Paint Booth Water Chemistry – Why It’s Important

A well run recirculating paint spray booth system requires the combination of two critical components – 1) properly designed and fully functioning booth and sludge handling equipment, and 2) the application of the appropriate paint booth chemical program matched to the equipment. However, what is often overlooked is the importance of the booth water chemistry that supports the chemical program. Even the best chemical program can fail if certain key parameters are ignored or not managed well.

This technical bulletin will take a look at some key paint spray booth water chemistry parameters, describing what they are and why they are important. These include – pH, Alkalinity, Total Dissolved Solids, Conductivity, Turbidity, and Suspended Solids.

**pH** – is the measure of the acidity or basicity of an aqueous solution. Paint detackification and sludge conditioning polymers will perform at their optimum level when the pH is maintained within a prescribed range. This range is normally determined by on-site or lab testing. pH outside the optimum range can result in loss of paint detackification/coagulation, an increase in suspended solids, loss of sludge dryness, and potentially increased foaming.

pH is measured in a unitless range between 0 and 14 – 0 being very acid, 7 is neutral, and 14 very basic. Most paint detackification programs run above neutral in the slightly alkaline to alkaline range.

**Alkalinity** – is the quantitative capacity of an aqueous solution to neutralize an acid. Total alkalinity is the amount of acid needed to bring the pH of a sample to 4.2. pH and alkalinity are related and in some cases maintaining a certain alkalinity level is preferred or is measured along with pH. The same issues that having an out of range pH also apply to alkalinity.

Alkalinity is typically stated as mg/liter equivalent of CaCO$_3$ – mg/L CaCO$_3$.

**Total Dissolved Solids (TDS)** – is a measure of the content of all inorganic and organic substances contained in a liquid in molecular or ionized form, such as minerals, salts, or metals. Depending on their form and quantities, dissolved solids can interfere with the charge neutralization that is used in paint detackification, coagulation and flocculation (See Galaxy Technical Bulletin TB 05, “Paint Spray Booth Chemical Terms”, for more information on those processes). The impact of higher total dissolved solids can result in higher suspended solids, paint deposition, wetter sludge and increased potential for foaming.

TDS is typically stated in parts per million (ppm) or milligrams per Liter (mg/L) and does not include suspended solids.
Total dissolved solids can be calculated by multiplying the conductivity by a factor between 0.55 and 0.9 (See Conductivity below).

**Conductivity** – is the measure of the ability of water to pass an electrical current – and is affected by the presence of inorganic dissolved solids such as chlorides, nitrate, sodium, calcium, magnesium, etc. Organic compounds like oil, phenol, alcohol do no conduct electrical current very well & therefore have a low conductivity when in water. Conductivity is affected by temperature – the warmer, the higher the conductivity.

Although every paint booth system is different, at some point, high conductivity in the booth water can have the same impact as high dissolved solids - since the two are directly related. High conductivity can also increase the potential for corrosion of metal surfaces in the system.

Conductivity is measured in mhos or siemens – i.e. µmhos/cm and µs/cm.

**Turbidity** – is the cloudiness or haziness of a fluid caused by individual particles/solids suspended in the water. High levels of turbidity can indicate potential solids that will settle out in the system in undesired locations leading to less paint sludge being removed in the sludge processing equipment. High turbidity can also trigger higher levels of foam.

Turbidity is typically measured by a device that passes light through a column of the water sample. Three common units of measure include FTU (Formazin Turbidity Units), JTU (Jackson Turbidity Units), and NTU (Nephelometric Turbidity Units).

Turbidity and Suspended Solids are closely related.

**Suspended Solids (aka TSS or Total Suspended Solids)** – are small solid particles which remain suspended in an aqueous solution. High levels of suspended solids can lead to settling in undesired locations leading to less paint sludge being removed by the sludge processing equipment. High suspended solids can also trigger higher levels of foam.

Suspended solids are measured by passing a prescribed volume of the water through a specific pore size filter, drying, and then weighing the filter. After subtracting the weight of the filter, the weight of the solids represent the amount of suspended solids – typically measure in milligrams per Liter (Mg/L).

The correlation between suspended solids and turbidity is generally regarded as linear, however site-specific testing should be performed to confirm this.

Consult with Galaxy Chemical for all of your paint spray booth chemical and technical needs.