COMMON FILTRATION AND SEPARATION INDUSTRY TERMS

A

Abrasion, Flex: Fabric wear in a creased area caused by excessive bending, usually associated with cage contact used in baghouse filtration.

Abrasion Resistance: Ability of a fiber or fabric to withstand surface wear.

Absolute: Used to describe or define a degree of filtration of a particular media. It assesses the diameter of the largest hard spherical particle that will pass through a media. Absolute ratings are reported as efficiencies or Beta ratings. For instance, a 2-micron filter with a 99.98% efficiency is a Beta Rating 5000. This would mean that the filter will stop 99.98% of particles of 2 micron or larger. See Nominal and Beta Ratings.

Absolute Pressure: The pressure above an absolute vacuum. One atmosphere (14.7 psi) greater than gauge pressure. Symbolized as psia when the pressure is in psi units.

Absorption: The taking in, incorporation, or reception of gases, liquids, light, or heat. Penetration of one substance into the inner structure of another, filling the void of the matrix.

Activated Carbon: Any form of carbon characterized by high adsorptive capacity for gases, vapors, or colloidal solids. The carbon or charcoal is produced by destructive distillation of wood, peat, lignite, nut shells, bones, vegetable, or other carbonaceous matter, but must be activated by high temperature steam or carbon dioxide, which creates a porous particle structure.

Activated Sludge: Biologically active floc from aeration and settling sewage and/or organic matter.

Adsorption: The adhesion of a substance to the surface of a solid or liquid. Adsorption is often used to extract pollutants by causing them to be attached to such adsorbents as activated carbon or silica gel.

Aerobic Bacteria: Organisms requiring oxygen to live.

Aerosol: A dispersion of small liquid or solid particles suspended in air, gas, or vapor.

Affluent: An older term used to describe fluid entering the filter or filter system. More commonly referred to as influent. The opposite of effluent.

Agglomeration Particle: Multiple particles joining or clustering together by surface tension to form larger particles, usually held by moisture, static charge, or particle architecture.

Air Flow: Measure of the amount of air that flows through a filter, a variable of the degree of contamination, differential pressure, total porosity, and filter area. Commonly expressed in either cubic feet/minute/square foot or liters/minute/square centimeter at a given pressure.

Air Standard: Dry air at 70°F and 29.92" mercury pressure.

Air-to-Cloth (A/C) Ratio: The ratio of gas volume (ACFM) to effective cloth area (sq. ft.) in SI units A/C = m^3/m^2.

Alkalinity: The capacity of water to neutralize acids, a property imparted by the water's content of carbonates, bicarbonates, hydroxides, and occasionally borates, silicates, and phosphates. It is expressed in milligrams per liter of equivalent calcium carbonate.

Ambient: Refers to common environmental conditions in which process occurs.

Amine: A class of organic compounds of nitrogen that can be derived from ammonia. May be a gas, liquid, or solid. All amines are basic in nature and will usually combine readily with hydrochloric or other strong acids to form salts. Commonly used in gas processing to remove H_2S and CO_2.

Anaerobic: Organism capable of growing without the presence of oxygen.

Angstrom: A unit of length 10^{-10} meter (0.1 nanometer) used to express wave lengths. Used in measurements of RO filtration in the ionic range.

Annular Velocity: The speed of a fluid moving in the annual space of a column. Calculated by dividing the actual flow rate by the annulus (or column) area. Modeled as a linear function with vertical distance. The annular velocity is zero at the bottom of the cartridge and increases to a maximum value at the top of the cartridge.

Anti-Foam: A defoamer or an anti-foaming agent is a chemical additive that reduces and hinders the formation of foam in industrial process liquids. The terms anti-foam agent and defoamer are often used interchangeably (e.g., oil based, powder, water based, silicone based).

Antistatic: A condition inherent in or applied to a material, usually fabric or plastic, that results in a significant reduction in or the absence of electrical charges (an electrical resistivity of ~10^{-10} ohm/square or higher).

API: American Petroleum Institute

Aqueous: Similar to or resembling water. Referring to solution made in water.

Arizona Road Dust: Standardized test dusts for both liquid and air classified from natural Arizona dust generally referred to as A.C. Fine and A.C. Course Dust. Both dust materials also carry an ISO designation and have a standardized size distribution of particles.

ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers

ASME: American Society of Mechanical Engineers. Publishes code, which governs the design of pressure housings.

Assay: Analytical procedure to determine purity or concentration of a specific substance in a mixture.

Asymmetric Membrane: A membrane in which the pore size and structure are not the same from one side of the membrane to the other. These membranes are usually considered directional because of difference in flow characteristics depending on which side of the membrane faces the feed stream.

Augmentation: In fabric air filtration, the imposition of an electrical field to the collecting surface and/or subjecting the incoming particulate matter to a charging process.

Autoclave: A chamber for sterilizing with saturated steam filters or equipment by using constant high temperature and pressure.

B

Backpressure: A backward surge of pressure from downstream to upstream of the filter. Can be the result of closing a valve or air entrapped in a liquid system.

Backwash: Reversal of a fluid flow through the filtration media to remove solids from the filter. To clean or regenerate a filter.

Bacteria: Free living, simple celled, microscopic organisms having a cell wall but lacking organelles or a defined nucleus; can be round, rod-like, spiral, or filamentous.

Bacterial Challenge: Testing the bacterial retention of a filter.

Baffle: Component of a housing that removes liquid and solids by impingement; may be either upstream or downstream of the basic filter medium. May also be a plate to protect filter elements from the velocity of flow into a housing.

Bag Life: Time a bag filter performs effectively.

Baghouse: An air filtration structure utilizing fabric filter bags for the purpose of removing solid particulate from the gas stream.

Bar: Unit of pressure. 1 bar = 14.5 psi.

Barren Liquor: Liquor for cake washing, which contains little to no valuable liquor, such as barren cyanide solution in gold cake slimes washing.

Basket: Element of a basket strainer. Normally uses a screen as a medium for removal of course bulk solids.

Belt Filter Press: Akin to a rotary drum and belt filter is an automatic pressure filter, where sludge is compressed on an endless rotating belt, dewatering, and providing for very dry cake for discharge.

Beta Ratings: Beta (β) ratings are assigned to absolute rated filters to express filtration efficiency. Beta ratings are not applied to nominal elements. The beta rating is the number of particles in the upstream (before filtration) divided by the number of particles downstream (after filtration) at a given micron rating. The efficiency of the filter can also be reported as a percentage using the formula [(β-1)/β]*100. For instance, if a process stream has 1,000,000 upstream particles but only permits 200 particles of a particular size downstream, the beta rating is 5000. To arrive at the percentage, it would then be [(5000-1)/5000)*100=99.98%. See Absolute and Nominal.

Biaxially Stretched Membrane: A microporous membrane from either polypropylene or PTFE that has been stretched in a manner to form pores of a controlled size and possessing a narrow pore size distribution.

Bioburden: The load or level of microorganisms in a substance to be filtered.

Biohazard: Biological refuse, possibly pathogenic in nature.

Biosafety: Biological safety or non-toxicity of a substance to a living organism. For filters used in healthcare applications.

Bipolar: Have two (opposing) poles, (+) and (-) as applied to ionic charges or particles.

Blinding: When particles are trapped by the media and fill the pores. Blinding of the pores reduces the amount of flow through the element, reduces its capacity to retain contaminants, and increases differential pressure across the element. Also referred to as blocking or plugging.

Blowdown: The use of pressure to remove liquids and/or solids from a vessel.

Breakthrough: Used to describe the passing of solids through the cake buildup of a filter medium. Also called breakpoint.

Bridging: Where particles form an arch over an individual pore in the media. Particles smaller than the pore openings can form stable bridges over a pore, thereby increasing filtration efficiency.

British Thermal Unit (BTU): A standard measure of heat content in a substance that can be burned to provide energy.

Brownian Motion: The continuous zigzag, random motion of suspended minuscule particles. The motion is caused by impact of the molecules in the fluid upon the particles.

Bubble Point Pressure: A test to determine the maximum pore size openings of a filter. The differential gas pressure in which a wetting liquid (e.g., water) is pushed out of the largest pores, and a steady stream of gas bubbles is emitted from a wetted filter under specific test conditions. A filter integrity test with specified, validated pressure values for specific pore size and type filters.

Buna-N: Gasket material. A synthetic rubber frequently used for housing closures, flanges, and filter elements. Also known as Nitrile.

Burst Pressure: The pressure causing rupture. The insideout differential pressure that causes outward pressure on the structure of a filter medium, filter, or housing. See Collapse Pressure.

Bypass: Condition resulting from the product flowing through a housing without flowing through the medium. Also, a filtering system that filters only part of the stream on a continuous basis. Opposite of full flow.

C

Cake (Filter): Solids deposited on the filter media. In many cases the cake may serve as its own filter medium.

Cake Release: Ability of a medium to allow clean separation of the cake from the medium.

Calendering: A manufacturing process where woven and/or nonwoven fabrics are pressed between heavy rollers compressing the fibers. The process reduces the filter medium void volume, pore size rating, flow rate, and dirt-hold capacity of the medium.

Candle Filter: A reusable filter consisting of a tube made from ceramics or metal. Flow is from the outside-in, with particulate accumulating on the outside of the candle. The candle can be cleaned by various means, including back-pulsing, heat, and chemicals, among others.

Capacity: Volume of product which a housing will accommodate expressed in gallons or similar units. Also, amount that a filter or filtration system can filter at a given efficiency and flow rate, expressed in gallons per minute or similar units.

Capsules: Disposable devices that have an integrated filter and housing, including inlet and outlet.

Cartridge: Filter devise and medium used in a housing to perform the function of coalescing, filtration, or separating. Also referred to as an element.

Catalyst: A substance that accelerates a chemical reaction without itself taking part in the reaction. For example, alkylation will not take place unless some substance, such as sulfuric acid, is present. The sulfuric acid would be the catalyst in this instance.

Cathode: Negative pole or electrode of an electrolytic system.

Caustic: A class or name given to a class or group of chemicals, usually soda or sodium hydroxide.

CD: Refers to the "cross-machine" manufacturing direction of filtration roll stock.

Cellulose: (1) Fibers used to manufacture wetlaid paper (2) Used as a filter media in highly refined alpha cellulose form or as the slightly more unbleached form. Cellulose, when impregnated with other properties, produces an excellent hydrophobic membrane that is non-water wetting. Cellulose provides for a variety of filtration efficiencies, low initial pressure drop, high wet strength, and solids retention.

Center Core or Tube: Material formed into a cylinder shape for structural purposes to permit a cartridge to retain its original physical form.

Center Pipe or Rod: Component of a housing that is used as a mount for cartridges, typically through the center core.

Centrifugation: Separating two substances of different densities by high-speed spinning to create centrifugal force. Generally used to separate suspended particles from liquid.

Charge Polarity: A particle, fiber, or other material carrying an electrostatic charge.

Chromatography: Separation of substances in a mixture based on their affinity for certain solvents and solid surfaces.

Clarification: Clearing a liquid by filtration by the addition of agents to precipitate solids or by other means.

Clarifier: A processing unit using flocculation processes to separate solids from liquid, often in a non-turbulent zone where heavy solids settle out of solution. Often used for wastewater.

Clarity: Amount of contaminant left in a filtered liquid.

Class 100 Environment: A room environment maintained by air conditioning and filtration so that fewer than 100 particles of size 1 µm or larger are found in a cubic foot of air.

Classification: Condition in which larger particles settle out below the finer ones. Also referred to as stratification. May also be referred to as the action to sort out particles by various groups or to other established criteria.

Clean Pressure Drop: Differential pressure across a housing or element at the time of startup. See Differential Pressure.

Cleanability: The ability of a filter element to withstand repeated cleanings while maintaining adequate dirt holding capacity.

Coagulation: In water and wastewater treatment, the destabilization and initial aggregation of colloidal and finely divided suspended matter by the addition of a floc-forming chemical or by biological processes.

Coalescer: Mechanical device that unites discrete droplets of one phase prior to being separated from a second phase. Can only be accomplished when both phases are immiscible.

Coalescing: Action of uniting small droplets of one fluid (liquid or gas) to separate it from another fluid (liquid or gas).

Coating: Immersion of filter media in a solution to provide the fibers with a coating that will lubricate and thereby reduce self-abrasion.

Cold Sterilization: Removal of all bacteria by filtration through a sterilizing grade 0.2µm absolute filter.

Collapse Pressure: The outside-in differential pressure that causes the structure of a filter medium failure of a filter element. See Burst Pressure.

Collection Efficiency: Percentage of contaminant collected.

Colloid: Very small, insoluble, non-diffusible solid or liquid gelatinous particles that remain suspended in a surrounding liquid. Solids usually on the order of 0.2 µm or less.

Compatibility: Relation to the non-reactivity of filter materials with a substance to be filtered.

Compressibility: Degree of physical change in filter cake particles when subjected to normal pressures.

Compression Band: Stainless steel band sewn into the end of a bag to provide a surface to clamp against in the baghouse.

Concentrator: Removes some of the water from a sample to concentrate substances dissolved or suspended in it; usually used to concentrate solutions of biological macromolecules (e.g., proteins and nucleic acids).

Contaminant: Unwanted foreign matter in a fluid or gas that is accumulated from various sources such as systems dirt, residue from moving parts, and atmospheric solids.

Continuous Phase: Basic product flowing through a filter or filter separator that continues through a system after being subjected to solids and/or other liquid separation.

Core: Material used for the center of an element to provide structural support. May also be called a center tube when used in a coalescer, separator, or other type of filter element.

Core Yarn: Used in filtration with fiberglass or synthetic yarn. Spun or texturized yarns are twisted around a filament (core) yarn, adding yarn strength and stability.

Critical Operating Pressure: Pressure above which filtration or separation equipment may produce reduced efficiency or fail to function properly.

Crossflow (Tangential Flow) Filtration: A filtration system in which the feed stream flows across the filter media and exits as a retentate stream. The retentate stream is recycled to merge into the feed stream, while a portion of it passes through the filter media, resulting in concentration of the feed stream.

Cubic-Feet-Per-Minute (CFM): Measure of velocity.

Cyclone: A conical-shaped vessel for separating mixed sized particulates from a fluid stream. The vessel has a tangential entry at the largest diameter, allowing the larger particles to drop out and be removed from the bottom of the cone, while smaller particulate exits overhead with the majority of the fluid stream.

D

Dalton: Measure of molecular mass.

Dead End Filtration: Feed stream flows in one direction only, perpendicular to and through the filter medium to emerge as product or filtrate.

Dehydration: Removal of water or hydrocarbon in vapor from an air or gas; also, water from another immiscible liquid. Differs from entrainment removal in that the dew point of a gas stream will be lowered by vapor removal. A form of purification.

Deionized (DI) Water: Process to remove (+) and (-) ions from water by passing it through a mixed resin bed.

Denier: A unit of measure for the linear mass density of fibers; the mass in grams of 9,000 meters of the fiber.

Density: Mass/unit volume, usually expressed in g/cc, lb./cu.ft. or lb./gal.

Depth Filtration: A process that entraps contaminants both within the matrix and on the surface of the filter media.

Desalination: Production of fresh (potable) water from sea water, salt, or brackish water by one of several processes, including distillation, flash distillation, electrodialysis, or reverse osmosis.

Desiccant: Drying agent or filter medium used in dehydration process of air, gas, or liquids (e.g., silica gel, activated alumina, and molecular sieve).

Dew Point: The temperature at which a gas is saturated with respect to a condensable component.

Dewatering: A physical process that removes sufficient water from sludge so that its physical form is changed from a fluid to that of a slurry or damp solid.

Dialysis: The diffusion of solute molecules through a semi-permeable membrane.

Diatomaceous Earth (D.E.): Soft, earthy rock composed of the siliceous skeletons of small aquatic plants called diatoms. Frequently used as a fiber aid to coat a filter medium. Capable of absorbing 1.5 to 4 times its own weight in water. Insoluble in acids except hydrofluoric, and soluble in strong alkalies.

Diatomite: Skeletal remains of tiny aquatic plants that lived in the ocean and inland seas millions of years ago.

Differential Pressure (ΔP): Difference in pressure between two given points of a filter. For instance, differential pressure (ΔP) is the pressure difference between the filter inlet and the filter outlet. Exceeding the maximum permissible pressure differential can compromise the integrity of the filter element.

Diffusional Interception: In a process stream, submicron particles are subject to Brownian motion, enabling them to move out of the process stream and become intercepted by the filter.

Digested Sludge: Sludge or thickened mixture of water with sewage solids in which the organic matter has been decomposed by anaerobic bacteria.

Dioctyl Phthalate (DOP): A plasticizer that can be aerosolized to particles of extremely uniform size. Retention of DOP aerosol is used as standard procedure for pore size rating of air filters. Typically, 99.97% DOP retention indicates HEPA efficiency.

Direct Interception: the particle is separated from the process stream due to its size, which is bigger than the pores of the filter membrane.

Dirt Holding Capacity (DHC): Amount of contaminant an element can hold before reaching the maximum allowable pressure drop. Volume will vary depending on the size and design of the element and the density of the solid particles. Usually reported by weight such as grams or pounds per element. Also called solids retention or solids holding capacity.

Discontinuous Phase: Separated phase or product from the continuous phase. For example, water may be the discontinuous phase when separated from a hydrocarbon, air, or gas. See Coalescer, Coalescing, and Continuous Phase.

Dispersion: Operation that results in solid or liquid particles entering into suspension in a fluid. Also applies to a two-phase system in which one phase is distributed throughout the other.

Disposable Filters: Those filters not cleaned or reused. Referred to as single-use or consumable elements.

Dissolved Solids: Any solid material that will dissolve in a liquid (e.g., sugar in water).

Distillation: Process of vaporizing a liquid and collecting the vapor, which is then usually condensed into a liquid.

Downstream: Portion of the product stream that has already passed through the filtration system. See Effluent.

Droplet: Minute drop that mates to form larger drops capable of falling by gravity. See Coalescer and Coalescing.

Drug Master File (DMF): A written document that explains the formulation of an active ingredient, referenced in an Investigational New Drug (IND), New Drug Application (NDA), or Amendment to New Drug Application (ANDA) from a company.

Dry Heat Sterilization: Sterilization at or above 356°F using a convection or forced air oven without moisture; may concurrently de-pyrogenate if adequate time and elevated temperature are employed.

Dry Scrubber: A chemical reaction chamber that neutralizes acids in a gas stream. Two system types include a spray dryer system that injects a slurry and a dry sorbent injection system that uses a dry powder.

Duplex Filter: Assembly of two filters with a valve for selection of either or both filters.

Durometer (Shore): Measurement of the resiliency of gasket material. The higher the score the firmer the gasket.

Dust Collection: A term usually associated with an assembly of large pleated elements that collect airborne particles where large volumes of air flow are found such as granaries, cement factories, abrasive production, and other manufacturing facilities.

Dyne: The amount of force that causes a mass of one gram to alter its speed by one centimeter per second for each second during which the force acts.

E

Effective Surface Area: The portion of filter that fluid flows through during the filtration process.

Efficiency: Degree to which filter element will perform in removing solids and/or liquids. See Beta Rating and Absolute.

Effluent: The fluid that has passed through a filter (filtrate or product stream); outflow from other treatment such as wastewater treatment plants. See Downstream.

Electrets: A dielectric body in which a state of electric polarization is established. An imposed electric field on heated polyolefin following the drawing stage to form a charged fiber or yarn with electrostatic like properties. These properties may decay by contamination with solvents and materials.

Electrochemical: A process by which electricity is used to affect a chemical reaction. The inter-conversion of chemical and electrical energy.

Electrodialysis: Dialysis (small molecules separated from larger molecules in the same solution/mixture) accelerated by an electromotive force applies to electrodes adjacent to the separating membranes.

Electrolyte: Substances that will conduct an electrical current, either in molten state or in a solution such as NaCl in water.

Electrophoresis: The separation of charged molecules (such as proteins) based on their mobility in an electrical field.

Electrostatic Deposition: The ability of a filter media to affect particle removal efficiency and/or particle retention by inducing a desired charge (usually positive) on the fiber to promote particle adherence of the usually negatively charged particles.

Electrostatic Forces: The forces between particles that are caused by electric charges. These non-contact forces can pull or push objects without coming into physical contact.

Electrostatic Precipitator: A type of particulate filtration control that attracts charged particles to oppositely charged surfaces to collect airborne particulates. The particles are charged by ionizing the air with an electric field. Charged particles are then collected by a strong electric field generated between oppositely charged electrodes.

Electrostatics: Electrical charges on particles and/or fibers in a filter medium to create attractive and/or repulsive forces between particles and the fiber/medium. As a direct result, for many types of particles, strong attractive forces produce the intimacy needed to agglomerate the fines.

Element: Used in a housing to perform the function of coalescing, filtering, or separating. Can refer to cartridge filter, bag filter, or coalescing element.

Emulsion: Dispersion of fine liquid particles in a liquid stream that do not necessarily dissolve in each other but are held in suspension. Many emulsions may be broken by coalescing if the liquids are immiscible. Emulsion stabilizers modify the surface tension of the droplets, which makes coalescing difficult, if not impossible.

Encapsulate: Process by which a material is coated or covered with a plastic film or sheath.

End Cap: The end of most filter cartridges. In particular, the shallow annular dish into which the ends of a pleated filter cylinder are bonded to a cap of a different substance than the media. This provides structural support and allows for a better seal within the housing, as well as aiding in changeouts.

End Point: Final objective or, in petroleum distillation, temperature at which the distillation ceases.

Endotoxin: A toxic substance produced by bacteria but which is released into the surrounding medium only upon the death or disintegration of the bacteria.

Entrained Water: Discrete water droplets carried by a continuous liquid or gas phase. May be separated from the continuous phase by coalescing and gravity separation. Usually picked up in a system by condensation or a water washing used in process.

Environment Protection Agency (EPA): Regulates environmental monitoring and establishes and enforces guidelines.

Escherichia Coli (E. Coli): The most prevalent bacteria in the gastrointestinal tract of humans and animals. E. Coli occurs in solids and water due to fecal contamination.

Ethylene-Propylene-Diene-Monomer-Rubber (EPDM): Used as a material for O-rings because of its chemical resistance. See Buna-N and Viton.

ETO Sterilization: Chemical sterilization using ethylene oxide at an elevated temperature of 1500°F and high relative humidity to facilitate permeation of the ethylene oxide into the material being sterilized.

Extractables: Chemicals leached from a filter during a filtration process. Usually tested for by soaking in water under controlled conditions. May be removed by pre-flushing with suitable liquid.

F

Face Velocity: The velocity of the gas across the filter's effective surface area.

Feed: Materials to be filtered. Also referred to as influent.

Fermentation: Enzymatically controlled breakdown of an energy-rich compound, such as a sugar, to produce ethyl alcohol, carbon dioxide, and energy, by the action of yeasts that carry the necessary enzymes. Bacterial fermentations also occur.

Fiber: Any particle with length greater than, or equal to, 0.5 micron and at least five times greater than its diameter, leaving substantially parallel sides.

Fiber Metal Felt: A nonwoven media consisting of extremely fine metal fibers (2-20 micron in diameter), which are compressed and sintered.

Fiber Migration: Carry-over of fibers from the media used in coalescer, separator, or filter cartridges into the effluent.

Fill: Yarns that run in the filling or cross-machine direction of a woven fabric.

Filter (noun): A specialized piece of equipment for carrying out filtration, consisting of a filter medium and suitable holder for constraining and supporting the filter in the fluid path.

Filter (verb): Passing a fluid containing particles through a filter medium wherein particles are removed from the process.

Filter Aid: Small-size particle substance of low specific gravity that remains in suspension when mixed with a liquid to be filtered. Increases filtration efficiency of a feed when deposited on a septum by forming a porous cake.

Filter Area: The surface area on the inlet flow side of the media used in a filter. The larger the filter area, the lower the flow resistance of the filter element. Simultaneously, the dirt-hold capacity (DHC) increases. The following applies in general: The larger the filter area, the longer the service life of the element. The filter area can be increased by the number of pleats added to the media in the construction of the element. See Surface Area.

Filter Cake: The accumulation of particulate on a surface. Can also mean a pre-coat for filtering.

Filter Efficiency: The percentage retention of particles of a specific size by a filter.

Filter Element: The filter element is in the filter housing and performs the actual filtering task. See Filter.

Filter Housing: Depending on the application, the filter housing is built into the pressure or return line and must be designed for the specific operating or system pressure and the flow rate. The filter element is in the filter housing. Depending on the application, the filter housing may be equipped with a bypass valve, a reversing valve, a clogging indicator, and other options.

Filter Life: Measure of a filter's useful service life based on the amount of standard contaminant required to cause differential pressure to increase to a preset terminal differential pressure recommended by the manufacturer or the downstream measure of unacceptable particulate..

Filter Material: The choice of the right filter material is dependent on different criteria. Among others, this includes the type of application, the filter function, the degree of contamination, or alternatively, the required dirt holding capacity (DHC), as well as requirements of chemical or physical resistance.

Filter Media Migration: Problem caused by a filter medium constructed of a non-continuous or fibrous matrix. Portions of the filter change structure causing fibers to migrate downstream.

Filter Medium: Permeable material that removes particles from fluid being filtered.

Filter Paper: A permeable web of randomly oriented fibers, generally cellulose or glass fiber formed from water draining from a suspension fed in a papermaking process.

Filter Press: Mechanical process in which wet solids are compressed between two or multiple surfaces in the same equipment, forcing water out of the solids, simultaneously compacting and drying the cake.

Filtrate: The end product of the filtration process. The liquid exiting the filtrate outlet.

Filtration: Process of removing solid particles from liquid or gas by forcing them through a porous medium.

Filtration Rate: The volume of liquid that passes through a given area of filter media in a specific time.

Fines: Portion of a powder like material composed of particles smaller than the size specified.

Fixed Random Pore: Consists of layers of medium, or a single layer of medium, having depth.

Flocculation: Growing together of minute particles to form larger ones, which are called flocs and are easier to filter due to their increased size. Also referred to as coagulation.

Flow Decay: Decrease in flow rate caused by filter plugging or clogging.

Flow Decay Test: Determines flow rate and throughput of a filter type or combination of filters on a specific liquid, usually by using small area filters, to determine the sizing of a filter system.

Flow Fatigue Resistance: The ability of a filter element to resist structural failure of the filter medium due to flexing caused by cyclic differential pressure.

Flow Rate: The speed at which a liquid flows, measured in gallons or liters per minute. Flow rate of a liquid can be affected by the liquid's viscosity, differential pressure, temperature, and type of filter used.

Flow Resistance: Resistance offered by a filter medium to fluid flow.

Flue Gas Desulfurization: The operation of removing sulfur oxides from exhaust gas streams of a boiler or industrial process. Usually a wet scrubber operation.

Fluid: Includes liquids, air, or gas as a general term.

Flux Rate: The rate of flow per unit area. For example, gallons per minute per square foot of media is a measurement of flux rate.

Fly Ash: The airborne combustion residue from burning coal or other fuels.

Foaming: Mechanical incorporation of a gas into a liquid where the liquid surrounds a volume of gas, creating a bubble.

Forward Flow Test: An integrity test measuring air diffusion at a low pressure (approximately 5 psi). Similar to a pressure hold test.

Fractionation Tower: Tower wherein rising vapors meet descending liquid. The lower boiling liquids tend to pass on to the condenser, and the higher boiling phases remain as liquids.

Frazier Permeometer: Porosity testing device. The normal measurement is air flow in CFM passed through one square foot of fabric at 0.5-inch differential water pressure.

Fullers Earth: Medium used in some elements, usually a blend of attapulgus and montmorillonite clay. A finely divided hydrous aluminum silicate. Often a filter aid.

G

Gallons Per Minute (GPM): A unit of volumetric flow rate measured in gallons.

Gas Scrubber: Housing designed to knock out liquid and solid contaminants by impingement on a series of baffles or demister pads. Accomplished by drastic reduction of velocity as the gas enters the scrubber. Entrainment separation would expand the general use of the term to include mechanical cartridge type separators.

Gasket: Material inserted between contact surfaces to ensure a fluid-tight seal. Although invariably softer than surfaces with which it is in contact, it should not form a permanent bond. Construction material is dependent on the temperature, pressure, and chemical nature of the fluid and contaminants. See Viton, Buna-N, and EPDM.

Gelatinous: Used to describe suspended solids that are slimy and deformable, causing rapid filter plugging.

Glass Fiber: Proper reference to a fibrous material made from glass that is commonly used as a filter or separator medium. May be used in blanket or tube form and, due to the random dispersal of the fibers, makes a good filter medium. Glass fiber is hydrophilic (water wettable) and performs the function of coalescing immiscible liquids for separation. May be used effectively on compressed air, gas, or liquids, which are acidic but only slightly caustic. Also referred to as fiberglass.

Glycol: General term for a family of alcohols; clear, colorless, and soluble to varying degrees in water, alcohol, ether, and benzene. Has a wide range of uses and is commonly found in products such as coolants and antifreeze.

Good Manufacturing Practices (GMP): Food and Drug Administration regulations governing the manufacture of drugs. Sometimes referred to as CGMPs.

Gradient Density: A stratified cross section. Used to describe a filter medium where larger pores are at the upstream side of the medium with finer pores downstream. The configuration increases dirt-holding capacity and improved filter life. The medium may be inverted when a surface filter effect is desired, resulting in lower differential pressure across the medium than if the medium has a single density throughout.

Gravimetric Analysis: The process of weighing an element or a definite compound of the element in as pure form as possible.

Gravity Filter: Filter in which the driving force for filtration is provided solely by the head of liquor above the filter medium.

Gravity Separation: Separation of immiscible phases resulting from a difference in specific gravity by coalescing.

Gurley Test: Time required to expel 100 CCs of air through a filter medium placed within an apparatus that can be fitted with a selection of sizes and weights. Historically used for paper products and more recently for microporous membranes. (ASTM: D-726).

H

Health Industry Manufacturer's Association (HIMA): Defines and sets standards governing the validation of filters for sterilizing liquids. A trade association, whose membership includes pharmaceutical manufacturers and filter manufacturers.

Heating, Ventilation, and Air Conditioning (HVAC) Filters: Air filters used in heating and air conditioning applications.

Heavy Metal: Metallic elements having a high density (> 5g/cm^3), and toxic for the most part (e.g., chromium, lead, and mercury).

High-Efficiency Particulate Air (HEPA) Filter: An air filter or medium that captures 99.97% when challenged with DOP 0.3-micron particles under certain laboratory-controlled conditions.

Holding Capacity: See Dirt Holding Capacity.

Housing: A metal or plastic tank or tube with an inlet and outlet containing a specific number of filters, allowing for the flow of a fluid and contaminant through the filter.

Hydrocarbon: Any compound composed of hydrogen and carbon. As a compound increases in molecular weight and boiling point, it may be gas, liquid, or solid.

Hydrophilic: Water accepting or water wetting. Having an affinity for water. Capable of uniting with, or dissolving in, water. Effective coalescing requires medium to have hydrophilic characteristics ,causing free or entrained water to form into droplets which, when mated with other droplets, form into drops which separate by gravity. Opposite of hydrophobic.

Hydrophobic: A membrane or other material which repels and cannot be wetted by aqueous and other high surface tension fluids. When pre-wetted with low surface tension fluid, such as alcohol, the filter will then wet with water.

Hydrometer: An instrument used to measure the density of a liquid.

I

Immiscible: Incapable of being mixed; insoluble.

Impermeable: Material that does not permit fluids to pass through.

Impingement: Process of removing liquid or solid contaminant from a stream of compressed air or gas by causing the flow to impinge on a baffle plate at high velocity.

Impregnated Resin: A kind of sticky, organic substance used for porosity sealing in filtration. It is used to upgrade the surface treatment.

Inert: Chemical inactivity; unable to move; totally un-reactive.

Inertial Impaction: The particle, due to its inertia and usually in stream-line flow, deviates out of the process stream, striking a fiber or other material of a filter medium.

Influent: Fluid entering the filter.

Initial Pressure Drop: Loss in differential pressure between two points upon the start of flow through a housing using new elements.

Inlet Pressure: Pressure entering the inlet side of the filter. Also called upstream pressure or line pressure.

Inorganic Matter: Chemical substances of mineral origin, not containing carbon to carbon bonding. Generally structured through ionic bonding.

Inside Diameter (ID): The diameter of the inside of a filter.

In-Situ: Sterilization or integrity testing of a filter in the system rather than as an ancillary operation such as in autoclave or bubble point stand.

Insoluble: Incapable of being dissolved in a fluid; opposite of soluble.

Integrity Test: Used to predict the functional performance of a filter. The valid use of this test requires that it be correlated to standardized bacterial or particle retention test. Examples: Bubble Point Test, Diffusion Test, Forward Flow Test, Pressure Hold Test.

Interfacial Tension: Measure of miscibility or solubility of the continuous and discontinuous phases. Increases as miscibility or solubility decreases.

Interstices: Spaces or openings in a filtration medium. Also referred to as pores or voids.

Interstitial: Pertaining to the openings in a filtration medium.

In-Vitro: In isolation from living organisms in an experimental artificial environment (e.g., cells in tissue culture; experiments carried out in test tubes).

In-Vivo: Within the living organism.

Ion(s): An atom or group of atoms that carries a positive or negative electrical charge as a result of having lost or gained one or more of the electrons.

Ion Exchange Columns: Vessels filled with ion exchange resin (anion, cation, or mixed) for producing conditioned or DI Water. Also, type of column used for Ion Exchange Chromatography.

Isotropic (Symmetric) Membrane: Membrane in which the pore openings are the same diameter throughout the thickness and on both sides of the membrane. Non-directional, their flow characteristics are independent of which side faces the feed stream.

K

K (k): The symbol for kilo (1,000).

Kilogram: (kg = 1,000g)

Kilometer: (km = 1,000m)

Knife Edge Seal: Narrow, pointed ridge on the sealing surface of an end cap, center seal, or cartridges adaptor that provides a seal by biting into the cartridge gasket.

L

L-Type Filter: Cartridge filter in which the inlet and outlet port axis are at right angles and the element's axis is parallel to either port axis.

Laminar Flow: Term synonymous with streamline flow and viscous flow. A flow regime in which the flow characteristics are governed mainly by the viscosity of the fluid.

Leaf: Any flat filter element that has or supports the filter septum.

Leaf Filter: A filter housing and device consisting of a plurality of leaves, often placed in a vertical position.

Line Pressure: Inlet pressure, upstream pressure. The pressure in the supply line.

Liquid Loading: The produced liquid accumulating in a well that creates a static column of liquid, which creates back pressure against formation pressure and reduces production until the well ceases production.

Liquor: Material to be filtered. Also referred to as concentrate, feed influent, intake mud, prefilt, slime, or sludge.

Liter: Metric unit of measurement for volume. 1.057 quarts.

Live Steam Sterilization: Sterilization by flowing saturated steam through a vented vessel or system, usually at 257°F and 20 psi. Can be performed up to 284°F and 35 psi.

Loaded: A filter element that has collected a sufficient quantity of insoluble contaminants such that it can no longer pass rated flow without excessive differential pressure.

Lock Up: Device that will lock either a column, elements, or the body of a housing in place.

Log Reduction Value: The logarithm to the base of 10 of the ratios of organisms in the feed to the organisms in the filtrate. For example, Log 1o [10 9/101.7] = 7.3. Also used as a ratio of in/out bioburden in other sterilization methods such as autoclaving.

Low Interfacial Tension: Where the force of attraction between the molecules at the interface of two fluids would be less than 25 dynes/cm at 70°F.

Lox Cleaning: Process of cleaning for liquid oxygen service.

LVM: Low volatile material.

M

Machine Direction (MD): Refers to the direction while manufacturing filtration roll stock.

Manifold: A pipe or assembly into which the filter elements are connected to form one common discharge for the filtered product.

Manometer: A U-shaped tube filled with a specific liquid. The difference in height between the liquid in each leg of the tube gives directly the difference in pressure on each leg of the tube. Used to monitor differential pressure.

Martin's Diameter: Statistical diameter used in particle size analysis; the mean length of the line, parallel to the microscope traverse, dividing each particle into two equal diameters.

Mass Distribution: Relative frequency distribution of mass within a particle size distribution. Sometimes presented as cumulative percentage undersize.

Mass Transfer Rate: Measurement of the movement of matter as a function of atoms.

Materials of Construction (MoC): The entire construction specifications for manufacturing.

Maximum Allowable Pressure Drop: Maximum pressure differential of a housing under specified product and flow conditions.

Maximum Allowable Working Pressure: Wall strength of a pressurized cylinder and how much pressure the walls may safely hold in normal operation.

Maximum Differential Pressure: Highest pressure differential that an element is required to withstand without structural failure or collapse.

Maximum Operating Pressure: Maximum pressure allowed in the system.

Mean Efficiency Rating: The measurement of the average efficiency of a filter medium using the Multi-Pass Test where the average filtration (BETA) ration equals 2.0.

Mean Flow Pore Measurement: It is calculated as the diameter of the pore of a membrane partially voided of liquid such that air flow of the partially wetted membrane is equal to 1/2 the dry air flow. (Theoretical diameter of the mean pore.)

Media: The material that performs the filtration of solids from liquids within a filter element. Common media are cellulose, polyester, polypropylene, and nylon.

Media Migration: Carry-over of fibers from filter and/or separator elements, or other filter material into the effluent.

Meltblown: A nonwoven manufacturing process for filtration media where a molten polymer is extruded out of an orifice with high-velocity air to create fine fibers. The fibers can create roll stock or be spray-spun onto porous tubes to create a finished filter.

Membrane: Media through which a liquid is passed; usually associated with an extremely fine or tight type of filtration. Highly engineered thin polymeric film containing a narrow distribution of pores. Used as the separation mechanism in R/O, Electrodialysis (ED), Ultrafiltration (UF), Nanofiltration (NF), and Microfiltration (MF).

Membrane Filter: Continuous matrix with fine pores of defined size or a film allowing for the diffusion of a fluid through its structure; sometimes referred to as a dense film in the case where no pores are present.

Mesh: A term referring to a woven filtration medium, typically wire cloth or monofilament woven fabric.

Mesh Count: Number of openings, or fractions of openings, in a lineal inch of wire cloth or monofilament woven fabric.

Microfiltration (MF): Used for clarification, sterilization, to detect, or analyze bacteria and other organisms and particulate matter. Separation of particles ranging from 0.1µm to 10µm.

Micron: Short unit of length in the metric system. One millionth of a meter or or 0.000039 of one inch. The naked eye can see a particle 40 microns or larger.

Micron Rating: The smallest size of particles a filter can remove at a given efficiency rating.

Microporous Membrane: Thin polymeric films (e.g. 0.001 to 0.005 inch thick) often with millions or pores per square inch, aligned as a torturous path, allowing for the passage of a fluid to remove solids. Often used for sterilizing filtration and other fine filtration purposes. Considered a surface filter medium.

Migration: Contaminant released downstream of a filter.

Mil: One thousandth of an inch.

Milliliter: One thousandth of a liter, equal to approximately one cubic centimeter.

Minimum Bubble Point Pressure: It is a diffusional flow pressure just before the onset of bulk flow. Minimum critical bubble point pressure: a filter specification derived from diffusional flow, bubble point curves for many filters.

Minimum Design Metal Temperature: A temperature arbitrarily selected by the user of the vessel according to the type of fluid and temperature range the vessel is going to handle.

Minimum Efficiency Reporting Values Rating (MERV): A system for rating air filters according to their average particle size efficiency on a scale from 1-16 with 16 being the highest capture efficiency for average particles in the 0.3 to 1.0-micron range. The rating is derived from a test method developed by the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).

Miscible: Capable of being dissolved, soluble. Opposite of immiscible.

Mixed Cellulose Esters: Synthetic materials derived from naturally occurring cellulose. Materials used in the manufacture of membrane filters. Mixed cellulose esters membranes are used in a wide variety of applications, such as bacteria concentration in water analysis and air sampling.

MMSCFD: Million standard cubic feet per day.

MMSCFH: Million standard cubic feet per hour.

MMSCFM: Million standard cubic feet per minute.

Molarity: The term used to indicate the concentration of a dissolved substance in a given solution. The measurement is in moles of dissolved substance per liter of solution.

Molecular Sieve: Zeolite, natural, synthetic, or similar materials where atoms are arranged in a crystal lattice in such a way that there are a large number of small cavities interconnected by smaller openings or pores of precise uniform size. Used as a drying agent or for absorptive applications.

Molecular Weight: Sum of the atomic weights of all atoms in a molecule. Also, Mole or Mol Weight.

Monofilament: Single, large continuous filament of a synthetic yarn. Similar to fishing line in cross section.

Monofilament Woven Fabric: Woven fabric from monofilament yarns used as a screen or surface filter. Often used in sifting, belting, and medical filters, among others. Most common yarns are from polyester, polypropylene, and nylon.

MSCFD: Thousand standard cubic feet per day.

MSCFH: Thousand standard cubic feet per hour.

MSCFM: Thousand standard cubic feet per minute.

Mud: Material to be filtered. Also referred to as concentrate, feed, influent, intake, liquor, prefilt, pulp, slime, or sludge.

Mud Sump: Area of a horizontal housing, located upstream of the media, for the collection of solids falling out by gravity prior to going through the coalescing media, where solids are present in the stream.

Mullens Burst Test: A formal measurement where test specimen (filtration medium) sees a force, which causes it to burst.

Multifilament: A number of unbroken continuous fiber stands that run parallel to form a yarn. Typically used to manufacture a woven or knit fabric.

Multipass Test: This test system is designed to be representative of a typical hydraulic and lubricating circuit. Fresh contaminant is introduced in slurry form into the test reservoir, mixed with the fluid in the reservoir, and pumped through the test filter. Contaminant not captured by filter is returned to the reservoir for another pass through the filter. Standardized in ISO 16889-2008. A multi-pass test will typically give a higher efficiency rating than a single pass test for a filter due to the buildup of cake after each pass of the slurry during testing. A single pass test is a truer form of testing media.

N

National Institute of Occupational Safety and Health (NIOSH): Develops basic methodology for analytical test procedures.

Needlefelt: A nonwoven fabric where staple fibers are entangled together through a manufacturing process using barbed needles, providing for a heavy weight filter fabric, which can filter airborne particles for use in baghouses and suspended particles in liquids from lighter-weight needlefelt fabrics for use liquid bag filtration.

Nominal: An arbitrary measurement used to describe a degree of filtration. Nominal ratings are assigned by the manufacturer and do not allow for reproducible results or comparison between filters. See Absolute and Beta Rating.

Non-Fiber Releasing (NFR): A filter or medium which will not release fibers into the filtrate.

Non-Fixed Random Pore: Filters constructed of non-fixed media of a thickness sufficient to trap particles in a given size range. For example, felts, woven yarns, asbestos pads, and packed fiberglass.

Nonpolar: Compound or element with a satisfied electron capacity. A neutral condition that will remain unreactive. Not polar. See Polar.

Nonwoven: A filter cloth or paper that is formed of synthetic fibers that are randomly oriented in the media.

Nylon: A thermoplastic, polymeric material that has high mechanical strength and compatibility with different chemicals. Used as a hydrophilic membrane.

O

Oleophilic: A substance that has an affinity for oils. See Hydrophilic.

Oleophobic: A substance that tends to repel oil. See Hydrophobic.

Open Area: Pore area of a filter medium, often expressed as a percentage of the total area.

Operating Pressure: Normal pressure at which a system operates.

Osmosis: Diffusion of a solvent through a semipermeable membrane from a diluted solution into a more concentrated solution, thus tending to equalize the concentration of each side of the membrane. See Reverse Osmosis.

Outer Shell: Outer covering of an element, usually a perforated media or screen.

Outer Wrap: Outside covering of an element.

Outlet Pressure: Downstream pressure. Pressure exiting the outlet side of the filter.

Outside Diameter (OD): The distance across the extreme outside dimension.

Oxidation: Chemical combination of any substance in which the positive valence of an element is increased. For instance, iron reacts with oxygen to form rust.

P

Packed Bed: Discrete particles such as sand, gravel, anthracite, fabricated rings, or saddles assembled in a confined space as a filtration medium for liquids and gases.

Paper: Filter medium used in filter elements. A general term applied to resin bonded cellulose.

Parallel Filtration: Branching a filtration setup. Two assemblies of the same pore size are in parallel to increase flow rate or to simplify filter changes.

Particle: Unit of material structure; a mass having observable length, width, thickness, size, and shape.

Particle Count: Practice of counting particles of solid matter in groups based on relative size contained in a certain area.

Particle Size Distribution: The size range and quantity of particles that are measurable in a dry or liquid sample. Used to determine the appropriate filter media for a specific process.

Particulate: Any solid or liquid material in the atmosphere.

Particulate Unloading: The process whereby a filter, particularly a depth filter, can become blocked with particulate matter and subsequently release part of this matter downstream.

Parts Per Million (PPM): One part per one million parts as a measurement of concentration

Peristaltic Pump: A pump functioning by alternate pinching and release of tubing that drives the fluid forward in a pulsing action. The pump is noninvasive. Only the inner wall of the tubing contacts the fluid.

Perlite: Material similar to volcanic glass with a concentrated shell structure. Used as a filter aid.

Permeability: Ability of a cake or medium to pass liquids; or the rate of flow of fluid under a differential pressure through a material. As a rule of thumb, lower permeability values indicate finer particle retentivity.

Permeable: Material that has openings through which a liquid or gas will pass in filtering.

Permeate: The fluid that passes through a membrane, a term usually used with ultrafiltration or R/O.

Phase: May be continuous, as the basic product flowing through a housing or discontinuous as the material to be removed from the basic product. Both are distinct and separate.

Phenolic Resins: Synthetic thermosetting resins obtained by the condensation of phenol or substituted phenols with aldehydes. Used as a binder in cellulose and glass fibers to form filter media.

Pinched Pleat: When a pleat, or two pleats together, are closed off by excessive differential pressure or crowding, thus reducing the effective surface area of the filter element. See Effective Surface Area.

Plastisol: Suspension of a thermosetting plastic that can be molded into a desired shape. Used as a combination end cap and gasket on an element.

Pleat Spacers: Used to prevent the collapse of pleats in a cartridge. Examples are individual spacers of expanded metal or plastic, and continuous spacers of plastics or woven materials, usually wire cloth.

Pleater: Automated equipment that folds a filter medium roll stock for subsequent incorporation into a filter element. Provides for greater media surface area in a limited space. There are many types of pleaters, including pusher bar and rotary.

Pleating: In filters with paper medium or other sheet material such as nylon, polypropylene, and polyester. Pleating means the folding process that provides more surface area within a given area of filter.

Plugging: Filtered out particles filling the openings (pores) in a medium to the extent of shutting down the flow of a fluid. Also referred to as blinding or blocking.

Point-Of-Use Filters: Filters located immediately prior to where a clean effluent is required in a process.

Polar: Compound or element capable of receiving or giving electrons. See Non-Polar.

Polyelectrolyte: Synthetic, water-soluble, linear polymers characterized by the presence of ionizing groups distributed along a molecular length. Used to promote flocculation.

Polyester: A synthetic resin used to make synthetic textile fibers. Used in media and non-media components in filters.

Polypropylene: A thermoplastic polymeric material resistant to a broad range of chemicals. When used as a membrane, polypropylene is hydrophobic.

Polysulfone: Has excellent flow rates, high mechanical strength, is resistant to a broad range of temperatures, can be sterilized, and is hydrophilic. Commonly used membrane material but is not resistant to many organic solvents.

Polytetrafluoroethylene (PTFE): Better known as Teflon. Highly durable and resistant to range of temperatures and chemicals. PTFE is hydrophobic.

Polyurethanes: Synthetic plastics formed by action of diisocyanates on dihydric alcohols, polyesters ,or polyethers. Used in media and non-media components in filters.

Pore Size: Diameter of pore opening in a filter medium.

Pore Size Distribution: Exclusive to permeable medium: describes the number of pores in various groups of sizes in a way similar to that discussed under particle size distribution.

Pore Size-Absolute Rating: The rated pore size of a filter. Particles equal or larger than the rated pore size are retained at a specified efficiency.

Pore Size-Nominal Rating: The pore size at which a particle of defined size will be retained with an approximate efficiency. Rating methods vary widely between manufacturers.

Pores: Openings in a medium. Also referred to as interstices.

Porosity: The percent of open areas per unit volume of a medium, whether it be a filter cake or roll stock, such as a paper, membrane, woven textile, or nonwoven fabric.

Porous Metal: Finely ground chards of sintered metal that serve as a filter medium. Often used in high-pressure and/or temperature applications.

Porous Plastic: Filter media made from finely ground plastic powder. When filled into a mold and heated, the points of powder contact to fuse, while allowing the spaces between the particles to remain open for fluid flow.

Potable: Drinkable water.

Potential Hydrogen (pH): Measure of a substance's acidity or alkalinity from 1-14. 7 is neutral, with acids falling below 7 and alkaline above.

Precoat: A deposit of material (usually inert), such as a filter aid on a septum prior to beginning filtration.

Prefilt: Material to be filtered. Also referred to as concentrate, feed, influent, intake, liquor, mud, pulp, slime, or sludge.

Prefilter: Filter for removing large contaminant before the product stream enters a filter separator. Used to remove gross solids to help extend life and reduce chance of fouling in the downstream finer filters. Prefilters are generally used to take out large courser solids ahead of a coalescing unit.

Prefilter Coalescer: Two-stage, horizontal housing for efficient solids and liquid removal at high flow rates. Used on light gravity streams.

Prefilter Coalescer Separator: Three-stage housing for use where stream carries an unusually high amount of solids; prefilter elements in first stage remove bulk of solids and permit coalescer and separator elements in next two stages to function more effectively for phase separation.

Pressure, Absolute: Gauge pressure plus 14.7 psi.

Pressure Differential: Difference in pressure between two points.

Pressure Drop (ΔP): Difference in pressure between two points, generally at the inlet and outlet of a filter or a filter separator.

Pressure Drop, Clean: Differential pressure (drop) across a housing with new elements.

Pressure, Proof: A test pressure above normal operating pressure to assure that the part will withstand the norm without damage or leakage.

Pretreatment: Changing the properties of a liquid-solid mixture by physical or chemical means to improve its filterability.

Primary Sludge: That portion of the raw wastewater solids contained in the raw plant influent, which is directly captured and removed in the primary sedimentation process.

Product: Continuous phase, either liquid, air, or gas, which is being processed through filtration or filtration separation equipment.

Protein Binding: Adsorption of a protein to a surface, such as a cellulose nitrate or nylon membrane, due to various types of interactions between protein molecules and the surface.

Pseudomonas Diminuta: Bacteria used in sterility testing. One of the smallest bacteria, 0.3µm in diameter, used to challenge a sterilizing grade filter during validation testing.

PSI: Measurement of pressure in Pounds per Square Inch. Differential pressure is commonly measured in PSI within the United States.

PSIA: Pounds per square inch absolute.

PSID: Pounds per square inch differential.

PSIG: Pounds per square inch gauge.

Pulsing Backflow: Intermittent on-off blowing, in the reverse direction of usual process flow, with or without cake discharge.

Pulse-Jet Baghouse: A baghouse using short intermittent bursts of compressed air to clean dust/particulate from filter bags that are supported by cages.

Pyrogen: Any substance that produces a fever. Pyrogens are lipopolysaccharides, which are a by-product of the metabolism of certain bacteria.

Q

Quiescent: State of rest of a body. In entrainment separation, the body would be a liquid. Also used to describe a sump containing evacuated liquids or solids.

R

Rated Flow: Normal operating flow rate at which a product is passed through a housing; flow rate which a housing and medium are designed to accommodate.

Raw Sludge: Untreated sewage sludge.

Reagent: Solution or substance used in analytical testing purposes or procedures.

Recovery: Ability of a filter to recover bacteria (or other defined particles) from a solution.

Red Mud: Filter cake in sodium aluminate filtration.

Reentrainment: When solid particles or liquid that have been removed from a flow stream reenter the flow stream. For example, liquid particles dropped out of a flow stream may be reentrained if the velocity through the coalescer is increased slightly or if the element is subjected to increased vibration.

Regenerated Cellulose: Those rayon's in which the cellulose raw material is changed physically, but not chemically. Viscose, cuprammonium, and nitrocellulose rayons are of this type.

Repack: Cylindrical element used in a single-stage filter separator for removal of one liquid and course solids from another liquid. May be used as a single element, a combination of wafers, or a cluster type. Medium may be excelsior, glass fiber, or steel wool; or a combination of glass fibers and metal mesh.

Residual Dirt Capacity: The dirt capacity remaining on a filter element after use, but before cleaning, measured under the same conditions as the dirt capacity of a new filter element.

Residue: Solids deposited upon the filter medium during filtration in sufficient thickness to be removed in sizeable pieces. Sometimes referred to as a cake or discharge solids.

Resin Impregnation: Treatment of fiber used in filter elements. Impregnation is carefully controlled by the manufacturer and provides a binder for the fibers, which must be cured precisely during cartridge manufacture to preserve all the properties of the original specification.

Retention: Ability of filter medium to retain particles of a given size.

Retrofitting: Modifying equipment to make compatible with new products or processes.

Reusable Filters: Filters that are washed or cleaned of contaminant for additional uses.

Reverse Osmosis (RO): A water treatment method whereby water is forced through a semi-permeable membrane that filters out impurities, such as salt (NaCl) from seawater.

Reynolds Number: Any of several dimensionless quantities of form (LVp/N) in fluid mechanics used to help predict flow patterns.

Rod: A guidepost, usually made out of stainless steel, that holds the filters in place during service within the vessel.

Rotary Drum: Continuous liquid filter equipment consisting of a large rotating drum covered with a filter cloth and cake, which collects incoming particulate from a contaminated bath or flow. A washing and/or discharge device (scrapper) ultimately cleans the contaminant from the cake as the drum rotates.

S

Sand Filter: Filter composed of layers of sand, graded in particle size, so that the courser particles face the unfiltered flow.

Saybolt Seconds Universal: Units of viscosity as measured by observing the time in seconds required for 60 ml of a fluid to drain through a tubular orifice 0.483 inches long by 0.0695 inches in diameter at stated conditions of temperature and pressure.

Scavenger: A filter or element in the bottom of a filter that recovers the liquid that remains in a filter tank at the end of a cycle.

SCFD: Standard cubic feet per day as a measure of flow.

SCFH: Standard cubic feet per hour as a measure of flow.

SCFM: Standard cubic feet per minute as a measure of flow.

Screen: Often a flat filter from wire cloth mesh or monofilament fabric filter used to classify particles of a certain size “to screen out particles”. Can also cover an element for protection; also used as a basic material for a separator element of basket in a basket strainer.

Screw Base: Element base which is threaded to mount by screwing the cartridge onto the cartridge adaptor.

Scrim: An open weave textile or nonwoven fabric used as a strengthening member incorporated within the matrix of a filtration medium to provide increased tensile or tear properties.

Scrubber: Any device in which a contaminant, solid or gaseous, is removed from a gas stream by impacting it with liquid droplets.

Seal: Any device that serves the purpose of sealing. Among examples are center seal, gaskets, O-Rings, and mounting caps. May also include two precision machined surfaces that seal, referred to as a metal to metal seal.

Sedimentation: Action of settling of suspended solids.

Seeding: The application of a relatively coarse dust, dry dust to an air filter bag before filtration start-up to provide an initial filter cake for immediate high efficiency and to protect the bag from blinding.

Self-Cleaning: Filtering device designed to clean itself by the use of a blowdown or backwash action.

Separation: Action of separating solids or liquids from themselves (e.g., by size, viscosity, density, charge, etc.) or liquids or gases from fluids.

Separator Plate: A cartridge mounting plate that separates the influent side from the effluent side. See Tube Sheet.

Septum: Any permeable material that physically supports the filter media, usually for filter aids.

Serial Filtration: Filtration through two or more filters of decreasing pore size, one after the other, to increase throughput or filtration efficiency, or to protect the final filter.

Service Life: Length of time an element operates before reaching an unacceptable benchmarking (e.g., maximum allowable pressure drop).

Shaker Baghouse: A baghouse using flexible bags applying a cleaning action accomplished by shaking the bags from the top.

Shell: Outer wall of a housing. Also referred to as the body of a housing.

Shifting: A separation process that separates solid particles by size, through rapid movement of a screen medium, such as a vibrating action. Used in flour, wheat, abrasive, sugar, and aggregate sizing.

Sieve: A screen filter with straight-through capillary pores and identical dimension.

Silica Gel: Regenerated adsorbent, consisting of amorphous silica. Used as a drying agent or dehumidifying agent for gases, liquids, or oils.

Silicone: A synthetic material that is typically resistant to chemical attack and insensitive to temperature changes. Used to make rubber, plastics, and lubricants.

Silting Index: Measurement of the tendency of a fluid to cause silting in close tolerance devices as a result of fine particles and gelatinous materials being suspended in the fluid; measured by a silting index apparatus.

Single-Pass: This test system is designed to be representative of a typical filter circuit. Fresh contaminants are introduced in a slurry form into the test reservoir, mixed with the fluid, and pumped through the test filter. The test is run in such a manner to produce one pass of all fluid and contaminant. The slurry is passed through a filter medium, and readings are taken before excessive cake builds such as in a multi-pass test.

Sintering: A process of heating materials (e.g., metal or ceramic) to elevated temperature causing mating surfaces to fuse as one.

Size Distribution: Proportion of particles of each size (by mass, number, or volume) in a powder or suspension.

Slimes: Slurry of fine particles; materials to be filtered. Also referred to as concentrate, feed influent, intake, liquor, mud, prefilt, pulp, or sludge.

Sludge: A thickened slurry. Municipal sewage is often dewatered to produce a concentrate for disposal. Also, residues and deposits occasionally formed by oils after extended use.

Slug: A large quantity of a gas or liquid that exists in the pipeline.

Slurry: Thin, watery suspension; a material to be filtered or dewatered.

Solids: Mass or matter contained in a stream, considered an undesirable discontinuous phase and should be removed.

Soluble: Capable of being dissolved in a fluid. Opposite of insoluble.

Solute: Liquid that has passed through a filter. Also referred to as discharge liquor, effluent, filtrate, mother liquor, or strong liquor.

Solution: Single-phase combination of liquid and non-liquid substances of two or more liquids.

Sparging: Steam, compressed air, or gas is forced into a liquid through perforations or nozzles in a pipe as part of fermentation.

Specific Gravity: Ratio of weight of a volume of a substance to the weight of an equal volume of another substance typically compared to water with a specific gravity (Sp.G.) of 1.0.

Spectrophotometer: Laboratory instrument that measures the wavelength and intensity of a light emitted by most chemical agents. When a sample is atomized and burned, the presence of most elements may be determined by their spectra (wavelength) emission down to the parts per million range.

Spin-On-Filter: Cartridge filter in which the filter body and the filter element have been constructed and an integral disposable item. Filter change is rapid by spinning off the used unit from a fixed filter head and rapidly adding on the replacement unit.

Spun Yarn: A continuous yarn for weaving of textiles consisting of staple fibers.

Spunbond: A nonwoven fabric formed by producing, laying, and self-bonding a web of filament material in one continuous set of processing steps. Usually made of polyester or polyolefins.

Stacked Disc Filter: A filter housing and device consisting of a plurality of leaves place in a horizontal position. Used widely in food and beverage filtration.

Stainless Steel (SS): A form of steel containing, at minimum, 10.5% chromium and is resistant to tarnishing and rust.

Standard Operating Procedure (SOP): A written document that explains how to complete a specific production-oriented task.

Staple Fiber: A short length of natural or synthetic fiber, typically from 1-4 inches in length, used to manufacture yarns for weaving and various types of nonwoven fabrics, such as needlefelt, air laid, and hydroentangled, for use in filtration media.

Sterilizing Filter: A non-fiber releasing filter that produces an effluent in which no microorganisms are present. Typically, microporous membranes at or below 0.2-micron pore size rating have this capability.

Stokes' Diameter: Diameter of a sphere having the same density and the same free-falling speed as a particle when moving in a homogeneous fluid of the same density and viscosity, under conditions of laminar flow.

Stokes' Law: A physical law, which approximates the viscosity of a particle falling under the action of gravity through a fluid. Friction drag controls the rate of fall at a constant velocity known as the terminal or free-setting velocity.

Stratification: Condition in which the larger particles settle out below the finer ones. Also referred to as classification.

Stream: Term sometimes used and synonymous with the words product, liquid, air, gas, fluid, etc. in speaking of any matter processed by filtration or separation equipment.

String Wound: An inexpensive filter consisting of textile roving (yarn) wrapped around a center core to form a filter medium and filter cartridge (element).

Strong Liquor: Liquid which has passed though the filter. Also referred to as discharge liquid, effluent, filtrate, mother liquor, or solute.

Sub-Micron: A particle smaller than one millionth of a meter. For example, particles dispersed into the air via an aerosol.

Substrate: Substance or basic material as a filter media or to which a deposit is added.

Sump: Collecting area of a housing located downstream, typically from a coalescer element, in which coalesced droplets of the dispersed phase are deposited; also called water leg. May also be used to collect solids in applications where gross solids are present in a stream; also called mud sump.

Supernatant: Liquid above settled solids.

Surface Area: The outside or uppermost layer of the filter.

Surface Energy: Molecular reaction; the breaking away of ion particles from a mass.

Surface Filter: Filter medium that retains particles wholly on the surface and not in the depth of the cross section of a filter medium (e.g., plain weave wire cloth and monofilament woven fabrics or membrane).

Surface Filtration: A process that traps contaminants larger than the pore size on the top surface of the filter, usually a membrane, wire cloth, or monofilament fabric. Contaminants smaller than the specified pore size may pass through the medium or may be captured within the medium by some other mechanism, such as surface affinity, triboelectric potential, or other means, which prevents particle penetration.

Surface Tension: Tendency of the surface of a liquid to contract to the smallest area possible under existing circumstances.

Surfactant: A soluble compound that reduces the surface tension of a liquid or reduces interfacial tension between two liquids or between a liquid and a solid.

Surge: Peak system pressure measured as a function of restricting or blocking fluid flow.

Suspended Solids: Solids that do not dissolve in liquid; those that remain suspended and can be removed by filtration.

Suspension: Any liquid containing undissolved solids.

Swing Bolt: Type of housing head closure that reduces service time. Opposite of thru-blot flange where studs are used, such as with ASA-type flanges.

T

Tangential (Crossflow) Filtration: See Crossflow (Tangential) Filtration.

Tare: A deduction of weight, allowing for the weight of a container or medium; the initial weight of a filter.

Teflon: Registered trade name of E.I. DuPont de Nemours Co., Inc. for a material having non-stick characteristics. Sometimes a Teflon material is used for gaskets or components within separators.

Tensile Strength: Resistance to breaking. The amount of force required to break a material by stretching.

Tensiometer: Device used to read the surface tension of a liquid or to reading the interfacial tension between two immiscible liquids.

Terminal Pressure: Pressure drop across the unit at the time system is shut down or when the maximum allowable pressure drop is reached.

Terminal Velocity: Steady velocity achieved by a falling particle when gravitational forces are balanced by viscous forces. See Stokes' Law.

Three-Stage Filter Separators: Liquid prefilter coalescer separators containing three kinds or types of replaceable elements.

Throughput: The amount of solution that will pass through a filter prior to plugging.

Tipping Pan Filter: Process industry equipment that collects particulate from a liquid stream on a screen over a vacuum forming a dewatered cake and discharging the accumulation by tipping the collection screens.

Tortuosity: A continuous path that can be traced from a point on the upstream side of a filter to a point on the downstream side through a twisting pore pathway traveled by the liquid or gas during filtration.

Tortuous Path: Crooked, twisting, or winding path which tends to trap or stop solid particulate matter in a filter medium. Manner of filtration within depth filters.

Total Dissolved Solids: Portion of the total solids in the sample that passes through the filter and indicated by the increase in weight in the vessel after the filtrate has been dried at 356°F.

Total Solids/Suspended Solids: The material residue left in the vessel after evaporation of a sample and its drying in an oven at 217-221°F. The increase in weight over that of the empty vessel represents the total solids. Used in analyzing drinking water.

Tramp Oil: Free oil contained in emulsion type machine tool coolants. May be from machine leakage and from breakdown of the emulsifying agents in the cutting oil.

Triboelectric Series (Potential/Charge): An inherent natural or induced positive or negative polarity that many materials possess. Fibers or a filtration medium with a triboelectric potential will capture charged and potentially neutral particles, assuming both positive and negative properties on the surface of the material. Triboelectric properties only work in air filtration assuming relative humidity below 90%.

Triboelectricity: The charge of electricity that is generated by friction, such as rubbing.

True Density: Mass of a particle divided by its volume, pores being excluded from the volume calculation.

Tube Sheet: A cartridge mounting plate which separates the influent side from the effluent side. See Separator Plate.

Turbidimeter: An instrument for measurement of turbidity in which a standard suspension usually is used for reference.

Turbidity: Measure of cloudiness within a liquid. Any insoluble particle that imparts opacity to a liquid creates turbidity when not settled.

Turbulent Flow: Flow regime in which the flow characteristics are governed mainly by the inertia of the fluid. Turbulent flow in ducts is associated with a high Reynolds Number (Re). It also gives rise to high drag.

U

Ultra-Low Particulate Air (ULPA): An air filter or medium that captures 99.999% when challenged with DOP 0.3-micron particles under certain laboratory-controlled conditions.

Ultrafiltration (UF): A separation method operating at 50-200 psi in crossflow filtration mode. Efficiency is approximately 90%. Used to separate large molecules according to their molecular weight.

Uniformity Coefficient: Separation factor applied to the sizing of the sand used in water filtration plants.

Uniformity of Feed: Uniformity of the mixture of the solids in the feed liquid.

United States Pharmacopeia/National Formulary (USP): The reference guide of pharmaceutical manufacturer and test protocol for filtration media using Edition/Title XXI as a basis for evaluation.

Unloading: The release of contaminant downstream that was initially captured by the filter medium.

Upstream: Portion of the product stream that has not yet entered the system and includes the side of the filter which the unfiltered process stream passes through first.

Useful Life: Determined when contamination causes a filter or system to have an adverse (lower) flow rate, low efficiency, or high differential pressure, providing for an inefficient operation.

V

Vacuum: Depression of pressure below atmospheric pressure.

Validation: Demonstration that a process or product does what it is supposed to do by challenging the system and providing complete documentation.

Van Der Wals Forces: The relatively weak attractive forces that are operative between neutral atoms and molecules that arise because of the electric polarization induced in each of the particles by the presence of other particles.

Vapor: A solid or a liquid in a gaseous form under normal conditions of pressure and temperature.

Vapor Point: The liquid is of a temperature in which the vapor pressure of the liquid equals the surrounding pressure which turns it to a vapor.

Velocity: Time rate of motion in a given direction.

Velocity Head: Velocity pressure or kinetic pressure.

Vent Filters: Filters that allow the passage of air while restricting the flow of fluid; typically containing low micron rated microporous membrane media. Common in medical devices and pharmaceutical tanks.

Vessel: A container, usually used as alternatively to the word housing (e.g., filter vessel).

Vibratory Sifter: Process equipment that separates solids by size on a metal screen through a vibrating action. Larger particles remain on the screen as fines fall through, sometimes to one or more higher mesh count screens for further separation of particle size.

Viscosity: Degree of fluidity. Resistance to flow as a function of force or gradual yielding of force. For a given filter and differential pressure, flow rate will decrease as viscosity increases.

Viscosity Index: Numerical value assigned to a fluid that indicates to what degree the fluid changes in viscosity with change in temperature.

Viton: Trade name for material used in gaskets and 0-rings. Fluorinated rubber characterized by its outstanding resistance to high temperatures, mineral oils, synthetic hydraulic fluids, fuels, and chemicals. See Buna-N and EPDM.

Void Channels: Open passages of the filter medium through which the liquid travels.

Void Restriction: Obstructions in the void openings that interfere with flow.

Void Volume: The amount of open or empty area across the full spectrum of a material or substance. A term often used to describe the amount of porosity in a filter medium.

Volumetric Flow Rate: Fluid flow expressed as a volume flowing per unit of time (cc^3/sec, ft^3/min, etc.).

W

Warp: The yarns that run lengthwise or in the machine direction in woven goods.

Waste: Material removed, rejected, or otherwise lost in various manufacturing processes.

Wastewater: Effluent water carried downstream from a filtration or separation process.

Water Breakthrough Test (WBT): An integrity test for hydrophobic filters or filter medium in which the resistance to water flow is overcome by a specific pressure such that water will flow through a specific pore size of the filter or filter medium. Also called Water Intrusion Test.

Water Flow/Flux: Measure of the amount of water that flows through a filter, a variable of time, the degree of contamination, differential pressure, total porosity, and filter area.

Water Intrusion Test: See Water Breakthrough Test (WBT).

Water Leg: Area of housing for collection of water.

Waterhead: The height of water in a column. Provides a defined amount of pressure on a surface.

Weight of Solids: Measure of solid particulate matter contained in a fluid sample.

Weir: (1) A diversion dam (2) A device that has a crest and some side containment of known geometric shape, such as a V, trapezoid, or rectangle, and is used to measure flow of a liquid.

Wet Cast Membrane: A process to manufacture microporous membranes, typically from thermoplastic materials, solvents, and non-solvents in the formation of a microporous membrane. 75 to 80% of all microporous membranes manufactured use this process.

Wet Strength: Strength of a medium when saturated with water.

Wetted: Having accepted water or other liquid.

Wetting Agent: A surfactant added to a filter medium to ensure complete intrusion (wetting) by a high surface tension fluid such as water.

Wire Cloth: Fabric woven from metal wire used as a screen, surface filter, or media support. Often used in sifting, belting, hydraulic filtration, etc. Most common wire used is stainless steel.

Wound Tubes: Also referred to as String Wound Filters.

Y

Yoke: End cap used to hold a cartridge in place.

Z

Zeta Potential: The potential across the diffuse layer of ions surrounding a charged colloidal particle.

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With the intention of providing a working, accessible reference tool for all industry professionals – and for those who seek to understand them – this Glossary of Terms is available for free download and distribution.

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