

# CEMS NEWSLETTER

Monitoring Solutions

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## CEMS FROM A-Z: A MULTI-PART SERIES

This issue continues our presentation of a comprehensive look at CEMS from beginning to end, with descriptions and details on a variety of components including the probe, umbilical, sample conditioning system, analyzers and more - including maintenance and troubleshooting topics.

This issue covers:

### THE AIR CLEAN-UP SYSTEM:

In an extractive CEMS, instrument grade air is brought to the CEMS cabinet for several purposes:

1. To use as purge air to clean out the CEMS probe.
2. To purge the calibration gas lines before, in-between, and after calibration cycles.
3. To purge analyzer cases (most commonly CO analyzers) to eliminate any interfering gases from the ambient atmosphere that might get into them.

The air brought to a CEMS should be instrument grade, oil free with a dew point less than -40°F. This can be sourced from the plant or produced by a compressor specifically for the CEMS.

The air cleanup system is the series of components used to insure that the instrument air supplied is clean and free

### PLEASE NOTE

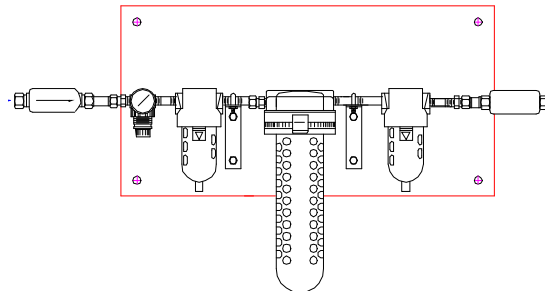
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of moisture. It can also have additional components to remove gases being measured by the CEMS.

Depending on the quality of the instrument air being supplied, different components can be utilized. In cases where compressed air is supplied instead of instrument grade air, additional oil and moisture removal



systems are required to prepare it for use by the CEMS.

The air clean-up system can be located in the CEMS cabinet or is often wall-mounted near the CEMS.

### COMPONENTS

The instrument air is brought to the air cleanup system at 80 – 90 psig where a pressure regulator brings it down to 40 – 60 psig at the beginning of the air clean-up. In the most basic extractive CEMS air clean-up system, it travels through a series of three components to insure all moisture (water, oil, etc.) is removed before it is sent to the umbilical. If a CO analyzer is used then one more component is added.

#### **A. Coalescing Filter/Auto-Drain**

The first component the instrument air is introduced into is typically a coalescing filter. This is normally an auto-drain but also could be a manual-drain. The instrument air travels through the Type “C” filter where moisture is removed. All moisture is collected at the bottom of the canister.

As an auto-drain filter fills, a floater moves up. The floater is attached to the bottom plug so as the floater moves up, so does the plug. This allows the moisture to be released. The moisture should be minuscule, so there is no need to drain it to a vent (i.e. it can be left to drip on the floor).

#### **B. Canister with Drierite**

After the coalescing filter, the air moves into a canister filled with drierite. The air travels down the stainless steel tube in the center of the canister and spills out through a screen at the bottom. The air then travels up through the drierite and onto the next component.

The drierite absorbs the moisture still in the instrument air. It has a distinctive property that when it absorbs moisture, it turns from blue to pink. This is used as an indicator to warn if the instrument air is not moisture/oil free. It is not a cost effective method to eliminate moisture.

**C. Canister with Carulite**

The air is introduced to a canister with carulite if CO is being analyzed. The reason being that ambient air around the correlation wheel in the CO analyzer contains a variable amount of CO. After the air cleanup, a tee is put in place for the air to go both up the umbilical and over to the CO analyzer. The air is introduced into the box around the correlation wheel to push out any ambient air around it.

Just like the canister with drierite, the air travels down a stainless steel tube and disperses out through a screen at the bottom. It then travels up through the carulite, thus removing any CO in the instrument air.

**D. Coalescing Filter/Manual- Draw Filter**

This filter works just like the initial coalescing filter except instead of the water automatically draining, the bottom plug is manually opened.

This manual-drain filter uses a Type "A" particulate filter to remove any particles down to .01 microns.

Three additional components may be used in an air clean-up system depending on the application:

**E. Canister with Purafil (NO<sub>x</sub> and SO<sub>2</sub>)**

After the coalescing filter, the air moves into a canister filled with Purafil. The air travels down the stainless steel tube in the center of

the canister and spills out through a screen at the bottom. The air then travels up through the Purafil and onto the next component.

The Purafil absorbs the NO<sub>x</sub> and SO<sub>2</sub> in the instrument air. It has a distinctive property that when it absorbs the two gases, it turns from pink to brown. This is only used if NO<sub>x</sub> and/or SO<sub>2</sub> are being measured.

**F. Canister with Charcoal (THC)** The air brought in must be free of hydrocarbons if a dryer is used and/or if hydrocarbons are being measured. If the instrument air is not already hydrocarbon free, then a canister filled with charcoal is used.

Just like the canister with Purafil, the air travels down a stainless steel tube and disperses out through a screen at the bottom. It then travels up through the charcoal removing any hydrocarbons in the instrument air.

**G. Dryer Towers (CO<sub>2</sub> & Moisture)**

These two tall towers are used to absorb CO<sub>2</sub> and any moisture still in the instrument air. It operates on 115V; plugged directly in an outlet. It uses solid state controls to operate the two solenoids which open and close the inlets/outlets to each of the two towers.

Much like the canisters, the air travels up a central tube

surrounded by a media which removes CO<sub>2</sub> and moisture. It then travels back down the outside of the tube, inside the tower, and on to the next component. When it gets about 75% depleted, the solenoids switch allowing the air to begin filling the 2<sup>nd</sup> tower. The other 25% is then pushed through the exhaust out the bottom; removing the moisture and CO<sub>2</sub> collected.

For the dryer towers to work properly, the air introduced into it must be oil and hydrocarbon free.

**MAINTENANCE:**

All preventative maintenance (PM) for the air cleanup system is done on a quarterly basis.

**A. Coalescing Filters**

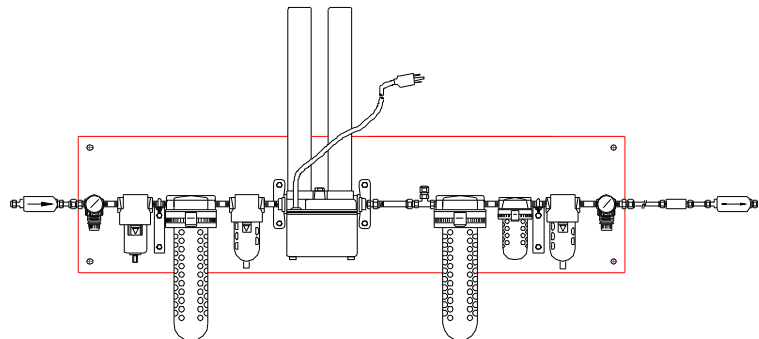
Each of the coalescing filters will have their respective filters and O-rings replaced.

**B. Canister with Drierite**

The old drierite is removed and new drierite is put in. The amount of drierite that is pink is noted to make sure that the air does not contain an excessive amount of moisture.

**C. Canister with Carulite, Charcoal and Purafil**

The old media is removed and new media is put in.



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### IN THIS ISSUE:

#### **CEMS FROM A-Z: A MULTI-PART SERIES (PT. 5)**

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