Introduction to Pumps

Historically, mechanical pumps probably began to be developed in ancient Mesopotamia soon after the establishment of agriculture. As depicted in Figure 1 (left), they evolved in Persia to take the form of a

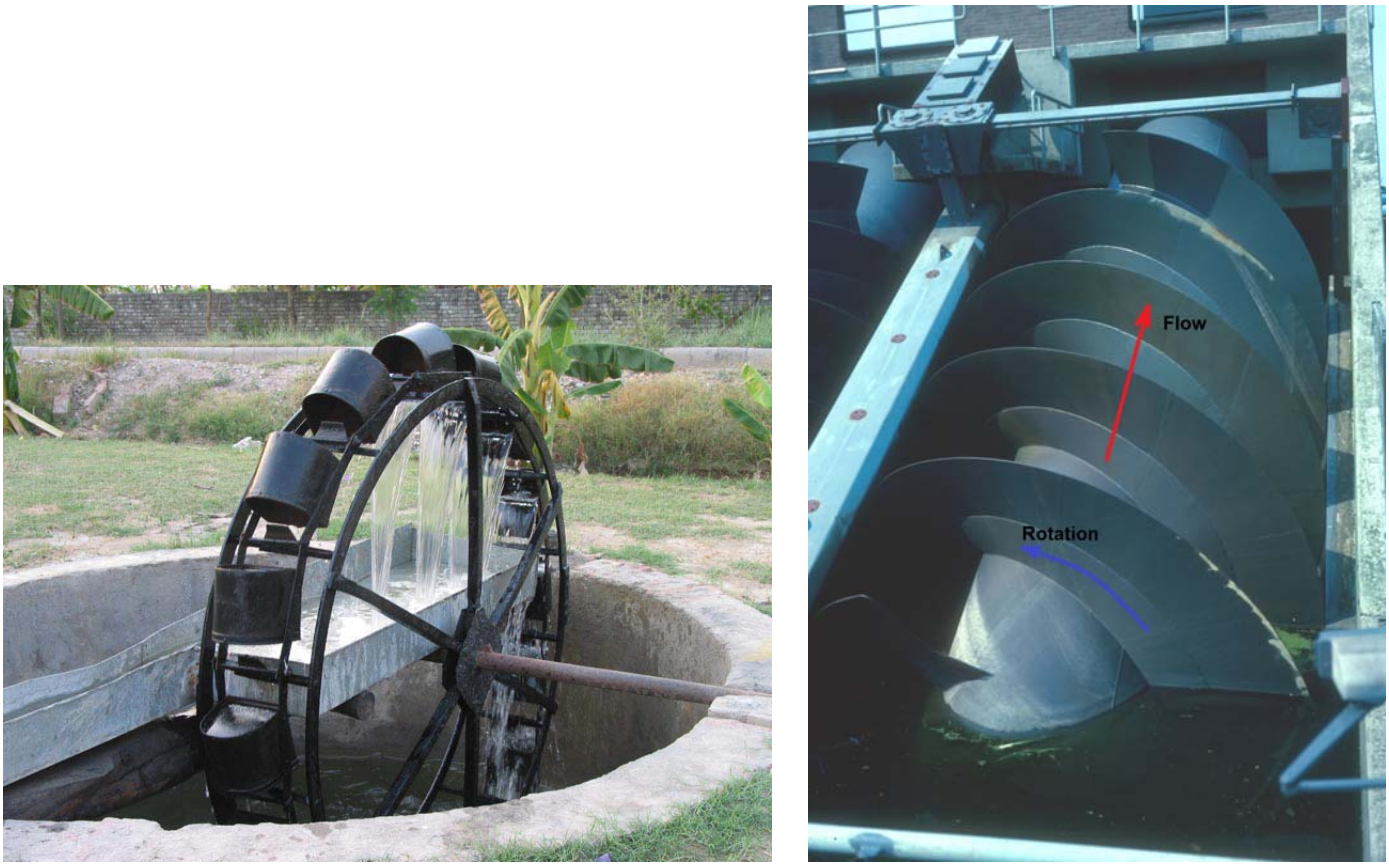

Figure 1: Left: Ancient Persian water wheel. Right: An Archimedes screw used to lift water in Netherlands from one canal to another.

series of buckets installed to lift water from a stream or river in order to irrigate a field of crops. It seems likely that this soon evolved from a human-powered arrangement into one driven by a domestic animal. Archimedes probably sketched the first rotary pump, a screw installed in the tube to perform the same task as the collection of buckets. Even today forms of this Archimedean screw are still used in the Netherlands to lift water from one canal to another (Figure 1 (right)). Presumably these kind of irrigation devices were driven by windmills in an original version of the "turbopump".

In modern times, pumps come in a vast array of shapes and sizes and in a great range of designs. In the section (Mbb) that follows we give just a few examples of pumps from a range of different technological contexts. However an essential preamble is to recognize the basic turbomachine design parameters presented in section (Mac), particularly the specific speed, N, that provides the universal framework sketched in Figure 2 within which to present these examples.

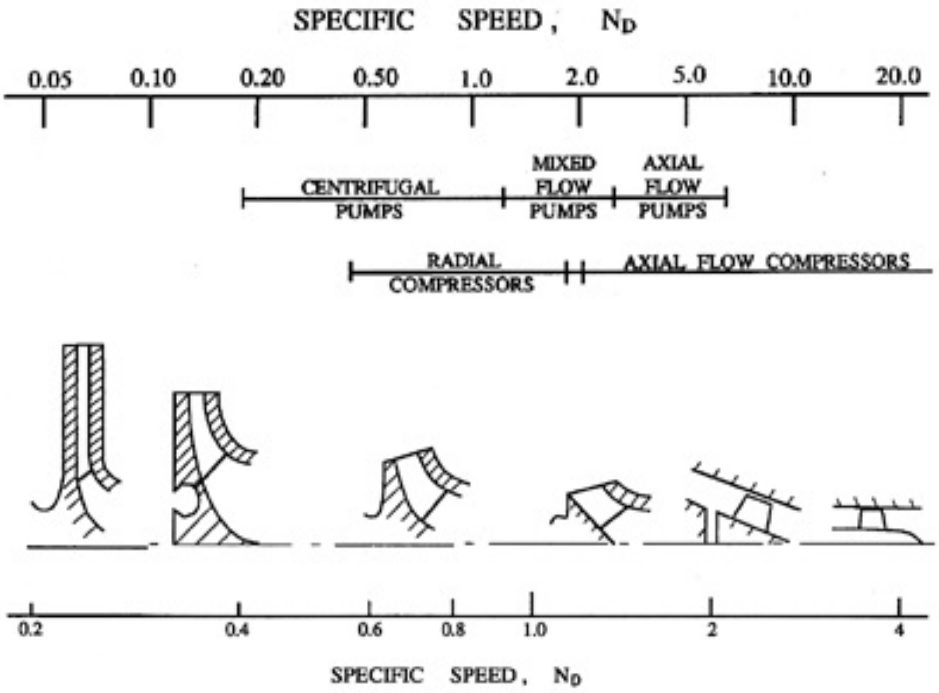

Figure 2: Pump shapes as a function of the specific speed, N (from Sabersky, Acosta and Hauptmann 1989).