

FACTORY: SHRINKING TO GROW

The first time I visited Continental Motors was about 1993—20 years ago. A colleague advised me to take a flashlight and he was right. In those days, the factory was a hot, dark cave straight out the 1940s, with row upon rank of discrete, hand-operated machinery for batch making of engine parts.

Twenty years later, few of those machines are still there and while the factory isn't exactly a gleaming clean room, it is well lighted and even air conditioned. It also resides in much smaller factory floorspace. Consistent with a general trend in manufacturing, Continental has made ongoing investments in modern CNC machining centers that are capable of dozens of different machining operations with greater repeatability and accuracy, displacing older machinery that had occasional trouble with both.

As Continental integrates production of the new TD300 into the Mobile plant, this kind of technology—and the continuing investment—should allow the diesel to flow through the production line seamlessly, sandwiched between gasoline engine parts production as customer demand warrants.

Martin Lee, Continental's senior manufacturing engineer, says that the plant is about \$6 million into an \$18 million capital improvement program that was actually started before AVIC International bought the company from Teledyne in 2011.

As volume in the aircraft engine business has declined, Continental has faced the daunting challenge of quality control in a low-volume, high-product-mix business. That requires frequent machine changeovers for batch production which, in addition to being expensive, presents the opportunity for errors of the sort that result in recalls and ADs. (That happened in 1999 with Continental crankshafts.)

On a plant tour, I was shown a pair of new Mori Seiki machining centers that form the core of the factory's new cam line. The economic impact

just these two machines have on production is eye opening.

"It gives us more flexibility and faster changeovers," Lee explains. "When we're all said and done, it will take 10 days out of the total machining cycle for cams. It used to be 25 days with six to 12 hours for changeover; now it's 15 days and 10 minutes."

In walking the plant and with the exception of cylinders, you don't see carts and bins full of parts, or at least you shouldn't. The idea is that flexible, fast-change machining allows the plant to build to demand, rather than storing large inventories.

"In the past, we might have kept 200 cams in inventory. It required tribal knowledge to know when to run another batch, so if the customer called for a cam, sometimes we wouldn't have it," says Mike Gifford, director of factory services. Flexible machining, says Gifford, lowers inventory and shortens lead time to deliver finished parts.

The company also expanded another machining line used for crankcases that advances another trend made possible by flexible CNC: in-sourcing. "We've taken the four-cylinder crankcases, the 200 and 240, back in house," says Lee. That sets the stage for automated crankcase production on the TD300 diesel when demand materializes.

During my visit, I saw an assembly cell—again, flexible for expansion—with a unique visual method of assembling engines from trays as a means of quality control. Mike Gifford says that TD300 components are almost entirely out-sourced for now, but some will likely be brought inside when TD300 production ramps up. —Paul Bertorelli

