Low Flow, High Head, *Low Noise*

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What pump uses close manufacturing tolerances, 'quiet' motors and acoustical coating technology to be quiet enough for residential HVAC applications? The answer may surprise you.

Pump engineers have long recognized regenerative turbine pumps (RTP) for low flow/high head applications. As Muller points out in a fairly recent discussion of RTPs, the regenerative turbine pump may clearly be the better choice (compared to a volute pump) for low flow and high head applications.[1]

Unfortunately, RTPs operating within environments that are sensitive to noise have sometimes been limited due to the sound pressure levels that may be produced in certain installations. Not any more.

Now, low noise performance can be added to the selection criteria that may make the RTP the best pump for the job. Close manufacturing tolerances, 'quiet' motors and advances in acoustical coating technology now permit the construction of RTPs that are quiet enough for residential HVAC applications.

One leading manufacturer, using a low VOC, water-based noise-inhibiting coating, formulated from a blend of latex and urethane-acrylics and an ultra-quiet motor, has reported the average sound pressure level for a close-coupled RTP operating at 60-ft head to be less than 51-dBA at three feet.

RTPs offer a number of unique capabilities, including excellent suction characteristics (relatively low NPSHr); the ability to handle entrained gases/vapor and to pump high temperature liquids without cavitation damage or binding; and the ability to handle moderately viscous (typically up to 600-SSU) fluids – all in a compact footprint.

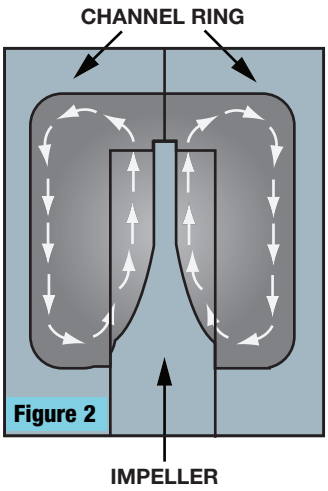

Figure 2

The RTP can be found in boiler rooms (for boiler feed and condensate return), fire protection systems (as jockey pumps), shipboard (in washdown and potable water systems), and a variety of industrial and commercial applications as diverse as car washes and refineries.

While most often classified as a centrifugal pump, the RTP's performance more closely resembles a hybrid of centrifugal and positive displacement (PD) pumps. The RTP is, in fact, a low specific speed pump.

In spite of having operating characteristics that mimic a

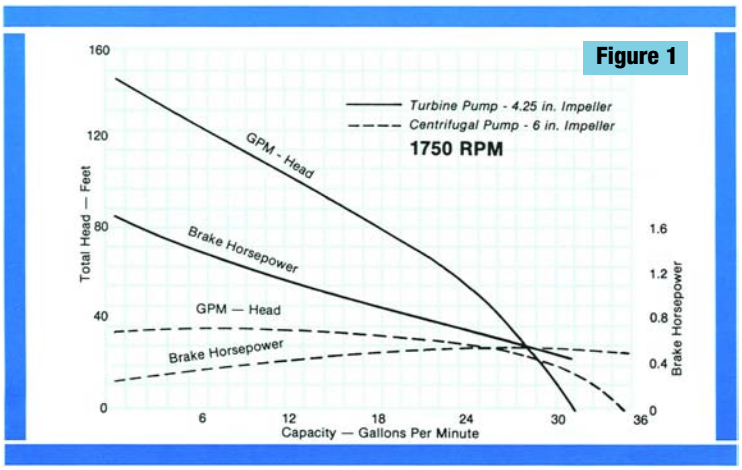

Figure 1

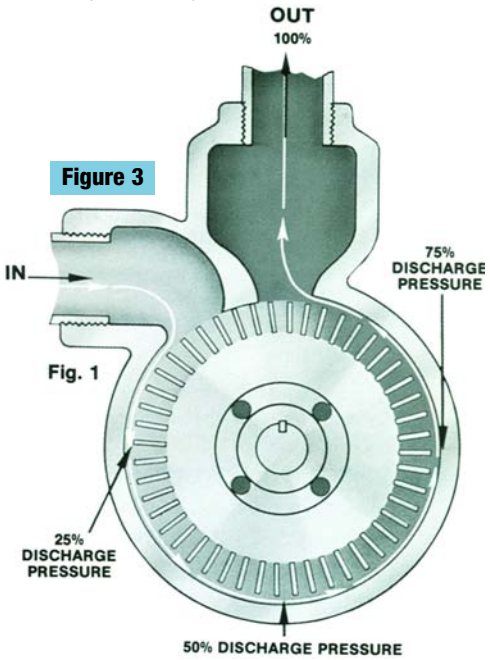

Figure 3

PD pump – power directly proportional to head (rather than capacity), with maximum power required at shutoff (where it's the lowest for a centrifugal pump) and a steep head-capacity curve – the RTP is a kinetic pump (Figure 1).

However, the RTP will develop significantly higher head than will a centrifugal pump with the same size impeller. The impeller is probably the most significant difference between the two types of pumps.

In the RTP, the impeller has a double row of vanes machined around its periphery.

The pumped fluid is divided to both sides of the impeller and continuously circulated between the vanes and the annular channel created by the liner ring on each side (Figure 2). This produces a helical flow pattern and a combination of centrifugal forces and shearing action add energy as each liquid droplet as it passes through a vane.

These multiple increases in fluid velocity are referred to as regeneration and result in the pressure developing progressively higher as the pumped fluid approaches the discharge port (Figure 3). The result is pressure performance similar to a multistage centrifugal pump, but with a single impeller and in a smaller, simpler package.

The reduced noise design is part of a project calling for RTPs to be used in place of the central pumping systems in high rise buildings served by heat pumps.

The turbine pump runs only when the heat pump is running and pulls the water from a standing loop. Since this is similar to a cooling tower loop (condenser loop), not a chiller loop, it's typically sized using rejected BTUs, yielding 15,000-BTU/ton vs. the standard 12,000-BTU/ton.

In residential high rise apartments (usually higher-end condominiums), the heating pump can apparently be sized using a 500-ft^2 per ton as the rule-of-thumb.

Based on a flow rate of 3-gpm/ton, the benefits of the RTP become obvious. Since the pump head will increase in direct proportion to the number of floors of the building, the higher the building, the better this pump fits.

In an 18- to 20-story condominium, where heat pumps are desired, an ultra-quiet RTP offers the most efficient and cost effective pumping solution available from today's technology.

P&S

References:
[1]Muller, S., Consider regenerative pumps for low-flow/low-NPSH applications. Hydrocarbon Processing, August 2004.

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