Aeon Petroleum Consultants Quarterly Newsletter

Aeon Petroleum Consultants is a professional engineering firm registered in the State of Texas. We specialize in estimating resources and reserves. Our intent on publishing this newsletter is to highlight topics of interest to those involved in estimating, reviewing, or reporting oil and gas resources and reserves.

In this issue, we will discuss the following:

- Aeon Petroleum Consultants website
- Advantages of Hiring a Small Engineering Firm
- Using Reserve-to-Production Ratio (R/P) to Forecast Production of Volumetric Reserve Estimates

We hope to make this quarterly newsletter informative and useful. If there are any topics you would like us to discuss in future newsletters, please contact us on our website and let us know.

Aeon Petroleum Consultants Website

The website for Aeon Petroleum Consultants can be found at:

www.aeon-petro.com

The website contains topics and items that should be of interest to those estimating, reviewing or reporting oil and gas resources and reserves. Besides listing the services that Aeon Petroleum Consultants can provide to the oil and gas industry, there are items available for download, software created by Aeon Petroleum Consultants available for download or demo, videos, and resource and reserve guidelines for viewing and download.

Check out our offerings here:

https://aeon-petro.com/supplement/shop/

Please feel free to contact us regarding our services, software, or items you would like us to discuss in these newsletters.

Advantages of Hiring a Small Engineering Firm

Aeon Petroleum Consultants is a small petroleum engineering firm specializing in the estimation of reserves and resources. As such, we are in competition with other firms that perform the same types of services. Some of the firms with which we compete are well-known, well capitalized, and have large staffs. So, how can we compete with them?

The choice of an engineering firm to estimate reserves and resources is similar to choosing a bank or physician. The choice is made based on a professional relationship of competence and trust. Even though the engineering firm will be analyzing data and performing calculations, the relationship will be person-to-person. As a client, you must be satisfied that the work is done properly and related to you personally.

Listed below are some of the advantages of hiring a small engineering firm:

- As a client, you will be dealing directly with the principal, or principals of the firm. The principals have a vested interest in the success of the firm. The principals at small firms manage all client accounts. At large engineering firms, clients deal with account managers and rarely with principals or owners of the firm.

- The principals of a small engineering firm will be the ones doing the engineering work. Except for technician and clerical work, there is little delegation of engineering work at a small firm. With small firms, the client can review the CVs of the principals that will be performing the actual work.

- Small engineering firms experience lower overhead expenses and therefore, lower overhead costs allocated to client accounts. Total costs to clients are a combination of hourly charges plus overhead. Overhead costs billed to clients of large firms can be 10 to 15 percent of the total bill.

- Small firms are able to provide more rapid response to clients. Since the principals of small engineering firms deal directly with clients (and also perform the work), a direct response to clients is available. Large firms have hierarchy and red tape that constricts client responses through the account manager.

- Billing rates at small firms are more flexible. Since clients of a small firm will be dealing with the principals, decisions about how a job will be billed can be directly negotiated. Negotiating billing rates with large firms requires going through the chain of command and the preparation of a detailed contract.

- At small engineering firms, your work will not be lost in the crowd. At small firms each and every client is important and the principals work on performing the work. At large firms it is easy for small client jobs to get lost in the workload. This is especially true at year-end when larger clients submit work for annual reserve reporting and engineers are assigned to these clients' work.

- Client feedback, whether favorable or unfavorable is directly communicated to the principals of small engineering firms. If the feedback is unfavorable, the principals of the company must make changes or risk losing clients. Unless an alternate mechanism is provided to clients, feedback to large firms is usually directed to the account manager.

Small engineering firms can perform as good or better work than larger engineering firms in most cases. If you desire excellent work, lower cost, and a more personal experience, consider choosing a small engineering firm for your next project. When was the last time you received a newsletter from one of the large firms?

Using Reserve-to-Production Ratio to Forecast Production of Volumetric Reserve Estimates

The following will discuss a method that can be used to estimate a production forecast for volumes that have been calculated using the volumetric method. According to the Petroleum Resources Management System, reserves must be economic. Therefore, to determine whether the volumetrically calculated volumes can be considered reserves, a forecast of production and the associated economics must be estimated.

The Reserve-to-Production ratio (RP ratio) is merely the reserves of a well divided by its initial production. The typical units of the RP ratio is in years and can be calculated as follows:

$$RP = \frac{N}{365 * q_i}$$

where,

RP = reserve to production ratio, years
N = volumetric estimated volume, bbl or scf (or thousands, millions)
q_i = initial daily production rate, bbl/d or scf/d (or thousands, millions)

The volumes and rates must match (i.e., volume in Mscf and rate of Mscf/day).

The main use of the RP ratio is to solve for the initial production rate given a reserve and RP ratio. Solving for the initial rate is:

$$q_i = \frac{N}{365 * RP}$$

The method to find the RP ratio is to use offset well data in the same formation, preferably in the same field. However, if this is a new field and there are no prior wells drilled, then using data from the same formation in a nearby field can be used.

When using data from producing or abandoned wells, the volume to use for N is the ultimate recovery of the well. If wells are still producing, the ultimate recovery is the cumulative recovery plus the reserves. Shown in the example below is a procedure that can be used to find the RP ratio from nearby producing wells in the formation of interest.

Well	Initial Production Rate (bbl/d)	Cumulative Production (bbl)	Reserves (bbl)	Ultimate Recovery (bbl)	RP Ratio (yrs)
Jones 1	153	81,300	99,500	180,800	3.24
Jones 2	204	184,325	76,300	260,625	3.50
Jones 3	85	95,208	0	95,208	3.07
Smith 1	91	79,609	30,000	109,609	3.30
Smith 2	132	91,058	77,600	168,658	3.50
Smith 3	68	39,424	40,000	79,424	3.20
Smith 4	78	26,798	70,000	96,798	3.40
Williams A	145	83,009	80,000	163,009	3.08
Williams B	88	73,820	28,000	101,820	3.17
Total/Average	1,044			1,255,951	**3.30**

Note that the RP ratio calculated is based on the total initial producing rate and total ultimate recovery. The result is a weighted average. A simple average of the RP ratios in the table above yields 3.27 years, which in this case is close to the calculated RP ratio of 3.30 years. One should always use the weighted average for the RP ratio.

For the well to be drilled, the volumetric estimate of reserves is 105,000 bbls. The estimated initial rate of the well is:

$$q_i = \frac{N}{365 * RP} = \frac{105{,}000}{365 * 3.30} = 87\ bbl/d$$

If one assumes an exponential decline rate, then the decline rate can be calculated as:

$$d = 1 - e^{\frac{-365*(q_i - q_e)}{N}}$$

where,

d = annual decline rate, decimal
q_i = initial daily production rate, bbl/d or scf/d (or thousands, millions)
q_e = initial daily production rate, bbl/d or scf/d (or thousands, millions)
N = volumetric estimated volume, bbl or scf (or thousands, millions)

If we assume a final daily production rate of 2 bbl/d, then the annual decline rate for this well is:

$$d = 1 - e^{\frac{-365*(87-2)}{105{,}000}} = 0.256 = 25.6\%$$

Now that the reserves, initial rate, and decline rate have been calculated, a forecast of oil production and economics can be made.