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Chapter 1 : Surface finish - Wikipedia

Depending on the workpiece and the type of finish desired, many different types of media can be used, including garnet, walnut shells, stones, or coarse sand. In tumbling, components are placed into a box or tub along with the abrasive particles, which is then rotated to mix everything together randomly.

Fabrication and Special Finishing Methods Stainless steels have some characteristics which should be considered when planning finishing operations: High tensile strength - This fact determines the power necessary for efficient metal removal in grinding and polishing. High surface hardness - This governs the selection of abrasive materials and their cutting behaviour. Low heat conductivity - This requires attention to precautionary measures that will prevent rapid or excessive rise in temperature which can cause heat tint discolouration, buckling and, possibly, a reduction in corrosion resistance. Rapid work hardening - This necessitates proper grinding techniques, especially of austenitic grades in which residual stresses at the metal surface may affect in-service corrosion resistance. Need for cleanliness - This means attention must be given to grinding and polishing media to keep them clean and free of iron particles, which can be picked up if also used on carbon or alloy steel products. Grinding In finishing, the dividing line between fine grinding and polishing is not always clear because both involve metal removal. Coarse or rough grinding, like a fine milling operation, removes excess metal from weld beads, flash on forgings, or run-outs on castings. Coarse or rough grinding is also used in centreless grinding of bars. Progressive grinding It is frequently necessary to employ a series of wheels of decreasing grit size in order to remedy an existing surface condition. The initial grit size is selected on the basis of what coarseness of abrasive is needed to remove the major portion of the unwanted condition. The operation is completed by using a graduated series of successively finer wheels until the desired final finish is attained. The bulk of the job is accomplished with the coarser grits; and the finishing is done with the finer grits. The direction of wheel traverse across the work is changed by 90 degrees with each grit in order to remove residual grinding lines. Grinding weld beads Cleaning welds of slag, spatter and discolouration can be achieved with stainless steel wire brushes followed by appropriate flap wheels. Excess metal in weld beads is normally removed by grinding, though an initial cut may be taken with a cold chisel when the size of the bead warrants. Procedures and precautions for grinding weld beads conform to those previously described except that the width of weld beads precludes right angle cutting with successive grit sizes. Metal adjacent to beads being ground should be protected from flying bits of metal cuttings by covering with shields of paper or other materials. Wet rags may be laid on the work to absorb heat and thus reduce thermal distortion, particularly on light-gauge work. Grinding Wheels Solid wheels used for coarse grinding include the vitreous and rubber-bonded or bakelite-bonded types. Grit sizes range from No. Abrasives commonly employed are the aluminium oxide, zirconia and silicon carbide abrasives. It should be noted that each abrasive media has different characteristics. For a given grit size, each medium can produce a result which is very different from another. Surface speeds for solid wheels usually range around to metres per minute. Care of Wheels Grinding wheels should be maintained under clean, dry storage conditions. Those intended for use on stainless steel should never be used on other materials, as particles of such materials may contaminate stainless steel surfaces and seriously affect their corrosion resistance. Operation of Wheels Grinding wheels should never be forced. Allowing them to ride on the work at proper speed constantly maintained makes for efficient cutting and checks the generation of unwanted heat. The elimination of heat build-up in localised zones is of major importance with stainless steels. Their relatively low thermal conductivity means slow diffusion of heat and consequently, increased thermal distortion. This is particularly the case with the austenitic grades whose coefficients of thermal expansion are relatively high. Low metal temperatures avoid heat tinting which becomes evident at about degrees Celsius, and other problems. It is good practice to keep a grinding wheel moving in as many sweeps or strokes as is possible when grinding flat or open work with a portable tool. Belt Grinding Linishing Belts carrying abrasives of various grit sizes are widely used for grinding and polishing stainless steel surfaces. They are commercially available in many widths ranging from those used for the grinding of wide sheet down to narrow sizes for work on relatively small parts. Examples of the latter are belt grinders and polishers used for cookware and furniture. Polishing With refinement, grinding becomes polishing, either in preparing metal surfaces for subsequent buffing or in the actual preparation of a surface finish, such as a No. Generally speaking, those operations which serve mainly to remove metal rapidly are considered as grinding, while those in which the emphasis is centred on attaining smoothness are classified as polishing. Grinding employs the coarser grits as a rule while most polishing operations are conducted with grits of 80 and finer. If polishing is required, start with as fine a grit as possible to reduce finishing steps. There is a wide range of grinding and polishing tools on the market and advice is available from ASSDA members to assist in particular applications. Polishing Operations Polishing operations are conducted with the abrasive mounted either on made-up shaped wheels or belts which provide a resilient backing. The base material may be in either a smooth rolled or a previously ground condition. If the former, the starting grit size may be selected in a range of 80 to If the latter, the initial grit should be one of sufficient coarseness to remove or smooth out any residual cutting lines or other surface imperfections left over from grinding. In either case, the treatment with the initial grit should be continued until a good, clean, uniform, blemish-free surface texture is obtained. The initial grit size to use on a pre-ground surface may be set at about 20 numbers finer than the last grit used in grinding, and changed, if necessary, after inspection. Upon completion of the initial stage of polishing, wheels or belts are changed to provide finer grits. Polishing speeds are generally somewhat higher than those used in grinding. A typical speed for wheel operation is metres per minute. The precautions previously referred to under grinding apply also to polishing. Buffing Buffed finishes are produced on stainless steel surfaces by equipment and buffing materials and handling procedures that are generally similar to those employed on other materials. Buffing operations are generally composed of two stages. The first is known as cutting down buffing while the second is known as colour buffing. The fine scratches left by previous polishing are cut down with a buff which carries no previously glued-on abrasive. Instead, abrasive is applied intermittently to the buffing wheel by rubbing a cutting compound in bar or stick form against it as it rotates. These cutting compounds are made to formulas containing very fine artificial abrasives such as aluminium oxide in the neighbourhood of grit size with a stiff grease as a binder. They adhere to the wheel by impregnating the cloth discs. Colour buffing is performed in the same manner as cutting down except that a colouring compound is substituted. A varied assortment of compounds rouges for use on stainless steel is available commercially; selection is best made by consulting with suppliers. When the desired final finish has been attained either by polishing or buffing, the work should be cleaned with a soft flannel cloth using a product like whiting pulverised calcium carbonate or powdered chalk. Tumbling Tumbling provides a combined rubbing and abrasive action which can be advantageously employed for the surface treatment of small parts. It can be adjusted to remove burrs, oxide scale and residual flux, and can also be used for light surface treatment such as cleaning, burnishing or colouring. The action that takes place during the working of a charge is the result of forced movement of a tumbling material against surfaces of parts at a certain speed and for a definite length of time. All three of these factors - tumbling material, speed and duration of the working period - must be considered in combination when setting up to obtain any desired result. Painting In the painting of stainless steel surfaces, the main requirement to be satisfied is that of providing a good permanent bond. Stainless steel surfaces are dense, hard and smooth, particularly when in cold rolled or polished condition. For that reason, it is usually advisable to roughen them by means of strong pickling or glass-bead blasting. Pickling etchants are solutions of either hydrochloric or hydrofluoric acid, both of which are commercially available proprietary products. The stainless steel has either a 2D or 2B finish. Paint companies are best qualified to suggest paint types and procedures for prime and finish coats. The former include glass-bead and sand blasting and the latter employ chemical solutions. Desired changes in surface texture can be produced by either type of process; and the areas covered can be delineated by the use of masking or stop-off materials. Changes in surface texture produce marked differences in light reflectivity and as a result, contrasting effects are readily obtainable. Such contrasts are most pronounced when the etching is performed on cold rolled, polished or buffed finishes. Dulling to reduce reflectivity of stainless steel components is sometimes called for. When glass bead or sand blasting, the medium must be clean and free from carbon steel contamination, which can cause stains. Surface Blackening Stainless steel surfaces can be readily blackened, the most common process is by immersion in a molten salt bath of sodium dichromate. This practice is widely used by the automotive industry to blacken stainless steel parts, such as windscreen wipers, and it is used by manufacturers of stainless steel solar collection panels and trivets for domestic gas stoves. The process applies a very thin smooth black oxide film to the surface of all stainless steel types. The film is normally dull black in colour, but it can be brightened by the application of oils or waxes. The film shows no tendency to age or lose colour in service; it is ductile, will not chip or peel, and it is resistant to heat-up to the normal scaling temperature of the stainless steel. A blackened stainless steel can be deformed moderately without harm and the film exhibits good resistance to abrasion. A black surface can also be produced by black chromium plating. The reaction of the base material with the hot acid produces a transparent film which in itself is basically colourless, but which shows colours through light interference. Colours produced in normal time sequence are bronze, blue, gold, red, purple and green, and within this range a wide variety of shades can be obtained. Black finish is also available. Appearance is also dependent on the nature of the starting surface; matt and satin surfaces produce matt colours, polished surfaces exhibit a high degree of metallic lustre. Electropolishing Electropolishing of stainless steel is a method of imparting brilliance to its surface by removal of a thin surface layer. Studies have also shown that electropolishing has a beneficial effect on corrosion resistance. The work to be polished is the anode in a cell containing a suitable electrolyte. The process may be considered to be the opposite of electroplating. It has taken its place as an important production tool in the fabrication of the stainless steels along with mechanical polishing processes. Generally speaking, the method supplements the mechanical polishing methods in that it provides an economical means of brightening many shapes or forms that cannot readily be finished by those means. Electrolytic methods should not be employed to remove surface blemishes such as scratches, burrs, pits, scale patterns, forging marks and the like; although they will do so if such defects are very shallow. It is important to realise that defects initially present on surfaces may be greatly accentuated. Surface condition before electropolishing governs appearance as finished. These processes are also applicable to cast stainless steels.

Chapter 2 : Publications â€” Zahner

Therefore, you can look for a surface finish chart that lists the relative surface finish roughness for various metal cutting methods, such as abrasive cutting, EDM, grinding, milling, turning, lapping, polishing, and so on.

Jeff Kwasny The desired finish of a job depends on the product application, material, and type of finish your customer requires. These tips will help you deliver just what the customer expects in terms of a surface finish. Whether you are trying to achieve a linear, nondirectional, or mirror finish, you need to follow a specific process to arrive at the desired finish. Following the correct steps and using the correct power tool and corresponding consumable result in a process that is efficient and effective, reducing frustration and quite possibly production costs in the long run. The desired finish of a job depends on the product application, material, and type of finish your customer requires. When formal training in the finishing process is lacking, it can lead to undesirable results. This includes the frustration of not achieving the required finish and the use of an excessive amount of consumables, which can have a large impact on the cost of the project. Following the required steps and processes to achieve different finishes can alleviate this frustration and help to prevent problems that fabricators may face when tasked with finishing. An Explanation of Finishing Values Before a discussion of a step-by-step process to metal finishing success takes place, you need to understand Ra which is the average roughness determined by an algorithm and the different values required to achieve a specific finish. Customers typically reference a desired Ra value when describing their finishing requirements. It is important to keep in mind that the resulting number is in fact an average of the data points that the profilometer collects, meaning that it is possible to have an inconsistent surface finish that still yields a desirable Ra. So, after your shop is done cutting, grinding, and blending, you are then charged with performing the final step of finishing. The job instructions call for a mirror finishâ€”an Ra of 4 to 8 microinches. How does that differ from a sanitary finish or even a fine finish? One process does not fit all, and having a clear understanding of the proper tool speed, the right consumable, and how to use those elements are critical to achieving the desired outcome. If you are dealing with food-grade products, achieving a sanitary finish Ra of 30 to 35 microinches is vital. Preventing bacteria growth is the primary goal in these types of applications. Because of this, no fine particulates or scratches are allowed because they can trap bacteria. A sanitary finish devoid of marring and particulate helps to facilitate proper washing and cleaning. To achieve a sanitary finish, you need to apply the right abrasive at the right speed, so that the scratch pattern is created evenly and consistently see Figure 1. A sanitary finish should not leave behind any deep scratches. A common problem in finishing stainless steel is discoloration. Stainless steel does not conduct heat well. If a grinder is running too fast, it generates excessive heat, which burns out the nickel and chromium in stainless steel. This also can have a negative impact on the life and performance of the consumable product. The end result is that you are left with just steel and a dull, yellow finish on your product. It is essential that you run the abrasive product at the recommended speed to control heat and mitigate this issue. Products used in medical and pharmaceutical applications, as well as in the aerospace industry, require a fine finish Ra of 12 to 16 microinches to prevent corrosion and improve structural integrity and durability see Figure 2. Additionally, a fine finish allows for sanitary cleaning with smaller particulates such as powders, which are common in these environments. Probably the most difficult and least understood finish is the mirror finish see Figure 3. They may not be all that common, but when your shop gets one of these jobs, you want to ensure you use the proper technique and achieve the end result in as few steps as possible. The Step-by-Step Process to Achieve the Finish For best results, use a product with a flexible backing pad that can be used with multiple abrasive discs. This saves valuable tool-change and labor time. These are the steps to get to the desired finish see chart: Figure 4 shows the different stages to achieve a mirror finish. Finishing is an important part of the fabrication process and can be easily achieved if you have a thorough understanding of the requirements for the desired finish. Material knowledge and the proper pairing of consumable to power tool speed are the keys to achieving the desired finish in the most cost- and time-effective manner.

Chapter 3 : Which Metal Finishing Option Is For You? - Sharretts Plating Company

The desired finish of a job depends on the product application, material, and type of finish your customer requires. These tips will help you deliver just what the customer expects in terms of a surface finish. Finishing is both an art and a science and often poses challenges for today's welding.

Manufacturing[edit] Many factors contribute to the surface finish in manufacturing. In forming processes, such as molding or metal forming , surface finish of the die determines the surface finish of the workpiece. In machining, the interaction of the cutting edges and the microstructure of the material being cut both contribute to the final surface finish. If necessary, an additional process will be added to modify the initial texture. The expense of this additional process must be justified by adding value in some wayâ€”principally better function or longer lifespan. Parts that have sliding contact with others may work better or last longer if the roughness is lower. Aesthetic improvement may add value if it improves the saleability of the product. A practical example is as follows. An aircraft maker contracts with a vendor to make parts. The steel is machinable although not free-machining. The vendor decides to mill the parts. There is no need to add a second operation such as grinding or polishing after the milling as long as the milling is done well enough correct inserts, frequent-enough insert changes, and clean coolant. The inserts and coolant cost money, but the costs that grinding or polishing would incur more time and additional materials would cost even more than that. Obviating the second operation results in a lower unit cost and thus a lower price. The competition between vendors elevates such details from minor to crucial importance. It was certainly possible to make the parts in a slightly less efficient way two operations for a slightly higher price; but only one vendor can get the contract, so the slight difference in efficiency is magnified by competition into the great difference between the prospering and shuttering of firms. Just as different manufacturing processes produce parts at various tolerances, they are also capable of different roughnesses. Generally, these two characteristics are linked: In other words, if a process can manufacture parts to a narrow dimensional tolerance, the parts will not be very rough. Due to the abstractness of surface finish parameters, engineers usually use a tool that has a variety of surface roughnesses created using different manufacturing methods. Rigging Techniques, Procedures, and Applications. United States Department of the Army. Bibliography[edit] Degarmo, E. Paul; Black, J T.

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Chapter 4 : Surface Finishing Tutorial | Technical Tutorial - MISUMI

Types of Metal Finishing Metal finishing is used to treat the exterior of a metal product by applying a thin complementary layer to its surface. There are numerous types of metal finishing processes that can be used for a variety of purposes.

Sanding Sanding is simply a method for rubbing abrasive particles against the surface of a workpiece to create a random, non-linear surface texture. Different abrasive media are used, glued onto a backing paper or plate. Very coarse grits can remove a lot of material quickly, while finer grits are able to achieve a mirror polish. Water or some other lubricant is often used to flush material away and expose a fresh cutting surface. Ultrasonic Polishing Image Credit: But tool steels are heat-treated and very hard, so polishing them is difficult. Ultrasonic polishing is used in these cases. A soft, fine-tipped tool is mounted onto an ultrasonic spindle that vibrates at 30KHz. In combination with an abrasive slurry medium, the tool tip does not actually touch the work surface but it induces a pressure wave that safely works away at the surface to create a fine polish. Depending on the workpiece and the type of finish desired, many different types of media can be used, including garnet, walnut shells, stones, or coarse sand. In tumbling, components are placed into a box or tub along with the abrasive particles, which is then rotated to mix everything together randomly. Rumbling is much the same but the parts and abrasive are in a trough that is then vibrated to increase the cutting action. Magnetic Polishing Deep holes, pockets, or large interior chambers sometimes need to be highly polished in order to make a smooth surface with a low frictional resistance to air or liquid. But these areas can be difficult or impossible to reach by hand, so a different method is needed. Using a focused magnetic field, these particles can then be directed to abrade away against the interior surface to achieve a fine polish. Sandblasting This is the process of treating the surface of a part by blasting it with an abrasive media under high pressure. The type of media used again will determine the quality of the resulting finish. Sandblasting, or blasting with a combination of air and water, can cover a large surface area quickly. It can also improve some of the mechanical properties of metal, by increasing fatigue strength and improving corrosion resistance through shot-peening. This fills microscopic surface voids and flattens high spots. Machines can also be used for this process but it requires a very slow speed to avoid heating the workpiece. Filing A file is a piece of very hard steel that has a series of parallel grooves cut into it, which leave behind rows of sharp cutting teeth. Files are typically used by hand and, depending on how coarse the teeth are, can aggressively remove material and shape metal quickly. The surface finish is somewhat rough and imprecise and often needs additional sanding or polishing for good results. But files are still versatile, easy to use and can produce fine results in skilled hands.

Chapter 5 : Electropolishing and Passivation for the Biotech Industry - Harrison Electropolishing

Perfect your final products with one of these finishing methods for metal surfaces. Without them, the metal will appear scratched and incomplete. Finishing techniques offer different advantages, depending on the method you choose.

Metal finishing is not one single process, and it can be executed in multiple ways. Sorting through the various metal finishing options can also be confusing. Industrial Plating Industrial plating is the process of depositing a thin coating onto the surface of a substrate. The most common form of industrial plating is electroplating, which is primarily used to build surface thickness. Also known as electrodeposition, electroplating is accomplished by sending an electric current through an electrolyte solution. This is referred to as a bath, which contains the metal substrate along with dissolved ions of the metal used as the coating. The electroplating procedure is regulated by tightly controlling various parameters throughout the process. These parameters typically include: The composition and purity of the bath solution Bath temperature Duration of the process Amount of voltage and amperage applied The process can involve rack plating , which is where large, fragile or complex parts are hung on a rack and immersed into the plating bath. Another option is barrel plating , which involves smaller parts being placed inside a barrel that is rotated through the plating solution. Standard Industrial Plating Types Electroplating can be further classified by the type of metal that is used to provide the coating. Standard metals include tin, copper, zinc and nickel, as well as various alloys. Tin â€" Tin is a relatively soft, malleable metal that is available in abundance. Because tin is so readily available, the tin plating process is often more cost-effective than when using other metals. Additionally, tinning can be precisely controlled to achieve a matte, semi-bright or bright appearance. Copper â€" Most of us know that copper is an excellent conductor of electricity. Thus, copper electroplating is a preferred metal finishing choice in the manufacturing of electronic circuit boards, semiconductors, and other electronic parts and components. In addition to being highly conductive, copper offers improved adhesion. Zinc â€" Like tin, zinc is a readily available element, which makes zinc plating a relatively inexpensive metal finishing option. Zinc plating is primarily used to increase corrosion resistance on smaller metallic parts such as nuts, bolts and screws. Nickel â€" Nickel is a strong, lustrous metal that is often used as a base coat prior to plating with a precious metal such as gold or silver. Nickel plating can harden the surface of the substrate, which increases wear resistance. Nickel also provides superior protection against corrosion. Electroplating With Precious Metals Unlike standard metals that can normally be found in abundance, precious metals are relatively rare. Consequently, precious metals tend to have a higher economic value. Precious metals such as gold, silver, palladium and rhodium contain properties that are beneficial for industrial plating purposes: Gold also has relatively high electrical conductivity and stable contact resistance, which makes it a popular plating choice for electrical components such as semiconductors and connectors. Silverâ€" Silver is a ductile, malleable precious metal. The silver plating process can then be regulated to achieve either a matte or bright finish. Palladium is known for its ability to absorb hydrogen, which can reduce the likelihood of the occurrence of hydrogen embrittlement. Palladium is also lighter than gold and offers comparable corrosion resistance. Rhodium â€" A member of the platinum family, rhodium is a relatively rare precious metal that is known for its hardness and durability. Rhodium also exhibits a reflective, silver-white appearance that makes it a popular choice for plating fine jewelry pieces. Because of its scarcity, plating with rhodium may be a cost-prohibitive process for many manufacturing operations. Electroplating Alloys While all of the metals mentioned above can be plated individually, they are often alloyed with other metals. Alloying can enhance the electroplating process by introducing additional benefits that one metal may not be able to provide alone. It may also negate the potentially harmful properties of one of the metals. Common electroplating alloys include: Get the latest industry information and stay up to date with plating and metal finishing solutions. Sign Up for our Newsletter Electroplating on Titanium Titanium is a lightweight, durable metal that is silver in color. Titanium cannot be electroplated onto other metals with current science and aqueous solutions. Electroplating on Plastic

Electroplating is not strictly limited to metal-on-metal plating applications. A primary reason to apply a metal coating onto a plastic or other non-metallic substrate is to make the surface of the object electrically conductive. Copper is usually the metal of choice for achieving this purpose. Plating on plastic can also improve the appearance of an object or enhance its resistance to corrosion. It can even harden the surface and increase its durability. Electroless Plating The industrial plating process does not always require the use of electricity. Instead of an electric current, electroless plating relies on a chemical reaction to deposit the metal onto the surface of the substrate. With electroless plating, the deposition of the metal coating typically occurs at a much slower rate than during electroplating. The key benefit is that the coating can be applied more smoothly and evenly. The electroless nickel plating process can also be simpler to execute, and the absence of electricity can reduce the overall process costs. Nickel is the metal that is most commonly used in electroless plating. Electroless nickel is compatible with a wide variety of base materials such as aluminum, stainless steel, copper, zinc die-cast and brass. An electroless nickel coating may also be applied on plastic as a preparatory step prior to electroplating on plastic. A recent development in the world of electroless nickel plating is a black electroless nickel process that provides a black nickel coating, which is desirable to many companies in industries such as aerospace and firearms manufacturing. Passivation Another widely applied metal finishing process is passivation. Passivation is often implemented as part of the post-treatment zinc or zinc-alloy plating process as a means of preventing the onset of white rust. It is also used for descaling and cleaning of stainless steel parts for enhanced corrosion resistance. Anodizing Primarily used to convert the surface of an aluminum object to aluminum oxide, anodizing can also deposit a thin, protective film on other nonferrous standard metals. By altering the molecular composition of the surface, anodizing can provide important benefits such as increased corrosion resistance, reduced impact of normal wear and tear, and a stronger, harder finish. While an anodized finish is naturally colorless, dyes in various colors can be added for applications requiring aesthetic appeal. Vacuum impregnation is a process that can reduce or eliminate occurrences of micro and macro porosity through the precise application of vacuum pressure. Vacuum impregnation works by removing the air that is present as the casting solidifies, and injecting a sealant to form an airtight seal. Abrasive Blasting Abrasive blasting also offers the advantage of combining surface finishing and cleaning into one process, which can save time and money. The abrasive blasting process involves the high-pressure propulsion of a blasting medium against the surface of an object. This can remove contaminants and produce a smooth, clean finish. Abrasive blasting can also be used as a surface preparation treatment prior to plating, painting or coating. It can even be applied to help alter the shape or increase the surface area of an object. Shot Peening Shot peening is somewhat similar to abrasive blasting in that the process uses high pressure to propel the medium shot onto the surface of an object. The key difference is that, instead of abrasion, shot peening relies on plasticity â€" which results in a change in the mechanical properties of the surface. Common shot peening applications include edgebreaking, cleaning and appearance enhancement. Mass Finishing Mass finishing is a highly complex process that is used to provide simultaneous bulk polishing of a high volume of smaller, more technical parts. Also known as mechanical surface finishing , the process involves the use of a vibratory or tumble finishing technique and a carefully selected medium. Processes that are compatible with mass finishing include degreasing, descaling, rust removal and general surface cleaning. The key benefit of mass finishing is that it enables the production of a large volume of uniform parts at a relatively low cost. E-Coating E-coating, or electrocoating , is the process of applying an epoxy paint onto the surface of a large part via electrodeposition. Because the part is completely submersed in the epoxy solution, e-coating can provide a more even paint application than traditional painting or powder coating processes. It also provides superior protection against corrosion. An e-coating can serve as a primer coat prior to painting to promote adhesion, as well as to increase the durability of jewelry pieces. Another important consideration is the length of time it takes to complete the finishing process. Cycle times can vary greatly from one process to another, and factors such as substrate, part size and job volume will also have a major impact. Of course, cost will also play an important role in your choice. When considering cost, you should think about the long-term as well as short-term costs. Remember that while some metal finishing processes may require a higher up-front expenditure, they may also result in significant cost benefits in the form of shorter cycle times or higher quality. An Experienced Metal Finishing Solutions Provider Experience should be an important factor as you begin evaluating metal plating companies. Sharretts Plating Company has nine decades of experience in providing cost-effective metal finishing solutions for companies in all types of industries. We offer all of the industrial metal plating and finishing services mentioned in this post. Our team will work with you to develop a customized metal finishing process that can reduce your operating costs, help you meet your production goals and provide better service to your customer base. Contact SPC today to learn more about our vast array of metal finishing services. Be sure to sign up to receive our informative e-newsletter.

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Chapter 6 : Surface finishing - Wikipedia

This is a method of forming surface alloy layers by covering the surfaces of heated metals and metal diffusion at the same time. There is a method of heating the pre-plated products, as well as heating the products in powdered form of metal to be coated.

Surface Treatment There are following types of surface treatments. Surface Treatment Type Concepts and Applications of the process Electroplating A method of forming metallic coatings plating films on subject metal surfaces submerged in solutions containing ions by utilizing electrical reduction effects. Electoplating is employed in a wide variety of fields from micro components to large products in information equipment, automobiles, and home appliances for ornamental plating, anti-corrosive plating, and functional plating. Electroless Plating A plating method that does not use electricity. The reduction agent that replaces the electricity is contained in the plating solution. With proper re-processing, virtually any material such as paper, fabrics, plastic and metals can be plated, and the distribution of the film thickness is more uniform, but slower than electroplating. This is different from chemical plating by substitution reaction. Chemical Process Chemical Coating The process creates thin films of sulfide and oxide films by chemical reactions such as post zinc plating chromate treatment, phosphate film coating Parkerizing , black oxide treatments on iron and steels, and chromic acid coating on aluminum. It is used for metal coloring, corrosion protection, and priming of surfaces to be painted to improve paint adhesion. Anodic Oxidation Process This is a surface treatment for light metals such as aluminum and titanium, and oxide films are formed by electrolysis of the products made into anodes in electrolytic solutions. Because the coating anodizing film is porous, dyeing and coloring are applied to be used as construction materials such as sashes, and vessels. There is low temperature treated hard coating also. Hot Dipping Products are dipped in dissolved tin, lead, zinc, aluminum, and solder to form surface metallic films. It is also called Dobuzuke plating and Tempura plating. Familiar example is zinc plating on steel towers. Vacuum Plating Gasified or ionized metals, oxides, and nitrides in vacuum chambers are vapor deposited with this method. Methods are vacuum vapor deposition, sputtering, ion plating, ion nitriding, and ion implantation. Titanium nitride is of gold color. Painting There are spray painting, electrostatic painting, electrodeposition painting, powder painting methods, and are generally used for surface decorations, anti-rusting and anti-corrosion. Recently, functional painting such as electro-conductive painting, non-adhesive painting, and lubricating painting are in active uses. Thermal Spraying Metals and ceramics oxides, carbides, nitrides powders are jetted into flames, arcs, plasma streams to be dissolved and be sprayed onto surfaces. Typically used as paint primer bases on larger structural objects, and ceramic thermal spraying for wear prevention. Surface Hardening This is a process of metal surface alteration, such as carburizing, nitriding, and induction hardening of steel. The processes improve anti-wear properties and fatigue strength by altering metal surface properties. Metallic Cementation This is a method of forming surface alloy layers by covering the surfaces of heated metals and metal diffusion at the same time. There is a method of heating the pre-plated products, as well as heating the products in powdered form of metal to be coated.

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Chapter 7 : Types of Metal Finishing

Surface Finish is a measure of the overall texture of a surface that is characterized by the lay, surface roughness, and waviness of the surface. Surface Finish when it is intended to include all three characteristics is often called Surface Texture to avoid confusion, since machinists often refer to Surface Roughness as Surface Finish.

Hot Blackening Metal Plating Metal plating machines use a chemical bath to coat or alter the surface of a substrate with a thin layer of metal, such as nickel or PTFE. The electroplating method generates an electric current to coat the substrate, while electroless plating employs an autocatalytic process in which the substrate catalyzes the reaction. Metal plating provides a number of advantages as a finishing process. It is also a useful option for coating other metals. In high-volume production runs, a barrel-finishing machine is a fast and efficient plating solution. However, plating machines are generally not suited for smoothing out surface defects. Brushed Metal Unlike plating, brushed metal finishing is an effective method for removing surface imperfections. An abrasive belt or wire brush is usually employed to achieve this effect. In addition, the singular direction of the belt or brush can create slightly rounded edges perpendicular to the grain. Buff Polishing If your project requires a smooth, non-textured finish, then a buff polishing machine may be your answer. The process is often used for decorative products that benefit from luster and smoothness. There are several types of grinding machines designed to deliver different levels of finite smoothness. For example, a ball-grinding mill is an excellent fine grinder for cement products, but may not work for more extensive smoothing projects. Most metal grinding machines consist of a substrate within a rotating drum. Rod mills are used to make metal rods, while semi-autogenous grinding SAG mills and autogenous grinding mills smooth copper, gold, platinum , and silver. Metal Vibratory Finishing Vibratory finishing machines are used to deburr products and remove sharp edges. They position material inside a drum filled with abrasive pellets and a substrate, then apply tumbling vibration to create a uniform random texture. Sand Blasting Sand-blasting machines are typically employed in projects requiring a uniform matte texture. The process also known as beadblasting forces sand, steel shots, metal pellets or other abrasives into a substrate at high speed. This results in a smooth, clean product texture, particularly in soft metals. Powder Coating Powder coating applies a decorative finish that is similar to paint, but with greater durability. The process involves melting dry plastic powder onto the metal to produce a textured, matte, or glossy coating. A textured powder-coating machine is also highly effective in removing surface defects. It is a high-temperature process in which the product is inserted into a series of tanks containing cleaners, caustics, and coolants. Hot blackening is most commonly used in the production of automotive parts, tools , and firearms. Choosing a Metal Finishing Process There are a few considerations that can help you narrow your choices in selecting a metal finishing technique suitable for your project. Some helpful things to keep in mind are: How quickly does the technique apply finish to the product? Certain finishing machines such as vibratory tumblers can be expensive, but may compensate for their price by delivering faster cycle rates Metal hardness:

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Chapter 8 : The basics of metal surface finishes - The Fabricator

These surfaces may have a satin or highly polished appearance depending on the finishing operation and material. These surfaces are specified only when design requirements make it.

The use of abrasives in metal polishing results in what is considered a "mechanical finish". Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed. January Learn how and when to remove this template message 3 Finish Also known as grinding, roughing or rough grinding. These finishes are coarse in nature and usually are a preliminary finish applied before manufacturing. An example would be grinding gates off of castings, deburring or removing excess weld material. It is coarse in appearance and applied by using 36â€" grit abrasive. A 4 architectural finish is characterized by fine polishing grit lines that are uniform and directional in appearance. It is produced by polishing the metal with a â€" grit belt or wheel finish and then softened with an 80â€" grit greaseless compound or a medium non woven abrasive belt or pad. This finish is much finer than a 4 architectural finish. This finish enhances the physical appearance of the metal as well as increases the sanitary benefits. A 4 dairy or sanitary finish is produced by polishing with a â€" grit belt or wheel finish softened with â€" grit greaseless compound or a fine non woven abrasive belt or pad. This finish is produced by polishing with a â€" grit belt or wheel softened with a â€" greaseless compound or very fine non woven abrasive belt or pad. Polishing lines will be soft and less reflective than a 4 architectural finish. This is a semi-bright finish that will still have some polishing lines but they will be very dull. Carbon steel and iron are commonly polished to a 7 finish before chrome plating. A 7 finish can be made bright by color buffing with coloring compound and a cotton buff. This is commonly applied to keep polishing costs down when a part needs to be shiny but not flawless. This finish is produced by polishing with at least a grit belt or wheel finish. Care will be taken in making sure all surface defects are removed. The part is sisal buffed and then color buffed to achieve a mirror finish. The quality of this finish is dependent on the quality of the metal being polished. Some alloys of steel and aluminum cannot be brought to a mirror finish. Castings that have slag or pits will also be difficult, if not impossible, to polish to a 8.

Chapter 9 : Chemical Surface Treatments

In simple terms, metal finishing is the process of applying a metal coating or other treatment to the surface of a metal part or component. This part or component is referred to as a substrate. Metal finishing can be a physical, chemical or mechanical process.

Technical Inquiry Chemical Surface Treatments Successfully using stainless steel depends on environment, grade selected, surface finish, the expectations of the customer and the maintenance specified. Stainless steels provide robust solutions, but in harsh or borderline environments with high expectations for durability, surface finish will have a substantial impact on performance. Surface finishes can be applied mechanically usually with abrasives and chemically. Understanding how chemical and mechanical treatments will affect the characteristics of the surface and will enable the best possible outcome for the client and the structure. Chemical treatment can be used to improve the corrosion performance of the steel, and hence its appearance in service. Stainless steels resist corrosion best if they are clean and smooth. Clean means being free of contaminants on or in the surface that can either react with the steel like carbon steel or salt or that create crevices or other initiation points where corrosion can start. The common feature of chemical treatments is that they all clean the surface of the steel. They may also smooth or roughen the steel surface, or leave it unaffected depending on which process is chosen. But if carried out properly, they all increase the corrosion resistance. Corrosion resistance improves as you go to the right of this graph. The graph shows the relative importance of the smoothness of the surface and chemical treatment of the surface. They can be used together to get the best corrosion resistance. The study reported by G. Coates Materials Performance - August looked at the effect of various methods of treating an artificial welding heat tint on grade , 2B surface. Stainless Steel Products During steel making, sulphur in the steel is controlled to very low levels. But even at these levels sulphide particles are left in the steel, and can become points of corrosion attack. Most bar products will be slightly higher in sulphur when produced, so chemical treatment to remove inclusions in the surface of these products becomes more important. Generally mill finishes for flat products sheet, plate and strip will be smoother as their thickness decreases. A No 1 finish on a thick plate may have dimples or other imperfections and a surface roughness of 5 to 6 micrometres Ra. A typical 2B cold rolled finish on 1. New surfaces will be created during fabrication processes, eg cutting, bending, welding and polishing. The corrosion performance of the new surfaces will generally be lower than the mill supplied product because the surface is rougher, or sulphide inclusions sitting just under the surface have been exposed or mild steel tooling contamination may have occurred. Chemical treatments correctly performed can clean the surface and ensure the best possible corrosion performance. Chemical surface treatments can be grouped into four categories: Pickling - acids that remove impurities including high temperature scale from welding or heat treatment and etch the steel surface. Passivation - oxidising acids or chemicals which remove impurities and enhance the chromium level on the surface. Chelating agents are chemicals that can remove surface contaminants. Electropolishing - electrochemical treatments that remove impurities and have the added beneficial effect of smoothing and brightening the surfaces. Pickling Mixtures of hydrofluoric HF and nitric acid are the most common and are generally the most effective. Acids are available as a bath, a gel or a paste. These chemicals etch the stainless steel which can roughen and dull the surface. Care is required with all these chemicals because of both occupational health and safety and environmental considerations. HF is a Schedule 7 poison which has implications for sale or use in most states. Passivation Nitric acid is most commonly used for this purpose. Passivation treatments are available as a bath, a gel or a paste. Used correctly, a nitric acid treatment should not affect the appearance of the steel although mirror polished surfaces should be tested first. Passivation works by dissolving any carbon steel contamination from the surface of the stainless steel, and by dissolving out sulphide inclusions breaking the surface. Nitric acid may also enrich the proportion of chromium at the surface - some chelants are also claimed to do this. Pickling and passivation L-R: The carboxylic acid group

COOH is the basis for many chelants which are used in cleaners, water softening and lubricants. The pH and temperature must be correct for the chelant to do its job. Turbulent rinsing of pipes and vessels afterwards is important. Cleaning by chelating agents tends to be based on proprietary knowledge and systems, and is less standardised than the other methods described. The successful use of these systems needs to be established on a case by case basis. Electropolishing Most commonly phosphoric and sulphuric acids are used in conjunction with a high current density to clean and smooth by metal removal the surface of the steel. The process preferentially attacks peaks and rounds valleys on the surface and raises the proportion of chromium at the surface. Electropolishing of the example on the right effectively removed contamination including heat tint and smoothed the surface lifting lustre and reflectivity compared with the untreated example on the left. Precautions For chemical processes that etch the stainless steel, reaction times will increase with increasing grade. The sulphur addition in these steels makes them readily attacked by chemical treatments. Care is also required when treating martensitic or low chromium ferritic stainless steels. Detailed recommendations for each grade of stainless steel are given below. The four categories of treatment are detailed in a number of Standards, but the most commonly used are: These very useful documents give detailed recommendations on many aspects of selection, application and evaluation of these treatments. Dirt and grease will mask the surface from treatments outlined above. Therefore, the steel surfaces must be free of these agents before applying chemical treatments. Many of the chemical treatments described contain strong acids. Before disposal they will require neutralisation. Check with your local authority concerning the requirements for trade waste, neutralisation and disposal. Many of the chemicals described above will be classified as hazardous substances under State OHS legislation, with implications for purchasing, transport, storage and handling. Chemical treatments are useful tools in cost effectively achieving peak performance with stainless steels. With appropriate training, hazards associated with their use can be managed.