

Polishing and **buffing** are finishing processes for smoothing a workpiece's surface using an abrasive and a work wheel. Technically *polishing* refers to processes that use an abrasive that is glued to the work wheel, while *buffing* uses a loose abrasive applied to the work wheel. Polishing is a more aggressive process while buffing is less harsh, which leads to a smoother, brighter finish. A common misconception is that a polished surface has a mirror bright finish, however most mirror bright finishes are actually buffed. Polishing is often used to enhance the looks of an item, prevent contamination of instruments, remove oxidation, create a reflective surface, or prevent corrosion in pipes. In metallography and metallurgy, polishing is used to create a flat, defect-free surface for examination of a metal's microstructure under a microscope. Silicon-based polishing pads or a diamond solution can be used in the polishing process.

The removal of oxidization (tarnish) from metal objects is accomplished using a metal polish or tarnish remover; this is also called polishing. To prevent further unwanted oxidization, polished metal surfaces may be coated with wax, oil, or lacquer. This is of particular concern for copper alloy products such as brass and bronze.

The term chem-mechanical was coined to describe action of corrosive slurry on silicon in a polishing process. Multiple rotating heads, each studded with silicon wafers, get forced against a large rotating buffing pad, which is bathed in corrosive slurry. Material removal at elevated temperature progresses first through oxidation, then through oxide removal by abrasion. This cycle repeats with each rotation of a head. Potassium Hydroxide and Silox (white paint-base) can be combined with deionized water to form such a slurry.

Process

The condition of the "metal" at hand determines what type of abrasive will be applied. The first stage, if the material is unfinished, starts with a rough abrasive (perhaps 60 or 80 grit) and each subsequent stage uses a finer abrasive, such as 120, 180, 220/240, 320, 400 and higher grit abrasives, until the desired finish is achieved. The rough (i.e. large grit) passes remove imperfections within the metal surface like pits, nicks, lines and scratches. The finer abrasives leave progressively finer lines that are not visible to the naked eye. To achieve a #8 Finish (Mirror) it requires polishing and buffing compounds, polishing wheels and high speed polishing machines or other machine tools that can be used for polishing, like an electrical drill. Lubricants like wax and kerosene may be used as lubricating and cooling media during these operations, although some polishing materials are specifically designed to be used "dry." Buffing may be done by hand with a stationary polisher or die grinder, or it may be automated using specialized equipment.

When buffing there are two types of buffing motions: the *cut motion* and the *color motion*. The cut motion is designed to give a uniform, smooth, semi-bright surface finish. This is achieved by moving the workpiece against the rotation of the buffing wheel, while using medium to hard pressure. The color motion gives a clean, bright, shiny surface finish. This is achieved by moving the workpiece with the rotation of the buffing wheel, while using medium to light pressure.[6]

When polishing brass,(A softer metal) there are often minute marks in the metal caused by impurities. To smooth out the finer marks, the surface is polished with a very fine (600) grit, copper plated, then buffed to a mirror finish with an airflow mop.[citation needed]

Polishing operations for items such as chisels, hammers, screwdrivers, wrenches, etc., are given a fine finish but not plated. In order to achieve this finish four operations are required: roughing, dry fining, greasing, and coloring. Note that roughing is usually done on a solid grinding wheel and for an extra fine polish the greasing operation may be broken up into two operations: rough greasing and fine greasing. However, for inexpensive items money is saved by only performing the first two operations.

Polishing knives and cutlery is known as fine glazing or blue glazing. Sand buffing, when used on German silver, white metal, etc., is technically a buffing operation because it uses a loose abrasive, but removes a significant amount of material, like polishing.

Equipment

Aluminium oxide abrasives are used on high tensile strength metals, such as carbon and alloy steel, tough iron, and nonferrous alloys. Silicon carbide abrasives are used on hard and brittle substances, such as grey iron and cemented carbide, and low tensile strength metals, such as brass, aluminium, and copper.

Polishing wheels come in a wide variety of types to fulfill a wide range of needs. The most common materials used for polishing wheels are wood, leather, canvas, cotton cloth, plastic, felt, paper, sheepskin, impregnated rubber, canvas composition, and wool; leather and canvas are the most common. Wooden wheels have emery or other abrasives glued onto them and are used to polish flat surfaces and maintained good edges. There are many types of cloth wheels. Cloth wheels that are cemented together are very hard and used for rough work, whereas other cloth wheels that are sewn and glued together are not as aggressive. There are cloth wheels that are not glued or cemented, instead these are sewed and have metal side plates for support. Solid felt wheels are popular for fine finishes. Hard roughing wheels can be made by cementing together strawboard paper disks. Softer paper wheels are made from felt paper. Most wheels are run at approximately 7500 surface feet per minute (SFM), however muslin, felt and leather wheels are usually run at 4000 SFM.

Buffing wheels, also known as mops,] are either made from cotton or wool cloth and come bleached or unbleached. Specific types include: sisal, spiral sewn, loose cotton, canton flannel, domet flannel, denim, treated spiral sewn, cushion, treated vented, untreated vented, string buff, finger buff, sisal rope, mushroom, facer, tampered, scrubbing mushroom, hourglass buff, rag, "B", climax, swansdown, airflow, coolair, and bullet.

The following chart will help in deciding which wheels and compounds to use when polishing different materials. This chart is a starting point and experienced polishers may vary the materials used to suit different applications.

Common buffing compound and wheel combinations

BLACK = Emery Compound, a coarse abrasive material for removal of scratches, pits, paint, rust etc.

BROWN = Tripoli compound used for general purpose cut and color on most soft metals.

WHITE = Blizzard compound, used for color and final finish of harder metals, has a cutting action.

RED = Jeweler's Rouge, designed to polish without any cutting action. Safe on thin plates. Use on its own wheel.

BLUE = A dryer, almost greaseless wheel - designed to polish without any cutting action. Safe on thin plates. Use on its own wheel.

GREEN = Used exclusively for Stainless Steel.

Applications

Polishing may be used to enhance and restore the looks of certain metal parts or object on cars and other vehicles, handrails, cookware, kitchenware, and architectural metal. In other applications such as pharmaceutical, dairy, and specialty plumbing, pipes are buffed to help prevent corrosion and to eliminate locations where bacteria or mold may reside. Buffing is also used to manufacture light reflectors