gearOPINION

Brett Watkins, president of Infinity Metal Finishing, LLC

THE ELECTROCHEMICAL PROCESS FOR DEBURRING

For extended life and improved finish—and especially for lower-volume operations—electrochemical deburring presents an interesting alternative for gear manufacturers.

The race for technological advancement in all aspects of manufacturing and finishing has resulted in an additional process for gear manufacturers and engineers to consider.

Everyone is aware of the world economy forcing rapid evolution in manufacturing and secondary finishing processes to yield better quality, faster turnaround, and superior products. The chemical industry has made rapid advancement in technology for many industries. This column will cover the specific process as it pertains to gears.

The electrochemical process for deburring was once limited to the stainless steel industry due to chemistry limitations. The industry has evolved and is now yielding chemistry for specific use in electrochemically deburring gears and components made of carbon steels, stainless, aluminum, titanium, and many other substrates. The process will not yield the volume of an automated deburring machine, but it offers other attributes that the brush, mechanical, and hand deburring processes cannot achieve.

Let's start with a simple description of how the process works: The gear or work piece is submerged into a chemical bath and is charged positive. The bath also has cathodes submerged, which are negatively charged. Depending on the burr size and customer surface finish requirements, a specific voltage and amperage setting is calculated. Once this has been determined, the cycle time can be calculated as well. Current is applied to the work piece, and once it is applied the process will start removing burrs which are selectively in a high current density area and are dissolved first, before any stock removal on the balance of the gear takes place. Depending on the burr size and surface finish requirements, the process can take from 15 seconds up to eight minutes. The parts are then removed, rinsed, and then dried. The electrochemical process can be set up for constant part configuration changes by adjusting the fixtures utilized to hold the gear. The cathode positioning can also be modified for difficult burr removal situations such as blind end holes and counter bores with small IDs. The volume of parts processed per hour would be determined by factors such as tank size, pieces per rack, rectification, and burr size.

We have covered the basics of how the electrochemical process works, so now let's look at the positive attributes the electrochemical process offers over the other conventional deburring methods. The electrochemical process will stress relieve the gear, remove impurities embedded in the part from the manufacturing process, and in most cases improve the surface finish and overall look of the part. These are considered by many to be the best attributes of the process. Many of the conventional deburring methods can ultimately embed impurities into the gear and reduce life cycle time. The electrochemical process enhances gear life by removing the impurities.

This process can also be designed to be an automatic, PLC controlled line with all of the quality control features for process control and precise part repeatability. There are environmental and safety issues which must be addressed and implemented, as with all processes. Operator training is minimal, and it us reduced more if the process is set up with PLCs and other process control devices.

The electrochemical process has its limitations and is not for every manufacturer or job shop. It is another evolution of technology which has presented itself as a legitimate deburring process for critical gears and component manufacturers. It is an alternative process to conventional methods for engineers to consider. The process lends itself well to lower volume requirements, for extending gear life, and for companies that do not have the volume to justify large capital equipment costs for automated gear deburring machines.

ABOUT THE AUTHOR:

Brett Watkins is president of Infinity Metal Finishing, LLC, which is based in Cleveland, Ohio. He can be reached at (216) 251-5102 or bwatkins@infinitymetalfinishing.com. The company's Web site is [www.infinitymetalfinishing.com].