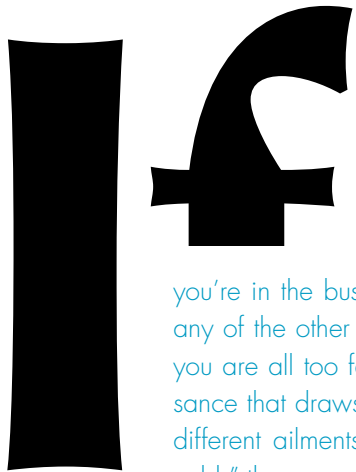


BURR

IDENTIFICATION AND REMOVAL



you're in the business of milling, grinding, drilling, plasma cutting, stamping, or any of the other various processes used to produce machined components, then you are all too familiar with burrs and the problems they cause. Burrs are a nuisance that draws close comparisons to the common cold. Just as there are many different ailments associated when diagnosing an individual with your "typical cold," there are multiple definitions that attempt to describe what constitutes a burr and the root cause of these deformations. One generally accepted description, provided by the Society of Manufacturing Engineers (SME), defines a "burr" as a raised edge or small piece of material that remains attached to a work piece after a modification process. For the purpose of this article, the primary focus will be centered on identifying burrs created by the molding and machining processes during the manufacturing of various types of metal-cased seals, and how these burrs can be properly removed.

Just as any machine part experiences wear from prolonged use, the seal molds (tools), which are used to cast the various shapes and styles of seals, also experience the same degradation after a certain working life period. As the tool is exposed to this prolonged use, the edges of the tool itself will slowly begin to deteriorate and lose their structural rigidity. When the mold's edges begin to wear away, excess metal alloy may escape through tiny gaps resulting in a seal casing that has excess metal deposits, or burrs. These excess deposits can become a problem if not removed prior to being installed in a particular application. Burrs increase the risk of corrosion, could cause unwanted friction, reduce the sealing between the seal case and bore, and in rare instances act as an electrical conductor.

Because the excess metal does not allow for the seal to fit properly into the application, one side of the seal may be raised higher than the other side. This allows air or moisture to directly contact the

metal seal casing, which is one of the primary causes of corrosion and could lead to premature seal failure or make it very difficult to remove the seal when replacement is required.

When the seal is being installed in a dynamic application, burrs could cause unwanted friction, improper lubrication, or damage to the shaft or bore. If the burr is located on the inner diameter of the seal, it could create scratches or wear marks on the shaft, thereby causing excessive, undesirable leakage. Conversely, if the burr is located on the outer casing of the seal, it could cause damage to the housing, or bore. In the most extreme instances, if a seal with a burr is installed in a dynamic application, the sharp

point of the burr can act as an electrical conductor, which can result in a static discharge, and depending on the media used in the application, the possibility of fire or explosion may exist.

Unfortunately, identifying burrs on a seal casing is not usually as simple as a visual inspection. This is the reason some burrs are not detected until the seal is already installed in an application, and the burr results in a seal malfunction or causes unnecessary wear or damage to the shaft or housing. Most seal manufacturing processes incorporate a finished goods inspection step in their Quality Management System. For burr detection this step would include having a technician or quality inspector test a representative sample amount from each batch of product prior to final approval of the product. This quality control step will certainly help in detecting these deformations and should provide the manufacturer an indicator of tool wear. Proper testing procedures for burr detection include both a visual inspection using a magnification tool or a physical "touching" process with the hand of the inspector. The limits on size or number of burrs is usually set by the manufacturer, but can also be specified by the customer. If burrs are detected and are not within tolerances, there are several methods of "de-burring" or removing these imperfections so that the seal cases still meet customer requirements. Of course, the tools should also be re-inspected to ensure that the tool meets design specifications.

The process of removing these extrusions or burrs from what should be smooth, finished surfaces is referred to as "de-burring." De-burring can be completed either manually or automatically. Manual de-burring has been around for decades and involves a worker physically searching, finding, and removing burrs using a manual de-burring tool (most often a type of brush with steel, nylon, or

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diamond-coated bristles). Those who are involved in this activity are noted for their patience, dexterity, and attention to detail. However, this process creates a large amount of metal dust, which can be hazardous to one's health, and the process is extremely repetitious, which often results in inconsistent dimensional "finished" products. Most manufacturers have automated the de-burring process. This ensures that each finished product is subject to the exact same procedures for product de-burring, as opposed to a manual process that sometimes produces inconsistent results.

Automated de-burring can be completed using a variety of different techniques including brushing, milling, grinding, and tumbling. For brush de-burring, the de-burring tool rotates on an axis and the brush material conforms to the product's surface removing any excess extrusions. This technique of burr removal relies heavily on the rotating speed of the brush, as well as the bristle flexibility. Factors that affect flexibility include the bristle material, length, diameter, and tensile strength. Typical cutting speeds for these de-burring applications range from 15 meters per second to 30 meters per second. The milling and grinding de-burring processes are required when burrs have a foot width (distance the burr extends along the product surface) in excess of 0.4 millimeters. Milling and grinding require guiding the tool precisely along the product's edge that is being de-burred. Pressure applied to the tool against the edge that is being de-burred (known as the "expansion pressure") determines how much excess metal will be removed from the case or metal product. Unfortunately, milling and grinding create secondary burrs that must then be removed using the brushing technique. The third option for de-burring is referred to as "tumbling." It is the most inexpensive option and allows for multiple products to be de-burred at the same time. This process involves placing the products with the deformations into a rotating barrel or vibratory bowl along with some type of finishing media (when dealing with metal alloys, the most popular finishing product is a type of ceramic media). This option for de-burring is best suited for unfinished materials. The reason for this is because the media that removes the burrs will also remove whatever type of finishing is on the product whether it is a polished plate or some type of paint. For finished products, one of the previously described de-burring methods should be utilized, which will increase lead times and costs.

IN SUMMATION, burr identification and removal processes are both issues that in an ideal world would not exist. Fortunately, most manufacturers have implemented appropriate identification techniques and removal procedures that minimize the occurrence of burrs in finished products. Whether you rely on an automated process like tumbling or on a worker in the warehouse, it is imperative that programs are in place for monitoring products and properly removing burrs from any unit prior to it reaching the end-user. Distributors should also have random inspection procedures in place for finished product that includes burr identification, especially if customers' print specifically requires that no burrs are acceptable.