



CASE STUDY

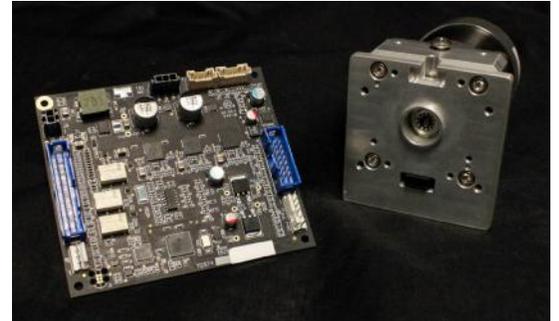
Power Electronics: Digital Pump Drive

THE CHALLENGE

Power a laboratory pump system occupying only one-half the bench space with one-quarter the volume of the current product, and increase performance while also reducing cost.

THE SOLUTION

A 3-phase Brushless DC motor control based on a motor control DSP controlling Infineon half-bridge intelligent power modules (IPMs).



"The design team at Tecnova developed a high quality, robust, and compact solution to meet our exact needs."

THE SUMMARY

In a continuous drive for smaller and higher performing products, a world leader in laboratory pumps developed a new pump that would significantly move the bar. The new product would be powered by an efficient, brushless DC motor supplied from a 24V DC in-cord power supply similar to the ones used to power laptop computers. The combination would allow for a very small pump taking up one-half the bench space compared to their existing products. With product plans in place, Tecnova was called-in to join the team. Our roll would be to develop the motor drive electronics, user interface electronics, and firmware inside the product.

The design called for a continuous 75W of output power and 2 to 3 times the continuous torque (current) for starting.

The electronics was also tasked to manage analog and contact closure process control inputs and outputs, a membrane keypad, and a graphic LCD display. This all was to be accomplished with a defined footprint (3" X 3.5") and with no external heatsink – and at low cost.

Fortunately, modern and inexpensive DSPs are up to the control challenge. A 16-bit DSP was chosen as the controller. At a blazing speed of 140 MHz, and supporting dedicated hardware for motor position feedback, current sensing, and 3-phase PWM, Tecnova was able to implement an effective vector control using only a small fraction of the processor's available instruction cycles. The product delivers smooth 0-300 RPM performance while maintaining seamless

refresh of the 128 X 64 pixel LCD and responsive I/O.

Three half-bridge drivers were chosen to drive the 3-phase bridge powering the motor. The maximum 5.0m (@ 25C) RDS(on) of the half-bridge MOSFETs coupled with the synchronous rectification of space vector PWM permitted operation without a heatsink. The entire power stage including two conductive polymer hybrid Aluminum Electrolytic bus capacitors occupies less than 2 sq-in of PCB area. The assembly is 0.5" high.

The new product is pumping up sales by meeting expectations for ever improved performance in a smaller package and at a lower price.

EXPERT SOLUTIONS, START TO FINISH

Tecnova provides advanced, sophisticated electronic contract manufacturing and engineering. We specialize in projects that benefit from technical innovation and design expertise.

Tecnova has been recognized by Quality Magazine as a top Quality Leadership 100 Company. We develop and maintain long-term relationships with our clients, working side-by-side to solve their simplest or most complex problems and to achieve their long-term strategic objectives. [Request a free project consultation.](#)



TECNOVA

Expert solutions. Start to finish.

2383 N Delany Road
Waukegan, IL 60087 USA
847.662.6260
www.tecnova.com

