ABSTRACT

INVENTORY AND CAVERN VOLUME

VERIFICATION BY COMPUTATION

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Inventory and cavern volume can be verified by computing Gas-In-Place and geometric volume from a specific gas volume injected/withdrawn in a short period of time. Data is then obtained by directly reading the cavern temperature and pressure utilizing wire line instruments lowered into the cavern. Temperatures and pressures must be obtained before and after gas injection/withdrawal to be used in a material balance equation. The results may contain some errors due to the inability to retrieve totally accurate data: consequently, a graph of the calculated results must be maintained and trends must be observed to predict inventory and geometric volume.

Inventory and cavern volume may also be verified by computing Gas-in-Place and geometric volume from the injection of a specific volume of a tracer gas. The tracer is mixed with a specified volume of natural gas to obtain a percent of gas by volume. Gas is then withdrawn and a sample analyzed for percent of tracer. This volume of tracer is expressed as a percent of the total cavern volume. Inventory and geometric volume can then be calculated very accurately.

Finally, inventory and geometric volume can be evaluated on a daily basis by observing the wellhead pressure and temperature and calculating a cavern pressure and temperature. This data is then used to construct a volume per pressure curve and observing the trend of the slope. A rising slope would indicate an increase in geometric volume. Since cavern geometric volume will not increase due to daily gas operations an increasing slope would indicate gas migration. A falling slope would indicate a decreasing cavern volume. Since cavern geometric volume does decrease due to gas operations (cavern creep), this would indicate shrinkage. Regular observation of the graph would allow the storage company to operate the cavern in a way which will be most efficient.