

Special Studies Related to Oil and Gas Production

TASK SUMMARY

1. Develop list of gas production companies. Send questionnaire to each identified gas production company for number of wells, number of engines and engine size. Analyze data to determine representative sizes of engines in service. Budget \$6600.
2. Perform field surveys. Look at engine sizes in field and number of wells tied to each engine. We would expect to visit at least 40 - 100 compressor sites. All site visits will be scheduled in advance. Talk to field supervisor and or leasing Company to determine the number of wells per engine. We will be seeking assistance from NETAC to obtain cooperation from oil and gas companies to accomplish the field surveys. This is critical for the overall project. Budget \$24000.
3. As a result of field surveys, determine the ratio of engines to producing gas wells. Different production patterns result in gas wells having no compressor, one compressor, or a pipe manifold arrangement that connects several wells to one compressor. Does the ERG report adequately represent engine sizes in field? Compare to survey data in task 1 and field data in task 2. A composite engine average will be developed using data from task 1, task 2, and ERG's report. Budget \$10400.
4. Remove engines from ERG list that should that should not be there because they are not area sources because of size or emissions. Keep list of engines removed for comparison to Minor points source list and Major point source list. Budget \$3000.
5. Determine emission rates for engines on ERG list utilizing engine manufacture specifications/tests for engines operating in economy mode. From this data calculate average emission rate and average hp. Budget \$6500.
6. Calculate emissions of NO_x and VOC per county for the five primary counties based on Railroad Commission (RRC)data and ratio of engines per well, average horse power per engine, manufacturing data of grams per horse power hour from above tasks. Budget \$11000.
7. Report detailing information gained, methodology for gathering information and model for calculating emissions. \$8500.00

OBJECTIVES

- 1) To ascertain average grams per hp-hr for compressor engines in service in Gregg, Harrison, Rusk, Smith, and Upshur.
- 2) To obtain better data for estimating engine population based on number of producing gas wells

3) To apply this data to Gregg, Harrison, Rusk, Smith, and Upshur for the oil and gas inventory .

BACKGROUND

Previous studies have identified compressor engines as significant sources of nitrogen oxide (Nox) emissions. Emissions have been estimated using the following methodology developed by Pollution Solutions for NETAC:

$$\text{Emissions} = \text{“Grams NOx per horsepower hour”} \times \text{“Horsepower hour per mcf of gas produced”} \\ \times \text{“mcf of gas produced”}$$

An advantage of this methodology is that accurate data are available from the Texas Railroad Commission for the amount of gas produced in each county (in mcf = millions of cubic feet). Difficulties are characterizing the average “horsepower per mcf of gas produced” and “grams NOx per horsepower hour” for each county.

Horsepower per mcf of gas produced is highly variable depending upon the well pressure and other factors.

Grams NOx per horsepower hour depends upon engine type, age, operating conditions and the presence of emissions abatement devices. New compressor engines greater than 500 hp can attain a very low gm/hp-hr (approximately 2 gm/hp-hr). Engines with alterations, add on controls, reduced loads etc. can achieve 5 gm/hp-hr. There is a significant population of engines in service with none of the above modifications. Depending upon the manufacturing specifications and operational parameters compressor engines may emit as much as 28 grams per horsepower hour. Previous studies have collected emission data for oil and gas production in Texas. The proposed study will provide more information on compressor engine size, the profile of emissions from various engine types and provide a basis for a more precise estimate of emissions related to the operation of compressors in natural gas service.

There are several information sources that can provide important data. The Railroad Commission keeps production information by well site and by county. Engine manufacturers provide documentation on emission factors for some, but not all of the engines used in Northeast Texas. Engine leasing companies maintain databases for compressors leased to various production companies.

All of the above sources may be utilized, but site visits (to well sites, gas production companies, engine shops, etc.) are essential to obtain the best data and utilize the data appropriately. It is proposed by field studies and use of information resources including natural gas gathering companies, previous studies with information from leasing companies, compressor/engine manufacturers, and regulating agencies to determine a more representative gm/hp-hr number for engines that are a part of the area source inventory. The emission rate will then be applied to the average horse power and average number of engines in service. This will provide a more reliable method of estimating emissions that depends upon the number of producing gas wells and not upon the mcf of gas produced.

METHODS

Enlist the cooperation of production companies and visit production sites.

Document numbers of compressors, compressor HP, well production, number of well sites served by each compressor.

Utilize previous studies done by ERG for lease engine population. Determine number of compressors, and engine manufacturer.

Determine engine emissions for each engine identified.

Manufacture's emission data for engines (economy mode) to be determined from manufacturer's documentation or by directly contacting manufacturing company.

Develop information from gas production companies.

Develop information from Railroad Commission for number of producing wells in each county.

DELIVERABLES

Tables detailing raw data. Tables showing emission calculations and results. Provide copy of survey form and copies of survey results. Report detailing information gained, methodology for gathering information and model for calculating emissions. All information will be provided in Adobe Acrobat format.

COST ESTIMATE

A total cost estimate of \$70,000 is estimated for the above study inclusive of the report summarizing results. A budget by task is shown in task summary.