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FIRING ON ALL CYLINDERS

MTU's new South Carolina plant hits full operation with machining, assembly and testing of Series 2000 and 4000 engines for North America

BY MIKE BREZONICK

With the recent commencement of machining operations, MTU's new North American engine facility has hit full stride. But in reality, things have been moving rather swiftly since MTU first announced its move south from Redford, Mich., to Graniteville, S.C.

The Tognum Group, MTU's parent company, finalized the deal for the 100 acre campus, formerly home to an SKF manufacturing facility, in March of 2010.

In the ensuing months, the 270,000 sq.ft. building was modified and expanded to accommodate engine assembly

and testing (see related story) facilities. By mid-October, the first engine assembly and testing began.

The final leg was the installation and commissioning of machining systems for cylinder heads and cubical parts such as flywheel housings and gear case housings, which was completed this spring. Since then, the company has continued to ramp up its activities at a plant that is expected to have an initial capacity of nearly 2500 engines a year and go up from there.

Yet while the entire process may have consumed more than a year

— and a total investment upward of nearly \$45 million — nothing about the pace of it was leisurely.

"It all took place very swiftly with much hard work," said Dr. Ulrich Dohle, a member of the Tognum executive board for Technology & Operations. "When you think of all that had to be done to go from Redford to South Carolina, it was really a remarkable achievement.

"When they first started talking about when they would begin, they told me that by the 15th of October, they wanted job number one running. And I said,



Tognum, the parent company of MTU, acquired the 100 acre Graniteville site in the spring of 2010 and began engine assembly by mid-October of the same year. Much of the manufacturing equipment and machinery was moved from the previous Redford, Mich., facility to South Carolina.

make it the 13th, it's my birthday. They actually made it a couple of days before that, but I was still pleased they achieved the birthday wish."

Assembly of Series 2000 engines in Michigan was halted in April of 2010, while the Series 4000 engine line finished at the end of July. "Actually, staging it that way, we had the opportunity to learn from the first line to the second," said Matthias Vogel, president and CEO of MTU Detroit Diesel. "From what we learned, we were able to move the second line faster.

"In order to save costs, we took everything we could — the hoist systems, the material racks, the turnover stations — everything we could move went onto trucks and came down here."

Even beyond the dizzying logistical challenge of shifting the complete assembly systems for two large engines more than 820 miles, there were several additional challenges, greatest of which was making sure no business was compromised along the way.

"In hindsight, it was basically the only time when such a move was feasible," said Dohle. "We had moved some of the engines to Friedrichshafen at the end of 2009. Because the economy was slow, between the engines we made in Friedrichshafen and the inven-

tory we had built up in Detroit, not a single engine was lost to a customer.

"That would not be the same today because the market has come back and we would not be able to supply all of it out of Friedrichshafen. It was

Putting Flexibility To The Test

Expandable engine test capability positions new MTU facility for future growth

When installing something as complex — and expensive — as engine production test cells, one of the most challenging issues comes down to scale. Do you build enough cells to suit your current and near-term business or do you roll the dice and install the test capacity you might someday need on the basis of longer-term business growth?

For its newest MTU engine plant in Graniteville, S.C., it's fair to say that Tognum, working with test facility integration specialist ACS, was actually able to accomplish both.

At the plant's initial opening late last year, two test cells were operating and a third is expected to go online within the next year. But very deliberately the test facility, which encompasses a sep-

pretty much loaded at the beginning of the year."

Local machining and assembly will also help MTU be less susceptible to currency fluctuations between the dollar and euro and avoid the high cost of importing parts from Europe. "The new facility in Aiken County is part of Tognum's global strategy to increase manufacturing in the markets where our products are sold," said Vogel. "With it, we will have greater flexibility to respond to market conditions and to compete for government contracts where local content is key."

The Graniteville facility is among several moves the company has made to broaden its engine footprint in North America over the last several years. It also established the MTU Oil & Gas Application Center in Houston that supplies engineered systems for the energy markets along with an engine maintenance facility in Alameda, Calif., designed to serve marine engine markets, primarily supporting naval and Coast Guard customers. **dp**



MTU's new Graniteville S.C., plant incorporates an expandable, highly flexible test cell facility developed by the company and test cells specialist ACS. The facility can do production hot testing of MTU's Series 2000 and 4000 engines, as well as future engines.



The new MTU test cell facility at the Graniteville site currently houses two test cells, which will be expanded to three within the next year. But the site has been developed to allow expansion to as many as six test cells capable of testing up to 15,000 hp.

arate area of the 270,000 sq.ft. plant, has been designed for growth. With a central mechanical room encompassing an array of chillers and heating systems, a 12,000 gal. fuel storage capacity and 50,000 gal. water tanks, the site can accommodate up to three more hot test cells.

In all, the test cell investment approached \$20 million, just under half the \$45 million Tognum spent on the entire Graniteville site. But it has also positioned the company for expansion far into the future.

"Our current setup is designed for 6000 hp and our test facility is designed for up to 15,000 hp," said Steve Blaszczak, manager of engine test testing at Graniteville. "So as we continue to grow our business, we'll have plenty of capacity for expansion, which we're already planning for.

"Each engine is tested and each test runs about 80 minutes long. We run anywhere from no load or rpm up to its full power range. So within the 80 minutes we will see temperatures of near 100°C of boiling point, and we can see almost 4 gal. of fuel burned per minute. We're not up there very long but we have to get up there for fuel mapping and to set fuel curves for the end customer. We have instrumentation

to control everything and we can do special requests for customers as far as validating whatever they need.

"Each test cell is multifunctional so any engine you see out there and additional from military can be tested on any test stand. So it dramatically reduces the investment for equipment maintenance. So we can test a Series 4000 and the next engine we bring in can be a Series 2000 or maybe a military engine when we design for that. We've designed the facility to be multifunctional so any additional piece of equipment we'll need can be added.

"It's what you can do with a clean design approach from the beginning."

Yet that clean design approach wasn't simply a matter of starting fresh and designing an entirely new facility from scratch. The reality turned out to be much more complex, according Scott Hoselton, director of Business Development for Madison, Wis. - headquartered ACS.

"As is often the case with manufacturing machinery and systems, MTU sought to reuse as much of the technology from the Redford plant as possible," said Hoselton. "When you're relocating existing equipment from one facility to another, there are significant challenges that go with that. It is often

more difficult to move and recondition existing equipment than to buy new.

"Another challenge was the schedule. We understood from the very first meeting that the schedule was a key driver due to market considerations. That wasn't a problem, since the way we deliver products is by utilizing an integrated project delivery model where we have the architect, the engineer, the construction manager, the equipment supplier and the integrator all working together in one room. In addition, many tasks are executed in parallel versus series, allowing us to accelerate the delivery of our projects as compared to the traditional design-bid-build approach.

"Because of the flexibility of our delivery model and available MTU resources, we were able to include MTU personnel as part of our project team, which helped facilitate timely decision-making. We had a good understanding of the culture because of the previous work we had done with MTU in both the U.S. and in Friedrichshafen. Having some of their people on our staff with clear responsibilities really helped accelerate the delivery process."

Jörg Klisch, director of operations for MTU Detroit Diesel and plant manager at Graniteville, also viewed that collaboration between MTU and ACS as critical. "Usually what you do in such a project is you have a general contractor build a building and at some point, he's through, you sign off and he walks away," Klisch said. "Then you're sitting there with whatever he designed — hopefully something good.

"We said in order to save some money and to educate the people that later on will operate the facility, we wanted to integrate three of my engineers into the ACS team. So they were basically taken out of their regular jobs — down to about maybe 20% — and they were teamed up with ACS. The benefit we saw, aside from the cost savings, is that these people know every screw and every bolt of the system and they can maintain it in a different way. Their understanding



Each engine assembled by MTU at the Graniteville facility undergoes a hot test that averages 80 minutes in which the engine is operated from no load to its full power range. The flexibility of the test instrumentation is designed to allow for a wide range of testing to meet specific engine customer requirements.

of the system was way better from the get-go. As the user of the system, that's the biggest benefit."

It also helped that the two companies had worked together previously. "We had experience with ACS from our time in Detroit," Klisch noted. "We had enhanced the test cells in Detroit with a new exhaust system that made the changeover times very fast compared to what it had before. It was very tricky because it had to be done while the test cells were running and we couldn't shut down more than one test stand at the time.

"The progress we made there was remarkable and the way ACS worked with us and the way they met the timeline basically met our expectations in every way. So when it came to the question of who could build the test cell environment in South Carolina, after doing a selection we ended up again with ACS, but this time, it was more than just enhancing a test cell — it was creating a new test cell.

"Meanwhile ACS was also working with our parent company in Germany as well, so it became a three-headed approach. We had our people in Germany with their experience, we had our own experience and we had ACS, and we said let's create something that's even more flexible than what Friedrichshafen is doing. Since we had the opportunity to create something new, it had to be better. Just to keep the status quo was not enough."

ACS had experience with that sort of challenge, as it has a nearly two-decade long history of developing advanced test facilities for the likes of Harley-Davidson, Cummins, Caterpillar and Gehl. "Our model of how we manage very complex projects is very exportable," Hoselton said. "It's based on things like extension of staff services, single source responsibility and most importantly, a proactive technical presence. It is critical that we have that technical presence because there are many project components that you can't go hire a typical mechanical firm to execute because of the lack of familiarity with all of the integration that's necessary between test systems and facility infrastructure.

"If you look at a typical engine/vehicle test facility project, there are several components — a planning component, an equipment component, a facility engineering component and construction and commissioning — and historically these are all separately contracted. What clients have found is the need to devote full-time staff to manage these projects, and when the project is complete they have all this expertise with no capability or opportunity to gain any revenue with this knowledge.

"Many of our opportunities develop after a client has done this internally. They found it is not cost-effective or took a lot longer or it tied up resources for an extended period of time and they weren't getting their regular jobs done. Of our new client base, at least 50% of it comes from, 'How can we do this better?'

"Integration is really an overused

term but that's really our expertise — understanding facility systems and test systems and how they work together."

The Graniteville project began in earnest in March 2010, as MTU finalized its acquisition of the site. "We saw almost at the very start that order intake was increasing and we thought internally, we might be two months behind at the beginning," Klisch said. "Basically the demand was driving us, and we had a lot of emotional meetings. But it helped us to really stay focused on the project."

The next six months involved moving and installing existing equipment and integrating new systems. Engine assembly began in mid-October as the test cells were in their final stages of installation and commissioning and the two cells were functioning by the beginning of November.

"Our integrated model delivers these types of facility projects and 12 to 14 months fairly regularly because it's our core expertise," said Hoselton. "But this took a lot less than that — it was very quick from the total project perspective. We recognize this was MTU's money and their project. Our goal is to always deliver the best project possible for the funds that are available and according to the client's timeline.

"Ultimately with this type of project and schedule, you are aware that clients may be waiting on the product. And it was a very aggressive timeline. It took strong and effective leadership from the client side and the integrator side and that's really what enabled the scheduling success. Good decisions were made quickly and that allowed the project to be moved forward, on time and according to budget."

"There were some tough decisions made during this project," Klisch agreed. "ACS was very responsive of our requests, they would understand where we were coming from, we'd reach a conclusion and move on. In that sense, I couldn't think of a company that could've done the same project better." **dp**

— Mike Brezonick