

GLOSSARY

Abrasion - Flex: Fabric weakness created by repeated fiber bending.

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

Abrasion - Surface: Fabric wear on the surface created by particulate erosion, rubbing or scuffing.

ACFM: Actual cubic feet of gas per minute. The volume of the gas flowing per minute at the operating temperature, pressure and composition. *Note - in the metric system, the corresponding value may be expressed in actual cubic meters per hour, ACM (H).

Acid Deposition: The process by which acidic particles, gases, and precipitation leave the atmosphere. More commonly referred to as acid rain, acid deposition has two components: wet and dry deposition.

Acid dew point: The temperature at which combustion gases are saturated with sulfuric acid.

Acid rain: The result of sulfur dioxide (SO₂) and nitrogen oxides (NO_x) reacting in the atmosphere with water and returning to earth as rain, fog, or snow. Broadly used to include both wet and dry deposition.

Adsorb: To take up and hold (a gas, liquid, or dissolved substance) in a thin layer of molecules on the surface of a solid substance. **A/E:** Architect / Engineer

Air Heater: A heat exchanger, which transfers heat otherwise wasted from the flue gases to the incoming furnace air. It may be regenerative (Ljungstrom or Rothemuhle) or direct (tubular) air heaters may also be heated with fuel (direct fired) or steam.

Air, Standard: Dry air at 70°F and 29.92 in Hg pressure. Equivalent to 0.075 lb/ft³

Air-To-Cloth (A/C) Ratio: The ratio between ACFM, flowing through a filter, and the square feet of filter area available. This can also be thought of as the velocity of the gas passing through the filter area in feet per minute (FPM). The typical A/C ratios for various types of cleaning systems are:

- Cleaning System A/C Ratio*
- Shaker 2.5 - 3.0 to 1
- Reverse Air 2.0 - 2.5 to 1
- Pulse-Jet 5 - 6 to 1
- Plenum Pulse 3.5 - 4 to 1

* NOTE: The term usually used in the metric system is filtration velocity instead of air-to-cloth ratio, defined as the relation between the cubic meters per min of air flowing through a filter and the square meters of filter area available. The typical filtration velocities are:

- Cleaning System Filtration Velocity
- Shaker 0.76 - 0.91 m³/m²/min
- Reverse Air 0.61 - 0.76 m³/m² min
- Pulse-Jet 1.52 - 1.83 m³/m²/min
- Plenum Pulse 1.07 - 1.22 m³/m²/min

Alignment: Refers to how well optimum clearances are maintained between the high voltage discharge electrode system and the grounded collecting plate surfaces. Uniform corona current distribution, maximum use of installed plate area, highest possible operating voltages and best precipitator performance occur when proper discharge electrodes are everywhere centered within collecting plate gas passages or ducts. Reasonable maximum tolerances are considered +1/4" (\pm 6 mm) off center for discharge electrodes and +1/4" (\pm 6 mm) from flat for collecting plate surfaces. Clearance from corona source to vertical projecting plate baffles or edges should be a least 0.75 duct width. The sharper the edge or projection on the collecting surface anode, the greater the clearance to discharge corona. Good alignment depends upon good and reliable overall system mechanical integrity without thermal distortions. High voltage discharge elements and frame must be held plumb with respect to vertical collecting plate surfaces. Uneven foundation settling cannot be tolerated.

Allowance: A tradeable permit to emit a specific amount of a pollutant. For example, under the Acid Rain Program, one allowance permits the emissions of one ton of sulfur dioxide (SO₂).

Anemometer: A device for measuring small air velocities. See hot-wire anemometer and rotating vane anemometer.

Anode: Positive electrical terminal of high voltage power supply; this is the collecting plate surface, which is maintained at ground potential. Precipitator (ESP) sparking starts at the anode.

Anti-Sneak Baffles: A gas distribution device in which, internal baffle elements within the precipitator prevent the gas from bypassing the active field or causing hopper re-entrainment.

Anti-Sway Insulator: Ceramic insulators used to prevent the bottom guide frame for the discharge wire tensioning weights from swinging and causing periodic misalignment of discharge electrodes resulting in premature sparking, poor precipitator performance. Two types in common use with two-point, high-tension (HT) frame support design: (1) vertical shaft 36" long supported off hopper walls; (2) horizontally mounted ceramic, positioning bars between bottom guide frame and precipitator outer steel shell. In some cases, teflon is used instead of ceramics.

AR: Aspect ratio; ratio of ESP total collecting plate length to plate height.

Arc: A relatively long, large discharge of high voltage, which is not immediately self-extinguishing.

Aspect Ratio: The length of a precipitator divided by its height. The aspect ratio normally ranges from approximately 0.5 to 1.5 and affects the amount rapping re-entrainment contributes to the

outlet burden.

ASTM: American Society for Testing Material

Automatic Power Supply Control: The automatic regulation of high voltage power for changes in precipitator operating conditions using feedback signal(s).

Auxiliary Control Equipment: The electrical components required to protect, monitor and control the operation of precipitator rappers, heaters and other associated equipment.

AVC: Automatic Voltage Control is an electrical or electro mechanical system to regulate the precipitator voltage requirements because of changes in operating conditions.

Back Corona: A localized corona discharge, which occurs when the gas within a high resistivity dust on the collecting surface breaks down and becomes ionized. Back corona starts at a critical bulk dust resistivity, e.g. = $1.0E+10$ ohm cm. In the incipient early stages it causes ESP sparking at reduced voltages and current densities; severe back corona ($5.0E+11$ - $5.0E+12$ ohm) causes heavy positive ion back current, greatly reduces particle charge and destroys ESP ,bprocess.

BACT: Best Available Control Technology

Baffle: A device, usually consisting of a plate or series of plates, which evenly distributes airflow and dust within a dust collector to protect filter bags from direct abrasion by dust.

Baghouse: An air filtration structure utilizing filter fabrics for the purpose of removing solid particulate from direct abrasion by dust.

Balanced draft: The condition where the absolute pressure in the boiler furnace is exactly equal to the absolute atmospheric pressure outside the furnace or is slightly negative.

Batch cleaned: Usually refers to that process used in heat-cleaning glass cloth in roll form by exposing it to 500°F - 600°F temperatures for prolonged periods to burn off the starches.

BDAT: Best Demonstrated Available or Achievable Technology

Bleedthrough: Particulate migration through the interstices of a woven filter bag fabric or through the needled fibers of a felt bag.

Blinding: Fabric blockage by dust, fume or liquid not being discharged by the cleaning mechanism, resulting in reduced gas flow or increased pressure drop across the media.

Blowpipe: Pipe connected to the pneumatic pulsing system with holes to distribute cleaning air to bag rows in pulse-jet units.

Bridging: The blockage of a hopper by the formation of an arch or "bridge" of compacted dust

over the hopper exit.

Bulked yarn: Filament yarn that has been processed by high-pressure air passing through the yarn and relaxing it into gentle loops, bends, etc.

Bursting Strength: General: A material's ability to resist rupture by pressure. Specific: Force required to rupture a fabric by distending it with the force applied at right angles to the fabric plane under specified conditions. Usually expressed in pounds per square inch. (kg/cm²)

Bus: A conductor enclosed within a grounded duct.

Bus Section: The smallest size high voltage assembly of discharge electrodes and minimum collecting plate area that can be independently energized by one electrical set; or one electrical output.

Cake: The dust formation developed on the surface of the filter medium during the filtration process.

Calendaring: High pressure pressing of the fabric; pushes the surface fibers down onto the body of the filter medium.

Can Velocity: In a dust collector with the filter elements suspended from the tubesheet, can velocity is the upward air stream speed passing between the filters calculated at the horizontal cross-sectional plane of the collector housing at the bottom of the filters. Example:

- Air volume: 18,850 ACFM (8.9 m³/hr)
- Total cross-sectional area of collector: 15 ft x 8 ft = 120 ft² (4.57 m x 2.43 m = 11 m²)
- Total area of filter bottoms: 20 x 12 = 240 filters; 28.27 in²/filter (0.018 m²/filter) = 47 ft² total (4.37 m² total)
- Open area between filters: 120 ft² (11.2 m²) - 47 ft² (4.37 m²) = 73 ft² (6.64 m²)
- Can velocity: 18,850 ACFM ÷ 73 ft² (6.78 m²) = 258 FPM (1.31 m/sec)

Cathode: This is the negative polarity, high voltage DISCHARGE ELECTRODE of a precipitator. It is the cathode that suffers metal erosion due to ESP repetitive sparkover - a common cause of localized wire thinning, draw-out due to weight tension, and ultimate breakage with sharp points.

Cell: A separate section of a precipitator which is energized by one TR set and which is located transverse to the gas flow. (a 4-cell precipitator would contain 4 parallel

electrically separated high voltage systems in each field) **Cell (in width):** A cell is an arrangement of a bus sections parallel to gas flow. Note: Number of cells wide times number of fields deep equals the total number of bus sections.

Cell Plate (Tubesheet): A steel plate to which the open end of the filter bags are connected.

Separates the clear air and dirty air plenums of the baghouse.

CFM (Cubic Feet Per Minute): The cubic feet of air being moved through the system per minute. Must be expressed as actual (ACFM) Standard (SCFM) wet or dry (SCFM W or SCFM D)

Chamber: A gas-tight longitudinal subdivision of a precipitator. A precipitator with a single gas-tight dividing wall is referred to as a two-chamber precipitator. Note: very wide precipitator chambers are frequently equipped with non-gas-tight load bearing walls for structural considerations. These precipitators are by definition single chamber precipitators.

Chamber: A parallel sub-division of a large precipitator, which is sealed off from other chambers by a solid steel wall. Each chamber contains its own set of individual sections comprising CELLS and FIELDS.

Char: The carbonaceous material in dust - usually incompletely burned fuel which has larger particles than the rest of the dust.

Chemical Conditioner: A chemical used to lower the resistivity of dust to reduce or eliminate back-ionization.

Clean Air Plenum: The baghouse area through which clean filtered gases are directed after filtration, located on the clean side of the bags above the tubesheet.

Cloth: In general, a pliant fabric that is woven, knitted, felted or otherwise formed from any textile fiber, wire, or other suitable material.

Cloth weight: usually expressed in oz/yd² or oz/ft². However, cotton sateen is often specified at a certain number of linear yd/lb of a designated width.

Coating: Immersing the filter medium in a solution to provide the fibers with a coating that will lubricate and thereby reduce self-abrasion; in the case of woven-glass bags, the most common coatings have been Teflon and silicone graphite

Cold side ESP: An ESP, which is installed downstream of the air heaters.

Cold spot: A point where a continuous metallic heat transfer circuit through the insulation creates an uninsulated area, resulting in an area that is colder than the surrounding area.

Collecting Surface: Describes the reinforced sheet metal, usually 20, 18 or 16 ga (0.90, 1.25 or 1.65 mm), collector plate or plates that form the gas passages of precipitator parallel ducts. The electrically charged dust particles are deposited or collected on said surfaces by means of powerful electric forces applied directly to the particles, per se.

Collection Efficiency: A measure of dust collector's ability to remove particulate from the inlet gas expressed in percent. % Efficiency = (Dust in - Dust out)/Dust in x100.

Collection Electrode (CE): The electrode (usually grounded) on which the particulate is deposited in an electrostatic precipitator. Also called collecting plate.

Collection Surfaces: The individual elements, which make up the collecting system and provide the total surface area of the precipitator for the deposition of dust particles.

Collection Surface Area: The total flat projected area of collecting surface exposed to the active electrical field (effective length) x (effective height) x (2) x (number of gas passages).

Collection Surface Rapper: A device, which imparts vibration or shock to the collecting surface to dislodge the deposited particles.

Compressed Air: Pressurized air generated by a compressor used to clean filter bags in a pulse-jet baghouse. Measured in psi (pounds per square inch). (Kg/cm²)

Concentration: Amount of dust in the gas. Usually expressed in terms of grains/ft³, lb/1000 lb of gas, ppm, mg/m³, or lb/million Btu.

Conductivity: The reciprocal of resistivity - the units are Mho-meters (Mho = Ohm, spelled backwards).

Conical Hopper: A hopper shaped like an inverted cone.

Control Damper: A device installed in a duct to regulate the gas flow by degree of closure. Examples: Butterfly or Multi-Louver.

Control Equipment: High voltage power supply control equipment generally consists of: electrical components required to protect, monitor and regulate the power supplied to the precipitator high voltage system.

Control Unit: Usually in an air conditioned room containing modern solid-state thyristor components for silicon-controlled-rectifier (SCR) electric power controls, microprocessor-mini computer type automatic voltage controls, instrumentation, protective devices, fault indicators, programmable inputs, various input and output signals capabilities, manual control switch, main line 1 or 3 ph, 50 Hz or 60 Hz circuit breakers, etc.

Corona: A gaseous discharge found near an ESP discharge electrode resulting in a faint glow caused by ionization of gas molecules due to the electric field.

Corona Power (KW): The product of secondary current and secondary voltage. Power density or specific power is generally expressed in terms of: 1) Watts DC per square foot (square meter) of collecting surface. Or 2) Watts DC per 1000 ACFM or watts per 1000 AMCH of gas flow.

Coronizing: A heat cleaning process for fiberglass fabric to burn off the starches (used in

processing) usually at temperatures of 1000°F (537.7°C) for a short duration before the finish is applied. Same as scouring.

Crimp: Waves contained in a yarn.

Curing: In finishing fabrics, the process by which resins or plastics are set in or on textile materials, usually by heating.

Current Density or Specific Current: The amount of secondary current per unit of ESP collecting surface.

Denier: A weight-per-unit-length measure of any linear material. The size of yarns used in woven fabrics including scrims is defined or designated by denier.

Dew point: The temperature of a gas at which condensation occurs. May be water dew point or acid dew point.

Diaphragm Valve: A compressed air valve operated by a pilot solenoid valve used to clean the filters in pulsejet or plenum pulse collectors.

Differential Pressure (ΔP): The change in pressure or the pressure drop across a component or device located within the airstream; the difference between static pressures measured at the inlet and outlet of a component, compartment or device (i.e., between the dirty and clean sides of filter bags and tubesheet).

Dimensional stability: Ability of the fabric to retain its size in hot or moist atmosphere.

Discharge Electrode (DE): The part, which is installed in the high voltage system to perform the function of ionizing the gas and creating the electric field. Typical configurations are: rigid frame, weighted wire, rigid discharge electrode.

Discharge Electrode Rapper: The device for imparting vibration or shock to the discharge electrodes in order to dislodge dust accumulation.

Drag: Normalized value for pressure drop wherein pressure drop is normalized by dividing by the gas velocity. This property allows comparison of one dust/filter medium to another on a common basis and at various parts of the filtration cycle.

Duct: A gas passage or space between two parallel collecting plate surfaces. Duct widths now typically vary from 9 to about 16 inches (229-400 mm). An electrostatic precipitator forms an electrical capacitor between the DE assemblies and the grounded collecting plates on each side thereof in each duct. Effective capacitance of typical ESP is $C_p \cong 30 - 40$ picofarad/m² plate area (9-10" ducts, wire DE).

Dustcake: Dust layer on filtration surface. A certain amount of porous dustcake is necessary for

filtration purposes unless the fabric is a surface filtration type (BHA-TEX[®] or spun bonded fabric).

Dust (or Mist) Concentration: The weight of dust or mist contained in a unit of gas, e.g., pounds per thousand pounds of gas, grains per actual cubic foot of gas, or grains per standard dry cubic foot (the temperature and pressure of the gas must be specified if given as volume). Metric equivalents are grams or milligrams/Kg of gas or milligrams/m³ of gas.

Dust Loading: The amount of solid particulate suspended in an air (gas) stream, usually expressed in terms of grains per cubic foot, grams per cubic meter or pounds per thousand pounds of gas.

Effective Cross-Sectional Area: Effective width times effective height.

Effective Height: The total height of collecting surface measured top to bottom.

Effective Length: The total length of collecting surface measured direction of gas flow.

Effective Migration Velocity: This parameter, defined by the Deutsch-Anderson relationship, is related to the average speed with which dust particles in an electrostatic precipitator move towards the collecting electrode. Values are generally stated in terms of ft/min. or cm/sec.

Effective Width: Total number of gas passages multiplied by spacing dimension of the collecting surfaces.

Electrical Set: May refer to the complete high voltage power supply energizing a precipitator section, or to the TRANSFORMER-RECTIFIER SET, per se, which is a major part of said power supply. The other principal parts of the complete ESP power supply include the special LINEAR REACTOR connected in series with the transformer primary circuit, and the CONTROL UNIT.

End: same as warp thread

End count: Same as warp count

EPA: Environmental protection Agency.

ESP: Abbreviation short form of ELECTROSTATIC PRECIPITATOR or ELECTRO FILTER.

Evaporative Gas Cooling: Water is sprayed into a hot gas stream. Energy is absorbed by the water as it is transformed from a liquid to gas, thus reducing the temperature of the gas stream. This technology is used to condition a gas stream to optimize the efficiency and reliability of air pollution control equipment. Also called adiabatic gas cooling.

Extensibility: Stretching characteristics of fabric under specified conditions.

Fabric: A collective term applied to cloth no matter how constructed and regardless of the kind of fiber used. In the commonest sense, it refers to a woven cloth.

Fan: A device for moving air and dust through the system. If the fan is on the dusty side of the collector pushing the dust-laden air through the collector, it is called a positive system. If the fan is on the clean airside of the collector pulling the air through the collector, it is called a negative system. (Most collectors are negative systems)

Felt (Needled): A fabric produced by using barbed needles to interlock carded fibers.

Felted bag: Type of bag frequently used on pulse-jet dust collectors. Features a thick mat of fibers supported by a woven backing or scrim.

Fiber: A slender, elongated structure of synthetic material. A group of fibers that form a single substance, such as flax.

Field (In depth): An arrangement of bus sections perpendicular to gas flow energized by one or more high voltage power supplies.

Fill: crosswise threads woven by loom. Yarn running from selvage to selvage at right angles to the warps in woven fabrics.

Fill count: Number of fill threads per inch of cloth.

Fill Yarn: An individual yarn, which interlaces with the warp yarn at right angles in a woven fabric. Also known as a pick or filling pick. These run around the circumference of the bag.

Filter cake: the accumulation of dust on a bag. Often assists in the filtration process.

Filter Drag: The ratio of differential pressure across the filters (differential pressure, inches or mm W.C. to velocity through the filters (air-to-cloth ratio, MPM meter/minute)

Filter Media: The permeable barrier employed in the filtration process; the fabric on which the filter cake is supported.

Filtration: A process by which particles are separated from a fluid stream by use of a permeable barrier.

Flange-to-flange: The APC equipment from inlet flange to outlet flange.

Float: The position of a yarn that passes over two or more yarns passing in the opposite direction.

Fly ash: Dust from a furnace; the term distinguishes the ash that is entrained in the gas from bottom ash which drops to a grate or pan at the bottom of the furnace.

Gas Distribution Devices: Internal elements in the transition or ductwork to produce the desired velocity contour at the inlet and outlet face of the precipitator. (See Gas Distribution)

Gas Distribution Plate Rapper: A rapper used to prevent dust buildup on gas distribution devices.

Gas Passage: A duct formed by two adjacent rows of collecting surfaces.

Gas sneaking: Bypassing of dust laden gas around ESP electrified regions, such as through hoppers and above the collecting plates.

Gas-to-cloth ratio: Gas volumetric flow rate/cloth area...the amount of process gas entering the fabric filter dust collector divided by the amount of cloth area filtering the dust from the air. Normally the gas flow is given in CFM and the cloth in square feet.

Glazing: High-pressure pressing of the filter medium at elevated temperatures; fuses surface fibers to the body of the filter medium.

Grab tensile: The tensile strength, in lb/in, of a textile sample cut 4 in. by 6 in. and pulled in two lengthwise by two 1 in. sq. clamp jaws set 3 in. apart and pulled at a constant specified speed.

Grain: A dust weight unit commonly used in air pollution control equal to 1/7000 lb.

Grain Loading: The amount of particulate by weight in a given volume of air (Grains/ft³); 1 lb (0.454 Kg) = 7000 grains.

Greige (Grey, Greige, Gray):s: Cloth, regardless of color, that has been woven in a loom, but has received no dry or wet finishing operations. Unfinished woven fabric.

Header: A pressurized pipe that contains the compressed air supply for a pulse type baghouse.

Heat Set Finish: Heat finishing treatment that will stabilize many man-made fibers so that there will be minimal change in shape or size.

High Voltage Bus: A conductor enclosed within a grounded duct.

High Voltage Conductor: A conductor, which carries the high voltage from the transformer-rectifier to the precipitator high voltage system.

High Voltage Power Supply: The supply unit, which produces the high voltage required for precipitation, consisting of a transformer-rectifier and controls.

High Voltage System: All parts of the precipitator, which are maintained at a high electrical potential.

High Voltage System Support Insulator: A device, which physically supports and electrically isolates

the high voltage system from the grounded structure.

Hopper: The vessel at the bottom of a precipitator where dust falls as it is rapped from the electrodes.

Hopper Capacity: The total capacity of a hopper measured from a point some distance below the high voltage system or plates, whichever is lower.

Hot side ESP: An ESP, which is installed upstream of the air heater.

Hot-Wire Anemometer: A device that measures gas flow by its cooling effect on a heated element. Air velocities of centimeters per second can be measured by this method.

Hydrophilic fibers: Fibers that do not readily absorb water.

Impedance Device: A linear inductor or current-limiting reactor required to work with SCR-type controllers. A transformer with a specially designed high impedance core and coils. Saturable core reactor. Resistors.

Impingement: the physical contact of dust laden gas flow against a filter media. Typically referring to an abrasive wear caused by this impact.

Inch of Water: A unit of pressure equal to the pressure exerted by a column of liquid water one inch high at standard conditions (70°F or 21°C @ sea level); 27.7 inches of water (703 mm w.c.) = 1 psi (69 mbar); usually expressed as inches water gauge (w.g.) or inches water column (w.c.)

Inlet dust loading: A measure of the particulate matter entering an ESP expressed in grains of particulate matter per actual cubic foot of flue gas.

Inside Collection: Particles are collected on the inside surface of the bag (most reverse air and most shaker baghouses).

In-situ resistivity: Particle resistivity as determined by a probe inserted into the flue gas stream.

Insulator Compartment: An enclosure for the insulator(s) which supports the high voltage system (may contain one or more insulators).

Interfacing: Openings between the interlacings of the warp and filling yarns in a fabric.

Interstices: The opening between the interlacings of the warp and filling yarns, i.e. the voids in the fabric through which air/gas passes.

Isokinetic Sampling: A sampling of the flue gases drawn from the mainstream of the gas into the sampling apparatus with no change of velocity.

Linear Reactor: A vital element for assuring reliable, stable electric energization at optimum current densities and highest ESP performance capability. It is an iron-core, convection-cooled inductance whose value is chosen according to rated power supply DC current output. The reactor has several important functions:

- 1) Essential series circuit impedance in the primary of the HV transformer acting as a ballast for stability with sparking load and limiting peak power supply current flow during ESP sparking to safe values.
- 2) ESP current waveform control adjustment capability to match power supply ratings to load demands for the best ESP performance and to prevent premature sparking.
- 3) Proper inductance values for TR Set ESP current conduction times \cong 70-86% maximum time between current pulses of 8.333 milliseconds (FW energization) provides for fast voltage and current recovery following a spark.
- 4) Slow down otherwise very steep rate of rise of currents when main SCRs are turned on and off 120 times a second, and protect silicon diodes in HV rectifier from damage by securing a nearly half sine wave shape for the ESP current pulses.

It is not the installed TR Set capacity that does the job; it is only the actual voltages and currents drawn under optimum conditions of electrode geometry, electrode alignment, and TR Set match to load that counts. In cases where high power TR Sets are running at only 10-50% of rated current capacity that major gains in useful electrical energy and ESP performance can often be realized by using an appropriately larger size reactor inductance to match a revised TR Set rating more closely to the ESP current needs at hand. The larger inductance is chosen to increase the ESP current conduction time to the optimum range \cong 70-86% instead of the original short conduction time of perhaps 25-55%. The broader current pulses result in significant increases in average DC precipitator currents and voltages, reduce premature sparking due to narrow current pulses and peaky voltage waveforms which limit useful current unnecessarily. Achieving the best possible electrical energization quality pays off handsomely in high ESP performance. In cases where proper operating currents are unknown, or to accommodate possible shifts in coal quality, etc., from time to time, it is convenient to use tapped linear reactors to cover a range from say one-half to full load in three taps.

Loom finish: Same as greige cloth.

Magnehelic Gauge: An instrument used to measure the differential pressure drop between two points in a system.

Manometer: A U-shaped tube filled with a specific liquid. The difference in height between the liquid in each leg of the tube is the differential pressure between the two points being monitored. Used to monitor differential pressure.

Manual Power Supply Control: The manual regulation of high voltage power based on precipitator

operating conditions observed by plant operators.

Micron: A unit of length, 1/25,000 of an inch (1/1000 of one millimeter) here used as a measurement of the largest diameter of a particle; 74 microns are equal to a 200 mesh opening.

Migration Velocity: A parameter in the Deutsch-Anderson equation used to determine the required size of an electrostatic precipitator to meet specified design conditions. Values are generally stated in terms of ft/min or cm/sec. See also "effective migration velocity".

Mit Flex Endurance Test: A test whereby a filter media specimen is rapidly flexed in an arc under a specified load until fabric rupture occurs. Test conditions are usually: 270°arc, 180 cycles/minute, 4 lb load, ½ inch width specimen.

Modacrylic: A synthetic polymerized fiber that contains less than 85% acrylonitrile.

Mullen Burst Test: Evaluation of the rupture strength of paper or cloth using a hydraulic diaphragm. Expressed as the pressure per square inch that will burst a two inch diameter test specimen.

Multifilament: Yarn composed of several filaments, which are continuous strands of fiber of indefinite length.

NAAQS: National Ambient Air Quality Standards (USA Clean Air Act)

Napping: A scraping of the filter-medium surface that raises the surface fibers. The rupturing of the filling yarns to produce a fleecy surface on woven fabrics.

Needled felt: A felt constructed by the use of barbed needles moving up and down, pushing and pulling the fibers to form an interlocking of adjacent fibers.

Negative Pressure Baghouse: A system where fan is located after the baghouse on the clean air side, pulling air through the system.

Nonwoven felt: felt made either by needling, by matting of fibers, or by compressing with a bonding agent for permanency.

NSPS: New Source Performance Standards.

Null Period: The period during the cleaning sequence in which neither cleaning nor on-line filtering is occurring, causing a static environment to allow dust to drop into hopper or discharge area.

Opacity: The visual density of stack emissions, usually expressed in percent.

OSHA: Occupational Safety and Health Act. (USA)

Outside Collection: Systems that are designed to collect dust on the outside of the filter. (Pulse-jet/plenum pulse baghouses and some reverse air and shaker baghouses.)

Particle resistivity: The electrical resistance (inverse of conductivity) of fly ash particles expressed in units of ohm-cm.

Particle size: The diameter in μm (micrometers) of a particular piece of particulate matter.

Particulate matter: Solid or liquid particles entrained in a gas stream.

Penthouse: An enclosure over the precipitator, which contains the high voltage insulators.

Permeability: A measure of fabric porosity or openness, expressed in cubic feet of air per minute per square foot of fabric at a 0.5 in. w.c. (13 mm w.c.) pressure differential.

pH: A value indicating the acidity or alkalinity of a material. A pH of 7.0 is neutral; less than 7.0 is acidic; and more than 7.0 is alkaline or basic.

Photohelic Gauge: An instrument used to measure differential pressure that has adjustable set points for starting and stopping the filter cleaning in order to maintain the desired range of operating differential pressure.

Plain weave: A weave in which each warp yarn passes alternately over each filling yarn.

Pitot Tube: A common instrument used for velocity determination in ducts leading to and from air pollution control devices.

Plenum: An enclosure typically fabricated of stiffened sheet metal; casing; housing (See clean air plenum).

Ply: Two or more yarns joined together by twisting

PM: Particulate Matter

Poppet Valve: A valve utilized to isolate compartments and/or allow for reverse airflow through individual compartments. Typically constructed of a flat wafer plate assembled on the end of the shaft of an air cylinder, which drives the wafer (poppet) into position against a seat or ring, which causes the seal.

Porosity: Sometimes erroneously used as a synonym for permeability. Originally a designation for the amount of air in a fabric, i.e. blankets.

Positive Pressure System: A system with a fan located prior to the collector on the dirty side, pushing air through the system.

PPB/PPM: Parts Per Billion/Parts Per Million

Precipitator Current: The rectified or unidirectional average current to the precipitator.

Precipitator Gas Velocity: A figure obtained by dividing the volume rate of gas flow through the precipitator by the effective cross-sectional area of the precipitator. Gas velocity is generally expressed in terms of ft./sec. And is computed as follows:

Velocity = Gas volume (ACFM) divided by Effective cross-section area (ft²) or actual meters cubed divided by sq. meters (Effective cross-section is construed to be the effective field height x width of gas passage x number of passages.)

Precoat: Material added to the air stream on initial process startup to aid in establishing an initial dustcake on the filter bags.

Pressed felt: A type of felt manufactured by pressing fibers into a scrim.

Pressure Drop: A measure of the resistance the gas stream encounters as it flows through a collection system. May refer to pressure differential across the tubesheet, across the entire collector or the pressure drop across the entire system. Commonly referred to as Delta P (ΔP); see differential pressure.

Primary Current: The current in the transformer primary.

Primary Voltage: The voltage across the primary of the transformer.

PSD: Prevention of Significant Deterioration (USA Clean Air Act)

PSI: Pounds per square inch; a unit of pressure; 1 psi equals 27.7 in. (70.35 cm) water gauge or 2.04 in. (5.18 cm) mercury (Hg).

Pulse Cycle: On a pulse-jet baghouse, the interval of time between one pulsing of a row of bags and the next pulsing of the same row.

Pulse Duration (On-time): The length of time a pulse lasts, generally described as the length of time the electrical signal holds the solenoid pilot valve open. However, due to mechanical losses, the time the diaphragm is open will vary.

Pulse Interval (Off-time): Elapsed time between pulses in a pulse-jet collector.

Pulse Jet: Generic name given to all pulsing collectors.

Pyramid Hopper: A hopper shaped like an inverted pyramid.

Radiant Cooling: A method of reducing exhaust gas stream temperature, which involves the use of long uninsulated ducts that allow the gas stream to cool as heat radiates from the duct walls.

Rapper Insulator: A device to electrically isolate discharge electrode rappers yet mechanically transmit forces necessary to create vibration or shock in the high voltage system.

Rappers (Both CE and DE): May be vibrator or impact (shock) type, the latter preferred. Function is to remove collected dust from collecting plate electrodes and from discharge electrodes. Individual electric type, single impact rappers. The function is to accelerate the metal electrodes away from the deposited material.

Rapping Intensity: Acceleration in multiples of acceleration due to gravity measured at various points on collecting or discharge electrodes. Measured forces should be specified as longitudinal or transverse.

Rapping Re-entrainment: Dust, which has been rapped from the electrodes and is carried back into the gas stream. This process can substantially lower the collecting efficiency of a precipitator.

Re-entrainment: The phenomenon whereby dust, which has been removed from a filter is returned to the air stream. It occurs when dust is cleaned from a filter and then caught again by an upward moving air stream, which re-deposits it on a filter.

Resistance: In airflow, caused by friction of the air against any surface or by changing the momentum of the gas.

Resistivity: The electrical resistance that a meter cube of a substance (usually of packed dust) has when measured between opposite faces of the cube. The units are ohm-meters (or ohm-centimeters - a resistivity of 1 cm is equivalent to a resistivity of 100).

Reverse-air Baghouse: A unit employing reverse flow flushing air to clean the dust from the bags.

Rings: metal bands sewn in the bag at various intervals to prevent bag from total collapse while cleaning.

Rotary Airlock Valve: A material handling valve that transfers material in pockets formed by vanes mounted on a turning shaft similar to a paddle wheel. This star wheel shaped shaft rotates in close fitting housing that provides a dust-tight seal while still transferring material through the valve.

Rotating Vane Anemometer: A windmill-like device, small enough to be held in the hand, for measuring air speed and direction.

Safety Ground Device: A device for physically grounding the high voltage system prior to personnel entering the precipitator. The most common type consists of a conductor, one end of which is grounded to the casing, the other end attached to the high voltage system using an

insulated operating lever or handle.

Saturable rectifier: A variable impedance device to regulate the current at the transformer primary.

SCA: Specific collecting area, given by the square feet of collecting area per 1000 acfm of flue gas.

SCFM: Standard cubic feet per minute. The volume of dry gas flow per minute at standard temperature and pressure conditions (70°F or 21°C @ sea level). Other standards such as 32°F and 29.92 inches of mercury (chemical engineers) and 60°F, 30 inches of mercury saturated (American Gas Assn.) may be used. Always specify which standard.

Scouring (ESP): The process in which collected dust is removed from the collecting electrodes by the gas flow. Usually associated with a region of high velocity.

Scouring (FF): Process of removing the starches and lubricants, which were applied to fabric to protect it during weaving. Fabrics that have been scoured are generally softer and better withstand clean action. Same as coronizing.

SCR: Silicon controlled rectifier.

Scrim: An open mesh, plain-weave cloth used as the base in some felted fabrics.

Secondary Current: The current in the transformer/rectifier secondary is the main energy source.

Secondary Voltage: The voltage as indicated by AC voltmeter across the secondary of the transformer.

Seeding: The application of a relatively coarse, dry dust to a bag before startup to provide an initial filter cake for immediate high efficiency and to protect bags from blinding. Also called precoating.

Selvage: The binding on the lengthwise edge of a woven fabric.

Shaker baghouse: A unit wherein cleaning is accomplished by shaking the bags.

Silicon Controlled Rectifier (SCR): A semi-conductor, electronic switch for voltage regulation; two are used in an inverse parallel arrangement for each half cycle, positive and negative. Also called thyristor.

Silicone finish: A treatment with silicone to provide a slick finish for improved dust release.

Sine Wave: A waveform consisting of a positive and negative half cycle, each one lasting 8.33 milliseconds. Based on U.S. power generation at a 60 hertz cycle or European at 50 hertz.

Singeing (Singed Finish): The process of burning off or melting fibers protruding from fabric surface by passing it over a flame or heated copper plates. Singeing gives the fabric a smoother surface, which aids in dustcake release, particularly in applications where moisture is a problem.

SIP: State Implementation Plan (UUSA Clean Air Act)

Sizing: A protective coating applied to yarn to ensure safe handling.

Slip: The proportion of dust escaping from the precipitator outlet. Slip may be expressed as a decimal fraction, or a percentage. It is usually estimated by dividing the outlet dust burden by the inlet dust burden. Also used to quantify conditioning materials such as sulfur trioxide and ammonia leaving the precipitator.

Slippage: The movement of yarns in a fabric due to insufficient interfacing.

Sneakage: The process in which dust-laden gas escapes through the treatment zone, either through the top, bottom or around the sides. Each percent of gas sneakage reduces the attainable precipitator collecting efficiency by almost one percent.

Solenoid Valve: Often times referred to as a "pilot valve", it is an electromechanical plunger energized to either a "normally closed" or "normally open" position to allow for relief of air pressure. In a baghouse, the solenoid valve is normally used to activate a compressed air device.

Space-Charge: The charge present (as dust particles, gas ions, and free electrons) in the space between the electrodes. Space-charge modifies the local electric field in an electrostatic precipitator in a way analogous to spacecharge modifying the field inside a thermionic diode. The space-charge strengthens the field near the collecting electrode (anode) and weakens the field near the discharge electrode (cathode).

Spark: A short, self-extinguishing discharge from the high voltage system to the grounded system. Sparks effectively cause the gas stream to act as a conductor.

Specific Collecting Area (SCA): A figure obtained by dividing total effective collecting surface of the precipitator by gas volume expressed in thousands of actual cubic feet per minute. In the metric system it is expressed as square meters per thousand actual cubic meters per hour.

Specific Corona Power: The quotient of the total corona power of all precipitator bus sections divided by the total gas volume handled by the precipitator, multiplied by 1000. Units are expressed as watts/1000 acfm.

Specific Resistance Coefficient of the Filter Cake: An indicator of how rapidly pressure drop increases during filtration.

Spray Tower Cooler (Conditioning Tower): A tower or cylinder into which a hot gas stream enters and water is sprayed. As the water evaporates, the gas stream is cooled to the desired exit

temperature by adiabatic cooling.

Spun fabric: fabric woven from staple spun fiber; same as staple.

Spunbonded: A non-woven fabric formed by producing, laying and self-bonding a web of filamentous material in one continuous set of processing steps. Usually made of polyester, polyamides or olefins.

Staple fiber: Short fiber cut to specific length in synthetics, 1.5 in., 2 in., 2.25 in., etc. Also, natural fibers of a length characteristic of fiber, animal fibers being the longest.

Sweepage: Sweepage is the process by which gases passing beneath the electrodes of a precipitator pick up dust from the hoppers and carry it out of the precipitator. Sweepage can severely limit precipitator efficiency and is usually controlled by means of baffles.

Tensile Strength: The force required to pull apart the fabric; this is designated by the measure of resistance to a testing machine (in pounds) that a fabric provides before the material breaks. The test strip width depends on the type of fabric.

Tenter frame: A machine for drying cloth under tension (Tentering: also called framing).

Texturized Yarn: Filament glass yarn that has been processed by high pressure air passing through the yarn to open of the yarn bundle, providing more surface area.

Thread count: The number of warp and filling yarns in a fabric.

Throw: A process of doubling or twisting fibers into a yarn of the desired size and twist.

T/R (TR): Transformer rectifier.

TR Set: Consisting of an oil or liquid insulation filled tank containing the high voltage transformer, a silicon diode, full-wave (FW) bridge rectifier assembly and usually a high voltage resistance divider calibrated for indicating the ESP operating voltage on an external kilovolt (KV) meter. On top of the tank is the high voltage output bushing, which is connected via pipe and guard to the HT frame of a typical ESP section. The TR Sets are located on the ESP roof. A nameplate on the tank specifies all connections and ratings. A tank with two HV bushings is equipped for HW (half-wave) energization - rarely used in modern ESPs.

Transformer/Rectifier: A unit comprising a transformer for stepping up normal service voltages to voltages in the kilovolt range, and a rectifier operating at high voltage to convert AC to unidirectional current (DC).

Treatment Time: A figure, in seconds, obtained by dividing the effective length in feet of a precipitator by the precipitator gas velocity figure calculated above. The length of time it takes process gas to move through the treatment zone.

TRI: Toxic Release Inventory

Tubesheet (Cell Plate): The steel plate with holes to which the open ends of bags and cages are connected; separates the clean air and dirty air sections of the baghouse.

Turning Vanes: A gas distribution device in which vanes in ductwork or transition guide the gas and dust flow to minimize pressure drop and control the velocity and dust concentration contours.

Turnkey: Complete APC system including all dust pickups, ducting, dust discharge auxiliaries and all equipment, which is part of the dust collection system.

Twill weave: Warp yarns floating over or under at least two consecutive picks from lower left to upper right, with the points of intersection moving one yarn outward and upward or downward on succeeding picks, causing diagonal lines in the cloth.

Twist: The number of complete spiral turns in a yarn, in a right or left direction, i.e., "Z" or "S", respectively.

U-Tube Manometer: (see Manometer)

Upper Weather Enclosure: A non-gas-tight enclosure on the roof of the precipitator to shelter equipment (T/R sets, rappers, purge air fans, etc.) and maintenance personnel.

Venturi: A cone-shaped device located at the top of each filter in pulse-jet collectors into which compressed air is blown. A negative pressure at the top of venturi is created to help pull additional volumes of air down into the filter element during pulsing.

VOC: Volatile Organic Compounds

Voltage: The average DC voltage between the high voltage system and grounded side of the precipitator.

Warp: The yarn running lengthwise (machine direction) in a woven fabric.

Warp count: Number of warp threads per inch of width.

Water Gauge (W.G.): See "Inch of Water."

Weather enclosure: A non-gas tight enclosure on the roof of the precipitator to shelter equipment and maintenance personnel.

Weave: The pattern of weaving, i.e. plain twill, satin, etc.

Weft: Same as filling.

Weight (fabric): The nominal weight per square yard of fabric. There is always a manufacturing tolerance on either side of this average weight, which may range from 3% to 8% depending on the product. Example: A 16 oz. (453.6 g) polyester felt has a weight tolerance ± 1 oz. (28.5g).

Woof: Same as filling.

Wovens: Filter media fabrics constructed solely by weaving or interlacing yarns more or less at right angles into a uniform structure.

Yarn: A term for an assemblage of fibers or filaments forming a strand, which can be woven or otherwise formed into a textile material.

Yarn Size (Denier or Count): A relative measure of fineness or coarseness of yarn. The higher the denier of a filament year, the coarser (heavier) the yarn is. Count is the number of yarns in a weave pattern per lineal inch.