

Description of Team Design Concept: Group 5 Team 17
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The Mech 150 design concept is to develop a human powered pump to deliver water from one 55 gallon drum to another with an 8 ft. head as a workload. The criteria for the project are: 1) Prototype development, manufacture and fabrication will not exceed \$125.00. 2) The unit will be designed so anyone in good physical condition from the ages of 10 yrs. to 60 yrs., and 5 ft. to 6ft.4in. tall will be able to operate the unit. 3) The unit will be able to be assembled and disassembled with only 2 allen wrenches. 4) One person used for the final prototype test will be female. 5) A pitot tube manometer will be used to measure the output for comparison of actual vs. calculated results. 6) The tubes will be replaceable without disassembling the crank assembly.

Team 17 chose to use a peristaltic pump design to accomplish the task. The mechanics used to deliver the fluid in a peristaltic pump are derived from peristalsis, the actions of the intestines to move food through the digestive tract. The water is pushed along a resilient tube by a compression roller that flattens the tube to form a seal. As the roller moves along the tube displacing water, the resiliency of the tube restores its cylindrical shape, and causes a vacuum to draw water in to be compressed by the next cycle.

The design concept for our pump will utilize a dual tube system for the pump chambers. This will allow the pump to be operated at two different power levels. When a tube is removed from either side of the unit it will operate in the 50% power mode. The design of the tubing restraint will allow for the tubes to be installed without having to disassemble the crank assembly. Having a two tube system will also provide redundancy in the event one of the tubes should fail.

The drive components of the unit will geometrically resemble an exercycle. This format provides use of the strongest muscle groups, and is also a drive mechanism almost anyone is familiar with and should be able to operate. The seat and handlebar components shall be adjustable to accommodate the parameters set in the design criteria.

The pump will be integrated into the pedal/crank assembly to derive direct drive from the crankshaft. The drive rollers on each side will be offset 90 degrees to provide for a more constant and smoother delivery of power. Toe clips will be installed on the pedals to allow the crank to be pulled on the upstroke as a means of increasing energy input.

A simple pitot tube manometer will be placed in the discharge line to measure the flow rate. The tube will measure the pressure differential of the pump system to the atmosphere, and knowing the area of the discharge line can be converted to flow rate in gallons/ minute. Pressure readings will be taken at regular intervals and converted to flow rates for comparison of actual vs. design performance results.