Forging and Lubricant Particle Size

COST CONTROL TAKES PLACE THROUGHOUT THE MANUFACTURING PROCESS

In applications for industries like automotive, where a die might produce a part every few seconds, there's no time to make adjustments between forgings. Precision is particularly important, and imprecise processes lead to higher rates of part failure, increasing costs. "A lot of times, manufacturers don't realize that they have a problem until a number of parts are produced," says Bingham. Henkel has a market advantage in this area due to their superior product breadth, providing more options for a precise match of particle size distribution and application.

For optimum process control, customers can take advantage of Henkel's thermal imaging testing, which can help identify hot spots relating to improper die management. Thermal imaging is a tool that allows customers to make adjustments to improve the process and output. It can also compare Henkel products to other sources, demonstrating the performance improvement in a real-world production scenario.

MOVING TOWARDS A MORE PRECISE FUTURE

As technology and trends toward lightweighting and power density impact every area of manufacturing, greater precision will become critical to all manufacturing processes. Today, manufacturers might think they're controlling costs in purchasing, but they might actually be increasing them in other areas, such as die wear, part failure, and even in dilution. Where a competitive product may appear to have more solids in the shipped product, after dilution, Henkel's graphite lubricant products provide greater precision, leading to a better performance and lower overall cost.

Graphite is still the most common forging lubricant, but Henkel's BONDERITE® synthetic lubricant compounds are also demonstrating superior performance compared to past generations of synthetics. Synthetic compounds are growing in popularity due to the waste management and cleanup costs associated with traditional graphite. Tests show that BONDERITE® synthetic compound lubricants provide superior film formation coverage, especially at higher temperatures. Whichever type of compound is used and no matter how complex the science, the goal remains the same: "You want the die to be completely covered and for it to be uniform coverage," says Bingham. "Uncovered areas may cause a wear spot, lowering die life."

A PRECISE PAYOUT

Precise particle size and distribution might seem like "nice-to-haves" when manufacturers are on a strict budget, but precision actually saves production time and money.

One Henkel customer, a company that formed and forged piston connecting rods, switched away from BONDERITE® L-FG F31 for a time. After switching, they found they required frequent production stoppages for cleaning and an increase of graphite inclusions and dimensional issues. Graphite buildup also increased wear on die beds and bolsters. When returning to BONDERITE L-FG F31, they experienced:

- 30% reduction in time cleaning dies
- Lower consumption
- Improved metal flow
- Lower overall forging costs
- Increased production throughput

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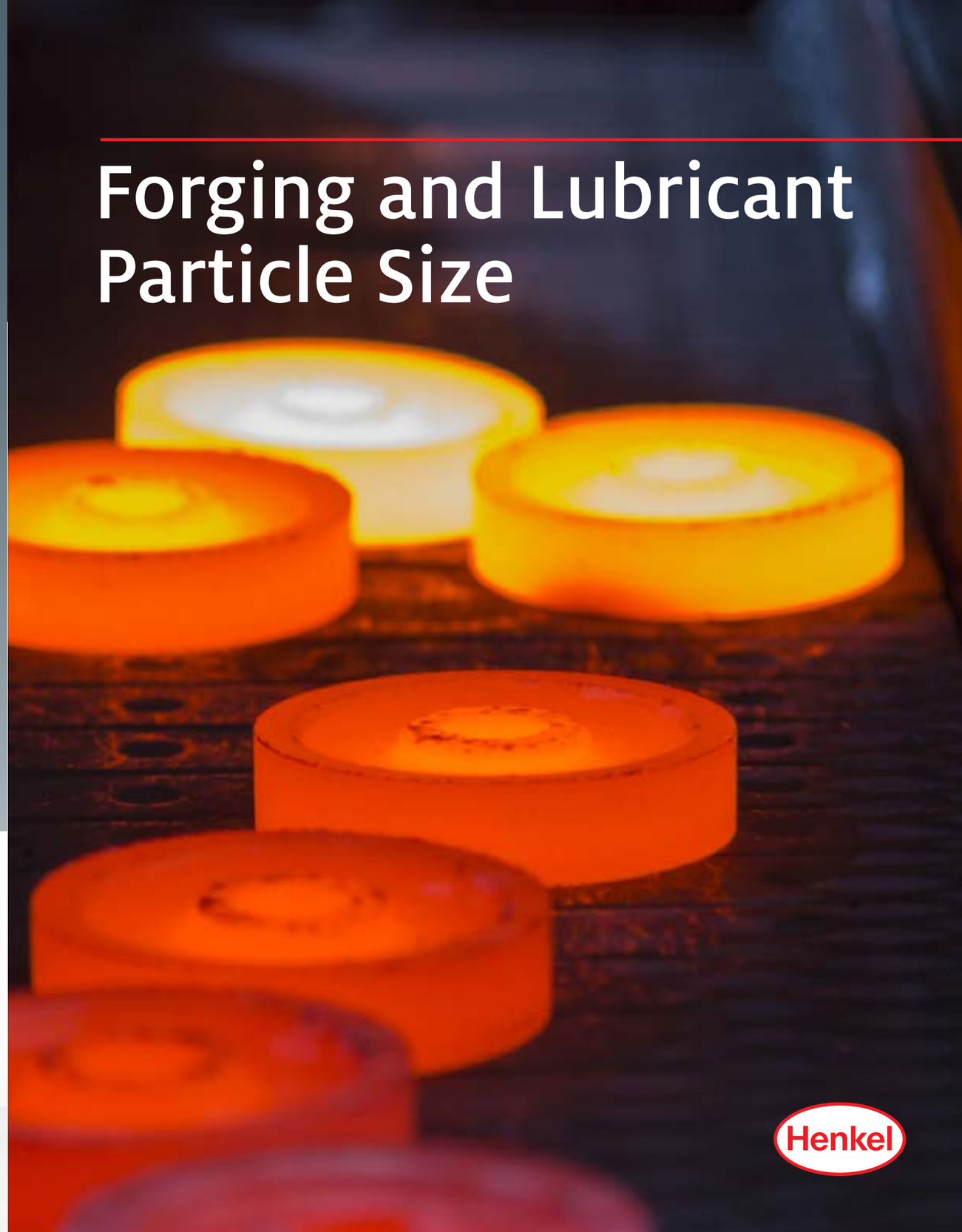

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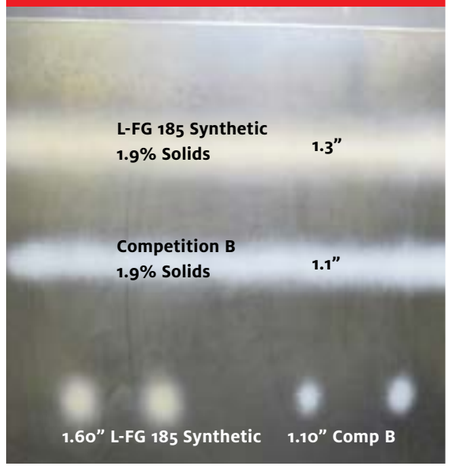
In the forging process, lubricant particle size matters, but meeting tight tolerances is really all about control.

Using graphite lubricants in forging has been around for about a hundred years, but today, there's finely-tuned modern chemistry included in the process. The new, more scientific carriers can help create important benefits in the forging process and in the resulting output. According to Steve Bingham, Business Development Manager for Henkel Cleaners and Lubricants, "how well you control the particle size" is an important aspect of improving processes through lubrication, which improves process results and cuts costs.

CONTACT US

Above: BONDERITE L-FG 185 Synthetic Film Formation @ 350 °F

Below: BONDERITE L-FG 185 Synthetic Film Formation @ 500 °F



APPLYING TODAY'S SCIENCE TO AN ANCIENT PROCESS

"There's a lot of science in coming up with the right product" in forging lubrication, says Bingham. "The point is properly matching the particle size to the application." According to Bingham, some applications have an extremely tight tolerance, while larger parts might be moving less metal and have a wider tolerance, but that's only one aspect. Another factor to control is that the graphite in a typical formula can provide more functions than lubrication. Additional functions might include scale reduction in billet coatings, release enhancement or heat transfer barrier, all of which may affect the optimum match of lubricant to application and process.

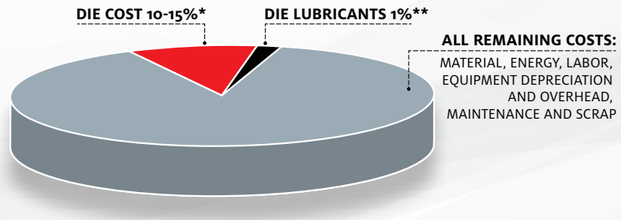
In short, particle size does matter, but it's not that simple. Factors like particle distribution in the material and film formation also greatly affect the results. "With BONDERITE®, we tend to have more consistency in managing the particle size than some other suppliers. We control those blends much better," says Bingham.

BETTER LUBRICANT MATCH MEANS LONGER DIE LIFE AND REDUCED COSTS

In the most common scenario, Henkel may be optimizing the lubricant formula to an impression die in either a Hot or Warm Forging process. The lubricant is often applied with an atomized spray. The graphite particles in the lubricant allow the liquid to flow, properly filling and coating the die. Lubrication is especially important on sharp corners, where rapid metal movement generates heat and softens the die, leading to wear or deformation. The finest particle size distribution results in the fastest and most consistent formation of the protective lubricant film, helping to increase the life of the die.

A die is an expensive tool, up to 15%* of the process cost. Lubricants are typically 1%** of the process cost. A small investment in improving lubrication can mean a significant increase in die life, often as much as a 20% increase, reducing overall production cost. And there are other costs associated with die life to consider, such as machine downtime and labor costs resulting from a die changeover.

Forging Costs



*Source: Forging Magazine, 2013 – http://forgingmagazine.com/forming/lubricant-choices-and-forging-cost?page=1
**Source: Henkel research