

OIL AND GAS DOCKET NO. 01-0249550

THE APPLICATION OF REGENCY FS LP UNDER RULE 36 AND RULE 46 TO DISPOSE OF OIL AND WASTE CONTAINING HYDROGEN SULFIDE GAS INTO ITS TILDEN GPI WELL NO. 1, TILDEN, S. (WILCOX H₂S DISPOSAL) FIELD, MCMULLEN COUNTY, TEXAS

Heard by: Donna Chandler on December 13, 2006

Appearances:

James Mann
Mike Donovan
Michael Younger
Clay Smith
James Smith
David Cantrell
Rose Marie Hanks

Representing:

Regency FS LP

EXAMINER'S REPORT AND RECOMMENDATION

STATEMENT OF THE CASE

Regency FS LP ("Regency") requests authority to inject sour gas in its Tilden GPI Well No. 1. Regency also requests that a new field, the Tilden, S. (Wilcox H₂S Disposal) Field, be set up for this disposal well. A permit for injection pursuant to Statewide Rule 46 can be administratively granted. However, Statewide Rule 36(c)(10)(A) requires that a public hearing be held before the injection of fluid containing hydrogen sulfide ("H₂S" or "sour gas").

The Commission's Field Operations section has reviewed the application and contingency plan and recommends approval of the application contingent on the following conditions:

1. That a new field designation is approved for the well, with such field name reflecting the potential presence of H₂S in this area; and
2. That Regency demonstrates through plume analysis and offset well construction/plugging evaluation that the injected fluids will be confined to the proposed disposal zone.

This application was unopposed and the examiner recommends approval of the Rule 36 and Rule 46 authority.

DISCUSSION OF THE EVIDENCE

Regency's Tilden Gas Processing Plant has been in operation for many years, removing carbon dioxide ("CO₂") and H₂S from the gas stream produced by wells in the area. The waste CO₂ and H₂S gas has been flared under TCEQ authority. Regency is proposing that this waste gas, or acid gas, be compressed into a liquid and disposed of into the proposed Tilden GPI No. 1. The Tilden GPI No. 1 has not yet been drilled, but is proposed to be located within the fenced area of the Tilden plant.

Regency requests authority to dispose of a maximum of 1,924 BPD of compressed acid gas. This is the equivalent of approximately 5,000 MCFD. The requested maximum surface injection pressure is 2,925 psig.

The Tilden GPI No. 1 will be drilled to a total depth of approximately 6,900 feet. The well will have three strings of casing cemented to surface: 13 3/8" to 350 feet, 9 5/8" to 5,200 feet and 5 1/2" to total depth. The TCEQ recommends that useable quality water be protected to a depth of 100 feet and that the Carrizo be protected between 4,400 feet and 5,100 feet. Injection will be through tubing set on a packer at approximately 5,800 feet. All of the tubular equipment which may come in contact with H₂S are H₂S-resistant stainless steels and alloys that meet all Commission and industry standards for handling H₂S.

The proposed disposal interval is the Wilcox between 5,870 feet and 6,800 feet. This zone has not been produced in any well within a 1/2 mile radius but the application was filed pursuant to Rule 46 because Regency has not established that there is no production from this interval within 2 1/2 miles. Establishing a new field designation called Tilden, S. (Wilcox H₂S Disposal) Field will identify the proposed disposal zone as a formation now containing hydrogen sulfide. Any operators drilling in the area will be aware of the potential of H₂S existing in an otherwise non-sour formation.

There are 11 wellbores within 1/2 mile of the proposed well. Three of the wells did not penetrate the proposed Wilcox disposal interval. Of the eight wells which penetrated the disposal interval, four were dry holes with no production casing set. All four of these wells have cement plugs across the base of useable quality water. The four remaining wells have production casing cemented to surface from deeper horizons. The completion and/or plugging of these wells is such that the proposed disposal will not affect useable quality water.

To estimate reservoir parameters at the location of the proposed Tilden GPI No. 1, Regency analyzed the log of the Vaughn Petroleum Company - J.M. Dickinson No. 2. This well is the closest well which penetrated the disposal interval and is approximately 1,600 feet to the southwest of the proposed disposal well. The Dickinson No. 2 was drilled in 1970 to a total depth of approximately 6,900 feet and was plugged and abandoned as a dry

hole. In the Dickinson No. 2, the average porosity of the Wilcox interval proposed for disposal is 17% over 117 feet of thickness. Average permeability is 10.8 md. The log of this well indicates the presence of at least 250 feet of shale overlying the disposal interval and at least 100 feet of shale below the disposal interval. These shale barriers will prevent the migration of acid gas from the disposal zone. Regency submitted two cross-sections of area wells demonstrating that both the proposed disposal interval and the confining shale barriers are continuous across the area.

Computer simulations of pressure and fluid migration were performed to predict the maximum probable extent of waste migrations. The numerical model SWIFT was used for the predictions. Input data included the porosity and thickness determined from the Dickinson No. 2 well, a project life of 40 years, and an average daily rate of 2,100 BPD (which exceeds the requested rate of 1,924 BPD). This model has been accepted nationally for hazardous waste wells by the EPA and has been previously accepted by the Railroad Commission.

The initial pressure in the proposed disposal interval is assumed to be 3,400 psi. After 40 years of injection, the pressure increase near the wellbore is calculated to be 3,975 psi. Approximately one mile away, the pressure is predicted to be 3,725 psi after 40 years of injection.

The waste being disposed of consists of approximately 34% hydrogen sulfide, 64% carbon dioxide and 2% natural gas. Acid gas concentrations were calculated and mapped based on the modeling. The outer edge of the injection plume is represented by a 1% contour line, where the fluid is 99% formation fluid and 1% acid gas. The maximum extent of this 1% line is 2,200 feet from the injection well after 40 years of injection. There are five wellbores within 2,200 feet of the proposed well. Two of the five wells within 2,200 feet did not penetrate the disposal interval. Another two of the five wells have production casing cemented through the disposal interval. The fifth well within 2,200 feet is the Dickinson No. 2 drilled in 1970 to a total depth of 6,913 feet. This well has no production casing but has a plug set at 4,960 feet and at 5,409 feet. The only interval open in the Dickinson No. 2 is the proposed Wilcox disposal interval, about 300 feet of shale above the disposal interval, and about 100 feet of shale below the disposal interval. Therefore, no existing wellbore within the injection plume will be a conduit for migration of injected fluid outside the disposal interval.

To estimate maximum blowout release rate and pressures, Regency employed Fekete Associates, Inc. Fekete's study assumes that the acid gas injection well has been drilled, completed and is actively injecting, prior to a loss-of-control incident at the wellhead. Worst case conditions are also assumed. The results of the study indicate a maximum escape rate through the 2 $\frac{7}{8}$ " tubing of 14 MMCFD. Similarly, if the loss-of-control events occurs through the 5 $\frac{1}{2}$ " casing, the maximum escape rate would be 21.5 MMCFD.

Regency employed Quest Consultants, Inc. to perform gas dispersion modeling based on the results of the maximum escape rates previously determined by Fekete.

Quest used a dispersion model called CANARY to determine the radius of exposure ("ROE") to H₂S. This model calculates release conditions, initial dilution of the vapor, and subsequent vapor dispersion. The model accounts for thermodynamics, mixture behavior, transient release rates, gas cloud density, initial velocity of the gas and heat transfer effects. This model has been previously accepted by the Railroad Commission. The calculated ROE for 100 ppm H₂S, due to the maximum catastrophic release on the proposed injection well, is 2,655 feet. For 500 ppm, the calculated ROE is 1,495 feet. Both of these calculated ROE's are already within the area covered by the approved contingency plan for the Tilden Gas Processing Plant.

Regency has modified the contingency plan for the Tilden Gas Processing Plant to incorporate the proposed disposal operations. There are no residences or public places within the 100 ppm ROE for the disposal well and no public roads within the 500 ppm ROE for the well. The contingency plan for the plant covers a much larger area.

The injection system is designed with numerous safeguards. The wellhead will be equipped with emergency shut-down valves and down-hole check valves will be installed to prevent surface flow through the tubing. The tubing and casing pressure, tubing and casing temperature, injection rate, and H₂S detection equipment will be continuously monitored. The gas processing plant is manned 24 hours a day with personnel trained in the recognition of and response to H₂S alarms.

FINDINGS OF FACT

1. Notice of this application to inject fluid containing hydrogen sulfide was issued to all surface owners and offsetting operators within ½ mile of the proposed well, and the McMullen County Clerk on September 22, 2006. No protest was received.
2. Notice of the application was published in *The Progress*, a newspaper of general circulation in McMullen County, Texas, on September 20, September 27, October 4, and October 11, 2006.
3. The proposed injection well, the Tilden GPI Well No. 1, will dispose of compressed waste gas containing H₂S. This waste gas is removed from hydrocarbon gas at Regency's Tilden Gas Processing Plant.
4. The Tilden GPI No. 1 will inject at rates up to 1,924 BPD of compressed acid gas. This is the equivalent of approximately 5,000 MCFD. This acid gas contains approximately 34% hydrogen sulfide, 64% carbon dioxide and 2% natural gas.
5. The proposed Tilden GPI No. 1 will be drilled, cased and cemented to confine the injected fluid to the proposed Wilcox disposal zone.
 - a. The requested injection interval is the Wilcox between 5,870 feet and 6,800 feet. This interval has not been completed in any well within ½ mile.

- b. The TCEQ recommends that useable quality water be protected to a depth of 100 feet and that the Carrizo be protected between 4,400 feet and 5,100 feet.
 - c. The well will have three strings of casing cemented to surface: 13 $\frac{3}{8}$ " to 350 feet, 9 $\frac{5}{8}$ " to 5,200 feet and 5 $\frac{1}{2}$ " to total depth.
 - d. Injection will be through tubing set on a packer at approximately 5,800 feet.
 - e. All of the equipment installed that might come in contact with H₂S will be stainless steel and alloys that meet all Commission and industry safety standards.
 - f. If the injection fluid is not confined to the approved strata, then the disposal well permit will be suspended and disposal cease until the fluid migration from such strata is eliminated.
6. The field name of Tilden, S. (Wilcox H₂S Disposal) should be approved for the disposal interval to alert other operators in the area to the possibility of encountering sour gas in this otherwise non-sour formation.
 7. The disposal well is inside the fenced area which surrounds the Tilden Gas Processing Plant.
 8. The requested maximum surface injection pressure is 2,925 psig.
 9. The injection well, compressor and flow lines transmitting sour gas, will be designed to contain the sour gas, and monitoring devices will immediately shut down the system if any leakage of sour gas is detected.
 10. The proposed disposal well is within the area covered by the contingency plan for the processing plant.
 11. The calculated ROE for 100 ppm H₂S due to a catastrophic release from the well is 2,655 feet. The calculated exposure radius ROE for 500 ppm H₂S due to a catastrophic release from the well is 1,495 feet.
 12. There are no residences or public places within the 100 ppm ROE for the disposal well and no public roads within the 500 ppm ROE for the well.
 13. No existing well will be a conduit for migration of injected fluid outside the disposal interval.
 - a. The maximum extent of the 1% acid gas plume is 2,200 feet from the

injection well after 40 years of injection.

- b. There are five wellbores within 2,200 feet of the proposed well.
 - c. Two of the five wells within 2,200 feet did not penetrate the disposal interval.
 - d. Two of the five wells within 2,200 feet have production casing cemented through the disposal interval.
 - e. The fifth well within 2,200 feet is the Dickinson No. 2 drilled in 1970 to a total depth of 6,913 feet. This well has no production casing but has a plug set at 4,960 feet and at 5,409 feet. The only interval open in the Dickinson No. 2 is the proposed Wilcox disposal interval, about 300 feet of shale above the disposal interval, and about 100 feet of shale below the disposal interval.
14. Regency has met the conditions for approval set forth by the Field Operations section of the Railroad Commission.

CONCLUSIONS OF LAW

- 1. Proper notice was issued as applicable in all statutes and regulatory codes.
- 2. All things have occurred and been accomplished to give the Commission jurisdiction in this matter.
- 3. The application of Regency FS LP to inject hydrogen sulfide gas into the Tilden GPI No. 1, Tilden, S. (Wilcox H₂S Disposal) Field, McMullen County, complies with the applicable provisions of Statewide Rules 46 and 36, 16 T.A.C. §3.46 and §3.36.

EXAMINER'S RECOMMENDATION

Based on the above findings and conclusions, the examiner recommends that the application of Regency FS LP be **APPROVED**. A new field designation of Tilden, S. (Wilcox H₂S Disposal) Field should be approved for the disposal interval.

Respectfully submitted,

Donna K. Chandler
Technical Examiner