

Why Won't This Motion System Work?

Integrating motion controllers, amplifiers, and motors from multiple vendors is at best a headache, and at worst can kill your project. Interfacing problems, component incompatibility issues, multiple vendor coordination, lack of system accountability, delayed time to market ... the list goes on and on. Can a company known for its "Dedication to the Science of Motion" solve the problem?

Having a complete line of products is only the beginning of solving customer's automation problems. What Aerotech adds is a company-wide philosophy, a "Dedication to the Science of Motion."

"One of the principles of this philosophy is to provide our customers with lowest cost-of-ownership solutions to their motion control and machine or process automation needs," states Ron Rekowski, Manager of Technology at Aerotech. "Lowest cost of ownership requires us to think of a product beyond its traditional definition as a piece of equipment with a given set of performance characteristics and an associated selling cost. For example, if our linear motors have a 30% greater force output than a competitor's model and both are priced similarly, then everyone recognizes Aerotech motors are a better value; that's a traditional way of evaluating two competing products. But if, in addition to superior product performance, our motors are easier to install and align, then our customer saves labor costs and further value is added to the product."

MACHINE AUTOMATION CHALLENGES

"Technological leadership still drives our growth," continues Rekowski, "but with customers pushing the performance envelope



Aerotech's BLM series linear motors provide peak forces from 292 N to 4744 N (66 lb to 1064 lb).

there's little margin for error in today's motion systems. Drive platforms are migrating toward direct-drive,

which are much less forgiving than mechanical drive trains. Today's shrinking product design and life cycles leave little time for engineering trial and error."

As a manufacturer of multi-axis motion controllers as well as motors and amplifiers, Aerotech is in a unique position to support machine automation projects. This "integrated solutions" approach allows companies to focus primarily on their core processes and technologies.

The two real-world case studies that follow illustrate how Aerotech's integrated solution approach

provided their customers the best solution, in the shortest time, and met or exceeded application requirements.

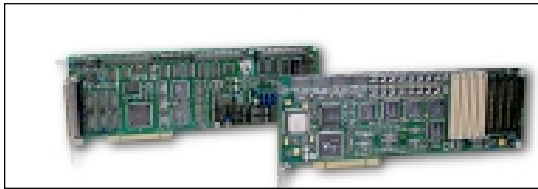
"Resolving these issues was made more complex as none of the incumbent component vendors was able to analyze the performance issues on a system level."

STUDY #1

Problem: A manufacturer of automotive component testing machines multisourced their motion system components. Their machine wouldn't work properly and diagnosing the causes was proving impossible.

Analysis: Often, these problems result from component incompatibility between different motion component vendors. Manufacturers typically design their products to optimize a certain set of performance parameters. But between two different motion vendors, these parameter sets might not match well, leading to degraded performance. These incompatibility issues are rooted in the fundamental design of the product, making them very difficult to anticipate or identify.

Solution: Their newest design, a four-axis machine utilizing linear motors, was underperforming in critical areas. First, the force output from the linear motors was significantly below the rated specifications from the motor manufacturer. Second,



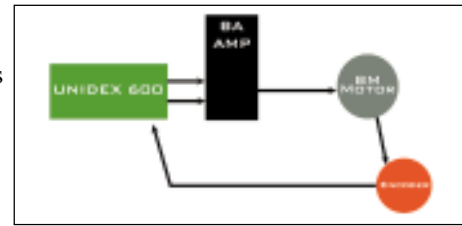
Aerotech's U500 and U600 PC-based motion controllers are available in both PCI and ISA bus formats with up to 16 axes of synchronized servo or stepper control from a single trajectory generator.

the velocity regulation of the system was poor; the motion was rough and jerky. Since the process required contoured motion, smooth velocity was a necessity.

The rest of the motion platform consisted of a PC-bus motion controller with four axes of amplifiers; both the controllers and amplifiers came from different vendors.

Resolving the performance issues was made more complex as none of the incumbent component vendors were able to analyze the performance issues on a system level. Unable to resolve the situation on their own and behind on their product launch, the customer turned to Aerotech's Motion Control Division. Together with the manufacturer, Aerotech engineers diagnosed two fundamental problems with the existing equipment selection. In the case of the underperforming motors, it was discovered that the amplifier could not deliver rated power due to an incompatibility with the resistance characteristics of the linear motors. In the case of the rough contouring, it was discovered that the incumbent motion controller could not sinusoidally commutate. Although the controller was capable of generating a contoured motion profile, their lack of sinusoidal commutation capability resulted in a torque profile with significant disturbances.

Aerotech proposed a solution consisting of the UNIDEX 500 series PCI motion controller, BA series amplifiers, and BLMX series linear motors. The



BLMX series motors easily met the acceleration requirements of the system and the UNIDEX 500 provided the requisite sinusoidal commutation capability for smooth contoured motion.

Brushless motors must be sinusoidally commutated to obtain the smoothest motion.

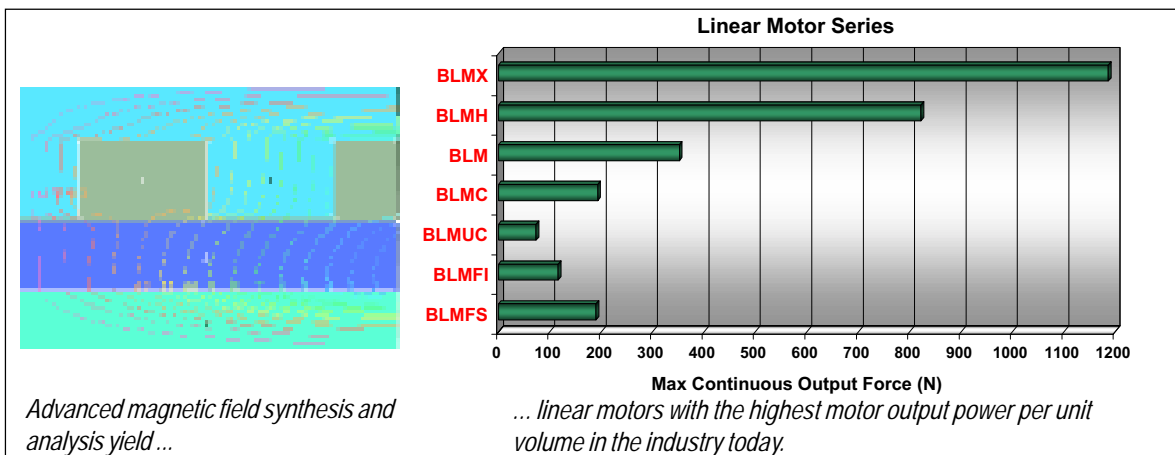
In addition to meeting the performance specifications of the system, Aerotech provided an easily integrated motion system with single source accountability for system performance, delivery, and service.

STUDY #2:

Problem: A manufacturer of electronic fabrication machinery had a competitor introduce a machine utilizing direct-drive linear motors. The new model offered significantly better throughput and lower cost of ownership than the manufacturer's existing ball-screw-based design. The competitor's market share was growing. A quick response with a competitive product was required; time to market was crucial.

Analysis: Migrating to direct-drive linear-motor-based technology from a traditional mechanical drive train design requires looking at more than just replacing the ball screws with linear motors. Controller, amplifier, and mechanical design issues must be taken into consideration to make the design work successfully and with optimum results.

Solution: The customer's current machine design used rotary motors with tachometer feedback along with ball screws and belt and pulley mechanisms to provide linear motion. The existing control technology had no support for commutated motors,





Aerotech's BA series amplifiers provide peak current of from 10 to 100 A.

nor could it sustain the higher speeds that would be required in the new design.

The time to market constraint lead them to select Aerotech as the sole source for their motion requirements. By dealing with a single vendor they could use components that were designed to function together as a system. With multiple vendor solutions the interconnection and configuration of the individual components requires a great deal of time during both the machine design and startup phases. The Aerotech single vendor approach reduced these complexities by providing "plug and play" interconnect between all of the motion components. Also, any design challenges that could arise, as well as questions concerning functionality, operation, or specifications that could be brought up during component integration, could be addressed through a single point of contact. In addition, the customer leveraged Aerotech's long history of applying linear motor technology to its own electromechanical systems. In fact, during the design phase, Aerotech often provided valuable insight concerning issues inherent in linear-motor-based systems, such as cable management, linear encoder integration, and linear-motor heating effects.

The final design incorporated three Aerotech BLMX series brushless linear motors for the X, Y, and Z axes. A UNIDEX 600 controller easily integrated the three-axis system to three linear encoders used for position feedback and verification. The final results were impressive. The new Aerotech-based machine operates at up to 1700 inches per minute at a maximum of 1.3 Gs of force, nearly doubling the throughput of their existing ball-screw-based machine.

FOR MORE INFORMATION

Visit Aerotech's web site at <http://www.aerotechinc.com>, e-mail to: aerotech@aerotechinc.com, call (412) 963-7470, fax (412) 963-7459, contact the company at 101 Zeta Drive, Pittsburgh, PA 15238, or circle the appropriate number on the Reader Service Card included with this supplement.

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AEROTECH ON THE WEB

"Downloadable PDF and CAD files make the Aerotech website a valuable tool for today's design engineers."

"When we set out to design the Aerotech website," stated Steve A. Botos, Director of Sales & Marketing, "we knew from our experience with the Aerotech print catalogs that our engineering audience wanted as much technical information as we could provide them. While important, the technical content of the site had to be complemented by a format which was logically organized and easy to navigate."



This proved to be no easy task for the company's extensive product lines. But in August, Aerotech

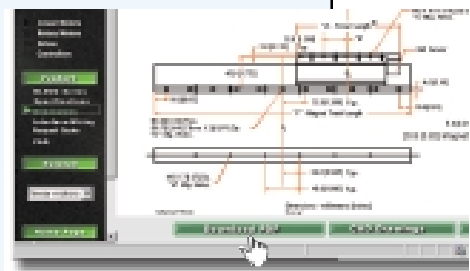
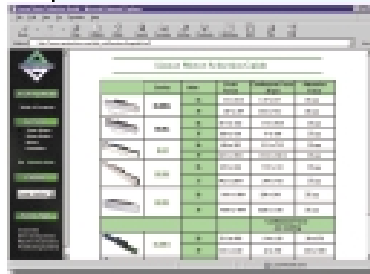
introduced an on-line catalog for its Motion Control Division. "The on-line catalog begins with selection guides to allow engineers to quickly scan product families," continues Botos,

"so they can then narrow their choices rapidly to the products they need."

Once the specific product is chosen, comprehensive technical details are available in an easy-to-navigate format.

"A terrific feature of our on-line catalog is all the products are available in PDF format for "print-like" page

downloads. Also, all the product drawings are available in CAD format so they can be downloaded and easily used." The Aerotech website is found at:



WWW.AEROTECHINC.COM