DEFINITIONS

Absolute pressure is the total pressure measured from absolute zero, i.e., from an absolute vacuum.. It equals the sum of the gauge pressure and the atmospheric pressure corresponding to the barometer (expressed in pounds per square inch).

Absolute temperature equals the degrees Fahrenheit plus 459.6 or the degrees centigrade plus 273. These values are referred to as degrees Rankine and degrees Kelvin, respectively.

Adiabatic (isentropic) compression of a gas is effected when no heat is transferred to or from the gas during the compression process. The characteristic equation relating pressure and volume during adiabatic compression is

$pv^k = C$ k is the ratio of the specific heat at constant pressure to the specific heat at constant volume.

Polytropic compression is effected when heat is transferred to or from the gas during the compression process at such a precise rate that the relation between the pressure and volume can be expressed by the equation

$pv^n = C$ in which n is constant.

Where the actual compression path for a particular compressor is known, and where the heat transfer to or from the gas is at the proper rate, the value of n may be determined from the equation.

Isothermal compression is effected when interchange of heat between the air or gas and surrounding bodies occurs at a rate precisely sufficient to maintain the air or gas at constant temperature during compression. It may be considered as a special case of polytropic compression. The characteristic equation for isothermal compression is

$pv = C$

k value is the value of the exponent defined by the equation under Adiabatic or Isentropic Compression for any particular gas.

n value is the value of the exponent as defined by the equation under Polytropic Compression for any particular gas.

Compressibility factor (Z) is a factor expressing the deviation from the perfect-gas law.

Pressure ratio or compression ratio is the ratio of the absolute discharge pressure to the absolute inlet pressure.

Free Air is defined as air at atmospheric conditions at any specific location. Because the altitude, barometer, and temperature may vary at different localities and at different times, it follows that this term does not mean air under identical or standard conditions.

Standard air is defined as air at a temperature of 68°F, a pressure of 14.70 psia, and a relative humidity of 36% (.0750 density). This agrees with the definitions adopted by the ASME, but in gas industries the temperature of "standard air" is usually given as 60°F.

Displacement of a compressor is the volume displaced per unit of time and is usually expressed in cubic feet per minute. In a reciprocating compressor it equals the net area of the compressor piston multiplied by the length of stroke and by the number of compression strokes per minute. The displacement rating of a multistage compressor is the displacement of the low-pressure cylinder only.

Capacity (actual delivery) of an air or gas compressor is the actual quantity of air or gas compressed and delivered, expressed in cubic feet per minute at conditions of total temperature, total pressure, and composition prevailing at the compressor inlet. The capacity is always expressed in terms of air or gas at intake conditions rather than in terms of standard air or gas.

Theoretical horsepower is defined as the horsepower required to compressor adiabatically the air or gas delivered by the compressor through the specified range of pressures. For a multistage compressor with intercooling between stages theoretical horsepower assumes equal work in each stage and perfect cooling between stages.

Theoretical power (polytropic) is the mechanical power required to compress polytropically and to deliver, through the specified range of pressures, the gas delivered by the compressor.

Air indicated horsepower is the horsepower calculated from compressor-indicator diagrams. The term applies only to displacement-type compressors.

Brake horsepower or shaft horsepower is the measured horsepower input to the compressor.

> It should be noted that horsepower, either indicated or brake, for any displacement compressor varies with the compression ratio as well as absolute intake and discharge pressures. Performance guarantees are expressed in terms of horsepower per cubic foot capacity. In comparing test results with performance guarantees, corrections should be made for any deviation from specified values of absolute intake pressures and ratio of compression.

Intercooling is the removal of heat from the air or gas between stage groups.

Degree of intercooling is the difference in air or gas temperatures between the inlet of the compressor and the outlet of the intercooler.

Perfect intercooling prevails when the air temperature leaving the intercoolers is equal to the temperature of the air at the compressor intake.

Volumetric efficiency is the ratio of the capacity of the compressor to the displacement of the compressor. The term does not apply to centrifugal compressors.

Mechanical efficiency is the ratio of the horsepower imparted to the air or gas to the brake horsepower. In case of a displacement-type compressor it is the ratio of the air or gas indicated horsepower to the indicated horsepower of the power cylinders for a steam engine or internal-combustion engine-driven compressor or to the brake horsepower delivered to the shaft in the case of a power-driven compressor.

Compression efficiency (adiabatic) is the ratio of the theoretical horsepower to the horsepower imparted to the air or gas actually delivered by the compressor. The power imparted to the air or gas is brake horsepower minus mechanical losses.

Efficiency of the compressor is the ratio of the theoretical horsepower to the brake horsepower. It is equal to the product of compression efficiency times mechanical efficiency.

Compressor efficiency (polytropic), for which alternate terms are "hydraulic efficiency" and stage efficiency", is the ratio of the theoretical power (polytropic) to the shaft power.

Temperature-rise ratio is the ratio of the computed isentropic temperature rise to the measured total temperature rise during compression. For a perfect gas, this is equal to the ratio of the isentropic enthalpy rise to the actual enthalpy rise. Consequently, for gases which do not deviate seriously from the perfect-gas law, the temperature-rise ratio is sometimes referred to as "temperature-rise efficiency".

Inlet pressure is the absolute total pressure at the inlet flange of a compressor.

Discharge pressure is the absolute total pressure at the discharge flange of a compressor. It is commonly stated in terms of gauge pressure; unless the associated barometric pressure is included, this is an incomplete statement of discharge pressure.

Inlet temperature is the total temperature at the intake flange of the compressor.

Discharge temperature is the total temperature at the discharge flange of the compressor.

Gas specific weight is the weight of air or gas per unit volume. Unless otherwise specified, it refers to the weight per unit volume at conditions of total pressure, total temperature, and composition prevailing at the inlet of the compressor.

Specific gravity is the ratio of the specific weight of air or gas to that of dry air at the same pressure and temperature.

Speed refers to the revolutions per minute of the compressor shaft.

Electrical input is measured at the motor terminals. For synchronous motors with separately driven exciters, the excitation input as measured at the slip rings is added to the input to the stator. For synchronous motors with direct-connected exciters, the exciter losses are deducted from the measured stator input.

Load Factor is the ratio of the average compressor load during a given period of time to the maximum rated load of the compressor.

Clearance in a reciprocating compressor cylinder is that volume contained in one end of the cylinder which is not swept by the movement of the piston. It includes space between piston and head at the end of the compression stroke, space under the valves, etc., and is expressed as a percentage of the piston displacement per stroke. Clearance may be different for the two ends of a double-acting cylinder. An average generally is used.

Dry Gas is any gas or gas mixture that contains no water vapor and/or in which all of the constituents are substantially above their respective saturated vapor pressures at the existing temperature. (See Wet Gas).

Gauge Pressure is pressure as determined by most instruments and gauges. Barometric pressure must be allowed for to obtain the true or absolute pressure.

Standard Pressure and Temperature (SPT) is 14,696 PSIA and 60 deg F unless specifically stated otherwise.

Wet Gas is any gas or gas mixture in which one or more of the constituents is at its saturated vapor pressure. The constituent at saturation pressure may or may not be water vapor.

ACFM - Actual Volume measure at either the inlet or discharge which has to be specified.

PSIG - Pounds per Square Inch Gauge.

PSIA - Pounds per Square Inch Absolute, 14.7 PSI plus the gauge pressure.

SCFM - Standard Cubic Feet per Minute.