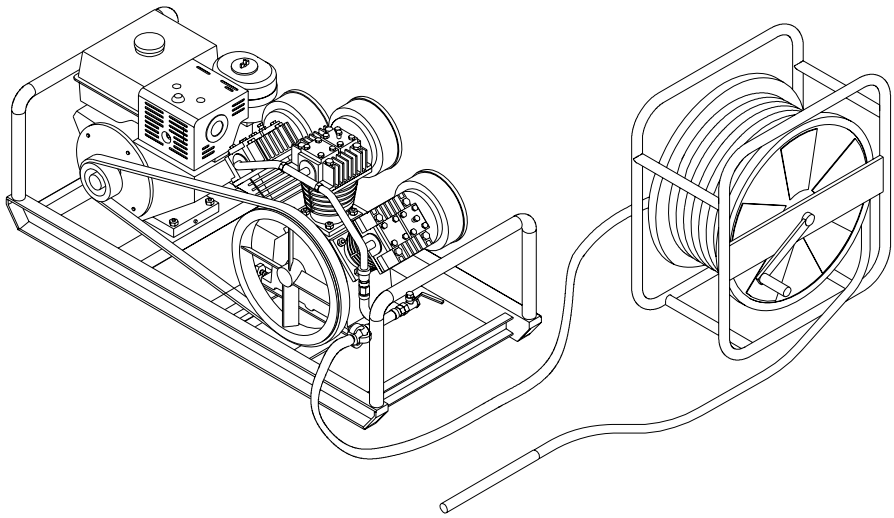
PAT BOREHOLE DEVELOPMENT COMPRESSOR

OPERATING PARTS BOOK



PAT BOREHOLE DEVELOPMENT COMPRESSOR SET

An explanation of how it works

Compressed air in small or large volumes is the best and quickest way to develop a 'mud drilled borehole' or indeed re-develop any borehole that needs cleaning.

The job of 'development' :

- Remove all the residue drilling mud from the borehole.
- Creating a graded filter between the water bearing formation and the well screen allowing the water to pass freely through the screen slot whilst re-taining filter material in the formation. The filter can be a a placed gravel pack or can be created from the natural sediments that are in the aquifer.
- Maximise the clean water flow into the well.

Using a high capacity air compressor that is capable of drilling a rock borehole makes an easy job to develop a borehole by simply inserting drill pipe to a depth near the well base and simply powering the water up and out of the borehole through the annulus with the huge volume of air that is available.

Not all rigs are equipped with these large capacity rock drilling compressors.

Very little air volume or compressor size is actually required to lift a significant volume of groundwater if as an example the air is used in a small diameter 20mm air hose inside and a 50mm bore eductor pipe This in effectively becomes an 'airlift pump'

A rig drilling in rock can usefully a borehole development compressor in place the big compressor allowing it to move off to another drill site.

An explanation about air compressor capacity.
Air Compressors produce compressed air measured by volume & pressure . Delivery volume - quoted as CFM (cubic feet per minute) or litres/sec - the volume will largely dictate the volume of water that could be displaced. The other attribute is pressure - this will dictate the depth under water it is possible to deliver air 1 bar = 10m head

With good submergence of the air tube & eductor pipe it is possible to lift a ratio of air vo-lume to pumped water volume of 10:1 So the PAT well development compressor model delivers 27 cfm can pump in excess of 1 litre/sec (4,000 litres/hour).

Additionally the PAT well development compressor develops 10 bar air pressure this is sufficent to lift a 100m column of water.
Good submergence is defined as being better than a 60% submergence of the air pipe tip & educator pipe under the water rest level - or more accurately the static level.

Example *60% submergence exists in a 100m deep well with educator & air pipe near the well base and with a water rest level of 40m.*
At this submergence ratio the water will pump at very near a constant discharge rate. Below this submergence ratio the water volume will drop off and be ejected from the borehole in 'slugs' of water - a rush of water followed by almost none.

Practically many water supply holes unless drilled into confined aquifers that rise high up the hole to rest are developed at less than optimum submergence and the air lift flow 'slugs' out the hole erratically. This erratic flow is very good aid to well development as it allows loose and fine material on the outside of the well screen to be washed inside and up and out of the well.

So as the submergence ratio decreases water volume blown out decreases the threshold minimum of effectiveness is about 20%.

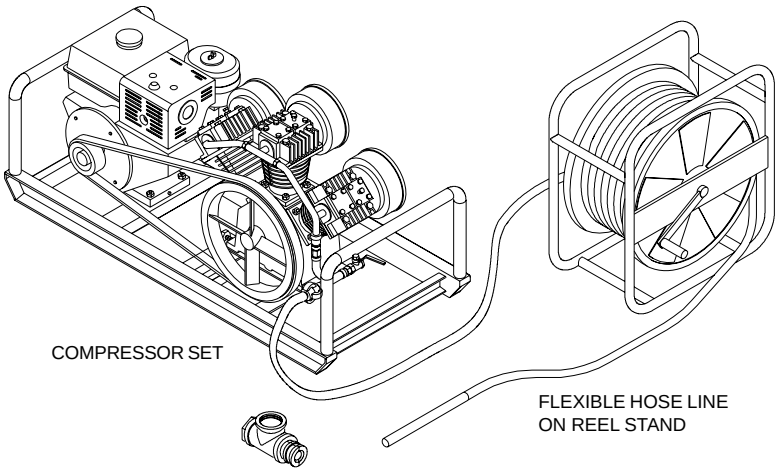
Example of Minimum Submergence

An eductor pipe and air hose set at 50m with water rest at 40m depth

Turbulence and an increased washing action can be achieved by lowering the hose beyond the depth of the eductor pipe leaving the hose to blow for a few minutes - then raise up 50cm + inside educator to revert to water removal.

Borehole Developing Compressor - Operating Manual

The unit is used to clean and develop the fines from a just completed borehole that has been drilled and had casing & screen installed



How to install:

1. Insert the 2" uPVC 2m long eductor pipes one by one to the base of the completed well - removing the last pipe so that the tubes are within 2m of the hole bottom.

Note the distance tube is off the bottom. Use pipe wrenches to support the column during lowering and removal from the borehole.

Tee piece with locker clamps & hose

2. Fit the threaded tee and an optional eductor tube to direct water away from borehole area

3. Lower the air hose down the centre of the eductor pipe to hole bottom - lift hose up the distance the eductor pipe is off the bottom of the well + 50cm. Wedge hose in position using the locker clamps.
(This is the 'pumping position' see illustration 1)

4. Connect air hose to air compressor.

Tee valve open for engine starting

5. Open tee valve so compressed air can discharge to atmosphere thus allowing engine to be started effectively off load. Start engine.

6. When engine warm - close open valve and open air flow into hose.

The injected air will then lift water to the surface (see following notes about percentage of submergence to understand if flow is constant or surging)

Best practice is to let the water discharge initially clearing the well of residual drill mud and large particles.

When the discharging water is showing signs of cleaning/clearing the development proc-ess can be stimulated by lowering the air hose beyond the educator pipe and allow air to lift water in the annulus between well casing/screen and eductor pipe 'The surging position' *(see illustration 2)*

After a few minutes pull the hose back into eductor pipe and allow water to discharge again in the 'pumping position' - noting if more sediments are being washed up.

At first discharge will be full of fines & drill mud - but will become clean

A perfectly developed well results in the water discharging with low turbidity ie crystal clear and with no further sediments being washed in even after the air hose has been lowered and raised from the 'surging position'.

Crystal clear water - already in demand

Note:
Read the following notes 'how does it work'. The well yield discharged by the air devel-opment compressor depends on submergence ratio of the airline below the static pumped water level - and the air flow. To properly determine well yield & static pump level after well developed should be undertaken by a separate test pump.

Illustration 1 **Surging position**

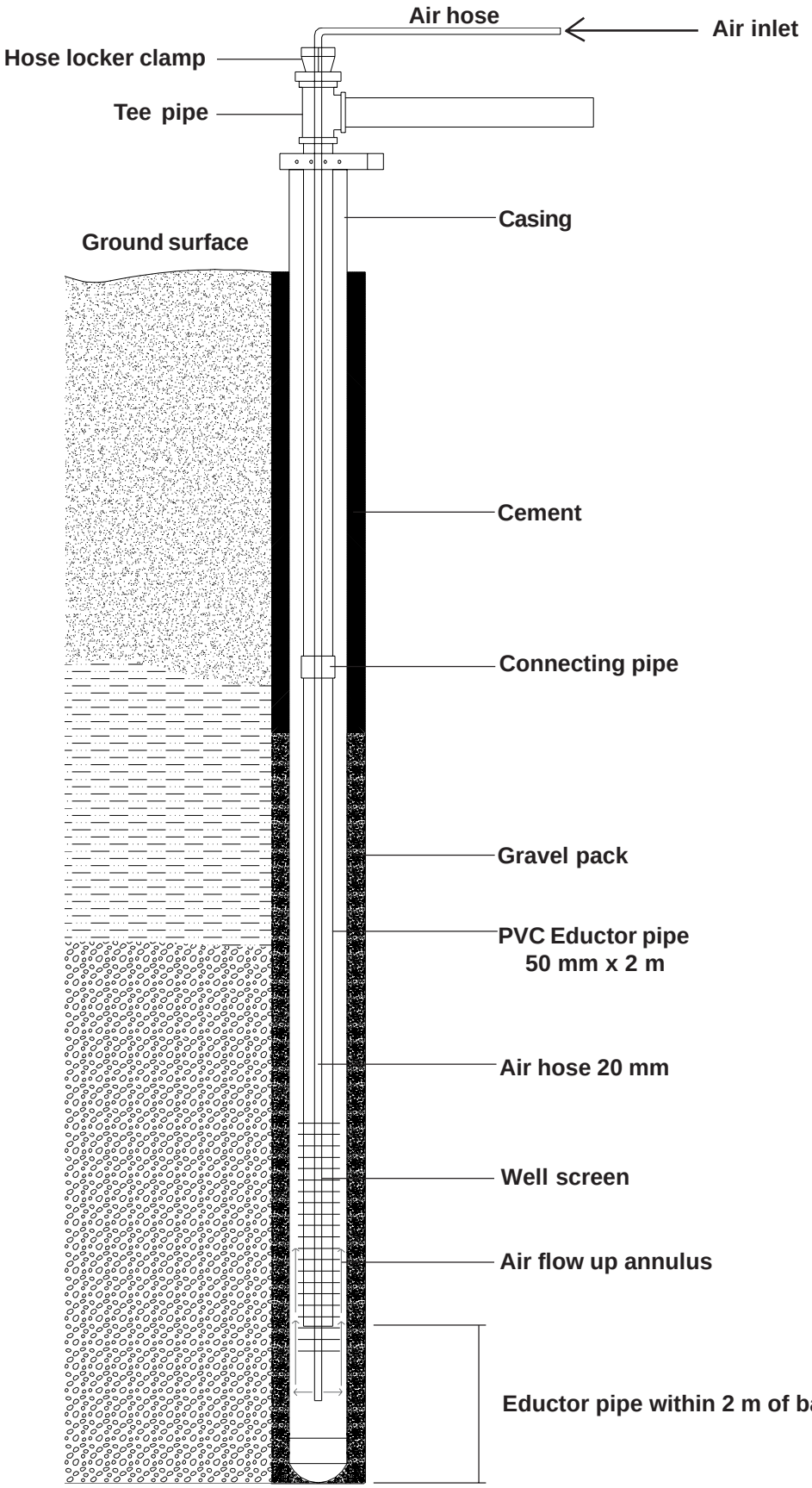


Illustration 2 **Pumping position**