# Modul 2

1) License agreements:

Traditional form of agreement, by which the government grants exclusive rights to a company to explore in a particular area.

Production sharing agreement:

The oil company takes the full exploration risk and pays all development and operating costs. These costs are recovered out of part of the production, referred to as 'cost oil'. The remaining 'profit oil' is split in a predetermined manner between the company and the government.

2) Concession Round: Process that leads to a license award. A Concession round is a set of laws and regulations that has been given to oil companies in order to explore and produce oil and petroleum.

3 Joint venture/partnership:

Companies develop a field together, pooling their resources, sharing the burden, spreading the risk. It is a deal that has been assigned for parts collaborating together in terms of a project or as a continuous collaboration.

What is a Concession Round? A Concession round is a set of laws and regulations that has been given to oil companies in order to explore and produce oil and petroleum.

* About how many kg CO2 and how many kg NOx are discharged per produced Sm3 of oil equivalents?

4 Operator:

Management of a joint venture’, submit a plan for development and operation to the ministry.

Minimum participating interest of 20% or more

Act on behalf

Cannot commit outside license operations

5 Participating interest:

How involved a company is in a joint venture. The proportion of a companys exploration and production costs each party will receive and the proportion of production each party will receive.

6 Unitization:

Sharing between different owners in one and the same reservoir, or reservoirs in pressure communication or the combining of multiple wells to produce from one specific reservoir.

7 PDO (Plan for development and operation)

Containing everything thinkable concerning the use of the field.

Development part: Impact assessment part:

- Description of the production licence -Introduction

- Production strategy -Plans for development and operation

- Reservoir engineering aspects -Environmental impact and remedial measures

- Technical description of facilities etc. -Impact on fisheries as a result of activities

- Economic analyses occupying an area

- Substantial contractual obligations -Impact on society

 -Planned assessments

8 Risk

Risk is regarded as the logical opposite of safety, and is therefore used as a measure of safety. High safety level <-> Low risk

Risk = Probability \* Consequence

9 FAR-value

Fatal accident rate, number of deaths per 100 million work hours. If it equals 10 it means that you will have a number of 10 fatalities per 100 million working hours.

10 About 42kg Co2 discharged per Sm3 o.e.

 About 0,171 kg Nox per Sm3 o.e

# Modul 3

1 Condensate: Hydrocarbons which are on the gaseous state under reservoir conditions and which become liquid when temperature or pressure is reduced.

2 Naphtha: A natural gas liquid with a vapor pressure immediate between condensate and liquefied petroleum gas

3 Natural gas: A naturally occurring mixture of hydrocarbon gases that is highly compressible and expansible

4 NGL: Natural gas liquefied, “liquid at surface”, Low vapor pressure: Condensate, intermediate v.p: natural gasoline, high v.p: Liquefied petroleum gas. Propane, butane, pentane, hexane, heptane, not methane and etane.

5 LPG: Liquefied petroleum gas, “bottle gas” has been liquefied at low temperatures and moderate pressures. Propane/butane.

6 LNG Liquefied natural gas, liquefied at cryogenic temperatures (-161, atm trykk), mainly methane and ethane.

7 Basic unit for energy: Joule (J) = 1 watt second = 1Nm

Basic unit for effect: Watt (W) = 1 joule/second = 1Nm/s

8 Wet gas: Natural gas containing significant heavy hydrocarbons.

 Rich gas: Natural gas containing heavier hydrocarbons than a lean gas

 Lean gas: Natural gas that contains a few or no liquefiable liquid hydrocarbons. Lean gas is also called dry gas.

9 Discovery: A petroleum deposit, or several petroleum deposits combined, discovered in the same well, and which testing, sampling or logging have shown probably containing mobile petroleum.

Field: One discovery or a number of concentrated discoveries, which have the licensees have decided to develop. For which there exists a PDO

10 1 Sm3 gas = 1 Sm3 o.e, 0,159 Sm3 o.e = 1 boe => 6,28 boe.

# Modul 4

1 Basin: A geological area or system containing layers of rock and sediments.

2 Play: A family of prospects, leads and undeveloped and developed pools and drilled unsuccessful features that are known or conceived to share the same gross reservoir, hydrocarbon charge system and regional top seal.

3 Petroleum system: A conceptual model for a style of hydrocarbon accumulation used by explorationists to develop prospects in a basin, region or trend.

4 Prospect: A possible petroleum trap with a possible delimited(avgrenset) volume of rock.

5 Trap: A hydrocarbon accumulation: 4 types =>

1 Anticlinal traps, 2 Fault traps, 3 Stratigraphic traps, 4 unconformity traps

Stort sett forekommer 1 og 2, og sammen blir de kalt structural traps.

6 Migration: Oil movement, within the rock.

7 6 requirements that must be satisfied if significant volumens of hydrocarbons are to be found in a basin:

1. A source rock, rich in organic carbon to be converted into hydricarbons.
2. Sufficient heat over long periods of time.
3. migration pathways available
4. suitable reservoir rock such as limestone or sandstone, with sufficient porosity to allow hydrocarbons to be stored.
5. an effective seal of impermeable rock, such as clay, shale or salt, above and against the reservoir.
6. closed structures to prevent to upwards migration,

8 Logging: technique of measuring [geologic formation](http://en.wikipedia.org/wiki/Geologic_formation) properties, we do this to confirm whether a structure contains oil or gas.

9 Well-testing: Obtaining insight into reservoir properties and well performance under operating conditions.

10 2D Seismic: a source and a single streamer ( line som flyter etter båten)

3D seismic: a source and multiple streamers.

4D seismic: 3D seismic including measurements over time, time being the 4th dimension.

# Modul 5

1 Porosity: forholdet mellom Vt total volume, og pore volume Tp, altså hvor mye ledig plass det er I strukturen I stoffet/steinen. Low: >5%, 5-10 mediocre, 10-20 average, 20-30 Good, 30+ excellent.

2 Permeability: The ability of a rock to allow a fluid with which it is saturated to flow through its pores.

3 Unit for measuring permeability:

Measured in mD, milliDarcy, <1, verylow, 1-10 low, 10-50 mediocre, 50-200 average, 200-500 good, 500+ excellent.

4 Hydrocarbon saturation: in the pore volume Vp, there may be found a Vw-water, Wo-oil and Wg-gas. Sw+Sg+So = 100 %

5 Difference between a saturated and a non-saturated oil reservoir?

Saturated: Liquid zone (oil) overlain by a gas zone, or gas cap.

Non-saturated:

6 Formation value factor, FVF=B0:

Number of m3 reservoir fluid that must be procured to obtain one stock tank m3 of stable oil at surface. (Always higher than 1,0, because the effect of temperature is greater than that of pressure.)

7 GasOilRatio, GOR=Rs:

The standard volume of gas recovered with a unit volume of stock tank oil ( the symbol Rs corresponds to the solution ratio)

8 What is the purpose of gas circulation in a retrograde gas condensate reservoir?:

To keep the liquid content of the gas procured as high as possible, because it is then more valuable.

9 IOR:

Improved oil recovery, actual measures resulting in a increased oil recovery factor. This includes conventional methods.

10 EOR: Enhanced oil recovery, advanced recovery techniques going beyond what is considered conventional techniques.

# Modul 6

1 Conductor:

Prevents the hole from caving in at the surface and endangering the drilling rig foundation.

2 Casing:

Casing is large diameter pipe that is assembled and inserted into a recently drilled section of a [borehole](http://en.wikipedia.org/wiki/Borehole) and typically cemented into place. The outer barrier.

3 Liner: Serves the same purpose as the a casing but does not go all the way to the surface, it simply hangs from the casing.

4 Production tubing: The final string of pipe usually run in a producing well is the tubing. Tubing as nearly always freely suspended in the well from the tubing head. The inner core.

5 Gravel pack:

Packer in general: a device put inside the pipe to control the flow., “en mekanisk propp som kan ha forskjellige bruksområder.

Gravel pack: A sand control pack used to prevent production of formatino sand. Et slags grusfilter som legges utenfor annulus, og som produksjonsvæsken føres gjennom.

6 Horizontal well: Drilled to a predetermined depth and level out to almost horizontal. This allows a better approach to the formation.

7 Multilateral well:

Multilateral wells are wells in which a single wellbore is drilled to a pre-determined depth, then multiple branches are drilled out from the original wellbore. These laterals may extend in opposite directions from each other in the same zone, or they may be drilled into different zones or formations. As with extended reach wells, multilateral wells allow much more contact with the target formation than vertical wellbores. These technologies allow the reservoir to be depleted with fewer wells than with vertical or conventional directional wells.

8 Smart/Intelligent well: The 'smart well' term refers to wells completed with valves or chokes downhole in the reservoir and with equipment which can be operated from the surface.

 - Shut off unwanted production

 - Control water injection

 - Eliminate the need for well intervention

 - Improved reservoir description

 - Increase ultimate recovery factor

9 Reservoir stimulation: Comprises several processes used to enlarge old channels or to create new ones in the producing formation.

Ex: acidizing (to remove damaging substances) and hydraulic fracturing(lage nye sprekker I formasjonen), . The technique is used to increase or restore the rate which fluids, such as [oil](http://en.wikipedia.org/wiki/Oil), [gas](http://en.wikipedia.org/wiki/Gas) or [water](http://en.wikipedia.org/wiki/Water), can be produced from the formation

10 Artificial lift: Helping to raise the fluid to the surface, used by ex: gas lift and pumps.

# Modul 7

1 Value Chain: Development of a business opportunity is structured around a business case. The business case can be separated into a series of value-generating activities referred to as the value chain.

The petroleum value chain:



Upstream: platform – midstream: between platform and “customer”

Downstream: The end, “petrochemical, heating, power, etc)

2 When will a field be developed as a satellite field?

usually a single well drilled offshore by a mobile offshore drilling unit to produce hydrocarbons from the outer fringes of a reservoir that cannot be produced by primary development wells drilled from a permanent drilling structure (as a platform rig). Sometimes, several satellite wells will be drilled to exploit marginal reservoirs and avoid the enormous expense of erecting a platform.

3 When will a mobile production system be used?

Mobile Offshore Production Systems (MOPS) offer a cost-effective alternative to conventional fixed platforms for a broad range of field applications. A MOPS is readily movable and can be floated onto a field and installed complete, ready to produce oil.  All construction work can be performed at a shipyard or dock facility. When the field is depleted, the MOPS can be removed quickly and inexpensively and redeployed to another field.

4 Wet / Dry tree?

A wet tree is placed under the surface which allows for simple surface facilities and more complex risers and subsea facilities. A dry tree, will be placed over the surface, and will demand more complex surface facilities and simpler riser/subsea facilities.

5 What is meant by subsea wells and platform wells?

Subsea wells: wells managed under the surface

Platform wells: Wells drilled and managed from the platform, often clustered together through one or several risers.

6 What will a typical “design basis” document contain?

1. Project scope and interfaces

Projects outline description, design life and schedule.

Battery limits and interfaces.

2. Metocean, geotechnical and mapping

Definition of location, geohazards, surveys and mapping.

Environmental and geotechnical design data.

3. Fluid properties and analysis

Fluid properties, fluid compositions, formation water analysis.

Sand production.

4. Production forecast

Production profiles, inlet pressures and temperatures, individual well rates

Injection design rates and pressures, well flowing and shut-in conditions

5. Product specifications

Specifications for crude oil, gas, produced water, injection water.

Other products.

6. Drilling and completion

Definition of drilling locations and well slots (production/injection).

Xmas tree and interfaces between wells and facilities.

7. Facilities design

Design capacities for production/injection of oil, gas and water. Living quarters.

Slots and tie-ins. Provisions in design to meet future flexibility requirements.

8. HSE

Restrictions relating to emissions and discharges. Disposal of waste products.

9. Operations and maintenance

Operating philosophy and staffing. Reliability, availability and maintenance.

Sparing and standardization. Material handling.

7 Why is it expected to have lower recovery factor for a subsea development than for a platform development?

Because with a subsea dev we cannot drill or perform well interventions onsite and “immediately”, so the recover factor will be less then with a platform system where we can do “everything”. And cost of subsea developments are more sensitive to the number of wells that platform wells.

8 What determines the plateau level in the plateau phase?

It is the production on site from the day we reach full capacity until the day when the production decline starts.

9 What is meant by tail end production?

This is the phase when the decline in production decline levels out and moves towards production cut-off.

10 What is meant by “infill drilling”?

To drill more wells, and closer wells to get more out of the reservoir, and to combat declining pressure in the reservoir.

# Modul 8

1 What is meant by a subsea production system and in what types of field developments are they used?

A production system is where the key elements of operating the well and processing the oil/gas are placed under water, mainly on the seafloor.

Used in: Satellite development, subsea-to-beach, mobile production system, permanent floating production system.

2 Name at least 4 physical elements in a subsea production system

* Riser base
* Flow lines
* Control umbilical
* X-mas tree
* Template
* Protection structure for x-mas tree

3 What is meant by a flexible pipe and what is it used for?

It is used for dynamic risers connecting seabed flowlines to floating prod. Facilities and for static seabed flowlines.

4 What is meant by the reeling method in relation to pipelaying?

A pipe carrying reel (hjul) is positioned on the vessel so that the pipe can be continuously laid on the seafloor.

5 What is a flowline bundle? A gathering of lines in to one big line.

6 What is multiphase flow? The flow of fluids in several phases. i.e. oil, gas, condensate..

7 What is flow assurance? “Safe, uninterrupted and simultaneous transport of gas, oil and water from the reservoirs to processing facilities”

8 Name at least 5 problems that are usually addressed in relation to flow assurance:

* Asphaltenes deposition
* Wax deposition
* Scale deposition
* Sand production
* Pressure maintenance
* Souring ( H2S)
* Etc…

9 Name 3 different methods that can be used to avoid hydrate formation in flowlines:

* DEH – Direct electric heating
* Scraper pigging
* Burial
* Insulation

10 Name 3 different types of subsea processing:

* Separation, Cooling, Mixing, Heating, Filtering, Pumping, Injection
* Etc…

# Modul 9

1 What is crude oil?

Crude oil is a mixture of many hydrocarbons ranging from light gases to heavy pitch.

2 What is stable and unstable oil?

Stable oil is mostly C5, Penthane, and unstable oil is mostly C2 to C4.

3 What is the difference between rich gas and sales gas?

Rich gas: Methane (C1), Ethane(C2), Propane(C3), Buthane(C4)

Sales gas: C1 and som C2

Sales gas is more refined, while rich gas is a mix of more components.

4 Why can it be difficult to deliver the products stable oil and sales gas from an offshore platform?

Because the stable oil and sales gas is very refined so that if say, the pressure or temperature has major deviations from the rig to the target facility, the puritylevel may vary.

5 What is LPG and LNG?

LPG: Liquefied petroleum gas, “bottle gas” has been liquefied at low temperatures and moderate pressures. Propane/butane.

LNG: Liquefied natural gas, liquefied at cryogenic temperatures (-161, atm trykk), mainly methane and ethane.

6 What is meant by the LNG-chain?

In its practical operation, and LNG chain is an alternative to a pipeline project. Going through plants, terminals and shipping.

7 What is meant by a crude oil assay?

A complete assay is a detailed description of the chemical and physical properties of the whole crude oil as well as the amount and quality of certain portions of the crude that will be separately processed in the refinery.

Measurements in properties such as API, viscosity or sulphur content.

8 What is Crude oil refining?

It’s the process of separating the crude oil into more usable components, through distillation, cracking, and the removing of impurities.

9 Name at least 4 different operations that are referred to as “marine operations”

Pipelaying, drilling, loading/unloading, Seismic readings.

10 Name at least 3 different types of loading buoys that have been used in the North Sea.

# Modul 10

1 What is a PDQ platform?

A platform consisting of Production, Drilling and Quarters

2 What are the 5 main functional areas on a PDQ platform?

* Living quarters
* Utility area
* Drilling area
* Wellhead area
* Process area

3 What is a LQ platform? Living Quarters platform

4 What is a PQ platform? Production quarters platform

5 What is a WHD platform? Wellhead platform

6 Why is it important to provide sufficient area/volume on a platform, and why do we often end up with insufficient area/volume?

* Safety
* Functionality
* Maintenance access
* Limit exposure
* Etc…

7 What is EMF and what is the purpose of EMF?

Equipment Maintenance factor, The ratio between required deckspace for one unit and the projected area of the unit.

8 How can design modifications improve platform safety?

* By limiting the exposure of say, gas containers, to any source of ignitions
* By keeping living quarters as far away from high risk equipment
* Provide access for controlling fires
* Etc…

9 What is the purpose of the pressure relief system?

The relief system is an emergency system for discharging gas by manual or controlled means, or by an automatic pressure relief valve from a pressurized vessel or piping system to the atmosphere for the purpose of relieving pressures in excess of rated working pressures.

10 What is the purpose of the flare system?

The flare system is a system for discharging gas through a control valve from a pressurized system to the atmosphere during normal operations. This discharge may be either continuous or intermittent.

+ flare systems must be designed to insure that vessels and tanks will not be over-pressured and accommodate the maximum volume that could be vented.

+ If problems occur the entire production of gas can be sent to flaring.

# Modul 11

1 What property is measured in degrees API?

API – American Petroleum Institute

The density of crude oil ( API gravity ) is measured in degrees API.

API = 141,5/r – 131,5 (r being the specific gravity of the oil relative to water at 16 degrees C).

2 What is a 3-phase separator? 3 What is 3-stage separation?

Separation in 3 stages is done by separating the fluid in 3 stages.

First the fluid in separated into oil, gas and water, this continues for 2 more stages, all the water is sent to treatment, the gas, from each stage, is scrubbed, compressed and cooled andjoined by the gas from the other stages and exported.

4 What is re-compression?

When the gas is separated in each stage, it happens because the pressure is dropped, so that the clean gas from each stage will have a pressure depending on how many stages it has passed through before separation. We need to join all the gas to export it, and so, the gas from other stages is cleaned re-compressed and cooled, to be joined with gas from other stages.

5 What is gas dehydration, and what is the most used method?

Removing water vapour from the gas to a level suitable for transport. Usually done by absorption in a glycol contactor, where highly concentrated glycol solutions are used to physically absorb the water from the gas

6 What is hydrocarbon dew-point control, and what is the most used method?

Hydrocarbon dew point (HDP) is similar to the water dew point issue, except that we have a multi-component system. Natural gas typically contains many liquid hydrocarbon components with the heavier components found in smaller amounts than the lighter gaseous ends. It is the heaviest weight components that first condense and define the hydrocarbon dew point temperature of the gas. The dew point temperature also moves in relation to pressure. Turbo expanders are widely used for “HC dew point control or NGL –extraction” The turbo expander is typically a single stage radial-inflow turbine.

7 What is gas sweetening?

The objectives of gas sweetening is the removal of H2S and/or CO2, by removing these “sour” gases we “sweeten” the gas.

8 What sort of processing is needed if we are to deliver sales gas?

Dehydration, sweetening and HC dew point control gives us sales gas.

9 Name 4 different methods that can be used in order to reduce the possibility for hydrate formation?

* + Perform minimum field treatment before re-injection
	+ Perform minimum field treatment to secure pipeline transport requirements. That is essentially dew point control (HC and water)
	+ Treat the gas to fall in a range above a minimum calorific value required by market
	+ Achieve maximum condensate recovery

10 What is a MODU? Give 3 examples?

A MODU is a Mobile Offshore Drilling Unit

1. Jack-up platform
2. Semisubmersible drilling platform
3. Drill ship
4. Fixed drilling (and production) platform

# Modul 12

1 What is a modularized deck? 2 What is an integrated deck?

Large modules placed on a supporting frame. A one piece structure.



3 What is a hybrid deck?

Modules on an integrated deck



4 Name 4 loading conditions that have to be considered in relation to weight estimating/control.

Dry weight, lift weight/hook weight, test weight, operating weight/live loads

5 Dry weight

Weight of components and assemblies in their dry installed condition.

6 Operating weight

Dry weight + content

7 What are the three main components of dry weight?

1. Equipment: tagged items of equipment
2. Bulk: El-items/cables, piping/valves, instrumentation/telecommunication, safety/loss prevention,
3. Structural steel: the topside and primary structural steel, and outfitting steel, including stair towers, ladders, walkways etc.

8 What is meant by weight allowance?

Weight allowance is a weight addition to account for definable items, that cannot possibly be specified at the respective project stage – inaccuracies in base weight estimates

9 What is meant by weight contingency?

To account for design changes or variation orders within the defined scope / design basis.

10 What is meant by management weight reserve?

The m.w.r is an amount, in tonnes, which may be utilized to incorporate design changes required by the project management.

Established at the commencement of the conceptual design phase.

# Modul 13

1 Define Natural Frequency

Egenfrekvensen  =  .. k= Stivhet, m= masse

2 Define Dynamic Amplification factor

 , u is the deflection of the structure due to load. DAF =

3 What is a wave spectrum?

The wave spectrum is the term that describes mathematically the distribution of wave energy with frequency and direction.

4 What is the significant wave height?

S.w.h is the average of the largest 30% of the waves.

5 We have a sea state characterized by a significant wave height of 9 metres. What is the maximum wave height that can be expected to occur during a period of 6 hours?



6 What are the 2 parameters that are used to describe a sea state?

H and 

7 Mention some similarities and differences between a TLP and a Spar.

Similarities:

* suitable for deep water
* platform wells
* top tensioned rigid risers

differences:

* TLP: At-shore installation of top sides, no oil storage
* SPAR: Offshore installation of top sides, possibility for some oil storage

8 Mention some similarities and differences between a semisubmersible platform and a Spar.

Similarities:

* Based on proven technology
* Suitable for deep water
* Conventional mooring

Differences:

* Semisub: Subsea wells, flexible risers, simple marine operations, at shore installation of top sides, no oil storage
* Spar: Platform wells, top tensioned risers, complex marine operations, offshore installation of top sides, some oil storage possible

9 Under what circumstances is a production ship very suitable?

When we may have to move because of the weater

10 What platform concepts have an advantage if offshore loading is the only option for oil export?

The concepts that can offer oil storage.

# Modul 14

1 Under what conditions is a jacket suitable?

* Limited water depth
* No oil storage
* Offshore installation of top sides

2 Under what conditions is a fixed concrete platform suitable?

* Long life structure
* Limited water depth
* Deepwater construction site and transportation route
* Inshore installation
* Oil storage

3 Under what conditions is a jack-up platform suitable?

* Ideal for shallow water
* At shore installation
* Possibility for subsea oil storage tank

4 Under what conditions is a compliant tower suitable?

* Deeper water
* No storage

5 - What is the purpose of ”mud-mats”?

These mats, fixed as the feet of the structure, prevents sinking into the seabed.

6 What is the alternative to piling of a ”jacket”?

Using buckets.

7 What are the most important parameters that determine the natural period of a jacket?

Buoyancy and wet area.

8 What are the most important marine operations involved in a “jacket-project”?

Transport, installation and lauching.

9 Why have fixed concrete platform been so popular in Norway?

Because we often have reasonably shallow water, and because there were no transport pipes available so we had to be able to store oil on site, which f.c.p offers.

10 What is ”air-gap” and why is it so important?

It is the pocket of air that we make sure exists between the inside of the bucket and the sea floor, so that the rig is “sucked” on site.

It is important, because otherwise the structure might not be secure.

# Modul 15

1 Why must the vertical mooring lines on a TLP be pre-tensioned?

De er pretensioned fordi det ikke skal oppstå trykkrefter i strekkstagene.

2 What is the set-down effect on a TLP?

When a TLP is moved horizontally by waves or other effects, the set-down effect is the vertical movement, the way the rig is pulled under when it moves horizontally.

3 Why has a Spar-platform such a deep draft?

 Because of the very favourable motion characteristics it makes.

4 How important are the tension legs for the stability of a TLP?

They are very important, the TLP is at all times deeper in the water than it would be if the legs were not there, should anything happen to the legs (loss of tension) the TLP would be in trouble.

5 How important are the mooring lines for the stability of a Spar platform?

The mooring system is very important for the Spar platform.

Because of its low motion the Spar can use a taut mooring system which is cheaper compared to a full catenary system.

6 There are different opinions about the reliability and robustness of different platform concepts. List some strengths and weaknesses of a TLP.

Strengths: Suitable for deep water, drilling possibilities, platform wells.

Weaknesses: Relies on the pretensioned mooring system, no oil storage possible.

7 There are different opinions about the reliability and robustness of different platform concepts. List some strengths and weaknesses of a Spar.

Strengths: Low motion in the water requires a simpler(cheaper) mooring system, oil storage possibility

Weaknesses: The possibility of the risers making contact with the rig because it has such a deep draft. “Flippers” along hull must be installed to avoid the effects of vortex induced vibrations

8 What could be the advantages and disadvantages of a multi-column DDF compared to a Spar ?

9 What is vertical top-tensioned rigid risers?

These are the risers that are fastened to a Spar or a TLP platform connecting the rig to the wells.

10 The interaction between platform and risers are different for a TLP and a Spar. How is it different?

På en TLP blir riserne holdt oppe av hydrauliske holdere, mens på en Spar har vi muligheten til å benytte oppdriftmoduler som holder riseren oppe slik at den bare kobles til riggen.

# Modul 16a

1 What is “extended well testing” and and what is the purpose of it?

E.W.T is a test period of up to a few months where we really investigate the wells potential, we seek to gain info about the well but also to have an income.

2 What is “early production” and what is the purpose?

Early production is a period of up to several years focusing mostly on earning money but also and gaining more knowledge about the well.

3 Why is it difficult or impossible to use dry trees in combination with floating platforms?

Because we can have little or no movement between the tree and the well, so if the tree is situated on a moving rig it becomes very unstable. Placing the tree on the seafloor however, will make the connection stabile.

4 Describe two different well configurations that are used in combination with semisubmersible production platforms.

Mostly subsea wells, but in the case of a MODU (mobile offshore drilling unit), we can also have platform wells.

5 Why will a semisubmersible drilling platform normally have two independent pontoons, and why will a semisubmersible production platform normally have ”ring-pontoons)?

A Semisub, will be towed to location and then stay there until production is finished. While a drilling rig will have to move over the reservoir, drill, and the move on, so its much easier for a rig with “openings” in each end to manoeuvre.

6 What is the metacentre height, and why is this an important parameter?

The length from the gravitational centre of the structure to the metacentre of the structure. This length is used to calculate the stability of a structure.

7 What does it mean if a structure is stable based on gravity or based on geometry?

Gravity based stability: Centre of buoyancy above centre of gravity

Geometry based stability: Centre of buoyancy below centre of gravity

8 Why is it favourable or even necessary to use pile anchors or suction anchors in combination with mooring lines made of polyester?

Because this ensures that we will not have mooring failure.

9 Name two parameters that determine that natural heave period for a floating structure.

* Water plane area
* Mass

10 List some advantages and disadvantages of a buoy structure compared to a semisubmersible platform

|  |  |
| --- | --- |
| Buoy | Semisub |
| Oil storage | No oil Storage |
| Protected riser | Risers not protected |
| Large motions | Less motion |
| No drilling | Possibility for a drilling rig |
|  |  |
|  |  |

# Modul 16b

1 What is the meaning of FPSO? Floating Production, Storage and offloading unit

2 What are the most important advantages and disadvantages of and FPSO?

Advantages:

* Easy and fast to move
* Oil storage
* Can move in case of bad weather
* Large deck area + ETC

Disadvantages:

* Everything has to pass the turret/swivel, which limits the amount of connections drastically.

3 What is ”single-point-mooring” and what is ”spread-mooring”?

Spread mooring utilizes several mooring lines almost surrounding the rig, while a singlepointmooring system anchors the rig at a single point.

4 What is the purpose of a swivel and what is the alternative to a swivel?

The purpose of a swivel is to allow the FPSO to follow the wind and wawe directions, while still producing from the field.

The alternative to a swivel is a Drag Chain (Turret with swivel or turret with drag chain)

5 What is a ”turret”?

The turret is the actual cylinder rotating in place on the FPSO, while the swivel is seated on top of the turret.

6 The ”Turret” can be external or internal relative to the hull. What are the advantages and disadvantages of each of the two cases?

* External turret, places the living quarters aft, so there`s less movement if bad weather
* Internal turret, places living quarters in the bow, and makes it more vulnerable to bad weather, (more movement)

7 What is a hybrid riser?

A hybrid riser is a freestanding riser. It moves horizontally along the seabed until it goes vertical up until a certain depth. It is buoyant so it stay “upwards” on its own. The top of it is connected to a flexible riser which is then connected to the rig.

8 What is a riser tower?

A riser tower, joins several prod.lines at the sea bed, then guides them upwards to a certain depth, and then a flexible hang-off pipe goes to the floater.

9 What is a steel catenary riser?

It is a riser which is “bent” on its way up to the rig. It moves in a “sinsus”-looking way, with floaters along the riser so that any movement topside results in the upper part of the riser to move, and not the bottom one which is connected to the wells.

10 What are the advantages and disadvantages of a risers made of flexible pipe?

Advantages

* Flexible, so it is less likely to break if f.ex hit by a boats or smthng.
* Easier to handle and can be used with many more types of rigs than soild risers.

Disadvantages:

* It is not solid steel. So it is more vulnerable all over.
* More movement.

# Modul 17

1 Cost estimates are developed for different purposes. Give 3 examples.

* Establish the *value* of a business
* *Improve and optimize* the development concept
* Establish the basis for *decisions* (at decision gates)
* Establish the basis for *control* during project execution

2 What is meant by Capex?

Capital expenditure, that is, Development costs or investments

3 What is meant by Opex?

Operating expenditure, that is, Operating costs

4 What is meant by PBS?

“Physical breakdown structure” – A system of defining and coding a big system into physical pieces.

5 What is meant by SAB?

“Standard activity breakdown” – Another system of coding, hint alphabetically.

6 What is the “most probable value”?

Aka most likely value: The value that is likely to occur most times.

7 What is “The expected value”?

The value that represents the weighed average. It reflects the “center of gravity” in the probability distribution

8 What is “the 50/50 value”?

The value that gives equal probability of under/overrun. The area under the curve is the same on both sides

9 What does it means that a cost estimate had and accuracy of +- 20%?

That estimated cost could vary with 20% of the value. i.e. between 80% and 120% of the estimated value.

10 Why do we “allowance” and “contingency” respectively? (ref weight estimating)

* Allowance is added to weight estimates to account for inaccuracies and incompleteness in the definition of equipment, components and materials.
* Cost Contingency shall cover for uncertainty within the given scope, which may lead to different design changes

# Modul 18

1 What is the purpose of “Decision gates”?

At a [Decision Gate](http://v-modell.iabg.de/v-modell-xt-html-english/44e3fbda665f67.html#ref37a1fbe919a38f) a decision is made whether a [Project Progress Stage](http://v-modell.iabg.de/v-modell-xt-html-english/44e3fbda665f67.html#reff055fbe919e46a) is reached. This decision is made on the basis of the [Finished](http://v-modell.iabg.de/v-modell-xt-html-english/44e3fbda665f67.html#ref11a32fbe9271576) [Work Product](http://v-modell.iabg.de/v-modell-xt-html-english/44e3fbda665f67.html#ref13cedfbe915cde9)s defined for the decision gate.

The order in which the decision gates have to be passed through in a project is determined in the [Project Execution Strategy](http://v-modell.iabg.de/v-modell-xt-html-english/44e3fbda665f67.html#ref13641fbe9196606).

2 What is a “project execution strategy”?

A plan for the execution of a project containing for example:

* Brief description of the concept
* Uncertainties
* Challenges
* Requirements
* HSE managements

3 What is a “project execution plan”?

The PEP is the core document for the management of a project. It is a statement of policies and procedures defined by the project director, although usually developed by the project manager for the project sponsor/project director's approval. It sets out in a structured format the project scope, objectives and relative priorities.

4 What is an “overall procurement strategy”?

A document concerning every aspect of procurements in the current project, such as:

* Purchasing strategy
* Description of contracts
* Listing of main elements and associated contract packages

5 What is the purpose of detail engineering?

* + Requisitions for procurement of equipment and material
	+ Drawings and documentation for fabrication and installation
	+ Procedures and manuals for commissioning, start-up and operation

6 What is a “master control estimate” (MCE)?

The ***Master Control Schedule*** is developed to support the technical concept along with the associated ***Master Control Estimate (MCE).*** This schedule with activities and milestones, will be defined and analysed by standard networks and models.

7 What is a “work breakdown structure”?

The WBS is the Scope of Work broken down in a hierarchy with the work package at the lowest level.

8 What is meant by “contracts philosophy”?

The contract philosophy decides:

* + the operating company’s involvement in the development
	+ the various contractors’ and vendors’ responsibility and commitments in the development
	+ where operating company has high risks and where maximum resources should be concentrated (for example a high technical risk connected to a low operator involvement will often lead to a high financial risk)
	+ economical compensation to the operating company if the installation does not perform as specified, or the start-up point is delayed
	+ how well the operating company manages to maintain control over the development

9 What is included in an “EPC contract”?

**E**ngineering, **P**rocurement and **C**onstruction

10 What is a “reimbursable contract”?

Denne typen kontrakt brukes når man kjøper tjenester som kan variere I pris som f.eks engineering/procurement /installation. Kontrakten skrives da basert på en fastsatt timespris per manhour osv. Ofte får contractor et budsjett å forholde seg til.

# Modul 19

1 What are the main cash flow elements?

Income

-Opex

-Capex

-tax

=Cash flow after tax (PROFIT)

2 What is a tariff?

Tariff: a tax imposed on goods

I off.felt sammenheng, for eksempel % av verdien av oljen et firma får utvinne som staten skal ha.

3 What is internal rate of return?

The **internal rate of return** (IRR) is a capital budgeting metric used by firms to decide whether they should make investments. It is an indicator of the efficiency or quality of an investment, as opposed to net present value (NPV), which indicates value or magnitude.

4 You are going to buy a house in year 2015. The cost of such a house in 2007 is 2 million NOK. What will the house cost in 2015 in real and nominal NOK if the inflation is 2,5% per year?

Trekk fra 2,5% av prisen for hvert år som går,: 1 633 303 NOK

5 You will receive 500.000 NOK in year 2015. What is the present value (PV) based in 7% calculation rate?

PV = F0 = Fn / (1+r)n

Med F0=500 000. r=0,07 og n=7 🡪 311 374 NOK

6 You have accepted to pay 300.000 NOK for a project in 2007 in order to receive a guaranteed reward of 500.000 NOK in 2010. What is the internal rate of return in nominal an real terms if the inflation is 2,5% per year?

500 000-300 000= 200 000. 200k – 2,5% inflasjon I 3 år = 185 371 NOK

7, 8 og 9 fra grafer I slides

10 What is SEC?

* The mission of the **U.S. Securities and Exchange Commission** is to protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation.
* The SEC oversees the key participants in the securities world, including securities exchanges, securities brokers and dealers, investment advisors, and mutual funds.
* *Here the SEC is concerned primarily with promoting the disclosure of important market-related information, maintaining fair dealing, and protecting against fraud.*

# Modul 20

1 Define profitability Index

PI = NPV/PV(Capex)

Profitability Index = Net Present Value / Present Value of capex

2 Define the internal rate of return

Kryssningspunktet når NPV krysser 0, hvilken discount rate som trengs.

3 Define Break-Even-Price

Kryssningspunktet når NPV er 0, avhengig av oljeprisen.

4 Some times the internal rate of return is referred to as RRoR. Why?

5 What is Pay-back time?

Payback time is the point when the NPV crosses 0. It drops to negative as we “build” the field, then starts to earn money, and when the NPV turns to positive, that is Pay-back time.

6 What is a tornado diagram?

A diagram where the most important value impacts (on the NPV) is placed on top, and the others placed in decreasing order, making a sort of “cone”, Tornado.

7 What is a balloon diagram?

A diagram where incidents are placed as balloons with a certain size showing the manageability of the incident, big balloon: low, smalles balloon: Well.

8 What is a scenario analysis?

An analysis made by doing analysis for several scenarios, and then combining them to a complete analysis to calculate the NPV.

Hvis vi har scenario a, b og c:

Expected NPV:

(E)NPV = 0,3NPVa + 0,4NPVb + 0,3NPVc

9 What is the purpose of a decision tree?

To map the effects of the chosen outcome, and the ones not chosen, in making a decision. The tree expands as we make the decision and probabilities and results can be filled in according to the consequences.

10 What is a stochastic NPV analysis?

An analysis made on stochastic values, which means unknown but calculable.