جامعة البصرة

كلية الهندسة ـ قسم هندسة النفط

PeE413

Petroleum Drilling Eng.

2019-2020

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Syllabus

- Casing landing (landing as cemented, landing in tension at the freeze point, landing in compression at the freeze point),
- buckling phenomenon,
- wellhead loads, blowout and blowout prevention,
- well kick (methods of control, drillers method, engineers method),
- factors affecting drilling rate (effect of pressure, effect of physical properties of drilling mud, effect of weight on bit and rotary speed economical effect),
- hole problems (pipe sticking, surge and swab pressure, hole deviation),

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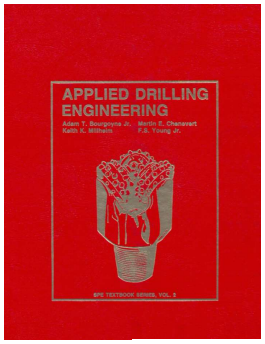
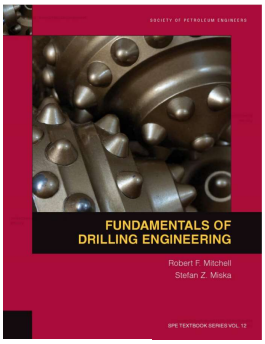
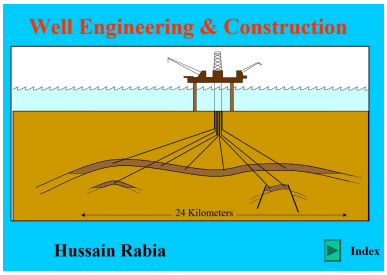
References

Books:







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Lecture # 1 PTEN403

Casing Design Review

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Task for designing a well

1. Well objectives
2. Casing design
3. Wellheads/BOP and Rig selection
4. Mud weight and mud design
5. Cementing and cement design
6. Drill stem and BHA design
7. Hydraulics
8. Bit selection and nozzle selection
9. Drilling time and drilling cost

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Operator's drilling engineer need input from many companies to design the well

- Rig selection
- Down hole tools and bits
- Mud design
- Cementing
- Tubular's and casing

NABORS INDUSTRIES LTD. Transocean Weatherford NATIONAL OILWELL VARCO BAKER HUGHES HALLIBURTON Schlumberger SMITH TECHNOLOGIES PATHFINDER Mi SWACO BARDID Weatherford BJ HALLIBURTON TenarisHydril TESCO

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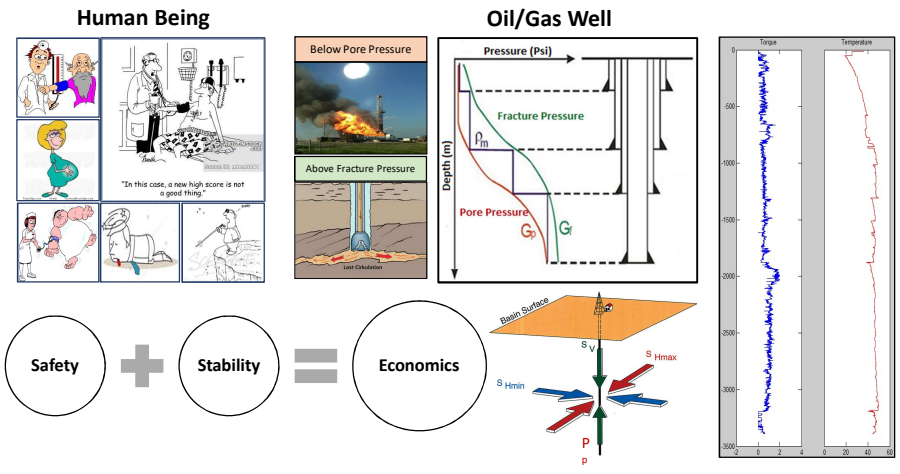
Proactive Oil Industry System Using Managed Pressure Drilling



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Well objectives

- Type of well exploration, appraisal, production, injection well
- Type of data gathering, production tests, coring logging…
- Completion methods and completion/production tubing sizes.
- Future side tracks

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Casing Design

- Why Run Casing?
- Types of Casing Strings
- Classification of Casing
- Casing design
  - Define the Casing Points
  - Hole and Casing Sizes
  - Pipe strength
  - Burst, Collapse and Tension Calculations

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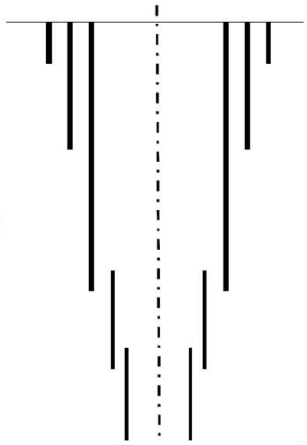
Example Hole and String Sizes (in)

Hole Size		Pipe Size
36”	Structural casing	30”
26”	Conductor	20”
17 1/2	Surface Csg.	13 3/8
12 1/4	Intermediate Liner	9 5/8
8 3/4	Production Liner	7



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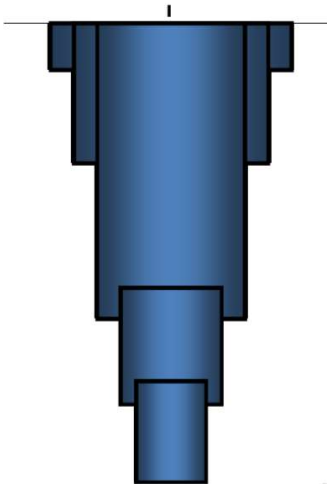

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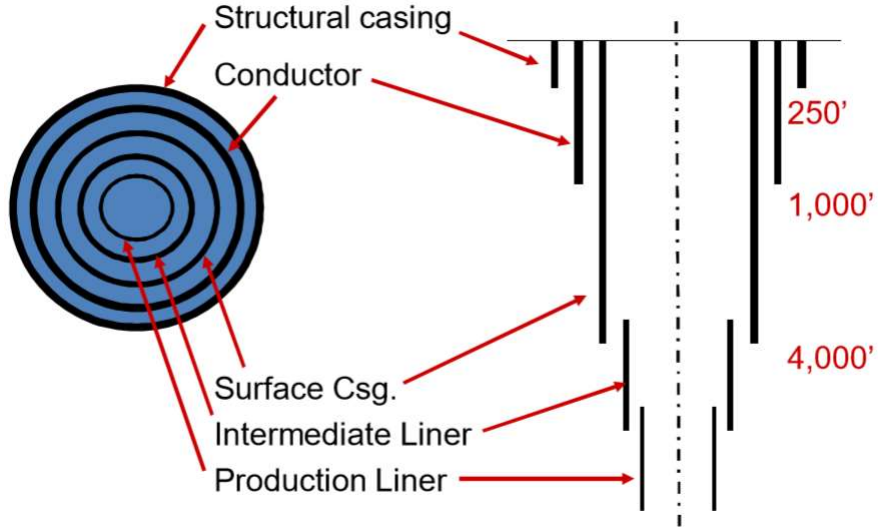

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Table 7.7 - Commonly Used Bit Sizes For Running API Casing

Casing Size (OD in.)	Coupling Size (OD in.)	Common Bit Sizes Used (in.)
4 1/2	5.0	6, 6 1/8, 6 1/4
5	5.563	6 1/2, 6 3/4
5 1/2	6.050	7 7/8, 8 3/8
6	6.625	7 7/8, 8 3/8, 8 1/2
6 5/8	7.390	8 1/2, 8 5/8, 8 3/4
7	7.656	8 5/8, 8 3/4, 9 1/2
7 5/8	8.500	9 7/8, 10 5/8, 11
8 5/8	9.625	11, 12 1/4
9 5/8	10.625	12 1/4, 14 3/4
10 3/4	11.750	15
13 3/8	14.375	17 1/2
16	17	20
20	21	24, 26

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Classification of CSG.

1. Outside diameter of pipe e.g. 9 5/8”
2. Wall thickness e.g. 1/2”
3. Grade of material e.g. N-80
4. Type to threads and couplings e.g. API LCSG
5. Length of each joint (RANGE) e.g. Range 2 (31 ft), Range 3 (46 ft)
6. Nominal weight (Avg. wt/ft incl. Wt. Coupling) (e.g. 47 lb/ft)

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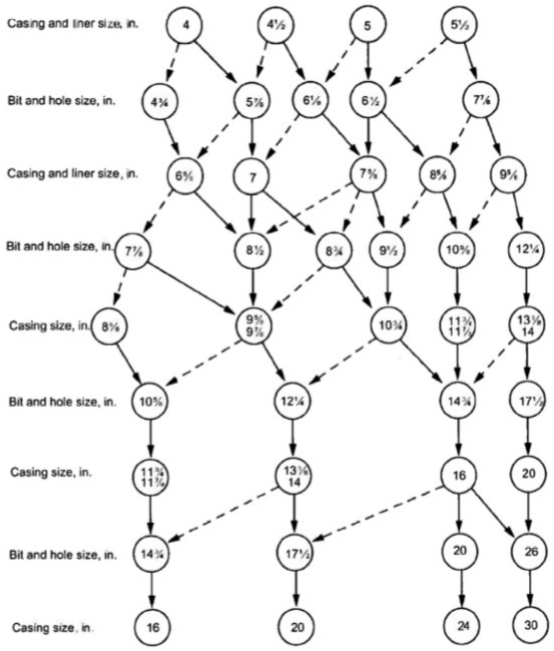

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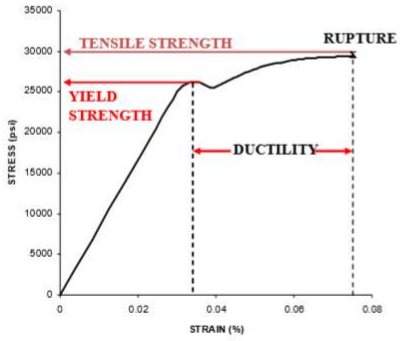
Stress and strain in Steel

Stress and strain curve provides
Yield strength
Tensile strength



Stress = Load/Area (psi)
Bulk Stress → overload failures
Point stress → fatigue failures

Strain = ΔL/L (%)
Elastic strain is temporary
Plastic strain is permanent

Yield strength
The stress level where a plastic strain starts to occur

Tensile strength
The stress level where the material brakes

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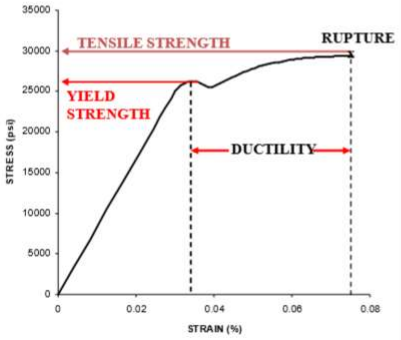
Stress and strain in Steel

Stress and strain
are determined by applied tensile load and measuring deformation.



Ductility
Is the amount of plastic strain the steel can withstand without breaking
Ductility is good

Drill stem design limit
Drill string is designed to limit stresses to yield strength
A design factor is applied to the yield strength to ensure the operating stresses are less than the yield stress.

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HW: Why run casing?

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