Application Note

CARRY-OVER TESTING ON VENTILATION HEAT RECOVERY UNITS

Total Energy Wheel developed by SEMCO.

The Opportunity

Testing for contaminant carry-over on HVAC equipment is a challenging task due to the level of trace concentrations to be quantitatively measured.

Heat recovery challenge in critical duty ventilation systems

For the ventilation system of some critical applications like laboratories or healthcare facilities, a dedicated outdoor air system (DOAS) is required (instead of more conventional air handling units) in order to prevent any recirculation of potential airborne contaminants from the return side to the supply side, either caused by internal or external short circuits.

Advanced total energy recovery systems, based on advanced molecular sieve desiccant, were developed by SEMCO to overcome the energy efficiency challenges of DOAS while providing high-end specifications in terms of carry-over for critical duty ventilation applications.

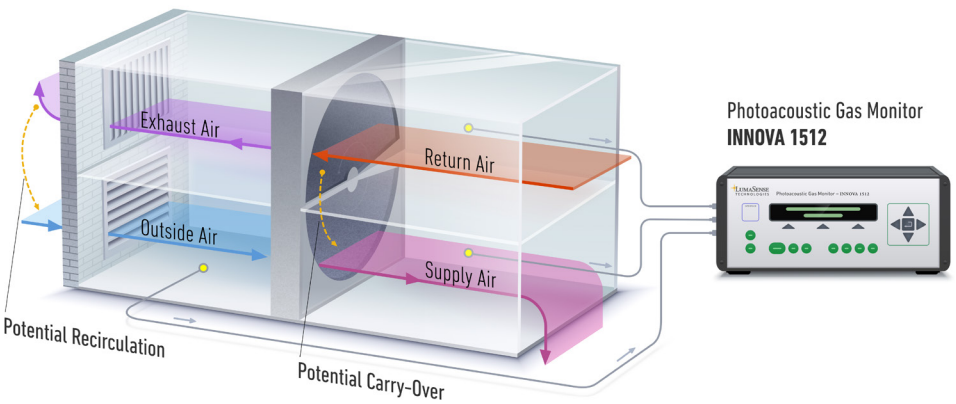
Monitoring Needs

First developed as performance selection criteria during their R&D works, carry-over testing has become a critical step of SEMCO's QA/QC processes.

The test consists of challenging the Total Energy Wheel matrix with an equivalent contaminated return stream while monitoring the air quality on the supply side. The challenge gas matrix is determined in accordance with the ASHRAE Standard 84 testing method (applicable to Air-to-Air Heat/Energy Exchangers) using "chemicals of concern" typically encountered in building environments.

SF_6 (Sulfur Hexafluoride) is first used as tracer gas to detect and quantify any recirculation from the exhaust to the supply duct. Any contaminants transferred to the supply side at a higher rate than the SF_6 recirculation would therefore result from actual carry-over transport via adsorption/desorption to the wheel matrix.

Rotating between two airstreams (outside/supply air and return/exhaust air), the total energy wheels transfer heat and humidity, while required to drastically limit the transfer (or carry-over) of contaminants. Besides its use in the R&D lab for material testing, our Photoacoustic Gas Monitor is also used in the field for commissioning purposes. Air flows are sampled at various locations in as-built conditions to verify the low levels of recirculation or the carry-over of contaminants.



Innova 1512
Photoacoustic Gas Monitor.

Our Solution

The Photoacoustic Gas Monitor Innova 1512 is an excellent field solution for multi-gas monitoring at trace levels. It can be configured with up to 5 different optical filters corresponding to as many different gases to be measured. For its needs, SEMCO typically uses filters for TVOC, SF_6, and CO_2. The water vapor filter (by default) is used to enable the cross-compensation algorithm that corrects from spectroscopic interferences and achieve the highest sensitivity and accuracy possible. CO_2 is measured as an air quality indicator.

As stated by John Fischer (Director of Technology, SEMCO LLC), key differentiators for a Photoacoustic Gas Monitor from LumaSense Technologies are that *"it provides real-time data at the accuracy level required to verify extremely low levels of contaminant carry-over. It integrates an effective sampling pump and has proven to be a very reliable and well-built system"* and "it *can be seamlessly deployed in the field for the commissioning and site acceptance tests on some demanding projects"*.

Measurement Results

This testing is easily done using our Innova Multi-Gas Monitoring instrument. Due to the unique properties of the tracer gas, very accurate measurement of any air leakage within the air handling system or the energy recovery device seals can be made and any purge inefficiency or exhaust re-entrainment can be detected and quantified. Any leakage of air associated with all of these factors can be limited to below .04% of the return air challenge concentration for a well-designed system.

Results from a typical TVOC field test. This real-time data was collected at a major laboratory site using a Photoacoustic Gas Monitor.

	ERU-1	ERU-2	ERU-3	ERU-4
	Concentration in parts per billion as propane			
Outdoor Air	114	118	119	115
Supply Air from Energy Wheel	111	116	119	109
Return Air to Energy Wheel	288	283	295	267

Note: Samples represent an average of 6 readings for each system taken over a 15 minute period around 1:00 PM.

Your Benefits

- ✓ **Monitoring of up to 5 gases at trace levels (typically in ppb-ppm range)**
- ✓ **True standalone monitor with excellent portability for field deployment**
- ✓ **Very low cost of ownership**
- ✓ **Ease of use, no analytical expertise required in analytical instrumentation**
- ✓ **Accuracy, Reliability, and Repeatability of Measurements**

Contact your Advanced Energy representative for more details on integrated solutions.

Advanced Energy

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