

Compressor Engine Load Factor Surveys and Analysis

Work Plan 1/12/08

Engine emissions depend not only on the horsepower available, but also on load factor. This proposal is to develop a survey technique and analysis of engines in use to determine this average load factor. Load factor may be determined based on engine operating rpm versus rated rpm.

There are several information sources that can be utilized to extract different pieces of the data. The Railroad Commission keeps production information by well site and by county. Various engine manufacturers have web pages where some, but not all of the engines are listed with the corresponding emissions information. There are engine lease companies, which provide compressors to the various production companies. There are engine maintenance shops, which specialize in compressor engines. There are the compressor sites, which have operating engines.

For those engines, which are leased, there is the setup information. The lease company and or maintenance shop may adjust the operating parameters at start up and may assist in the sizing of the engine for that well site. This may include the use of a larger engine, which must be down rated or used at a low rpm. For those sites which request a specific size, but ultimately accept a larger engine, there is information as to the intended load factor and the actual load factor. For those engines, which are currently sited, look for operating rpm versus engine rating rpm. Manufacturing emission data can then be adjusted for the load factor to recalculate the emissions.

Load factor is the useful work/rpm versus the maximum work or maximum rpm. The leasing companies potentially have the most information and the largest number of engines available for comparison. However this must always be compared to the total population of engines and the operating practices of field personnel. The information from the leasing company, maintenance shop and field production site, in aggregate, may be used to arrive at an average load factor.

QAPP and Survey Plan

A Quality Assurance Preparation Plan (QAPP) will be prepared and submitted to the TCEQ. The survey plan will be developed to quantify the individual steps to be performed and the expected result from each portion of the total survey. The survey plan will contain detailed elements describing steps to extract data, number of maintenance shops to be visited, questions to ask the maintenance shops and lease companies, and number of well sites to be visited. The type and amount of information to describe each well site. The type and amount of information to be derived from engine manufacturers and the Railroad Commission. RRC data would be used to obtain/improve contact information for producers.

Survey of Maintenance Shops and Leasing Companies

The survey of maintenance facilities and leasing companies offers the potential of getting information on many engines without the time and expense of visiting each well site where they may be utilized. Because engine leasing is the predominant method of acquiring production equipment, it allows the opportunity to interview people familiar with the all of the different engine types and sizes. If the shops can be persuaded to share the information, it has the potential of giving a very accurate breakout by engine type and size that is being used today. Engine manufacturing data provides horsepower available at different rpm's. The engine manufacturing data also provides the horsepower at which emissions were determined. Engine leasing companies would be asked to provide the setup rpm for the various engines versus the maximum rpm.

Survey of Production Sites

To validate and expand some of the information from leasing companies/maintenance shops it is suggested that well sites be surveyed. While at the well site, engine rpm versus rated rpm would be obtained. The actual rating would then be compared to potential rating for a load factor on that well site.

Wells that have no compression, should be accounted for. Through our surveys, we will ask for information on current experience with wells produced without compression. Previous work that used hp per mcf and our current methodology of hp per well assumed that the wells without compression were a small fraction of the total and on average were insignificant. However the total emissions would be less by whatever percentage that the wells were not using compressors. Therefore, it is proposed that a part of the study is to identify the average number of wells that are completed and produced without compression. This is a fluid number because the well may be initially produced without compression, but most wells ultimately use compression. The number of new wells completed would be relevant as well as the absolute number of wells that are currently without compression.

Final Report

At the conclusion of the study the results of the engine information and the emission information would be written up and documented. An emission inventory would be prepared including Panola County and the five primary counties. The 2005 inventory for compressor engines would be updated using a load factor. The emissions from compressor engines would be reported in greater SCC detail than reported in previous studies. The emissions would be reported according to rich burn engines, lean burn engines, 2-cycle engines and 4-cycle engines.

COST ESTIMATE

A total cost estimate of \$40,000 is estimated for the above study inclusive of the report

summarizing results.

TASKS

- 1.) Preparing plan, QAPP and contacting Leasing and production companies \$7,500
- 2.) Survey Leasing Companies \$5,000
- 3.) Survey Production Sites \$22,500
- 4.) Preparing Report \$5,000

SCHEDULE

Begin as soon as contract is signed. Project completed by July 1, 2008.