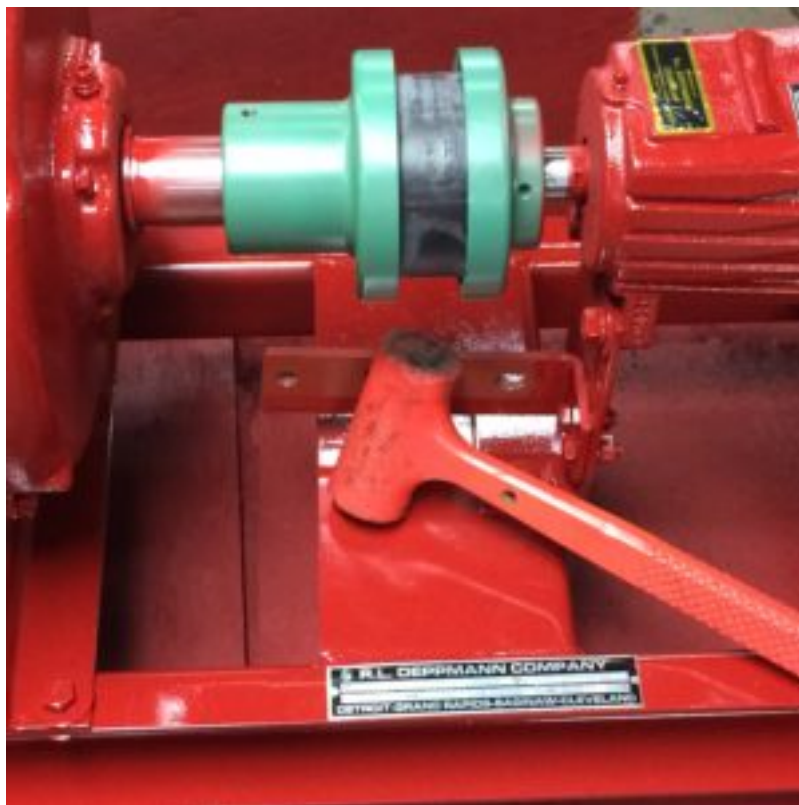


Monday, June 19, 2017

How to Pick a HVAC Centrifugal Pump Part 4: Pump Coupling Types - Close, Split, or Flexible Coupled?

Monday Morning Minutes | by Norm Hall, R.L. Deppmann and Chad Edmondson, J. M. Pleasants, June 19, 2017

When selecting the HVAC centrifugal pump, there are different choices. In the last R L Deppmann Monday Morning Minute we examined the mechanical room space required for base mounted end suction vs. base mounted vertical inline pumps. This week's topic centers on the types of couplers available.

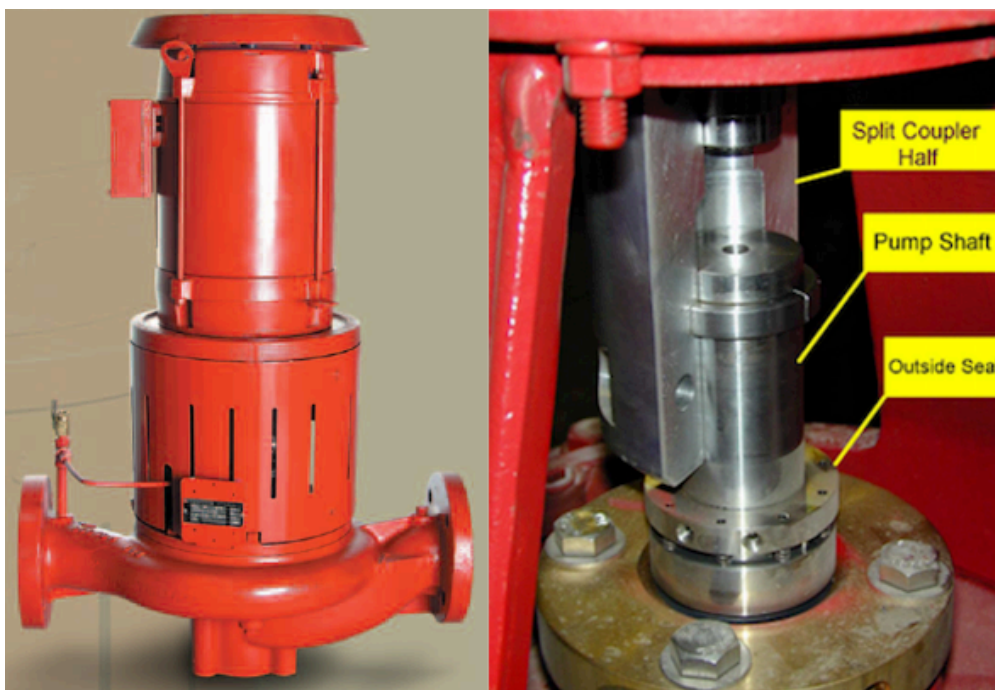


Centrifugal HVAC and plumbing pumps may be direct closed coupled or flexibly coupled. Pump couplings serve an important purpose, the greatest of which is to connect the pump to the motor for the efficient transfer of power. They also help accommodate for misalignment, making it easier to service the pump; and in the case of flexible coupled pumps, help protect the bearings.

Hydronic HVAC pumps typically have one of the following types of couplers:

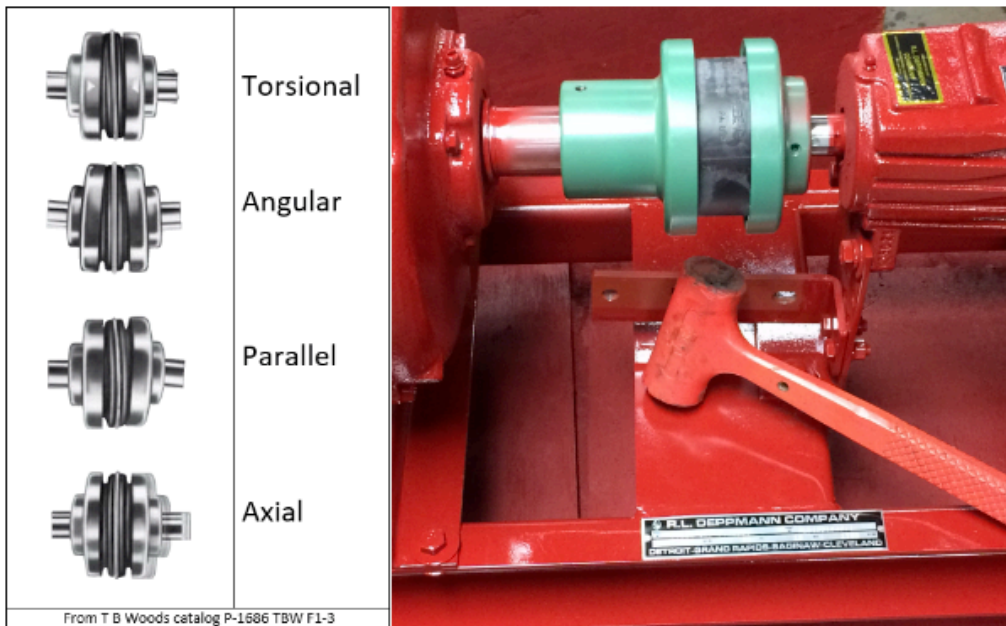
Split Couplers on HVAC Centrifugal Pumps

This is a solid metal coupler that connects the pump shaft to the motor shaft. The picture on the left shows a split coupled inline pump. A close-up of the interior coupling mechanism is shown on the right. A split coupler can make the pump easier to service but notice that the coupling is made of steel and thus does not provide any flexion whatsoever. The sole purpose of the split coupling is to connect a standard frame motor to the pump end. If the motor shaft starts to vibrate due to motor bearing wear, the vibration and movement will be transferred directly to the pump. If the pump end starts to vibrate due to cavitation, operation off the end curve, mechanical seal wear due to water quality, or simply age; the vibration will be directly transferred to the motor bearings and shaft.



Flexible Couplers on HVAC PUMPS

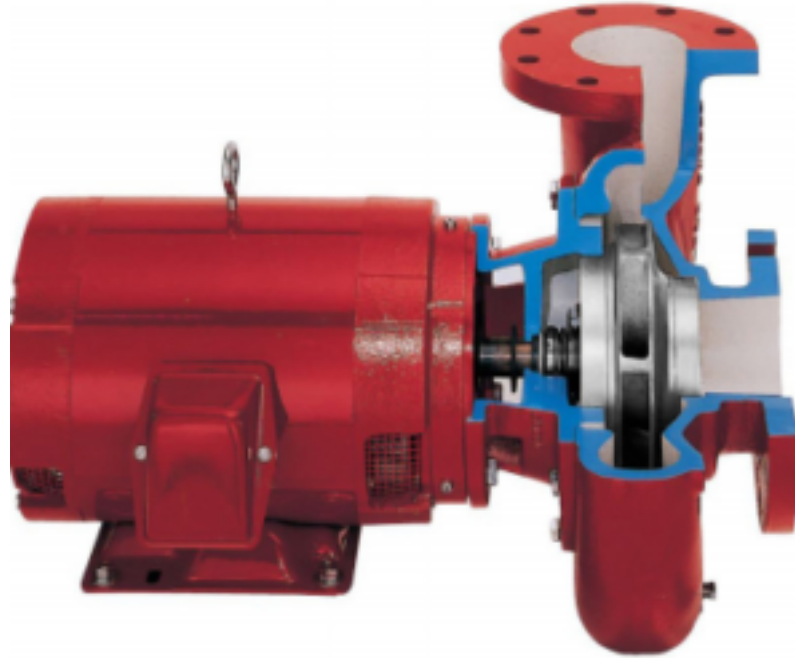
Flexible couplers are the type of couplers we usually see in base-mounted pumps. These couplers are typically made of a rubber material sandwiched between two metal hubs. This type of coupler joins the standard frame motor to the pump end but also provides a certain amount flexion or bending movement. The flexion of the rubber insert helps to protect motor bearings from the pump born damage mentioned above and protects the pump from motor born damage. This is important with the non-constant torque associated with HVAC pumps and especially variable-speed systems. Flexible couplers act as a sacrificial fuse that breaks to protect the motor bearings and the pump shaft. (It is much less expensive to replace a flexible coupler than a shaft or bearing!) A flexible coupler helps compensate for various types of misalignment that occur during typical operation as shown here:



Closed Coupled or Direct Coupled HVAC Pumps

Of course, there are some pumps that do not have couplers at all. These are referred to as close coupled pumps. Close-coupled pumps have a single shaft (instead of two connected shafts) that extends from the motor to the pump body through an opening in the cover plate. The mechanical seal, shaft sleeve, and impeller are all mounted on the motor shaft. There is no bearing

assembly in the pump section, so the motor bearings must absorb all of the torsional load. This means the bearings have to be large, which makes the motors somewhat special and not as readily available on larger sizes as motors on split or flexible coupled pumps.



While close-coupled pumps often take up less floor space, they can be tricky to service because the motor must be removed for seal change and maintenance. An overhead gantry and crane may be required to lift the motor away from the pump for servicing if the motor is large and there is not enough horizontal space available to remove the motor. One advantage of closed coupled pumps is they do not need to be aligned. This can be helpful if you have a high speed (3600 rpm) application where the alignment tolerances are tight.

While there are PROs and CONs to all of the above pump configurations, we typically advocate base-mounted, flexible coupled pumps unless the specific application precludes them as an option (e.g. there is not sufficient floor space for a base-mounted pump.)

The table below is a handy reference for comparing the advantages and disadvantage of close coupled, split coupled, and flexible coupled pumps.

Pump Assembly	PROs	CONs
Close Coupled	<p>MAY require less floor space</p> <p>No pump alignment is required</p> <p>May be less expensive first cost</p>	<p>Motor must be removed for seal change/maintenance</p> <p>Requires longer motor shaft (shaft deflection)</p> <p>Requires special motor frames</p> <p>Damage is transferred between motor and pump</p>
Split Coupled	<p>MAY require less floor space</p> <p>No pump alignment is required</p> <p>Seal can be changed without moving the motor</p>	<p>Motor must be removed for some types of maintenance</p> <p>Requires longer pump shaft (shaft deflection)</p> <p>Damage is transferred between motor and pump</p>
Flexible Coupled	<p>Quieter operation</p> <p>Uses standard, “off-the-shelf” motors</p> <p>Well suited for variable -speed systems and systems with lots of air</p> <p>Short shaft length increases longevity (shaft deflection)</p> <p>Pump can be serviced without moving motor</p>	<p>Requires alignment</p> <p>Takes up more floor space</p>

Next week the R L Deppmann [Monday Morning Minutes](#) will focus on the choice of single vs. double suction HVAC centrifugal pumps.