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 first issue, we will discuss the following:

- Aeon Petroleum Consultants website
  - New items on our website
- Stochastic Petroleum Economics
  - Stochastic economic modelling
  - Software to use for stochastic economics available from Aeon Petroleum Consultants
- Hyperbolic to Exponential decline
  - Basic insights
  - How to calculate time to exponential decline

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.

Stochastic Petroleum Economics

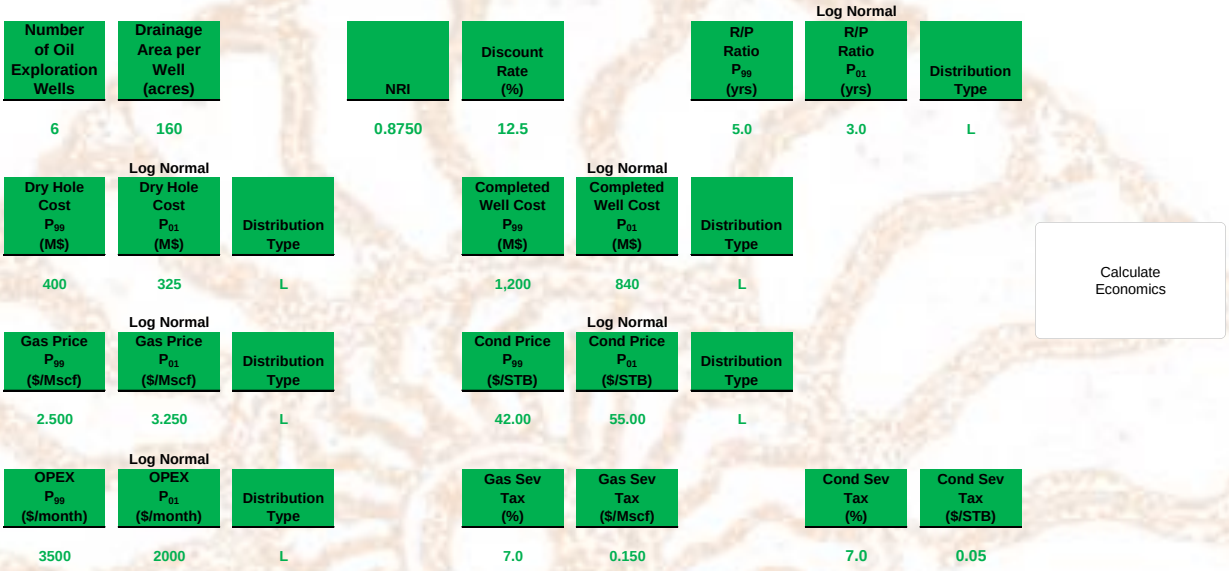
As reserves and resources estimators, we have a great deal of experience modelling petroleum projects. Occasionally we are asked to estimate the value of a prospective resources project. The difficulty in assessing the value of prospective resource projects is due to the uncertainty of the resources themselves. Additionally, the economics will have to account for risk factors and uncertainty in the economic input parameters.

Using the currently available commercial economics software one would have to run hundreds of economic cases to account for the risk factors and the variability of input parameters and their distributions. This method is a time-consuming and ineffective way to assess the value of exploration projects.

To solve this problem and assess exploration projects in an efficient manner, Aeon Petroleum Consultants has developed Excel-based software. This software uses stochastic methods to estimate prospective resources and also calculate the economics of those resources. The resource calculations are based on ranges and distributions of input values of area, thickness, porosity, water saturation, formation volume factors, etc. and their associated distributions. The economics are stochastically calculated from the resource estimates and the risk profile. Input for the economics are the number of wells to be drilled, rages and distributions of the resource to production ratio, dry hole and completed well costs, product prices, operating expenses, production taxes, and discount rate for net present value calculations. The output of the economics is the expected value of drilling the specified number of wells.

One of the main inputs for the economics is the resource to production ratio (R/P). This is the ratio of estimated resources to initial production rate, specified in years. For example, a well with a resource of 1,000 MMscf with an initial production rate of 700 Mscfd will have a R/P ratio of 3.9 years. A typical range of R/P is 3 to 5 years. By inputting a range of R/P the software is able to calculate a production curve for a given resource estimate.

Shown below are the input and output pages for the economics:



ABC Oil Company
Jackson 4 Prospect
Jackson County, Oklahoma
as of March 31, 2021

			Gross Resources		Net Resources		Expected Values (M$)					
Wells	Producers	Dry Holes	Gas (MMscf)	Condensate (MSTB)	Gas (MMscf)	Condensate (MSTB)	Gross Revenue	Expenses	Production Taxes	CAPEX	Net Income	NVP at 12.5%
6	2	4	2,936	8.8	2,569	7.7	7,711	846	1,058	3,456	2,351	888

To watch a video showing the use of this software, download a demo or purchase the software, visit our website at:

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

Hyperbolic to Exponential Decline

With the increased drilling of tight gas and shale reservoirs, it is likely that most engineers performing reserves and resources estimates will be working with hyperbolic decline curves. It is quite evident however, that wells initially declining hyperbolically will eventually decline exponentially at some final or terminal decline rate. So how does one calculate when a hyperbolic decline will change to an exponential decline?

If the minimum decline rate is chosen, then the time when the decline changes from hyperbolic to exponential can be calculated as:

$$t = \frac{(1 - d_m)^b * (1 + d_i * b) - 1}{d_i * b * (1 - (1 - d_m)^b)}$$

$$d_i = -\ln(1 - d_e)$$

where,

t = time when decline changes from hyperbolic to exponential (months)
d_i = initial hyperbolic decline rate (monthly decimal)
b = b factor
d_m = minimum exponential decline rate (monthly decimal)
d_e = initial effective decline rate (monthly decimal)

Using monthly decline rates and volumes allows one to solve for time in months. Not much accuracy will be lost by rounding the time to the nearest month.