

Flexibility Fuels Ford Facility

Forklift-free material handling system keeps engine plant flexible.

Steve Orr laughs when he refers to the “Dark Side” of Ford Motor Co.’s Cleveland Engine Plant No. 1.

And the space leftover? Well, that’s the Dark Side. “Before, we’d build a line, and it could just do one engine,” explains Orr. “Now, we can build six different engine models on the same line. We can go from a six-cylinder engine to an eight-cylinder engine or whatever. It’s pretty neat.”

More than 800 employees now work at the facility, and the plant is expected to assemble 325,000 engines per year at full production. The plant’s sister facility, Cleveland Engine Plant No. 2, won the Shingo Prize for Excellence in Manufacturing in 1996. Combined, the two plants can produce more than 1 million engines annually.

“We use carts to deliver pretty much everything to the line.”—Steve Orr, Ford Motor Co.



Forklifts are confined to the dock, where they transfer skids of parts from trucks to the carts. Photo courtesy Kinetic Technologies

In 2000, Ford closed the 53-year-old facility so it could be revamped to produce the company’s new Duratec aluminum engines. More than \$350 million was invested in new equipment and tooling to make the plant more flexible and efficient. When the plant reopened 3 years later, it was radically different.

“We totally redid the whole place,” says Orr, superintendent of material handling at the facility. “Or, I should say, we redid half the place.”

That’s because the new line is so flexible that it can produce more models in half the space of the previous facility.

Cleveland Engine Plant No. 1 is organized into three lines for machining the engine blocks, crankshafts and cylinder heads. These lines then feed into a central assembly line. Radio frequency identification tags and 2D Data Matrix codes track each engine and ensure that the right processes are performed on the right parts. Engines travel along the line on custom pallets that give operators access to all sides of the assembly. In-process test and inspection procedures are so thorough that the plant doesn’t need to hot-test fully assembled engines at the end of the line.

■ By John Sprovieri
Senior Editor



Using carts to deliver parts to the line has saved space. Because parts can be sequenced and loaded onto racks at a central location, there's less need to store all the parts for different engine models on the line.

Photo courtesy Kinetic Technologies

Forklift-Free Delivery

The material handling system has played a key role in improving the plant's flexibility, safety and ergonomics, says Orr. Parts are delivered to the line in bins or custom-built racks traveling on wheeled carts pulled by electric tuggers. Forklifts are confined to the loading dock, where they transfer skids of parts from trucks directly onto carts or to a nearby "supermarket," where workers place parts into the racks in the sequence in which they are needed.

The carts were supplied by **Kinetic Technologies** LLC (Willoughby Hills, OH), and the tuggers were supplied by Taylor-Dunn Manufacturing Co. (Anaheim, CA). Some 188 carts are now used for line-side parts replenishment throughout the plant. "We use carts to deliver pretty much everything to the line," says Orr.

Safety was a major reason for delivering parts with the carts, says Orr. In the past, the plant had a problem with accidents involving forklifts colliding with workers or equipment on the line. The carts have eliminated those accidents.

Space was another reason. The carts can be wheeled easily into place by hand or with the tugger, in less space than a forklift would need to do the job. And, because parts can be sequenced and loaded onto racks at a central location, there's less need to store all the parts for different engine models on the line.

For example, **Kinetic Technologies** custom-built racks for the carts to hold oil

pan. Through a wireless communication system, the assembly line broadcasts an order for oil pans. At the supermarket, workers fill the order, placing the pans into the racks in the order in which they are needed. A pick-to-light system prevents workers from pulling the wrong pan.

The carts are built from welded steel tubing and angle irons. They have a short wheelbase that places most of the load on the fixed rear wheels to improve turning and reduce the force needed to push them. Hard front casters and soft rear wheels reduce skidding when the cart is towed around turns. The casters are equipped with sealed, deep-groove radial ball bearings that allow heavy loads to be positioned with minimal effort.

"A full load of crankshafts weighs 4,000 pounds," says Orr. "With the carts, one person can easily push that in place without help from a motor. Sure, you can tell you're pushing a heavy load, but it's still within Ford's ergonomic guidelines, and they're pretty strict."

The carts are built low to the ground, so that operators can reach into bins without stretching. In addition, the carts are designed to work with low-profile lift tables, so the loads can be raised to the level of the assembly line.

The carts can be topped with a turntable or conveyor rollers. The turntable prevents excessive reach when handling parts in wide containers. The turntable has soft detents to keep it from shifting while loading and



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Photo courtesy Kinetic Technologies

unloading parts, and an automatic locking mechanism prevents rotation during towing. The rollers allow operators to gently push a bin or pallet onto a line-side flow rack.

The decision to use carts instead of forklifts to deliver parts to the line did not come without some trepidation, says Orr. "We were concerned that it would require more manpower or that it would take too much time for an operator to park, unhook the carts, and wheel them into place," he explains. "As it turned out, the exchange time on the line was a lot quicker than with the forklifts. My guys have become so skilled with the carts that they can often back them into place with the tugger. We're actually using a few less people than we would have needed with the forklifts."

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