Glossary of Chemical Process Terms

ABSORPTION

Definition 1: A process in which a gas mixture contacts a liquid solvent and component(s) of the gas dissolves in the liquid.
Definition 2: The process by which a substance in one state becomes incorporated into another. Unlike adsorption, it permeates the bulk.

ADIABATIC

Definition 1: A process in which no heat is transferred between the process system and its surroundings.
Definition 2: A thermodynamic process where no heat or mass is exchanged; only work is done.

ADSORPTION

Definition 1: A process in which a gas or liquid mixture contacts a solid and components adhere to the surface of the solid.
Definition 2: The adhesion of molecules to a surface, forming a film of adsorbate; differs from absorption as it's a surface phenomenon.

BAROMETER

Definition 1: A device that measures atmospheric pressure.
Definition 2: An instrument used to measure air pressure. Useful in forecasting weather and analyzing pressure systems.

BOILER

Definition 1: A process unit where boiler feedwater passes through tubes in a combustion furnace and gets converted into steam.
Definition 2: A closed vessel where fluid (usually water) is heated. Used in heating, power generation, and sanitation.

Boiling Point

Definition 1: For a pure species, it is the temperature at which the liquid and vapor phases coexist at a given pressure.
Definition 2: The temperature at which a liquid's vapor pressure equals the surrounding pressure, leading to vaporization.

Bubble Point

Definition 1: The temperature at which the first vapor bubble appears when heating a liquid mixture at constant pressure.
Definition 2: In thermodynamics, the point where the first vapor bubble forms in a liquid mixture. Useful in distillation design.

Calibration

Definition 1: A process in which an instrument measures known variable values to create a calibration curve.
Definition 2: Comparison of device output with known standards to ensure measurement accuracy. Often traceable to national standards.

Catalyst

Definition 1: A substance that significantly increases the rate of chemical reaction, although it is neither a reactant nor a product.
Definition 2: Catalysts are not consumed during reactions and act repeatedly. Often used in small quantities in industrial processes.

Compressibility Factor

Definition 1: $z = PV/nRT$ for a gas. If $z = 1$, the gas behaves ideally.
Definition 2: Describes deviation of a real gas from ideal behavior. It's the ratio of molar volume of a real gas to that of an ideal gas under same conditions.

Compressor

Definition 1: A device that raises the pressure of a gas.
Definition 2: Mechanical device that increases gas pressure by reducing its volume. Commonly used in industrial and domestic applications.

CONDENSATION

Definition 1: Process in which a gas is cooled or compressed, causing some components to liquefy.
Definition 2: Change from gas to liquid phase, reverse of vaporization. Common in water cycle and atmospheric processes.

CRYSTALLIZATION

Definition 1: Cooling a liquid solution or evaporating solvent to form solid crystals.
Definition 2: Formation of solids with organized structures (crystals) through cooling, evaporation, or deposition.

DECANTER

Definition 1: Device where liquid-liquid or liquid-solid phases separate by gravity.
Definition 2: Vessel used to allow sediment to settle or separate layers, often in chemical or beverage industries.

DEGREES OF FREEDOM

Definition 1: Number of variables that must be specified to determine the state of a system.
Definition 2: Number of independent parameters that define a system's configuration.

DEW POINT

Definition 1: Temperature at which first liquid droplet forms from a gas mixture when cooled.
Definition 2: Temperature at which air becomes saturated with water vapor and dew begins to form.

DISTILLATION

Definition 1: Separation process involving heating and condensation to separate mixture components based on volatility.
Definition 2: Physical process separating substances via selective boiling and condensation. It is widely used in industries.

DRYING

Definition 1: Heating a wet solid or contacting it with hot gas to evaporate moisture.
Definition 2: Mass transfer process removing solvent (usually water) from materials, often final step before packaging.

ENTHALPY

Definition 1: Property defined as H = U + PV where H is enthalpy, U is internal energy, P is pressure, V is volume.
Definition 2: Thermodynamic quantity representing total heat content of a system at constant pressure.

EVAPORATION

Definition 1: Vaporization process for liquids or mixtures resulting in vapor formation.
Definition 2: Surface phenomenon where molecules escape liquid phase to form gas; causes evaporative cooling.

EXTRACTION

Definition 1: Liquid-liquid process where a solute transfers from one solvent to another immiscible solvent.
Definition 2: Separation process using solubility differences between solvents. Includes techniques like solid-phase and supercritical fluid extraction.

FILTRATION

Definition 1: Separation of solids from liquids using a porous medium (filter).
Definition 2: Physical process separating components based on size using a barrier. Common in water treatment and labs.

FLASH VAPORIZATION

Definition 1: High-pressure liquid exposed to lower pressure causing partial vaporization.
Definition 2: Sudden vapor formation due to pressure drop; used in refrigeration and separation processes.

HEAT

Definition 1: Energy transferred between systems due to temperature difference.
Definition 2: Form of energy transfer that alters internal energy; flows from hot to cold bodies.

HEAT EXCHANGER

Definition 1: Device where heat is transferred between two fluids across a barrier.
Definition 2: System used in heating/cooling applications in industries, air conditioning, and engines.

INTERNAL ENERGY

Definition 1: Total microscopic energy possessed by a system's molecules.
Definition 2: Thermodynamic property accounting for energy within a system excluding kinetic and potential energy of bulk motion.

MEMBRANE

Definition 1: Thin film through which certain species in a process stream can permeate.
Definition 2: Selective barrier allowing some particles to pass. Used in water treatment, bioprocessing, and gas separation.

OVERHEAD PRODUCT

Definition 1: Product stream that exits from the top of a distillation column.
Definition 2: Top stream often condensed to liquid; rich in volatile components.

PUMP

Definition 1: Device used to move liquids or slurries from one location to another.
Definition 2: Mechanical device transferring fluids using kinetic energy. Types include centrifugal, gear, and piston pumps.

SCRUBBER

Definition 1: Absorption column designed to remove undesirable gas components.
Definition 2: Air pollution control device removing particulates and gases from industrial exhaust streams.

SHAFT WORK

Definition 1: Work transferred to/from a system not by fluid flow but via a rotating shaft.
Definition 2: Energy interaction involving mechanical devices like turbines and compressors.

STACK GAS

Definition 1: Gas exiting a combustion furnace.
Definition 2: Exhaust gases released through flue or stack; also called flue gas.

STRIPPING

Definition 1: Process where a gas removes dissolved components from a liquid.
Definition 2: Separation process using vapor to remove solutes from liquids in packed or trayed columns.

VAPOR PRESSURE

Definition 1: Pressure exerted by a vapor in equilibrium with its liquid at a given temperature.
Definition 2: Measure of a liquid's evaporation rate. High vapor pressure indicates volatility.

VOLUME PERCENT

Definition 1: Percentage of total volume occupied by a component in liquid mixtures.
Definition 2: Concentration term expressing solute volume in 100 units of solution. Used in mixtures like alcohol-water.

WORK

Definition 1: Energy transferred from a system via motion against a force, excluding heat transfer.
Definition 2: Thermodynamic concept describing energy transfer due to force acting over a distance.