Polishing & Buffing metal using your hands, takes a much longer time & the disered effects is never achieved but using wheels, compounds & a very high speed using electrical power motor , relates to using sand paper thats wet & dry to acheieve shine that is desired. The objective of buffing and polishing is to make a rough surface into a smooth one and, of course, each work piece will be in a different condition, so will need different procedures. Imagine the surface magnified thousands of times, it will look like jagged mountains and valleys. By repeated abrasion, you are going to wear down those mountains until they are old, soft, rolling hills! Then they will not dissipate the light, but reflect it. It is the reflection that makes the buffed part appear shiny.

The edge, or face, of the wheel is the 'sanding block', which carries a thin layer of 'compound' which is the sandpaper. Varying types of wheel are available, & the different grades of compound are scaled similar to sandpaper. The compounds are made from a wax substance which has the different abrasive powders added to it. When this hard block is applied to the edge of a spinning buffing wheel, the heat from the friction melts the wax, and both wax and abrasive are applied in a thin slick to the face of the wheel.

One Wheel For One Compound

Applying different compounds to the same wheel only causes problems, because you end up with a mixture of abrasive surfaces, and metal deposits left over from the more abrasive operation. These microscopic particles only scratch the surface, destroying any benefit gained by the finer compound. To remove excess compound from the work, apply a small amount of talc to the work and the wheel, then rebuff.

Applying Compound

LITTLE & OFTEN is the rule. Too much compound will reduce the effectiveness of the cutting action, because the surface will become TOO greasy and over lubricated. This can often be seen by the prescence of a black slick of compound that seems to reveal around the work piece. Apply compound to the wheel for approx 1 second. Any more is wasted.

CHOOSING THE RIGHT WHEEL

There are different types of wheels and these have different effects on the compound they are used with. For example, the SISAL wheel is a coarse 'rope like' fiber, which frays out to make a sort of brush. These fibers have a very beneficial effect on scratched and rougher surfaces, almost stroking them smooth. When used with a course 'EMERY' compound, they 'cut' the metal down very rapidly. You could use this compound on a SPIRAL SEWN wheel and it would work, but the job would take much longer because the softer SPIRAL SEWN wheel is not going to thrash the metal so aggressively.

As you progress through the buffing compounds, you will change your buffing wheel, ending up using a soft polishing wheel,such as the CANTON FLANNEL with the least abrasive BLUE or RED compound which only polishes, it has no cutting action.

So, depending on the job in hand, you will determine which abrasive compound and wheel you are going to use first, then step down through the stages until YOU are satisfied with the results. Compounds are made from a mixture of fine abrasive fillers and a sort of greasy wax. The compound is melted, by friction heat, as the bar is pressed to the revolving wheel. This applies a thin layer of abrasive, 'glued' onto the cloth wheel, making it similar to an emery paper, only much faster!

CUT AND POLISH MOTIONS

There are two basic buffing motions you should use.

1. CUT MOTION gives you:- SMOOTH SURFACE, SEMI-BRIGHT & UNIFORM.
The workpiece should be moved AGAINST the direction of the wheel, using a MEDIUM to HARD pressure.

2. COLOR MOTION gives you:- BRIGHT, SHINY & CLEAN SURFACE. The workpiece should be moved TOWARD the direction of the wheel, using a MEDIUM to LIGHT pressure.

BUFFING SPEED AND PRESSURE

The correct pressure must be applied to the workpiece to provide the best finish economically and safely. Inadequate pressure will

give NO buffing action.

Excessive pressure will cause the buffing wheel to slow down or actually collapse. This can also result in burn marks on the workpiece.

BUFF RUNNING SPEEDS

For best results your wheel should maintain a surface speed of between 3600 & 7500 Surface Feet Per Minute. (SFPM). The higher your speed, the better and quicker your results.

Formula for calculating surface speed of wheel in SFPM.
SFPM = 1/4 x diameter of Wheel x RPM (revs of spindle per min.)

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.

Alloy All copper and copper alloy objects, e.g. brass and bronze, on exhibition or in storage in a museum require periodic maintenance and cleaning.

Cleaning enhances the appearance of copper objects, and helps to reduce further deterioration by removing sources of corrosion such as grease, dust, metal polish residues, and fingerprints. Polishing, by contrast, is an abrasive operation that removes tarnish and some surface metal.

When cleaning a bronze object, the first consideration is whether or not it should have a polished appearance. Many items, such as cookware, acquire a stable tarnish during use. Others, such as medals and statuary, may have been artificially patinated when made. Still others, such as scientific instruments, have coloured lacquer coatings that are an important feature of their original appearance. Some "bronze" statues from the late 19th or early 20th century may have been cast in a soft white metal and "bronzed" with a tinted, transparent varnish . Polishing, or even cleaning with a solvent, could remove this varnish from the high points, thus disfiguring the piece. The patina on Oriental bronzes is highly prized and should never be polished.

The appropriate appearance for an individual object must be determined by curatorial research and consultation.

A clear work space is required, with a bench or table, good illumination, and suitable ventilation. A few layers of paper on the table will protect it from stains and provide some cushioning for the object. The paper should be changed frequently to keep the work surface clean. A tray to hold cleaning materials will help contain any accidental spills. A space should also be set aside for making notes.

Cleaning

Before attempting to clean an object, record its accession numbers in case cleaning and/or polishing removes them. Next put on clean cotton gloves to avoid transferring the moisture, corrosive salts, and oils in your fingers to the freshly cleaned and polished metal surfaces.

Begin the cleaning process by brushing away **dry dust and dirt**. Brushes made of hog bristle are recommended, and several types are useful. Conduct overall cleaning with brushes whose bristles are set at right angles to the

handle, such as natural bristle toothbrushes (soft or medium) or jewelers' watch brushes. More detailed work can be carried out with round artists' oil painting bristle brushes (sizes 4–6) or stencil brushes.

To remove **greasy residues**, apply a mixture of equal volumes of methyl hydrate (methanol) and water with cotton swabs or Q-tips. Where the grease proves resistant, a stencil brush may help. A few drops of a mild detergent added to the mixture will help to cut grease . Always carry out a preliminary test to see if the cleaning solution will remove accession numbers.

Polish residues from previous treatments should also be removed. These are usually found as Grey, white, or green deposits in inaccessible areas of the object. If they prove resistant to the procedure described above, use a wooden toothpick moistened with a mixture of equal volumes of methyl hydrate and water.

If you find **waxes, paints, or lacquers** during cleaning, determine whether or not they originate from manufacture or from use of the object, i.e. if they are part of the object's history. The preservation of these layers can be technically difficult, and their removal usually requires chemicals that are both toxic and flammable. These problem cases should be referred to a conservator for advice or treatment.

Polishing

Polishing is an abrasive process. If polishing is necessary, always begin with the mildest and least harmful method.

The gentlest procedure is to lightly rub the metal surface with a paste of precipitated chalk and water on a soft cloth Next in abrasiveness is jewelers' cloth, which has an outer layer of flannelette and an inner layer of flannel impregnated with jewelers' rouge (hematite), a fine abrasive. Gently and evenly rub the inner layer of the cloth over the surface of the metal, and then remove the residual rouge by polishing with the soft outer cloth.

If jewelers' cloth is not sufficient, consider a wadding-type polish applied with a soft cloth. However, proceed carefully as excessive rubbing could produce noticeable scratches on the surface of the metal. Finish by hand buffing with a clean, soft, lint-free cloth.

Be cautious of commercial polishes . Those formulated for automotive or stainless steel cleaning often contain very hard particles which can scratch the softer alloys of bronze. Some products contain tarnish inhibitors that leave a film on the surface, making further treatments difficult. Many metal polishes contain ammonia, which can dissolve copper in some conditions.

Waxing

A wax coating will provide some protection against both the environment and handling. A suitable wax can be prepared by mixing equal volumes of Shellsol or Varsol with a bleached micro-crystalline paste wax. Ensure that the wax contains no synthetic components, such as polyethylene, as these will make it difficult to remove. This mixture should then be stored in a sealed jar. To apply the wax, wipe or brush it evenly over the clean metal and then set the object aside for the solvent to evaporate. Alternatively, if the metal is not attached to wood, ivory, or other heat-sensitive materials, apply the wax and then heat the object with a hair dryer to melt the wax evenly over the surface and into the recesses. Finish by blotting the object (while still warm) with tissues to remove excess wax.

After the wax has set, buff the surface with a clean, lint-free cloth. A thin layer of wax will remain on the metal. To reduce the need for frequent cleaning, protect waxed objects from dust. When the need arises for further cleaning and polishing, the wax can be removed easily with odourless mineral spirits. This procedure should leave paints, lacquers, and accession numbers unaffected, but it is best to conduct a preliminary test.

Lacquering

Polished copper alloy objects are sometimes lacquered to protect them from handling and the environment.

However, museum objects should not generally be treated in this manner. No matter how well lacquer is applied, it always alters the appearance of an object. Also, applying a lacquer is a tacit acceptance of a failure in other areas of protection, e.g. the object is being handled more than it should, precautions against handling are being ignored, or the object is not being cleaned properly after use. Nevertheless, there are situations where lacquering is an appropriate treatment even if all other possible precautions are taken, especially if the object was originally lacquered and the coating has worn off or been deliberately removed.

There are two potential problems with lacquering. It is difficult to apply lacquer in a very thin yet even coat, and it is difficult to remove lacquer should it be necessary. The first problem can be addressed by taking the object to a company that specializes in applying lacquers and has the equipment and expertise necessary to do it well. Such companies can also remove lacquers.