

SULFUR RECOVERY UNIT – CONTINUOUS EMISSION MONITORING (CEM)

Hot-Wet Measurement

What is hot-wet measurement?

Hot-wet measurement means analyzing the stack gas sample on an as-is basis, and ensuring the integrity of the sample, from extraction through analysis, is maintained. The main objective of hot-wet measurement is to prevent the condensation of acid mist or water vapor.

Cold-dry analysis refers to cooling a hot-wet stack gas sample until the water condenses out. Here we will mainly focus on hot-wet applications. A comprehensive evaluation of both methodologies is available and can be provided upon request.

Why use hot-wet measurement?

Hot-wet analysis is especially well suited to the measurement of sulfur dioxide (SO₂) emissions from a Claus sulfur recovery unit (SRU) incinerator using AMETEK 909/910 or 919/920 analyzers for the following reasons:

1. A Claus SRU incinerator can generate significant quantities of sulfur trioxide (SO₃) as well as high temperatures during upset conditions (sulfur entrainment, off-ratio, etc.). SO₃ is very corrosive and can damage dry gas or insitu-type analyzers. Keeping the sample above the acid dew point simplifies maintenance. Hot-wet measurement does not require specific sample handling, drying, and diluting, and therefore higher reliability and accuracy can be achieved.
2. Cold-dry measurement requires removing water, so some soluble components can be removed. For example, if a sample containing a finite amount of SO₂ is cooled to below the water dew point, SO₂ dissolves in the water phase, reducing the SO₂ concentration in the vapor phase, where it is being measured. If the sample is cooled to the point where SO₃ condenses, corrosion can result.
3. Measuring the sample on an as-is basis is compatible with mass emission measurement (kg/h of SO₂), in which both the stack gas velocity and the component of interest are measured on a wet basis. In the cold-dry analysis however, the analyte and the stack flow rate are measured dry and wet, respectively.
4. In the hot-wet system, there are no moving parts in the analyzer, the sample is extracted and drawn through the analyzer with an air-driven eductor. No mechanical pump is used, and the analyzer is designed to be extremely robust.

EQUIPMENT

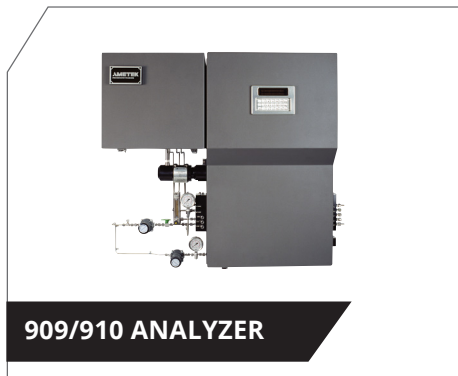
AMETEK offers several analyzers for hot-wet or cold-dry measurement applications:

Hot-wet:

- 909** – Hot-wet single-gas mass flow CEM
- 910** – Hot-wet multi-gas mass flow CEM
- 919** – Hot-wet single-gas concentration-based CEM
- 920** – Hot-wet multi-gas concentration-based CEM

Cold-dry:

- 9900** – Offered for measuring on a cold-dry basis, in a rack (shown) or wall-mount configuration
- 914** – Uses dry extractive sampling techniques designed to meet governmental regulations for all types of compliance monitoring. Combining a temperature-controlled conditioning unit and a heated sampling line ensures integrity of the sample gas. The sample gas is then dried as required and introduced into the instruments



ANALYZER COMPARISON CHART

	909	910	919	920	9900
Measurement technology	Hot-wet single-gas mass flow CEM, non-dispersive UV	Hot-wet multi-gas mass flow CEM, non-dispersive UV	Hot-wet single-gas concentration-based CEM, non-dispersive UV	Hot-wet multi-gas concentration-based CEM, non-dispersive UV	Cold-dry single or multi-gas CEM, non-dispersive UV
Measurable species and ranges (minimum full scale)	H ₂ O: 0 to 125 ppm SO ₂ : 0 to 250 ppm NO: 0 to 300 ppm NO ₂ : 0 to 300 ppm NO _x : 0 to 300 ppm NH ₃ : 0 to 500 ppm	H ₂ O: 0 to 125 ppm SO ₂ : 0 to 250 ppm NO: 0 to 300 ppm NO ₂ : 0 to 300 ppm NO _x : 0 to 300 ppm NH ₃ : 0 to 500 ppm	H ₂ O: 0 to 125 ppm SO ₂ : 0 to 250 ppm NO: 0 to 300 ppm NO ₂ : 0 to 300 ppm NO _x : 0 to 300 ppm NH ₃ : 0 to 500 ppm	H ₂ O: 0 to 125 ppm SO ₂ : 0 to 250 ppm NO: 0 to 300 ppm NO ₂ : 0 to 300 ppm NO _x : 0 to 300 ppm NH ₃ : 0 to 500 ppm	H ₂ O: 0 to 25/100 ppm SO ₂ : 0 to 10/20 ppm NO: 0 to 50/50 ppm NO ₂ : 0 to 100/100 ppm NH ₃ : Application dependent

Notes:

- The above ranges might change depending on the application. Please consult factory.
- The ranges for 9900 analyzers are for single and multi-species measurements, respectively.
- All analyzers are designed to meet US EPA standards of performance for 40 CFR Part 60.

SALES, SERVICE & MANUFACTURING

USA - Pennsylvania

150 Freeport Road
Pittsburgh PA 15238
Tel: +1 412 828 9040
Fax: +1 412 826 0399

USA - Delaware

455 Corporate Blvd.
Newark DE 19702
Tel: +1 302 456 4400
Fax: +1 302 456 4444

Canada - Alberta

2876 Sunridge Way NE
Calgary AB T1Y 7H9
Tel: +1 403 235 8400
Fax: +1 403 248 3550

WORLDWIDE SALES AND SERVICE LOCATIONS

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Germany

Tel: +49 2159 9136 0
Fax: +49 2159 9136 39

India

Tel: +91 80 6782 3200
Fax: +91 80 6780 3232

Singapore

Tel: +65 6484 2388
Fax: +65 6481 6588

China

Beijing
Tel: +86 10 8526 2111
Fax: +86 10 8526 2141
Chengdu
Tel: +86 28 8675 8111
Fax: +86 28 8675 8141
Shanghai
Tel: +86 21 5868 5111
Fax: +86 21 5866 0969



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