Kansas Administrative Regulations

Kansas Corporation Commission

Article 3.—Production and Conservation of Oil and Gas

82-3-303. Determination of open flow of a gas well.

In the absence of field rules to the contrary, the open flow capacity of a gas well shall be determined by flowing the well into a pipeline for a period of 24 to 72 hours, as required to attain stabilization through approved metering equipment. This procedure shall be known as a one point stabilized flow test. The rate of flow shall be recorded on a standard orifice meter chart, either graphically or mathematically, or recorded electronically in a flow computer connected to a metering device. The rate of flow at the end of the period shall be extrapolated to atmospheric pressure by using the characteristic well slope as determined from a multipoint back-pressure test.

(a) Multipoint back-pressure test. A multipoint back-pressure test shall be taken for determination of characteristic well slope, "n," as determined from the equation

$$Q = C\left(P_c^2 - P_w^2\right)^n$$

where:

Q = the rate of flow, using MCF per day at 14.65 pounds per square inch absolute and 60°

C = the performance coefficient of the well;

P_c = wellhead shut-in pressure, expressed in pounds per square inch absolute and using the casing or tubing pressure, whichever is higher;

P_w = static wellhead working pressure, expressed in pounds per square inch absolute, at the termination of each flow period. Except as otherwise provided, the casing pressure shall be used if the annulus is open to the formation. If the annulus is not open to the formation so that the pressure cannot be measured on a static column, the tubing pressure shall be used if the flowing pressure is corrected for friction. All squared pressures shall

be expressed in thousands; and

n = a numerical exponent characteristic of the particular well, referred to as "slope."

Multipoint back-pressure tests shall be limited to one per commercial gas well. A second test shall be permitted for a commercial gas well only if the well is recompleted into a separate common source of supply or for good cause shown.

The basic procedures for taking a multipoint back-pressure test shall be as follows:

(1) The well shall be shut in for 72 hours, plus or minus six hours, and the shut-in pressure shall be taken. This shut-in pressure shall be considered stabilized unless readings taken with commission-approved equipment at a shorter period are higher. In this event, the highest recorded pressure during the test shall be used as the shut-in pressure. If the shut-in period appreciably affects the surface pressure, appropriate correction of the surface pressure shall be made in order to account for the pressure due to the liquid column.

(2) If the well being tested has a pipeline connection, it shall be flowed for at least 24 hours before the shut-in period at a rate high enough to clear the well of liquids.

(3) A series of at least four flow tests shall be taken. The tests shall be run in an increasing flow rate sequence. In the case of high liquid-to-gas ratio wells, a decreasing flow rate sequence may be used if the increasing sequence method will not give point alignment. If the decreasing sequence method is used, a statement giving the reasons why the use of this method is necessary, with a copy of the data taken on increasing sequence, shall be furnished to the commission.

(4) Each flow test shall extend for not more than two hours. If the wellhead working pressure does not decline more than 0.1 percent of the wellhead shut-in pressure during any 15-minute period before the end of the two-hour flow period, the pressure may be recorded and the next flow test started. All subsequent flow periods shall be of the same duration.

(5) If the back-pressure curve cannot be drawn through at least three of the plotted points, the well shall be retested. If upon retest a curve cannot be drawn through at least three of the plotted points, an average curve shall be drawn through the points of the test if the slope of the curve will be not more than 1.0 and not less than 0.5.

(6) If the curve drawn through at least three points of the back-pressure test has a slope greater than 1.0 or less than 0.5, the well shall be retested. If upon retest the slope of the curve is greater than 1.0, a curve with a slope of 1.0 shall be drawn through the data point corresponding to the highest rate of flow. If upon retest the slope of the curve is less than 0.5, a curve with a slope of 0.5 shall be drawn through the data point corresponding to the lowest rate of flow.

(7) All tests shall be subject to review and approval by a representative of the state corporation commission.

(8) The lowest rate of flow on the test shall be at a rate high enough to keep the well clear of liquids.

(9) If possible, the working wellhead pressure at the lowest rate of flow shall be drawn down at least five percent of the well's shut-in pressure and, if possible, 25 percent of the well's shut-in pressure at the highest rate of flow. If data cannot be obtained in accordance with this paragraph, a written explanation shall be furnished to the commission.

(10) Correction for the compressibility of flowing gas shall be made in accordance with approved commission methods.

(11) If the static wellhead working pressure reading cannot be obtained due to packer or dual completion, the pressure shall be calculated by using appendix A in the document adopted by reference in paragraph (b)(4).

(12) If a satisfactory test cannot be obtained on wells whose indicated open flow is 500 mcf or less, an exception to the foregoing procedure may be granted by the commission and a slope of 0.85 may be assigned to the well.

(13) Upon completion of the test, all the calculations shall be shown on any approved form and shall be accompanied by a back-pressure curve neatly plotted on equal scale log paper of at least three-inch cycles.

(b) One-point stabilized flow test.

(1) An initial one-point stabilized flow test shall be made within 30 days from the date of first production of gas into a pipeline, and additional tests shall be taken yearly or as ordered by the commission. Upon the completion of all flow tests, a copy of the flow calculations shall be submitted to the commission.

(2) Immediately after the shut-in wellhead pressure is taken, the well shall be opened into the pipeline and gas shall be produced for the subsequent 24 to 72 hours at the test rate as required to reach stabilization. During this time, the working pressure at the wellhead shall be maintained as nearly as possible at 85 percent of the wellhead shut-in pressure, expressed in pounds per square inch gauge, or as close to 85 percent as operating conditions in the field will permit.

(3) The wellhead working pressure shall never be more than 95 percent or less than 75 percent of the wellhead shut-in pressure of the well being tested unless, in the judgment of the commission's representative, it is impractical to maintain the pressure within these limits. In this case, the well shall be produced at maximum capacity through either the tubing or the annulus, whichever will give the greater drawdown.

(4) The open flow shall be calculated by use of the formula specified in this paragraph. Flow shall be measured by an approved meter throughout the test period, and the wellhead and meter pressures shall be measured at the close of the test period by gauges approved for use in the state corporation commission's "manual of back pressure testing of gas wells," written pursuant to commission order dated May 15, 1957, docket number 34,780-C (C-1825), which is hereby adopted by reference, including the appendices.

The rate at which the well is producing at the end of the flow period shall be considered the stabilized producing rate corresponding to the wellhead working pressure existing at that time, if the rate is not greater than the average producing rate for the entire flow period. The observed stabilized producing rate shall be converted to open flow by use of the following formula:

$$OF = R \text{ times } \left[\frac{\left(P_c^2 - P_a^2\right)}{\left(P_c^2 - P_w^2\right)}\right]^n$$

where:

OF = Open flow, expressed in MCF/D.

R = Stabilized producing rate, expressed in MCF per day at 14.65 pounds per square inch absolute and 60°F.

P_a = Atmospheric pressure, expressed in pounds per square inch absolute.

P_c = Wellhead shut-in pressure of the well, expressed in pounds per square inch absolute.

P_w = Stabilized wellhead working pressure at rate R, expressed in pounds per square inch absolute.

n = Characteristic well slope as determined by the multipoint back-pressure test.

(5) Shut-in wellhead pressure shall be measured after the well has been shut in for approximately 72 hours. The well shall have been shut in for not less than 66 hours and not more than 78 hours when the shut-in pressure is taken. If the representative of the commission believes that the shut-in pressure taken upon a well is incorrect, the representative may require that the well be blown to clean fluids from the well bore or may take any other reasonable steps that may be necessary to get a true pressure reading upon the well. If more than one shut-in pressure is taken upon a well during the test period, the highest shut-in pressure obtained shall be used in calculating the open flow of the well.

(c) Metering devices. An orifice meter, a critical flow prover, or a turbine meter in good operating condition and properly calibrated in accordance with the manufacturer's recommendation shall be the only acceptable metering devices. The owner of the metering device shall have documentation of any recalibration or refurbishment of the metering device and shall furnish the documentation to the conservation division upon request.

(d) Gas venting. Gas shall not be vented except when absolutely necessary.

(Authorized by K.S.A. 55-704; implementing K.S.A. 55-703; effective, T-83-44, Dec. 8, 1982; effective May 1, 1983; amended May 1, 1987; amended April 23, 1990; amended June 1, 2007.)