

Replaceable Carbide Tip Drills Cut Costs, Free-Up Production

For a company, which suddenly doubled its business, a production bottleneck caused by re-work had to be eliminated.

That's the spot that Tulsa-based Harsco's Air-X-Changer group (AXC) found itself in. The company is a leading supplier of heat exchangers for natural gas production, which is expanding on a fast track. Reworking the out-of-round holes in its code tube headers (fabricated headers to ASME standards) using their existing manual drilling operations, was impairing throughput and jeopardizing delivery commitments.

A combination of new tooling and CNC machining centers solved the problem. Throughput rose, a pre-drilling operation was eliminated, and sustainable hole tolerances were achieved, which reduced reworks and sped up the follow-on rolling in process. Cost savings were significant.

"Most important, it enabled AXC to meet the challenges of today's market while sustaining our delivery and quality commitments for which AXC is known in the industry," says Scott Jacoby, vice president and general manager, Air-X-Changer.

Drill Inventory Slashed

The tooling switch was from re-grindable solid carbide drills to Ingersoll's Qwik-Twist drill with replaceable tip. Besides debottlenecking the operation, the new drills cut drill inventory requirements from \$4000 to less than \$500. Now all they need is a couple of drill bodies and a supply of replaceable tips.

No more drill "merry go round" and inventory float to cover the 12-14 week re-order time for the solid carbide drills.

The fabricator's rapid growth mode stemmed from the increasing pace of natural gas well drilling. In Canada drilling increased 14% to 15,645 new wells in 2004. For the US the increase was 15% to 22,673. Every cluster of new wells needs its own compression unit to raise wellhead gas pressure up to pipeline pressure, and every unit needs a heat exchanger. Air-X-Changer air-cooled heat exchangers extract the heat of compression from the gases and also cool the engines that power them.

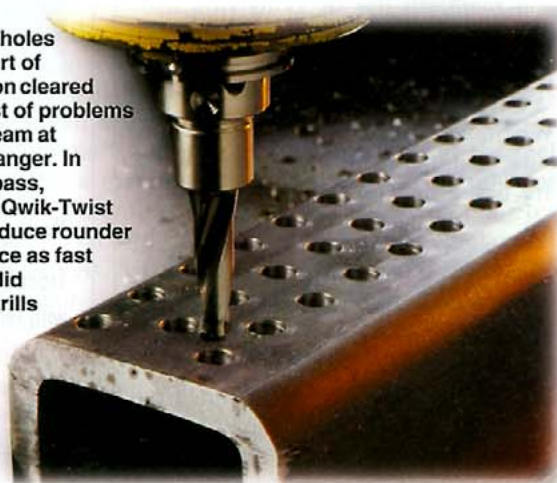
Quick Fix

Though the retooling itself went quickly, identifying the root cause of the bottleneck took a little longer.

It was the result of a deliberate lean manufacturing/six sigma process. Jacoby challenged plant manager Kevin Ishmael to implement the new disciplines to increase throughput and minimize rework. Ishmael in turn assigned Gary Williams to evaluate the production process. His study revealed that out-of-round holes in the code tube headers created a "snowball" bottleneck effect downstream in the section assembly department – excessive rolling-in time, leakers to fix, hydrostatic tests to conduct and repeat. He also concluded that the drilling operation itself – the principal machining operation to make code tube headers – should run at least three times faster.

At the time, Air-X-Changer was outsourcing some of the pre-drilling work and finish-drilling them in house on a manual radial drill. Total time to drill a typical prefabricated header with 300 5/8" holes was about two hours, excluding reworks. Some pre-drilled holes were too out of round for the finish pass to fix. Each bad hole had to be repaired and redrilled.

Rounder holes at the start of fabrication cleared out a host of problems downstream at Air-X-Changer. In a single pass, Ingersoll Qwik-Twist drills produce rounder holes twice as fast as the solid carbide drills used before.





Changing tips on Qwik-Twist drill takes just seconds. Air-X-Changer uses one drill body for two different hole diameters.

Meeting Tolerances

"We realized that if we fixed the hole roundness problem, virtually all of the downstream delays would go away," Ishmael reasoned.

So Ishmael and Williams focused on applying six sigma best practices to find tooling able to maintain 0.002" roundness tolerance on the holes. He brought in a Tulsa-based tooling distributor, to look at other drill alternatives. This led to the recommendation of Ingersoll's Qwik-Twist drill, featuring replaceable tips.

These drills were recommended for doing the holes on the machining center and bypassing the old radial drilling process. With that setup, it was believed the drilling

could be done to tolerances with a single pass.

Accordingly, Air-X-Changer retired the radial drill and installed two new gantry type CNC machining centers to handle the drilling. The company credits the throughput improvements to the Qwik-Twist drills and the quality improvements with the new machines.

Replaceable-Tip Anatomy

Introduced in 2000, the Qwik-Twist drill has made the greatest impact replacing solid carbide drills in high-volume drilling operations like Air-X-Changers.

Getting off the reconditioning merry-go-round creates dramatic reductions in tool inventory and reconditioning costs. The reusable drill body is fluted alloy steel for toughness, shock- and impact-resistance. Only the replaceable point is coated carbide.

The operator locks the insert in place with the quick 90° twist of a key tool much like an Allen wrench handle; a 20-second operation to remove and replace a point. The points lock in place with +/- 0.002" axial-length repeatability, eliminating the need for or touching off after each point change. All this can be accomplished on the machine without removing the drill body from the spindle, thus eliminating lost time for a tool change.

Points are self-centering and available in geometries for either general-purpose or cast iron drilling. *Ingersoll Cutting Tools*

www.rsleads.com/509mn-201 or **Circle 201** for more information

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DRILLING RESULTS

(per box header with 300 5/8" holes)

	Before	After
Rough drill	2 hr	Eliminated
Finish drill	2 hr	1 hr
Drill life	1300, 1 regrind	3000 holes/tip and rising 18,000 holes/ drill body
Tooling cost/drilled hole	\$0.20	\$0.03
Hole quality	couldn't reliably hold all holes within +/-0.002 in. roundness	+/-0.002in (on CNC Machine)
Hole rework rate (drilling and rolling-in)	w/radial drill 10-15%	0
Required drill inventory	\$4000	\$500
Lead time	special order; 12 weeks	Next day for tips