

# Tackling Fluid Power Challenges

Increasing power density and improving cylinder lifespan are key issues.

Alex Cannella, Associate Editor

**A focus on power density is a growing part of life no matter the industry you're in.** No matter where I go or who I ask, it comes up time and time again: Customers want everything in a smaller package, but that doesn't make the torque required for a job magically any less demanding. And so power density becomes the buzzword of the day, with component manufacturers working to either shrink down existing designs without compromising on power or beef up models without getting bigger.

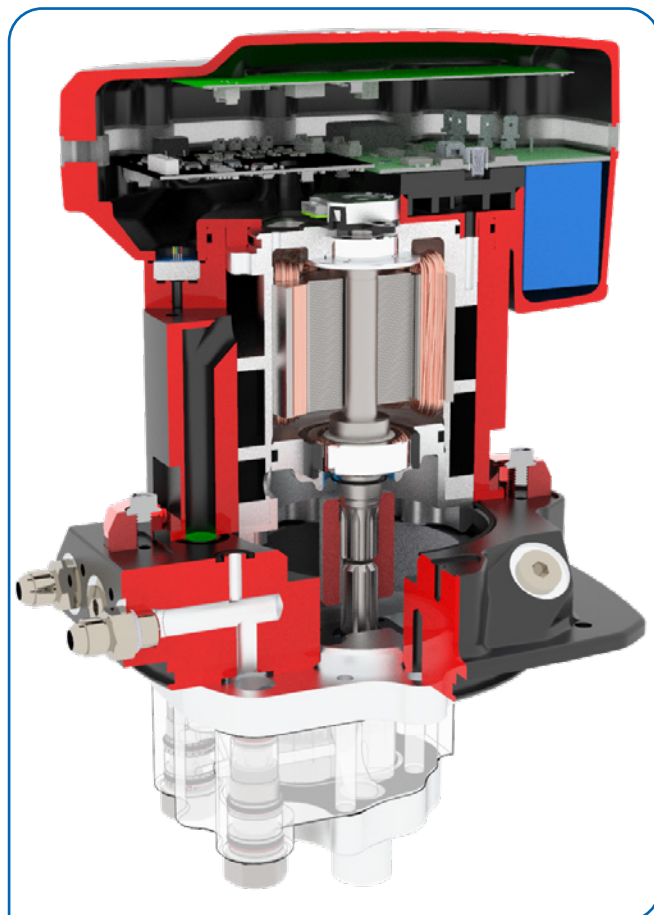
Depending on who you ask, the fluid power industry isn't immune to this surge in demand, either. For some components, it's more important than others, but as with any other industry that somehow ends up using common components like motors, downsizing is an inevitable drive.

Which brings us to Hydrapulse, a package that sells itself on its downsizing benefits.

Hydrapulse has a pretty straightforward pitch. What if you just took a hydraulic power unit with all of its varying components—induction motor, pump, valving, etc.—and just sold those ancillary components pre-attached in a single, cohesive unit?

There's a little more to it than just that, of course. Hydrapulse is also a hybrid power solution. Its PCP board inverter and other electronics also come pre-installed, giving users the ability to control both the pressure and flow of the system, out of the box.

But the main selling point is the assembly's, well, pre-assembled nature. No need to hunt down and acquire a dozen different components, or hash out how you're going to make it all fit inside your own product's parameters. Everything's



Hydrapulse from Terzo Power Systems combines electronic, fluid power and mechanical components in one compact system.

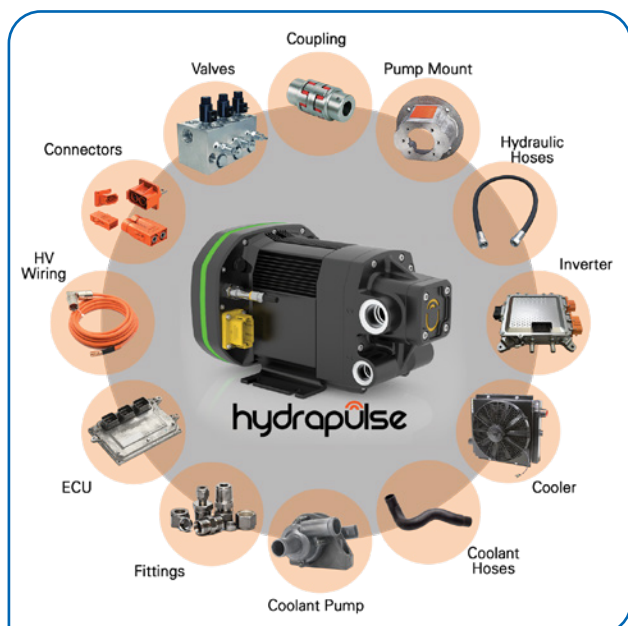
already together and, perhaps most importantly, already guaranteed to work together.

"The idea is that by having that integration already done, that that will reduce installation costs, troubleshooting costs, and it will be a lot more efficient," Rich DiGirolamo, VP of sales, distribution, and business development at Terzo Power Systems, which developed the Hydrapulse, said.

In addition, having everything pre-installed has kept the entire package as small as possible, which is perhaps Hydrapulse's biggest boon. With the manufacturing sector increasingly pressured by power density demands in general, smaller is almost always going to be better.

It's a different approach to improving power density. Usually, doing so would involve looking at different materials and often hiking up costs in the process. But "what if we pre-Tetris'd most of the system's components into one optimized package" tackles the same issue from another angle that often goes overlooked: efficiency. In this case, space-conscious efficiency.

And according to DiGirolamo, the advantage in efficiency and power density that Hydrapulse enjoys doesn't just come down to its smaller package. Sometimes, it can have as much



By combining a wide variety of component technologies, the Hydrapulse system aims to provide smart, flexible systems in a small package.

to do with the existing legacy systems it replaces, which may not always be as efficient as they could be due to a lack of proper diagnostics on hand to inform an OEM's decisions.

"What we're finding when we're going to certain places is a lot of times, they're not exactly sure. They didn't use diagnostic information when they developed the equipment," DiGirolamo said. "A lot of hydraulics is sort of like a black art. People go out and there and say 'ok, we're going to build this and this is kind of what we think it is.' But the diagnostic information is typically not completely dialed in to what specifically pressure or flow you need."

DiGirolamo related how, without the right tools or diagnostics, they'd occasionally find some OEMs who were missing that mark and oversizing their equipment. Hydrapulse manages to tackle that issue head on with built in diagnostics to give those OEMs that information they didn't have last time they designed their hydraulic system.

"If they had a Hydrapulse on their unit—if [oversizing] was even a question for them—they could just go in immediately, reset the pressure and flow on that, and see if they could push the load at a lower power output requirement," DiGirolamo said. "And they could do it right then and there. It

wouldn't even require them to go and plug in diagnostic information. They would be able to see that immediately."

And just as importantly, they'd be able to act on that information, thanks to Hydrapulse's aforementioned ability to adjust the system's pressure and flow. That's not just shaving down on a product's size—that's also energy savings, and energy savings mean monetary savings.

But even beyond Hydrapulse's primary pitch, a whole bevy of additional, compounding benefits spiral out from design decisions made to keep the entire installation small. One notable example: customers can get a Hydrapulse unit without any manifold valving, perhaps the device's greatest space-saving trick of all.

How do they get away with being able to just discard such an important component? Hydrapulse's hybrid design means that for a vast majority of the time, only the battery is



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required for it to run. The only time the motor actually activates is to recharge that battery, and when the motor only needs to turn on intermittently, the overall system produces significantly less heat. And with a primary source of heat removed, manifold valving becomes superfluous, especially in non-continuous duty applications.

This is what I mean about compounding benefits. One decision naturally improves performance in other metrics, which in turn unlocks additional options for Hydrapulse to further improve their product.

Of course, it's still possible to get Hydrapulse with attached manifold valving if the application demands it, which admittedly in some cases, it does. Terzo's got plenty of different ways to implement their system depending on the demands of the application.

"It's sort of what you want to do," DiGirolamo said. "You can have one Hydrapulse that meets an overall power requirement for multiple different functions and use a valve selector and run several functions simultaneously. You could also have a Hydrapulse that is run directly to each individual function and that would completely eliminate all the valving. Or you could take the Hydrapulse and you could plug it into a traditional directional/proportional control valving system and have it just function in the same way that an induction motor would or a VFD servo drive/servomotor would, but it would just be a power on demand system overall."

Hydrapulse works across a wide range of industries: agriculture, construction, hybrid utility vehicles, buses, lifts, doors—the list of applications Terzo is marketing Hydrapulse to is extensive, with its only limiting factor being its intended for use with hydraulic systems.

Perhaps most interestingly for the purposes of this article, Terzo finds itself straddling both sides of the power density question. On the one hand, power density is a major bullet point for products they sell like Hydrapulse. On the other, they have to consider the power density of the components they include in their own designs with Hydrapulse, as well. Not all of the assembly's various components are manufactured in-house—a fair number of them are outsourced. And for a product that sells itself on power density gains, it's only natural that the power density of the components they outsource for also be a top consideration.

"Our value is in our integration," DiGirolamo said. "Being able to integrate all those components of a traditional hydraulic system into a single power-dense unit, so power density is critical."

For others, however, power density isn't quite as critical. The technicians at Peninsular Cylinder experience a similar impetus to do more with the same size components, but according to Jim Czegledi, engineering manager at Peninsular Cylinders, that pressure from customers manifests differently with cylinders.

"Most of the time, [customers] just ask to increase the psi rating of the cylinder so they can achieve more work in the same amount of space," Czegledi said.

Achieving higher psi rating usually comes down to using better materials—a straightforward solution that leaves Peninsular Cylinders with plenty of energy to focus on other,



higher priorities for their products. Instead, the ever-present drive for innovation is to lengthen their cylinders' lifespan, a constant concern that Peninsular Cylinders' Senior Marketing Strategist Chadwick Conte notes they're "constantly making strides" towards addressing.

And according to Conte and Czegledi, if you want to talk about improving cylinder life, it all comes down to the seals, the most common fail point on a cylinder.

For improving seal life, once again the first step is to look at materials. In Peninsular's case, they use heavy urethane for their seals, which improves tensile strength. They don't stop there, however. In addition, they also tweak their designs so that the seal can be pushed further before it critically fails in the first place. While the most straightforward place to put an o-ring is just at the end of a cylinder's tube, Czegledi noted that Peninsular installs their o-rings underneath and inside the tube, which allows the ring to stretch further before the seal is broken and begins leaking.

"We think we have a better mousetrap than everybody else," Czegledi said.

But according to Conte, a big part of improving a cylinder's lifespan is also about designing specifically for its intended application.

"A lot of it comes down to the information that's being gathered initially," Conte said. "A lot of [considerations] that come into play: environment, heat is definitely an issue, the type of fluid that's going to be used inside the cylinder."

As a general rule, the more information you can give a component manufacturer about your application, the better they'll be able to help you design the best part for that application. But in this case, Peninsular Cylinder considers it to be a vital part of the process — so vital that they even have a 50-question data sheet for customers to fill out. According to Conte, the sheet usually doesn't get filled out point by point, but it does usually inform Peninsular on what special needs might need to be addressed in a particular application.

And it's perhaps unsurprising that the list of questions has to be so long when you see the equally long list of industries Peninsular serves, which translates to numerous unique conditions they have to account for. Much like Terzo's Hydrapulse, Peninsular products find their way into applications in machine tooling, oil and gas, the lumber industry, automation, and steel plants, just to name a few.

Flexibility does seem to be the common denominator between the two companies, and when casting a wide net of different industries to serve, they've adopted different strategies. One presents a universally appealing model with additional features, while the other dives into full-on custom tailoring their components to account for application.

Honestly, both probably work. **PTE**

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