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John Tajirian anticipated the aerospace trend for more titanium parts several years ago—and installed two high-torque, rigid, five-axis trunnion HMCs.

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KT Engineering Thinks Ahead

Strategic planning is key to this award-winning aerospace manufacturer's success

Michael C. Anderson
Senior Editor

Visitors to KT Engineering (Rancho Dominguez, CA) find a clean and orderly manufacturing area with an undercurrent of purpose-driven energy: CNC machinists clearly know the nuances of the equipment and the minutia of their tasks. Engineers walk briskly carrying SPC reports, slight furrows at their brows—countenances of concentration. Assemblers work adroitly, handling freshly finished parts with care. Machine tools buzz, coolant splashing their interior windows. All the elements—place, procedure, people, production—pulsate. But then, they must: They make jet fighter parts here.

Established in 1986, KT Engineering is a vertically-integrated supplier that offers OEMs a single source to design, produce, assemble, and deliver a range of components, many for defense programs. Its walls feature awards and certifications from the

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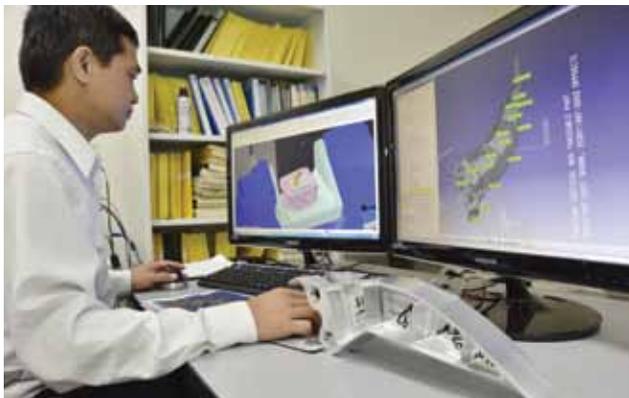
major aerospace OEMs. The company is also licensed for the International Traffic in Arms Regulations (ITAR) for exporting products out of the country. Company president John Tajirian is most proud of winning Lockheed-Martin's coveted Supplier of the Year award in 2011, because it represents many aspects of the relationship, not only part quality and delivery, but also characteristics such as cooperation, receptivity, communication, and responsiveness.

"It is a great honor," Tajirian said.

Planning is Paramount

It's an honor over a quarter-of-a-century in the making, with the ongoing refinement of an approach to the parts-making business that works at KT Engineering. That approach in a word: Planning.

"Even when we get an order in that isn't due for a year, we schedule a meeting usually within ten days of receiving it," said Tajirian. Applying the just-in-time production theory as it's described in text books can put a subcontract shop in an awkward position at times. Our idea of just-in-time is three to six months ahead preferably."



The CNC Programmer reviews toolpaths in Mastercam before running a repeat order of a titanium hinge component used in a jet fighter program.

That being said, KT Engineering can fulfill emergency orders from existing and even new customers quickly, thanks to all the planning the staff does for material, tooling, and redundant machine tools on the floor of the 25,000 ft² (2325 m²) facility. Further sustaining that philosophy of thorough preparation, most of the company's 26 employees have support and planning roles to champion all the activities done in advance of production, as well as post-production follow-through—finishing, assembly, and shipping. For example,

when the company receives a project (often via Exostar, the secure collaboration media channel predominantly used in the aerospace industry), one of the early tasks is to place an order for the raw material. The team determines a shipping date, which could be months ahead, and follows-up with the material source at plotted intervals to ensure the inbound date is still on target. Regarding equipment redundancy, several CNC machines are duplicates of the same brand, perhaps stepped in size, from three-axis VMCs to heavy duty four- and five-axis HMCs, some less than two years old. The company even has two CMMs, which is unusual for a manufacturer of this size.

"We are a subcontract business. We have to be flexible and ready for whatever work comes in. Having redundant and diverse machinery is one of the many ways to be prepared and respond," said Tajirian.

KT holds two production meetings a week—another uncommon occurrence at a company of this size—to review all of the open purchase orders and assess the status of incoming vendor orders. Additionally, Tajirian facilitates at least one planning meeting each week that also includes two programmers well-versed in Mastercam, the general manager, and the project manager. They discuss how a part will be processed. The group reviews the CATIA models as they come in from the customer and all of the guidelines, including quality parameters, heat treating, finishing requirements, which equipment it will run on, material grades and dimensions, fixturing, special tooling needs—all the aspects required to process the part.

"We are a subcontract business. We have to be flexible and ready for whatever work comes in."

"There are myriad requirements in aerospace," Tajirian said. "What we're doing, I'm sure all subcontractors have these kinds of meetings. It's *when* we do it in the process and *how* we execute the project that keeps us on target that really differentiates us and has helped us become a reliable, certified supplier for these major aerospace military programs. In fact, we just scored another 100 percent on a recent client report card. It's a tangible acknowledgement for a methodology and philosophy here that involve intangible activities."

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Constant Production Improvements

About six years ago, KT Engineering anticipated the trend for more demand of titanium parts from its clients and prepared by researching the typical parts and the work envelope required for 80% of the work that would be outsourced. The company purchased two additional Mitsui Seikis—five-axis horizontal mills with trunnions—as a companion to its two other legacy four-axis Mitsui Seiki HMCs.



Dual-pallet system on the two trunnion-style Mitsui Seiki HU63A-5X machines enable the titanium stock to be loaded while the workpieces are being machined.

“We have gained a lot of experience in titanium since then. This is another aspect of planning—we listen to our vendor resources about what they are seeing in the marketplace and the technology solutions that are truly working. We also visit the OEMs in our target sector and note what they have on the production floor or, perhaps more importantly, *wish* they had on the floor. Mitsui Seiki advised us on the comprehensive titanium-cutting solution, including tooling, such as the Kenametal Harvi cutters.”

KT’s early-and-often planning approach might be intangible, but quantitative data are not, and the company’s clients evaluate KT’s part consistency, among other factors, in numerical terms. To that end, Tajirian and his team are continually looking for ways to improve part precision. The two CMMs—supported by the latest PCDMIS and CATIA software—and the other gaging devices in the cool, quiet quality room get a healthy workout at KT engineering. The company is certified to both ISO 9001:2008 and AS9100C.

Quality technicians measure part accuracies, monitor productivity gains, track all parts via a barcode system, and compute and appraise the trend analyses. For instance, a titanium hinge used in an aircraft wing assembly used to take 32 hours to produce; now it’s down to 18 on the five-axis trunnion HMCs. KT’s skilled machinists have always been able to hold required tolerances, but before those new HMCs were in place the part had to travel to and from five different machines, which increases the risk of going out of bounds with varying positioning values of each piece of equipment. Plus the extra physical handling added more unproductive time to the statistics. An unforeseen benefit: finer surface finishes are also being achieved, which translates to less bench time.

“The ample work envelope on the trunnion machine allows us to cut two parts out of the titanium block now, and cut five sides in one setup,” said Tajirian. “That has also improved our efficiency. As for the quality impact, the rigidity and accuracy are exceptional. On the bores we are achieving a plus or minus two ‘tenths’—better than half a thousandths, and true positioning of less than a thousandth. The customer asked for plus or minus one thousandth of an inch, but is getting even greater accuracy and at no additional cost. Each piece of equipment here has its place, its areas where it’s the optimal choice. For titanium, it’s the Mitsuis. For aluminum, it’s the SNKs.”

A tool presetter with optical magnification and a shrink-fit system are the centerpieces in a well-organized tooling area at KT Engineering. Tool presetting contributes to time savings and human error reduction. Tooling adjustments that can take up to 15 minutes in the machine can be made offline in less than a minute on a presetter. The data are transferred directly to the machines rather than an operator having to manually input the figures. Tajirian said that shrink fitting the tools has extended the tool life and run-out on the high-torque trunnion machines cutting titanium significantly.

A wing assembly’s titanium hinge used to take 32 hours to produce; now it’s down to 18.

“Everyone is noticing how much our tool life has improved on titanium,” he said. “By at least 15%.”

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As a back-up check, machinists use a separate mechanical presetter to verify that the tooling dimensions are indeed correct. While this step takes extra time, it provides additional insurance to avoid potentially costly errors during machining.

Content, Competent Workforce

For many employers, people represent the most challenging aspect of managing a company. KT Engineering is committed to continually provide training to its diverse staff to expand the employees' knowledge, capabilities, and confidence. Further, Tajirian cultivates—mainly by example—an atmosphere of respect, dedication, integrity, and striving to improve. He is considered a generous employer; he, in turn, is grateful to the KT team “for their dedicated, persistent effort every day and the value they bring to everything we do here,” he said.

Going Forward

As do most subcontract manufacturers, KT Engineering would like to expand its business, but at a manageable pace to maintain its high level of customer satisfaction.

“About 99% of our work is in aerospace and defense,” Tajirian said. “Serving additional industries would diversify our base, which we welcome, but in no way would it dilute our aptitude and interest in our core market, particularly with our growing knowledge in titanium machining now with the Mitsui Seiki equipment. We are extremely dedicated and proud to be a member of this critical, complex supply chain and will do what we need to do to ensure we keep evolving to become even better partners to our current, and new, customers.”

At KT Engineering, it's evident that plan is well underway. **ME**

This profile was edited by Senior Editor Michael Anderson from information provided by Mitsui Seiki.