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Case Histories of Manufacturing Problem Solving

Fluid Switch Promotes Green Operation

Taking a risk is always challenging. For Brian Bradley, stamping operations supervisor at Unistrut International Corp.'s Wayne, MI facility, questioning current metalworking practices and introducing a process change have resulted in dramatic improvements and cost savings for the Tyco International division. Important improvements in worker environment and safety, and real cost savings have been realized, according to Bradley. "By eliminating the use of a straight oil in favor of a water-dilutable product, we have saved money as well as furthered Unistrut's commitment to greener, safer, and more environmentally responsible operations."



Unistrut's Brian Bradley worked with Chemetall to replace the straight oil used in its tapping and press line operations with a water-dilutable, semisynthetic metalworking fluid with important process and cost saving benefits.

Today, Unistrut is the global leader in metal-framing and pipe-support systems. Since 1924, customers have relied on Unistrut to provide a product representing the latest technologies in product design, quality, and performance. The initial Unistrut concept—a simple spring nut and bolt connecting a fitting to a

continuous slotted-steel channel—has evolved into comprehensive engineered building and support systems. The company's success depends on precision components to assure a successful assembly for their customers.

"I have a laundry list of improvements and savings that I have documented."

Unistrut's Wayne, MI facility has three nut-tapping lines and eight automatic press lines. The nut-tapping lines tap holes in cold-rolled steel nuts. Hole diameters range from $\frac{1}{4}$ to $\frac{1}{2}$ " (6.35–12.7 mm), using a titanium nitride-coated tap. There are a total of eleven tapping heads. Each tapper processes between 16 and 20 nuts/min. There are eight automatic press lines consisting of a coil straightener, feeder, and press. There are six 150-ton presses and one each at 75 and 250 tons. The smaller press does a simple cut-off and forming of a bracket. The other presses do cut-off and hole punching. The substrates are cold-rolled steel and 304 or 316 stainless. Thickness range of the substrates is 0.060–0.25" (1.52–6.35 mm). Hole diameters range from $\frac{1}{4}$ to $\frac{9}{16}$ " (6.35–14.28 mm). The most demanding operation is punching a $\frac{9}{16}$ " (14.28-mm) diam hole in the stainless substrate. The easy-forming operation runs at 140 strokes/min, and the hole-punching operations run at 60 strokes/min.

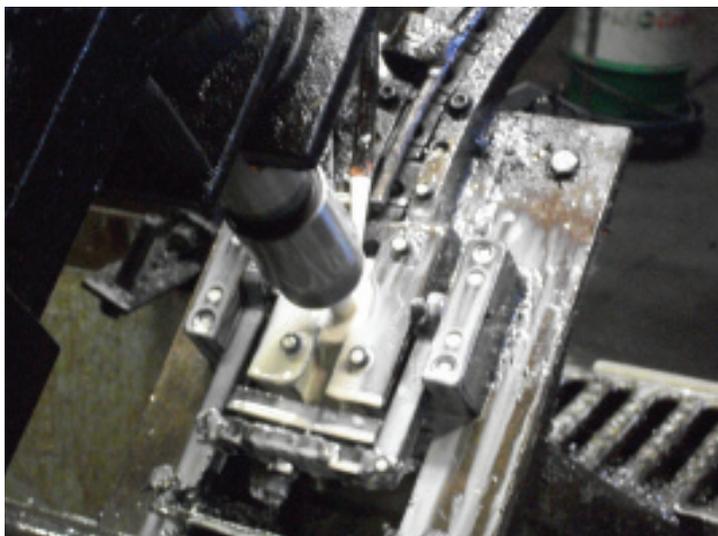
A straight-oil lubricant was used in both the nut-tapping and press lines, because of the lubricity requirements of these difficult metalworking operations. Bradley says, "The use of the straight-oil lubricants provided the lube needed to do these jobs, but there were some negative side effects like oil mist in the machining areas, slip hazards, skin irritations, and cleaning and pickling problems down the line."

Working closely with Bradley, Chemetall NAFTA (New Providence, NJ) proposed the use of a water-dilutable, semisynthetic metalworking fluid to replace the straight oil currently in use. Tech Cool 35045, a heavy-duty, semisynthetic metalworking fluid containing an extreme-pressure (EP) additive was chosen to be tested on one nut-tapping head. Concentration was set at a 25% by volume dilution with water. The one-month trial proved to be

successful. The tapping process was not only smooth and efficient, but a tooling life improvement of 30% was documented. The Tech Cool 35045 was expanded to all 11 tapping heads in the three nut-tapping lines with equal success.

“By eliminating the use of a straight oil in favor of a water-dilutable product, we have saved money as well as furthering Unistrut’s commitment to greener, safer, and more environmentally responsible operations.”

Similar success was realized on the press lines using a 25% by volume solution of Tech Cool 35045. The punches on these lines remained significantly cooler, and so did the workpieces, allowing for much easier handling. In the long run, keeping the punches cooler will dramatically extend their life. Cleanliness of both machines and work area is much improved.



Chemetall’s Tech Cool 35045 metalworking fluid improved tapping life 30% in a test on one nut-tapping head and was expanded to the 11 tapping heads in three nut-tapping lines.

“This product change has been very, very successful. I have a laundry list of improvements and savings that I have documented and

I’m really pleased with the results,” Bradley says. For tooling, documented benefits include 30% longer tap life. Punches on the press line remain cool as opposed to getting hot when using the straight oil.



Nut-tapping cells in Unistrut’s Wayne, MI, facility function in an environment that is cleaner, safer, and greener after 85% reduction of oil usage in all operations.

On the chemical side of the process, annual coolant cost savings of 40% are realized. Ease of cleaning will reduce the usage of cleaner and pickling acids downstream dramatically (projected to be 50%), and less frequent dumping of clean/pickle lines results in less waste-treatment chemicals used.

Waste minimization results from significantly reduced amounts of oil containing water needing to be treated. Substantial reduction in the amount of chips/shavings produced reduces recycling costs and tool failure due to chip build-up. Chips are also significantly less contaminated with oil. In addition, there are a reduced number of oil soaked floor absorbent pads.

Important safety, health, and environmental benefits have resulted from 85% reduction of oil usage in all operations. There is a significant reduction in greenhouse gas emissions and a reduced carbon footprint. Oil mist is completely eliminated as are slip hazards resulting from to oil drag-out. Machine tools and work areas are cleaner. There is less wastewater discharge, and shop odors are virtually eliminated. Equally important operator discomfort resulting from skin irritation has been eliminated. **ME**

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