Canadian School of
Hydrocarbon Measurement

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Proration Batteries: Enhancing Accuracy through Measurement by Difference

Presented by Wayne Dunnington

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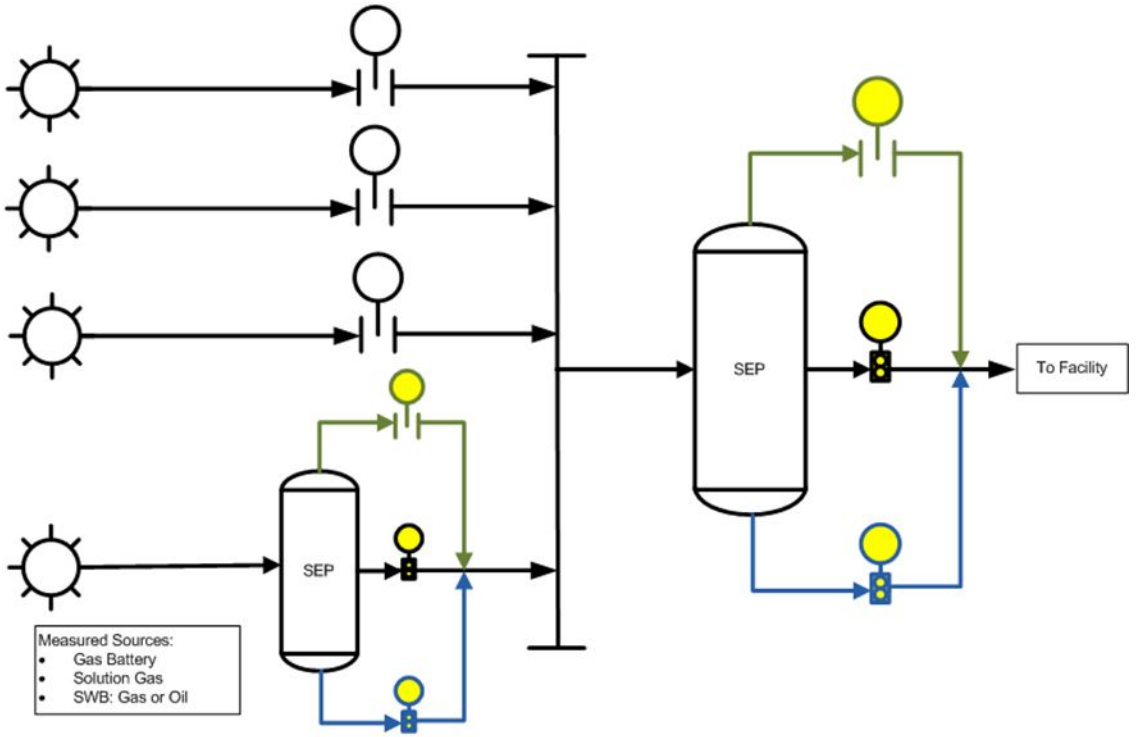
Introduction

- Objective: Highlight the importance of effluent measurement in proration batteries.

- Proration batteries…how does measurement by difference improve accuracy?



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Regulatory Framework

- AER Directive 017: Requirements for gas measurement.
  - Chapter 4 (small)
  - Chapter 7
- BCER BC Measurement Guideline: Key differences and additional requirements.
  - Chapter 4 (small)
  - Chapter 6
  - Appendix C

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What is Measurement by Difference?

Measurement by difference (MbD) is defined as any situation where an unmeasured volume is determined by taking the difference between two or more measured volumes. It results in the unmeasured volume absorbing all the measurement error associated with the measured volumes. In the case of a proration battery (effluent measurement, or periodic testing without continuous measurement), new gas or oil source errors may be difficult to detect because the proration testing errors in the original system can hide the new source errors. Despite these concerns, a properly designed and operated measurement system can minimize the risk and attain reasonable accuracy, provided that the measured source gas or oil rates are a small proportion of the total system delivery rates.

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Restrictions

- Chapter 5 in both AB and BC!!!

Table 5.6-1 When MbD is Acceptable for a Measured Gas Source tied-in to a Gas Proration Battery/Facility

Prorated gas flow rate (excluding all measured gas source)	R(1)	Application Required
≤ 0.5 e3m3 /d	< 1.00	No
> 0.5 e3m3 /d	≤ 0.35	No
> 0.5 e3m3 /d	> 0.35 and ≤ 0.75	No (2)
> 0.5 e3m3 /d	> 0.75	Yes

1) R = Ratio of volume of all tied-in measured gas volumes (including GEV of condensate where applicable) to (including fuel, flare, and vent volumes).
2) Must meet additional qualifying criteria in section 5.6.1.2 below.

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WAIT…What?!

5.6.1.2. **Qualifying Criteria for R: 0.35 < R ≤ 0.75**

1) Single point measurement uncertainty of the measured gas source gas meter and of the prorated battery group gas meter must be ≤ 2.0 per cent.

2) EFM must be installed on both the gas and condensate meters at the measured gas source meter(s) and the prorated battery group separator.

3) Gas proration factor targets, as set out in section 3.2.3 must be maintained.

4) Potential reservoir engineering / management concerns have been considered and determined to be acceptable the total battery gas disposition volume.

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Challenges?

- Working interest
- Measurement errors
- Hidden losses/gains
- Density differences
- GIS – VGWL of oil or gas well delivering to an oil facility

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Solutions…31-Day Test!

HCL Recombined at the Battery

ECF =

(Test Gas + GEV Test Condy) / Effluent Meter

(B + GEV of C) / A

HCL Tanked at the Battery

- ECF =
- Test Gas + GIS Test Condensate / Effluent Meter
- B + GIS of C / A

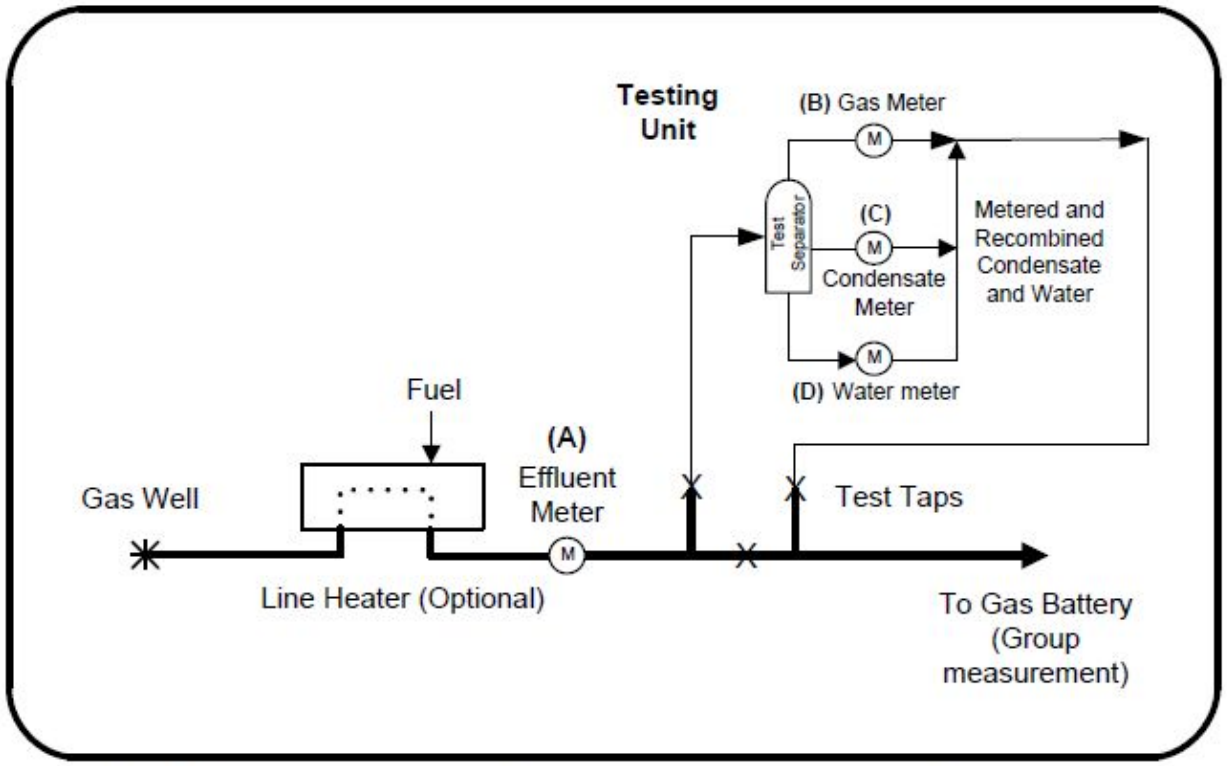
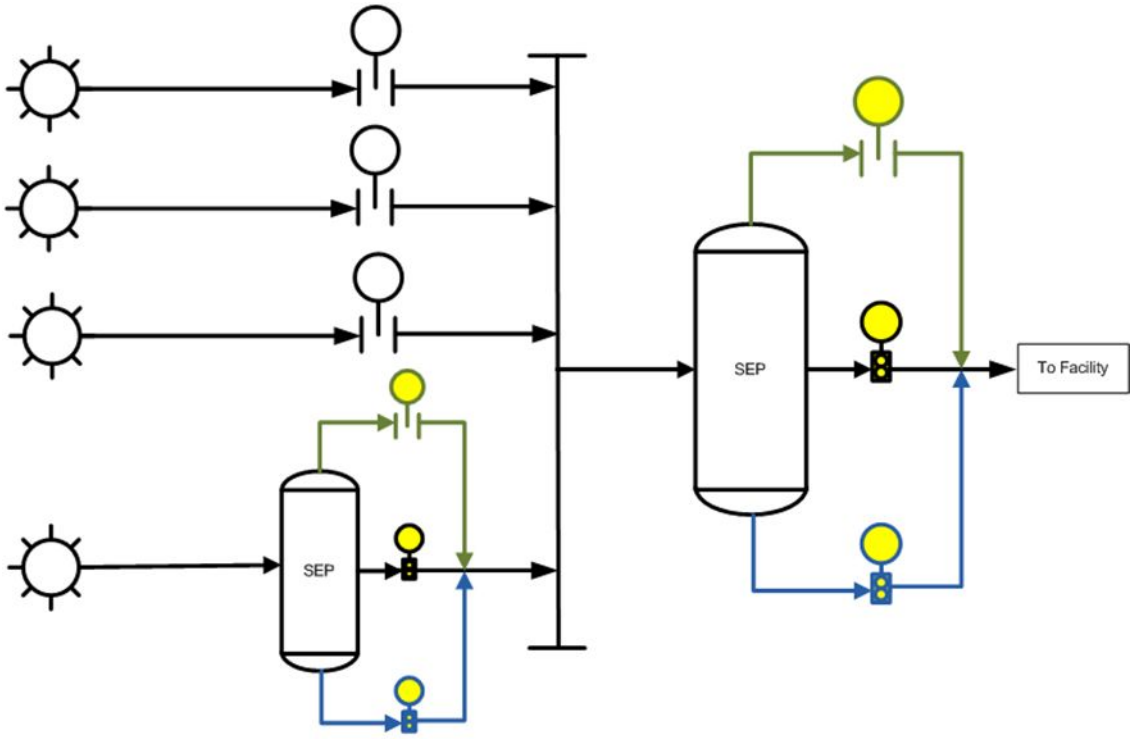


Figure 7.10. Effluent well meter testing configuration with condensate production

Solutions…31-Day Test!



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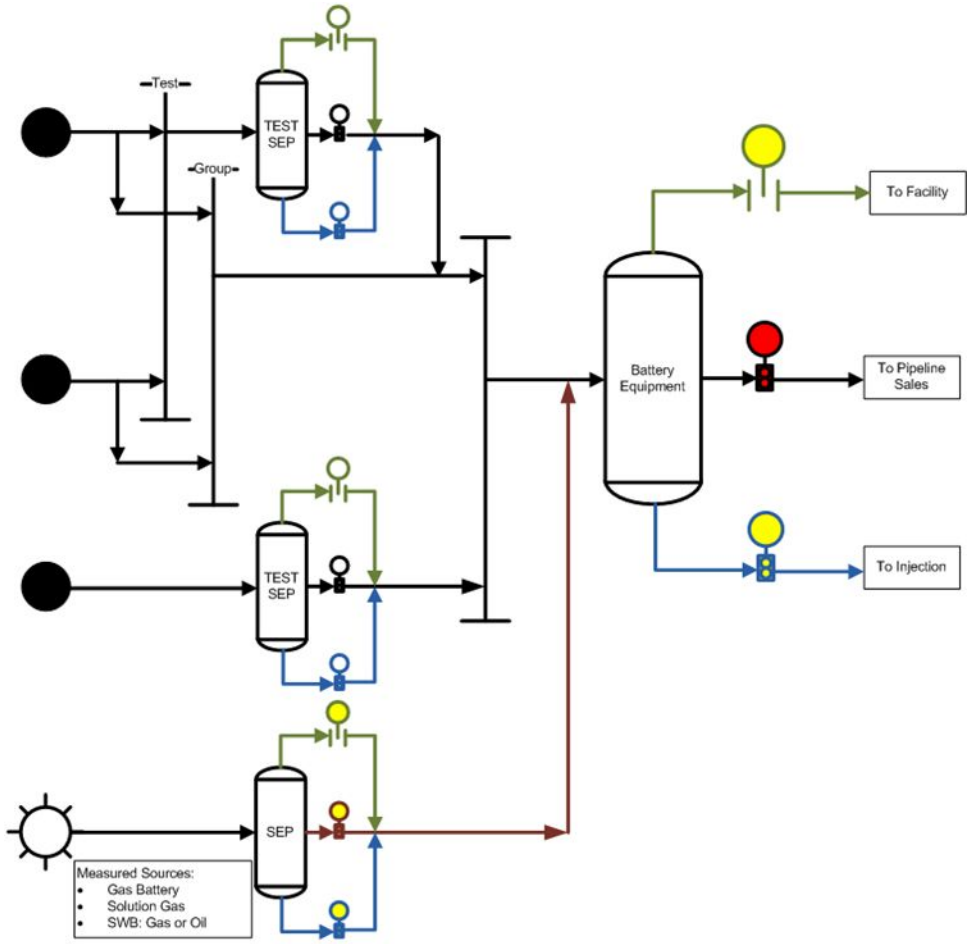
It Must be Said

- Gas wells producing condensate delivering to an oil facility…
  - Delivery point measurement required on condy
  - Condy to be proved to delivery point requirements
  - Condy volumes kept whole
  - Applicable shrinkage calculations to be determined



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It Must be Said

- Oil wells producing oil delivering to a gas facility…
  - Delivery point measurement required on oil
  - Oil to be proved to delivery point requirements
  - Oil volumes kept whole
  - C5+ Netted of Condy at gas facility

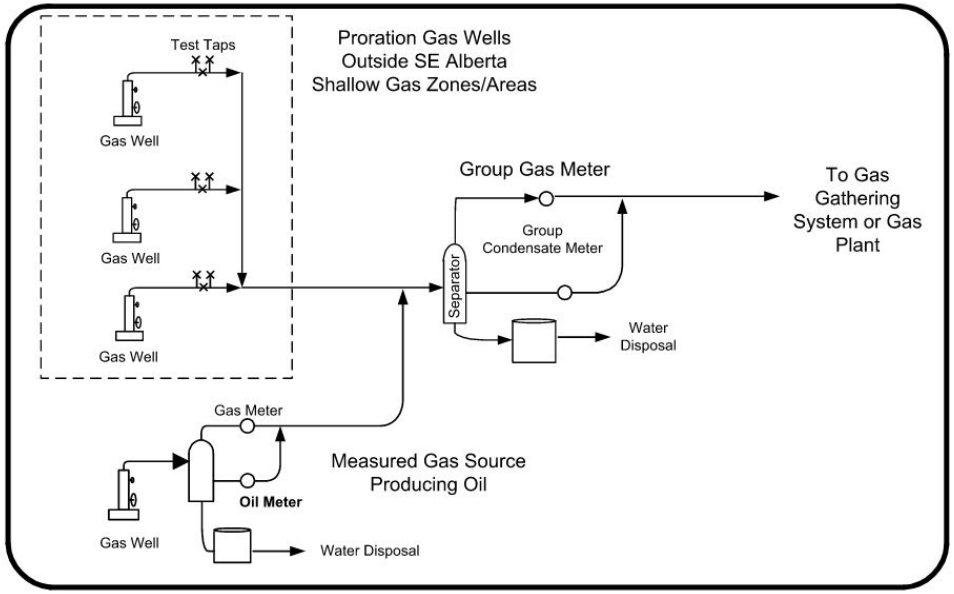

Figure 5.12 Measured oil or oil emulsion from a measured gas source delivering into a gas proration battery or gas plant

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Bait-and-Switch

- Proration B[illegible]er[illegible] Enha[illegible]ing Accuracy through Me[illegible]uren[illegible] b[illegible]ifference

- Discussion…what is your specific MbD scenario. Let's discuss it together.

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