12 Technology: The Archimedes Screw

The Archimedes screw is an example of simple machine application that has survived the ages to fit diverse products in the modern era. Historians date the first evidence of Archimedes screw use around 250 B.C., and it is so-named because tradition suggests it was invented by the Syracusan natural philosopher and scientist Archimedes. However, archaeological evidence has led others to posit its earlier invention in Assyria (modern day Iraq) or Egypt; Archimedes simply improved upon an earlier design.

Regardless of its origins, the Archimedes screw represents the combination of two common simple machines: the inclined plane and the cylinder. The plane wraps around the cylinder, making a common screw shape. However, the Archimedes screw is not intended to drill into anything; rather, the rotation of the screw forces liquid or small materials upwards. This movement is intended to process liquid, irrigate, move corn, and many other applications.

Basic Archimedean Screw Structure

Not much has changed in basic screw design, and they are essentially the same as they were in ancient times. Originally, Archimedes screws were composed of wood; but, gradually wood was replaced by metal. Current screws are exclusively made of metal. Typically, Archimedes screws are encased in a box covering so as to prevent splash out or loss of material, but some, such as those used in sewage treatment, are designed in a way that makes this unnecessary.

As stated, the standard design of an Archimedes screw resembles a very large screw, an inclined plane wrapped around a cylinder, which rotates, sending material or liquid “up” (sometimes these screws are positioned horizontally) along the threads. The variations in design present some of the crucial differences in the Archimedes screw. These include:

> **Rotation** comprises the speed at which the drill turns. A faster speed means the transported material moves along the screw faster; but, for heavier or more viscous items, a slower motion might be required to prevent damage. For instance, in an irrigation screw, too fast a rotation could lead to flooding.
> **Extention** refers to the length of the screw. The length can change the way the screw operates because a shorter screw will transfer material a short distance more quickly, but, like rotation speed, it

can cause flooding problems. Also, if a screw is being used for sorting, there will be less time to perform the separation.

Archimedes Screw Modern Applications

Archimedes screws are generally used to transport material. An irrigation system is a good example of this mechanism. A screw can be positioned over a reservoir. When it spins, water is pushed up the length of the screw to the end of the threads, where it is deposited, generally over an arid, planted land. Other liquids use Archimedes screws as well. Sewage treatment systems use the screws to drain containers of sewage and transport them into treatment tanks. A combine, which is used on farms to harvest crops like grains and hay, is essentially a horizontal Archimedes screw that grabs the plants from the ground and feeds them into a container. In these instances, an Archimedes screw will be called a “screw conveyor,” but it is basically the same.

Archimedes screws operate with varying flow rates and suspended solids. One example of this application has been found in fish nurseries. In some of these nurseries, a screw is used to transfer fish safely between tanks. The screw turns and allows both water and fish to move along the threads, helping to keep the fish breathing and comfortable during transport.

Reprinted with permission from: Pending Granted Permission.
http://www.thomasnet.com/articles/hardware/archimedes-screw