

Glossary of Pretreatment and Stripping Terms

A

Abrasive. Agent used for abrasive blast cleaning. Examples include sand, grit, steel shot, and glass or plastic beads.

Acid. A species which reacts in liquid water to generate hydrogen ions (represented as cations— H^+ or hydronium H_3O^+ ; anions such as sulfate, SO_4^{2-} ; and nitrate, NO_3^-) which were associated with the H^+ in the acid are also released.

Acid descaling. A process using acid to dissolve oxide and scale. See *pickling*.

Acidity. Measure of the free acid present.

Activation. Process of removing last trace of oxide on a metal surface and a thin layer of the metal itself to ensure that the metal surface is electrochemically active. See *etching*.

Active metal. Metal in the condition of high chemical activity that is more susceptible to corrosion.

Adsorption. The binding of a molecule to a surface (solid or liquid) by nonspecific physical forces. For example, the removal of free chlorine and chloramines by activated carbon is through the mechanism of adsorption.

Age tank. A tank used to store a known concentration of chemical solution for feed to a chemical feeder. Also called a day tank.

Air jet. Type of sandblasting gun in which the abrasive is conveyed to the gun by partial vacuum.

Air knife. Mechanical device that uses a small amount of compressed air to pull in large volumes of surrounding air and produce a high-flow, high-velocity curtain or sheet of air.

Alkali. Caustic. Inorganic substances that share the characteristic of being strongly basic (high pH). Examples include sodium hydroxide, caustic soda, and lye.

Alkaline descaling. A chemical process for removing scale. A typical descaling solution uses caustic soda with additives, such as detergents and chelating agents.

Alkalinity. A measurement of the quantity of chemicals present in the water that can neutralize acids. These include carbon dioxide, bicarbonate, carbonate, and hydroxides. See *titratable alkalinity*.

Alum. See *aluminum sulfate*.

Aluminum sulfate. An aluminum salt commonly used as a flocculant by municipal water treatment plants.

Ambient temperature. Room temperature or temperature of surrounding area.

Amphoteric. A substance, such as aluminum, capable of acting either as an acid or a base.

Amphoteric surfactant. Surfactant having both negatively and positively charged functional groups.

Anion. A negatively charged ion. See *ion*.

Anionic surfactants. Surfactants that give negatively charged ions in an aqueous solution.

Anchor pattern. Surface profile, usually after blasting.

Anhydrous. Dry. Free of water in any form.

Antifoaming agent. Material added to pretreatment chemical solutions to reduce the tendency of materials to foam.

Aquablaster. A surface cleaning process where an abrasive material is suspended in water. The resulting slurry is pressurized and ejected through a nozzle. This process can use higher pressures than other types of blasting and quickly removes surface metal and leaves a good surface finish.

Aqueous. A water-based material.

Ash. The nonvolatile inorganic matter of a compound, which remains after subjecting it to high temperatures.

B

BTU. British thermal unit. The amount of heat needed to raise the temperature of one pound of water 1°F.

Base. A species which when dissolved in water generates hydroxide (OH^-) ions or is capable of reacting with an acid to form a salt.

Baume Scale. Specific gravity scale used for taking the relative weight of a liquid as compared to the weight of an equal volume of a standard liquid. The lighter-than-water, or oil scale, has as its zero point, the distance to which a hydrometer sinks in a mixture of one part salt in nine parts of water. The 10° point is determined in pure water. The distance between these two points is divided into ten equal parts and these spaces are added above the 10°-mark as high as needed for the liquid where the hydrometer is most frequently used. The heavier-than-water, or acid, scale uses pure water for its zero point. The point to which the hydrometer sinks in a mixture of 15 parts salt to 85 parts of water is marked 15°. Between these two points, the space is divided into 15 equal parts. These spaces are added below the 15°-mark to make a total of 0° to 70°. French scientist, Antoine Baumé, designed this type of hydrometer.

Best available technology (BAT). A level of technology represented by a higher level of wastewater treatment technology than needed by best practicable technology (BPT). BAT is based on the very best (state of the art) control and treatment measures that have been developed, or are capable of being developed, and that are economically achievable within the appropriate industrial category.

Best practicable technology (BPT). A level of technology represented by the average of the best existing wastewater

treatment performance levels within the industrial category.

Biodegradable surfactant. Surfactant that may be decomposed by biological action.

Blast cleaning. Removal of surface contaminate from a part by using an air- or mechanically propelled abrasive.

Blemish. Any surface imperfection of a coating or substrate.

Blow-off. Removal of particulate and fibers from materials in preparation for powder application using compressed or high-volume, fan-driven air.

Bright blast. White metal surface blast. See *NACE No. 1 white metal blast cleaned surface finish*.

Brush-off blast. Lowest blast cleaning standard. See *NACE No. 4 brush-off blast cleaned surface finish*.

Buffer. A solution or liquid whose chemical makeup neutralizes acids or bases without a great change in pH.

Builder. A chemical that aids in soil removal without significant influence on surface tension.

C

CFS. Cubic feet per second. A measure of flow rate.

Cation. A positively charged ion. See *ion*.

Cationic surfactant. Positively charged surfactant molecule.

Caustic. A strong chemical base.

Cellulose acetate. A synthetic polymer derived from naturally occurring cellulose and widely used in fabricating membranes. The polymers used for water purification membranes may be diacetate, triacetate, or blends of these materials.

Chelant. Chemical that complexes metal ions in soluble form.

Chromate rinse. See *Chromic acid rinse*.

Chromic acid rinse. A chromic acid solution used after zinc or iron phosphate to passivate the metal at the base of cracks or pinholes in the phosphate coating. Used to improve corrosion resistance.

Chlorine. Chemical used to disinfect municipal water.

Cleaner. Detergent, alkali, acid, solvent, or other cleaning material, often water- or steamborne, used to clean and degrease parts before powder application.

Coagulant. A chemical which causes dispersed colloidal particles to become destabilized, thereby, aiding in their removal during municipal water treatment. Aluminum and iron salts are commonly used for this purpose.

Coagulation. A chemical (coagulant), most commonly alum, is added to water to destabilize colloidal particles by neutralizing their electrical charges. Coagulation is used together with flocculation as a process for colloidal removal.

Colloid. Undissolved, submicron-sized particles that are suspended and well dispersed in a solution and will not readily settle out on standing.

Compaction. The undesirable physical compression of a reverse osmosis or ultra-filtration membrane, resulting in reduced flux rates. Higher temperatures and pressures accelerate this phenomenon.

Conductivity. Conductivity is a quantitative measure that describes the ability of an aqueous solution to carry electric current and depends on the presence of ions in the solution. Solutions of inorganic ions are relatively good conductors—and exhibit high conductivity—whereas solutions of organic molecules are rather poor conductors—and exhibit low conductivity. Highly purified water is also a poor conductor. Conductivity is expressed in units of Siemens/centimeter (mhos/cm). Conductivity measurements can be used to monitor the performance of reverse osmosis equipment. The measurement is temperature dependent and should be measured with a temperature-compensated meter. The usual reference temperature is 77°F (25°C). Conductivity measurements can also be used to estimate total dissolved solids in water. See *resistivity*.

Contaminants. Foreign material, such as dirt, which can be detected in the cured powder coating.

Conversion coating. Inorganic pretreatment—zinc or iron phosphate—for metal substrates that prepares the surface for powder coating.

Copper sulfate test. Test to determine the presence of mill scale or passivated metal. A copper color indicates absence of mill scale and presence of bare steel when steel is swabbed with a 5- to 10-percent solution of acidified copper sulfate.

Corrosion. Decomposition or reaction of a metal with oxygen, water, or other chemicals, when exposed to a particular environment.

Counterflow. Transporting overflowed solution from one washer stage to another for reuse.

Creepage. Corrosion under a scribe line or edge after salt spray or other testing. See *scribe creep*.

D

Day tank. See *age tank*.

Deflocculation. A cleaning procedure that breaks down soil into very fine particles, which are maintained in a dispersive phase to prevent agglomeration.

Defoamer. See *antifoaming agent*.

Degreaser. Solvent or compounded material for removing oils, fats, or grease from a substrate. Also the apparatus in which the operation is carried out.

Degreasing. Removal of grease, oil, and other fatty matter by the use of solvents or chemical cleaners, electro, or heat processes.

Deionization. The removal of ions from a solution by ion exchange.

Deionized water (DI water). Water containing no ions other than hydrogen and hydroxyl ions. Typically produced through using ion exchange resins and used for parts after a seal rinse in a spray washer.

Descaling. Removal of mill scale or caked rust from steel by chemical and/or mechanical means, sometimes assisted by flame cleaning.

Detergent. An alkaline or ionized cleaning or emulsifying agent. A formulation that will remove soil. See *surfactant*.

Dilute. To make thinner or less concentrated by adding liquids such as water or solvent.

Dilution ratio. Ration by which a given solvent or solution may be diluted without adverse effects.

Dispersion. Suspension of one substance in another.

Drag-in. The water or solution that adheres to workpieces introduced into a bath.

Drag-out. Process of solution entrapment being pulled with the product, typically out of the washer zone or coating enclosure.

Drain. A piping system used to collect and carry off surface and ground water.

Dry blasting. Any form of blasting where the abrasive agent is not carried in water.

E

Effluent. Any spent liquors or other waste material which are emitted by a source, such as waste from plating shops, pickling tanks, and sewage treatment plants.

Effluent limitations. Any restrictions, established by the government or by management, on quantities, rates, and concentrations of chemical, physical, biological, and other constituents that are discharged from paint sources.

Emulsion. Suspension of colloidal-sized, immiscible liquid droplets in another liquid; two phases present.

Emulsion cleaning. A cleaning technique that emulsifies contaminants. Emulsions are mixtures of two liquids; one holds the other in a suspension. The liquids will typically have different polarities and will dissolve different types of materials. One of the liquids is usually water and the other will have nonpolar properties and they can dissolve nonpolar contaminants, such as oil and grease, from metal surfaces.

End point. Samples are titrated to the end point. This means that a chemical is added drop by drop to a sample until a certain color change (blue to clear, for example) occurs. This is called the end point of the titration. In addition to a color change, an end point may be reached by the formation of a precipitate or the reaching of a specified pH. An end point may be detected by the use of an electronic device such as a pH meter. The completion of a desired chemical reaction.

Enzyme. For detergency, an amino acid polyester derived from bacteria, that breaks down proteins (protease), fats (lipase), or starches (amylase).

Erosion. Wearing away of a coating to expose the undercoat and substrate.

Etch. Wear away or roughen a surface with, or as if with, an acid.

Etching. Surface preparation of metal by chemical process; removal of a layer of the base metal.

Evaporation. The physical process by which a liquid substance is converted to a gas or vapor.

F

Face rusting. Appearance of rust on an apparently unblemished coated surface.

Feed water. Water entering a purification system or an individual piece of purification equipment, such as an ultrafilter or reverse-osmosis system.

Filiform corrosion. Corrosion resembling a thread-like formation; usually caused by poor substrate cleaning or rinsing.

Filter. A porous material on which solid particles present in the air or in other fluids which flows through it are largely caught and retained.

Filtration. The process of segregation of phases, such as the separation of suspended solids from a liquid or gas, usually by forcing a carrier gas or liquid through a porous medium.

Flame cleaning. Surface preparation of steel using flame to burn off contaminants.

Flash rusting. Very thin coating of rust or oxide occurring within minutes to hours after applying a pretreatment solution.

Flocculant. A substance used in combination with coagulants, which causes submicroscopic, suspended matter (colloids) to aggregate into larger particles that can be removed by settling or filtration.

Flowmeter. An instrument for measuring the rate of flow of a fluid moving through a tube, pipe, or duct system. The instrument is calibrated to furnish volume or mass rate of flow.

Flux rate. The rate per unit of area at which water passes through a semipermeable membrane, such as those used for ultra filtration or reverse osmosis.

Fouling. The deposition of insoluble materials, such as bacteria, colloids, oxides, and waterborne debris, onto the surface of a reverse osmosis or ultra filtration membrane. Fouling is associated with decreased flux rates and may also reduce the rejection rates of reverse osmosis membranes.

G

GPD. Gallons per day.

GPM. Gallons per minute.

GPY. Gallons per year.

Gallon. Unit of volumetric measure (4 quarts, or 3.785 liters).

Galvanized steel. Steel coated with a layer of metallic zinc.

Gray blast cleaning. A commercial blast standard. See *NACE No. 3 commercial blast cleaned surface finish*.

Grit. Abrasive obtained from slag and various other materials.

Grit blasting. Abrasive cleaning of a surface by blasting with angular chilled iron grit, aluminum oxide, or any crushed or irregular abrasive.

H

Hexavalent chrome. Chromium most often used as a seal rinse in a five-or-more-stage pretreatment system. Has a +6 valence Hex and is considered a reactive seal rinse.

Hydroblasting. Cleaning with high-pressure water jet.

Hydrogen ion concentration. pH. See *pH*.

I

Immiscible. Descriptive of the two or more fluids that aren't mutually soluble.

Impeller. Located within the pump housing, this device provides the mechanical action needed to pump the washer solution through the piping in a spray treatment system.

Impingement. A process resulting in a continuing succession of impacts between liquid or solid particles and a solid surface.

Indicator (pH) paper. A vegetable-dyed paper that indicates relative acidity or basicity (alkalinity).

Industrial waste water. Water discharged from an industrial process as a result of formation or use in that process.

Industrial water. Water (including its impurities) used directly or indirectly in industrial process.

Inorganic. Designation of compounds that generally don't contain carbon.

Interfacial tension. See *surface tension*.

Ion. An atom or group of atoms that has acquired a net of electric charge by gaining or losing one or more electrons.

Iron phosphate coating. Conversion coating. Chemical deposition on steel and aluminum for corrosion protection.

L

Laminar scale. Rust formation in heavy layers.

M

Media. Aggregate used to effect dispersion in certain types of production equipment, such as ball pebble and sand mills.

Media mill. Any mill using any one of the various types of grinding media such as sand, steel, ball, and pebble.

Mild steel. Structural steel or plate, malleable iron-based alloy. SAE 1020, with a carbon content of up to 2.5 percent.

Mill scale. Oxide layer formed on steel by hot rolling process.

Miscible. Capable of mixing or blending uniformly.

Molten salt. Inorganic chemical or chemicals that are used at temperatures above their melting point for heat transfer, heat treating, or metal cleaning purposes.

Molten salt bath. A specially designed vessel used to contain and heat molten salt processes.

N

NACE. National Association of Corrosion Engineers.

NACE No. 1 white metal blast cleaned surface finish. This finish is a surface with a gray-white uniform metallic color; slightly roughened to form a suitable anchor pattern for coatings; this surface shall be free of all oil, grease, dirt, visible mill scale, rust corrosion products, oxides, paint, or any other foreign matter; the surface shall have color characteristic of the abrasive media used; photographic or other visual standards of surface preparation may be used to further define the surface. Syn: white blast.

NACE No. 2 near-white metal blast cleaned surface finish. This finish is one from which all oil, grease, dirt, visible mill scale, rust corrosion products, oxides, paint, or other foreign matter have been removed from the surface except for very light shadows, very slight streaks, or slight discolorations; at least 95 percent of the surface shall have the appearance of a surface blast cleaned to a white metal surface finish and the remainder shall be limited to the light discoloration mentioned above; photographic or other visual standards of surface preparation may be used to further define the surface.

NACE No. 3 commercial blast cleaned surface finish. This finish is defined as one from which all oil, grease, dirt, rust scale, and foreign material have been completely removed from the surface and all rust, mill scale, and old paint have been completely removed except for slight shadows, streaks, or discolorations; if the surface is pitted, slight residues of rust or paint may be found in the bottom of the pits; at least two thirds of the surface area shall be free of all visible residues and the remainder shall be limited to light discoloration, slight staining, or light residues mentioned previously; photographic or other visual standards of surface preparation may be used to further define the surface.

NACE No. 4 brush-off blast cleaned surface finish. This finish is one from which oil, grease, dirt, rust scale, loose mill scale, loose rust, and loose paint or coatings are removed completely, but light mill scale and tightly adhered rust, paint, and coatings are permitted to remain provided they have been exposed to the abrasive blast pattern sufficiently to expose numerous flecks of the underlying metal fairly uniformly distributed over the entire surface; photographic or other visual standards of surface preparation may be used to further define the surface.

Neutralization. Addition of an acid or alkali (base) to a liquid to cause the pH of the liquid to move toward a neutral pH of 7.0.

P

pH paper. See *indicator paper*.

pH value. Measure of acidity or alkalinity. pH7 is neutral. The pH values of acids are less than 7. The pH values of alkali bases are greater than 7.

PPM. Parts per million.

Paint and varnish remover. Liquid, principally solvents, sometimes with wax or thickeners, which is applied to a coated surface in order to soften the old coating and bring it to such a condition that it can be easily removed. Syn: stripper.

Parkerized. Descriptive of iron or steel, which has received a rust-resisting treatment by being dipped in a boiling solution of manganese dihydrogen phosphate; this protective coating also improves the bonding (adhesion) of paint and lacquers.

Passivation. Conversion of metal surface to less reactive state to reduce corrosion rate of metal surface.

Phosphate. Chemical radical $(PO_4)_3$. In coating operations, zinc, iron, or manganese phosphate is used as a conversion coating to prepare the part for coating application.

Phosphating. Pretreatment of steel or certain other metal surfaces by chemical solutions containing metal phosphates and phosphoric acid as the main ingredients, to form a thin layer which serves as a good base for subsequent paint coats.

Phosphatize. Formation of thin, inert phosphate coating on surface, usually by treatment with phosphoric acid or other phosphate compound.

Pickling. Use of chemical solution to prepare surface for coatings or bonding by dissolving away surface oxides and other impurities.

Power wash. Multistage cleaning and conditioning machine or structure to transport material using some form of conveyor system.

Pretreatment. Chemical cleaning and etching before powder application in order to improve adhesion and corrosion resistance.

Product water. The purified water stream from purification equipment, such as reverse osmosis units and ultrafilters.

Profile. Surface contour; usually used as a blasting term.

Pyrolysis. Decomposition or transformation of compound caused by heating.

R

Reagent. A substance used in chemical reaction to detect, measure, examine, or produce other substances.

Recovered solvent. Solvent which is extracted from a process or exhaust stream usually by absorption or condensation.

Reverse osmosis (RO). Method of removing ions from water to make purer water. Method of removing metal ions from an aqueous solution via semipermeable membranes.

Rust. Corroded iron. Red iron oxide deposited on metal. Also other metal oxides formed by corrosion.

Rust bloom. Discoloration indicating the beginning of rusting.

Rust grade scale. In evaluating the resistance to rusting, the linear, numerical rust grade scale is an exponential function of the area of rust so that slight amounts of first rusting have the greatest effect on lowering the rust grade (ASTM D-610).

Rust resistance. The ability of a coating to protect the substrate of iron or its alloys from rusting.

Rust-inhibitive washes. See *conversion coating*.

Rusting. Corrosion on the surface of iron or ferrous metals resulting in the formation of products consisting largely of hydrous ferric oxide.

Rustproofing. Processes applied to steel, including coating or galvanizing, but most often refers to phosphating and similar low-duty rust preventatives.

S

Salt-spray test. Corrosion test using salt (NaCl) solution sprayed as a mist in a heated humidity chamber to simulate seashore conditions, or to accelerate corrosion at a controlled rate. (ASTM Test B-117).

Sandblast. Blast cleaning using sand as an abrasive.

Sanitary shield or shroud. Shield that protects the conveyor from excessive moisture in the washer.

Saponification. Decomposition of esters to their constituent alcohols and fatty acids, usually accomplished with an alkali.

Scale. Rust occurring in thin layers, commonly found on hot-rolled steel.

Scaler. A hand-cleaning chisel used to remove scale.

Scaling. In reference to reverse osmosis equipment, scaling is the precipitation of sparingly soluble salts, such as calcium carbonate, onto the surface of a membrane. Scaling is associated with decreased flux and reduced reverse osmosis rejection rates.

Scribe creep. Measurement taken from the scribe line in a salt-spray test to measure the quality or corrosion resistance of a coating system.

Seal rinse. A final rinse in a spray washer that passivates the pretreated surface to prevent oxidation and provide corrosion resistance in the field.

Sedimentation. The process by which solids are separated from water by gravity and deposited on the bottom of a container or basin.

Semipermeable. Descriptive of a material, such as a reverse osmosis or ultrafiltration membrane, which allows the passage of some molecules and prevents the passage of others.

Shot blasting. Blast cleaning using steel shot as the abrasive.

Shot peening. See *shot blasting*.

Soap. Salt of fatty acid; used to designate all detergents.

Soils. Foreign matter on a part's substrate before being cleaned in a pretreatment system. Can be organic or inorganic.

Solubilizer. Chemical used to hold materials in suspension in a solution.

Solution. Mixture formed when one material (solid or liquid) is dissolved into a liquid.

Solvent. Liquid or blend of liquids used to dissolve or disperse a paint. A true solvent is a single liquid that can dissolve paint.

Solvent washing. Cleaning with solvent.

Spray chamber. An enclosure that surrounds the pretreatment process and contains overspray.

Steam clean. Cleaning with live steam.

Stripper. Device or chemical used to remove a coating from a substrate by means of pyrolysis, chemical attack-dissolution, mechanical abrasion, or a combination, such as high heat burn-off, molten salt, grit blast, and alkaline strippers.

Suction feed. Siphons abrasive to the nozzle of a sandblaster.

Surface active agent. See *surfactant*.

Surface preparation. Operations necessary to prepare the surface to receive a coating.

Surface tension. Cohesive surface on a liquid surface. Force attracting molecules at the surface to the bulk of the material or energy difference between two phases (interfacial tension).

Surfactant. Chemical used to adjust surface tension of a material. Term contracted from surface active agent.

Suspension. Mixture of fine particles of any solid with liquid or gas.

Sweep blast. See *NACE No. 4 brush-off blast cleaned surface finish*.

T

Titrateable Alkalinity. When certain anions, such as carbonate (CO₃), are dissolved in water, they bind hydrogen ions (H⁺) and thus shift the water equilibrium to produce free hydroxyl ions (OH⁻). This excess concentration of OH⁻ is termed alkalinity. Titrateable alkalinity can be measured by determining the amount of H⁺ (in mEq or mmol) which must be added to water to restore the pH to 7.0, the condition of neutrality where [H⁺] = [OH⁻].

Titrate. To titrate a sample, a chemical solution of known strength is added drop by drop until a certain color change, precipitate, or pH change in the sample is observed (end point). Titration is the process of adding the chemical reagent in increments until completion of the reaction, as signaled by the end point.

Total dissolved solids (TDS). A measurement of the solids content of water in the parts per million (ppm).

Tooth. Profile. Mechanical anchorage. Surface roughness.

U

Ultrafilter. A membrane based filtration system in which the pore sizes range from 0.001 to 0.1 micron.

V

Vapor degreasing. The use of a condensing solvent vapor to dissolve and rinse away oil and grease before assembly or coating.

Vestibule. Small entrance hall to the pretreatment washer.

W

Washer crystal. Particles caused by crystallization of minerals, additives, cleaners, or chemicals found in the water of power washers.

Washer drain zone. The space in between spray zone within the washer tunnel.

Washer process zone. The spray treatment zones within the washer tunnel.

Washer vestibule. The portion of the washer tunnel at the entrance and exit.

Washing. The combination of mechanical and chemical means to remove soil.

Water blasting. Blast cleaning of metal using high-velocity water.

Water break. The appearance of a discontinuous film of water on a surface, signifying nonuniform wetting and usually associated with a surface contamination.

Water-break-free. The ability of the rinse water to cover the surface in an unbroken film.

Water hardness. Presence of heavy metals, commonly calcium (Ca) or magnesium (Mg), in solution.

Water softness. Absence of high concentration of Ca or Mg. Water is considered soft when concentration is below 100 parts per million (ppm) (as CaCO₃).

Water spotting. Visual blemish that occurs on the surface in areas where water droplets have dried and left dissolved solids. Whitish blemishes on a pretreated part where minerals in the water have left a deposit on the surface.

Wetting. Ability of a liquid to spread over a surface.

Wetting agent. See *Surfactant*.

White blast. Blast cleaning to white metal surface. See *NACE No. 1*.

White metal. Blasting metal to a specified appearance, such as SSPC-SP-10, and NACE No.1.

White rust. White corrosion products (zinc hydroxide and zinc oxide) on zinc-coated articles. Syn: white storage stain.

Z

Zinc phosphate coating. Conversion coating used on steel and galvanized steel parts to improve coating adhesion and corrosion resistance.

Definitions come from the following sources:

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