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 & CO2Sampling 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 m³/hour (0.85) $m^{3} X 24 hrs = 20 m^{3}/day$) Volume For a Two Week Period – >280 m³

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)