

LONG TERM SEMI-CONTINUOUS D/F MONITORING SYSTEMS

GENE RILEY
EMISSION MEASUREMENT
CENTER

LONG-TERM DIOXIN & FURAN SAMPLING SYSTEMS

- AMESA (German Instrument)
 - Adsorption Method for Sampling of D/F
- DMS (Austria Instrument)
 - Dioxin Monitoring System

APPLICATIONS

DIOXIN/FURAN EMISSIONS

- MUNICIPAL INCINERATORS
- HAZARDOUS WASTE INCINERATORS
- HOSPITAL WASTE INCINERATORS
- SEWAGE SLUDGE INCINERATORS
- OTHER COMBUSTION SOURCES

SAMPLING PRINCIPALS

AMESA & DMS

- Auto-isokinetic Sampling
- Titanium Probe & Nozzle
 - Heated application
 - Air or water cooled application
- Sampling Periods
 - 4 hrs to 4 weeks
 - Usually 2 weeks per XAD module

AMESA SAMPLING EQUIPMENT & PROTOCOL

- Titanium Probe Positioned at Average Velocity Sampling Point
- Electronic System Leak-Check Valve
- Collects D/F in XAD-2 Module
- Collects & Measures Stack Moisture
- Monitors & Records Temperatures

DMS SAMPLING EQUIPMENT & PROTOCOL

- Two Titanium Probes Positioned at Average Velocity Sampling Points
- Electronic System Leak-Check Valve
- Collects D/F on Filter & PUF Cartridges
- Does Not Measure Stack Moisture
- Monitors & Records Temperatures

DMS SAMPLING EQUIPMENT & PROTOCOL

- Dual Titanium Probes Positioned at Average Velocity Sampling Points.
- Probes Switch Every 30 Minutes
- Uses the “Null Nozzle” Concept
- Stack Sample is Diluted & Cooled
- Electronic System Leak-Check Valve
- Collects D/F on Polyurethane Foam (PUF)
- Does Not Collect Stack Moisture

DMS SAMPLING PROTOCOL

- Null Nozzle Sampling Approach
 - Design assumes by adjusting the nozzle sample flow to produce a “null condition” for the manometer pressures, isokinetic sampling can be achieved.
 - Reliability of null sampling nozzles is a function of design and use.
 - Isokinetic sampling conditions are not always guaranteed.

DMS SAMPLING PROTOCOL

■ Dilution Sampling Method

- Stack gas is sampled isokinetically
- Mixed with dried, cleaned, D/F-free compressed air
- Purpose of dilution air is to cool and dilute the stack gas to a dew point where little or no condensate is realized
- Dry gas mixture passes through a filter and two PUFs for D/F collection

DMS SAMPLING PROTOCOL

- Polyurethane Foam (PUFs)
 - Two PUFs in series collect D/F
 - PUFs are cleaned and vacuum dried prior to use
 - Glass fiber filter and two PUFs are installed in field module
 - 100 ul of a recovery standard surrogate is applied to glass fiber filter surface
 - Module is assembled by laboratory

AMESA & DMS SAMPLING EQUIPMENT

- Measures Stack Gas Velocity, Temperature, & Pressure
- Optional System Can Measure O₂ & CO₂
- Sampling Range – 0.0001 to 10 ng/m³
- Condensate Can Be Collected & Analyzed For AMESA

AMESA & DMS SAMPLING PROTOCOL

- Isokinetic Sampling Procedures
- Duplicates M23 Sampling Rates
- Collects Approx. $0.85 \text{ m}^3/\text{hour}$ ($0.85 \text{ m}^3 \times 24 \text{ hrs} = 20 \text{ m}^3/\text{day}$)
- Volume For a Two Week Period – $>280 \text{ m}^3$

AMESA & DMS SAMPLE MULTIPLE ANALYSES

- From a 280 m³ XAD Sample Extract:
 - Dioxins/Furans
 - Polynuclear Aromatic Hydrocarbons (PAHs)
 - Polychlorinated Biphenyls (PCBs)
 - CAA Semivolatile HAPs
 - Other Organic Target Compounds

AMESA SUMMARY

- Conducts Isokinetic Sampling
- Sampling Probe/Nozzle
 - Titanium materials
 - Single average-point sampling
 - Usually not heated (can be modified)
 - Probe sample fraction usually not recovered (20% factor added to XAD catch)
- No Fiber Glass Filter (can be added)
- Collects Stack Gas Moisture

DMS SUMMARY

- Conducts Isokinetic Sampling
- Null Sampling Probe/Nozzle (2)
 - Titanium materials
 - Two average-point sampling locations
 - Usually not heated (can be modified)
 - Probe sample fraction usually not recovered (20% factor added to XAD catch)
- Stack Gas Dilution
- Fiber Glass Filter & PUFs
- No Stack Gas Moisture

AMESA & DMS SUMMARY

- Can Measure D/F 52 Weeks/Year
- Estimated Cost (less analysis)
 - Purchase price - ~\$100,000 US
 - Lease Price (12 months) - \$4000/month
- AMESA – 55 Units in Operation
- DMS – 5 Units in Operation

AMESA & DMS CONCLUSIONS

- Allows for Long-Term D/F Measurements – up to 4 weeks
- Annual D/F Method 23 Estimates for Plants Have Increased 15 to 25% When Measured by AMESA & DMS
 - Increases attributed to: 1) daily plant operation variations and 2) that very few of the D/F are “non detects” as seen in Method 23 analyses.

AMESA & DMS AS ALTERNATIVE TEST METHODS

- Must Meet M 301 Acceptance Criteria as Compared With EPA Method 23
- Procedures Could be Approved
 - As alternative compliance test method
 - At specific industry category
 - Facility by Facility approval
(each emission point must be evaluated)