

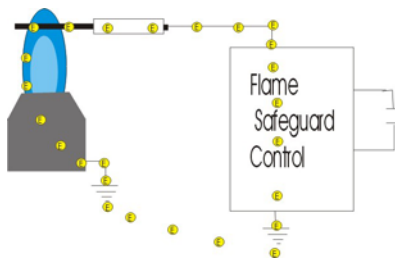
Flame Safe Guard Controls and Flame Rectification Part 1

There is a correlation between application and safety. The more we move toward application the less safety we have, and the more we go toward safety the more we loose on our application.

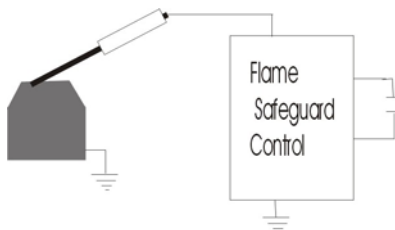
Recently the gas laws have increased dramatically and safety has become more of an issue. Flame rectification is used on almost all new gas equipment manufactured today. As a result, so have the so called nuisance failures. Hopefully with a full understanding of flame safety, and more importantly flame rectification, we will be able to reduce the amount of nuance service calls.

Flame Rectification

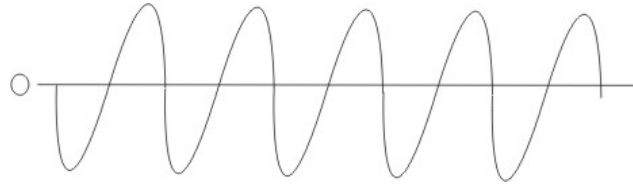
As our fuel burns the atmosphere in and around the flame, becomes electrically charged or ionized. The level of this Ionization changes depending on what area of the flame we are measuring. Basically there are 2 parts of a flame, the inner and outer cone. The inner cone is mostly pure unburnt gas and has very little ionization, therefore the outer cone has the highest amount of ionization and this is the area we are most concerned with. What makes this area so unique is that it can conduct electricity. Yes, you heard me right, the outer or high ionized part of the flame can actually conduct electricity just like an electrical wire. At the most basic level, if we were to input a signal onto this flame and use the flame as the conductor we could monitor the condition of this flame.



The problem with this basic example is, if the flame rod was too short, to ground. The flame safe guard control would still think there was a flame and therefore would not shut off.



Here is an A/C sign wave. If you don't understand how A/C power operates, Try to picture that the electrons flow in both directions, for our example electrons flowing out of our flame rod to ground are represented from the part of the wave from 0 higher. The lower part of the wave is the electrons coming back into our flame rod from ground or they reversed direction.



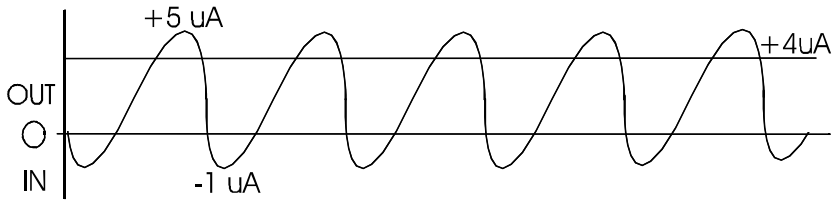
Now lets talk about rectification. A rectifier is basically a device used to convert A/C into D/C. In flame rectification we basically build a rectifier, By using our flame rod, flame and a grounding surface area of at least 4 times greater than our flame rod's area we can accomplish this.

To try and make this easy to understand I want you to think of a shot gun. If we were to fire a shot gun at a target a certain amount of pellets would hit the target. Now if we were to make the target 4 times smaller and fire again, a smaller amount of pellets would hit this smaller target and the rest would miss the target.



Now lets look at our flame. If we fire out electrons at our grounding surface a large amount of them will hit this surface since it's a large area. However when our grounding surface fires these electrons back to our flame rod many of them will miss the flame rod since it now a much smaller target.

So think about this, if are sending out more electrons than we are getting back we have just created a rectified circuit. With this style of circuit the flame safe guard control can monitor this difference of electrons being sent back and forth and can recognize it's a flame and not a short causing this to occur. This example shows a +4uA rectified signal.



As you can see from the above information a good clean flame rod and grounding surface at both the burner and flame safe guard control is imperative to allow the control to recognize this rectification occurring . During maintenance calls you should consider sanding both the burner face and the flame rod to ensure they are always clean. If you were to monitor the flame current on a regular basis you would actually see the flame signal to degrade as oxidation and contaminants built up. As this build up would actually appose or resist the flow of current.

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April 7 2004

Part 2 will discuss trouble shooting and preventing problems before they happen.