

Information Report **Production Test Reporting and Data Validation**

■ ***Production Testing in General***

Principals Production testing is a generic term for any flow through portable facilities. Usually, but not necessarily, production testing is done prior to tie-in for commercial operations. Production testing includes:

- Underbalanced drilling; where the well is allowed to flow while drilling.
- Fracture stimulation treatment; sand and fluid clean-up operations.
- Acid wash or squeeze stimulation treatment; fluid clean-up operations.
- Various well workover, clean-up and swabbing operations.
- Single point and multi-point flow test operations.

Facilities Test facilities range from essentially none (blowing a well to atmosphere) to sophisticated, high pressure, heated, multi-phase sand/liquid/gas separation equipment.

Camps Production testing can be continuous for several days. Companies will thus install a small camp (trailer) for employees on shift work.

Welltesting This *i*REPORT will focus on operations, quality control, data reporting and data validation topics related specifically to testing wells. Note that all flow from a well is important, with respect to welltest interpretation, analysis and engineering.

→ ***Facilities—Basic***

Dry, Sweet Gas The most basic of production tests is to blow a well to atmosphere through a bean choke or critical flow prover. A small water knock-out separator can be added for minor liquids. See production nomenclature at the end.

↕ Facilities—Intermediate	
Sweet Gas & Liquids	Intermediate facilities include a header or manifold, water/oil/gas multi-phase cold separator, orifice meter or vortex meter, backpressure valve and flare stack. Tanks can be added to hold liquids.
↕ Facilities—Advanced	
Sour Gas, Sand & Liquids	Advanced facilities include a header or manifold, line heater, multi-phase, high pressure sand/water/oil/gas separator, orifice meter, backpressure valve, flare stack and incineration gas injection. Tanks can be added to hold liquids. Underbalanced drilling applications may include additional, highly specialized equipment, for the circulation gas (N ₂ or air).
🕒 Flow Meters	
Parameters	Gas metering requires measurement of several parameters to solve the equation-of-state: temperature, static pressure and differential pressure. Gas gravity (density), composition (H ₂ S, CO ₂ , N ₂) and properties (ρ_{P_c} , ρ_{T_c}) should also be known.
Flow Prover	Critical flow provers are simple gas flow meters using orifice plate theory. Gas is blown to atmosphere, so the differential pressure is assumed.
Orifice Meter	The most common type of gas flow meter is in-line, with differential pressure controlled by the backpressure valve. Orifice plate theory is employed for velocity and rate calculations.
V-Cones	V-Cones are simply the opposition of an orifice (hole) whereby an obstruction is placed in the flow stream. Parameters are the same as for orifice meters.
Vortex	Vortex meters are being used more often. These place a bar in the flow path, creating flow eddies or vortices. Frequency is an input parameter. Vortex meters shouldn't be used for frac sand flow back.
Incineration	High hydrogen sulfide (H ₂ S) sour gas concentrations require gas incineration. Propane is used as a volatile gas additive. Be sure to use correct physical properties for flow volume calculations. The relative density of propane (C ₃ H ₆) is 1.45 vs. the Fekete FAST Field Notes default of 0.65. Using $\rho = 0.65$ for propane metering would <i>overestimate injection rates by nearly 50 %!</i>



Test Considerations

- Clean-up Sand returns (an abrasive) should be eliminated, before running pressure recorders. Load fluids should be minimized, before conducting a production test. Clean-up gas volumes are important for welltest analysis and should be provided.
- Interruptions Flow interruptions (choke changes, backpressure adjustments, orifice plate changes, well shut-ins) should be minimized throughout single point or extended production flow tests. Modified isochronal tests should have consistent flow/shut-in periods, without changes.



Reporting Considerations

- Gas Properties Sampled gas properties should be input for correct gas flow rate and volume calculations.
- Flow Time & Volume Incremental and cumulative flow time should be shown on the table for analytical usage. Meters should be zeroed appropriately for correct gas volume and flow time calculations.
- Load Fluids Load fluids left to recover (LFLTR) should be tracked carefully for analytical purposes.



Government Regulations

- Regulatory Boards In Canada, petroleum well testing is controlled by provincial boards, each with a variety of rules, regulations and submission requirements:
- Alberta Energy and Utilities Board (AEUB)
 - British Columbia Oil and Gas Commission (BC-OGC)
 - Saskatchewan Industry and Resources (SIR)



Alberta Requirements

- Act & Regulations Alberta has the most stringent requirements and one should be thoroughly familiar with Oil and Gas Conservation Act 151/71, AEUB published guides G3, G5, G40 and G60 as well as General Bulletins 2003-01, 2003-05 and especially 2003-15 (the PAS file mnemonic guide).
- AEUB.pas Files All clean-up and production test data are required to be submitted to the AEUB, in electronic format, via their web site, as PRD.pas files (pressure ASCII standard). Appropriate electronic files are expected by all welltest analysts.



British Columbia Requirements

- Regulations All test data and applicable analyses must be submitted, as per requirements of Section 95 of the *Drilling and Production Regulation*. Well testing requirements are further detailed in Section 6.7 of the *British Columbia Oil and Gas Handbook*.
- Submissions Welltest submissions to the BC-OGC are still via paper copy. Reports should be prepared by qualified welltest interpretation experts. Underbalanced drilling, clean-up and production data are documented on the Well Deliverability Test Report (OGC-062-AOF form).



Saskatchewan Requirements

- Submissions Welltest submissions to the SIR are still via paper copy. Absolute Open Flow (AOF) reports should be prepared by qualified welltest interpretation experts, with the accompanying AEUB-EG-32 form (predating AEUB.pas electronic files).



Contact

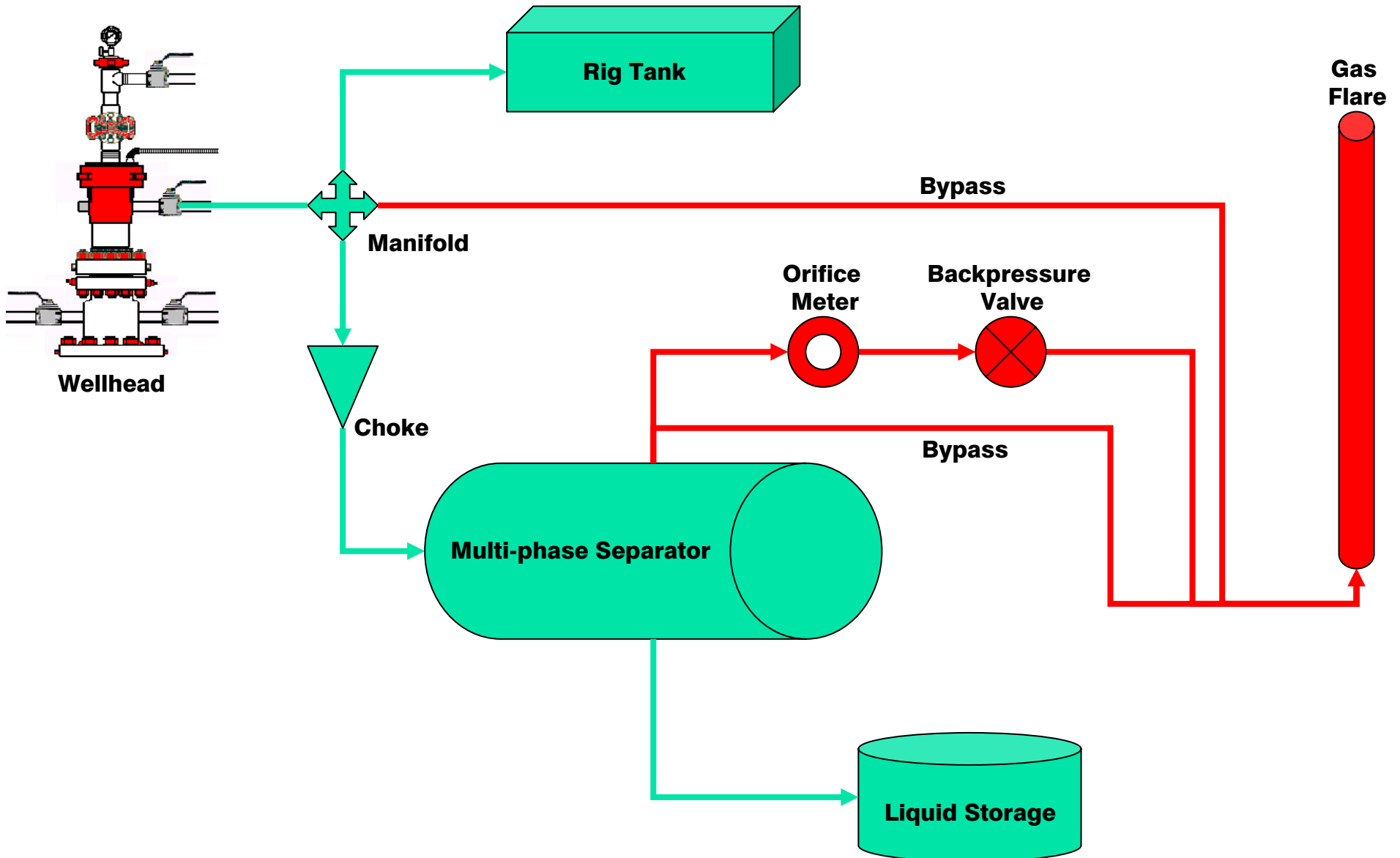
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Production Nomenclature

Facilities	Equipment used for production test facilities
Wellhead	Capping the wellbore, wellheads allow access to tubing and casing (annulus) flow.
Manifold	Allows control and diversion of flow stream to different places (rig tank, separator, bypass).
Rig Tank	An open-air tank with the service rig to hold load fluids.
Choke	Bean chokes or adjustable chokes control the flow volume.
Separator	Two-phase (gas, water), three-phase (gas, oil, water) or multi-phase separation of well effluent.
Cold Unit	Most common, non-heated separator.
Line Heater	Warms the gas to reduce hydrating problems.
P-Tank	Separator built to handle high pressure gas, usually multi-phase.
Backpressure Valve	Special valve to hold back pressure on the orifice meter/separator. Mimics line pressure.
Flare Stack	For igniting and burning off gas production.
Meters	Parameters and flow meter parts
Orifice	Hole in an orifice plate. Meters have a variety of orifice plates to use, each with a specific hole ID size.
Static Pressure	Pressure immediately upstream of the orifice plate.
Differential Pressure	Difference in pressure across the orifice plate. With the common in-line meter, this is controlled by the backpressure valve and measured. With a critical flow prover, the differential is assumed between static pressure and atmospheric pressure (AEUB standard barometric pressure = 93 kPa _a).
BS&W	Base Sediment and Water. From a “grind-out” or centrifuged sample. Subtracted from total liquids to estimate water rates and volumes.
LFLTR	Load Fluid Left To Recover. After recovery of load fluids, liquids are considered to be “new”.
Pressures	Clarification of pressure standards
Absolute	Open-air pressure measurements include atmospheric or barometric pressure. Wireline pressure recorders measure absolute pressures (kPa _a). Engineering standard is to use absolute pressures.
Gauge	Measurements of closed systems (i.e. wellhead, pipeline, separators) are exclusive of atmospheric influence. Gauge pressures (kPa _g) must be converted for engineering use (AEUB standard barometric pressure = +93 kPa _a).



B2B Energy Ltd.
 100/10-20-030-04W5/00
 Start Test Date: 2005/12/01
 Final Test Date: 2005/12/08

B2B Willy Wonka
 Formation: Rock Creek
 Pool: 2531.0 - 2762.0 mKB-MD
 Job Number: PRD

Frac/Clean-up & Single Point Test

