ABSOLUTE – A measure having as its zero point or base the complete absence of the entity being measured.

ABSOLUTE PRESSURE (psia) – The pressure above absolute zero, the sum of atmospheric and gauge pressure.

ACCUMULATOR – A container in which fluid is stored under pressure as a source of fluid power. It also absorbs shocks and surges and smoothes out operation.

ACTUATOR – A device for converting hydraulic energy into mechanical energy. A motor or cylinder.

AERATION – Air in the hydraulic fluid. Excessive aeration causes the fluid to appear milky and components to operate erratically because of the compressibility of the air trapped in the fluid.

AMPLITUDE OF SOUND – The loudness of a sound.

ANNULAR AREA – A ring shaped area – often refers to the net effective area of the rod side of a cylinder piston, i.e., the piston area minus the rod area.

ASTM – American Society for Testing Materials.

ATMOSPHERE (ONE) – A pressure measure equal to 14.7 psi.

ATMOSPHERIC PRESSURE–Pressure on all objects in the atmosphere because of the weight of the surrounding air. At sea level, about 14.7 psi absolute.

BACK CONNECTED – A condition where port connections are on normally unexposed surfaces of hydraulic equipment. (Gasket mounted units are back connected.)

BACK PRESSURE – A pressure in series. Usually refers to pressure existing on the discharge side of a load. It adds to the pressure required to move the load.

BAFFLE – A device, usually a plate, installed in a reservoir to separate the pump inlet from return lines. The baffle also aids fluid cooling.

BAR – A unit of pressure based on 105 Newtons per square meter, equal to 100 kPa (kilopascals), approx. equal to 14.5 psig.

BERNOULLI PRINCIPLE – An increase in velocity causes a decrease in pressure.

BLEED-OFF – To divert a specific controllable portion of pump flow directly to a reservoir.

BREATHER – A device which permits air to move in and out of a container or component to maintain atmospheric pressure.

BSPP – British Standard Parallel Pipe.

BSPT – British Standard Pipe Thread.

BY-PASS – A secondary passage for fluid flow.

CARTRIDGE –

- The replaceable element of a fluid filter.
- The pumping unit from a vane pump, composed of the rotor, ring, vanes and one or both side plates.
- A removable valve element that fits into a cavity in a hydraulic component, e.g. manifold.

CASE DRAIN LINE – A line conducting fluid from a component housing to the reservoir.

CAVITATION – A localized gaseous condition within a liquid stream which occurs where the pressure is reduced to the vapor pressure.

CELSIUS – A temperature scale. 0° Celsius is the freezing point of water.

CENTISTOKES (cSt) – A unit of kinematic viscosity. 1 cSt = 10-2 square centimeters per second (cm^2/s).

CHAMBER – A compartment within a hydraulic unit. May contain elements to aid in operation or control of a unit. Examples: spring chamber, drain chamber, etc.

CHANNEL – A fluid passage, the length of which is large with respect to its cross-sectional dimension.

CHARGE (supercharge) –

- To replenish a hydraulic system above atmospheric pressure.
- To fill an accumulator with fluid under pressure (see pre-charge pressure).

CHARGE PRESSURE – The pressure at which replenishing fluid is forced into the hydraulic system (above atmospheric pressure).

CHECK VALVE – A valve which permits flow of fluid in one direction only.

CIRCUIT – The complete path of flow in a hydraulic system including the flow-generating device.

CLOSED CENTER – The condition where pump output is not unloaded to tank in the center or neutral operating condition.

CLOSED CIRCUIT – A piping arrangement in which pump delivery, after passing through other hydraulic components, bypasses the reservoir and returns directly to pump inlet.

COMPENSATOR CONTROL – A displacement control for variable pumps and motors which alters displacement in response to pressure changes in the system as related to its adjusted pressure setting.

COMPONENT – A single pneumatic or hydraulic unit.

COMPRESSIBILITY – The change in volume of a unit volume of a fluid when it is subjected to a unit change in pressure.

CONTROL – A device used to regulate the function of a unit (see Hydraulic Control, Manual Control, Mechanical Control and Compensator Control).

COOLER – A heat exchanger used to remove heat from the hydraulic fluid.

COUNTERBALANCE VALVE – A valve which maintains resistance to flow in one direction but permits free flow in the other. Usually connected to the outlet of a vertical double-acting cylinder to prevent uncontrolled falling, dropping or cavitation.

CRACKING PRESSURE – The pressure at which a pressure actuated valve begins to pass fluid.

CUSHION – A device sometimes built into the ends of a cylinder which restricts the flow of fluid at the outlet port, thereby slowing the motion of the piston rod.

CYLINDER – A device which converts fluid power into linear mechanical force and motion. It usually consists of a movable element such as a piston and piston rod, plunger rod, plunger or ram, operating within a cylindrical bore.

DELIVERY – The volume of fluid discharged by a pump in a given time, usually expressed in gallons per minute (gpm).

DELTA P (ΔP) – The change in pressure between two points in a system, such as in a passageway or between the inlet and outlet of a component.

DEMULSIFY – To separate water from oil.

DE-VENT – To close the vent connection of a pressure control valve permitting the valve to function at its adjusted pressure setting.

Fluid Power Glossary

DIRECTIONAL VALVE – A valve which selectively directs fluid to or prevents fluid from desired channels.

DISPLACEMENT – The quantity of fluid which can pass through a pump, motor or cylinder in a single revolution or stroke.

DOUBLE ACTING CYLINDER – A cylinder in which fluid force can be applied in either direction.

DRAIN – A passage in, or a line from, a hydraulic component which returns leakage fluid independently to a reservoir or to a vented manifold.

EFFICIENCY – The ratio of output to input. Volumetric efficiency of a pump is the actual output flow divided by the theoretical or design flow. The overall efficiency of a hydraulic system is the output power divided by the input power. Efficiency is usually expressed as a percent.

ELECTRO-HYDRAULIC SERVO VALVE – A directional type valve which receives a variable or controlled electrical signal and which controls or meters hydraulic flow.

EMULSION – A fluid formed by the suspension of one liquid in another.

ENERGY – The ability or capacity to do work. Measured in units of work.

FEEDBACK (or feedback signal) – The output signal from a feedback element.

FILTER – A device whose primary function is the retention of insoluble contaminants from a fluid by a porous media.

FLOODED – A condition where the pump inlet is charged by placing the reservoir oil level above the pump inlet port.

FLOW CONTROL VALVE – A valve which controls the rate of oil flow.

FLOW RATE – The volume, mass or weight of a fluid passing through a conductor per unit of time. Normally expressed in gallons per minute (gpm).

FLUID –

- A liquid or gas.
- A liquid that is specially compounded for use as a power transmitting medium in a hydraulic system.

FORCE – Any push or pull measured in units of weight. In hydraulics, total force is expressed by the product of pressure and the area of the surface on which the pressure acts. F = P x A.

FOUR-WAY VALVE – A directional valve having four flow paths.

FREQUENCY – The number of times an action occurs in a unit of time. Frequency is the basis of all sound. A pump or motor's basic frequency is equal to its speed in revolutions per second multiplied by the number of pumping chambers.

FRONT CONNECTED – A condition wherein piping connections are on normally exposed surfaces of hydraulic components.

FULL FLOW – In a filter, the condition where all the fluid must pass through the filter element.

GAUGE PRESSURE (psig) – A pressure scale which ignores atmospheric pressure. Its zero point is atmospheric pressure (14.7 psia at sea level).

gph (gallons per hour) - Unit of measure representing volume of liquid flow.

gpm (gallons per minute) - Unit of measure representing volume of liquid flow.

HEAD – The height of a column of fluid above a given point expressed in linear units. Head is often used to indicate gauge pressure. The pressure is equal to the height times the density of the fluid.

HEAT – The form of energy that has the capacity to create warmth or to increase the temperature of a substance. Any energy that is wasted or used to overcome friction is converted to heat. Heat is measured in calories or British Thermal Units (BTUs). One BTU is the amount of heat required to raise one pound of water one degree Fahrenheit.

HEAT EXCHANGER – A device which transfers heat through a conducting wall from one fluid to another.

HORSEPOWER (hp) – The power required to lift 550 pounds one foot in one second or 33,000 pounds one foot in one minute. A horsepower is equal to 746 watts or to 2544 BTUs per hour.

HYDRAULIC BALANCE – A condition of equal opposed hydraulic forces acting on a part in a hydraulic component.

HYDRAULIC CONTROL – A control which is actuated by hydraulically induced forces.

HYDRAULICS – Engineering science pertaining to liquid pressure and flow.

HYDRO – Greek word for water.

HYDRODYNAMICS – Engineering science pertaining to the energy of liquid pressure and flow.

HYDROSTATICS – Engineering science pertaining to the energy of liquids at rest.

INTENSIFIER – A device which converts low pressure fluid power to higher pressure fluid power.

JIC – Joint Industry Conference.

37° JIC – Refers to a JIC standard that establishes the 37° flare for use in plumbing with steel tubing. A 45° flare is commonly used for copper tube. This distinction assists in preventing the accidental use of low pressure fittings, designed for use with copper tubing, in hydraulic systems where pressures merit steel tubing and appropriate fittings.

KINETIC ENERGY – Energy that a substance or body has by virtue of its mass (weight) and velocity.

LAMINAR (flow) – A condition where the fluid particles move in continuous parallel paths. Streamline flow.

LEVERAGE – A gain in output force over input force by sacrificing the distance moved. Mechanical advantage or force multiplication.

LIFT – The height a body or column of fluid is raised; for instance, from the reservoir to the pump inlet. Lift is sometimes used to express a negative pressure or vacuum. The opposite of head.

LINE – A tube, pipe or hose which acts as a conductor of hydraulic fluid.

LINEAR ACTUATOR – A device for converting fluid power into linear motion. A piston or ram.

LOAD SENSING – A type of hydraulic circuit where the actual pressure required by the load is transmitted to the control elements such as valves and pumps. This typically allows the system to deliver only the pressure and flow required, usually saving energy.

MANIFOLD – A fluid conductor which provides multiple connection ports.

MANUAL CONTROL – A control actuated by the operator, regardless of the means of actuation. Example: Lever or foot pedal control for directional valves.

MANUAL OVERRIDE – A means of manually actuating an automatically-controlled device.

MECHANICAL CONTROL – Any control actuated by linkages, gears, screws, cams or other mechanical elements.

METER – To regulate the amount or rate of fluid flow.

METER-IN – To regulate the amount of fluid flow into an actuator or system.

METER-OUT – To regulate the flow of discharge fluid from an actuator or system.

MICRON (µ) – Size of a particle one millionth of a meter.

MICRON RATING – The size of the particles a filter will remove.

MOTOR – A rotary motion device which changes hydraulic energy into mechanical energy; a rotary actuator.

NEWTON METER (Nm) – Metric unit of measure representing force.

NPT – National Pipe Taper (requires pipe sealant).

NPTF – National Pipe Taper Fuel or Dry Seal Pipe Threads (may not require pipe sealant).

OPEN CENTER – A condition where pump delivery circulates freely to tank in the center or neutral position.

ORIFICE – A restriction, the length of which is small in respect to its cross-sectional dimensions.

OXIDATION – The chemical reaction of elements with oxygen which cause corrosion or deterioration.

PASCAL – Unit of pressure in metric system, usually expressed in kPa (kilopascals). 1 kPa = 0.01 bar = 0.145 psi.

PASSAGE – A fluid conducting path which lies within or passes through a component.

PI (¶) – Ratio of circumference of circle to diameter. Numerically expressed as approximately 3.1416.

PILOT PRESSURE – Auxiliary pressure used to actuate or control hydraulic or pneumatic components.

PILOT VALVE – An auxiliary valve to control the operation of another valve. The controlling stage of a 2-stage valve.

PISTON – A cylindrically shaped part which fits within a cylinder and transmits or receives motion by means of a connecting rod.

PLUNGER – A cylindrically shaped part with only one diameter that is used to transmit thrust (also called a ram).

POPPET – That part of certain valves which prevents flow when it closes against a seat.

PORT – An internal or external terminus of a passage in a component.

POSITIVE DISPLACEMENT – A characteristic of a pump or motor which has the inlet positively sealed from the outlet so that fluid cannot recirculate in the pump or motor.

POTENTIAL ENERGY – The energy level change which results when an object is raised to a new height.

POTENTIOMETER – A control element in the servo-system which measures and controls electrical potential.

POWER – Work per unit of time. Measured in horsepower (hp) or watts.

ppm (parts per million) - Unit of measure representing the number of particles in a given body.

PRECHARGE PRESSURE – The pressure of compressed gas in an accumulator prior to the admission of liquid.

PRESSURE – Force per unit area; usually expressed in psi, bar, or kPa.

PRESSURE DIFFERENTIAL (PRESSURE DROP) –The difference in pressure between any two points of a system or a component.

PRESSURE LINE – The line carrying the fluid from the pump outlet to the pressurized port of the actuator.

PRESSURE OVERRIDE – The difference between the cracking pressure and the full flow pressure of a valve.

PRESSURE REDUCING VALVE – A valve which limits the maximum pressure at its outlet regardless of the inlet pressure.

psia (pounds per square inch absolute) – See Absolute Pressure.

psig (pounds per square inch gauge) – See Gauge Pressure.

PUMP – A device which converts mechanical force and motion into hydraulic fluid flow.

RAM – A single acting cylinder with a plunger rather than a piston and rod. The plunger in a ram type cylinder.

RECIPROCATION – Back and forth straight line motion or oscillation.

RELIEF VALVE – A pressure operated valve which bypasses pump delivery to the reservoir, limiting system pressure to a predetermined maximum value.

REPLENISH – To add fluid to maintain a full hydraulic system.

RESERVOIR – A container for storage of liquid in a fluid power system.

RESTRICTION – A reduced cross-sectional area in a line or passage which produces a pressure drop.

RETURN LINE – A line used to carry exhaust fluid from the actuator back to a tank.

REVERSING VALVE – A four-way directional valve used to reverse a double acting cylinder or reversible motor.

ROTARY ACTUATOR – A device for converting hydraulic energy into rotary motion.

SAE – The Society of Automotive Engineers.

SAE O-Ring – Refers to a style of threaded connection that employs straight thread to secure the fitting and an o-ring to provide sealing. This style of connection is very popular for use in hydraulic systems and can be removed and reinstalled numerous times without damaging the sealing ability of the connection. Tapered pipe thread is actually damaged to make a fluid tight seal. Vibration and repeated connection of tapered pipe threaded connections will always result in leaks. An o-ring style or a 37° JIC flared connection are the best choices in preventing leaks.

scfm (standard cubic feet per minute) - Unit of measure representing volume of gas flow.

Fluid Power Glossary

SEQUENCE –
- The order of a series of operations or movements.
- To divert flow to accomplish a subsequent operation or movement.

SEQUENCE VALVE – A pressure operated valve which diverts flow to a secondary actuator while holding pressure on the primary actuator at a predetermined minimum value after the primary actuator completes its travel.

SERVO MECHANISM – A mechanism subjected to the action of a controlling device which will operate as if it were directly actuated by the controlling device, but capable of supplying power output many times that of the controlling device, this power being derived from an external and independent source.

SERVO VALVE –
- A valve which controls the direction and quantity of fluid flow in proportion to an input signal.
- A follow valve.

SIGNAL – A command or indication of a desired position or velocity.

SINGLE ACTING CYLINDER – A cylinder in which hydraulic energy can produce thrust or motion in only one direction. (Can be spring or gravity returned.)

SKIVING – Cutting, splitting or paring away the outer layer of a flexible hose.

SLIP – Internal leakage of hydraulic fluid.

SPOOL – A term loosely applied to almost any moving cylindrically shaped part of a hydraulic component which moves to direct flow through the component.

STRAINER – A coarse filter.

STROKE –
- The length of travel of a piston or plunger.
- To change the displacement of a variable displacement pump or motor.

SUBPLATE – An auxiliary mounting device for a hydraulic component providing a means of connecting piping to the component.

SUCTION LINE – The hydraulic line connecting the pump inlet port to the reservoir.

SUPERCHARGE – (See Charge).

SURGE – A momentary rise of pressure in a circuit.

SUS (Saybolt Universal Seconds) – A measure of viscosity, the time required for a given fluid to flow through a standard orifice.

SWASH PLATE – A stationary canted plate in an axial type piston pump or motor which causes the pistons to reciprocate as the cylinder barrel rotates.

TANK – The reservoir.

THROTTLE – To permit passing of a restricted flow. May control flow rate or create a deliberate pressure drop.

TORQUE – A rotary force. The output torque of a fluid motor is usually expressed in pound-inches (lb-in) or Newton-Meters (Nm).

TORQUE CONVERTER – A rotary fluid coupling that is capable of multiplying torque.

TORQUE MOTOR – An electromagnetic device consisting of coils and the proper magnetic circuit to provide actuation of a spring restrained armature, either rotary or translatory.

TURBINE – A rotary device that is actuated by the impact of moving fluid against blades or vanes.

TURBULENT FLOW (TURBULENCE) – A condition where the fluid particles move in random paths rather than in continuous parallel paths.

TWO-WAY VALVE – A directional control valve with two flow paths.

UNLOAD – To release flow (usually directly to the reservoir), to prevent pressure being imposed on the system or portion of the system.

UNLOADING VALVE – A valve which bypasses flow to a tank when a set pressure is maintained on its pilot port.

VACUUM – The absence of pressure. A perfect vacuum is the total absence of pressure; a partial vacuum is some condition less than atmospheric pressure. Measured in inches of Mercury (in.Hg) with the zero point equal to atmospheric pressure.

VALVE – A device which controls fluid flow direction pressure, or flow rate.

VAPOR PRESSURE – The pressure at which the liquid and gaseous phases of a fluid are in equilibrium.

VELOCITY –
- The speed of flow through a hydraulic line. Expressed in feet per second (fps) or meters per second (m/s).
- The speed of a rotating component measured in revolutions per minute (rpm or min-1).

VENT –
- To permit opening of a pressure control valve by opening its pilot port (vent connection) to atmospheric pressure.
- An air breathing device on a fluid reservoir.

VISCOSITY – A measure of the internal friction or the resistance of a fluid to flow.

VISCOSITY INDEX – A measure of the viscosity-temperature characteristics of a fluid as referred to that of two arbitrary reference fluids.

VOLUME –
- The size of a space or chamber in cubic units.
- Loosely applied to the output of a pump in gallons per minute (gpm).

WORK – Exerting a force through a definite distance. Work is measured in units of force multiplied by distance; for example, pound-feet or joule (1 J = 1 Nm).