The Original Environmental Inertial Pump

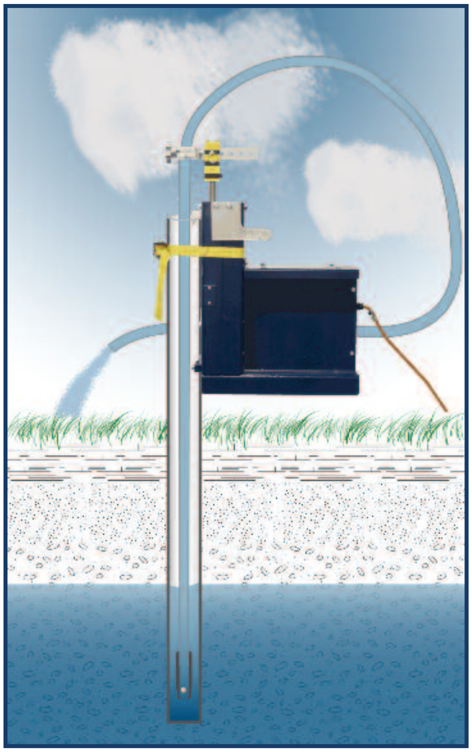
our most popular system

standard flow

high flow

low flow

micro flow



THE INERTIAL PUMP IN ACTION

The Waterra Inertial Pump is extremely well suited for sampling all types of well parameters, including volatile organic compounds. It is frequently used to test permeability, acquire samples for metals analysis and develop new monitoring wells or re-develop old ones.

Constructed from a variety of materials including stainless steel, polyethylene, Teflon and acetal thermoplastic, inertial pumps can survive in any chemical environment likely to be encountered. Inertial pumps have even been used for such diverse applications as sampling ships bilges and chemical tanks.

The Waterra Inertial Pump is perfectly suited to sampling in 2" monitoring wells and can also be used in 4" wells. The Inertial Pump can also go into much smaller installations, even as small as 3/8" ID, making it perfect for many drive point installations or larger wells with multiple pieces of equipment already installed.

Waterra offers one of the best tools for the development of monitoring wells — the **Waterra Inertial Pump**.

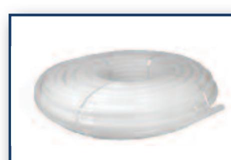
The Waterra Inertial Pump was developed in Canada in the 1980's when it was realized that there was a demand for an efficient, reliable and inexpensive pump, suitable for purging and sampling groundwater monitoring wells. The Waterra Inertial Pump embodies all three of these characteristics.

Its simplicity has allowed the Inertial Pump to be adapted to a wide variety of sizes, making it suitable for numerous applications. It will also perform well in harsh environments that would ruin other more expensive pumps. Today, it has become one of the most prolific devices for purging and sampling monitoring wells.

Waterra manufactures foot valves in a broad range of sizes to suit most monitoring well applications.

FOOT VALVES

ACTUATORS



TUBING

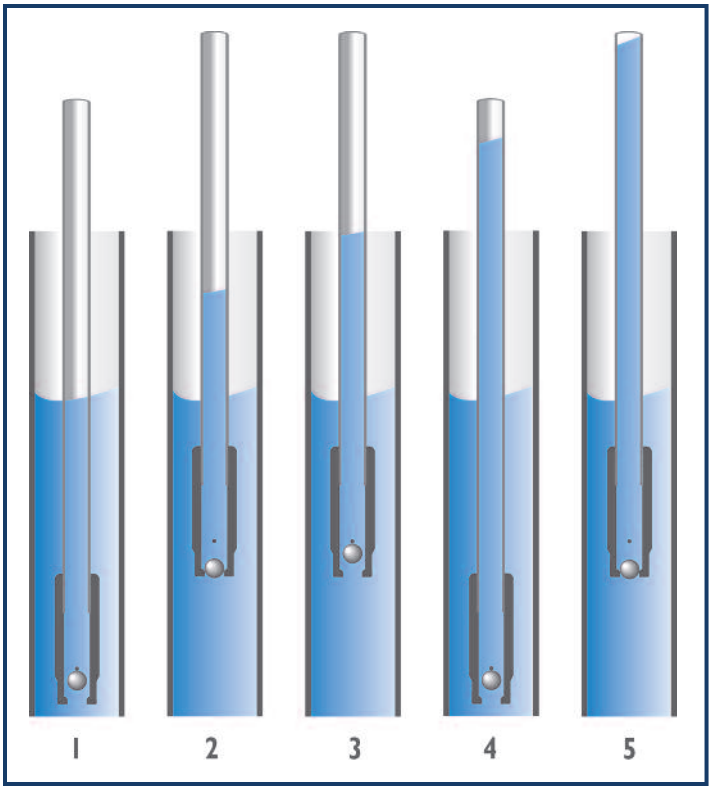
SYSTEM ELEMENTS

Waterra's Inertial Pumping System consists of a foot valve, an actuator and some tubing.

Inertial Pump Operation

step by step

inertial pump



Step by Step Operation

1 The inertial pump is installed in the well. The one way foot valve lets water into the tubing. The water level within the tube is the same as the head level in the well.

2 Operation of the inertial pump begins with a rapid upstroke. The weight of the water column within the tube keeps the valve closed during the upstroke. The water level within the tube is raised above the head level in the well by the length of the pumping stroke.

3 At the end of the upward stroke, (2) the water within the tubing continues to move upwards because of its momentum. The distance it moves is to a large degree determined by how rapidly the upstroke was applied to the tubing and how effectively this energy was transferred to the bottom of the well where the valve is located. As the water within the tubing moves upwards, the valve opens and more water is drawn into the tubing. The rate at which water enters the tubing is effected by how much momentum was imparted to the water in the tube and the depth of submergence of the valve.

Greater submergence increases the pressure differential at the end of the upward stroke and increased the inflow rate.

4 Water continues to flow into the tubing during the downward stroke. The valve closes at the end of the downward stroke.

5 The cycle is repeated and the water rises in pulses with each pumping stroke to discharge at surface.

performance charts

The Inertial Pump

factors affecting performance

The **Performance Chart** is an example of how Waterra has classified the performance capabilities of its four Inertial Pump Systems. This chart is intended to assist you with the selection of the most suitable system for your specific site.

Please note that the ratings have been calculated by actual field testing in a variety of well conditions and therefore may seem somewhat conservative in value.

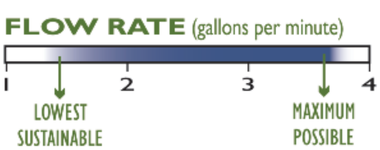
The performance (flow rate) of the inertial pump is affected by a number or parameters. The inertial pump works by imparting upward momentum to the water column within the pump's tubing. Momentum is imparted to the water at the end of the upward pump stroke. If sufficient momentum has been imparted to this water column, then more water is drawn into the tubing through the foot valve. This occurs during the downward stroke.

Factors that affect flow rate include such parameters as the depth of submergence of the foot valve, the total length of tubing, the tubing diameter, the well casing diameter, the length of pump stroke and the speed of oscillation of the pump.

Obviously, the speed of oscillation is the primary factor in imparting momentum to the water column in the pump's tubing. Generally, a pumping rate of 100 to 180 strokes per minute is recommended. The recommended stroke length is 4 to 6 inches, with a longer stroke performing better in deeper piezometers.

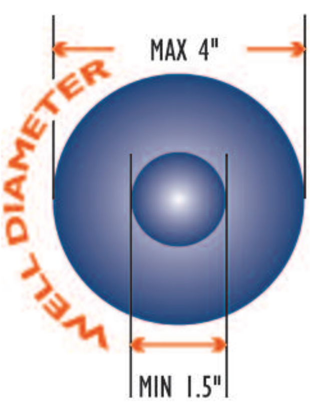
Greater submergence of the foot valve increases the pressure differential (the pressure difference between the water within the tubing and the head pressure outside the valve) that is created at the end of the upward pump stroke. Increasing the pressure differential increases the rate of water inflow through the valve at the end of the upward stroke, thereby increasing the flow rate.

Another factor affecting the flow rate with the inertial pump is the size of the annular gap between the inertial pump tubing and the ID of the well casing. When the inertial pump is in operation, the flexible tubing will tend to wobble from side to side within the well casing. This wobble results in a loss of vertical movement where the valve is located. For this reason, the stiffer High Density Polyethylene tubing is usually preferred in deeper monitoring wells (depth in excess of 60 – 70 feet). The inertial pump performs best in smaller diameter piezometers (4" or less).



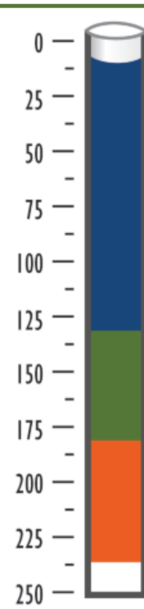
FLOW RATE

Depicts full range of flow from the maximum possible to the lowest sustainable flow. Typical flow rates usually fall between the two values. Expect the best flow rates in high yield (minimum draw down) wells with large water columns.



WELL DIAMETER

Illustrates the smallest diameter well suitable for the system, as well as the largest diameter well where the use of the system is practical.



DEPTH CAPABILITY

Illustrates the depth (in feet) at which:

— optimal performance is obtained

— system limitations are approached

— operation is questionable

— the system is at its limit