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## Dedication

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Aside from our calendar of classes at our factory, our on-line FloPro University provides an ever-expanding library of videos, webinars, and podcasts to help you learn at your own pace and apply that knowledge to your daily work.

## Dialogue

The free exchange of ideas benefits us all. You can talk to us, talk to your peers, share experiences, offer advice,

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## Efficiency

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## Anatomy of a Circulator: *Not* as Scary as it Sounds

In most circles, a course in anatomy is thought to be a rather ugly ordeal. But Taco's scalpel-less "Doctor of Circulation" revels in this realm, teaching with no cadaver, toe tag or messy incision.

Rather, John Barba, residential training/trade program manager, and other Taco experts designed their latest *FloPro University* e-learning topic as a complete, self-study course for hydronic system installers. Through compelling video and graphics, Barba takes "students" through all facets of circulator function and design.

Barba explained that, initially, it's important for installers to understand:

- The difference between a pump and a circulator.
- How a circulator works and specifically what it does in a hydronic system;
- The different types of circulators;
- The parts of a circulator and how each affects its performance, and finally...
- How to read pump performance curves and use them to choose the best circulator for the job.

Barba, widely known for his humor and his expertise, masterfully guides online audiences through easy, fast-paced learning, beginning the course of study by asking, then answering a

question. "Why should we care about a circulator or the details of how a particular circulator is designed and manufactured?"

"That's an easy one," he adds. "The circulator is the vital heart of any hydronic system. You can't make a hydronic system work without a circulator. The circulator has one purpose: to move water in the system by creating flow."

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*"John Barba's teaching style*

*is unique; he's one of the best instructors I know . . . and I've been to 'em all."*

*— Mike Lampkin, Mike Lampkin*

*Heating, Ontario*

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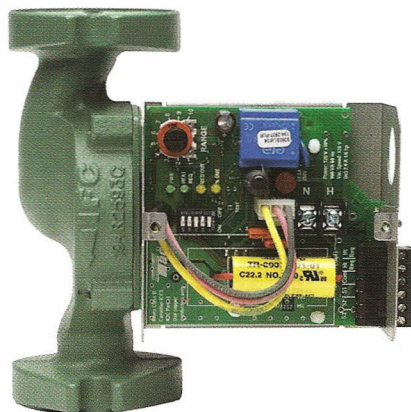
Students quickly learn about the use of centrifugal force to produce pressure differential and then the difference between pumps and circulators (they're not the same).

There are several different types of circulators, each with its own design and best application. Some are "wet rotor" and some are dry. Some need to be lubricated, others are self-lubricating. Some run fast, some run slow, while others can even vary their speed.

Barba's Anatomy course, however, focuses on wet rotor circulators. And, just as he does at many given points during the e-learning course, Barba offers a quiz based on most recent instruction. This happens repeatedly as students make their way deeper into the instruction which, ultimately, concludes with an exam.

But, wait, there's more.

*(continued on page 16)*





## Anatomy of a Circulator: not as scary as it sounds

(continued from page 15)

### Differential differences

Long before Barba's ready to give the final exam or dismiss class, he moves into the next topic: flow + pressure differential. Just as it is with weather fronts, a fluid *must* flow from an area of higher pressure to one of lower pressure.

Water enters the casing and is then pulled into the eye of the impeller which spins it to outside with (you guessed it) centrifugal force. It's this action that adds velocity to the water, creating higher pressure before leaving the circulator.

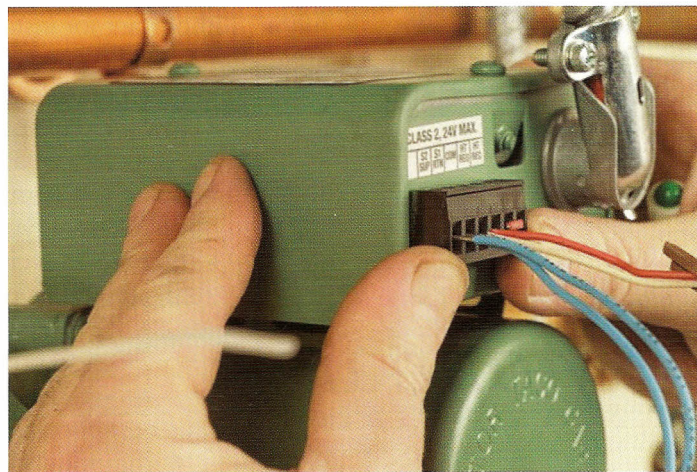
cated," he adds. "There's always water in the cartridge. There's no need for oil or grease. The system water lubricates the bearings inside the circulator cartridge just like having oil lubricate the engine pistons in your car."

Once the system is filled and pressurized, small amounts of air must be purged by running the circ for a few minutes. But once the cartridge is full of water, the hollow ceramic shaft acts as a mini expansion tank. It provides the exact amount of space needed for the water in the cartridge to expand and contract as it heats and cools, limiting new system water from entering the cartridge. That way you aren't continually running the dirty system water across your moving parts. That's a good thing and Barba tells 'em why.

overall head losses.

At this point, Barba revs up the discussion with a look at motor and cartridge assembly – and of the most amazing segments of the course – an explanation of motor function that Henry Ford and the producers of Orange County Choppers would be proud of.

Taco 00 circulators are equipped with a permanent A/C split capacitor motor, which is a type of single-phase A/C induction motor commonly found in many commercial equipment and household appliances – valued for their simplicity, efficiency and ruggedness. With these motors, small electromagnets do all the grunt work, spinning the motor with ease.



Hydronic systems mimic Mother Nature: the greater the pressure differential, the greater the flow. Ah, there's magic in the flow when an installer selects the right circulator, enabling appropriate flow through the system.

Barba dives right into the anatomy of it, using slight of hand and digital graphic wizardry to "explode" circs, dissecting parts and components while they're hard at work. Amazing what that guy can do.

Barba holds up a Taco 00 circulator, telling his audience that the replaceable cartridge contains all moving parts, ideal for field replacement.

"The 00 circulator is water lubri-

... which takes students into the maw of another quiz.

### Anatomically correct

If he had a scalpel, here's where he'd wield it. Barba now takes students into the thick of it, peeling layers back, looking into the parts n' pieces of a circulator.

He wades into a circ's design and the influence of horsepower and impeller speed. Students learn about circulator performance curves and different applications, offering that flat curve circulators are used in radiator and baseboard applications which require higher flow rates but have lower

### Was that a Gerbil wheel or a squirrel cage?

Students quickly learn about the relationship between all key motor components, including the rotor, made up of an equal number of steel laminations fitted with evenly-spaced copper bars along the outside edge.

"This is a so-called 'squirrel cage' rotor, by the way, for obvious reasons," he adds with a grin.

During the manufacturing process, the rotor is mounted on a hollow ceramic shaft. The shaft spins on two carbon bearings positioned on either side of the rotor.

"The entire assembly is then slid



into the stainless steel cartridge sleeve. Two rings are positioned over the cartridge sleeve to line up with the bearing supports . . . and shaft," continued Barba. "The top of the cartridge is capped off so water can only enter through the hollow shaft. Finally the impeller is mounted on the end of the shaft."

At the end of all this, you have a device that's ready to work. Apply electrical power and the rotor spins in the magnetic field, turning the impeller.

As we mentioned before, the size of the motor, its horsepower rating, directly affects its performance. A circulator with a more powerful motor will produce more pressure and more flow than a circulator with a smaller motor.

Barba shifts into high gear as he describes motor ratings and performance (with flow capacities from zero to more than 30 gallons per minute and a head range from zero to 34

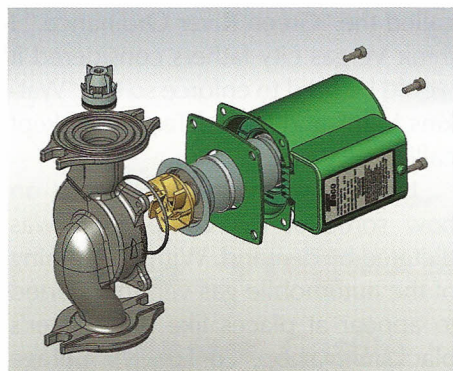
feet) and the value of an integral flow checks, too. Barba's audience learns about three-speed, variable speed, hot water recirculation and solar circulators, too; flat curves and steep curves – every explanation tailored for installers.

Before students know it, it's time for the final exam.

"I completed the course in just over an hour a few weeks ago," explained Eric Aune, owner of Minnesota-based Aune Plumbing. "And because of it, I'm smarter and more capable in the

field."

"Flo Pro University courses are among the best there are, anywhere and at any price," said Mike Lampkin, Mike Lampkin Heating in Pembroke, Ontario Canada. "They don't cost a penny, and I don't have to travel to learn. Besides – John Barba's teaching style is unique; he's one of the best instructors I know . . . and I've been to 'em all. He keeps things simple and definitely leaves an impact. Nobody forgets the Barba. It's first class training all the way."



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