GMI Expo 2103

Evaluation of Casing Gas Recovery Options in China

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Basic Casing-Gas Control Strategy

- Use what you can on site or at other nearby facilities (especially where this reduces reliance on offsite fuel and other supplied energy).
- Transport the gas to market by gaining access to a nearby gathering system or convert it to an alternative energy form that can be more readily transported to market (e.g,, LNG, LPG or electricity).
- Dispose of the gas that cannot be conserved or utilized in in a manner that minimizes GHG emissions (i.e., flare rather than vent).

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Challenges

- Most large and medium scale opportunities already addressed:
  - Recovery of condensable hydrocarbons.
  - Electric power generation.
- Individual site opportunities generally <1000 m^3/d.
- Flows from individual wells range from 0 to 20.6 m^3/h or (0 to 494.4 m^3/d).
- Lack of site-specific measurement data to evaluate opportunities.
- Reliable gas analyses generally unavailable.

Challenges

- One surveyed oilfield in China comprised several thousand widely dispersed wells (primarily in mountainous terrain).
  - Difficult pipelining conditions.
  - Limited opportunities to cluster wells.

- In older development areas:
  - Casing gas flows have declined.
  - Local residents have begun using the waste gas for domestic needs and flare the balance.

Oilfield Terrain

Approach Being Taken

- Measurement program to identify practicable casing-gas recovery opportunities.
- Application small-scale solutions:
  - Small Scale Power Generators.
  - Micro-condensers.
  - Micro-LNG Plants.

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Measurements

- Continuous data logging of vent gas flows using ultrasonic flow meter:
  - Zero back pressure.
  - Tolerant of some condensation or aerosols.
  - Composition independent.
  - Excellent range ability (2000:1).
  - Good accuracy ±2 to 5%.
  - Easy to install.
  - Determination of gas MW from sound speed.

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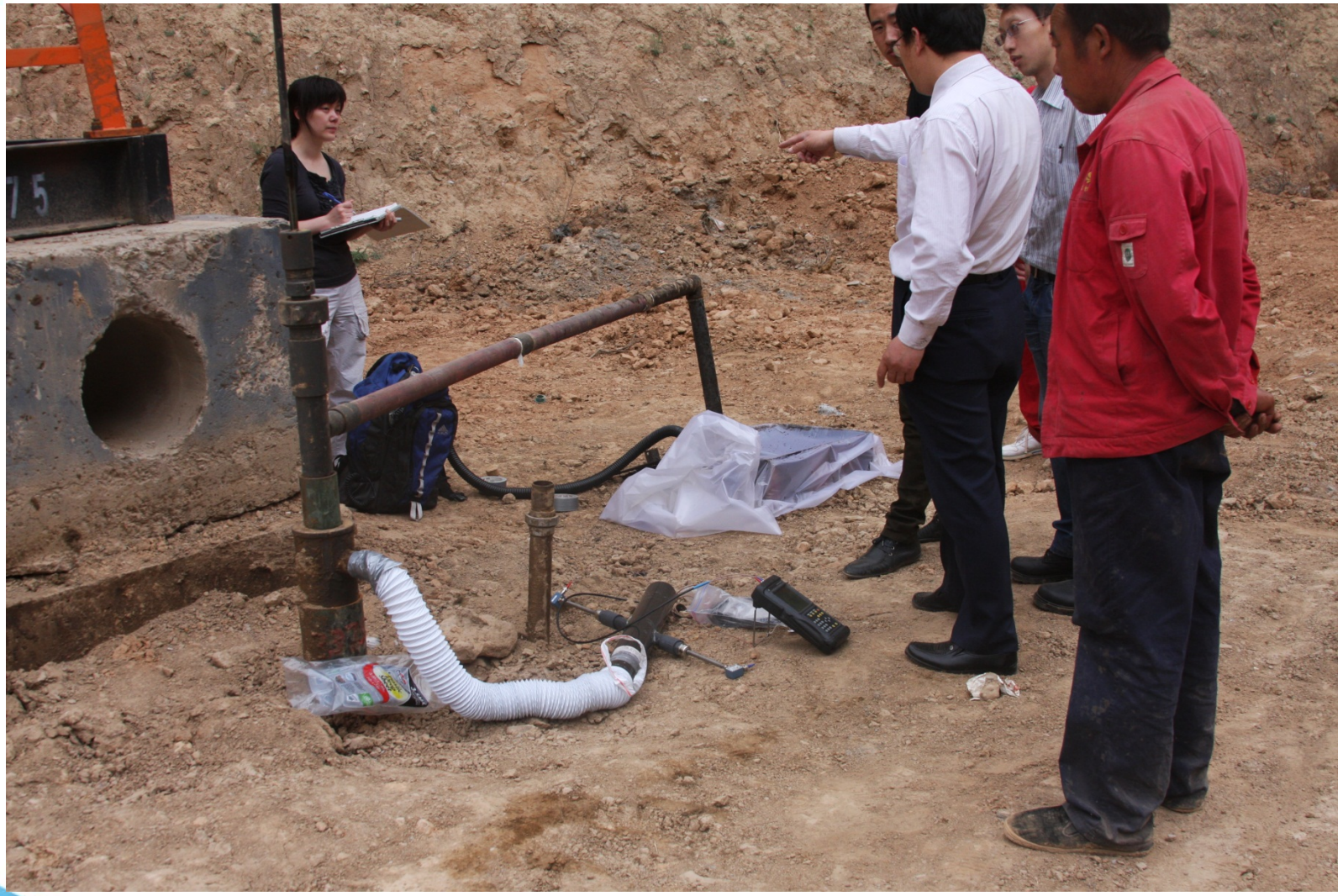
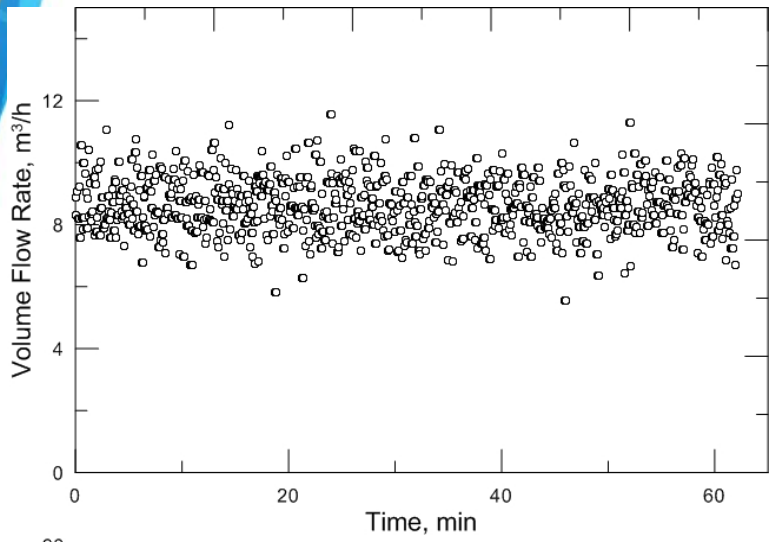
Casing-Gas Flow Measurement

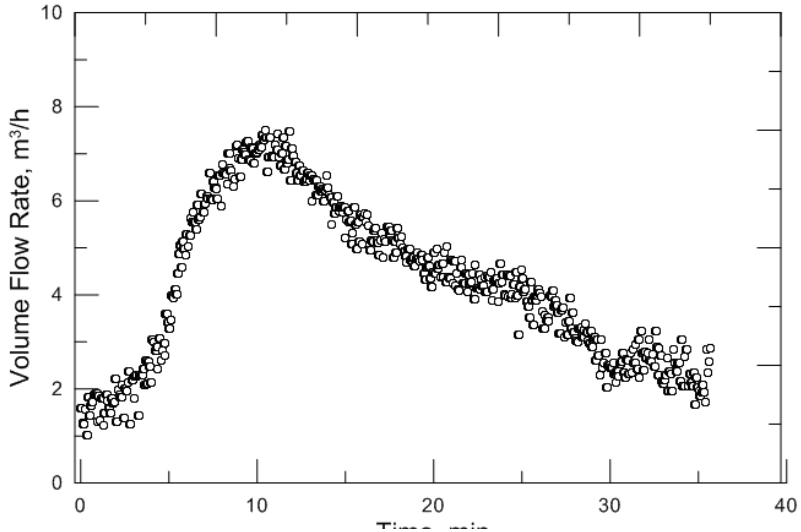
Casing-Gas Flow Measurement

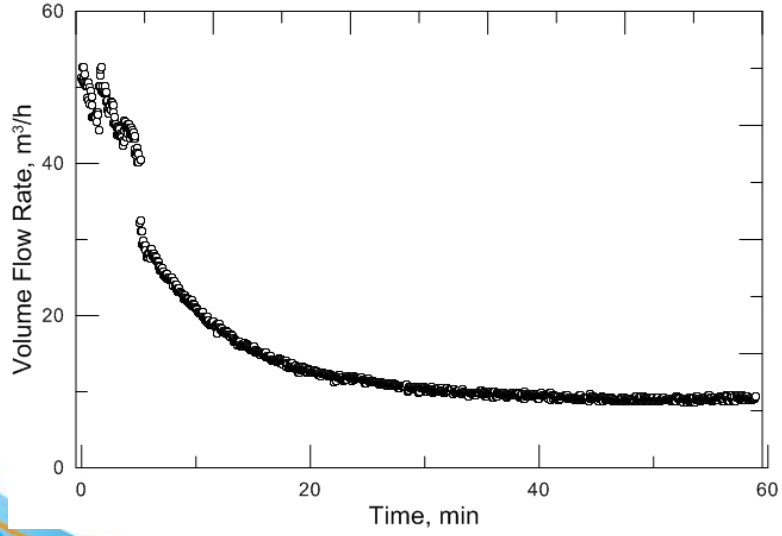


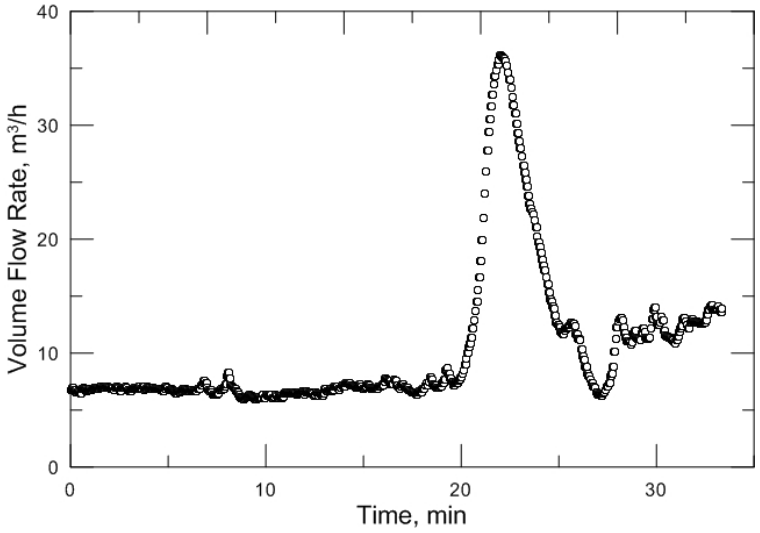
Hi-Flow Sampler Measurement of Emissions from a Sump

Variations in Casing Gas Flows









Micro-GCs: Technological Innovations

- Field analyses reduces or eliminates sample degradation issues.
- Micro-GCs offer stable and reliable performance in the field.
- Low power requirements.

Micro-Condenser Units

Capacity: 282 to 2832 m3/d of waste gas.

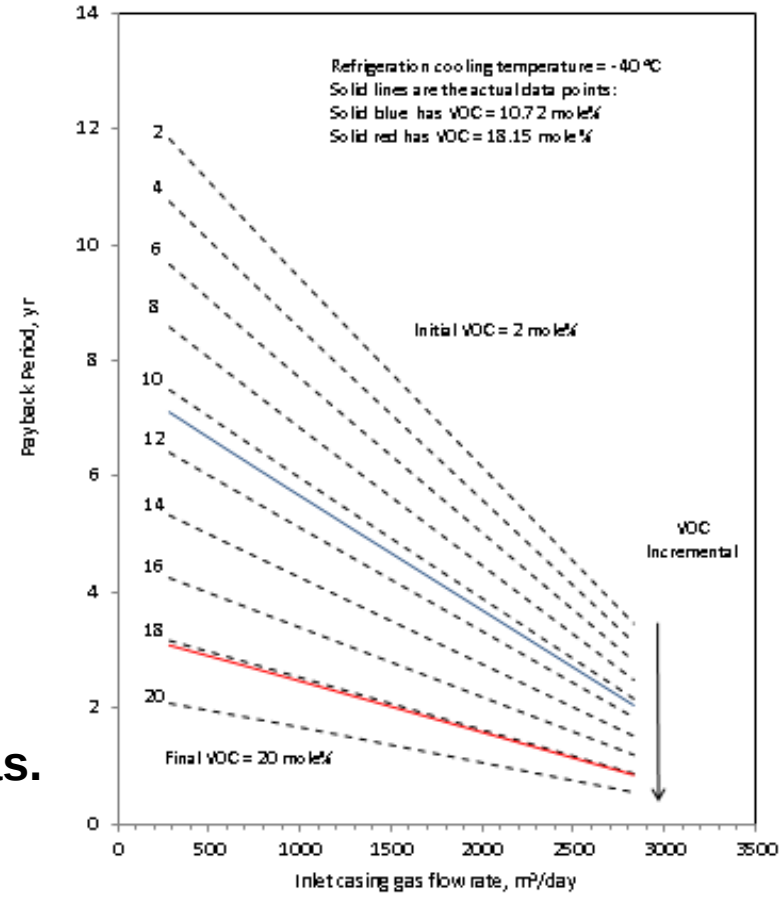


Figure 8: Screening tool for site selection for refrigeration casing gas recovery system - payout period as a function of casing gas flow rate and VOC concentration of casing gas for the generate and flare scenario.

Small-Scale Power Generators

Capacity: 10 to 117 kW (70 to 828 m^3/d).

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Micro-LNG Plant

Source: Kryopak Inc. (Texas)
Capacity: 50 tonnes/d (73,700 m^3/d)

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Key Findings

- Adequate time-series monitoring of casing-gas flows important for determining true production potential.
- For the cases investigated the casing gas comprised noteworthy amounts of non-methane hydrocarbons:
  - 5 times more valuable than methane fraction.
  - Greatly enhances feasibility casing-gas recovery projects.

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Thank you!

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