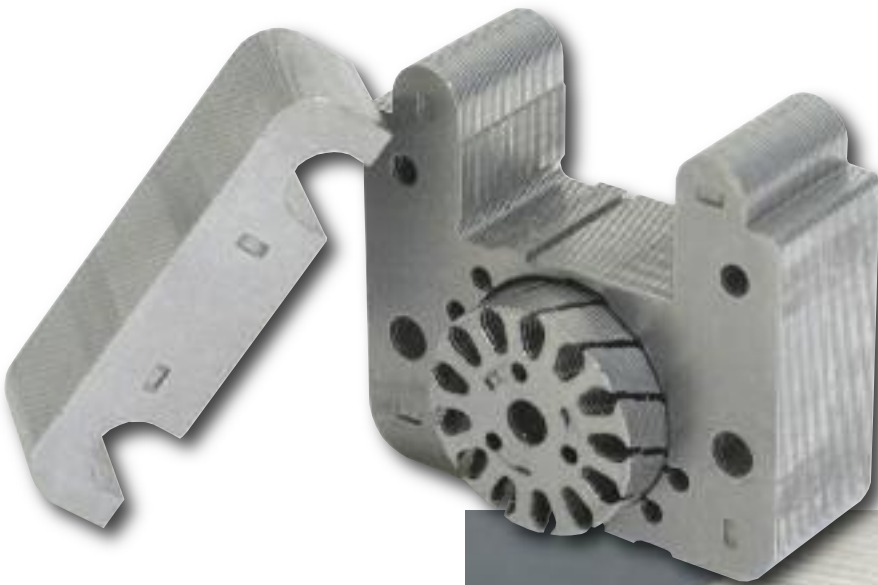


# The Birth of a Lubricant...

...and the benefits realized by a lamination stamper: improved corrosion and stain protection, reduced lube consumption, superior quality and elimination of environmental concerns such as excessive mist and operator dermatitis.

BY JOE HOUGH



With more than 227,000 sq. ft. under roof, the Orchid International plant in Monroe, WI, specializes in the production of lamination stampings as well as motor die castings and general metal stampings and assemblies. Stampings are produced on more than 30 high-speed presses, and the facility operates four annealing ovens with a total capacity of more than 20,000 lb./hr.

I frequently am asked where we get ideas for new-product development. Many of the ideas come from our customers asking for a better lubricant. This is the story of one such idea—a new lubricant developed as a custom formulation to meet the requirements of a metalforming customer.

## Understanding the Customer's Needs

In 2005, Orchid International, Monroe, WI, asked us to take a look at its metalforming-lubrication requirements. It was using a soluble oil to lubricate motor and electrical lamination stampings running at speeds to 750 strokes/min. Employees were mixing the lubricant at 20:1 with city water with a hard-

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ness of 18 grains/gal., and it formed a stable emulsion with very good corrosion protection. The plant also needed to use a second product for lubricating prepainted steel used to manufacture

ballast boxes and covers, and for galvanized steel used for an assortment of brackets. The soluble oil failed to work on these materials because of residue, staining and corrosion issues, so Orchid

had to use a second product—a semi-synthetic lube mixed at a 10:1 ratio.

Orchid came to us hoping to use one die lube for all of its pressroom applications. This would better-suit its central mixing station piped to each press, designed to deliver one product. Using only one lube also would solve problems with its recycling program—it had been mixing both lubricants together in recycling, and could only use the recycled mixture on certain jobs.

The plant had been satisfied with tool life using its previous lubricants, so the new product needed only to provide equal or better tool life, as well as be compatible with the carbide tooling used in its high-speed lamination dies. Rusty laminations presented a costly problem for the plant, and occurred randomly throughout the year, so Orchid looked to improve corrosion protection. Laminations are annealed at 1600 F for 6 hr., so the firm requires that the lubricant residue burn off clean and not cause the laminations to stick together.

The facility does not clean its stampings, so lubricant residue must be compatible with its customers' manufacturing processes. Materials processed include laminations from M-33 cold-rolled steel, M-6 and M-9 grain-oriented, and silica steels. Other materials stamped include black, white, brown and green prepainted steel, galvanized steels, hot-rolled steel and tin plate. In every case, lubricant must provide corrosion and stain protection, and leave an acceptable residue.

## Product Development

Our lubricant-development laboratory decided to use a synthetic, since Orchid wanted to avoid having to wash the parts, and it needed a clean burn-off during annealing. Next on the priority list was to develop a lubricant to handle the most critical application—the motor and electrical lamination stampings. Here the lubricant needed to protect the tool for millions of hits between sharpenings; be compatible with the

carbide tooling; not interfere in the annealing process; and provide rust protection to lamination stacks.

The lab concluded that a new lubricant would have to be developed to meet all of these requirements, under the guidance of a senior product-development chemist. The resulting lubricant has a newly developed corrosion-inhibitor package that proved successful during lamination-stack stain and filter-paper stain tests, using test coupons cut from M-33 cold-rolled steel, M-6 grain-oriented steel, and galvanized and black prepainted steel. This formula, initially dubbed LS-P-388, was proved out via laboratory testing, and also put through a product-authorization process and tested for, among other properties, product stability at various temperatures and dilutions; stain and corrosion protection on a range of materials; and wetting, cleaning and physical properties.

Finally LS-P-388 was given to a chemist with expertise in safety, health and environmental regulations, who evaluated the chemicals used in the formula along with any possible chemical reactions that might occur between them.

## Product Trials and Evaluation

To evaluate the new lubricant in a production environment, Orchid loaded the lube, at a 17:1 mix, into a recirculating roll coater feeding a laminating press. In short order, the toolroom became comfortable with the new lubricant, after noting how well it could handle and clean the dies. Employees also liked the fact that only a light residue remained on the dies.

Careful attention was paid to tool life, although measuring improvement here posed a challenge due to frequent tool changes and the stamping of different parts. In general, Orchid's production and toolroom personnel felt that tool life had improved, even doubling on some dies. Also, when switching from stamping high-silica steel to cold-rolled on the same die, which had previously required adjustment of the

die and the lube, they were able to avoid making any adjustments, minimizing downtime during changeover.

Along with increased tool life, Orchid also has been able to reduce the amount of lubricant applied to the stock. Before the switch in lubes, the pressroom used a float switch to sense lubricant level in the sump. A rising level during operation indicated a lube failure because all of the fluid in circulation was draining back to the tank. During testing with LS-P-388, Orchid employees noted that flow had reduced so much that the level of the tank never changed enough to trigger the float switch. The plant installed a new sensor in the return line to monitor lubricant flow back to the tank.

Also, employees noted that LS-P-388 burned off cleanly during annealing.

## Proof-Positive on Prepainted

Testing was expanded to drawing and forming prepainted steel used to make ballast boxes. Orchid found that LS-P-388, used at the same dilution of 17:1, improved wetting and lubricity on painted surfaces compared to the previous lube run at a 10:1 dilution. In fact, since lubricating properties were improved, tests showed that Orchid could reduce the amount of lubricant used by more than 50 percent.

Next, Orchid looked at lubricating only the top of the stock rather than both top and bottom. This proved successful, and eliminated mist problems caused by the air ejectors. Previously, parts were so oily that they stuck to the discharge conveyor belt and needed to be pulled off by operators at packaging stations. Now the parts lift easily off of the conveyor belt.

Also tested with the lube: stamping of brackets of galvanized steel and cold- and hot-rolled steels, to 0.90 in. thick. Finally, early in 2006, Orchid's customers for ballast boxes and brackets approved the change to LS-P-388.

## Customer Benefits

In March, 2006, Orchid changed its central mixing station from a tote of

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the new lubricant, dubbed Lamstamp 3488, allowing the metalformer, for the first time, to feed the same lubricant to all of its presses, mixed at the same dilution. It went with a mix ratio of 15:1 to optimize performance as well as create a cushion for variations in the mix ratio.

After 18 months of using the new lubricant, Orchid noted that the amount

of lubricant applied to its dies could be reduced due to the improved lubricating properties of Lamstamp 3488. The health and safety of Orchid's employees also improved, since application of the previous die lube created a mist in the air around the presses running pre-painted steel. Now, thanks to reduced lube consumption with Lamstamp 3488, any residual mist, as well as slip-

pery floors from settling residue, has been eliminated. Lastly, dermatitis, which posed a serious problem with the prior lubricant and required operators to wear special gloves and apply skin creams, also has been eliminated with the new lubricant.

As for production, Orchid has not experienced any issues with its carbide tooling after more than two years of using the new lubricant, while application of lubricant has been reduced to where the lamination stampings exit the presses dry. This gives optimum results for the annealing process but makes it difficult for the stackers to wire the lamination stacks together. Now Orchid applies just enough lubricant to allow the laminations to stick together coming out of the die, making it easier for the stackers to insert the wires.

## Part Quality Improved, as are Packaging and Recycling

The ballast boxes stamped from pre-painted steel now run better than ever since the change to Lamstamp 3488, say Orchid officials. The lubricant also has improved part quality by eliminating scratching and water marks on painted parts. Customer complaints about adhesive stickers not sticking have been eliminated. And, the packaging boxes no longer are soaked with lubricant, making for a better-looking product going out the door.

To recycle the lubricant, used die lube is sucked from a pan under each press and is taken to a recycling station where tramp oil is removed and solids filtered out. In the past, the shop mixed two types of lubricants together and then treated the mixture with as many as three different and expensive additives to control microbial growth, pH and corrosion. And then, it could only use the reclaimed mixture on certain dies. Now, only one lubricant—at a much lower volume—is collected and requires the use of only one additive for microbial control. Orchid uses reclaimed Lamstamp 3488 in all of its presses.

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Lamstamp 3488 is a synthetic metalworking lubricant designed to meet the special and demanding requirements of the lamination stamping industry. It includes a new corrosion inhibitor, which was developed to meet the more requirements. The performance of this new additive allows for a maximum blend of boundary film and extreme pressure additives, providing superior tool life over competitive products in field trials as well as improved Twist Compression test results in our laboratory. Lamstamp 3488 represents technological advancements in synthetic lubricants for lamination stamping processes.

Lamstamp 3488 is formulated as a die lubricant for cold rolled motor lamination steels, grain oriented iron-silicon alloys, and silicon based alloy steels used for electrical laminations. It is also suitable for galvanized and painted steels. Typical dilutions are 6 to 10% by volume. It forms a stable solution in waters of varying degrees of hardness and resists breakdown and inhibits the formation of foul odors caused by biological attack.

- Does not contain Mineral Oil, Chlorine, or Sulfur
- Burns off Clean in Annealing Furnaces
- Contains no V.O.C.'s
- Provides Excellent In-Process Corrosion Protection
- Provides Superior Tool Life with High Lubricity
- Delivers Excellent Cooling, Flushing, and Wetting Properties
- Consistently Earns Outstanding Operator Acceptance

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