Competency definition - PEPD program

Reservoir

CEP001 **Reservoir engineering (fundamentals)**

To be able to describe the basic concepts of reservoir engineering (petrophysics, PVT, well testing, mechanisms of production) and its interactions with geosciences.
To be able to identify the characteristics of rocks and fluids that govern the fluids state and flow in a porous medium.
To be able to qualitatively interpret a well test in terms of reservoir geometry and limits.

To be able to differentiate the drainage mechanisms of a reservoir and associate them an order of magnitude.

CEP002 **Reservoir characterization & data acquisition**

Within a "3G" team, the reservoir engineer will contribute to the characterization of the reservoir by:
Integrating the Geosciences data .
Managing the acquisition of field data (acquisition, validation, interpretation, storage) used to characterize the field and understand its behavior, at each phase in the life of a field. Areas concerned:
- characterization of rocks and flow patterns: routine measurements, SCAL,
- fluid characterization: PVT measurements,
- well logs,
- well tests,
- field monitoring (routine, specific).

CEP003 **Estimation of hydrocarbon in place volumes**

The official calculation of volumes in place is generally the responsibility of geologists.
- Calculating the volumes by using simplified methods (without the use of a numerical geological model)
The Reservoir Geologist can also carry out a calculation from a numerical geological model, and estimate the related uncertainties.
The reservoir engineer, on the other hand, is able to:
- Help to provide data necessary for the calculation (e.g. PC drainage curve), and can identify the uncertainti related to these parameters.
- Evaluate the volume in place using dynamic methods to compare to values obtained from static calculatio

CEP004 **Fluid flow in porous media**

Describe the principles of fluids flow in porous media, the diffusivity equation and its assumptions.
Describe the main solutions of the diffusivity equation.
Describe the different flow regimes and their impact on well behavior in terms of IP or II.
In simple cases, solve the diffusivity equation. (e.g. calculation of water influx)

CEP005 **Production mechanisms**

On a field, determine the mechanisms of primary recovery and associated reserves. If necessary, propose enhanced recovery techniques.
In detail, it's about being able to:
- Describe the material balance principles.
- Describe the primary recovery mechanisms.
- Determine the primary recovery mechanisms using the production history; calculate the associated recovery factors.
- Describe the secondary recovery mechanisms and the indicators which show their effectiveness; evaluate the associated recovery factors.
- Describe the main EOR methods.
- Using screening, recommend EOR methods for a determined field.
- Use a material balance software.

Advanced skills
- Evaluate and recommend an EOR method.

CEP006 **Field development methodology**

Propose an initial field development plan or optimization, based on the understanding of the field behavior resulting from data acquisition.
Identify uncertainties and their impact on results (reserves, production profile).

CEP007 **Reserves and production profile evaluation**

Determine the most appropriate reserves and production profile evaluation method in a given context.
Implement the use of different reserves and production profiles calculation tools concerning: analogue calculations, analytical calculations (Buckley-Leverett type), material balance, well production decline curves, numerical simulation.

CEP008 **Reservoir simulation**

Describe the theoretical principles of a dynamic reservoir simulator.
Describe the construction of a geological model, and its impact on dynamic reservoir simulation.
Describe the main upscaling methods.
Describe the main input data.
Recommend - when facing an issue that needs to be resolved- the type of model to use as well as the simulator options/modules to use.
Build and use a dynamic reservoir model.
Perform history match.
Generate production forecasts, sensitivity analysis and uncertainties evaluation.
Describe the experimental design used to evaluate the impact of uncertainties on the input parameters of the model.
Advanced skills
Evaluate some complex recovery methods via reservoir simulation:
- use of a compositional model.
- use of a thermal model.
- use of a model representing the chemical EOR.
- use of a model representing fractures.

CEP009 **Field monitoring**

Monitor the behavior of a field and identify anomalies; diagnose the cause of these anomalies (whilst proposing appropriate method of acquiring data).
Recommend corrective or optimization actions (e.g. WO, artificial lift, etc.).

CEP010 **Reservoir-wellbore connection / well performance**

Describe the different possible completions. (layer - wellbore, bottom hole - surface).
Describe the main completion anomalies and their conversion in terms of production.
Describe the different possible artificial lift methods.
Evaluate a well performance using a software (IPR/VLP concepts).
Generate well curves for reservoir simulation.

CEP011 **Uncertainties analysis**

Evaluate existing uncertainties, their impact on the stated results and ways to reduce them if necessary.
- On in place volumes estimation for Reservoir Geologists.
- On reserves and production profiles for Reservoir Engineers.

CEP012	**Economics** Describe the international oil industry scene. Describe the current, different types of contracts between an operator and a host country. Describe the parameters allowing for an economic evaluation of a project, the comparison of different investment scenarios. Economically evaluate an investment (cash flow and associated economic criteria).
CEP013	**Advanced Geosciences for Reservoir Engineers** Describe the different stages leading to a seismic interpretation. Collect, analyze and incorporate the necessary data for the geological description of a reservoir. Build a geological model, identify uncertainties, calculate the associated hydrocarbon volumes in place. Describe the specificities of carbonate and clastic reservoirs, and estimate their impact on the reservoir behavior.
CEP014	**Petroleum Engineering** In order to work effectively in an integrated group project, to be able to describe the stakes of the main following occupations and their interface with reservoir engineering: - Drilling and completion. - Surface installation design. - Surface installation operation.
CEP015	**Naturally fractured reservoir** Describe natural and induced fractures. Recognize fractures with the appropriate tools. Characterize fractures. Describe the geological modeling of fractures. Model fractures in simple cases. Describe dynamic modeling of fractures.
CEP016	**Unconventional hydrocarbons** Describe unconventional hydrocarbons and their specificities in terms of methods of production and monitoring.
CEP017	**CO2 management** Describe the estimated impact of CO2 emissions and the global objectives of reducing CO2 emissions. Discuss the economical, legal, societal and technical issues related to CO2 storage. Identify the technical specificities of storing CO2 and how it is modeled.

Drilling/Well

CEP020 Choice of well stimulation techniques

Evaluate the problems that will be encountered in the well during operation and search for possible damage.
Specify appropriate reservoir treatments: acidizing, fracturing, sand control.

.Acidification

Select the wells to be treated.
Choice of acids and additives.
Prepare implementation procedures, control and establish recommendations during and after operations.

.Hydraulic fracturing

Know the goals and principles.
Know the data and tools needed to design a fracturing operation.
Know the equipment and procedures for implementing hydraulic fracturing.

.Sand control

Understand the problems of sand and water influx.
Specify the type of control: crepine, gravel packing...

CEP021 Design of the well architecture: Well engineering & Well planning

. Choice of the type of completion

To give the basic scheme of the completion (open hole, cased hole) and the equipment of the completion according to the production requirements of the well and a possible activation and/or stimulation.
Prepare the procedures for setting up and testing the completion.

. Design of the drilling and casing program

Understand the relationship between the expected production rate and the well configuration (casing and tubir
Prepare the pore pressure/fracture gradient curve as a function of depth.
Analyze the lithological section of a well, make choices of shoe dimensions based on the pore pressure/fracture gradient curve as a function of depth and taking into account geomechanical constraint
Optimize the well architecture: number and depth of casings.

. Design of the mud program

Determine the minimum density of the mud for each drilling phase and give the rheological characteristics.
Optimize the well hydraulics.

. Design of the cementing program

Analyze the regulations (aquifer protection, isolation of the different reservoirs...).
Specify the different slags and calculate the cement volumes
Dressing the casing column with the centering devices.
Establish the cementing and testing procedure for all phases of the program.

Drawing and calculation of the trajectory

Determine the profile of a borehole according to the target and the production objective (J profile, S profile, large offset borehole, horizontal borehole, multidrains...).
Select the buildup rate and optimize the inclination of the well.
Optimize the drilling and casing program to avoid "key seats" and minimize friction and casing wear.
Propose the drill string and the downhole equipment (turbines, motors...) and give the operational limits.
Study the directional behavior of the drill string.
Choose the measurement tools during the drilling process and the trajectory monitoring (MWD, LWD, cable measurements...).

Design of the tools program

Choice of tools by drilling phase.
Determination of the cost per meter.
Optimization of hydraulics.

Design the formation evaluation program

Design of the formation evaluation program (logging, mud logging...).
Design of the effluent testing program.

Determination of the provisional footage

CEP022 Equipment sizing and specification

Sizing and Specification of Casing

Understand the principle of casing sizing: bursting, collapsing, and tensioning under different pressures and temperatures.
Size surface, intermediate and production casings to maintain well integrity.
Select casings and their connections according to the environment (H2S, CO2, HPHT, etc.)

Sizing and specification of the completion

Select the equipment of the completion (suspension olive, valves....) according to the production objectives.
Calculate the stresses on the tubing and the other elements of the completion.
Dimension the tubing according to the pressures, temperatures and fluid environment (H2S, CO2).

Sizing and specification of activation equipmer
Sizing the pumping system.
Sizing the gas lift system.
Wellhead/BOP recommendatio
Recommend wellheads and BOPs to ensure well integrity.
Determine BOP stacking and testing procedure.
Select BOP control units and accessories.
Sizing and specification of the drill string element
Select the elements of the drill string (rods, BHA,...).
Select the appropriate drilling tool for each drilling phase and the optimum drilling parameters.

CEP023 **Selection of the drilling rig**
Determine the required lifting capacity.
Determine the hydraulic power required.
Determine the required rotation power.

CEP024 **Realization of the budget of the well and the AFE - call for tenders, follow-up of contracts**

Calculate the fixed costs, the cost of consumables and evaluate the cost of different operations and services.
Establish the global budget of the well and prepare the AFE.
Prepare tenders.
Follow up contracts.

CEP025 **Monitoring and optimization of drilling parameters**
Identify and analyze the main measurements during drilling (logs, mud logging...).
Determine the optimal operational conditions to monitor and control the drilling process.
Know the main equipment and techniques to solve a drilling instrumentation;
Analyze the performances and the N.P.T.

CEP026 **Blowout prevention and kick control**
Understand kick situations during drilling.
To know and know how to recognize the warning signs of a kick.
Know the blowout control procedures and know how to apply them.
Detect incidents during a kick control and react accordingly.

CEP027 **Supervision and management of operations**
Well construction: drilling, casing, cementing
Instrumentatio
Setting up the completio
Conducting the well test
Delivery of the well to the operato

CEP028 **Preparation of well recovery procedures**
Well recovery : Work-over
To know the means to be implemented and their principles (wire line, snubbing, coiled tubing)
To know the procedures to be followed to carry out the work-over of wells.
Drawing up the operating program.
Neutralization of a producing wel
To know the fields of application and procedures of the main neutralization methods.
Preparation of the operating program.

CEP029 **HSE**
To know the typical practices of safety management on site (prevention, protection).
Know the risks related to products and materials.
To know the risks related to operations and works.

CEP030 **Optimization of rig equipment**
Specify rig equipment.
Prepare the reception of a drilling rig.
Follow the technical construction of a drilling rig.

CEP031 **Advanced drilling**
Advanced casing sizing and completion
Advanced dimensioning of the drill string
Advanced hydraulic calculations
Deep and ultra deep offshore drilling
High temperature and high pressure wells

Casing drilling
Underbalanced drilling and drilling pressure management
Intelligent completions

Production

CEP040 **Modeling multiphase flows in pipes**
Analyze the behavior of fluids at the surface
Model multiphase flows in pipes, in their thermodynamic and hydrodynamic aspects.

CEP041 **Principles of effluent treatment**
To know the main surface treatments of effluents
Know how to set up a treatment chain
Have an overview of the production chain, from the tank to the surface

CEP042 **Operating principles of surface equipment**
Know the main elements of a process diagram
To know how they work
To know how to dimension them

CEP043 **Control and instrumentation of the entire surface process**
To know how to choose the instrumentation useful for the control of the process
Know how to establish the process control diagram
Know how to establish an electrical power balance

CEP044 **Underwater architecture**
To know the specificities of offshore developments
Know the techniques related to this environment
To know the different components of an offshore field
Know the current field architectures
Know the latest technical advances

CEP045 **FPSO - Platforms**
To know the different types of FPSO
Know the different structures of platforms
To know how to choose the most suitable structure
To know the organization of offshore structures
To know the installation techniques of an offshore field (pipes, risers, anchoring, etc...)

Project

CEP050 **Choice of surface treatments**
Model the thermodynamic and hydrodynamic aspects of multiphase flows in pipes.

Define the adequate surface treatments according to the thermodynamic data and the production objectives of the field

CEP051 **Choice of the field architecture**
Know how to propose a coherent development scheme taking into account the project constraints
Know how to take into account in these choices all the constraints of the production chain, from the reservoir to the surface

CEP052 **Equipment sizing and specification**
Know how to model equipment
Know how to optimize them
Know how to define their nominal operating
Know how to propose a layout plan for the treatment unit by proposing an HSE analysis