

# Petrogenium. Academy

Upstream (Exploration)

## Prospect Evaluation, Risks and Volumes

Consultant / Trainer

**Jan de Jager/Maarten Wiemer**



The **Petrogenium** (in collaboration with EPTS) **Prospect Evaluation, Risks and Volumes** course participants will gain a comprehensive understanding of how to assess the risks and potential hydrocarbon volumes associated with drilling exploration wells, which is essential for making informed business decisions in the petroleum industry. They will learn practical methodologies for evaluating geological details, regional context, and current play understanding, enabling them to realistically estimate the chance of success and the potential volumes of a prospect.



### Participants

This **Petrogenium**. course is designed in the first place for geoscientists working in exploration, for prospect portfolio analysts and for their direct supervisors. It is also a very instructive course for staff from disciplines working closely with exploration staff, such as reservoir engineers, petrophysicists and geophysicists.



### Learning Objectives

At the end of the course the participants will have a good understanding of the essentials for realistic risk and volume assessments of exploration prospects. The course should allow participants to produce well-considered and realistic assessments for prospects they may be working on, and to understand and constructively challenge risk and volume assessments of colleagues and/or partners/competitors (e.g. in a data room).

### Why select Petrogenium.?

The above support will be provided by principal consultants with 30+ years world-class experience in the technology and hands-on know-how from operation of refinery units.

### Contact Petrogenium.:

Email: [training@petrogenium.com](mailto:training@petrogenium.com)

Website: <https://www.petrogenium.com/training/>

***Because Experience Matters***

## Course content

The course will demonstrate that realistic risk and volume assessment is not a "black box" operation, but needs geological understanding of the prospect, and the regional setting.

Specific topics that will be discussed include:

- The fundamentals of Risk and Volumes assessment; translating geological understanding into reasonable numbers and ranges.
- The difference between risk and uncertainty.
- Fundamentals of statistics; including explanation of distribution curves, understanding of expectation curves, do's and don'ts for adding risked volumes, and Bayes theorem.
- Uncertainty of trap, reservoir, seal and charge, illustrated by examples.
- Guidelines and exercises for estimating risks realistically and consistently.
- Calculating volume ranges for prospects and for portfolios of prospects; how to add prospect volumes for a correct representation of prospect portfolios.
- Incorporation of geophysical evidence (DHIs) in a realistic risk assessment.

# Programme

## **DAY 1**

### **General introductions**

- Introduction and the basics: a brief introduction of the topics and concepts that will be covered during the course
- Risks, Volumes & Uncertainty: Explanation of how the terms Risk and Uncertainty are used in exploration. Presentation of a practical workflow to assess prospect risks. Introduction to the calculation of prospect volumes, and a discussion of pitfalls and biases in estimation.
- Prospects and Plays: Module to stress the importance of understanding prospect details in the context of basin type and basin development, and of the "play" to which the prospect belongs.
- Prospects and portfolios: Different prospect categories (near-field, proven play, greenfield, etc) followed by a discussion of ranking criteria for prospects.

# Programme

## DAY 2

### Recap Day 1

1. **Traps:** the main uncertainty in assessment of prospect volumes is the uncertainty of the gross rock volume. The importance of recognizing potential spill- and leak-points that may control the HC-water contact is stressed. A "read thread" prospect is introduced followed by an exercise to identify potential spill- and leak-points
2. **Traps in important HC provinces:** examples of working traps in rift basins, sag basins, passive margins, deltas, deep water settings and carbonate settings
3. **Reservoirs:** explanation of the main reservoir parameters (thickness, N/G, porosity, permeability and reservoir geometries. Modern probabilistic volume assessment tools make it possible to input detailed reservoir data. We will discuss cases where detail is essential, and cases where it is not. Correlation (dependency) between reservoir input parameters, and its effect on calculated volumes, will be discussed
4. **Reservoirs in important HC provinces:** examples of reservoirs in different basin types and depositional settings of around the globe: rift basins, deltas, deep water settings, carbonate provinces

## DAY 3

### Recap Day 2

1. **Seals:** In exploration, seals are often not given the attention they deserve. Mechanisms of leakage will be discussed: permeability seals, hydraulic fracturing of seals. The role of seals in the differential entrapment of oil and gas will be discussed. Fault seal mechanisms are presented with an exercise to calculate Clay Smear Potential (CSP) at several points along a fault plane.
2. **Pressures and overpressures:** Pressure gradients and how they can be used as an indication to determine fluid contacts in traps. Mechanisms of overpressure development, and the provinces where they typically occur are presented. A discussion of the meaning of the fracture gradient and Leak-off Pressures follows.
3. **Seals & Pressures in important HC provinces;** Examples of working seals in a range of different basin types and settings from around the globe, with examples of cases where seals are breached and of cases where differential leakage of gas has allowed oil to be trapped, despite abundant gas charge.
4. **Charge:** The conditions under which source rocks can be deposited and preserved in the subsurface as well as the different source rock types (I, II and III) and their typical expulsion products are discussed. There is an exercise on constructing a burial diagramme, and the effect of inversion (uplift and erosion) on hydrocarbon charge is explained.

# Programme

## DAY 4

### Recap Day 3

- 1. Charge in important HC provinces:** Examples of charge in different basin types and depositional settings from around the globe. This module includes an exercise on predicting source rocks from a regional seismic section.
- 2. Risk assessment - practical group exercise:** In this module the read thread prospect that has been introduced earlier will be used for assessment of the chance factors for trap, reservoir, seal and charge. The exercise is designed such that several practical every-day issues will come up in discussion. This is always a highly energetic session that leads not only to lively discussions, but also to important practical insights of how to go about assessing risks.
- 3. Volume assessment - back-of-the envelope calculation:** this is a short session where the participants are asked to calculate "on the back of an envelope" low, most likely and high volumes of a prospect. The objective of this module is to take away the "black box" feeling that our probabilistic volume assessment tools may bring.
- 4. Volumes and Portfolios:** In this module it will be explained in a practical manner how prospect volumes can be added. Some mistaken, but common, practices will be highlighted. Prospect dependencies and their effect on prospect additions will be discussed.

## DAY 5

### Recap Day 4

- 1. Exploration economics:** An introductory module on exploration economics with an explanation of the main factors that control the economic viability of prospects, and of the terms Net Present Value (NPV) and Expected Monetary Value (EMV). The module includes an exercise on calculating the EMV of a prospect.
- 2. Geophysical evidence:** The presence of "Direct Hydrocarbon Indicators" (DHIs) may provide good evidence that trapped hydrocarbons are present. Pitfalls are explained (with real examples) and an approach for determining an increase of the Probability of Success (POS) is presented. The module also touches upon the impact of Controlled Source Electromagnetics (CSEM) on prospect POS.
- 3. Local prospect examples:** In this module participants have an opportunity to bring in examples of prospects that they may be working on, to discuss specific risk and volume assessment issues in the light of what has been learned. In particular for in-house courses this may be a good opportunity to bring the main learnings into practice.
- 4. Look backs:** A short module on how pre-drill predictions can and should be compared with post-drill well findings. It is stressed that we can only improve our pre-drill predictions if we know if there is any bias in our predictions.