



RAILROAD COMMISSION OF TEXAS

OFFICE OF GENERAL COUNSEL

OIL AND GAS DOCKET NO. 01-0272550

THE APPLICATION OF PETROHAWK OPERATING COMPANY TO CONSIDER A PERMANENT GAS WELL CLASSIFICATION FOR THE HAWKVILLE (EAGLEFORD SHALE) FIELD IN DIMMIT, LA SALLE, MCMULLEN, AND WEBB COUNTIES, TEXAS

OIL AND GAS DOCKET NO. 02-0272549

APPLICATION OF GEOSOUTHERN ENERGY CORPORATION AND PETROHAWK OPERATING COMPANY TO CONSIDER A PERMANENT GAS WELL CLASSIFICATION FOR THE DE WITT (EAGLE FORD SHALE) FIELD IN DE WITT COUNTY, TEXAS

OIL AND GAS DOCKET NO. 02-0272551

APPLICATION OF PETROHAWK OPERATING COMPANY TO CONSIDER A PERMANENT GAS WELL CLASSIFICATION FOR THE SUGARKANE (EAGLE FORD) FIELD IN BEE, DE WITT, KARNES, AND LIVE OAK COUNTIES, TEXAS

HEARD BY: Brian K. Fancher - Technical Examiner

HEARING DATE: October 28, 2011

APPEARANCES:

REPRESENTING:

APPLICANT:

John Soule
Taylor Lepley

Petrohawk Operating Co.,

John Soule

Geosouthern Energy Corporation

INTERVENOR:

Jaime Nielson
Judi Robertson
Greg Cloud
Oscar Mora
Andi Polanski
Matt Hunter
Amy Lasche'

Burlington Resources Oil & Gas Co., Inc.

Brian R. Sullivan
Meri Lynn Gobran

Pioneer Natural Resources USA, Inc.

OBSERVERS:

George C. Neale
Bob Tierney
Amy L. Wharton Vanderhall

Plains Exploration & Prod. Co.

EXAMINER'S REPORT AND RECOMMENDATION

STATEMENT OF THE CASES

Petrohawk Operating Company ("Petrohawk") and Geosouthern Energy Corporation ("Geosouthern") request that all wells demonstrating a gas-oil ratio of 3,000 cubic feet per barrel and above in the Hawkville (Eagleford Shale), De Witt (Eagle Ford Shale), and Sugarkane (Eagle Ford) Fields be permanently classified as gas wells, effective the date of first production for each well. Further, for wells completed with a gas-oil ratio less than 3,000 cubic feet per barrel, the applicants request modification of current Commission policy relating to submission of Pressure, Volume, Temperature (PVT) data in support of gas well classification. Specifically, if PVT data are submitted for a well with a gas-oil ratio of less than 3,000 cubic feet per barrel in the subject fields and a dew point is identified, a well may be permanently classified as a gas well.

On December 22, 2011, counsel on behalf of Petrohawk and Geosouthern formally withdrew the request in each of the referenced applications with respect to permanent gas classification for wells completed with a gas-oil ratio of less than 3,000 cubic feet per barrel, where PVT data are filed and a dew point is identified. Moreover, Petrohawk, Geosouthern, and the operators supporting the applications indicate they seek to follow current Commission practice with respect to gas classification for wells with a gas-oil ratio of less than 3,000 cubic feet per barrel. The applications are unopposed and, after reviewing the evidence submitted during the hearing along with subsequent late-file exhibits requested by the examiner, the examiner recommends approval of a permanent gas well classification for all wells completed with a gas-oil ratio of 3,000 cubic feet per

barrel and above in the Hawkville (Eagleford Shale), De Witt (Eagle Ford Shale), and Sugarkane (Eagle Ford) Fields in Dimmit, La Salle, McMullen, Webb, De Witt, Bee, Karnes, and Live Oak Counties, Texas.

DISCUSSION OF EVIDENCE

The Hawkville (Eagleford Shale) Field ("Hawkville") is situated as the southern most field of the three subject fields. The Hawkville is a non-associated, 100% AOF gas field and was discovered in October 2008. The field extends over portions of four counties, La Salle, Dimmit, Webb, and McMullen Counties. There are 113 producing wells with thirteen operators carried on the October 2011 proration schedule. Field Rules provide for 330'-660' well spacing and 320 acre density. Cumulative production from the Hawkville through November 2011 is reported as 228 BCFG and 5.5 MMBC.

The Sugarkane (Eagle Ford) Field ("Sugarkane") is positioned as the central most field of the three subject fields. The Sugarkane is a non-associated, 100% AOF gas field and was discovered in April 2009. The field extends over portions of four counties, Live Oak, Bee, Karnes, and De Witt Counties. There are twenty-one producing wells with seven operators carried on the October 2011 proration schedule. Field Rules provide for 330'-0' well spacing and 320 acre density. Cumulative production from the field through November 2011 is 73 BCFG and 9.2 MMBC.

The De Witt (Eagle Ford Shale) Field ("De Witt") is located as the northern most field of the three subject fields. The De Witt is a non-associated, 100% AOF gas field and was discovered in April 2009. The field extends over portions of three counties, De Witt, Gonzales, and Karnes Counties. There are ten producing wells with four operators carried on the October 2011 proration schedule. Field Rules provide for 330'-0' well spacing and 320 acre density. Cumulative production from the De Witt through November 2011 is 47 BCFG and 9.8 MMBC.

Petrohawk submitted a stratigraphic cross-section that traverses from southwest to northeast across the three subject fields and incorporates the top of the Eagleford formation as the datum line. The cross section consists of twelve wells across southern La Salle, central McMullen, northern Live Oak, northwestern Bee, south-central Karnes, and northern De Witt Counties. The well logs used in the cross-section integrate gamma ray, resistivity, and porosity log curves to correlate the top and base of the Eagleford formation. The correlations indicate the Eagleford formation is continuous across the three subject fields, occurs in greater net-thickness to the southwestern area of the three subject fields combined, and gradually decreases in thickness towards the northeast direction.

The Commission's current administrative policy in gas well determination provides four separate options an operator may utilize to demonstrate a hydrocarbon producing well may be classified as a gas well. Of the four options, a well may be administratively classified as a gas well if the heptanes plus (C7+) mole percent of a compositional analysis

is less than eleven percent (11%). The examiner takes notice of Phillip L. Moses's publication of "Engineering Applications of Phase Behavior of Crude Oil and Condensate Systems". In his publication, Moses opines, "there is a fairly sharp dividing line between oils and condensates from a compositional standpoint. Reservoir fluids that contain heptanes and are heavier in concentrations of more than 12.5 mol% are almost always in the liquid phase in the reservoir. Those with less than 12.5 mol% are almost always in the gas phase in the reservoir".¹ Further, Moses explains that "retrograde condensate reservoirs are characterized by gas/liquid ratios of approximately 3,000 to 150,000 cubic feet per barrel and that liquid gravities usually range from about 40° to 60° API."

At the hearing, Petrohawk submitted a consolidated report of well information that includes heptanes-plus mole percent, Form G-1 Initial gas-oil ratio, three month production gas-oil ratios, and Form G-1 API gravity. The information was taken from 37 wells completed in the three subject fields and operated by either Pioneer Natural Res. USA., Inc., Burlington Resources O&G Co., LP, Petrohawk, or Geosouthern. The results of the aforementioned table for the nineteen wells completed in the Sugarkane, fourteen wells completed in the De Witt, and four wells completed in the Hawkville indicates the following information:

	Hawkville	Sugarkane	De Witt
Avg. C7+Mol %	7.56%	8.22%	9.47%
Avg. Initial GOR	6,102:1	7,297:1	11,825:1
Avg. 3 month GOR	6,544:1	7,233:1	8,612:1
Avg. API gravity	55.38°	55.38°	55.06°

The combined average gas-oil ratio on initial test for the three subject fields is approximately 8,000 to 9,000 cubic feet per barrel. The mol% heptanes-plus in 31 of the 37 samples analyzed was less than 12.5 mol%. The six wells that demonstrated a heptanes-plus mol% of more than 12.5 mol% also had an average three month producing gas-oil ratio and initial test gas-oil ratio of approximately 2,552 cu.ft./bbl. and 2,969 cu.ft./bbl., respectively.

EXAMINER'S OPINION

The examiner opines that all wells with a gas-oil ratio of 3,000 cubic feet per barrel and above in the Hawkville (Eagleford Shale), Sugarkane (Eagle Ford), and De Witt (Eagle Ford Shale) Fields should be permanently classified as gas wells, effective the date of first production from each well. The mathematically recombined heptanes-plus wellstream analysis for 37 wells is summarized as follows:

¹Moses, Phillip L., "Engineering Applications of Phase Behavior of Crude Oil and Condensate Systems." Journal of Petroleum Technology, pg 717, July 1986.

- * The mol% heptanes-plus in 31 of the 37 samples analyzed was less than 12.5%.
- * The mol% heptanes-plus in 6 of the 37 wells was more than 12.5 mol% and also had an average three month producing gas-oil ratio and initial test gas-oil ratio of about 2,552 cu.ft./bbl. and 2,969 cu.ft./bbl., respectively.
- * The average API gravity of the liquid hydrocarbons is above 50.0 degrees.
- * For a gas-oil ratio on initial test of less than 3,000 cubic feet per barrel, most of the wells have more than 12.5 mol% heptanes-plus and would be classified as an oil well.
- * For a gas-oil ratio on initial test of 3,000 cubic feet per barrel and above, most of the wells have less than 12.5 mol% heptanes-plus and would be classified as a gas well.

Any additional wells completed in the field are expected to exhibit similar fluid characteristics. Additional mathematically recombined heptanes-plus wellstream analyses are unnecessary for classification of wells as gas wells.

Statewide Rule 79 defines a gas well as "...A well which produces hydrocarbon liquids, a part of which is formed by a condensation from a gas phase and a part of which is crude petroleum oil, shall be classified as a gas well unless there is produced one barrel or more of crude petroleum oil per 100,000 cubic feet of natural gas; and that the term "crude petroleum oil" shall not be construed to mean any liquid hydrocarbon mixture or portion thereof which is not in the liquid phase in the reservoir, removed from the reservoir in such liquid phase, and obtained at the surface as such."

The examiner concludes that the liquid hydrocarbons in the reservoir constituting the three subject fields are immobile, and therefore any liquid produced at the surface does not meet the definition of "crude petroleum oil". Instead, the produced liquid is a product of condensation due to the reservoir-type for each of the three subject fields indicating a retrograde gas reservoir and should not be used as a basis for classification of the wells as oil wells.

FINDINGS OF FACT

1. Notice of this hearing was given to all affected persons at least ten days prior to the date of hearing. No protests were received.
2. The Hawkville (Eagleford Shale) is a non-associated, 100% AOF gas field and was discovered in October 2008. The field extends over portions of four counties.
 - a. The field is classified as associated with 100% AOF status.
 - b. There are twenty-one producing wells with seven operators carried on the October 2011 proration schedule.

- c. Field Rules provide for 330'-660' well spacing and 320 acre density.
3. The Sugarkane (Eagle Ford) is a non-associated, 100% AOF gas field and was discovered in April 2009. The field extends over portions of four counties.
 - a. The field is classified as associated with 100% AOF status.
 - b. There are twenty-one producing wells with seven operators carried on the October 2011 proration schedule.
 - c. Field Rules provide for 330'-0' well spacing and 320 acre density.
4. The De Witt (Eagle Ford Shale) is a non-associated, 100% AOF gas field and was discovered in April 2009. The field extends over portions of three counties.
 - a. The field is classified as associated with 100% AOF status.
 - b. There are ten producing wells with four operators carried on the October 2011 proration schedule.
 - c. Field Rules provide for 330'-0' well spacing and 320 acre density.
5. All wells completed with a gas-oil ratio of 3,000 cubic feet per barrel and above in the Hawkville (Eagleford Shale), Sugarkane (Eagle Ford), and De Witt (Eagle Ford Shale) Fields should be permanently classified as gas wells because they produce from a retrograde gas reservoir.
 - a. There are mathematically recombined heptanes-plus wellstream analyses for 37 wells in the three subject fields.
 - b. The mol% heptanes-plus in 31 of the 37 samples analyzed was less than 12.5%.
 - c. The mol% heptanes-plus in 6 of the 37 wells was more than 12.5 mol% and also had an average three month producing gas-oil ratio and initial test gas-oil ratio of about 2,552 cu.ft./bbl. and 2,969 cu.ft./bbl., respectively.
 - d. The average API gravity of the liquid hydrocarbon is above 50.0 degrees.
 - e. The combined average gas-oil ratio on initial test for the three subject fields is approximately 8,000 to 9,000 cubic feet per barrel.

- f. For a gas-oil ratio on initial test of less than 3,000 cubic feet per barrel, most of the wells would have more than 12.5 mol% heptanes-plus and would be classified as an oil well.
 - g. For a gas-oil ratio on initial test of 3,000 cubic feet per barrel and above, most of the wells would have less than 12.5 mol% heptanes-plus and would be classified as a gas well.
5. Liquid hydrocarbons produced at the surface from the subject wells are the product of condensation and should not be classified as crude petroleum oil.

CONCLUSIONS OF LAW

- 1. Proper notice of this hearing was issued.
- 2. All things have been accomplished or have occurred to give the Commission jurisdiction in this matter.
- 3. All wells completed with a gas-oil ratio of 3,000 cubic feet per barrel and above in the Hawkville (Eagleford Shale), De Witt (Eagle Ford Shale), and Sugarkane (Eagle Ford) Fields in Dimmit, La Salle, McMullen, Webb, De Witt, Bee, Karnes, and Live Oak Counties, Texas, are gas wells, effective the date of first production, based on the definition of a gas well pursuant to Statewide Rule 79 (a) (11) (C).

RECOMMENDATION

Based on the above findings of fact and conclusions of law, the examiner recommends that all wells completed with a gas-oil ratio of 3,000 cubic feet per barrel and above in the Hawkville (Eagleford Shale), De Witt (Eagle Ford Shale), and Sugarkane (Eagle Ford) Fields in Dimmit, La Salle, McMullen, Webb, De Witt, Bee, Karnes, and Live Oak Counties, Texas be permanently classified as gas wells, effective the date of first completion.

Respectfully submitted,



Brian K. Fancher
Technical Examiner