

BUILDING A WORLD OF DIFFERENCE

November 8, 2011

ALASKA NATURAL GAS HEATING VALUE STUDY WORKSHOP

STATE OF ALASKA, DEPT OF REVENUE/BLACK & VEATCH



BLACK & VEATCH
Building a world of difference.

AGENDA

- **Introductions**
- **Workshop Overview**
- **Review of Existing Practices**
- **Heating Value Study**
- **Discussion**
- **Questions**
- **Adjournment**



WORKSHOP OVERVIEW



OVERVIEW

- **Sec. 43.55.011. Oil and gas production tax.**
 - (g) For each month of the calendar year for which the producer's average monthly production tax value under AS 43.55.160(a)(2) per BTU equivalent barrel of the taxable oil and gas is more than \$30, the amount of tax for purposes of (e)(2) of this section is determined by multiplying the monthly production tax value of the taxable oil and gas produced during the month by the tax rate calculated.

REVIEW OF EXISTING PRACTICES

HEATING VALUE STUDY

PROJECT OBJECTIVES

- Black & Veatch retained by DOR as to industry standards related to determining the heating value of gas produced from leases or properties in the state, including sampling of gas, determining the composition and water vapor content of gas, and calculating the gross heating value of gas in BTU equivalent barrels.
- Also, B & V was to asked to review and advise the Department on:
 - Sampling methods for gas, including composite and spot sampling methods
 - The most current industry standards
- Recommendations as to which standards the Department should consider for use in implementing the requirements of the oil and gas production tax
- Types of additional costs, if any, that may be incurred by operators in order to comply with the various options and recommend a time frame to be used for the implementation of any change to current practice
- Other components relevant to the determination of heating value of natural gas

PROJECT APPROACH

Black & Veatch investigated the following topics in its analysis:

- Previous heating value studies
- Existing DOR practices, State statutes
- Sampling methods for gas, including composite and spot sampling methods
- The most current industry standards and best practices
- Representative equipment used/approximate cost
- Other components relevant to the determination of heating value of natural gas

REVIEW OF ALASKA STATUTES, PRACTICES



REVIEW OF ALASKA STATUTES, PRACTICES

- **Sec. 43.55.900. Definitions.**

- "British thermal unit" means the quantity of heat required to raise the temperature of one pound of water from 58.5 degrees Fahrenheit to 59.5 degrees Fahrenheit at a constant pressure of one atmosphere;
- "BTU equivalent barrel" means
 - in the case of oil, one barrel;
 - in the case of gas, the amount of gas that has a heating value of 6,000,000 British thermal units;
- "cubic foot of gas" means the volume of gas contained in one cubic foot of space measured at a pressure base of 14.65 pounds per square inch absolute and a temperature base of 60 degrees Fahrenheit;

Ref:



REVIEW OF ALASKA STATUTES, PRACTICES

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POTENTIAL SAMPLING ISSUES



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1. **Sampling Frequency** – Sampling once a calendar year does not provide a reasonable level of documentation of the heating value of the natural gas produced and transported throughout the year.
 - Proposed Change (15 AAC 55.811): “To ensure accuracy of this method, the gas sample must be representative of the gas under consideration”
 - Shorter sampling time slices (i.e., increased sampling population) provides for reliable heating value determination
 - Routine and consistent sampling time slices are more reflective of actual thermal volumes produced
2. **Sampling Methodology** – A potential source of error in assessing the representative gas composition of spot samples taken in field occurs during the process of extracting the sample, transferring it to a sample cylinder, marking and cataloguing the sample, as well as the general handling of samples
3. **Consistent Policy, Procedures & Training** – Consistent, proper and adequate handling polices, procedures, and training form the cornerstone of consistent and reliable natural gas sampling under varying and difficult field conditions

CURRENT INDUSTRY PRACTICE

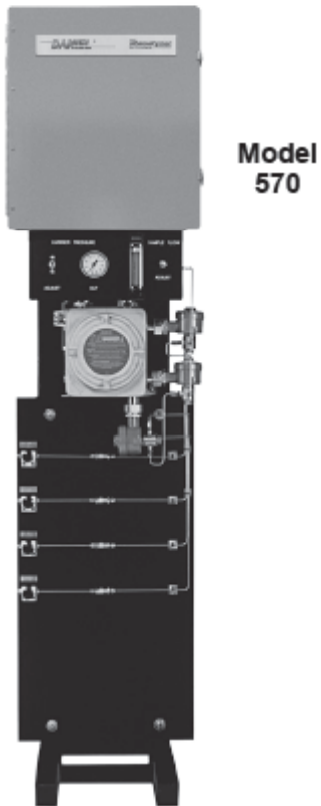


INDUSTRY STANDARDS

- **Sampling Frequency “Best Practice”**
 - Sample and analyze gas stream on a basis consistent with a reasonable level of accuracy
 - Necessary to meet statutory requirements as opposed to commercial sales requirements
 - Gas Chromatograph units offer superior sample frequency flexibility
 - Fractional hour or hourly basis
 - Daily basis
- **Gas Chromatographs**
 - Most common method to determine heat value content of natural gas streams
 - Flexible installment across natural gas pipeline networks
 - Provide analysis of flowing gas and calculating physical properties used for flow calculations and custody transfer purposes
 - Daniel Model 570 – A popular model

GAS CHROMATOGRAPH

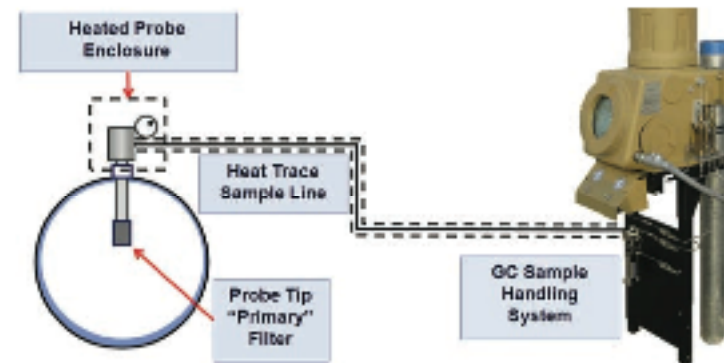
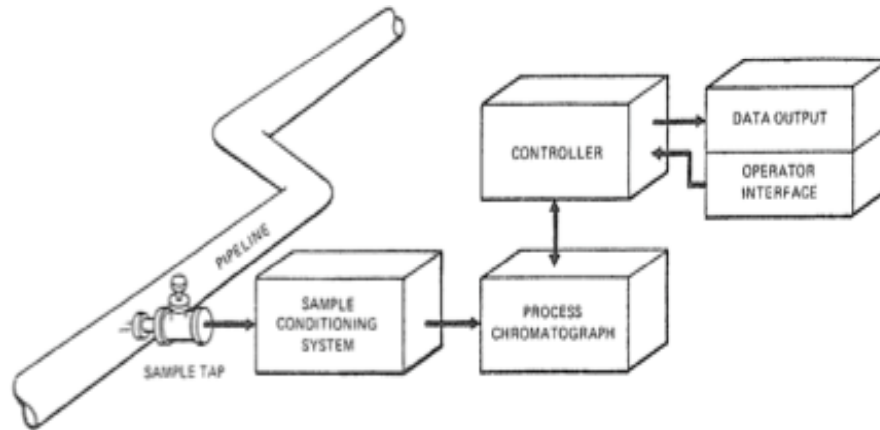
Features and Benefits



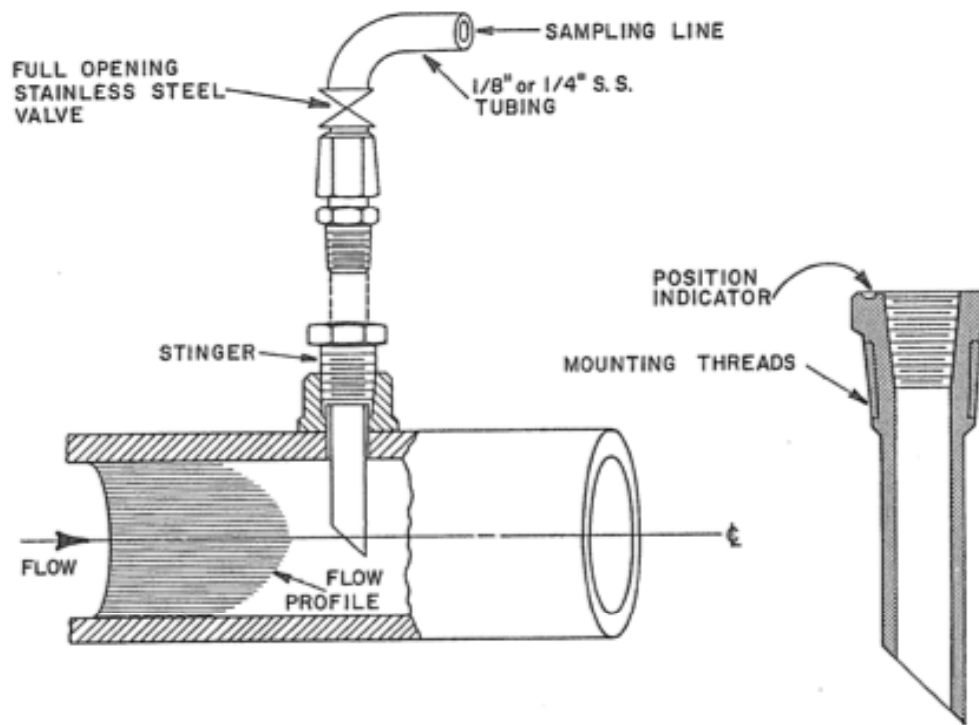
- Custody transfer
- Compositional analysis (CH_4 to C_6+ , N_2 and CO_2 , as well as water content)
- Thermal value determination
- High Precision
- Wide dynamic range from percent to trace level components
- Operating Temperature: $0^\circ\text{F} - 131^\circ\text{F}$
- Low helium/power consumption
- Industry leading warranties
- Ease of use
- Electronic capture of historical time slice analyses

Source: Emerson Process Management. Daniel Product Datasheet, DAN-PDS-GC-500. May 2010

TYPICAL GAS CHROMATOGRAPH INSTALLATION



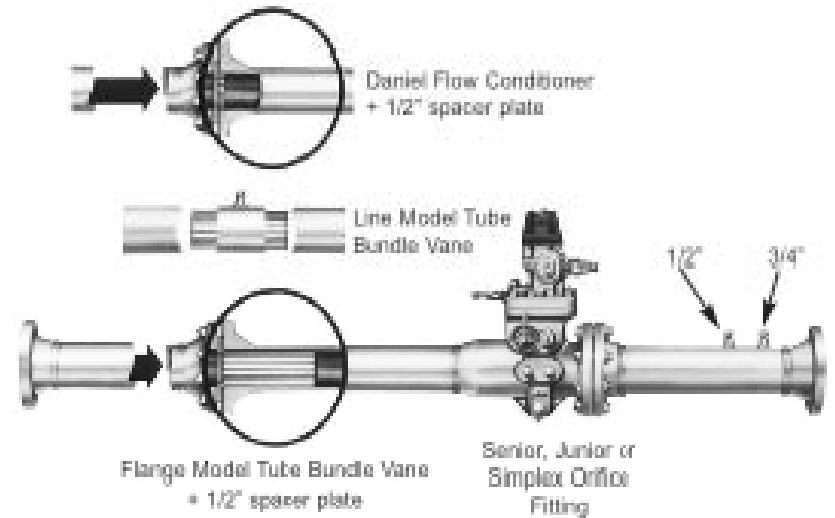
TYPICAL GAS CHROMATOGRAPH INSTALLATION



TYPICAL GAS CHROMATOGRAPH INSTALLATION



Typical Meter Tube



GAS CHROMATOGRAPH INSTALLATION

- **Installation Requirements**

- Recognizing the severity of the Alaska weather environment, gas chromatograph installations should be installed inside weather protected shelters

- **Recommendations**

- Install gas chromatographs at unit transfer points to allow for:
 - Proper gas stream segregation
 - Continuous gas stream sampling
- Install electronic data transfer means to enable downloading of data for enhanced analysis
- Eliminate potential issues associated with current methods of collecting and handling of gas samples in field and transporting to lab for eventual analysis

REFERENCES



REFERENCES IN PROPOSED 15 ACC 55.811

- **Standards**

- *Calculation of Gross Heating Value, Relative Density and Compressibility Factor for Natural Gas Mixtures from Compositional Analysis* (Latest version: Gas Processors Association Standard 2172-09)
- *Standard Test for Water Vapor Content of Gaseous Fuels using Electronic Moisture Analyzers* (Latest version: ASTM International Standard D 5454-11)

COST EXAMPLE



GAS CHROMATOGRAPH COST EXAMPLE

- **Daniel Model 570**
 - \$40,000 - \$50,000 including gas sampling panel with probes, regulators, switching valves, hoses, brackets for helium carrier gas and calibration gas cylinders, modem and software.

FINDINGS AND CONCLUSIONS

- Alaska statutes, per AS 43.55.011, require that the production tax value of gas be determined using a BTU equivalent barrel basis.
- More frequent, accurate sampling needed to calculate heating value of natural gas.
- Industry best practice is to utilize gas chromatography to sample natural gas more frequently over time instead on one sample/year.
- Typical installations and equipment range from \$40-50k.

DISCUSSION/QUESTIONS?

