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Design and development of a low cost screw type coil pump for irrigation purposes

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Irrigation of crops is a primary route to bringing more land under cultivation and to increasing yields from existing farm land. Lift irrigation requires that the water be raised from its source to the field surface whatever the source of water available. The efficiency of the system depends on the application of sound principals in the design and construction of the utilization structure and the characteristics of the water lifting device in relation to the source of water. On the other hand, there is a considerable incentive in most of the poorer developing countries to discourage the use of oil, even though there is an equally strong incentive to encourage the increase of agricultural production, which so often demands pumped irrigation. As a result there is an increasing need to find new or modified methods of water lifting.

Low cost manually operated modified methods of a water lifting device was designed and constructed. This pump can be installed with low technical experience. The designed pump consists of a steel frame, rotating handle and spiral hose with a large tube. The pump which is attached to the frame is inclined so that its lower end picks up water from the water source and the upper end discharges in to a channel. The principle is that water is picked up by the submerged end of the coiled tube each time it dips below the surface, and as it rotates a pool of water gets trapped in the enclosed space between the tube and the lower part of each turn. As the whole assembly rotates, so the coiled tube it self screws each trapped pool of water smoothly further up the casing until it discharges from the opening at the top. The pool water progressively moves along the base of the coil or spiral as the pump terns, a like an Archimedean screw pump.

Two experiments were conducted to test the discharge rate of the designed pump with two inclination angle ranges. The height between water surface and discharge outlet (m), Discharge per revolution (L) and rotational speed were measure for adapted inclination angle range of 15 to 20 degrees and 20 – 30 degrees. The result shows that the discharge (L/min) rotational speed and the height between water surface and discharge outlet for 15 – 20 degrees inclination angle range were 23.8 L/min 38 rpm and 1.3 - 1.5m respectively. Above observation for 20 – 30 degrees inclination angle range were 20.5 L/min 36 rpm and 1.7 - 1.85 m respectively. In additionally the results revels that the designed pump is not operated when the inclination angle is more than 30 degrees. At that point total height of the pump is about 2m. Therefore the designed water lifting device can be recommended as a low head high discharge energy saving water lifting device.