Hydraulic Ram Encyclopedia Article

Hydraulic Ram

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Hydraulic Ram

A hydraulic ram is a pump used to raise water from one level to another by utilizing the energy of the water itself that is flowing in a pipe. The design is based on the principle that occurs when a flow of water encounters a sudden blockage. The energy generated from this sudden stop is used to force the water through pipes that raise it to another level.

In 1796 Joseph Montgolfier, better known for his work on early hot-air balloons, introduced the hydraulic ram. His system worked by sending water through a pipe that had a valve which could be shut suddenly. When the valve was closed, the pressure in the pipe immediately rose. This forced the water into a closed air chamber through a one-way valve. When the water came into the chamber, this again increased the pressure and forced the water through a delivery pipe to a higher level.

Joseph Montgolfier's son, Pierre, varied his father's design to produce what he called a *compound* or dirty water ram. The problem with the ordinary ram was that it required a flow of water to operate that was significantly greater than the amount actually being raised. Pierre addressed the problem by using dirty water to provide the power. The dirty water was fed to the main pipe, and the rise of pressure was used to lift a spring-loaded plunger which pumped the clean water.

Hydraulic rams are still used, but they are not widespread because of the large quantity of water needed to operate them. They normally pump water for isolated farms. The Montgolfiers proposed to use them for air compressors and to help pump the bilges on ships through the rolling action at sea. Some have even suggested recently that the rams may be useful for driving heat pumps.