Johnston Boiler Company Boiler/Burner Glossary

The following is a list of common terms used when talking about boilers and burners , we hope you find it useful.

- **Absolute Pressure -** The sum of gauge pressure and atmospheric pressure.
- **Accumulation Test -** Test used to establish the relieving capacity of boiler safety relief valves.
- **Acid Dew Point** - Temperature at which acids begin to settle out of flue gases.
- **Alkalinity** - Determined by boiler water analysis. Boiler water with a pH over 7 is considered alkaline.
- **Ambient Temperature** - Temperature of the surrounding area.
- **Ampere** - Unit of measure of electrical current.
- **Anion** - Ion that has a negative electrical charge.
- **Area** - The number of unit squares equal to the surface of an object.
- **ASME Code** - Code written by the American Society of Mechanical Engineers that controls the construction, repairs and operation of boilers and their related equipment.
- **Atmospheric Pressure** - Pressure at sea level (14.7 PSI).
- **Atomization** - Process of breaking a liquid fuel stream into a mist of tiny droplets.
- **Atomize** - To break up fluids into a fine mist.
- **Boiler** - Closed vessel in which water under pressure is transformed into steam by application of heat.
- **Boiler Capacity** - Pounds of steam of BTU=s of hot water a boiler is capable of producing.
- **Boiler Horsepower** - The evaporation of 34.5 pounds of water per hour from and at a feedwater temperature of 212°F.
- **Boiler Lay-Up** - Removing a boiler from service for a period of time. A boiler can be laid-up wet or dry.
- **Boiler Room Log** - A data sheet to record pressures, temperatures of other operating conditions of a boiler on a continuous basis.
  Boiler Shutdown - A sequence of operation completed when taking a boiler off line.

- **Boiler Startup** - A sequence of operations completed when preparing a boiler for service.
- **Boiler Vent** - Valved port coming off highest part of the waterside of the boiler that is used to vent air from the boiler when it is filled. Also used to prevent a vacuum from forming when the boiler is drained.
- **Boiling Point** - Temperature at which water changes into steam.
- **Bottom Blowdown** - Periodic draining of part of the water in the boiler to remove the heavy sludge that settle to the bottom of a vessel.
- **Breeching** - Ducting from boiler flue gas outlet to stack (or chimney).
- **British Thermal Unit** - (BTU) Amount of heat necessary to raise the temperature of 1 lb. Of water 1°F.
- **By-Pass Line** - A pipeline that passes around a control. Used so a boiler can operate manually without use of the control.
- **Calibrate** - Adjusting a gauge, control or piece of equipment to conform with a test gauge, control or piece of equipment.
- **Carryover** - Particles of water that flow with steam into the system piping.
- **Cavitation** - Condition caused when a portion of water or other liquid entering the eye of a pump impeller flashes into steam bubbles. Causes pitting of pump impellers.
- **Celsius (Centigrade)** - Temperature scale commonly used with the metric system of measurements. The freezing point of water on this scale is 0° and the boiling point of water is 100° at normal atmospheric pressure.
- **Centrifugal Force** - caused by a rotating impeller that builds up in a centrifugal pump.
- **Check Valve** -One-way flow valve for fluids.
- **Combustible Material -** Any material that burns when it is exposed to oxygen and heat.
- **Combustion** - The rapid union of oxygen with an element or compound that results in the release of heat.
- **Complete Combustion** - The burning of all supplied fuel using the minimum amount of excess air.
- **Compound Gauge** - Combination pressure gauge and vacuum gauge.
- **Condensate** - Steam that has lost its heat and returned to water.
- **Condense** - Process whereby steam turns back to water after the removal of heat.
- **Conduction** - A method of heat transfer in which heat moves from molecule to molecule.
- **Continuous Blowdown** - Small stream of water that constantly drains from a boiler to control the quantities of impurities in a boiler on a continuous basis.
- **Convection** - A method of heat transfer that occurs as heat moves through a fluid.
- **Cracking Open** - Slowly opening a valve, generally to allow equalization.
- **Cross AT@** - Used in water column piping for inspection for being clean and clear.
- **Cut-In Pressure** - Automatic pressure control setting at which the boiler turns on.
- **Cut-Out Pressure** - Automatic pressure control setting at which the boiler turns off.
- **Cycle of Concentration** - Number of times solids in a particular volume of water are concentrated as compared to concentration of the solids in the original volume of water.

- **Deaerator** - Pressure vessel that removes oxygen from the feedwater before going into the boiler.
- **Dealkalizer** - Ion - Exchange unit that works exactly like a sodium zeolite water softener, but removes anions and replaces them with chloride.
- **Differential Pressure** - Difference between two pressures at different points.
- **Differential Setting** - Difference between the pressure at which the automatic pressure control turns the burner on, and the pressure at which the automatic pressure control turns the burner off.
- **Dissolved Solids** - Impurities that have passed into solution.
- **Draft** - The difference in pressures between two points that cause air or gases to flow.
- **Economizer** - Uses the gases of combustion to heat boiler feedwater.
- **Element** - A basic substance consisting of atoms.
- **Enthalpy** - Total heat in steam.
- **Erosion** - Wearing away of metal.
- **Excess Air** - Air more than the theoretical amount needed for combustion.
- **Factor of Evaporation** - Heat added to water in an actual boiler in BTU per pound and divided by 970.3.
- **Fahrenheit** - Temperature scale commonly used with the U.S. system of measurements. The freezing point of water on this scale is 32° and the boiling point of water is 212° at normal atmospheric pressure.
- **Feedwater** - Water that is supplied to a boiler.
- **Feedwater Treatment** - Using soft water and chemicals in the boiler feedwater. Protects against scale and corrosion.
- **Fire Point** - Temperature at which fuel oil burns continuously when exposed to an open flame.
- **Firetube Boiler** - Has heat and gases of combustion passing through the furnace and boiler tubes surrounded by water.
- **Firing Rate** - Amount of fuel the burner is capable of burning in a given unit of time.
- **Flame Failure** - When the burner pilot or main flame goes out on its own.
- **Flame Scanner** - Device that confirms that the pilot and main burner flame exists.
- **Flash Point** - Temperature at which fuel oil, when heated produces a vapor that flashes when exposed to an open flame.
- **Flash Steam** - Created when water at a high temperature has a sudden drop in pressure.
- **Foaming** - Rapid fluctuations of the boiler water level that can lead to priming or carryover. Caused by impurities on the surface of the boiler water.
- **Foot Pound** - Unit of measure that equals the movement of an object by a constant force (in pounds) to a specific distance (in feet).
- **Force** - Energy exerted or brought to bear on.
- **Forced Draft** - Mechanical draft produced by a fan.
- **Furnace Volume** - Amount of space available in a boiler furnace to complete combustion.
- **Gate Valve** - Valve used to shutoff or admit flow.

- **Gauge Glass** - Glass connected to a water column or directly to a boiler that allows an operator to see the water level inside a boiler.
- **Gauge Pressure** - Pressure above atmospheric pressure. Assumes atmospheric pressure being zero.
- **Gas Analyzer** - Used to analyze the gases of combustion to determine combustion efficiency.
- **Gas Leak Detector** - A device to locate gas leaks in the boiler room.
- **Gases of Combustion** - Gases produced by the combustion process.
- **Globe Valve** - Valve having a tapered rounded or flat disc held horizontally on the stem.
- **Gravity** - Natural force that makes objects on earth fall to the lowest point possible.
- **Handhole** - Small access hole, smaller than a manhole (manway), used for looking and reaching into the boiler shell during inspections.
- **Header** - Manifold that feeds several branch pipes or takes in steam or water from several smaller pipes.
- **Heat Exchanger** - Any piece of equipment where heat is transferred from one substance to another.
- **Heating Surface** - Any part of a boiler metal that has hot gases or combustion on one side and water on the other.
- **Heat Recovery System** - Equipment that is installed to reclaim heat that is normally lost.
- **Heat Transfer** - Movement of heat from one substance to another that can be accomplished by radiation conduction or convection.
- **Heating Value** - Expressed in BTU=s. Heating value of fuel varies with the type.
- **High Pressure Boiler** - A boiler that operates over a steam pressure of 15 PSI.
- **Hot Water Boiler** - Boiler that is completely full of water that produces only hot water, not steam.
- **Hydrostatic Pressure** - Water pressure per vertical foot (.433) exerted at the base of a column of water.
- **Inches of Mercury** (IN.Hg) - Unit of measure for vacuum.
- **Incomplete Combustion** - Occurs when all the fuel is not burned, resulting in the formation of smoke or soot.
- **Infrared** - Invisible light rays produced by the combustion process and detected by a flame scanner.
- **Latent Heat** - Heat in BTU that is added so boiling water at a given temperature will change into steam at the same temperature.
- **Laying Up** - Taking a boiler out of service for longer than a normal period of time.
- **Low Pressure Boiler** - A boiler that operates at a steam pressure of not more than 15 PSI.
- **Low Water** - Lower than acceptable water level in a boiler that is dangerous because it can cause overheating of a boiler.
- **Low Water Fuel Cutoff** - Device located slightly below the NOWL of a boiler that shuts off the boiler burner in the event of low water.
- **Main Steam Stop Valve** - Gate valve in the main steam line between the boiler and the steam header.

- **Makeup Water** - Water that must be added to the boiler to make up for condensate that was dumped, lost through boiler blow downs or leaks in the system.
- **Manhole** (Manway) - Hole on the steam and waterside of a boiler used to clean, inspect and repair a boiler.
- **Maximum Allowable** (MAWP) - Highest legal pressure at which a pressure vessel may be working pressure operated.
- **Modulating Pressure** - Control device that regulates the burner for a higher or lower fuel Control burning rate depending on steam pressure in the boiler.
- **Multiple-Pass Boiler -** Boilers that are equipped with a means to direct the flow of the gases of combustion so that the gases make more than one pass over the heating surfaces.
- **Natural Draft** - Caused by the difference in weight between a column of hot gases of combustion inside the chimney (stack) and a column of cold air of the same height outside the chimney.
- **Non-Condensable Gas -** Any gas that will not change into a liquid when its temperature is reduced.
- **Non-Return Valve** - Combustion shutoff and check valve that allows steam to pass out of the boiler, but a back flow of steam from a drop in pressure causes the valve to close.
- **Normal Operating Water Level** (NOWL) - Level of the boiler water at normal operation.
- **Overfiring** - Forcing a boiler beyond its designed steam producing capacity.
- **Package Boiler** - Boiler that comes completely factory assembled, with exception of those items that have to be removed from the boiler for shipment.
- **Passes** - Number of times gases or combustion flow the length of the pressure vessel as they transfer heat to the water.
- **Perfect Combustion** - Burning of all the fuel with the theoretical amount of air. Can only be achieved in a laboratory.
- **PH** - Value representing how acidic or alkaline water is.
- **Phosphates** - Chemicals that cause hardness particles to settle out as a heavy sludge.
- **Power** - Unit of measure that equals the amount of foot pounds of work in a given period of time.
- **Pneumatic System** - A system of control that uses air as the operating medium.
- **Pounds of Steam Per Hour** (LB/HR) - Unit of measure that expresses the amount of steam produced by a boiler in one hour.
- **Popping Pressure** - Predetermined pressure at which a safety relief valve opens and remains open until the pressure drops.
- **Post-Purge** - The passing of air through the boiler fireside after normal burner shutdown.
- **Pour Point** - The lowest temperature at which a fuel oil flows as a liquid.
- **Pre-Purge** - The passing of air through the boiler fireside prior to pilot and main burner flame lightoff.
- **Pressure** - Application of force commonly measured in PSI.
- **Pressure Reducing Station** - Where higher pressure steam is reduced in pressure for lower pressure needs.

- **Primary Air** - Air supplied to the burner that regulates the rate of combustion.
- **Priming** - Severe form of carryover in which large slugs of water leave the boiler with the steam.
- **Process Steam** - Steam used in a plant for manufacturing or processing purposes.
- **Products of Combustion** - Gases that are formed as a fuel is burned in a furnace.
- **Programmer** - Device that controls the burner sequence of operation.
- **Proving Pilot** - Sighting the pilot through a flame scanner to verify that the pilot is lit.
- **Pounds Per Square Inch** (PSI) - Number of pounds of pressure exerted on one square inch of a given area.
- **Purge Period** - Before ignition and after burner shutdown when explosive combustibles are removed.
- **Quality of Steam** - Term used to express the moisture content present in saturated steam. Quality of steam effects the BTU content of the steam.
- **Rate of Combustion** - The amount of fuel that is being burned in the furnace per unit of time.
- **Raw Water** - Untreated water.
- **Reseat Pressure** - The pressure at which a safety valve will reseat. It will pop above the pressure.
- **Ringlemann Chart** - Chart used as a measure of determining smoke density.
- **Safety Valve** - Valve that keeps the boiler from exceeding its maximum allowable working pressure.
- **Safety Valve Capacity** - Measured in pounds of steam per hour safety valves can discharge.
- **Sample Cooler** - Closed heat exchanger that cools a sample before it enters a sample container.
- **Saturated Steam** - Steam at a temperature that corresponds with its pressure.
- **Scale** - Deposits in the boiler waterside caused by improper boiler water treatment.
- **Scotch Marine Boiler** - A firetube boiler with an internal furnace.
- **Secondary Air -** Air that is needed to complete the combustion process.
- **Sediment** - Particles of foreign matter present in the boiler water.
- **Sensible Heat** -Heat that can be measured by a change in temperature.
- **Sludge** - Accumulated residue produced from impurities in water.
- **Smoke Density** - Varies from clear to dark. Determined by the amount of light that passes through the smoke as it leaves the boiler.
- **Sodium Zeolite Water Ion Softener** - Exchange water softener that uses a bronze solution and resin
  Softener beads to soften water.
- **Solid State** - An electronic system using transistors in place of electronic tubes.
- **Soot** - Fine powder consisting primarily of carbon that results from incomplete combustion.
- **Spalling** - Hairline cracks in boiler refractory due to changes in fireside temperatures.

- **Specific Gravity** - Weight of a given volume of a material divided by the weight of an equal volume of water measured at 60°F.
- **Spontaneous Combustion** - Occurs when combustible materials self-ignite.
- **Stack** - Outlet to the atmosphere for the gases of combustion. Used to create a draft.
- **Static Head Pressure** (SHP) - Pressure at the bottom, or at some specified point, of a column of still liquid.
- **Steam** - Gaseous form of water. Steam is odorless, colorless and tasteless.
- **Steam Boiler** - A closed pressure vessel in which water is converted to steam by the application of heat.
- **Steambound** - Condition that occurs when the temperature in the open feedwater heater gets too high and the feedwater pump cannot deliver water to the boiler.
- **Steam Space** - The space above the water line in a steam boiler.
- **Steam Trap** - Mechanical device used to remove condensate from steam piping.
- **Sulfur** - A combustion element found in coal and fuel oil.
- **Superheated Steam** - Steam at a temperature above its corresponding pressure.
- **Surface Tension** - Caused by impurities on the top of the water in a steam boiler.
- **Tensile Stress** - Occurs when two forces of equal intensity act on an object, pulling in opposite directions. Affects boiler plates and staybolts.
- **Therm** - Unit used to measure BTU content of natural gas. A therm has 100,000 BTU.
- **Thermal Efficiency** - The ratio of heat absorbed by the boiler to the heat available in the fuel per unit of time.
- **Thermal Shock** - Stress imposed on boiler metal by a sudden and drastic change in temperature.
- **Total Force** - Total pressure that is acting on an area, determined by diameter and pressure.
- **Total Heat** - Sum of sensible heat and latent heat.
- **Turbulence** - Movement of water in the boiler.
- **Ultraviolet** - A form of light that is produced during combustion.
- **Vacuum** - A pressure below atmospheric pressure.
- **Vacuum Breaker** - Vent on top of vessel that allows air to be pulled into the tank to prevent formation of a vacuum.
- **Vacuum Gauge** - Pressure gauge used to measure pressures below atmospheric pressure.
- **Valve** - Mechanical device that starts, stops or regulates flow of a liquid, gas or loose bulk material.
- **Vapor** - Diffused matter in a gaseous state.
- **Vertical Firetube Boiler** - One pass boiler that has firetubes in a vertical position.
- **Viscosity** - Ability of a liquid or semi-liquid to resist flow.
- **Waste Heat Recovery Boiler** - Boiler in which heat that would otherwise be discarded is used to make steam.
- **Water Column** - Metal vessel installed on the outside of a boiler shell or drum at the NOWL that helps an operator determine the water level in a boiler.

- **Water Hammer** - A banging condition that is caused by steam and water mixing in a steam line.
- **Wet-Lay-Up** - Method of short term boiler storage that keeps the boiler free from oxygen on the inside, which prevents damage from corrosion.
- **Working Pressure** - Maximum allowable working pressure or the pressure at which the boiler is normally operated.

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