Wood Performance Carburetors

Glossary of Weather Conditions

Absolute Barometric Pressure, expressed in inches of Mercury ("Hg), is not the same as what is reported on weather forecasts, which is Sea Level Corrected pressure. Absolute is the actual air pressure at elevation. Roughly every thousand feet of elevation reduces barometric pressure by one inch of mercury. For instance, if you were in Colorado at 6000', the absolute pressure would be around 24 "Hg, while the Sea Level Corrected reading would be around 30 inches. By using absolute, you need not recalibrate for every new location, and you need not know the elevation of the track.

When the barometric pressure is higher there is more oxygen available for combustion in a given volume. During a typical 12 hour period the barometric pressure will change only 1 to 2 tenths of an inch of Mercury (for example from 27.24 to 27.40). An approaching front may bring in air that is higher or lower by 1"Hg (28.95" to 27.95").

Barometric pressure is caused by the gravitational pull on the 'column of air' lying directly above the place you are measuring. It is usually measured with an altimeter or barometer. Creative racers (with way too much time on their hands) may wish to experiment with a hypsometer, which indicates pressure by monitoring the boiling point of water.

Absolute Humidity (AH)
This calculated value expresses the actual amount of moisture present in the air as a percentage of volume. This reveals the displacement of O2 molecules by water molecules, and has a direct relationship with the power making capabilities of your motor.

Accuracy
What a wonderful word, and as with statistics, the numbers used can be made to say almost anything. When you say an instrument has 1% accuracy do you mean it is 99% inaccurate? No, accuracy is usually measured *in terms of inaccuracy* but expressed as accuracy, and as a percentage of the full-scale range. Two things to keep in mind when evaluating claims of accuracy are:
1) The plus/minus statement which can make a gauge look twice as good as it tests out to be. For example, a thermometer that claims + or - 1% accuracy full scale is really 2% accurate, not 1%.

2) On the lighter side, remember that you will seldom use a gauge to both ends of its scale. So a 2% full scale temperature sensor (measuring from 0 to 125 degrees) that you only use from 45 to 100 degrees is for all practical purposes better than 1%, (or + or - 4/10 of a degree).

ACE Factor (ACE)
The Air-Cooled-Engine Factor describes the cooling ability of the air. Moist air cools more efficiently than dry air. Developed by Altalab to help Junior Dragsters predict ET in situations where using the AA alone is not sufficient, the ACE Factor can also help Kart racers avoid costly engine destruction.

Adjusted Altitude (AA)
This one number, expressed as a footage, is a relative performance altitude compared to STP (Standard Temperature and Pressure which is 60 ^{o}F, 0% RH, and 29.924 "Hg). We have found this one number, which relates directly to observed engine performance, to be the most accurate value for horsepower correction and predicting vehicle performance, and our software for ET and TS prediction uses AA. All Altalab weatherstations calculate AA. (The Alta Series also provides . Density Altitude.)

Air
Atmospheric air is Moist Air, which is a mixture of Dry Air,Water Vapor, and contaminants like smoke or pollen. Dry Air exists when all contaminants and water vapor are removed from Atmospheric Air. The composition of Dry Air by volume is nitrogen, 78.084; oxygen, 20.9476; argon, 0.934; carbon dioxide, 0.314;neon, 0.001818; helium, 0.000524; methane, 0.00015; sulphur dioxide, 0 to 0.0001; hydrogen, 0.00005; with krypton, xenon and ozone at 0.0002.

The amount of Water Vapor in Moist Air (humidity) varies from none (Dry Air) to Saturation (100% Relative Humidity). The most common ways of describing the amount of moisture in the air are by Relative Humidity, Absolute Humidity, Grains per Lb., and Dew Point.

Density Altitude (DA)
Originally developed from formulas used by aircraft pilots to calculate lift, this relative performance altitude when calculated for racing includes additional compensation for the effects of humidity on engine performance.Altalab prefers Adjusted Altitude as an indicator of the oxygen available for combustion, but our Alta Series weatherstation also include DA. Our version of this number matches the most commonly calculated versions used for ET and TS prediction. See STP.

Dew
Dew is water that has condensed on objects near the ground, as a result of those objects, like car windshields, getting cooler than the Dew Point temperature.

Dew Point (DP)
The Dew Point is the temperature at which the air you are measuring would be saturated (100% RH), and condensation (dew) would begin appearing on surfaces. As air cools it contracts, leaving less room for moisture. If the track cools to the Dew Point, condensation will occur on the racing surface. The air and other surfaces may reach DP before the track does, as the asphalt can hold heat.Dew Point temperature is a good indicator of water vapor quantities and is used frequently by the meteorological folks on their weather maps. A typical summer day, with sub-tropical air flowing north from the Gulf of Mexico, may have dew points ranging well into the seventies. The mid-day air temps could easily be into the ninties producing extremely uncomfortable conditions for outdoor activities like racing. These conditions are also ripe for afternoon thunderstorms.At the other extreme, a nice brisk, blue sky day in early spring can have dew points way down in the teens or twenties. In both cases, the dew point is indicating the total amount of water vapor present in a quantitive sense. When dew points are in the seventies, absolute humidity will be above 3%, when dew points are extremely low, AH will be less than one percent.

Dry Bulb Temperature
The temperature of the air, especially for comparison to Wet Bulb temperature

Humidity
Water Vapor content of the air. This is a big deal in racing because not only is moist air lighter (less dense) than dry air, moisture additionally displaces oxygen needed for combustion. Humidity can be expressed as relative humidity, absolute humidity, grains/lb, and also Dew Point.

Relative Humidity (rh)
Expressed as a percent, this figure is the ratio of the amount of water vapor in a particular temperature air to the maximum amount of water vapor that temperature air could hold.100% RH means saturation, or dew point at that temperature. Do not get confused with relative humidity readings at different temperatures. For instance, air at 90 degrees at 50% RH has the same amount of moisture as does air at 70 degrees and 100% RH.One reason Altalab offers racers several different calculated values that describe moisture in the air, is because RH *is relative*, it is relative to temperature. For example, early in the morning it is cool and the RH is high. Later in the day it warms up and the RH drops. Then, after dark the temperature cools and the RH goes up again, *but the actual amount of moisture in the air has not changed!* (Unless a different air mass has moved in.) Some of the other calculated values, like Absolute Humidity, Grains per Pound, Vapor Pressure, and Dew Point indicate the quantity of moisture in the air in such a way that can be more useful to the racer trying to tune or predict.

Saturation
When the air is at 100% RH. Dew Point is the saturation temperature of a particular air sample.

Settling Time
The length of time it takes an instrument to register changes in what is being measured. See Response Time.

Station Pressure
The same as Absolute Barometic Pressure. This term is used at airports.

STP
Standard Temperature and Pressure, accepted by international agreement to be:
29.9231 "Hg (or 760mm or 1013.25 mb)
60 degrees F (some scales use 59 degrees)
0% RH (or dry air)
Some values of a weatherstation which are calculated from all three of these measurements directly relate to STP. At STP the Adjusted Altitude and Density Altitude are equal to 0 feet, and Air Density Ratio is equal to 1.

Vapor Pressure (VP)
This is the part of atmospheric pressure (absolute barometric pressure) due to water vapor, and is expressed as inches of mercury.
Abs - vp = dry pressure, or the partial pressure of dry air.

Vapor Pressure is often monitored by racers of alcohol fueled vehicles, who have noticed vehicle performance changes at some observed vapor pressure. For example, a sportsman drag racer might rely on the Adjusted Altitude for predictions unless the Vapor Pressure is over a certain point that the racer has observed decreases performance.