The Lease Pumper's Handbook

Chapter 18
Producing Natural Gas Wells

Section E

NATURAL GAS SYSTEMS

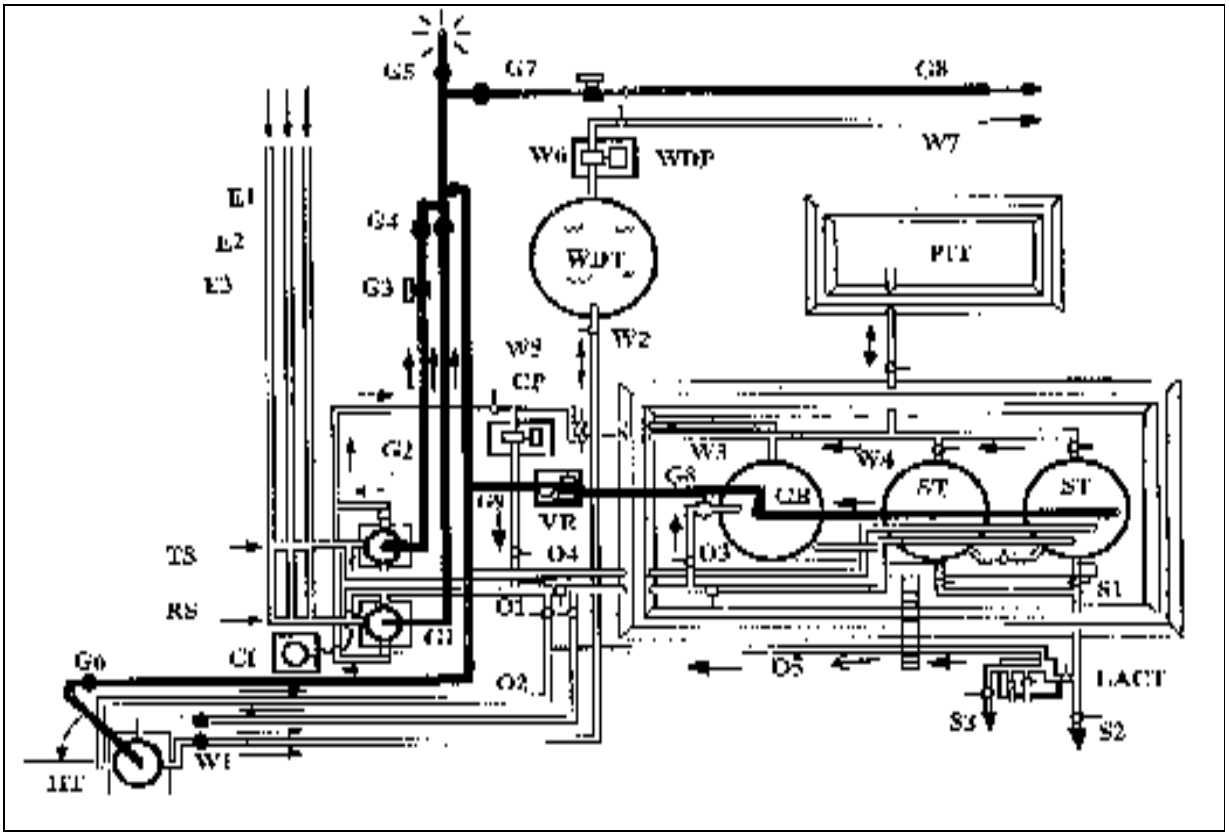

Figure 1. The high and low pressure gas system is indicated by the letter *G*.

E-1. The High-Pressure Gas Line System.

The natural gas system at the tank battery (Figure 1) begins in the first vessel that the produced fluid enters and where the natural gas is separated. The high-pressure gas system is really not *high* pressure, especially when considering the truly high pressure of bottom hole and wellhead pressures. High pressure is just the separator pressure, which may vary from as low as 20 pounds to as much as 50 pounds. When producing stripper wells, the well pressure has usually been depleted. It is usually producing with the assistance of a mechanical pumping unit and makes a low volume of gas. The casing valve may even be open to the atmosphere. As the downhole pump pumps fluid, however, enough gas will usually break out of the oil so that a separator pressure can be maintained as needed.

E-2. Controlling the Pressure in the Separators and the Heater/Treater.

Controlling the pressure in pressurized vessels is usually done by using a diaphragm-controlled automatic backpressure valve (Figure 2). These valves have a spring, bolt, and nut arrangement on top for easy adjustment. Since fluid can only flow from a higher to a lower pressured vessel, the separator must carry a higher pressure than the heater/treater. In turn the atmospheric vessels have the lowest pressure in the system, which is just a few ounces. Fluid will flow from one atmospheric vessel to another by line height or pump.

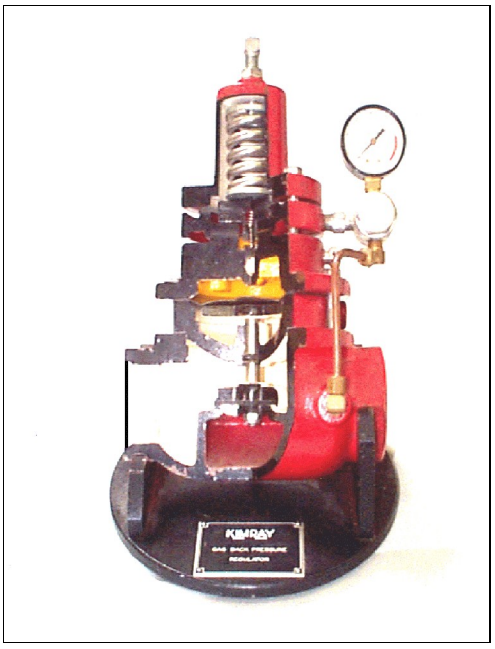

Figure 2. An automatic backpressure gas valve.
(courtesy of Kimray, Inc.)

E-3. The Well Testing Gas Measurement System.

All wells are normally tested one time per month. The well will be tested through a separator, heater/treater, or by producing directly to a stock tank, according to emulsion content. Figure 3 shows a gas testing system that requires a gas chart, a gas meter, and an orifice plate holder installed in the gas line.

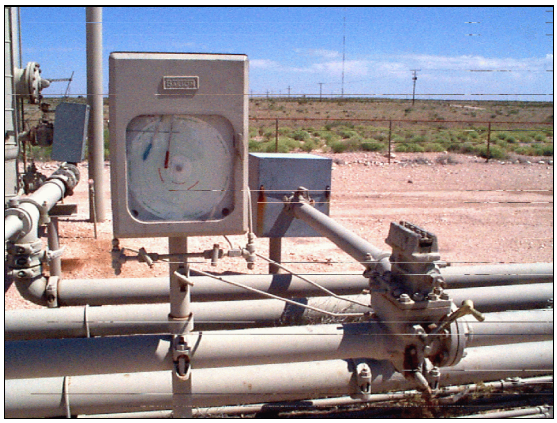

Figure 3. A gas test system that includes a gas meter with chart recorder.

E-4. The Gas High Pressure Gathering System.

As indicated in Figure 1, the heater/treater will have a backpressure valve located near the vessel. Each of the two separators will also have its own backpressure valve installed in the lines just before they join together. The backpressure valves are identified on the chart by a round black dot on the gas line drawing.

Each of the three vessels will have a gas pressure that is appropriate for that vessel. The heater/treater will have a lower pressure than the separator to permit the fluid to flow from the separator to the heater/treater.

E-5. The Low Pressure Gas Line System and the Vapor Recovery Unit.

Each of the atmospheric vessels will have a gas line coming out of the center of the top of each vessel. Even though the gas in the

system flows through the line to a vapor recovery unit, a safety release must be provided. One design has two A-frame support stands, and the end of the pipe turns up for about 1 foot. On the end of this connection, a one-ounce backpressure valve (Figure 4) is attached. This permits the gas to escape in the event the pressure inside the vessel exceeds the safety vent setting. The ounce pressure rating is usually indicated in raised letters on the side of the fitting.

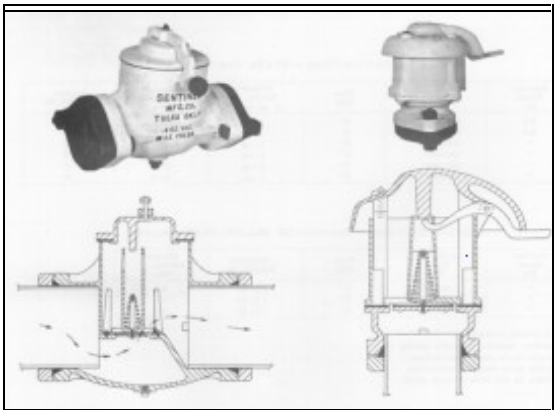

Figure 4. Horizontal and vertical one-once backpressure valves for atmospheric vessels.
(courtesy of Sivalls, Inc.)

The vapor recovery unit. The **vapor recovery unit** is placed in a location between the atmospheric vessels and the high pressure gas system. The tank battery can be tested for gas loss due to gas entering the atmosphere to evaluate the value of the vapor recovery unit.

The higher the API gravity of the crude oil and the higher the temperature of the crude oil, the higher the vapor loss. Even with low gravity oil, a heater/treater used to treat the oil increases the vapor loss. When the tank battery is located in a community, regulations may require the installation of a vapor recovery unit.

The vapor recovery system (Figure 5) is a skid-mounted unit that contains several components. When the gas enters the unit, it passes through a final liquid recovery unit to remove any distillate that may be condensing out of the gas. This vessel is important, because the gas is going to be compressed to a pressure greater than the separator pressure so that it can be re-injected into the high pressure gas system.

Figure 5. A vapor recovery unit.

The compressor is a gas compressor and cannot handle any significant amount of liquid. If the vessel should fill up with liquid and this liquid spill over into the compressor, the unit could be damaged. An automatic control will send the accumulated liquid back to the stock tank, or it will have to be performed mechanically by the lease pumper. Either way, the pumper will periodically check the liquid level in the vessel.

Gas can be very dry, and most gas compressors require lubrication to prevent metal galling and the resulting mechanical problems.

E-6. The Flare and the Gas Sales System.

All of the gas systems come together into one system before leaving the tank battery.

This includes the separators, heater/treaters, and the vapor recovery line from the low pressure atmospheric vessel collection system.

The gas company will install a backpressure control valve, a gas measurement meter, and a check valve in their system just outside the fence of the tank battery. As an illustration, consider a tank battery gas system having separator pressures of 30 and 35 pounds. The heater/treater has a pressure of 25 pounds. This means the system is operating with pressures of 25, 30, and 35 pounds. The flare vent pressure may have to be set at 50 pounds.

The gas company may set their gas line pressure at 15 pounds. This pressure is lower than the lowest vessel operating pressure, so everything will operate as normal. The gas company will have an area compressor that steps the gas pressure up to more than 500 pounds so it will move down their line at a rapid rate, providing room for the gas and that of other operators.

If the gas company has a slowdown accepting gas, and the line pressure builds up to 45 pounds, the system will still continue to function, but the backpressure on the pumping wells will slow down production dramatically. The tank battery will appear to be operating normally, but the system will be encountering production problems. If the pressure in the gas company line builds up to 55 pounds, all of the gas production is being vented to the flare (Figure 6), and this may require shutting in the wells temporarily.

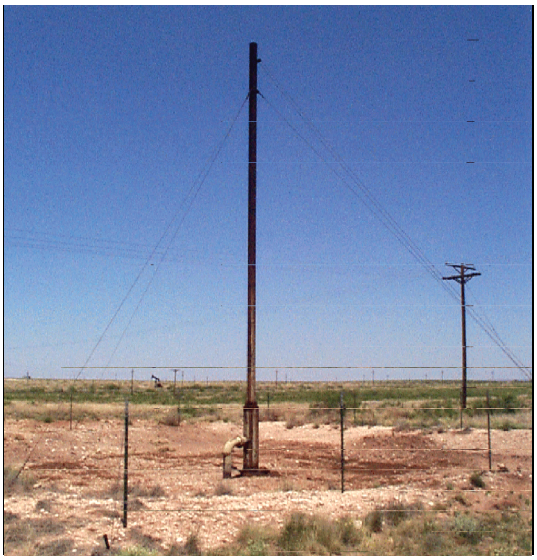

Figure 6. A gas vent and protective pit.