AMETEK Dynamic Fluid Solutions (DFS) and HVAC and boiler manufacturer Mestek Inc. have partnered for years on blowers destined for integration into various boiler products and subsystems.

AMETEK and Mestek have worked together to develop a new high-energy Nautilair 12.3-in. diameter 240-Vac blower capable of higher pressure and flows. Mestek is currently working with AMETEK DFS engineers to design and source a blower optimized for 460-V installations. The following factors prompted Mestek’s request of AMETEK DFS for two new blower designs:

The HVAC manufacturer is currently expanding its boiler product line to provide higher power levels for end users — including those for 240-V installations that currently use traditional Nautilair 12.3-in. blowers.

For its 460-V customers, the HVAC manufacturer is working to eliminate the use of stepdown transformers.
PROTOTYPES TO PRODUCTION USING CUSTOM BLOWERS

“We’ve been testing prototypes of the high-output 460-V blowers and they’ve performed extremely well,” said Sabino Piccirilli, boiler group product manager for Mestek Inc. Instead of using stepdown transformers to take 460 V down to 240 Vac (to supply 12.3-in. 240-Vac three-phase blower with power) once in production, the new 460-V blower will let the Mestek eliminate one subcomponent and use a single-source wire into the boilers.

Drawbacks of stepdown transformers include the fact that they necessitate significant investment of labor for installation, which means added cost for the end user. In the case of very large boilers, there are still more reasons to eliminate stepdown transformers. One is that increasingly large boilers necessitate increasingly bulky (and difficult to contain) stepdown transformers, noted Piccirilli of Mestek.

LARGE BOILERS BENEFIT FROM EFFICIENT BLOWERS

Mestek and AMETEK DFS collaboration on new blower solutions is currently focused on optimizing Mestek’s KN40 — a new boiler with a 4-million BTU/hr capacity. Made through the Mestek division of Advanced Thermal Hydronics (ATH), KN-Series boilers offer advantages over traditional tubular-based condensing boilers. At their core is a cast-iron heat exchanger that holds latent heat longer than legacy setups — to extend boiler life while boosting overall performance, reliability, and efficiency.
More specifically, the heat exchangers have wall thicknesses that are five times that of comparable stainless or aluminum offerings. Cast iron is more rugged than welded subsystems sporting joints and seams. That means the heat exchangers in KN-Series boilers withstand more stress and heat — plus are resistant to corrosion, so are less sensitive to basic and acidic pH levels. KN-Series’ heat exchangers also accept myriad water flows to work as variable-volume systems and maintain working pressure to 100 psi.

Mestek’s KN40 boiler, which utilizes the largest single blower of any boiler offering utilizes AMETEK’s Nautilair series of products. KN40s that are installed in commercial applications will integrate with new Nautilair 460-V blowers to get the same performance and output flow as high-energy 240-Vac setups while accepting three-phase input. The ability to omit the transformer on these larger boilers is key. That’s because these boilers would otherwise require stepdown transformers that are quite large and heavy.

Elimination of this transformer reduces system complexity as well as eliminates the need for thermal mitigation in the electrical cabinet.

**QUALITY ASSURANCE — WITH PROTOTYPING AND TESTING**

Mestek continues to test boiler designs employing the high-energy Nautilair 240-Vac blower. Next steps for the manufacturer will include further thermal testing using additional Nautilair blowers. These investigations will verify that boiler operating temperatures stay within predicted ranges. By conducting these tests, Mestek can ensure the longevity of the boiler system.

During boiler blower testing, AMETEK has provided blowers with thermocouples on key areas to verify temperatures won’t exceed set ratings. Final tests on the high-energy 240-Vac blower (for final boiler validation before shipping) include placement of six thermocouples on the blower installed in a completely packaged boiler.
“We then cover the blower with a box during operation to decrease noise levels,” said Piccirilli.

**BLOWERS COMPATIBLE WITH VARIOUS VENT SIZES**

The Nautilair blowers are also useful in that they offer high power density and accommodate various vent sizes. Consider for a moment condensing boilers that need expensive stainless-steel vents. “Here, we need to keep costs down by minimizing vent diameters — but that in turn means the system exhibits more impedance or pressure drop,” added Piccirilli. AMETEK DFS Nautilair blowers are powerful enough overcome this pressure drop, and the new Nautilair 12.3-in. High Energy blower was designed specifically for this reason. “Mestek still rated to a maximum vent length requirement … and the 12.3-in. blowers give us that capability,” added Piccirilli.

**MORE ON NAUTILAIR HIGH-ENERGY BLOWERS**

Nautilair variable-speed blowers are based on brushless (permanent-magnet) motors and excel in boiler applications and gas-fired burner systems that need measured air-fuel mixtures for optimized combustion and minimized NOx emissions. These Nautilair pre-mix blowers work in commercial boilers, furnaces, food-service equipment, hot water heaters, fuel cells, and kilns, to name a few.
Some of Mestek’s cost-competitive boiler designs still incorporate blowers that necessitate preprogrammed variable-frequency drives (VFDs). But for their upgraded KN Series of boilers, Mestek engineers wanted blowers that (among other things) don’t require separate VFDs.

Nautilair blowers fit the bill as they constitute an energy-management system (EMS) that eliminates the need for a VFD. So, the blowers accept commands from Mestek’s HeatNet systems-management control board preprogrammed with the OEM’s firmware. Pulse-width modulated (PWM) signals are sent from the HeatNet control board directly to the blower’s control board for tight rpm modulation and integration of subsystem functions.

“Our engineers had to work closely with Mestek engineers to ensure the two control systems communicated properly,” noted Benner of AMETEK DFS. “We had to address issues related to current limits and had to go from open to closed loop control.”

“We also had to make improvements to maintain blower rpm on our boilers using the 240-V units, as there were drop-off issues between 208 and 240 V,” noted Piccirilli.
MESTEK AND AMETEK DFS: PARTNERSHIP FOR INNOVATIONS

The relationship between Mestek and AMETEK DFS began in 2010 when Mestek started development of its KN30 boiler, a unit with a 3-million BTU/hr input. As mentioned, the Mestek division of Advanced Thermal Hydronics (ATH) designs and manufactures the KN-Series boilers. Mestek needed a three-phase high-output blower to allow for small-diameter ducts and other special design features ... so in the end, Mestek utilized a Nautilair 12.3-in. blower due to their ability to customize the blower.

Mestek then pursued other projects with AMETEK DFS — to replace blowers the manufacturer had used on other boilers with Nautilair blowers to get better performance and efficiency. Now the entire KN line of Mestek boilers uses Nautilair blowers.

The relationship between Mestek and AMETEK has not only allowed Mestek to develop larger more efficient boiler systems, it has increased AMETEK’s knowledge of the industry and the evolution of their products in this application.

No innovation comes without challenges. On a recent release of a new product there were concerns with the blower system. “So Mestek and AMETEK DFS representatives visited job sites together to investigate the problem — and ultimately brought some units back to our boiler-room laboratory for in-house testing and video recording. Then we identified the issue and went through a collaborative redesign with AMETEK DFS to refine the blower design ... and address the concern,” said Piccirilli.

“AMETEK’s support to quickly address the concerns verified our trust was well-placed — especially as this was just at the end of the heating season in the early spring,” he added.

Accepting various voltage inputs is another useful Nautilair blower capability. After determining the required air performance, the next parameter to dictate blower selection is electrical supply — whether three-phase or not — and at 240 Vac or 460 Vac.
AMETEK DFS supplies blowers that satisfy both commercial and industrial blower applications. Most smaller Mestek boilers that supply between 500,000 and 1 million BTU/hr accept single-phase voltage supply or straight 120 Vac and employ Nautilair 8.9-in. blowers. Mestek also uses Nautilair 7.6-in. blowers (with slightly lower cfm capacity) for boilers that accept 120 Vac and output from 200,000 to 400,000 BTU/hr.

“Over the last several years, we’ve also become increasingly comfortable with supplying custom AMETEK DFS blower products to Mestek,” said Tim Papp, technical sales and application engineer with AMETEK.

“Sales goes beyond the salesperson and catalog-based ordering to give Mestek access to our engineers, and the relationship has evolved into a far closer one of collaboration.” This applies to products over a wide BTU/hr range — from 200,000 to 4 million BTU/hr.

The Mestek division of RBI joins the ATH division in its use of AMETEK DFS blower products. RBI — known for its flagship FlexCore Symmetrical Firetube boilers — designs and sells an array of boilers and water heaters in packaged solutions to fit niche specifications. These include noncondensing and full condensing installations needing 100,000 to 10,000,000 BTU/hr. RBI FlexCore boilers with 850 and 1 million BTU/hr capacities integrate Nautilair 8.9-in. blowers; larger sizes use Nautilair 12.3-in. blowers.

For more information, visit ametekdfs.com/learningzone.

---

**POWER DEMAND AND SPEED VERSUS CFM**

Notice the useful maintenance of speed from just one Nautilair 12.3-in. blower that Mestek employs.