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RIGAS
Runyan Industrial Gas Analyzers
2310 East Hutton Road
Wooster, OH 44691
877-616-0600 (toll free)
330-345-1460 (local phone)
330-345-5944 (fax)

TECHNICAL INSTRUCTION

Topics:

[1] Glow plug modification (to achieve easier lighting of 400, 400A, & other FIDs)
[2] "Almost never fails" burner lighting method

Preface:

So, your THC analyzer won't light! But strangely enough the analyzer is getting fuel and air, and the glow plug is glowing in the presence of oxygen, but the crazy thing just won't 'pop' or 'ignite'. This short TB describes what I call the "IWLNMWID* situation."

***It Won't Light No Matter What I Do**

Background:

The THC analyzer uses a glowing plug, almost exactly the same as you would use on a model airplane motor, to ignite and explode the O_2/H_2 mixture inside the burner/chimney assembly. When the fuel air mixture gets just right in the presence of a heat source or spark source then, in reality, it should 'pop' or ignite every time.

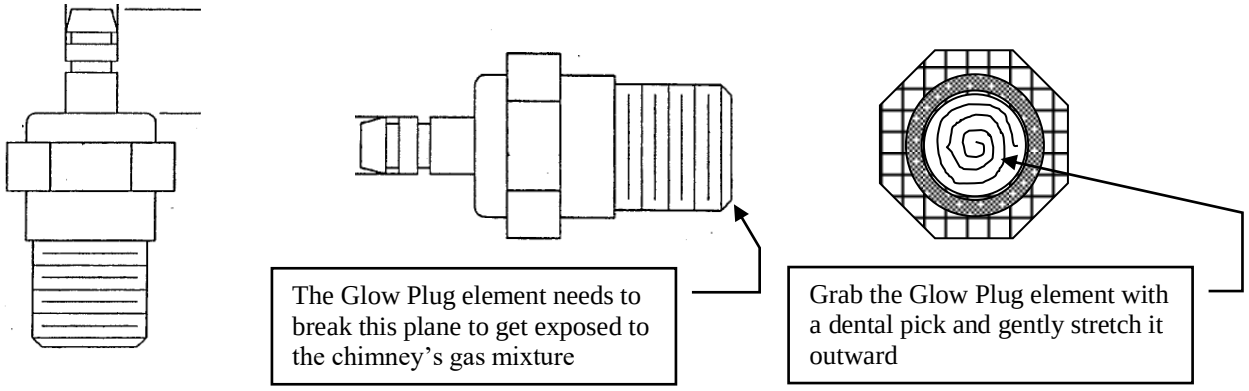
Discussion:

What is actually happening in the case of an unmodified glow plug is this: the glow plug's heating element is normally (although incorrectly for our application) slightly recessed in to the glow plug body; when the glow plug is energized it consumes the oxygen around it (inside the glow plug body) and thus changes the fuel/air mixture to the point where it is no longer ignitable; AND it creates a blanket or shield of low concentration oxygen around it so that the heat can't ignite the properly mixed H_2/O_2 gas only a few micrometers beyond the end of the glow plug assembly. We refer to this phenomenon as self-shielding.

The solution is simple: just pull the glow plug's heat coil out of the body of the glow plug SLIGHTLY so that there will be no possibility of the coil consuming the oxygen and shielding itself from the explosive H_2/O_2 mixture that you've created for the lighting sequence.

Procedure:

1. Turn off the instrument
2. Remove the burner cap assembly (leave all wires attached if possible)
3. Using a needle or dental pick, gently grab part of the glow plug's heating coil and pull it till just



clears the plane of the end of the glow plug (see drawing below)

4. Ensure that the thermistor is positioned correctly (bent towards the center of the cap assembly and NOT bent upward towards the cap or touching the cap); ensure that the leads are not broken; ensure that the thermistor is not broken via a continuity check (expect 100K ohms @ 25°C or 40-60K ohms @ operating temperature).
5. Reassemble the burner; ensure that all components (collector, chimney, cap) are seated snug (any air leaks cause 'hard to light' symptoms as well)
6. Attempt to relight the burner
7. If lighting is still a problem, you'll need to reverify the following:
   - Igniter voltage (2.5 vac)
   - Igniter glows in the presence of O_2
   - Fuel flow (40/60 = 75-80 cc/min)(100/0 = 35-40 cc/min)
   - Air flow (both mixed & pure = 400 cc/min)
   - Chimney components are seated correctly (no air leaks)
   - Burner jet is not crimped, distorted, etc.
   - Exhaust is not blocked (watch for condensate traps as well)
   - Vent header back-pressure

Here is a recommended, '***almost never fails***', lighting method:

(a) Set burner air pressure to 0 psig

(b) Set sample pressure to 'normal' pressure (usually 3 to 4 psig; not >5 psig)

(c) Go to "Purge"; adjust fuel pressure to 30 psig; hold "Purge" for 30 – 45 seconds

> **Note:** if you have recently changed your fuel cylinder or opened the fuel line to atmosphere (when swapping out the analyzer for instance) then you'll need to purge the fuel line for a significant amount of time. Your hydrogen fuel is diluted and will not allow a normal light up until it reaches its full 'normal' concentration.

(d) Continue to "Purge"; add 5 psig of burner air rapidly

(e) Go to "Ignite"

(f) Start adding burner air at the rate of 1 psig per 1 ½ to 2 seconds

(g) Expect a "pop" between 8 and 12 psig

(h) Continue to hold switch in "Ignite" (or switch to "Purge" to de-energize the glow plug if you prefer) for 5 to 8 seconds (so that thermistor has a chance to sense the flame temperature)

(i) **Slowly** adjust the burner air up to 15 psig

(j) **Slowly** adjust the burner fuel down to 25 psig

(k) Option: every year or more frequently, it's a good idea to check flame temperature. We have found that the thermistor feedback sensor reads anywhere from 60 to 120 mVDC when the analyzer is tuned correctly. Less than 60 mVDC means that you're tunning too hot (too much fuel, or the wrong fuel); more than 120 mVDC means a fuel restrictor is getting fouled (just add more pressure to compensate).

Larry Runyan
Technical Support Engineer