Training and Consulting

KAPPA

Contents

Microsoft CERTIFIED Partner

The objective of a KAPPA course is to deliver practical training, the knowledge from which can be employed immediately in the commercial world. The training provides essential theoretical knowledge and then immediately concentrates on the real-world use of analysis.

Workflows are developed to QAQC data, start at the most basic level and then develop into the most complex realms, as they are required.

There is an overlap between methodologies; working close to the wellbore or on full-field scale, the physics governing the behavior is the same but the methods of processing and presenting the data varies.

From 2013, the Foundation PTA/PA course combines PTA and PA analysis theory and practice.

The Advanced PTA/PA course builds on this knowledge by including more complex geometry, fluids and testing methods.

The Foundation PL course teaches the QAQC and analysis of conventional single and multiphase logs. The HPL (Horizontal PL) course covers the complexities of MPT (Multi-Probe Tools) such as the Schlumberger FSI™ and the GE Sondex MAPS™ suite.

The Rubis Modeling and problem solving course deals with ‘what-ifs?’ and real life production issues such as coning, well placement and forecasting.

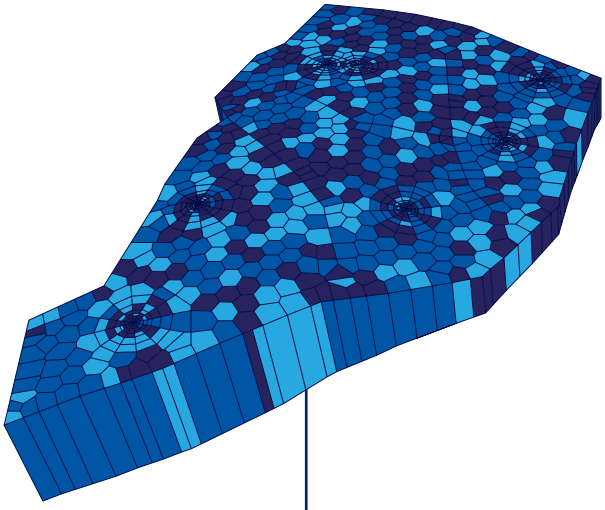
Workflow training from the handling of PDG data through to the interconnectivity is offered through the Ecrin DDA software course.

Public courses are delivered worldwide. KAPPA also trains hundreds of engineers every year in client specific in-house courses and workshops.

Clients have access to software support through extensive contextual help in the application, our regional offices, web collaboration tools and interactive videos.

Our consultants are some of the most experienced in their field in the industry and are available for short or long term interventions anywhere in the world.

Training, consulting and support



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COURSES

- Foundation Pressure Transient and Production Analysis
- Advanced Pressure Transient and Production Analysis
- Foundation Production Logging
- Horizontal well log interpretation
- Unconventional Resources
- Data management and workflow
- Model building and problem solving

SUPPORT

- Free training
- Live web tools
- Forum and workflow videos
- Extensive example catalogue
- Dynamic Data Analysis book (free to download)

KAPPA trains and consults in Dynamic Data Analysis; namely, transient and production analysis, production log analysis, data management, modeling and history matching. Public courses are delivered worldwide. KAPPA also trains hundreds of engineers every year in client specific in-house courses and workshops.

The KAPPA aim is to provide practical training that offers sufficient theory to understand the subject and the tools to perform useful work immediately after the course. KAPPA trainers are all experienced practitioners in their fields and selected to get the message across with clarity and, bearing in mind we are in the commercial world, with a need to produce a real return on the training dollar.

Clients have access to software support through extensive contextual help in the application, our regional offices, web collaboration tools, interactive videos on the web, free workflow training courses and forums.

If you do not have time to make the analysis or would like a second opinion on a case our consultants are some of the most experienced in their field in the industry and are available for short or long term interventions anywhere in the world, or simply on the end of telephone.

We ask clients to register on our website to keep them informed. We do not spam and we zealously protect your identity.

LEARN MORE

LEARN

Foundation PTA/PA

NEW: Pressure Transient and Production Analysis (PTA and PA) share much in common. The physics, the models and much of the Saphir and Topaze functionality are identical. Modern PA is on the ascendant, especially in the context of Unconventional Resources. It therefore made sense, from 2013, to create a new amalgamated foundation course to cover PTA and PA theory and practice.

- **Modern pressure transient analysis (PTA) and production analysis (PA) from theory to practice**
- **Strong practical emphasis on real data with many real life examples**
- **Immediate return on investment with attendees able to perform commercial analysis upon completion of the course**

The KAPPA foundation pressure transient/production analysis (FPTA/PA) course has been designed to teach the generic methodology and the practice of pressure transient analysis (PTA) and production analysis (PA) in addition to the mechanics of Saphir and Topaze software which is learnt almost as a by-product. The emphasis is therefore on a visual and conceptual approach to interpretation including only essential mathematics. Full theory, including formulae and derivations are provided, as well as the conceptual explanation of PTA and PA in the accompanying KAPPA dynamic data analysis (DDA) handbook provided to each attendee.

Field examples are used to illustrate each concept. By the end of the course the attendee should be capable of performing analyses and developing interpretations. In addition, the attendee should have the foundations sufficient for developing further experience in transient and production analysis.

Course programme

Introduction to PTA and PA
When do we perform PTA or PA?

Basic theory of diffusion PTA / PA
The basic principles and terminology governing both methods. Introduction to Darcy's law and the equation of state leading to the diffusivity equation, the principle of superposition, infinite-acting radial flow, wellbore storage and skin and pseudo-steady state.

PTA methodology
Methodology from the simple straight line Horner to the current model-on-the-fly Bourdet derivative.

QA/QC
The quality control process before making an analysis.

Saphir practical
The basic Saphir features including the interpretation path of load, edit, synchronizing, model, classical methods, the derivative and the application to field examples.

Well models
Vertical wells, skin, finite/infinite conductivity fractures, limited entry and horizontal wells.

Reservoir models
Homogenous and heterogeneous models behavior including 2Φ, 2κ and composite

Boundary models
Single limit, intersecting, parallel faults and closed system. Includes typical errors encountered when diagnosing a boundary effect with an illustration of superposition effects and the influence of production duration on the analysis

Basic gas tests
The use of pseudopressures and multiple period analysis for rate dependant skin includes an isochronal test example.

IPR AOF
The IPR AOF options in Saphir and the connection to the Amethyste WPA module.

Test design
Test objectives and how to design a test to achieve them.

PA methodology
Methodology from the basic empirical methods including Arps and Fetkovich to the current modern Blasingame, material balance and loglog diagnostic plots.

Topaze practical
The basic Topaze features including the interpretation path of load, edit, model, p(q), q(p), fast model and the application to field examples.

Basic numerical PTA /PA
The principle of the linear (single phase) numerical model, how to build a model including defining the well type, composite zones, faults and thickness.

An introduction to advanced features

Advanced PTA/PA

- **For practitioners with at least six months PTA/PA analysis experience**
- **Self assessment pre-course test on the KAPPA website**
- **Five day course with additional day options**

This course is five days duration. In that time it is impossible to cover every advanced subject in the detail necessary. In the week following this course additional subjects are offered on a 'pick-and-mix' basis. These can be selected at the time the course is booked.

Optional subjects include but are not limited to:

- Multi-layer testing
- Interference and pulse testing
- Slug and close chamber testing
- Formation testers
- Fractured horizontal wells
- Unconventional resources

Course programme

Advanced PTA/PA
The Advanced PTA/PA course builds on the knowledge and experience gained from the Foundation PTA/PA course by dealing with the advanced functionality of the PTA module Saphir and PA module Topaze and the more complex aspects of analysis. Many examples are worked 'hands on' to illustrate the practical aspects of complex cases using the analytical and numerical methods. In keeping with the effort to keep things as simple as possible, but no simpler, problems are analysed at their simplest level with layers of complexity added as demanded by the particular case.

Pre-requisites to attend the course
To attend the APTA/PA course it is essential you have attended the Foundation PTA/PA (DDA I) or its equivalent and have at least six months of 'real world' PTA and/or PA experience. Without this experience it is unlikely you will keep pace with the course.

To check that you are ready to attend the APTA course please try the self-assessment test on our website. If you are an experienced PTA engineer but are not familiar with Saphir we can arrange a free demonstration copy of the software to assist you in your preparation prior to the course. Please contact tcs@kappaeng.com for assistance.

Software usage
The use of the software will be taught at an advanced level as part of this course. It is essential that attendees have attained a good working knowledge of Saphir and/or Topaze prior to registering for this course.

Refresher
Using a real field case, a very brief review of user knowledge and a brief revision of key principles to correct any misconceptions and to prepare our in-depth look at transient and production analysis tools. The session includes the theory of diffusion, IARF and pseudo-steady state. The concept of the Bourdet derivative including derivation, properties and limitations. Test design and objectives, superposition in time and in space, sensitivity to input parameters, radius of investigation. Transient analysis and where it sits in relation to other reservoir engineering methods. Constant wellbore storage and why it never is, skin components, standard interpretation models including finite radius and fractured wells, double-porosity reservoirs and boundary effects. This will also include a revision of the use of Saphir, with help on shortcuts and advanced level functionality.

Advanced wellbore models
Well performance models and intake with examples.

Advanced well models
A detailed look and worked examples of difficult limited entry, multilayer slanted, advanced horizontal, multilateral, numerical wriggly well, multi-frac horizontal and horizontal anisotropy. This will include looking at the theoretical derivation and response and comparing this to what happens in the real world. A detailed look at the parameters affecting pressure behavior in horizontal wells including low vertical permeability and partial horizontal drainage. The session will include a number of real examples to illustrate the various issues.

Advanced reservoir models
Heterogeneous, composite reservoirs; their bad reputation and their real world use illustrated with examples. Advanced 2Φ, 2κ, multi composite, anisotropy and multilayer models stressing their complexity and the non-uniqueness of the solution.

Advanced boundary models
Complex boundary conditions and unconventional limits including constant pressure boundaries, leaking, conductive and non-continuous faults handled with a common sense approach. Finite reservoirs and material balance and the effect of compressibility on reserve estimations. A discussion of the validity of radius of investigation.

Deconvolution
The principle and the use of the complete production and pressure history in transient analysis, the use of the method for seeing deeper into the reservoir coupled with the limitations and caveats of the method illustrated by worked examples to help us define, question and verify the reservoir limits.

Minifrac analysis
Developing a consistent workflow combining the G-function plot with derivatives to define the leakoff behavior and the closure pressure. Including after closure analysis (ACA).

Analytical and/or numerical?
Development of the workflow from the simple analytical case through to the numerical case with increasing complexity. From 2D to 3D and multiphase using increasing geological and petrophysical data.

PTA and/or PA?
Comparing the information gained from looking at high resolution, high frequency data (PTA) and low resolution low frequency data (PA). Transient versus boundary dominated diffusion.

Complex PVT
The multiphase problem. Aquifers and the choice and tuning of the model. Non-Darcy flow. Heavy oil analysis, gas condensate, using the non-linear numerical model.

Foundation Production Log Interpretation

- **Emphasis on real data with real life examples**
- **Production logging tool limitations, application and data interpretation**
- **Immediate return on investment with attendees able to perform commercial analysis upon completion of the course**

The KAPPA foundation PL course has been designed to teach the generic methodology and the practice of production log analysis, in addition to the mechanics of Emeraude software which is learned almost as a by-product. The emphasis is therefore on a visual and conceptual approach to interpretation including only essential mathematics. Non-essential formulae and derivations are provided in the accompanying literature, including all the presentation material.

Participants are encouraged to bring their own production log datasets to be worked in class.
At the end of the course the user should be capable of making a reasonable basic interpretation and have the foundations for developing further experience in production log interpretation.

Course programme

Basic theory
Sensors and measurements, their accuracy, application and resolution. Spinner calibration, essential PL concepts including hold up and slippage. Basic PVT and flow correlations. Two phase and three phase models.

QA/QC
Judging data quality, selecting passes, editing and comparing with simulated data. Tips for QA/QC on all sensors. Programming a PL job for best results.

Practice
Demonstration of the interpretation method and 'hands on' exercises using Emeraude mean that the participant gains a sound working knowledge in the use of the application and the basics of the interpretation process.

Emeraude features
Advanced features of Emeraude not used during the basic course are demonstrated to make the participants aware of options available in the application. This includes an introduction to horizontal well logging including the Schlumberger FSI™ and Sondex MAPS™ suite. These subjects are covered fully during the Horizontal well PL interpretation course.

Horizontal Well Production Log Interpretation

- **For advanced practitioners with at least six months interpretation experience**
- **Self assessment pre-course test on the KAPPA website**
- **Emphasis on Schlumberger FSI™ and Sondex MAPS™ suite interpretation**

The KAPPA horizontal well PL course has been designed to assist experienced interpretation engineers in dealing with the advanced functionality of Emeraude with a particular emphasis on the interpretation of horizontal wells.

It is essential that the attendee has previously attended the KAPPA foundation production log interpretation course or its equivalent, and has at least six months of 'real world' interpretation experience of production log data. Due to the volume and complexity of data processed on this course a high degree of proficiency in Emeraude is essential.

To check that you are ready to attend this course please try the self-assessment test in the horizontal PL training section of the KAPPA website.

Numerous advanced examples are worked 'hands on' to illustrate the practical and critical path of any horizontal production log analysis using the MP tools and the advanced functionality in Emeraude.

Course programme

Multi-Probe Tools
Working with images and data from the Schlumberger GHOST, DEFT, FSI™ and the Sondex MAPS™ (CAT/RAT and SAT) suites. An in-depth review of the Emeraude zoned and continuous regression and calculation schemes.

Practice
There is a strong emphasis on real examples with practical hands-on work on multiphase deviated producers with conventional and multi-probe measurements. Complex completion configurations and multi survey PLTs integrating interpretation with logging objectives and secondary information are included. Horizontal PLTs with conventional spinners and multi-probe measurements and integration of stations are used as the input sources.

Additional subjects
Although the emphasis is on horizontal well log interpretation, temperature theory/analysis and selective inflow performance (SIP) are also addressed in this session.

Production Logging Reservoir Surveillance (why PL?)

- **Generic training for engineers requiring an overview of production logging and where technique fits in the reservoir surveillance.**
- **Three day overview of PL planning, acquisition and interpretation.**

Traditionally PL has been seen as a 'black art' called in when all else fails. This course is designed to dispel that myth and gives an introduction to the reservoir engineering aspects of the technique as a part of the surveillance suite. It introduces the link between the reservoir engineer's objectives, job planning, tool selection, job execution and the final interpretation. Whilst the objective is not to teach the use of the software attendees get to work with real data, hands-on, to appreciate the issues faced in planning, running and interpreting the results of a successful PL job.

Course programme

Reservoir engineering principles, reservoir monitoring: a review of the means and methods. Production Logging objectives, tools and sensors, types of PL, single and multi phase, deviated and horizontal memory PL, temperature, sensing and modeling, accuracies and sensitivities: PVT, interpretation models, integration into the reservoir model, examples and interpretations. A hands-on session looking at some real data and examples is included.

This is NOT a course on production log interpretation.

Rubis Modeling and Problem Solving

- **Highly practical with hands-on model building from day 1**
- **No previous or specialist simulation experience required**
- **Immediate return on investment with attendees able to build history matched models, run what-if? scenarios, and forecast upon completion of the course**

Rubis sits between single tank material balance and a multi-million-cell simulator, not replacing them but doing much of the work they can do, easier, faster and in concert with the Ecrin suite. This is used to build a predictive model 'bottom up'.

This course will help reservoir and production engineers, geologists and well technologists build reservoir or sector models with no previous experience. They can then forecast, perform what-ifs? and foresee future intervention opportunities and risks with build and run times in minutes instead of days.

Pre-requisites to attend the course.

No prior simulation knowledge is required. Previous experience in using the Ecrin Suite will be of benefit although not strictly required. When understanding the complementary nature of the simulation model and the PA and PTA analysis prior experience of these methodologies would be an advantage. The theory of numerical simulation, transient and production analysis are NOT covered in this course. If you wish to discuss this please contact tcs@kappaeng.com and one of our trainers will talk it through with you offering pre-course reading/worked examples to give you a head start if needed.

Course programme

Basic theory
This is NOT a course on the mathematics and theory of numerical simulation. The entire emphasis is on the building of the physical problem and application to various scenarios.

Rubis mechanics and model building
Introduction to Rubis and its role in the Ecrin suite compared to transient and production analysis leading to flexible upscaling from the wellbore to the full field. Building a simple model: reservoir structure, rock and fluid properties and well description. Defining multiple regions with different initial PVT states. Importing and loading data from various sources including Geomodelers.

Running the model
Automatic grid building, run settings, initialization, simulation, displays, re-runs, what-ifs? and reporting.

Specific problem solving
Recovery comparisons for different field scenarios and well placements. Adapting the grid to model coning effects. Modeling and adjusting the aquifer model and strength. Modeling multiple and connected gas tanks.

Practical integration with PTA and PA.
Initializing a Rubis case from production analysis in Topaze and returning this to the production analysis. Initializing a Rubis case from pressure transient analysis in Saphir. Using a sector of a Rubis case to analyze a build-up in Saphir.

Full Field Case History
The course culminates in the attendees building a full-field history matched model leading to production optimization, forecast of primary recovery and scenarios for secondary recovery.

Ecrin Dynamic Data Analysis software training

- **A course to explore the full Ecrin suite functionality and interconnectivity**
- **No pre-requisite software knowledge required**
- **For those requiring software training from raw data to prediction**

The Ecrin Dynamic Data Analysis suite handles the most complex full field massive pressure and rate data down to the simplest single well, single rate case, and everything in between. This software course is designed to teach, hands-on, the functionality of the full suite. The purpose is also to teach the interconnectivity of the modules and how a result from one analysis can be used and compared in complementary techniques.

As the logic of the software is coherent between the modules and as the knowledge compounds as the training progresses, by the time the attendees get to 3D, 3-phase history modeling in Rubis they will be able to build much of it intuitively.

In addition to classical data load, editing and processing the course will cover the handling of massive data from PDG in the KAPPA client interface including wavelet data reduction, automatic multiple build-up selection, rate correction/allocation and versus time monitoring.

Selected data is then processed in Saphir for PTA and Topaze for PA using classical analytical modeling. Object sharing, data management and the time-saving drag and drop workflow is emphasized. Modeling will then move to construction of the Voronoi model in 2D, 2D with 3D local refinement at the wellbore and then to 3D multiwell, multiphase in Topaze and Rubis history matching. During this process grid upscaling and sector interconnectivity between modules will be practiced.

For correction to sandface and wellbore optimization, the WPA module, Amethyste, will be used linked to Saphir, Topaze and Rubis.

Pre-requisites to attend the course

Prior knowledge of the software is not required but if you have never used it before, as a primer, we would be happy to give you a full working demo version with examples prior to attending. This is a software course only. Theory is only touched upon. You should at least be conversant with transient analysis. If the shape of a build-up log-log and derivative plot means nothing to you this is not the course for you.

Course programme

Data Load and Edit

Data QA/QC, connecting to raw PDG data, setting wavelet filtration levels, rate allocation, basic data loads, automatic multiple build-up selection, transferring selected data to analysis modules.

Analytical Modeling

Well, reservoir and boundary models, external models, regression and matching, generating plots from classical ‘straight line’ to Bourdet Derivative and Blasingame.

Numerical Modeling

2D and 3D model building, upscaling, single and multiwell treatment matching and forecasting, PVT input, well configuration input, multilayer modeling, aquifer modeling.

Special Processing

Deconvolution, formation testers, handling and comparing multiple analyses in the same session, sensitivity and what-if forecasting, CBM and shale gas, desorption, compaction, changing model with time; time dependent skin, pre and post frac, tidal effects, multilayer rates from production logs, use of the production profile generator.

Connectivity

Creating and using the wellbore model, sharing common objects, transferring analyses between modules, sector models in transient analyis.

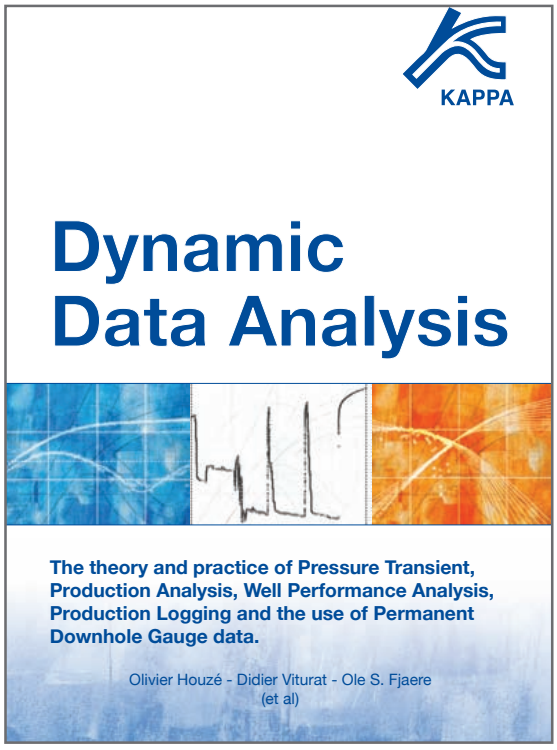
Support and Consulting

KAPPA Dynamic Data Analysis (DDA) book

This book works at a number of levels. It is a standalone generic technical reference for those interested in transient and production analysis. It can also be read as a practical guide to testing and analysis and includes, where needed, all the necessary theoretical background mathematics.

The DDA book also works as a practical support to the interpretation process in the KAPPA Ecrin suite. A printed version of the relevant modules is given to all attendees on courses provided by KAPPA. Recent additions reflect the release of enhanced software numerical capabilities, and embrace technology such as deconvolution and wavelet filtering of PDG data.

The DDA book is free and to keep apace of new versions you are invited to register on www.kappaeng.com and elect to be kept updated on minor new releases.



Interactive support video

As more modules are added and their interconnectivity increases it is important for users to have access to various learning media. We have an expanding library of support videos to help Ecrin users understand and simulate this workflow available to all registered users.

More support...

The software is supported by intuitive help files, many worked examples, multilingual support and we are always ready to help in person. Send us an email on support@kappaeng.com or contact one of our regional offices. Our engineers are happy to help using the collaborative web based tools all of which are included in the maintenance of the software.

Consulting

KAPPA consultants are known for being some of the best in their field in the industry. We are happy to assist with short or long term interventions, onsite or web based and at short notice.

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