

## USER MANUAL FOR ROTAPUMP MODEL 100

Rotapump is a surface-mounted pump developed to quickly and easily pump 2-inch monitoring wells where the water levels is as deep as 200 feet.

The pump is easily transported, easily setup, conveniently run using a portable DC drill, AC drill, or DC motor mounted on the pump.

Because the pump uses dedicated pumping tubes in each well, decontamination of equipment between wells is eliminated and there is no rinse water to be disposed.

The pump is self priming and can pump sediment laden water without difficulty.

The pumping rate can be precisely controlled at a constant rate from 80 milliliters per minute up to up to 6 gpm or more depending on the tubing diameter, depth the water, and power supplied to the pump.

Pump parts are primarily stainless steel, aluminum, and Teflon/Delrin. All shaft and roller bearings are sealed. The pump does not require lubrication and is easily disassembled.

Load bearing materials in contact are aluminum or steel and Teflon/Delrin. This combination of materials results in negligible wear of bearing surfaces.

## MANNER OF OPERATION

The pump has an elliptical plate mounted on a rotating shaft.

As the shaft rotates the edge of the plate moves up and down.

This up and down motion is transferred to a follower with rollers bearing on the top and bottom of the plate.

The follower is constrained to move only vertically by rollers attached to each side of the follower that bear on vertical rods.

A pumping tube with a bottom check valve is attached to the follower with hose clamps so that with each revolution of the plate the pumping tube moves up and down once.

On the down stroke, the bottom check valve opens due to water resistance and admits water into the pumping tube.

On the upstroke the pumping tube is lifted and the check valve closes due to water pressure.

Water is incrementally added to the pump tube and once the tube is full, water is discharged from the tube.

At high rpm, the rapid lifting of the pumping tube on the upstroke imparts upward momentum to the water in the tube.

On the rapid reversal of direction on the downstroke, the momentum causes water to continue to flow upward and draw additional water in the tube through the bottom check valve.

Briefly stated:

The pump mechanism action converts horizontal rotary motion into cyclic up-and-down motion.

The vertical motion is imparted to a pumping tube in the well that has a bottom check valve.

The cyclic up-and-down motion jacks water up then out of the pumping tube.

The faster the up-and-down motion the greater the flow rate.

## METHODS TO DRIVE PUMP

The pump can be driven with an electric hand drill or by a dedicated DC electric motor mounted on the pump.

A battery powered hand drill is convenient to use.

The speed of drill and therefore the flow rate from the well is controlled by the variable speed trigger on the drill.

The drill may be hand-held and the flow rate controlled by finger pressure on the trigger.

The drill may be mounted on the pump using an accessory drill harness.

Speed may be controlled by tightening a cord wrapped around the trigger and drill handle.

Speed may also be controlled by selecting a speed setting on the drill (low RPM- high torque, high RPM- high speed) and holding the drill trigger back with a cord or nylon tie.

The hand-held or mounted drill can also be operated with a 12 volt car battery by plugging a two wire extension cord, such as 16 gauge lamp cord, into the battery slots in the drill handle.

Any DC drill will run on 12 volts but the battery slot configuration of some drills are more convenient than others. Milwaukee, Porter Cable, and certain Black and Decker drills have convenient battery slot configurations for a two-prong plug.

Using a dedicated car battery has the advantage that the battery will last an entire sampling day and an extension cord can be connected to the battery in the field vehicle for convenient pumping of more distant wells.

The pumping rate may also be controlled by an accessory inline speed controller connected between the battery and drill. With the speed dial turned all the way down counter clockwise, the toggle switch is turned on. Turning the speed dial clockwise increases voltage to the drill which increases drill speed and therefore the pumping rate. Using the speed dial, a constant pumping can be selected.

The pump can also be driven with an accessory DC motor mounted on the pump.

The accessory motor or portable drill can be powered by a 12 volt battery or two or four 12 volt batteries wired in series for 24 and 48 volts input, respectively. A jumper in the speed controller allows selection of 12, 24, or 48 volt input.

## MOUNTING THE PUMP ON THE WELLHEAD

Each well should have a dedicated pumping tube stored in the well.

The tube is most economically constructed of 1/2-inch plastic irrigation line and a 1" Brady plastic check valve available at most hardware stores.

For rapid setup, the pumping tube is slid onto the lower end of a 1/2" OD pipe nipple attached to the pump follower. Pump discharge is collected from a short length of tubing attached to the other end of the pipe nipple. The ends of each tube are secured to the threaded ends of the pipe nipple by small hose clamps. Alternatively, the pumping tube can be threaded through the two hose clamps on the pump follower.

### At Grade Completion

For at grade wellheads, the pontoons should be attached to the front and back of the aluminum baseplate so that the wide portions of the pontoons face outward. The pumping tube is most easily attached to the end of discharge tube by laying the pump on its back with the edge of the rear pontoon and backside of the motor touching the ground, lifting the pumping tube from the well, and pushing the tube onto the pipe nipple and tightening the hose clamp. The pump is rotated upright over the well while feeding the pumping tube into the well.



Pump rotated backward to permit easy attachment of pumping tube to follower.



Pump rotated down onto well for pumping.

For efficient operation of the pump, there must be sufficient resistance to the force applied to the pumping tube on its downstroke. At low motor speeds and flow rates the weight of the pump and drill and/or motor may provide enough weight resistance to the force of the downstroke. At moderate speeds and flow rates the more weight resistance to the downstroke force is needed. The operator can simply stand on the pontoons to provide additional resistance weight, or if a car battery is used for power, the battery can be placed on the front pontoon for additional weight.

### Above-Grade Completion

The pump can be mounted on circular wells surrounds 4 to 12 inches in diameter. For above-grade mounting, the pontoons are attached to the front and back of the baseplate so that the wide portion of each pontoon faces inward. The rear pontoon is attached before the front pontoon to allow the insertion of the metal brace beneath the rear pontoon. A set screw holds the brace fully retracted while the front pontoon is attached. The set screw is retrieved from its storage location on the side of the rear pontoon.



Rear pontoon and brace attached for above-grade mounting. Note storage location of set screw.



Front pontoon attached for above-grade mounting. Note set screw holding brace fully retracted.

For a level, circular well surround, place one of the supplied 1" thick shims on the well and then place the pump on the well with the vertical brace against the well surround. The shim supports the pump on the top of the well surround. Strap the brace to the well surround with the supplied ratchet/tape set, loosen the brace set screw, slide the pump horizontally to position the follower over the pumping tube, bind the brace with the set screw, and attach the pumping tube to or through the follower. The pump is now mounted for operation.



Pump on 4" surround with brace fully retracted and pump supported on 1" shim.



Pump brace strapped to well surround with ratchet and tape.



Pump slide backward on brace to position follower over pumping tube. Pump rests on shim and front pontoon on 4" well surround..



Pump mounted on 8 inch well surround (stove pipe). Pump rests on shim and front pontoon.

For well surrounds up to 12 inches in diameter, the brace slot in the rear pontoon is modified by cutting away 2 inches of the slot so that the brace can be retracted an additional 2 inches. A rear pontoon modified in this way is available upon request. When the pump is mounted on a 12 inch well the pump rests on the front and back pontoons.

For noncircular surrounds or surrounds that do not have a level top, place the fully retracted brace against the highest side of the surround and support the pump on its base on the highest edge of the surround. Strap the brace to the well surround with the ratchet/tape set, loosen the brace set screw and slide the pump horizontally to position the follower over the pumping tube, reset the screw, and attach the pumping tube to or through the follower.

### MAINTENANCE OF THE ROTAPUMP

The pump is easily disassembled for cleaning, adjustment, and repair.

Once the discharge tube is removed from the follower by loosening the two binding hose clamps, the follower is removed by unscrewing the two screws joining the mated halves of the follower.

With the two screws removed, the two halves of the follower are pulled apart vertically and removed from between the vertical guide posts by rotating each by 45 degrees.

Each follower half supports one large plate roller and two smaller vertical guide rollers.

These rollers are easily removed for cleaning or replacement by unscrewing their center bolts.

Removal of the follower permits access to the wobble plate and vertical guides for cleaning.

The follower is reassembled by placing one half between the vertical guides above the wobble plate and placing the other half between the vertical guides below the plate.

The two halves are joined by a trapezoid channel guide that maintains alignment between the halves.

The halves are slid together, the two set screws joining the two halves are screwed in finger tight, and the follower halves gently squeezed together to bring the rollers in contact with the top and bottom surfaces of the wobble plate.

The plate is rotated to insure the follower rides freely over a complete turn of the plate.

The set screws are then tightened and plate rotated to see if the rollers bind at any point on the plate.

If the follower binds slightly, the set screws are backed out and the two follower halves are moved slightly apart and rejoined.

#### ADDITIONAL INFORMATION

Videos of the pump in operation and several useful field forms and procedures are available on [www.rotapump.com](http://www.rotapump.com).