can measure the supply head by using a Selwyn Level:

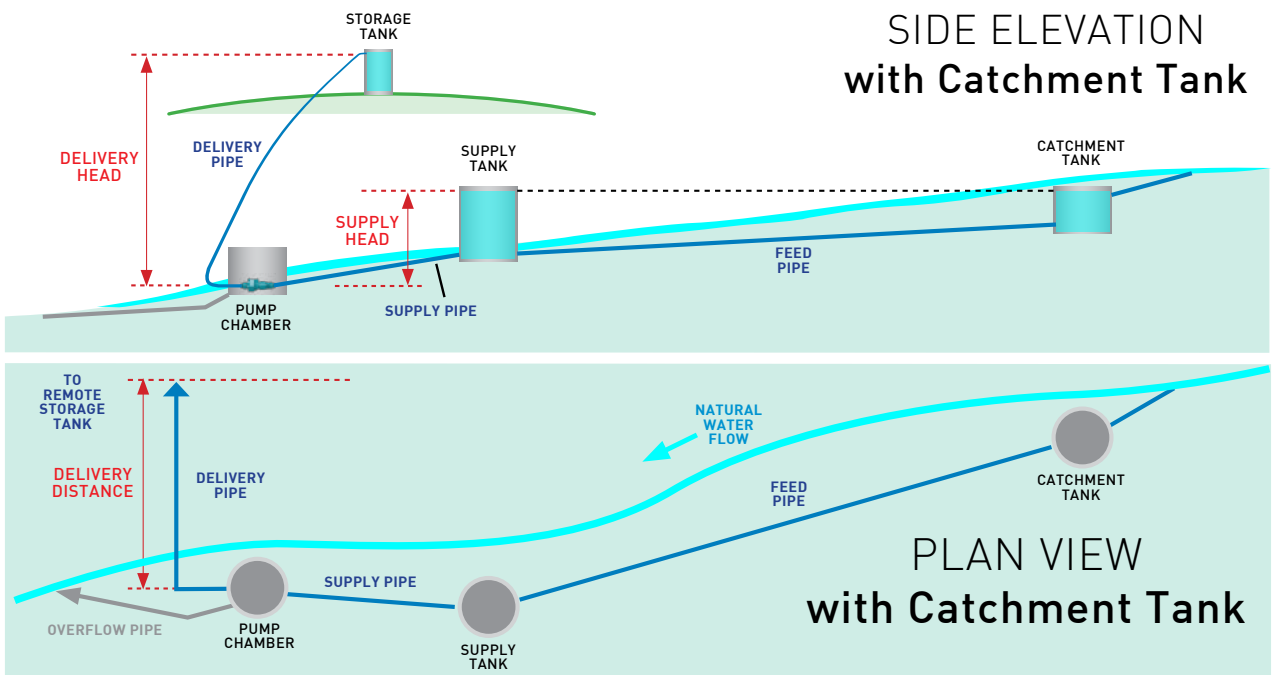
1. Place the stake in the river at the catchment point.
2. Reel the hose out down to the site of the proposed pump chamber.
3. Wait a couple of minutes until the reading on the gauge settles and then read the figure measured in Bar.



4. Convert the Bar reading to metres: 1 bar = 10 metres.

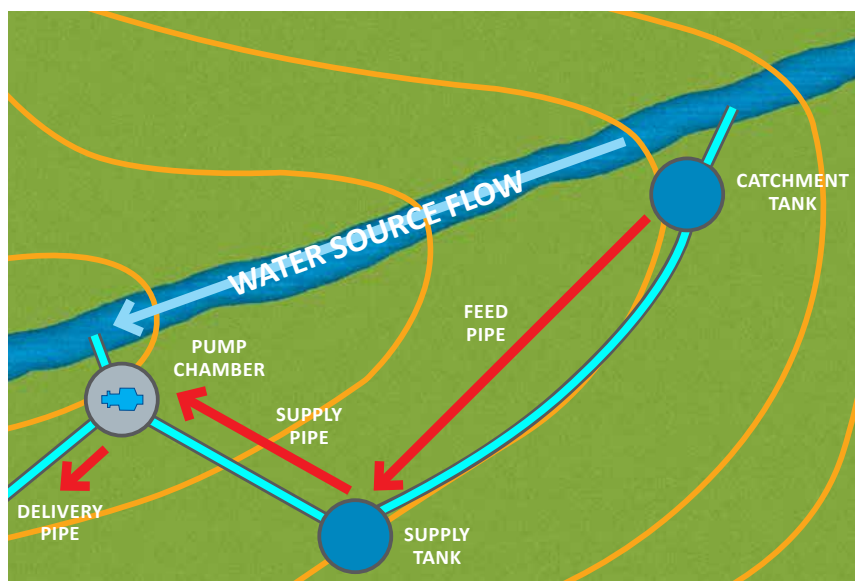
As an example, a reading of 0.46 Bar will equate to 4.6 metres supply head.

# Correct Site Layout



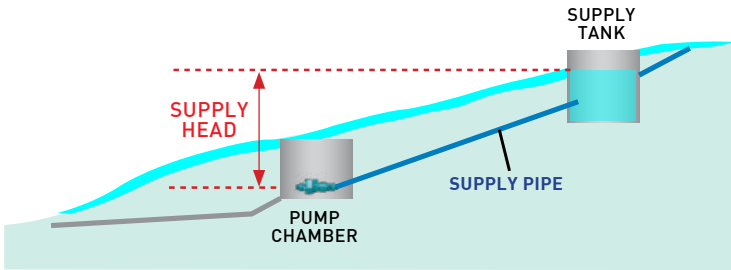
## Using the contours of the land

The route of the feed pipe doesn't have to follow the stream or river. You can place the Supply Tank on the same contour as the catchment point to create a greater supply head with a shorter Supply (Drive) Pipe so that the Pump will deliver more water.



# When a Catchment Tank is not required

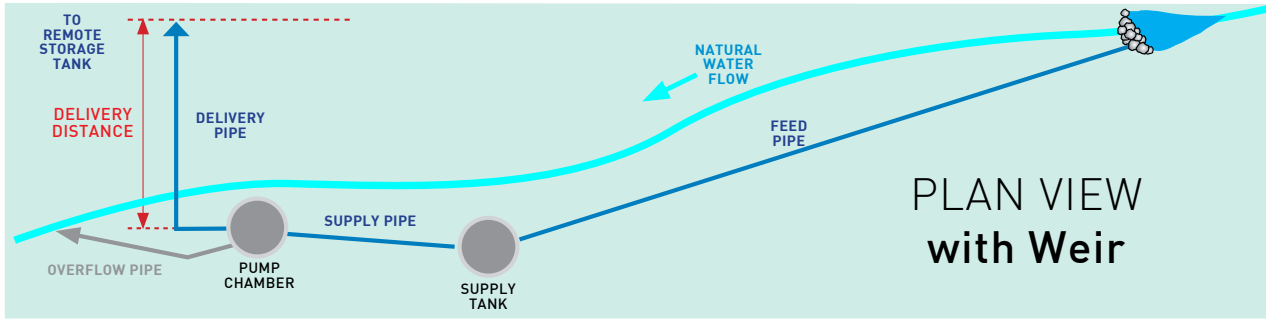
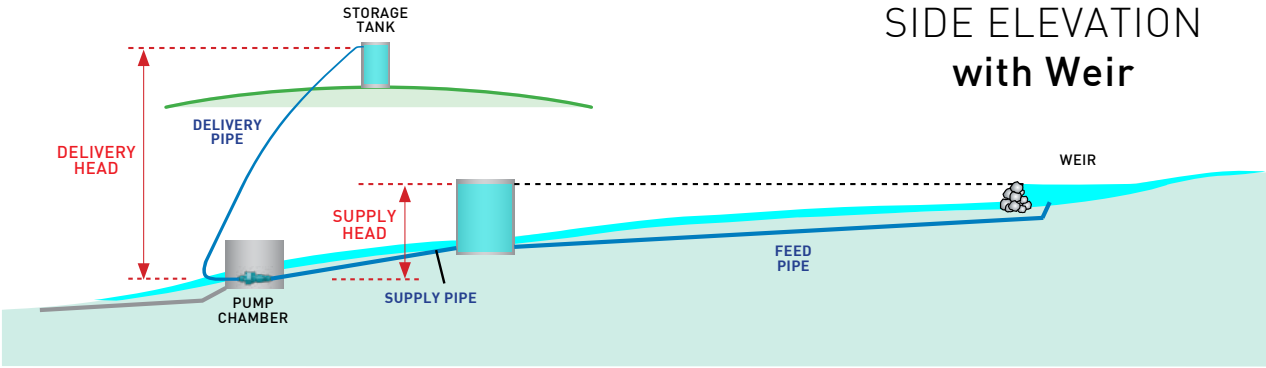
**Springs or Streams with a high Supply Head do not require a Catchment Tank**



If the Spring/Stream is on a steep gradient you can achieve a good Supply Head within a small distance. In this case, water can be fed directly to the Supply Tank.

## Using a Weir

You can also use a weir to direct feed the Supply Tank.





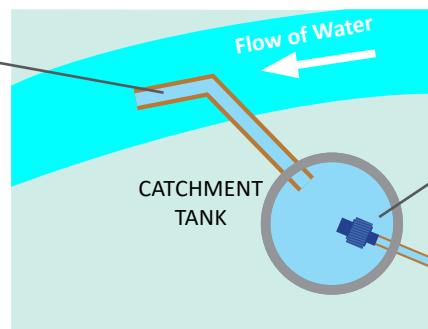
# Installation

## The Catchment Tank

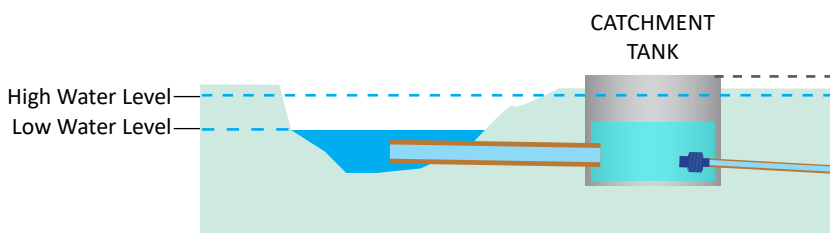
**A filter should be fitted to the Feed Pipe to prevent particulates affecting the efficiency of the Pump.  
2 Seradisc Filters are included with every Papa Pump Kit**

The Catchment Tank (or Weir) acts as the first stage of filtration from large debris and allows the settlement of sediment. A Catchment Tank is recommended for rivers and streams where there is a great difference between high and low water levels or for small flows (for instance, water from a spring).

**Please note:** The pipe inlet **must** face downstream



It is highly recommended that a Seradisc Filter is fitted to the Feed Pipe to protect the Pump from debris.



**Please note:** The high water level **must not** exceed the height of the tank



Seradisc Filters are a specially designed high performance filter/screens which will protect your pump from ingress of debris and air. 2 Seradisc Filters are supply with every Pump Kit.

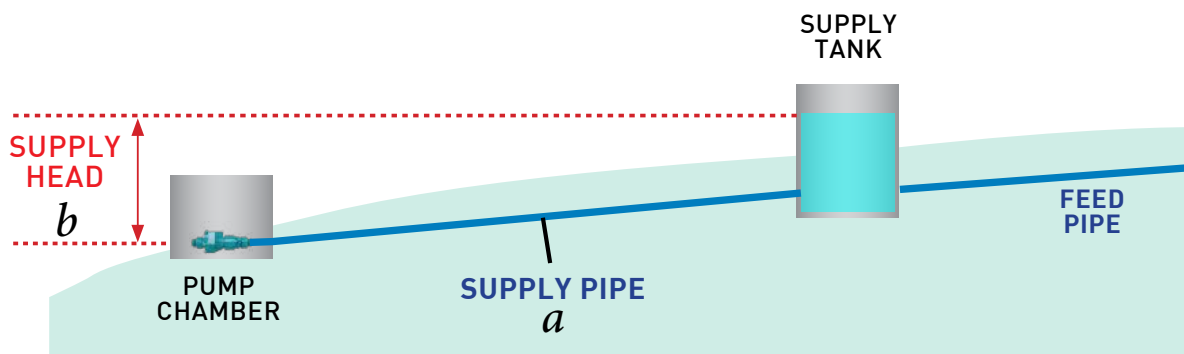
Recommended Pipe for Inlet Pipe and Feed Pipe:  
**110mm Soil Pipe** (up to 2 pumps) or **150mm Soil Pipe** (3+ pumps)

# The Supply Tank


**Papa Pump Systems with low Supply Heads and long Feed Pipe distances require a Supply Tank**

**A Minimum Supply Head of 1 metre is required but 2 metres is recommended for efficient pumping**

Streams or rivers with small gradients may require the water to be transported a long distance to the pump to gain a sufficient Supply Head. The Supply Tank should ideally be close to the Pump Chamber so that the length of the Supply Pipe is between 5 and 7 times the Supply Head. (e.g. If the Supply Head is 2 metres, the Supply Pipe should be between 10 and 14 metres)



$$a = b \times 5 \text{ (min.)} / 7 \text{ (max.)}$$

**2 inch**  (internal diameter) **Steel Pipe** is the ideal material for the Supply Pipe but to reduce costs **63mm MDPE** (Medium Density Polyethylene) can be used on long supply pipe lengths

Rules for the use of Steel/MDPE pipe depend on the height of delivery:

**If the Delivery Head is less than 15 metres**, the Supply Pipe can be entirely 63mm MDPE

**If the Delivery Head is greater than 15 metres**, the Supply Pipe must be at least one third Steel Pipe with the rest being MDPE (with steel portion being at the Pump Chamber end)

**DO NOT** use flexible hose for the Supply Pipe.

**IT IS IMPORTANT THAT ALL PIPES ARE KEPT AS STRAIGHT AS POSSIBLE**

(Bends in the pipe will produce friction and reduce the efficiency of the Pump)

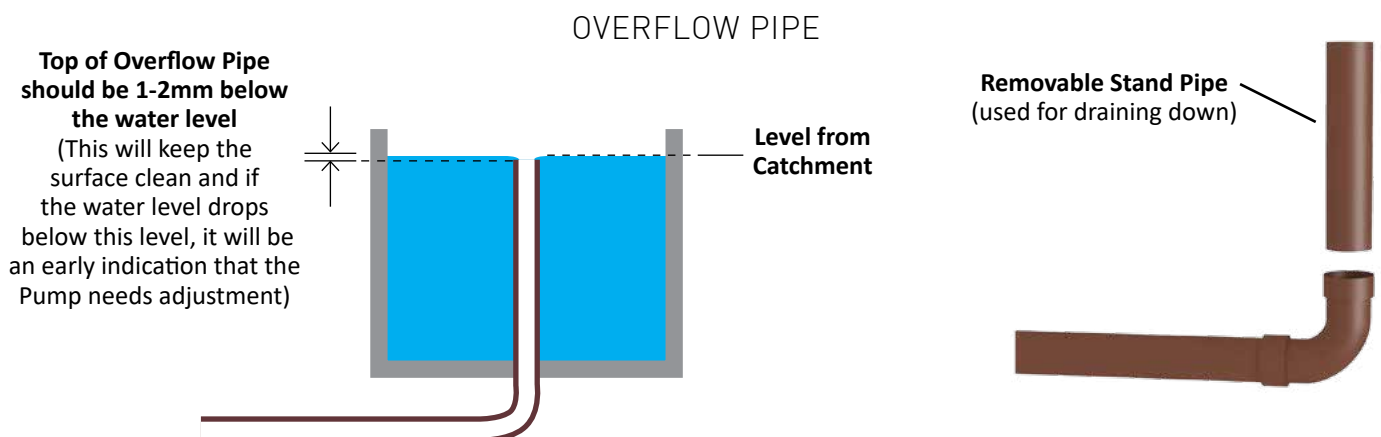
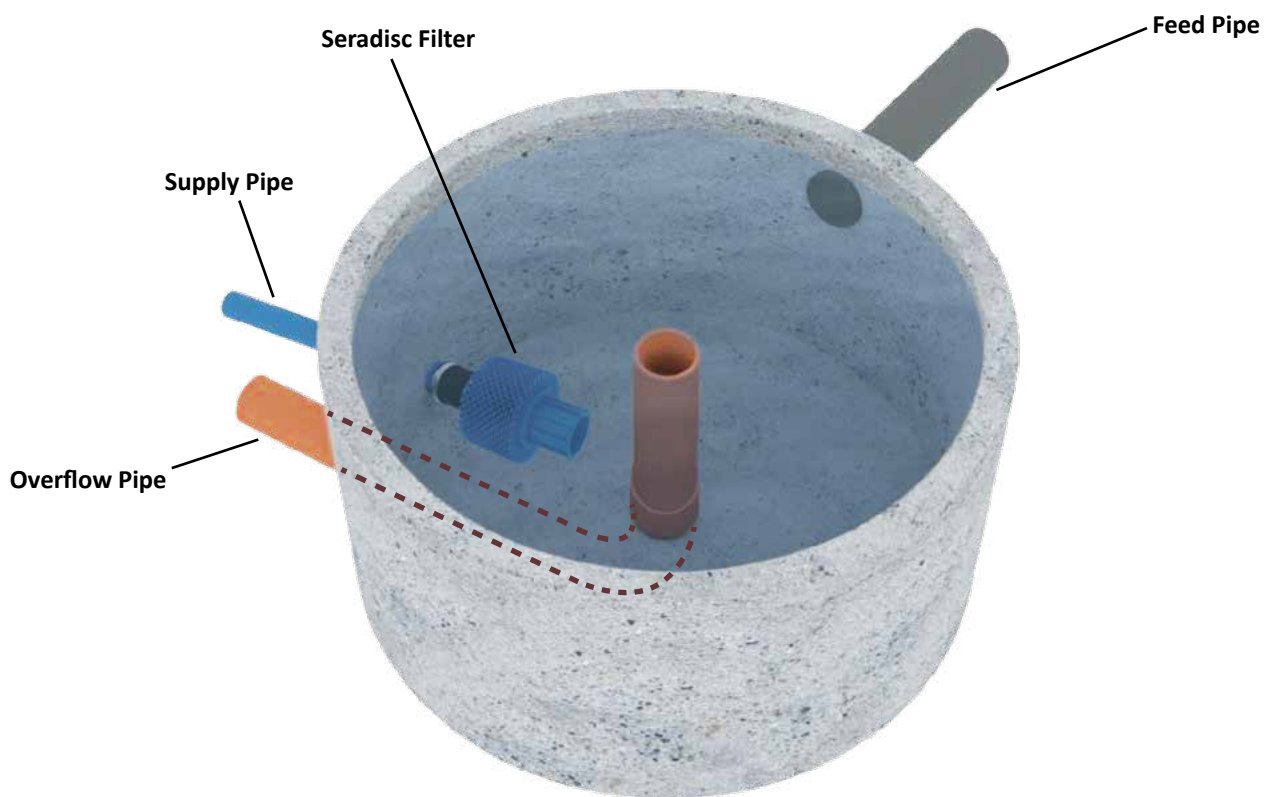
# The ideal Supply Tank installation

Installing the Supply Tank correctly is important if you want the Papa Pump system to work to maximum efficiency.

The minimum size of tank should be 1m depth and 1m internal diameter.

The Feed Pipe can come into the side of the tank or from underneath.

Cover your tank to keep free of debris.

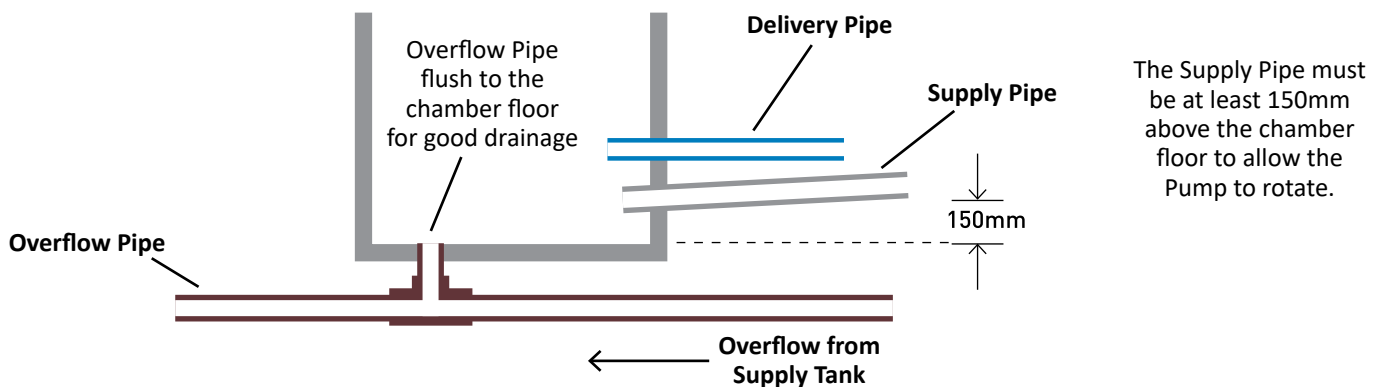
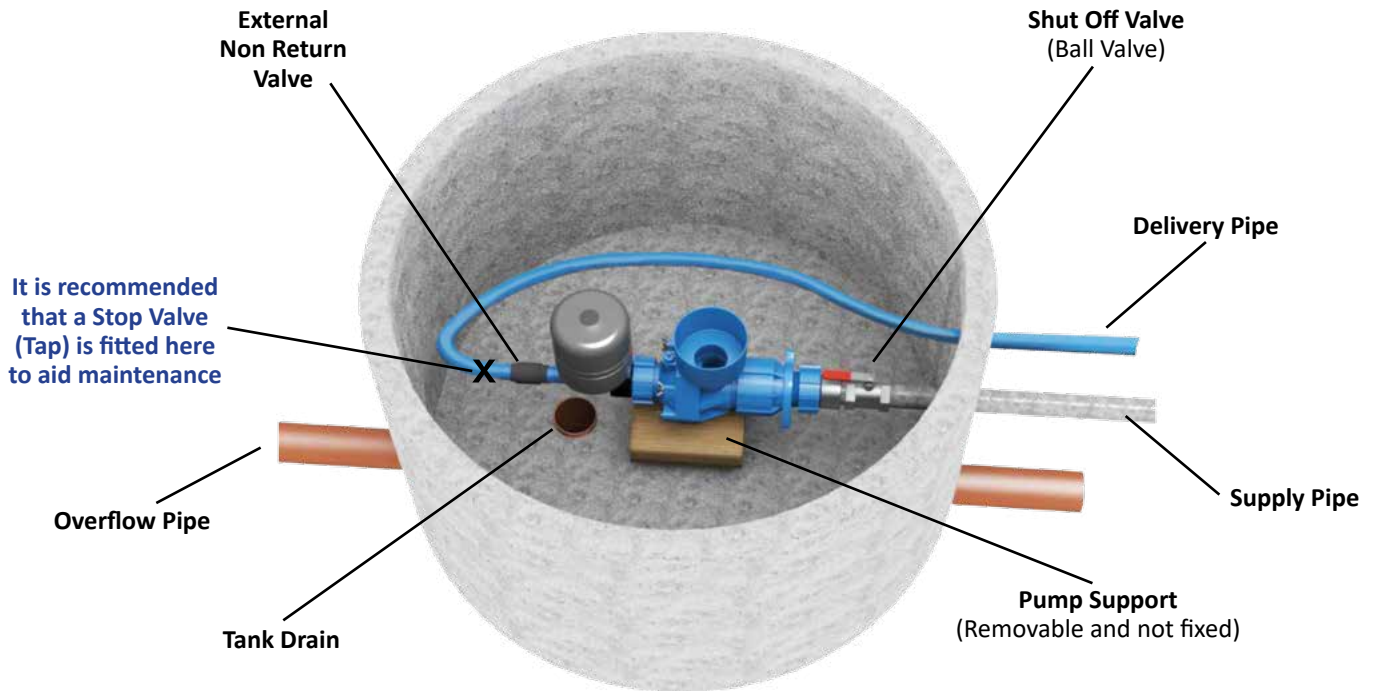




# The ideal Pump Chamber installation

A 1m depth and 1m internal diameter tank can house up to 2 Papa Pumps.  
If 3 or more Pumps are required you will need a larger tank.

Cover your tank to keep free of debris.



## Delivery Pipework, Tanks and Troughs

A stop valve should be installed at the Pump end of the Delivery Pipe to allow for maintenance and replacement of non-return valves, etc., without having to drain the whole delivery pipework.

Water troughs can be branched off the main delivery pipe as long as they are fitted with float valves. In these cases, the delivery pipe should be plumbed into the bottom of the storage tank to allow for back flow when demand is high.

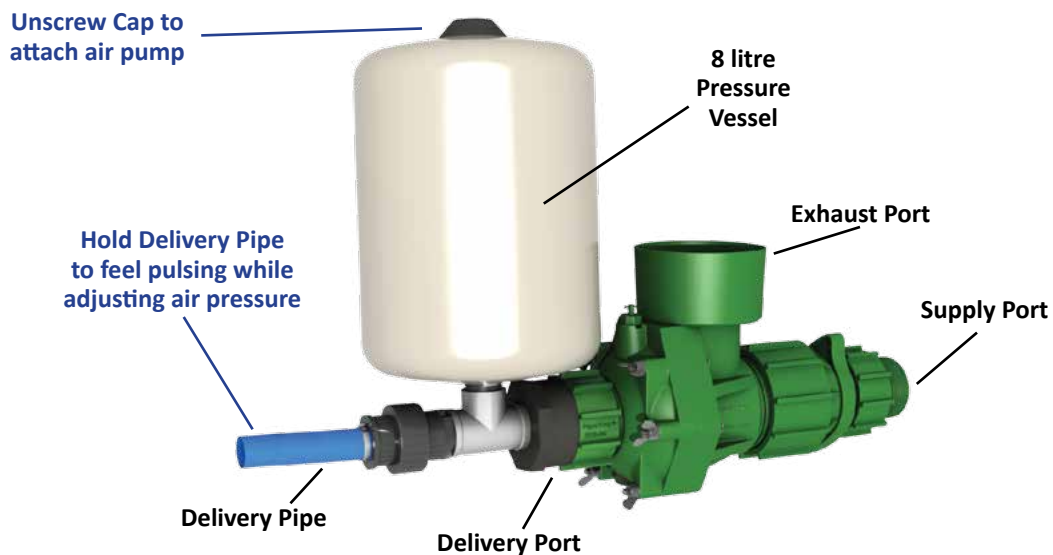
The highest off-take requires an overflow either back to the source or ditch.

# Using a Pressure Vessel

An 8 litre Pressure Vessel comes with the Papa Pump Kit. It should be attached to the delivery port and will reduce pulsing in the delivery pipe.

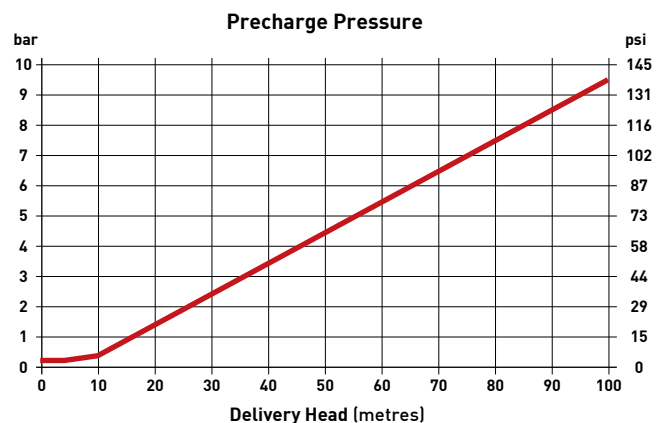
**It is important to set the air pressure in the pressure vessel to 0.5 bar below the delivery head pressure BEFORE attaching the pressure vessel to the system**

You can use any motor tyre air pump attached to the top of the Pressure Vessel to adjust the pressure. Once attached to the system, hold the delivery pipe as described in the following schematic and adjust the air pressure until the pulsing in the pipe is at it's minimum.



## Pre-charging the Pressure Vessel

1. Stop the Pump
2. Unscrew the Pressure Vessel **a maximum of 2 turns** to release pressure.
3. When pressure has been fully released, re-tighten the Pressure Vessel
4. Adjust pressure by using an air pump attached to the top of the Pressure Vessel
5. Re-start the Pump



Unscrew 2 turns maximum!

**CAUTION! DO NOT FULLY UNSCREW THE PRESSURE VESSEL WHILE PRESSURISED**

Stop the pump and unscrew a maximum of 2 turns. Wait until water pressure is fully released before removal.



# Pump Installation

## Flushing the Pipe System Prior to Pump Installation

It is very important to flush the pipe system prior to pump installation to prevent the ingress of harmful stones and debris which **will** cause serious damage to the Pump.

### Flushing Procedure:

1. Using PTFE tape (thread tape), fit the 2 inch Shut Off Valve supplied with the Pump onto the Supply Pipe in the Pump Chamber
2. Close the Valve and allow the system to fill with water
3. When the system is full, open the Valve and allow water to exit for a while to ensure all debris is washed from within the pipework, then close the Valve
4. Remove the overflow/flush standpipe in the Supply Tank to allow any loose material to be flushed away, then refit the standpipe and allow the system to refill

*\*Ensure that Seradisc Filters are installed on both the feed and the Supply Pipe intakes to prevent ingress of debris into the system during normal operation.*

### Installing the Papa Pump:

1. Using PTFE tape (thread tape), fit the BSP Adapter into the 2 inch Shut Off Valve
2. Screw the Papa Pump into the Adapter until hand tight and adjust the Adaptor so that the Pump is in the correct position, i.e., with the exhaust facing upwards
3. **Support the underside of the Pump with a suitable wooden block to alleviate the weight on the Shut Off Valve**
4. Unscrew the release coupling on the hose assembly (located after the tee) and attach the assembly to the Pump ensuring that the rubber valves in the Pump are present and correctly installed and that the securing tape has been removed. Check that the tee connector is vertical and refit the release coupling
5. Using PTFE tape, install the Non-Return Valve on to a suitable pipe connector and fit to the Delivery Pipe ensuring that the pipe is not tight or twisted
6. Adjust the air pressure in the Pressure Vessel to 0.5 bar below the Delivery Head pressure, (e.g. with a delivery head of 50m, the air pressure will be set to 4.5 bar. Using PTFE tape, install the Pressure Vessel into the delivery tee
7. Install the Exhaust Extension into the Exhaust Port of the Pump.

## Installation Procedure (*continued*)

### Starting the Pump:

To start your pump, any air present needs to be expelled from both the Supply Pipe and the Pump. This process is referred to as 'priming' and the time required to achieve this will depend on the pipe length and gradient. A short pipe and steep gradient will allow the system to be primed quicker than systems with have long pipes and gradual gradients.

### The operational sequence required to prime and adjust the Pump is as follows:

1. Turn the adjuster in the direction indicated on the body of the Pump (+) to open the Pump main valve fully. The 'C' Spanner can be used to assist if required
2. Open the Shut Off Valve so that the water is allowed to flow through the Pump and expel any air. (Be careful not to allow the Supply Tank water level to fall thus allowing air to enter the Supply Pipe when priming. The Shut Off Valve can be closed intermittently to allow this level to be maintained during the process)
3. With most of the visible air removed, turn the adjuster in the opposite direction (-) until the Pump 'beats'. If the Pump stops and no further water flows, close the Shut Off Valve, lift up the Pressure Relief Valve (located next to the Pump Exhaust Port) and release. Re-open the Shut Off Valve. Repeat this process until the Pump operates continuously
4. Adjust the Pump setting with the Adjuster so that a small overflow is permitted from the Supply Tank. Lock the Adjuster with the lock nut.

*If the Pump operates with an irregular beat, this means that air is still present in the Supply Pipe. The Pump will often 'self prime' when operating, provided the air is first removed and the Pump does not stop.*

5. Check the delivery of the pump at the highest point using a measuring jug. Remember that, depending on the Delivery Pipe length, it can take a long while for the system to fill. You can also check the performance of the Pump by fitting a pressure gauge in the Delivery Hose line.

**Note: The slower the pulse, the greater the flow through the Pump and the amount pumped.**

# Notes

Lined area for notes.





## Marketing & Sales

Visiting a site is the opportunity to inform customers of the benefits and features of a Papa Pump system. We're confident that the benefits and features of the Papa Pump will do most of the selling for you but don't leave your potential customer without reminding them of the following points...

**The Papa Pump operates without any power or fuel, just the natural energy produced by a flowing water source.**

**It is environmentally friendly using no fossil fuels and emitting zero CO<sub>2</sub>.**

**It is small, light and made from very strong non corrosive material.**

**It will operate 24 hours a day without attendance.**

**You can store water during wet periods for use in drought periods.**

**It can operate with small and variable flows.**

**It has only 2 moving parts (the rubber valves) which would only have to be replaced every few years (a very simple procedure) so very little maintenance.**

**Some customers have run their Papa Pumps for many years without having to do a thing!**

**INSTALLATION IS SIMPLE - Many farmers have installed a Papa Pump themselves.**

**It is about a quarter of the price of a traditional cast iron ram pump.**

**The RETURN ON INVESTMENT (for the whole installation) is usually between about 2-5 YEARS and from then on its FREE WATER FOR LIFE**

**A Papa Pump will benefit their family for generations to come.**

**If you have an old ram pump, THE PAPA PUMP CAN RETRO FIT to an old system and you can save ££££'s on installation.**

**WATER PRICES WILL CONTINUE TO RISE - Why wouldn't you use the FREE WATER flowing on your land?**







## Contact Details

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