

WHAT IS PYROGENIC OXIDATION?

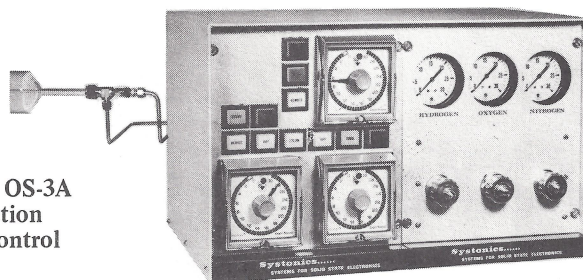
It is a lot more than simply replacing messy water bottles and lines wrapped in heat tape with the burning of hydrogen in an oxygen atmosphere.

Pyrogenic oxidation offers a new dimension in oxidation process control. The ease of on-off valving of dry gasses makes the dry-steam-dry oxidation cycle REALLY a push-button operation. Inherent in the use of pure hydrogen and oxygen to produce water vapor is a reduction of oxide contamination due to carry over of fast-ions from the source. To be sure, the oxides produced with pyrogenic water vapor are no purer or have less pin holes than the best obtained from a well set up and maintained liquid source generator, but routine source maintenance is virtually eliminated with a pyrogenic source.

What Does Pyrogenic Source Look Like?

The best one looks like this:

SYSTONICS MODEL OS-3A
All-Metal Construction
Laminar Gas Flow Control



How Does It Work?

The furnace process tube is supplied with an oxygen atmosphere. Hydrogen is then introduced through a small concentrically located quartz injector tube. The length of the small tube is adjusted so the point where the hydrogen meets the oxygen is above 580C. This assures autoignition at all hydrogen to oxygen ratios. Modern diffusion furnaces easily accommodate the heat of formation which is released.

In the unit shown above, a 100% inert gas ambient may be produced in addition to the steam and oxygen ambients. During change over from steam-to-dry or dry-to-steam, the hydrogen injection line is automatically purged with the inert gas. A time interlock also assures that the burning point is surrounded with oxygen after changing from an all inert atmosphere.

Other systems provide the injection tube purge feature but do not provide the all inert ambient. Systonics systems of this type produce steam and 100% oxygen conditions. Some other manufacturers systems cannot produce the 100% oxygen ambient and are limited to steam only. In other models, oxygen is used to purge the hydrogen line. This type system provides steam and 100% oxygen ambients. They depend on the high volume rate change in the ¼ inch OD injector line to completely eliminate any possibility of flash back or pre-ignition.

Are They Safe?

Most certainly! The safest of all are of all metal construction and utilize laminar gas flow control. These features eliminate breakable glassware and gas flow overshoot on valving. Interlocks prevent hydrogen accumulation in the absence of ignition temperature and an oxidizing atmosphere. In Systonics systems the hydrogen may be interlocked to prevent over or under supply.

The hydrogen required to produce two liters per minute of steam is a little over four cubic foot per hour. Even with ignition failure it is difficult to accumulate destructive amounts of hydrogen in an open exhaust system or in a ventilated room. The rapid diffusion of hydrogen at room temperature sees to that. The sudden ignition of a processing tube filled with hydrogen produces an exciting moment similar to that of a sudden water ejection through a process tube from a superheated water boiler. The specific failure of extremely reliable components is required to produce this unique event accidentally.

What Else?

Pyrogenic oxidation systems are particularly compatible with the addition of HCl. The most reliable control of HCl utilizes manual or air operated stainless steel bellows valving. With automatic valves interlocking may be structured to limit HCl injection to specific ambient conditions or portions of the cycle in timer controlled systems.

All properly engineered systems have no restrictions to gas flow after the point at which dissimilar gasses meet. They do not rely on check valves to prevent cross contamination of gas supplies. Systonics systems use the positive action of properly scaled solenoids and extra gas control channels to accommodate free flow to atmosphere. These extra control channels allow the set up of constant volume flow conditions through all operating modes. They assure full flow purge of lines exposed to the furnace. These features are not common to all makes of pyrogenic sources.

Why SYSTONICS?

The selection of a proper pyrogenic oxidation system depends on a variety of processing and facility considerations for cost effectiveness. Systonics offers three basic types of oxidation systems to meet these needs. All are available in manual or fully automatic versions and with or without HCl. The standard models have been designed to fit the most restrictive space limitations even with a timing system. The automatic cycle timers may be added later and are available with ATC or Eagle timers. Custom configurations are available to fit any hood or cabinet.