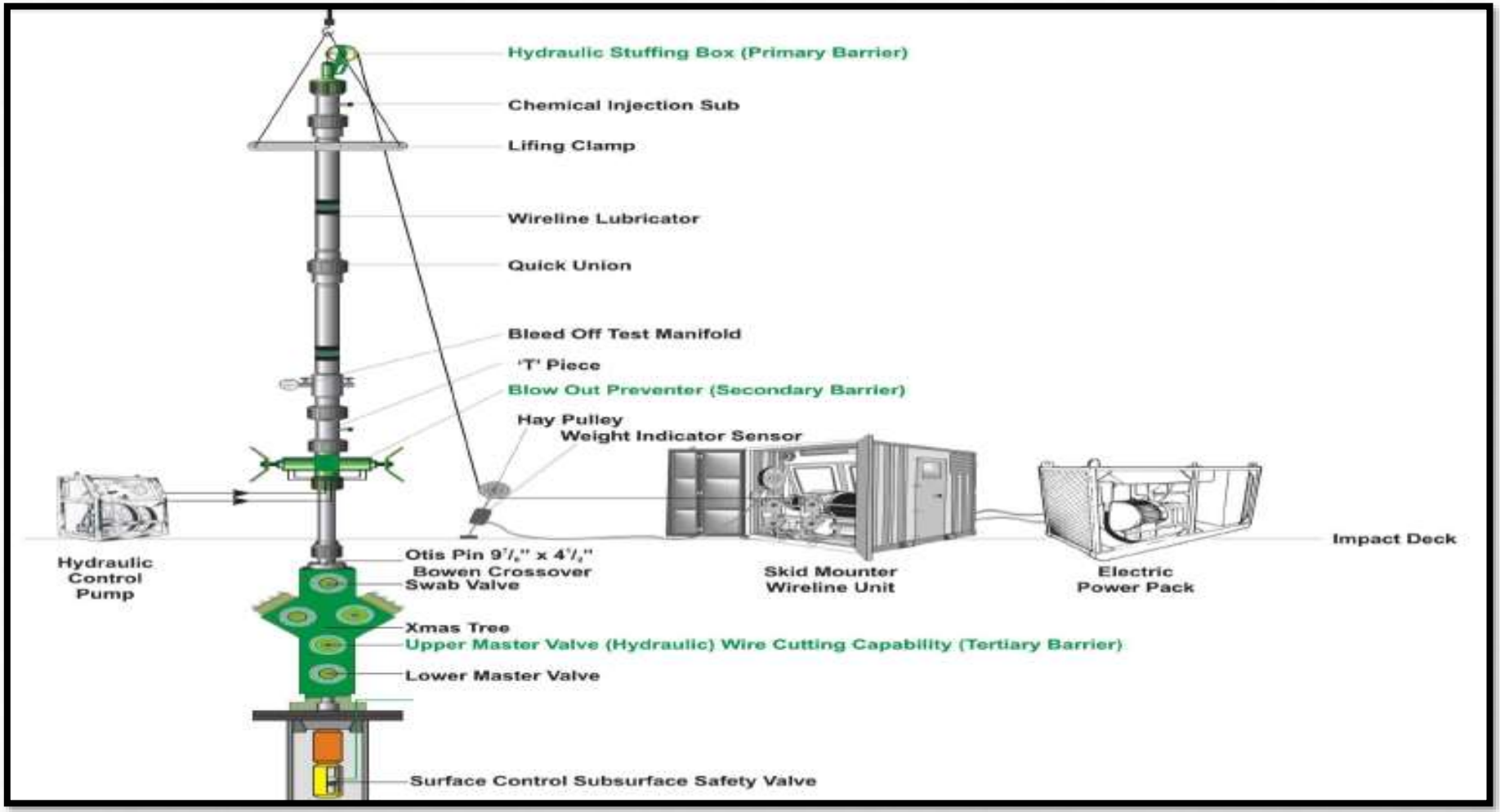
Advanced Wireline Operations Course



Mahmoud Farag Radwan

Subsurface & Integrity Op. Dept. Head

Enppi - Oil & Gas Skills (OGS); New Cairo – Egypt

18 : 22 December 2022

Mahmoud Farag Radwan

Short Biography

Mahmoud Radwan is a Subsurface & Integrity Operations Dept. Head at AMAL Petroleum Company (AMAPETCO) with 15 years of experience in oil & gas industry. Mahmoud worked in Well Engineering, Intervention, Integrity & Work-over at several companies, including KDT Global Solutions, Badr El-Din Pet. Co. (BAPETCO), Qarun Pet. Co. (QPC) and Wadi El-Sahel Petroleum Co. (WASPETCO).
Also, a freelance instructor at upstream Oil & Gas in Egypt & GCC since 2008.
Mahmoud received a BSc degree in Petroleum Engineering from Al-Azhar University in 2007.

Publications

- **Evaluating Sustainable Annulus Pressure (SAP) in Sour Wells and the Possible Causes to Avoid Recurrence to the Well Integrity Annual Middle East Conference in Abu Dhabi; UAE in Apr 2015**
- **Implementing NDT methods for maintenance and inspection to the Asset Integrity Management North Africa Conference in Cairo; Egypt in Nov 2015**
- **Feasibility Evaluation of Using Downhole Gas-water Separation Technology in gas Reservoirs with Bottom Water; paper number: SPE-183739-MS to the 20th Middle East Oil & Gas Show and Conference in Mar 2017 http://dx.doi.org/10.2118/183739-MS**
- **Managing the Operational Challenges in Corroded Wells through Well Integrity Management System to the Improving Brownfield Performance Technical Convention, in Cairo; Egypt in Dec 2019**
- **Safe and Economic Attractive Rigless Operations Using a Digital Slickline in Unmanned Platform with Low Structure Loads and Spacing; paper number: SPE-202857-MS to the Abu Dhabi International Petroleum Exhibition & Conference (ADIPEC) in Nov 2020 https://doi.org/10.2118/202857-MS**

Course Objectives

- **Provide a full understanding of wireline operations.**
- **Highlight the critical aspects of wireline and the pressure control.**
- **Learn the function and use of a wide range of wireline tools.**
- **Utilize a “hand-on” approach to learning in a workshop.**
- **Use cutaway tools to ensure a complete understanding of downhole operation.**
- **Become proficient in the operation of the wireline unit.**
- **Learn the “job planning” aspects of a successful wireline operation.**
- **Provide a venue for questions and discussion.**

Course Contents

- **Pressure Basis & Well Completion**
- **Xmas Trees, Types of trees; single, dual, composite, solid block. Wireline, History, and development**
- **Uses and limitations of wireline. Wire types and strengths.**
- **Wireline Units, Design, function, and operating procedures**
- **Surface equipment: Pressure control equipment.**
- **Braided line equipment**
- **Pressure Testing, Test Procedures, safety precautions, Tool string Components**
- **Rig-up Procedures, Lifting options**
- **Plugs and Flow controls, Running and pulling procedures**
- **Sliding Side Doors, Description and use in the well and types**
- **Shifting tools and procedures, Additional Equipment**
- **Caliper surveys - brief overview, TCP guns - wireline release options.**
- **Safety Valves, SSV – Surface tree actuators and lock-out, SCSSV – wireline and tubing retrievable TRSSV – Tubing Retrievable, DCSSV – back up downhole valves,**
- **Gas lift, Side Pocket mandrels uses, Gas lift valves – design, function, and procedures.**
- **Fishing job planning, well site constraints, Fishing tools**
- **Special Topics (DSL, New Deployment Technology & Highly Dev. Wells Op.)**

PRESSURE BASIC & BASIS

7 Case Study

What is the differential pressure in psi exists between the tubing & annulus at the SSD assembly located at 8960 ft MD (8200 ft TVD) in the tubing?

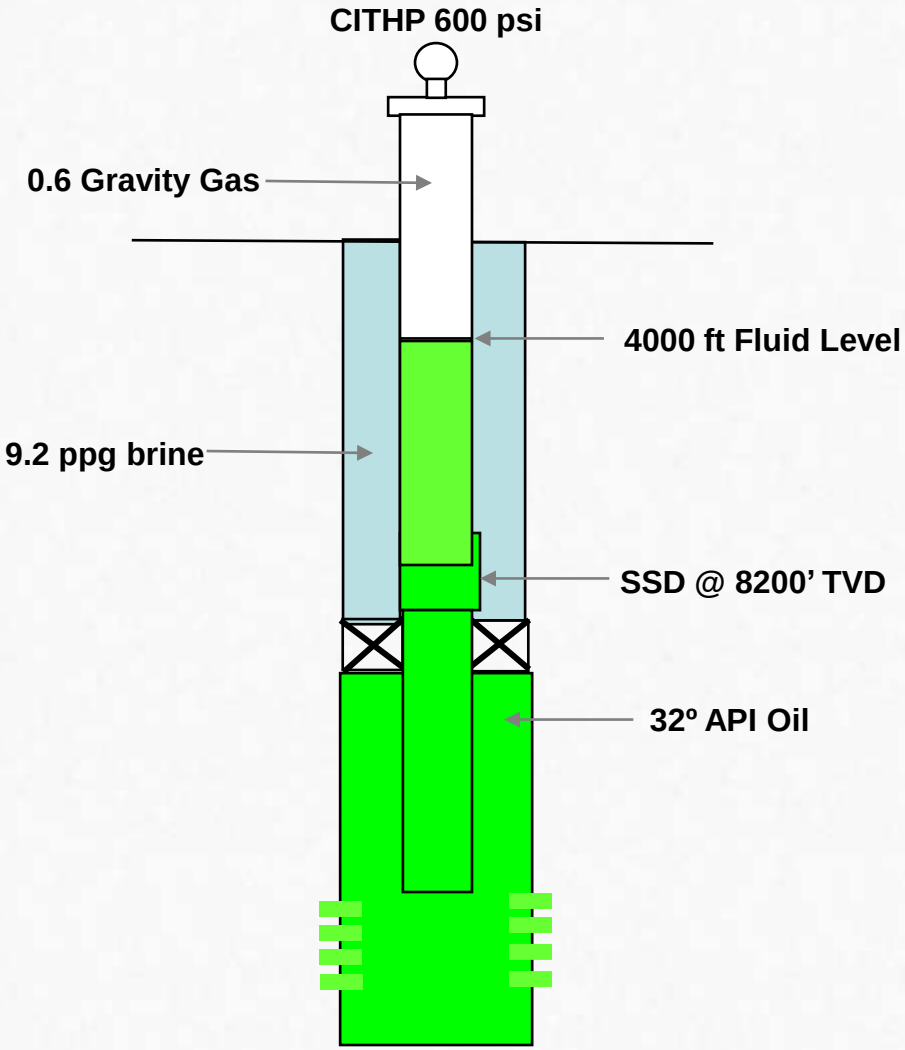
Available Information:

- The tubing/casing annulus is filled with 9.2 ppg brine full.
- The well is S/I at surface with CITHP of 600 psi.
- There is a gas cap of 0.6 SG gas down to 4000 ft fluid level
- 32° API oil from fluid level' to 12000 ft.

Steps:

1 Sketch your information.
2 Calculate HP @ 8200 ft TVD brine in annulus
3 Calculate HP of gas cap @ 4000'
4 Calculate HP of oil column from 4000 ft to 8200 ft
5 BHP of tubing @ SSD, Gas HP + 32° API oil HP
6 Calculate the differential pressure at 8200 ft.

STEP 1 Always draw a sketch with all relevant information



Mahmoud Farag Radwan

Case Study

1 HP of brine in annulus; = SG × WPG × TVD
HP = 9.2 ÷ 8.33 × 0.433 × 8200
= 3919.6 psi

2 HP of gas = CITHP × GCF
∴ GCF from table = 1.087
∴ CITHP x GCF = 600 × 1.087 = 652.2 psi

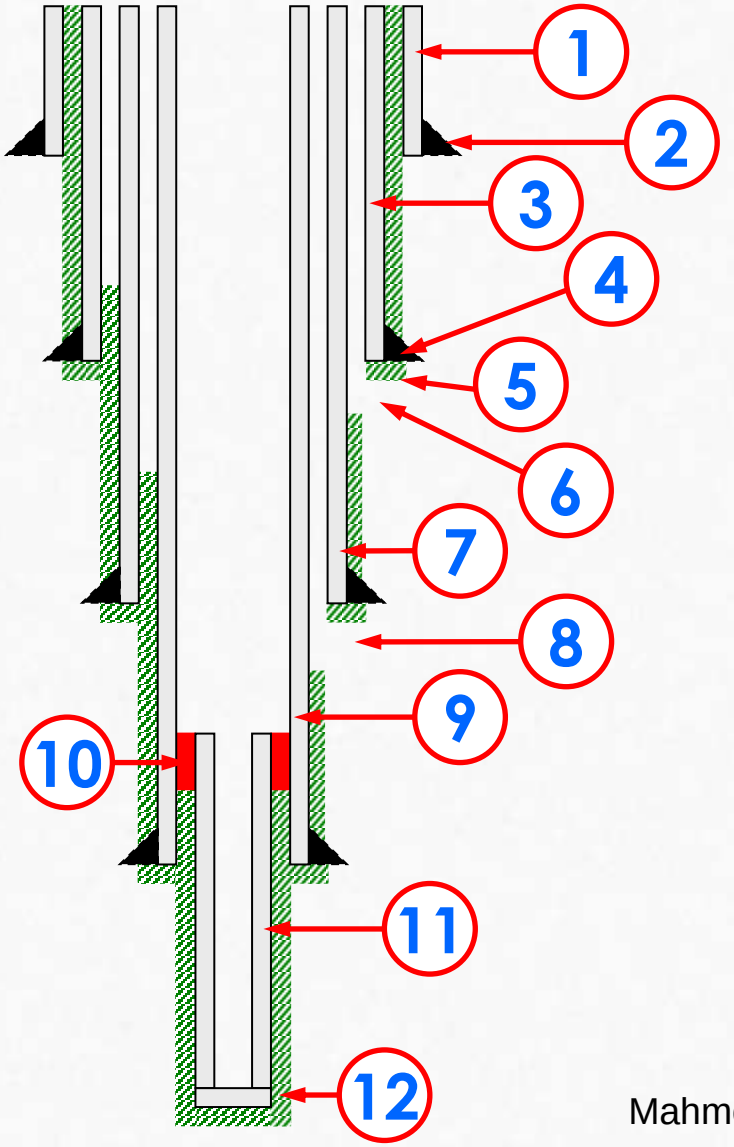
3 HP of oil column; = SG × WPG × TVD
HP = 141.5 ÷ (131.5 + 32° API) × 0.433 × 4200
= 1573.9 psi

4 BHP in tubing @ SSD = 652.2 + 1573.9 = 2226.1 psi

5 ∴ Differential Pressure @ SSD = Annulus HP – Tubing BHP
= 3919.6 - 2226.1
= 1693.5 psi

∴ Direction of flow is from Annulus to Tubing.

Casing Design : Basic Construction



1. 30” conductor
2. Conductor setting depth
3. 20” surface casing
4. 20” shoe
5. Cement
6. Formation open to C annulus
7. 13 3/8” casing
8. Formation open to B annulus
9. 9 5/8” production casing
10. Liner hanger
11. 7” Liner
12. TD – Total Depth

Well COMPLETION

COMPLETION ACCESSORY:

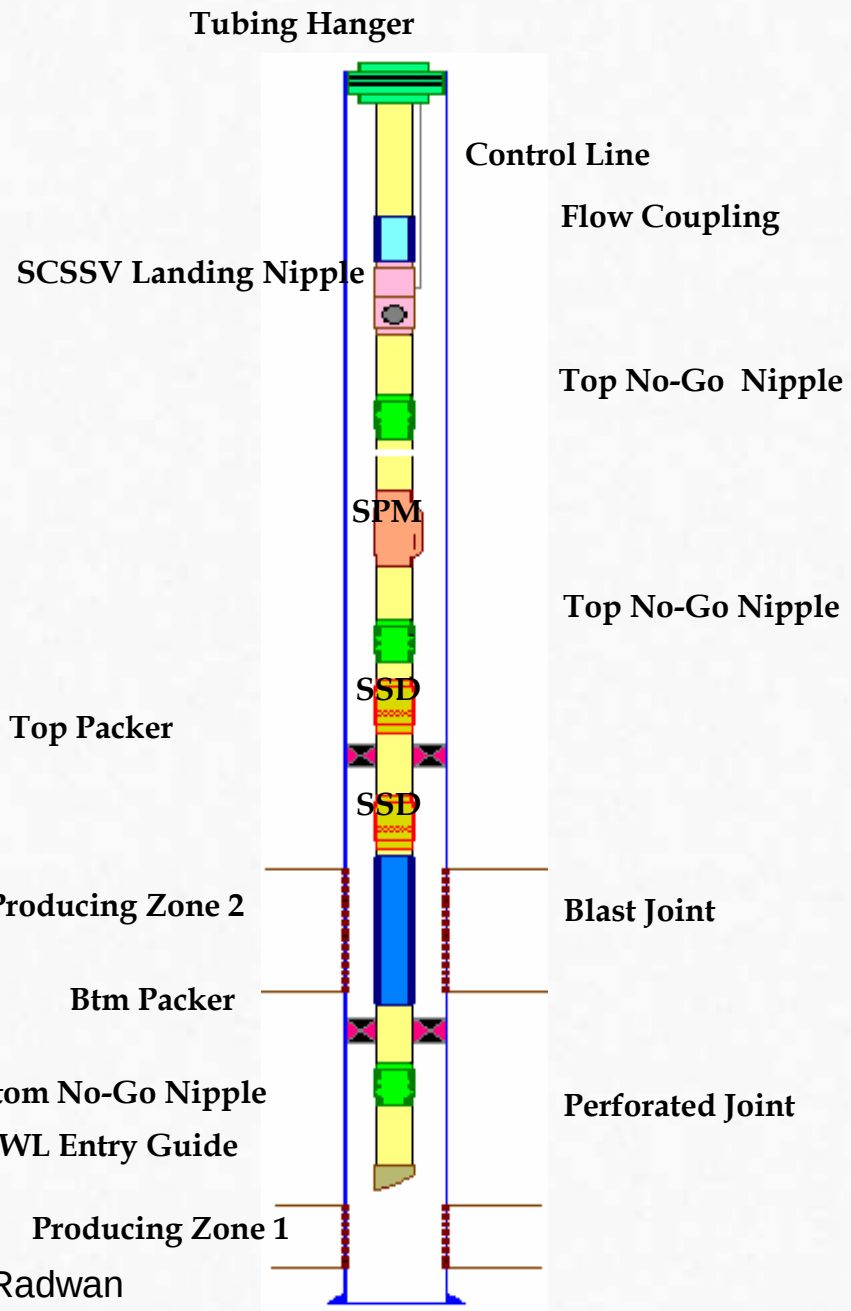
1 Anchoring Device
- Landing Nipples

2 Circulation Device
- SSD
- SPM

3 Isolation Device
- Packer
- Tubing Seal Assembly, PBR

4 Anti-Erosion Device
- Blast Joint
- Flow Coupling

5 Others
- WLEG
- Perforated Joint
- Control Line
- Tubing Hanger



PRODUCER COMPLETION SCHEMATIC

Well COMPLETION

1. ANCHORING DEVICE

Short tubular with 3 main features;

Shoulder,

Seal Bores

Profiles.

1.1 Ported Nipple

- Provides communication & receptacle.

1.2 Top No-Go

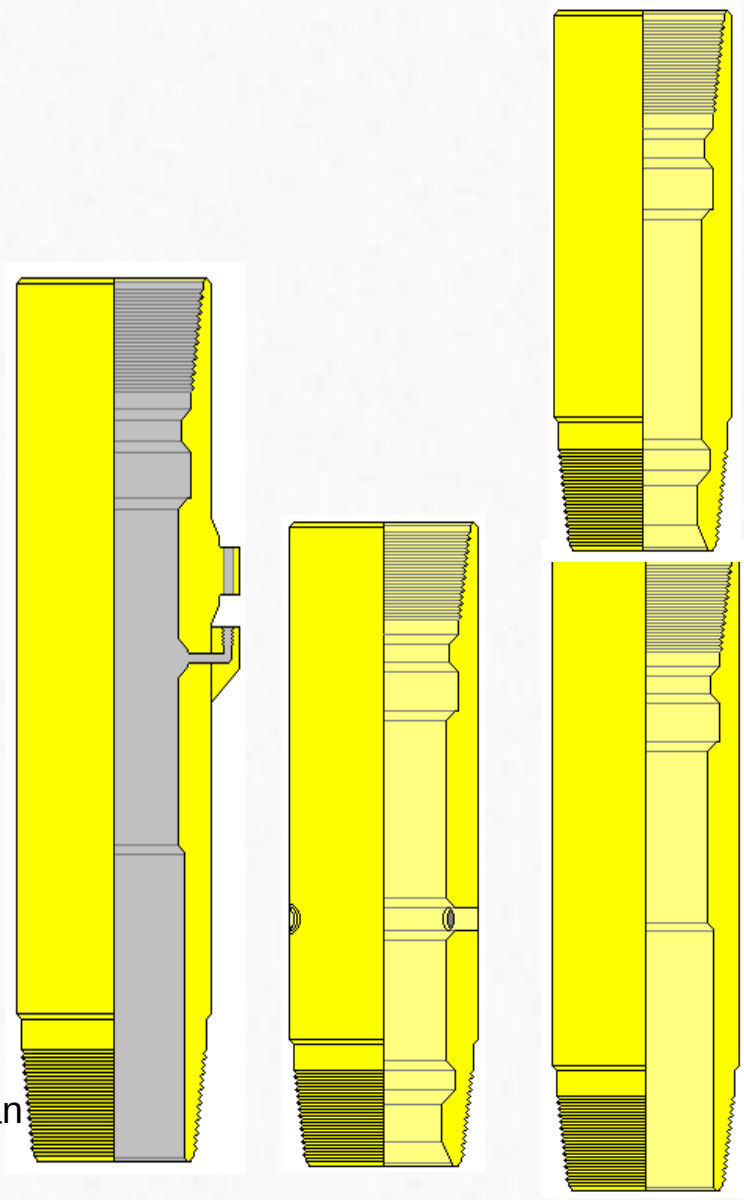
- Receptacle for selective locks.

1.3 Bottom No-Go

- Receptacle for No-Go locks & prevent WL tools drop into rat-hole.

1.4 SV Nipple

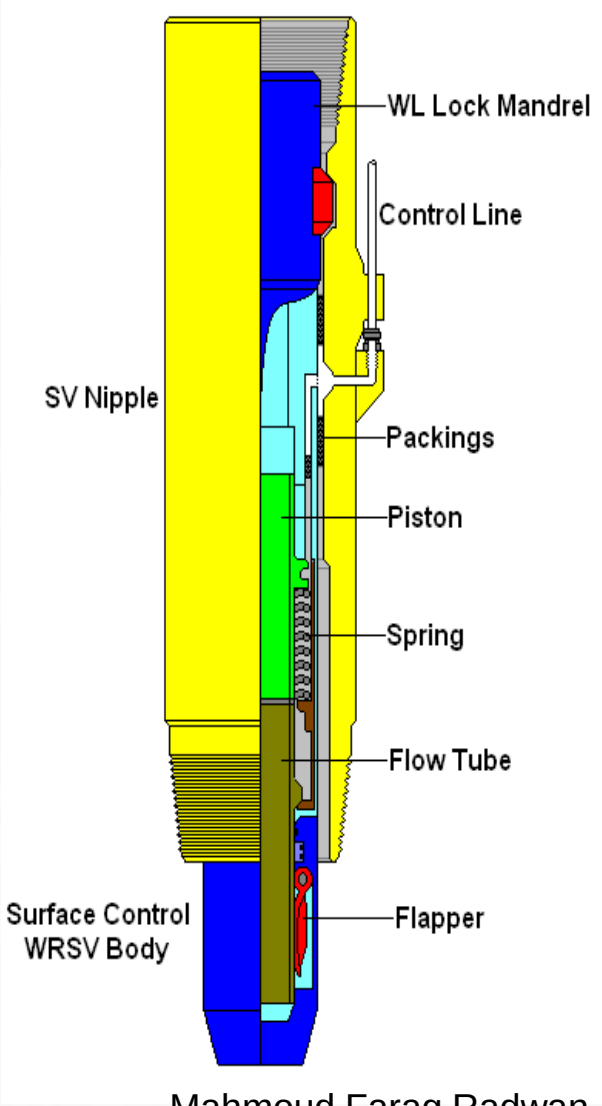
- Provides receptacle for SV locks & hydraulic fluid.



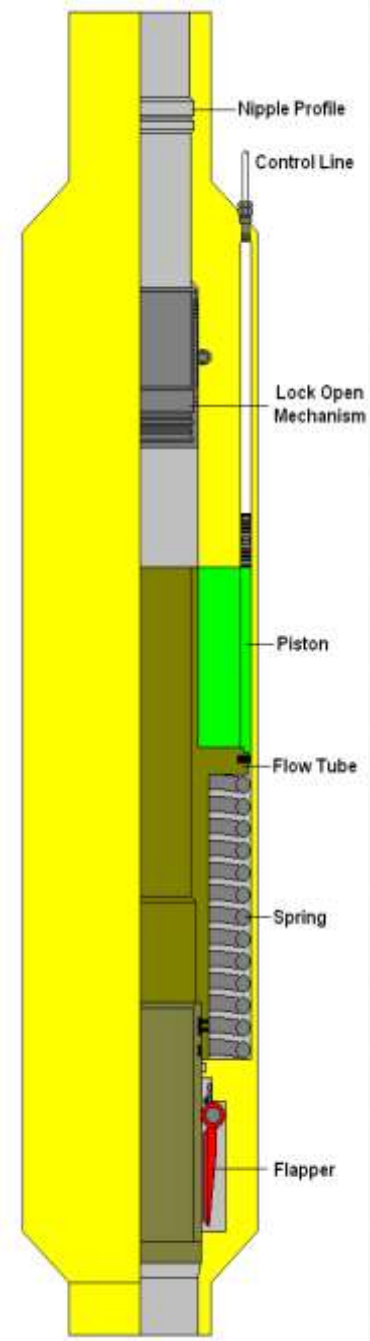
DHSV

1. PASSV
2. SCSSV
   - WRSV
   - TRSV

WRSV



TRSV



Well COMPLETION

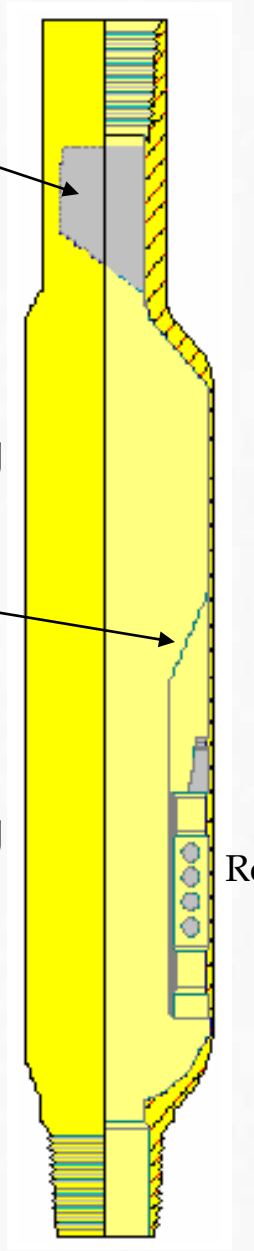
2. CIRCULATION DEVICE

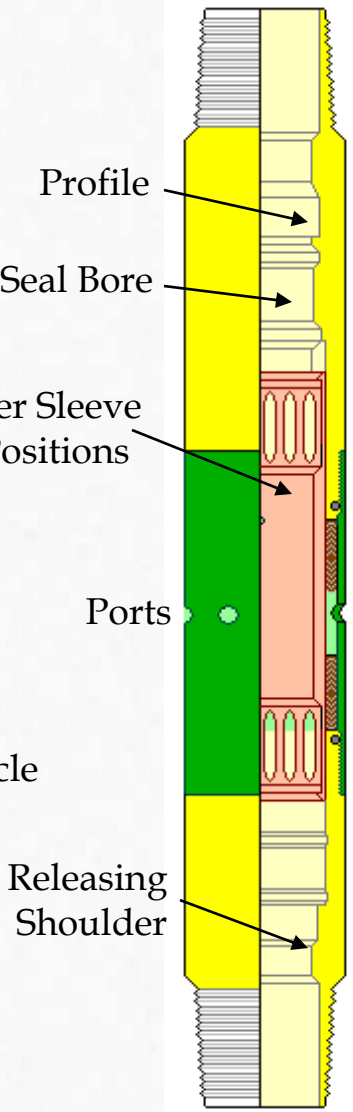
2.1 Sliding Side Door (SSD)

- Provide communication between tubing annulus.
- Incorporate nipple profile. inner sleeve with packing, & seal bores
- Advantage & Disadvantage

2.2 Side Pocket Mandrel

- Provide communication between tubing annulus.
- Incorporate orienting sleeve, discriminator, receptacle with profile & seal bores for 1" or $1^1/_2$" valves.
- Advantage & Disadvantage





SPM ACCESSORIES

Dummy Valve

- Blank off the communication port

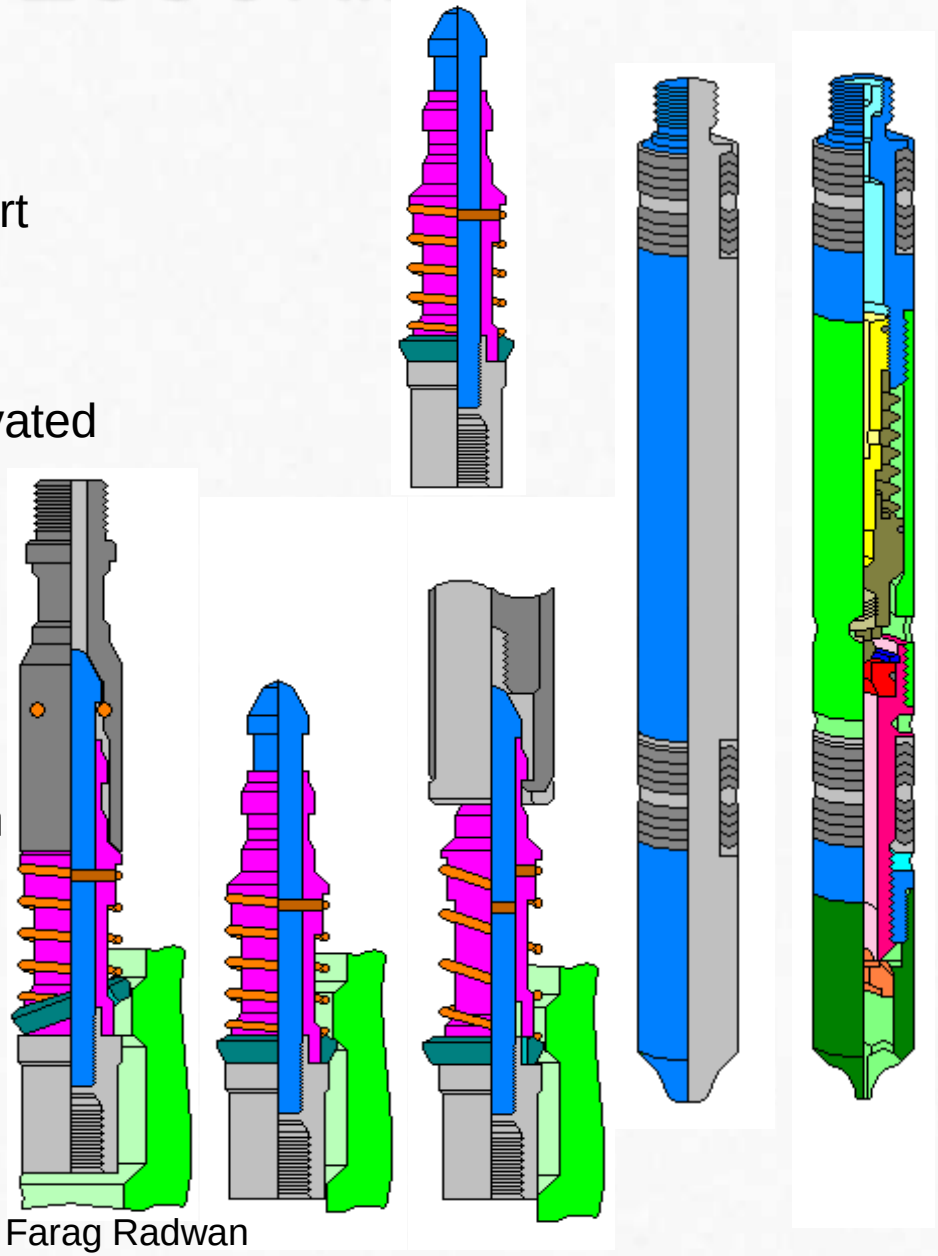
Gas Lift Valve

- Annulus injection pressure activated
- Production pressure activated

Latches

- Lock in receptacle profile

Locking & Releasing Mechanism



Well COMPLETION

3. ISOLATION DEVICE

PRODUCTION PACKER

3.1 Permanent Packer

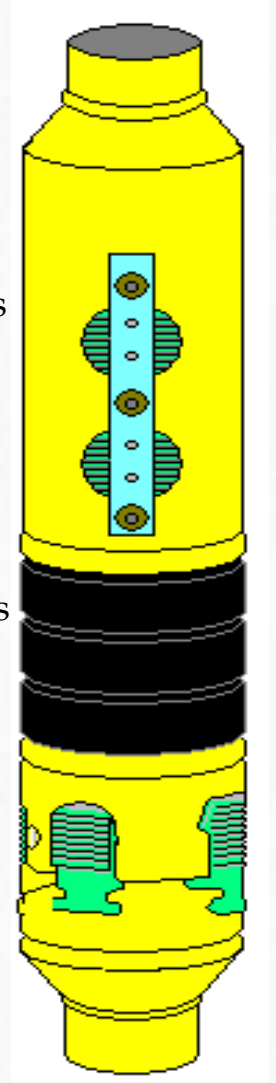
- Integral casing part & run independently.
- Tubing run with connector & seal elements.
- Remove by milling.
- Electrically WL set.

3.2 Retrievable Packer

- Integral part of tubing & run on production tubing.
- Hydraulically set.

3.3 Inflatable Packer

- Well Intervention applications



Well COMPLETION

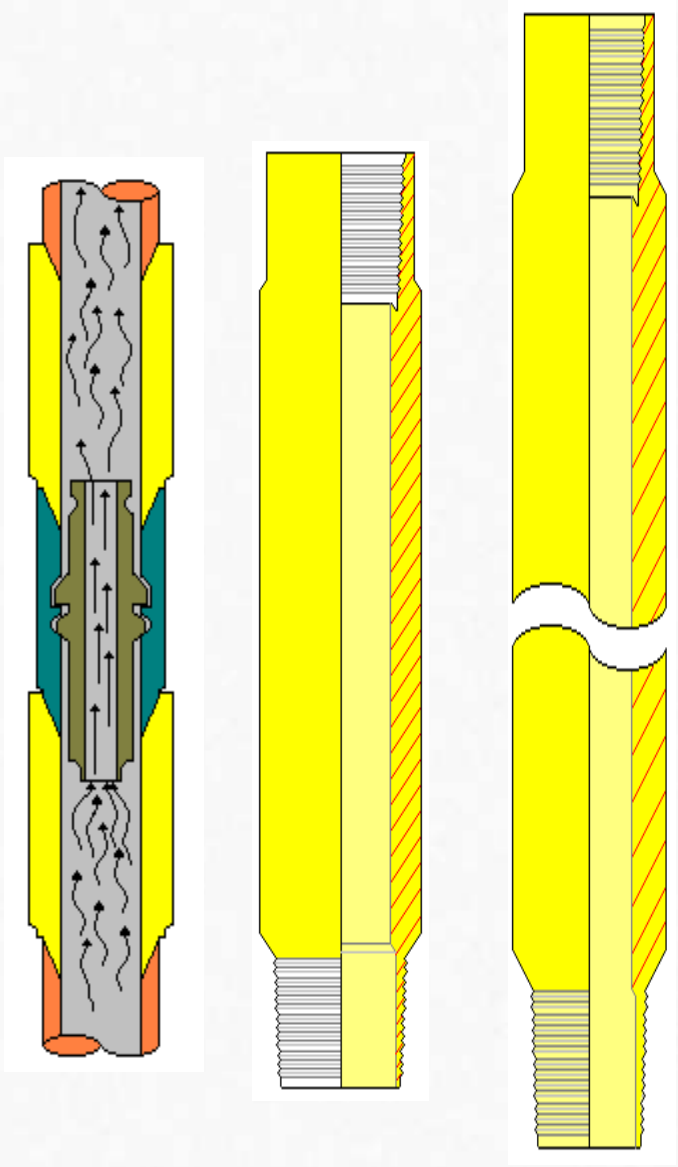
4. ANTI-EROSION DEVICE

4.1 Blast Joint

- Heavy-walled tubular.
- Installed opposite perforations (non-gravel pack) where abrasive action & external cutting occurs caused by formation fluids or sand.

4.2 Flow Coupling

- Heavy-walled tubular.
- Installed DS FCD which caused turbulence e.g. Nipple, SSD, SCSSV.
- High velocity & high pressures wells installed both US & DS.

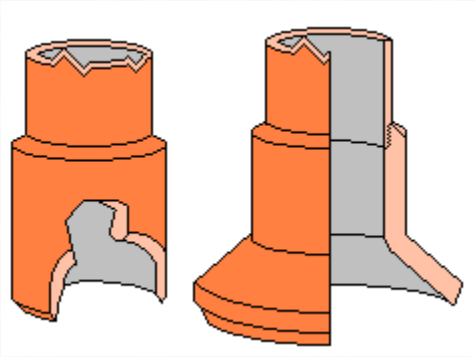


Well COMPLETION

5. OTHERS

5.1 Wireline Entry Guide (WLEG)

- Bottom most tubing accessories.
- Provide easy access for WL tools into tubing.

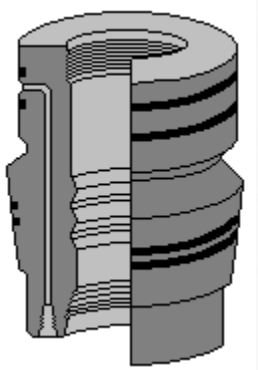


5.2 Perforated Joint

- Eliminate flow restrictions.
- Provide true downhole flow readings.

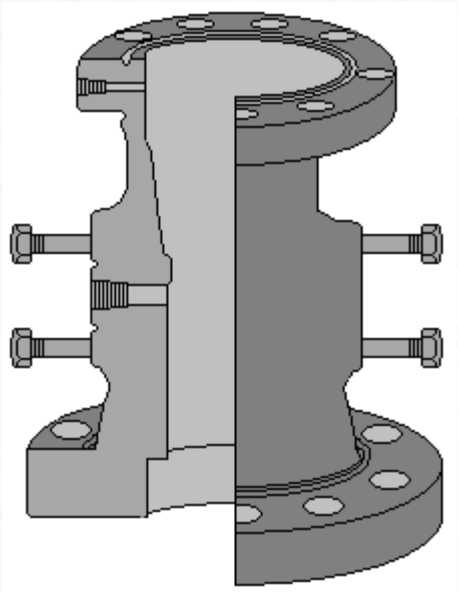
5.3 Control Line

- Transport hydraulic fluid to SCSSV
- Continuous length & securely clamped on tubing wall.



5.4 Tubing Hanger

- Set in THS , suspend tubing weight & provide sealing.
- BPV Receptacle



Well COMPLETION

COMPLETION ACCESSORY DEPTH RATIONALIZATION

1 DHSV
- HP of control line fluid
- Earth crater depth

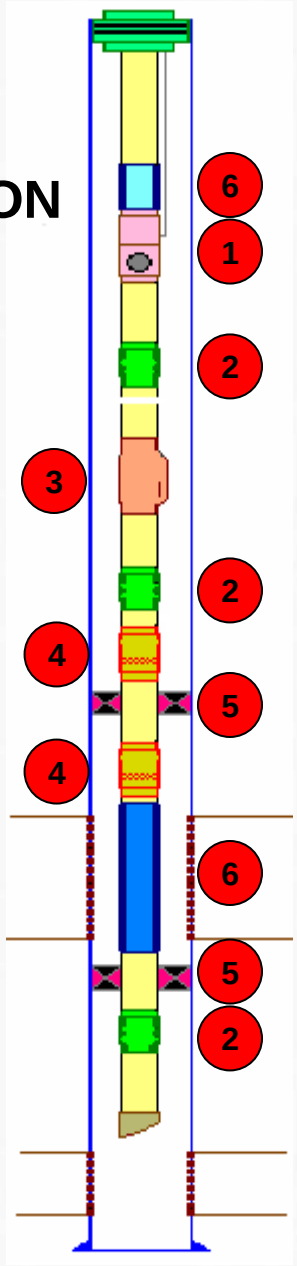
2 Landing Nipple
- Below kick off point for deviation.
- Check well integrity
- Hanging depth for FCD.

3 SPM
- Hydrostatic head of hydrocarbon & communication

4 SSD
- Depth of required communication

5 Packer
- Determined by reservoir depths.

6 Anti-Erosion Device
- Determined by reservoirs & flow characteristics



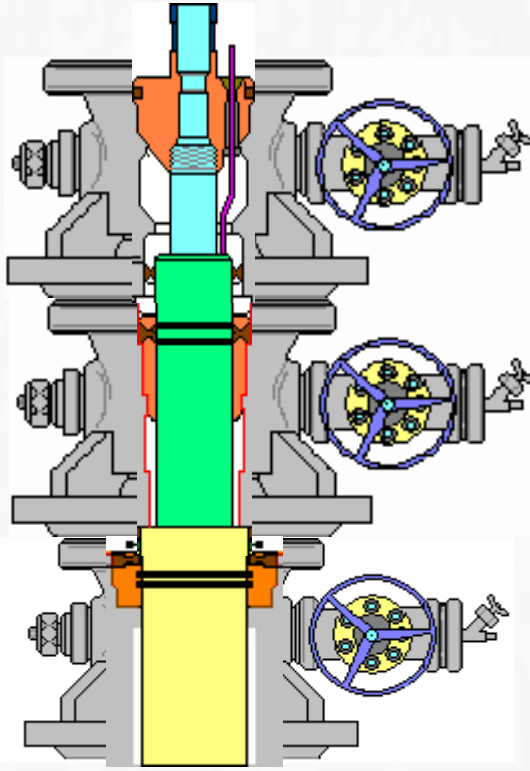
WELLHEAD & XMAS TREE

CONVENTIONAL WELLHEAD

It's a built up of modules. During drilling BOP is installed above it & it must be removed each time a new module to be installed & replaced the BOP on top of it before commence drilling.

Features:

1 Starter Spool (Conductor Pipe)
2 Surface Casing Head
3 Surface Casing Hanger
4 Production Casing Head
5 Production Casing Hanger
6 Tubing Head
7 Tubing Hanger

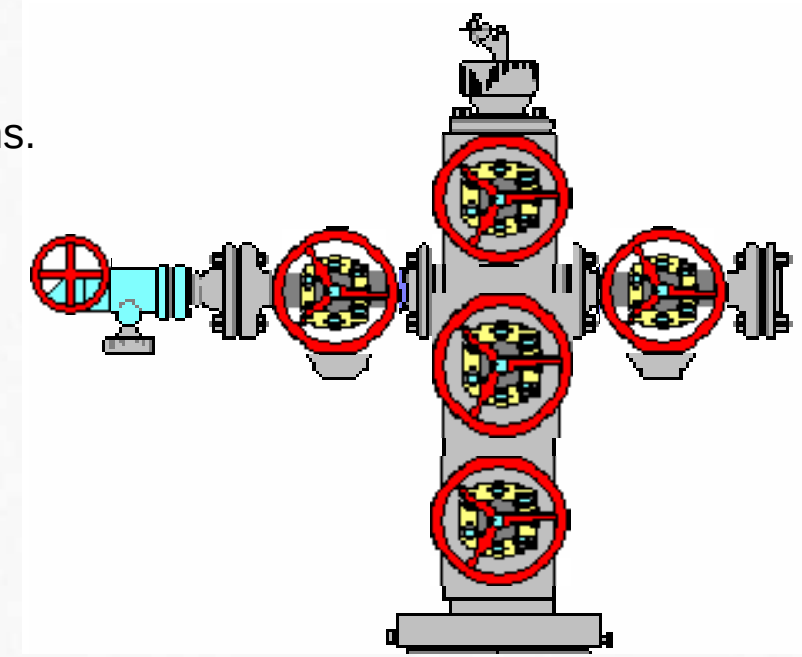


WELLHEAD & XMAS TREE

XMAS TREE

Surface valves manifold to control flow of well fluids & access for well intervention activities.

Features:



1 **LMV**

Manual, **NOT** working valve optimum conditions.

2 **UMV**

Emergency valve (*Hyd/Pneu*) & cut wire.

3 **FWV**

Permits passage of well fluids to CV.

4 **CHOKE VALVE (CV)**

Restrict, control or regulate flow of well fluids.

5 **KWV**

Permits entry of kill fluids into tubing or equalize.

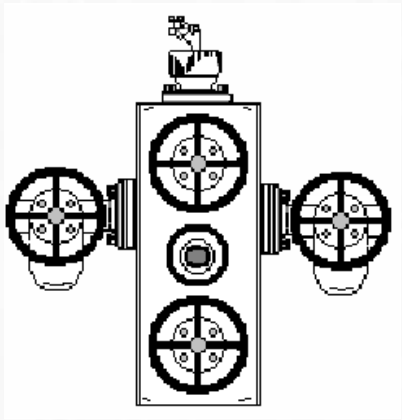
6 **SV/CV**

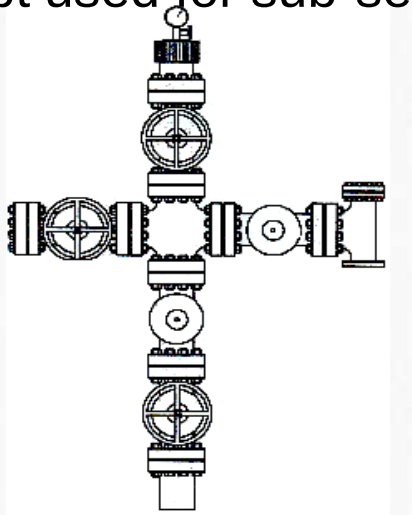
Permits entry of well interventions.

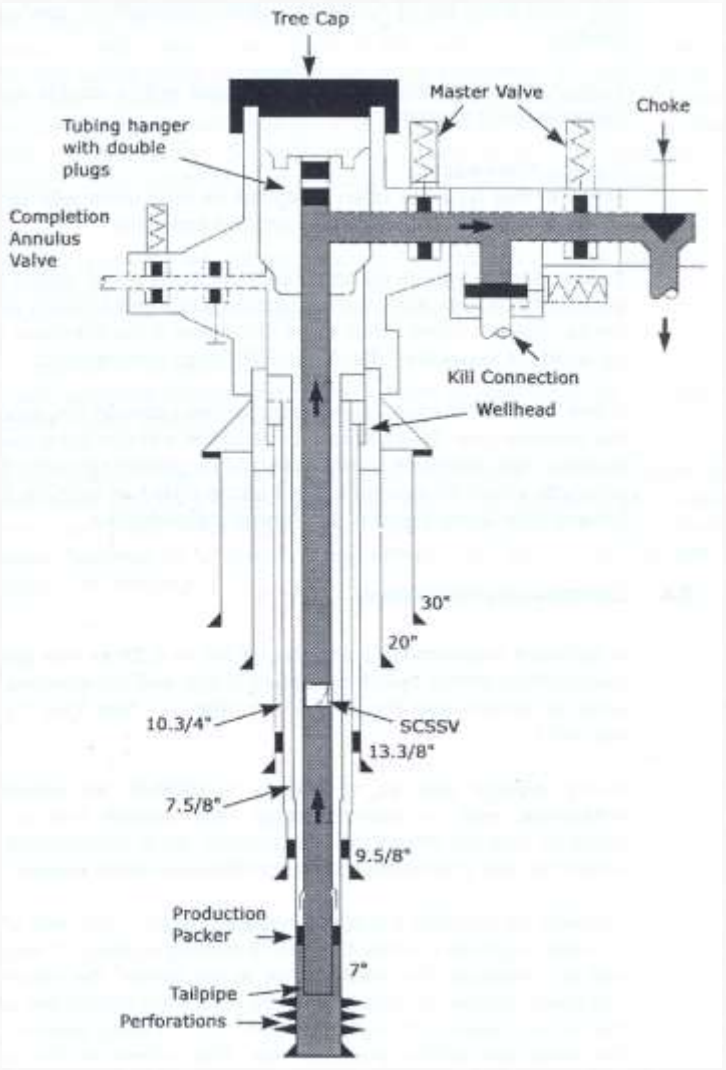
Xmas Tree Type

Xmas Tree type:

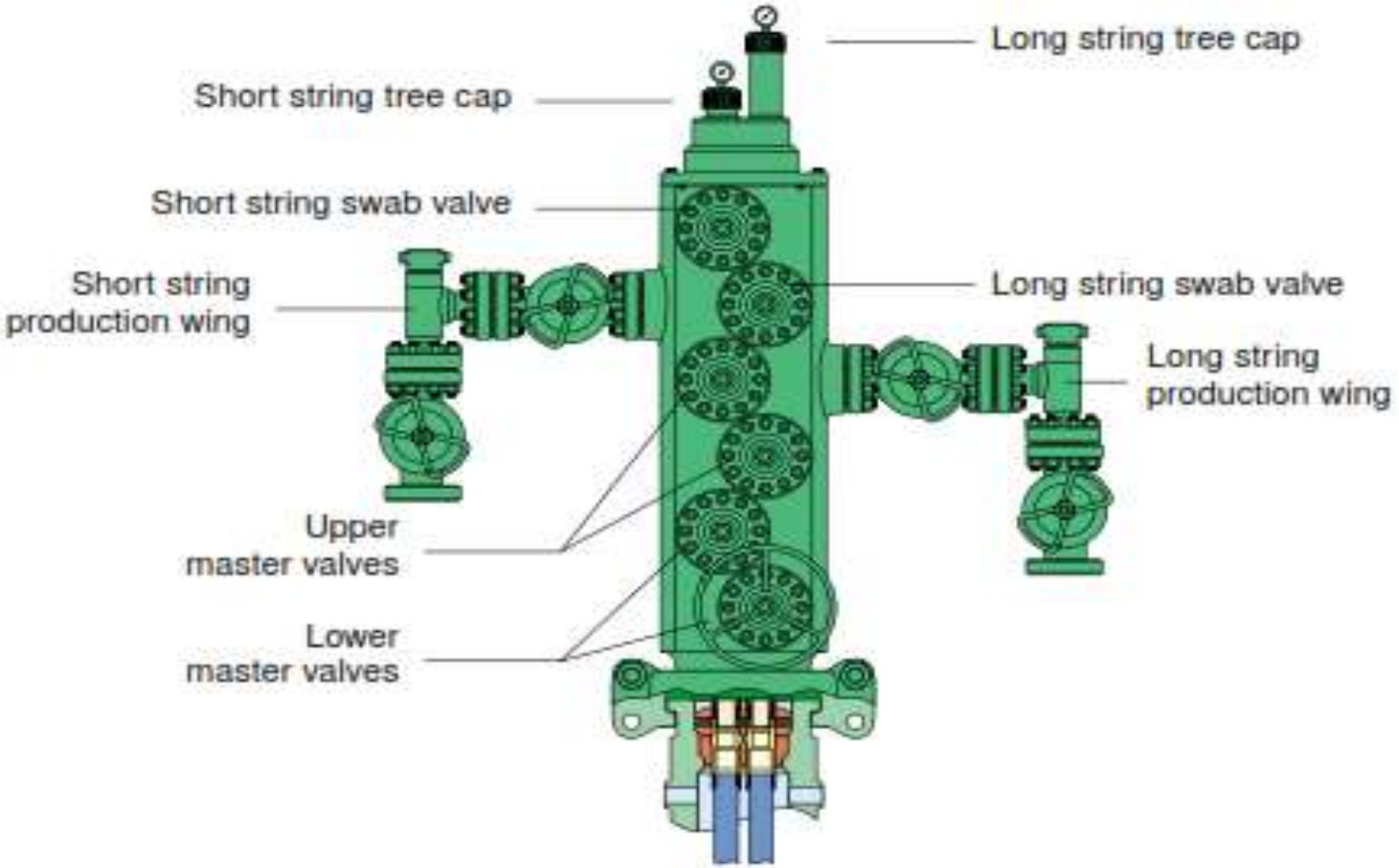
- Solid Block (Mono Block) Xmas Tree
  - Contains fewer components (for high pressure wells)
- Composite Block Xmas Tree
  - Valves are located on separate block & joined by API flange.
- Horizontal Xmas Tree
  - New concept used for sub-sea completion.







Dual Solid Block Xmas Tree



WIRELINE

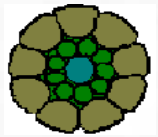
Well Intervention technique of conveying tools & instrument downhole.

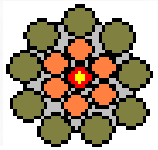
The most efficient & practical method to diagnose well problems.

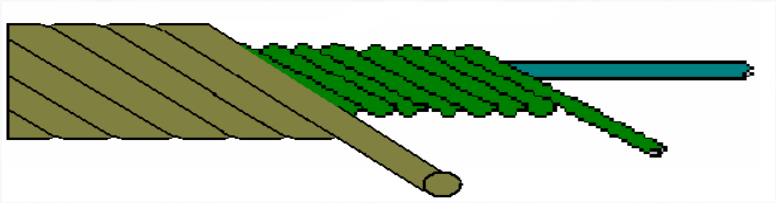
Easily junk wells if not properly manage.

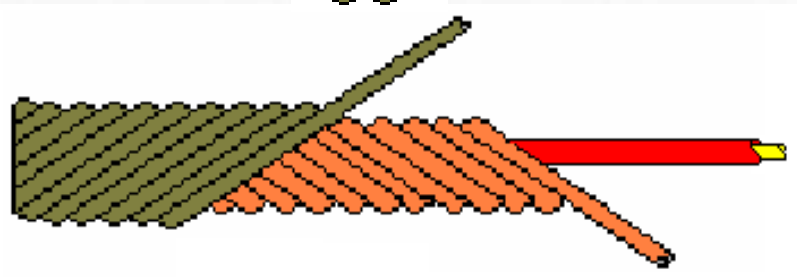
Wireline Category:

1. Slickline or Solidline or Pianoline
2. Digital/Live Slickline
3. Braidedline
4. Electricline



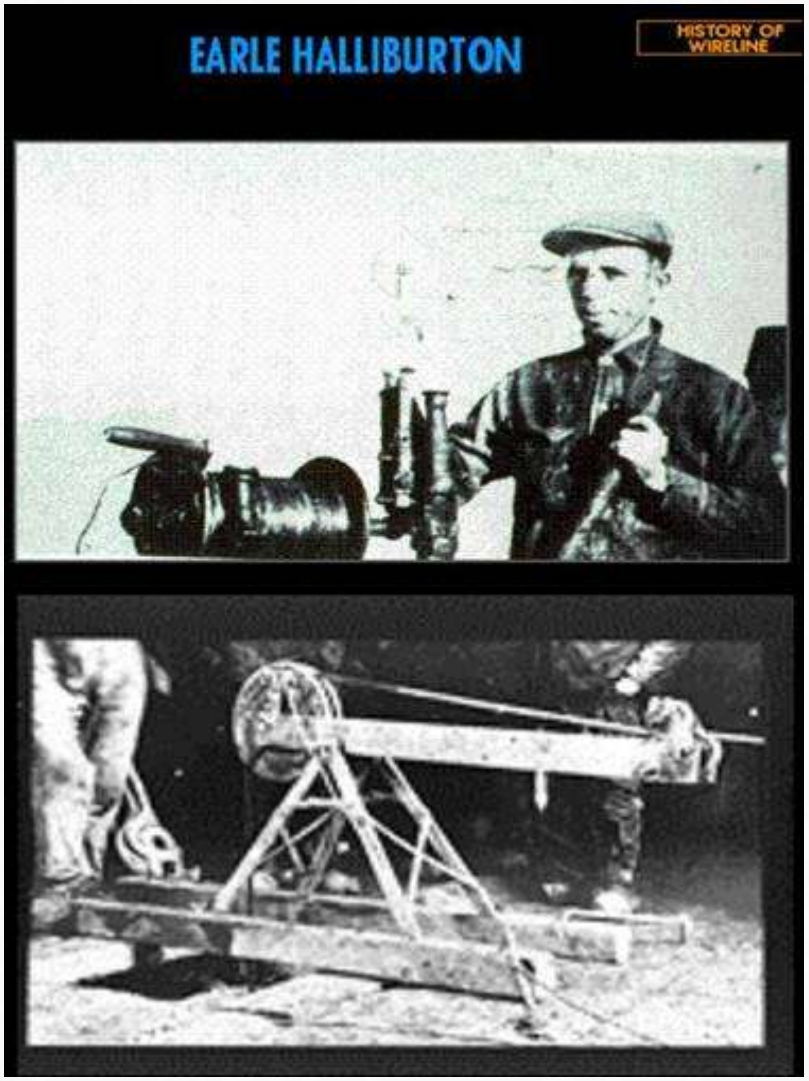




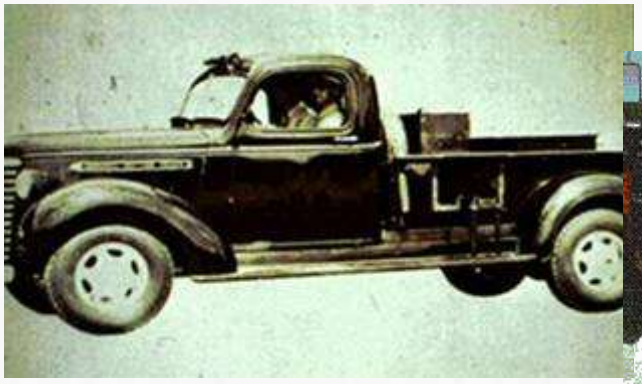


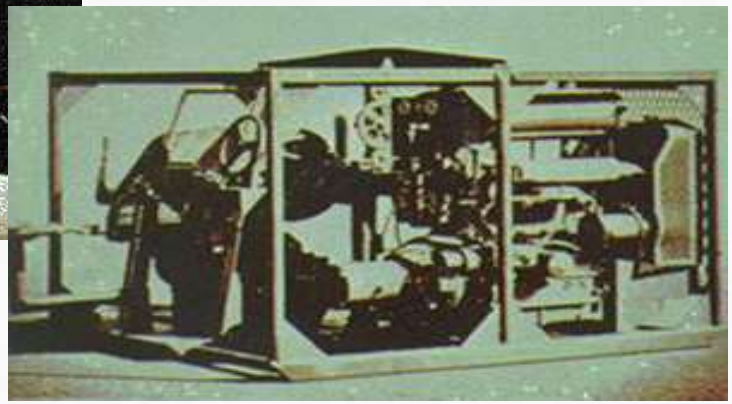
Introduction to Wireline - history

- Cross-circular Slickline – around 1930s
- Hand powered - wells were shallow
- Measuring device hand-held against the wire
- Tension in line – felt by the operator leather-covered hand on the wire



Wireline - development





Mahmoud Farag Radwan

Slickline - testing

Testing of Slicklines

- Before each operation, during the operation, when finished
- Three methods in use

Torsion, wrap and straight pull testing

- Other indicators
  - Coil of the wire
  - Marking, pitting of the line

Care of Wireline

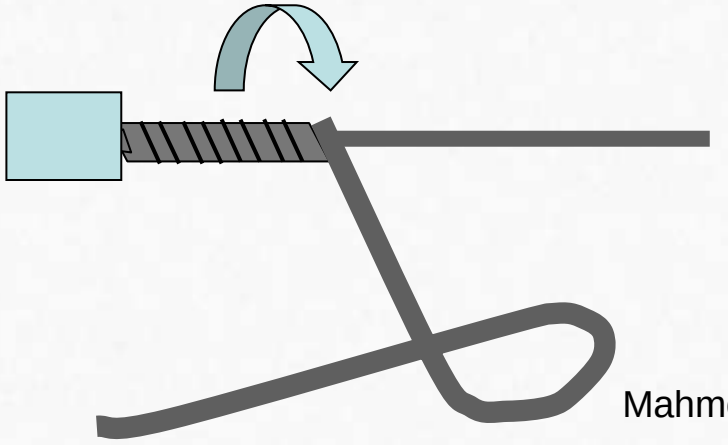
How to Reduce the Odds

Taking Care of The Wireline

Special Alloy/SS

Wrap test

Wire Wrapped Around it's Own Diameter

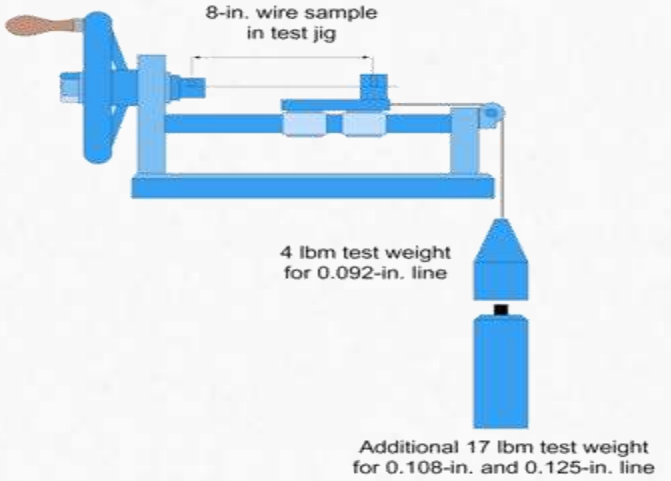


Carbon Steel

Torsion Test

One End Fixed
Other End Rotated.

Slickline - testing



Torsion testing

- ☐Used to test IPS
- ☐Set length of line
- ☐The rotations counted
- ☐Fracture inspected
- ☐Four different scenarios possible

1.1.1 Wire Testing - Carbon Steel Wirelines

It is becoming accepted that frequent line testing during an operation is required, and that the most reliable method of testing, is to torsion test carbon steel lines, and wrap test stainless steel and special alloy lines. Although it is possible to hand test lines by using a vice and mole grips, testing in this way can present a danger to hands and eyes, and must be performed using gloves, goggles and utmost caution. The safest most reliable test is to use a torsion test machine. This is a machines which will clasp a measured piece of wire between two jaws and allow the line to be twisted on its own axis, until destruction.

After the wire has broken:

- The number of twists before destruction will be registered
- The type of break and condition of the spiralling along the length of the line will be inspected.

A line would be suitable for further use if the testing proved acceptable under the conditions set forth in API 9A. Ductility Tester.

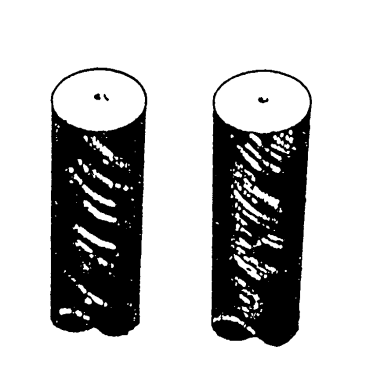
Torsion Requirements Of The API-9A Specification							
Nominal Wire Diameter	0.066	0.072	0.032	0.092	0.105	0.108	0.125
Minimum Number of Twists in 8"	32	29	26	23	20	19	14

WARNING: ALWAYS WEAR EYE PROTECTION WHEN USING WIRE TESTER.

Care of Wireline

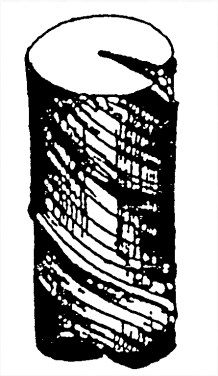
How to Reduce the Odds

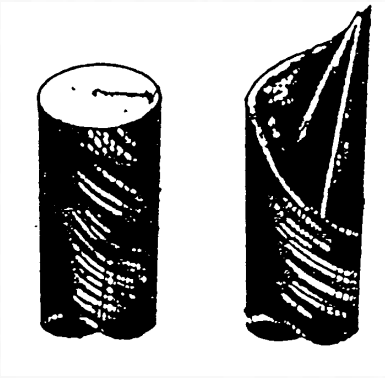
Taking Care of The Wireline



Test Good

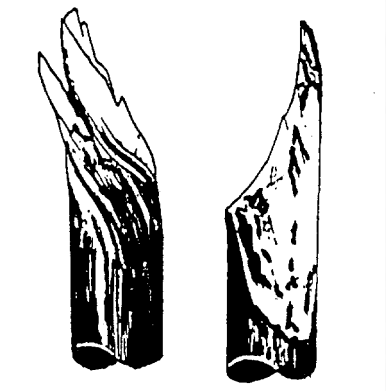
Test Bad





Test Good

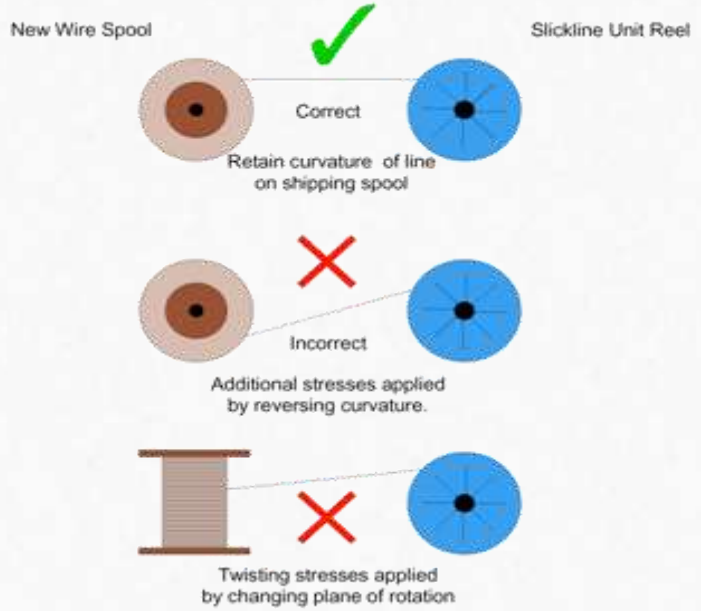
Test Bad



Mahmoud Farag Radwan

Slickline – line spooling

- Initial spooling
- Marking of flat wraps
- Spooling during the operation
- Spread evenly across the drum
- Tension on line when running in/out of the hole – loose wraps?
- Oiling of line



Mahmoud Farag Radwan

Slickline – bending cycles

- Bending stresses are created whenever the wire deviates from the straight-line condition
- This in conjunction with sheave size is the most common reason for line failure
- 14 bending cycles to run in and out of the hole

1.5 EXAMPLE OF WIRE LOG

(Knowing Wire Size and Type)

Date Wire Spooled			Total Length 20,000 ft				
Date	Type of Job	No. of Runs	Footage Run	No of Turns	Type of Break	Wire Cut Off (ft)	Balance Remaining
13-11-99	Ball/ v Change	8	2,400	23	Good	50	19,950
18-11-99	Gauge Rings + Tag Fill	4	14,000	21	Good	50	19,900
20-11-99	Set Plug TBG Test	5	8,500	21	OK	50	19,850
9-12-99	Bailing	16	11,250	20	OK	500	19,350
12-12-99	Fishing	14	12,100	19	Good	300	19,050
25-12-99	Plugs For Completion	8	10,800	15	Retest	1000	18,050
25-12-99	Recommended Wire Change						

Braided & Electric-line Testing

Mahmoud Farag Radwan

WIRELINE EQUIPMENT

1 Surface Equipment

- 1.1 WL Unit
- 1.2 Power Pack
- 1.3 Hoisting Unit

2 PCE

- 2.1 Quick Union
- 2.2 Stuffing Box / GIH
- 2.3 Lubricator
- 2.4 BOP
- 2.5 Tree Adapter

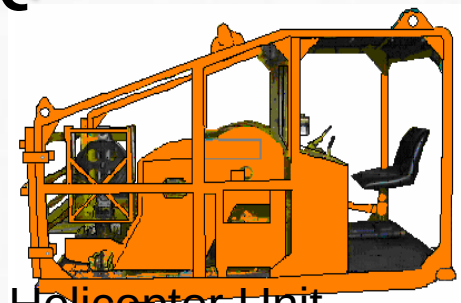
Optional PCE

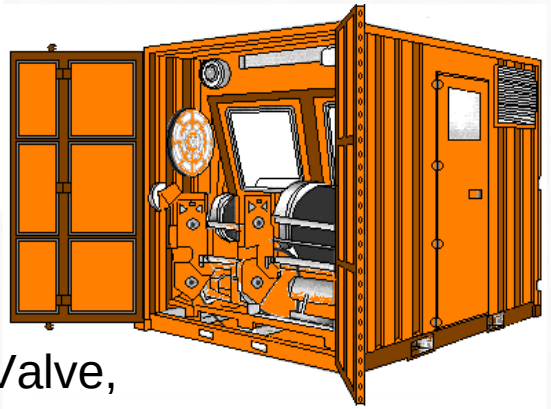
- 2.6 Tool Trap
- 2.7 Tool Catcher
- 2.8 Injection Sub
- 2.8 SCU
- 2.9 Pumping Tee

3 Subsurface Equipment (SSE)

- 3.1 Toolstring
- 3.2 Service Tools
- 3.3 Tubing Conditioning Tools
- 3.4 Running Tools
- 3.5 Pulling Tools
- 3.6 Shifting Tool
- 3.7 Kick Over Tool
- 3.8 Overshot
- 3.9 Spear
- 3.10 Flow Control Device

Surface EQUIPMENT



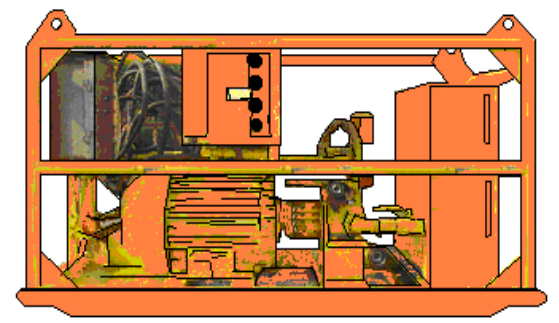


1.1 Wireline Unit

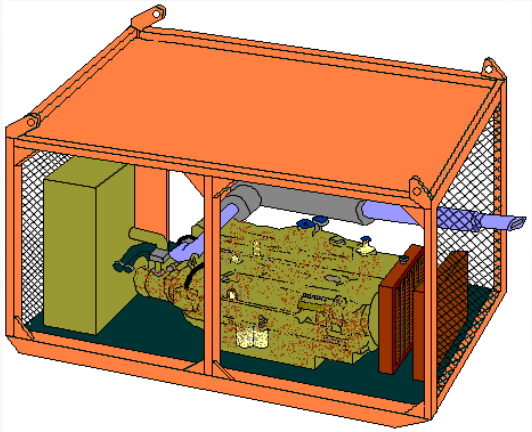
- Single Drum or Dual Drum
- Skid Mounted / Containerized / Helicopter Unit

Component

- Operating Panel – Direction Lever, Brake, Hydraulic Valve, Gauges etc
- Measuring Device
- Weighing Device
- Level Wind



1.2 Power Pack



- Diesel or Electrical Powered
- Zoning Classification

Zone 0 – Continuous present of flammable agent.

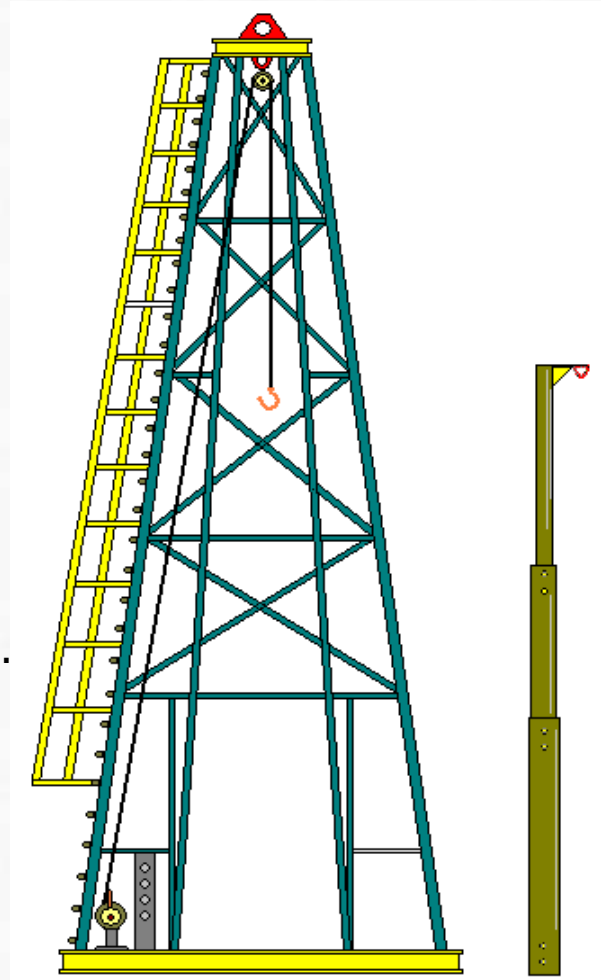
Zone 1 – Flammable agent likely to occur in normal operation.

Zone 2 – Flammable agent not likely to occur in normal operation.

SURFACE EQUIPMENT

1.3 Hoisting Unit

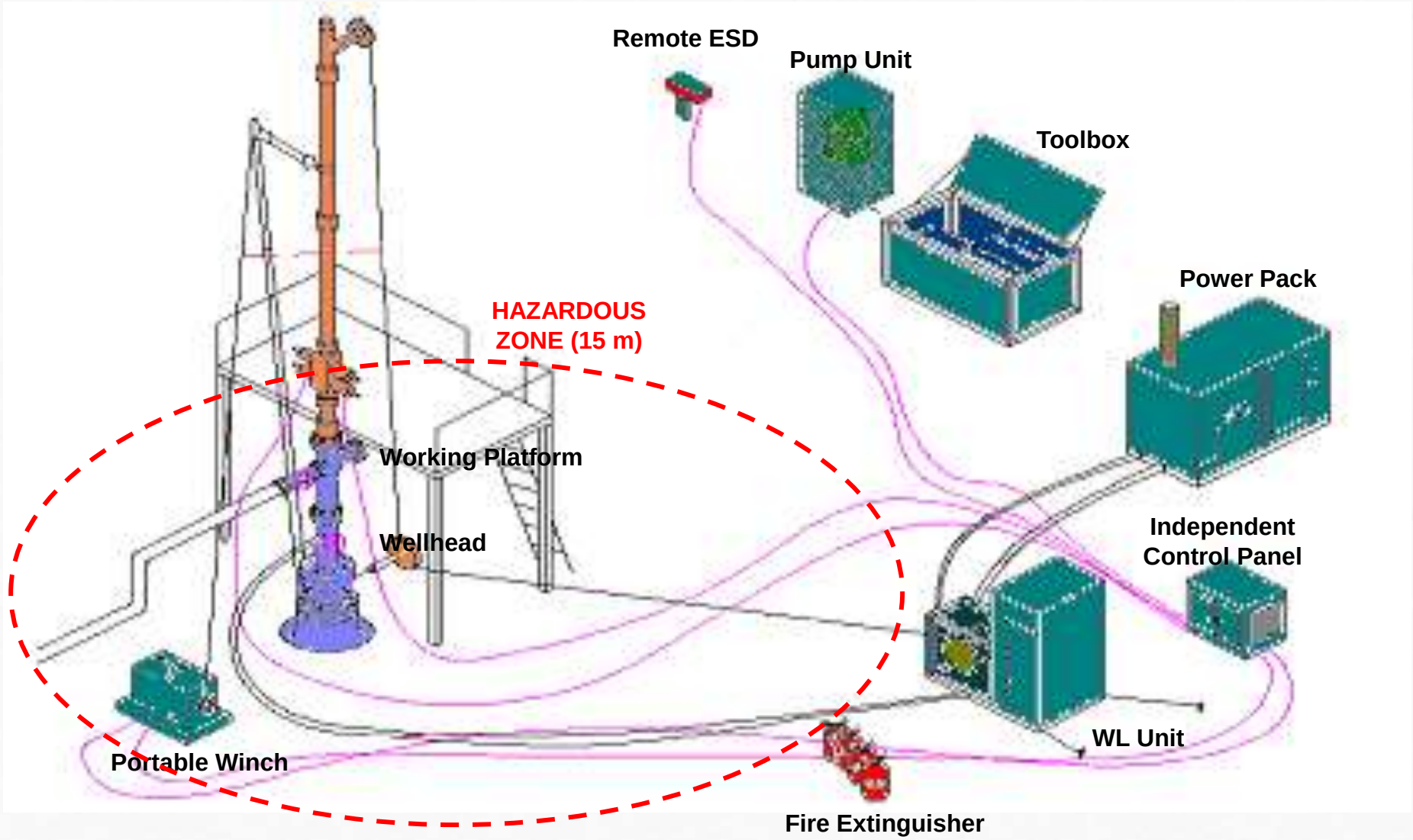
- Pedestal Crane
- Mast
- ‘A’ Frame
- Derrick
- Gin Pole
- Rig



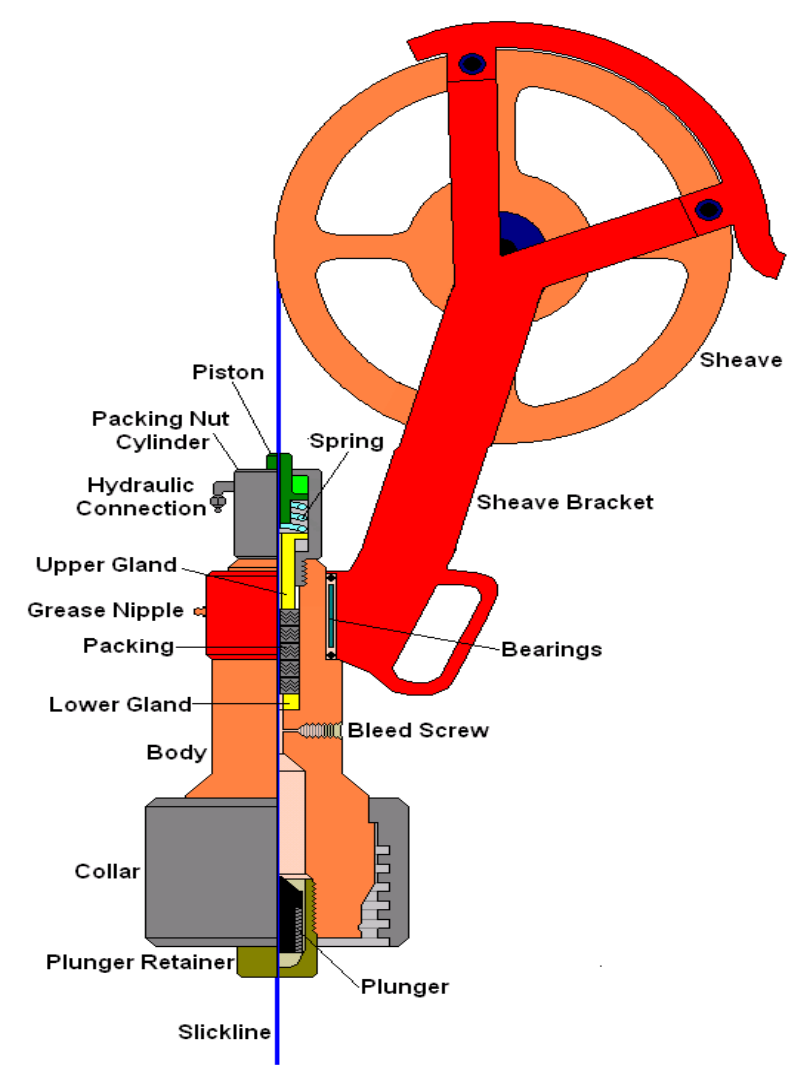
Operational Considerations:

- Length of Lubricators, Risers & Stack Up.
- Height of Hoisting Unit
- Fishing Job
- Toolstring Length

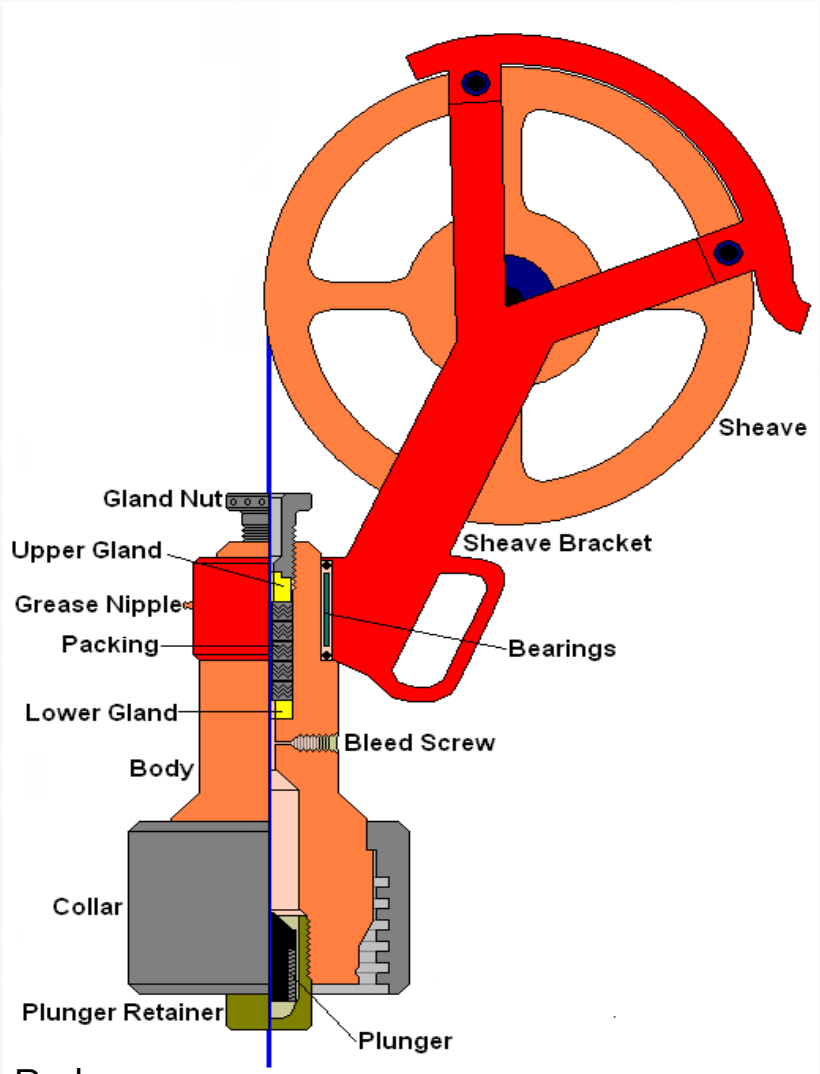
Slickline Surface Equip. Lay-out



PCE - STUFFING BOX



Hydraulic Stuffing Box



Manual Stuffing Box

Mahmoud Farag Radwan

Top Sheave with Isolation

Mahmoud Farag Radwan

Liquid seal head (Grease Injection Head GIH)

- Developed by Camco for work in Alaska
- Improved sealing at higher pressure
- 5,000, 10,000 and 15,000 WP
- Low friction – no stuffing box packings
- Separate pump to operate

PCE - GREASE INJECTION HEAD

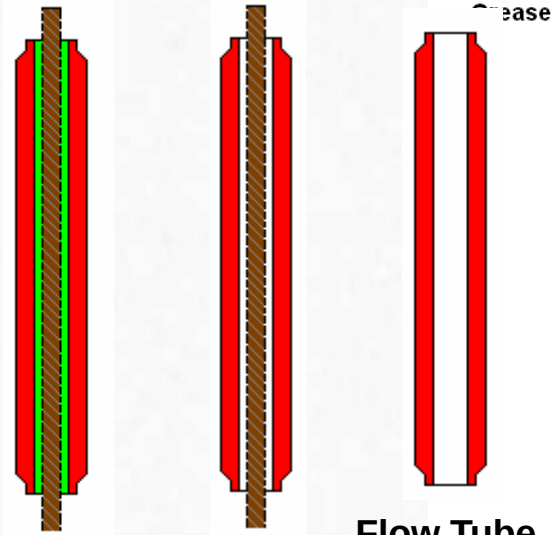
Flow Tube Range:

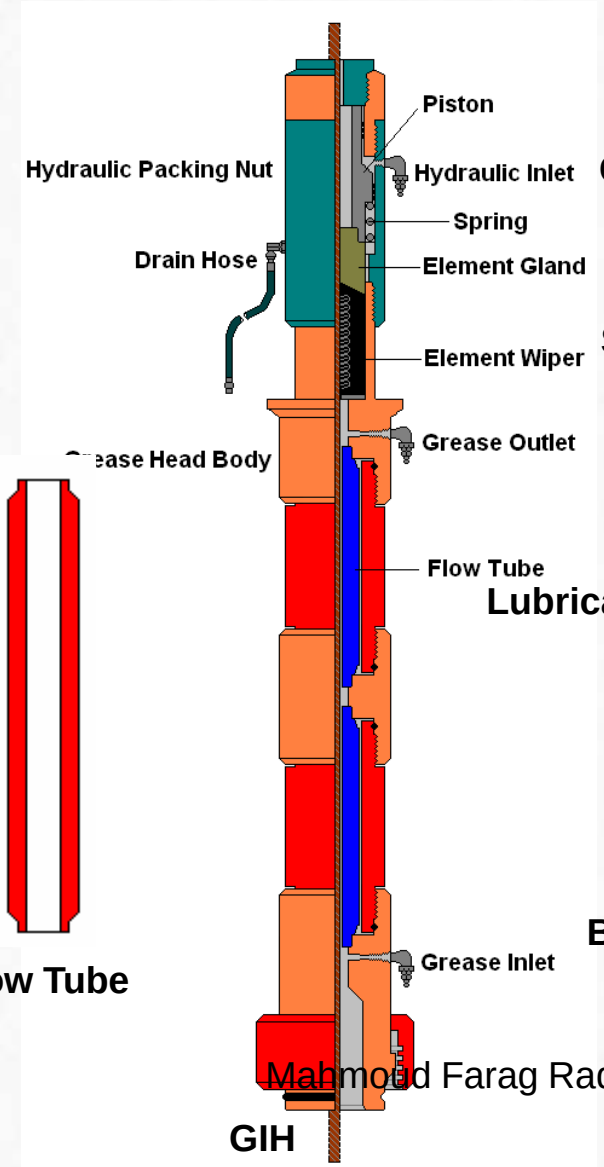
2 Tubes: <2K psi

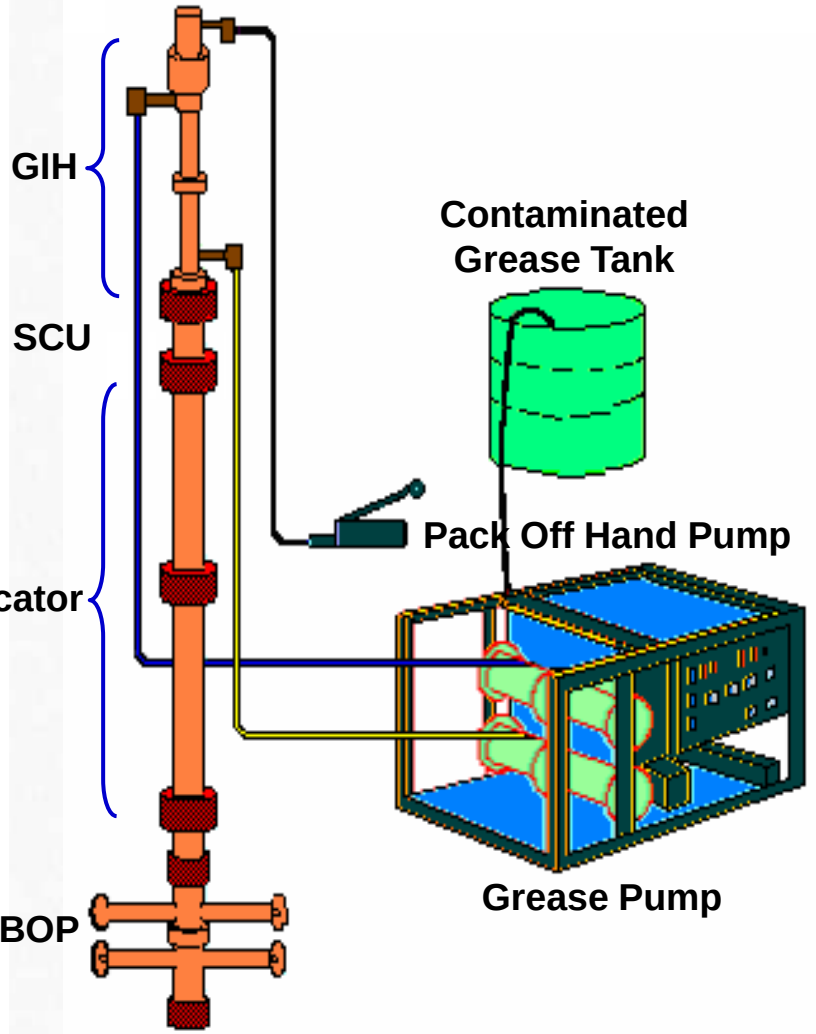
3 Tubes: <10K psi

4 Tubes: <15K psi

Clearance: 0.004” – 0.006”



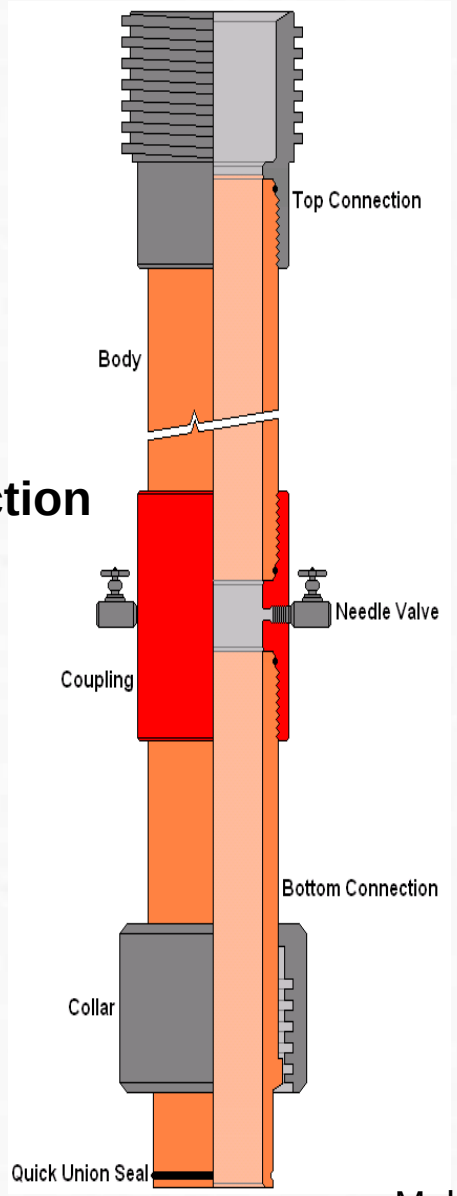




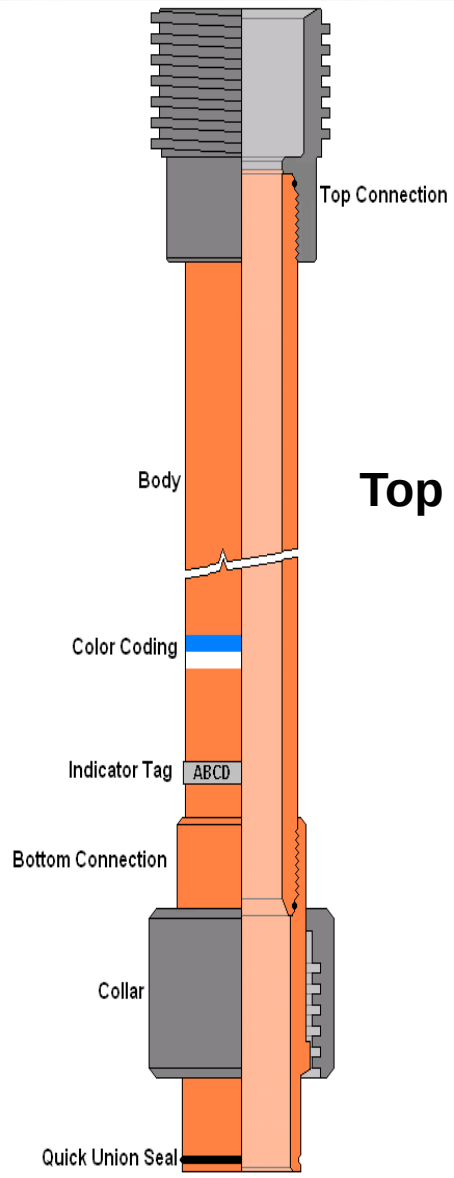
GREASE SYSTEM

PCE - LUBRICATOR

Lower Section

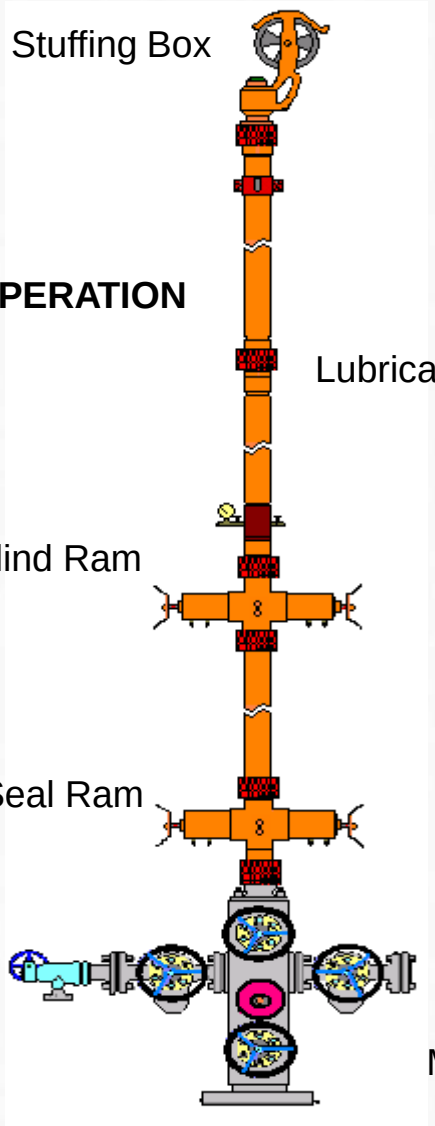


Top Section

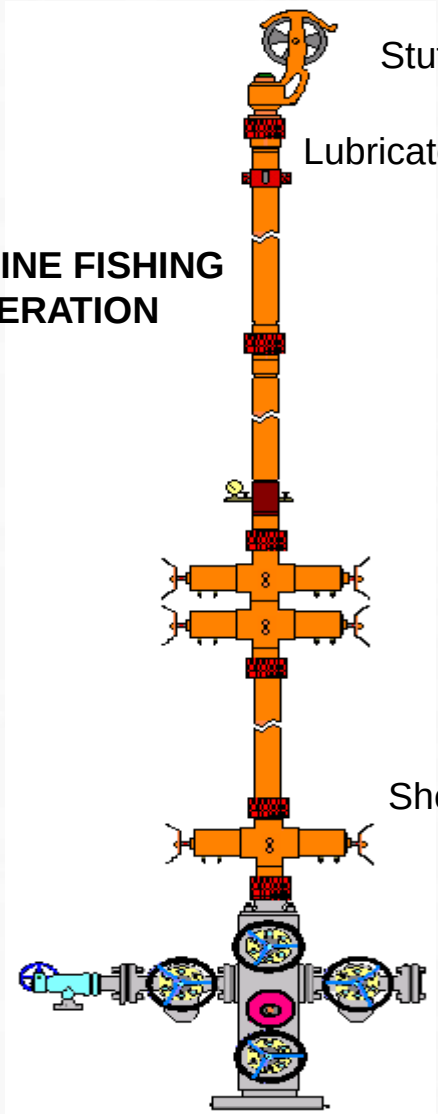


Slickline PCE

SLICKLINE OPERATION

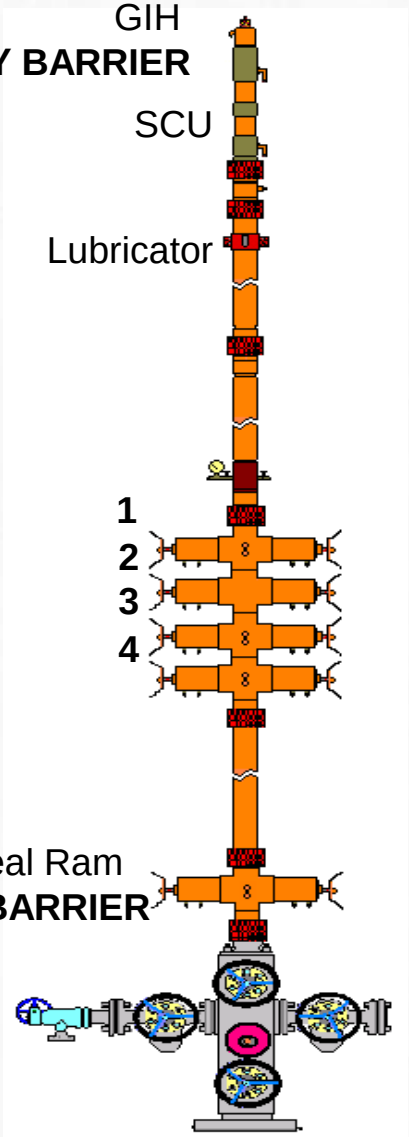


SLICKLINE FISHING OPERATION



Mahmoud Farag Radwan

BRAIDEDLINE PCE



SECONDARY BARRIER

1 Braidedline Ram

2 Braidedline Inverted Ram

3 Blind Ram

4 Shear Ram

Mahmoud Farag Radwan

Sub Surface Equipment

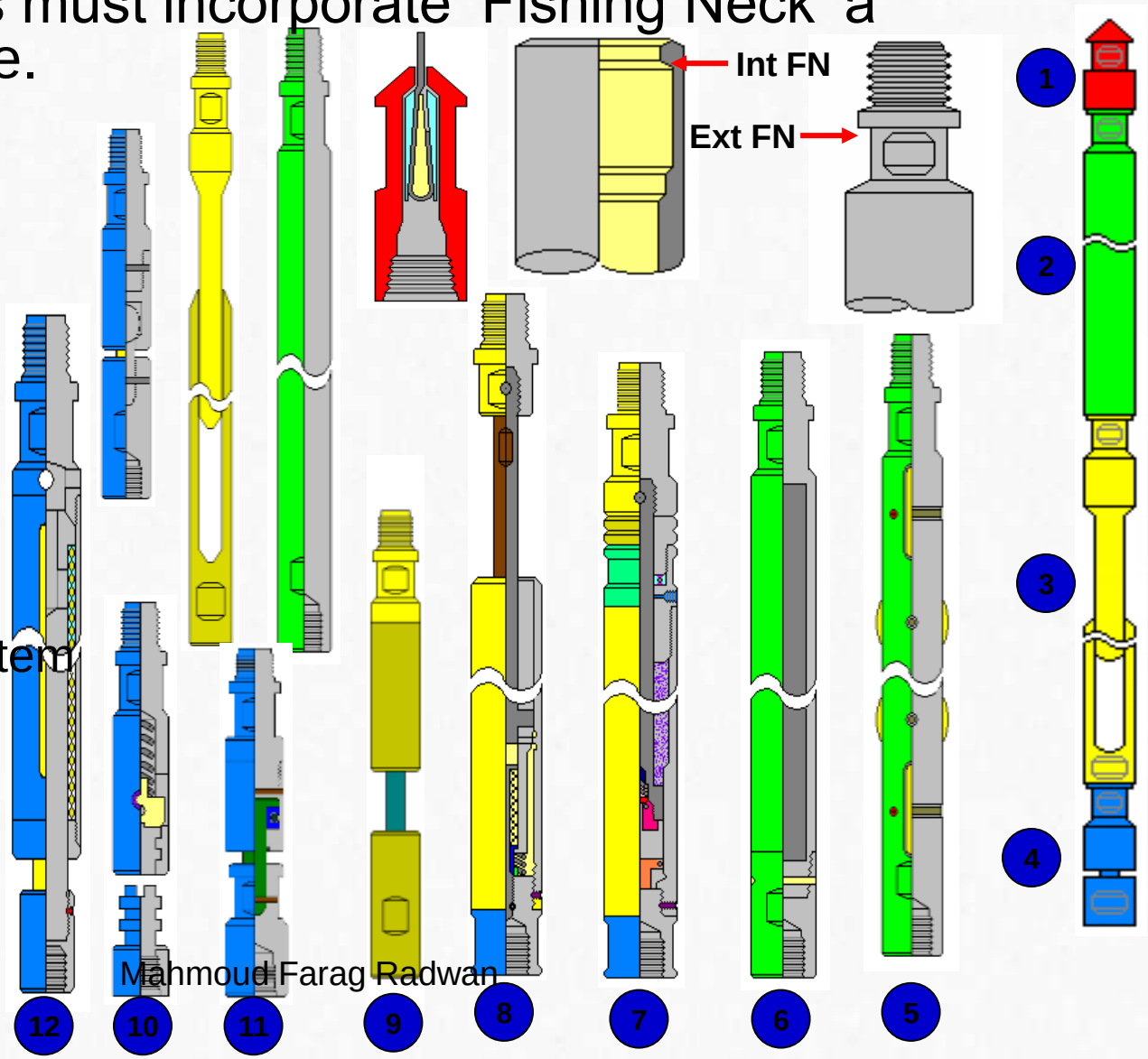
All sub surface tools must incorporate ‘Fishing Neck’ a recovery feature.

3.1 Toolstring

1. Rope Socket
2. Stem
3. Jar
4. Knuckle Joint

Optional Tools

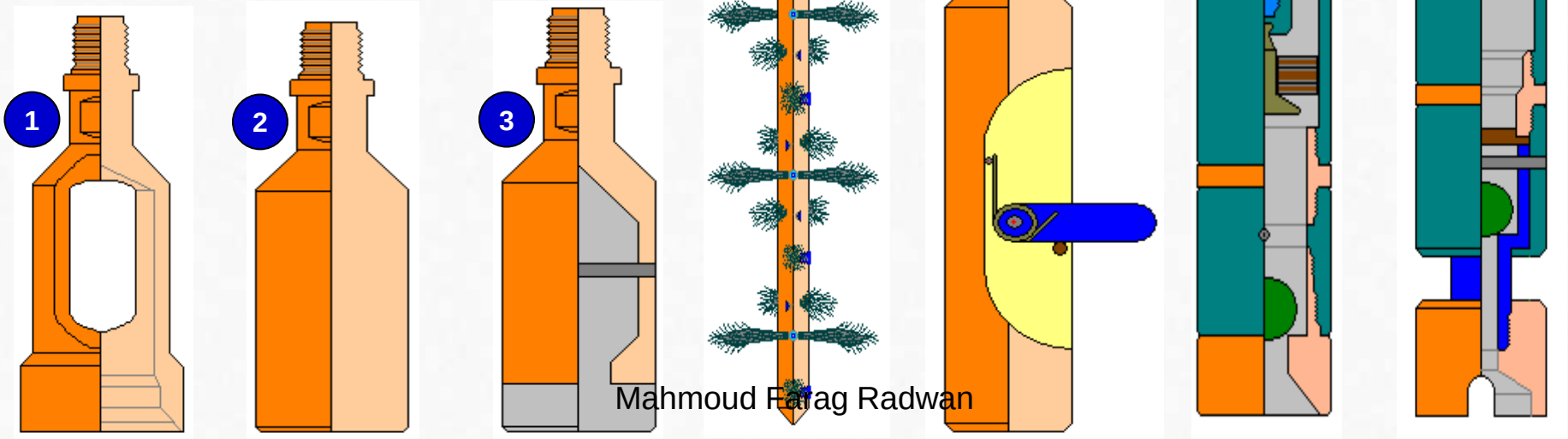
5. Roller Stem
6. High Density Stem
7. Hydraulic Jar
8. Spring Jar
9. Knuckle Jar
10. QLS
11. Swivel Joint
12. Accelerator



SUB-SURFACE EQUIPMENT

3.2 Service Tool

1. Gauge Cutter
2. Blind Box
3. Lead Impression Block (LIB)
4. Wire Scratcher
5. Tubing End Locator
6. Pump Bailer
7. Hydrostatic Bailer

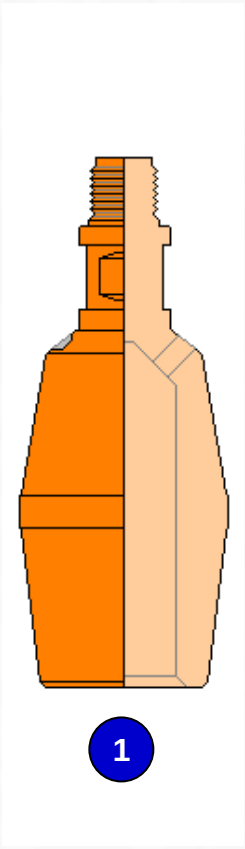


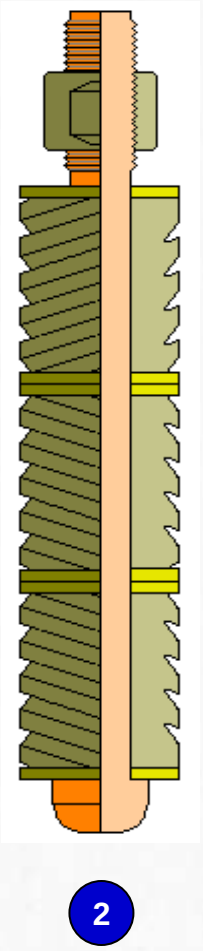
SUB-SURFACE EQUIPMENT

3.3 Tubing Conditioning Tool - Always use with Pulling Tool

1. Swage
   - To restore light tubing collapse.

2. Broach
   -To remove scale /paraffin deposits





SUB-SURFACE EQUIPMENT

3.4 Running Tools

1 External Fishing Neck
2 Internal Fishing Neck
3 Selective Running Tool
4 Non-Selective Running Tool

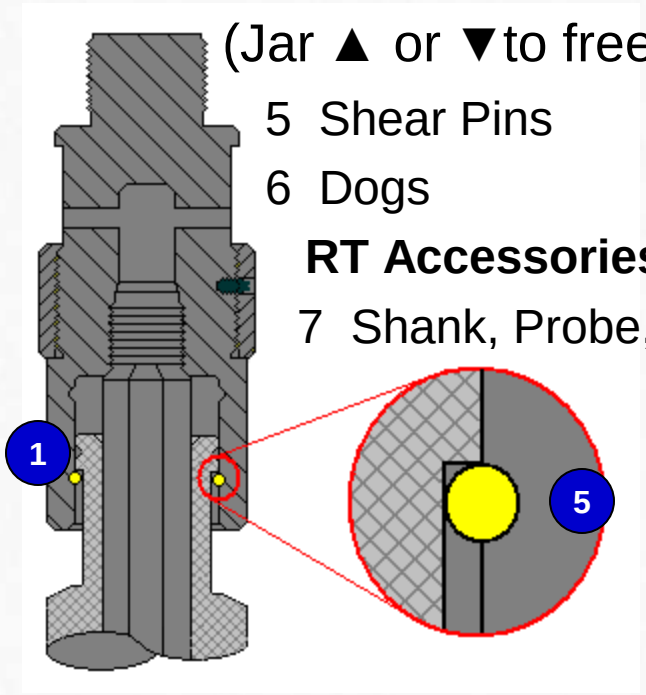
Latching Mechanism:

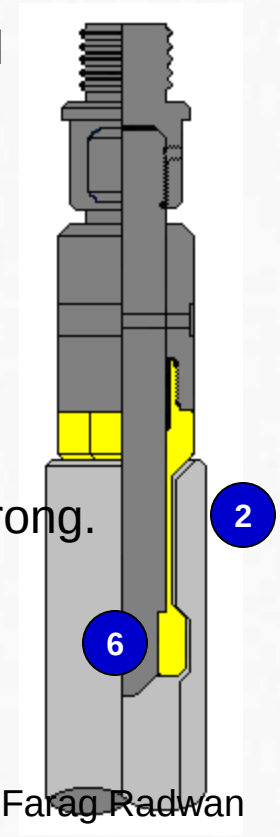
(Jar ▲ or ▼to free)

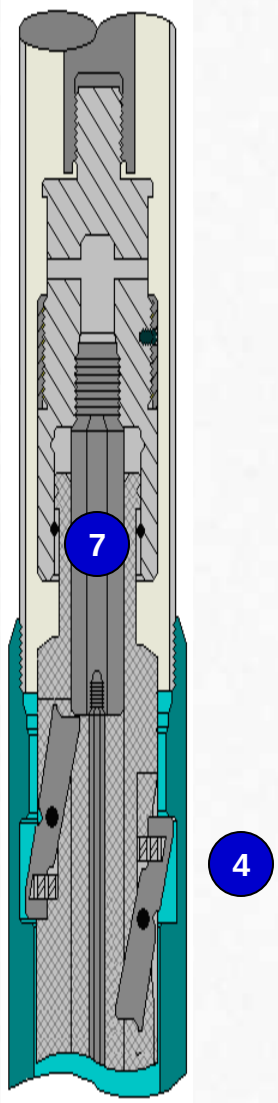
5 Shear Pins
6 Dogs

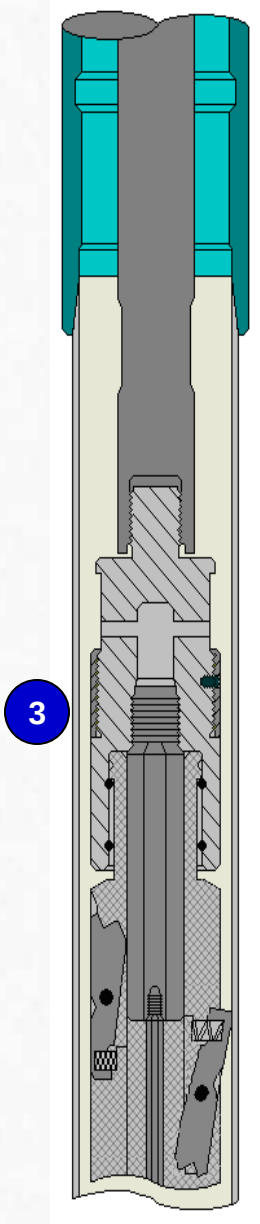
RT Accessories:

7 Shank, Probe, Guide & Prong.

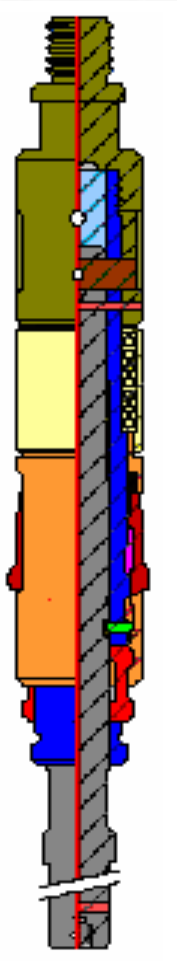




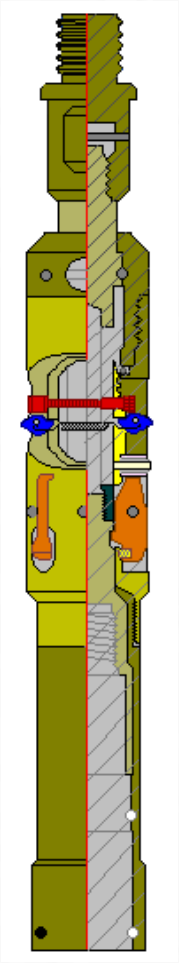




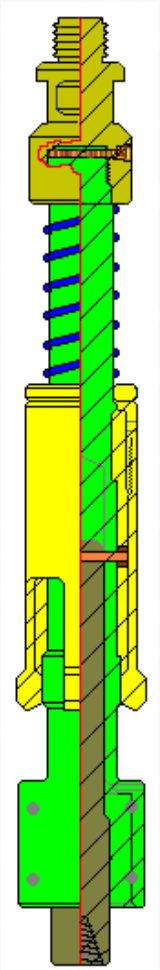
RUNNING TOOLS



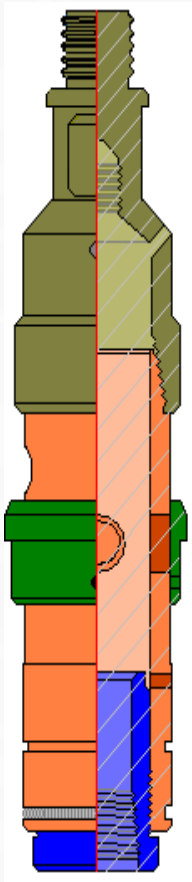
OTIS "X" R/T
(X-Lock)



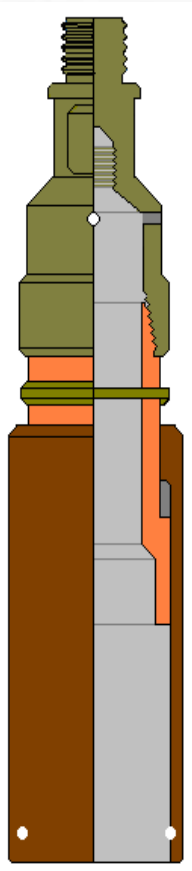
CAMCO "W-1" R/T
(M-Lock)



BAKER "G" R/T
(S-Lock)



CAMCO "Z-6" R/T
(DB-Lock)



CAMCO "DT" R/T
(C-Lock)

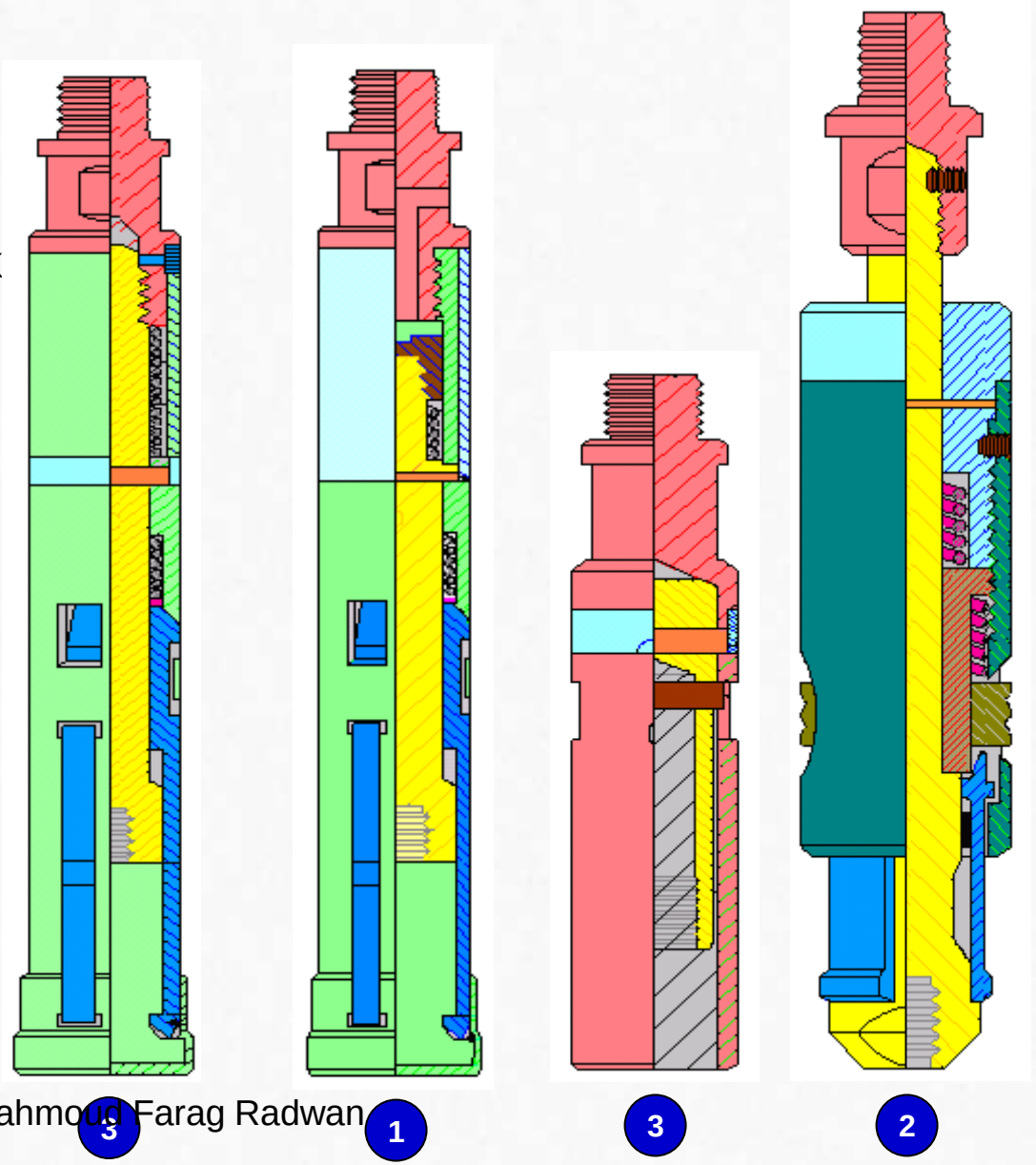
SUB-SURFACE EQUIPMENT

3.5 Pulling Tools

1. External Fishing Neck
2. Internal Fishing Neck

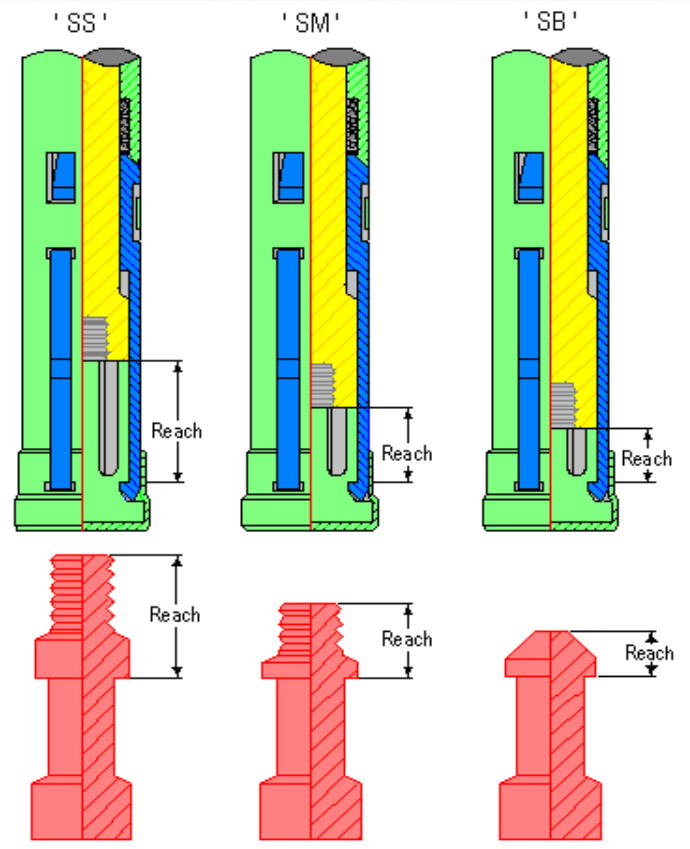
Shear Direction:

3. Jar ▲ (Large Pin)
4. Jar ▼ (Small Pin)

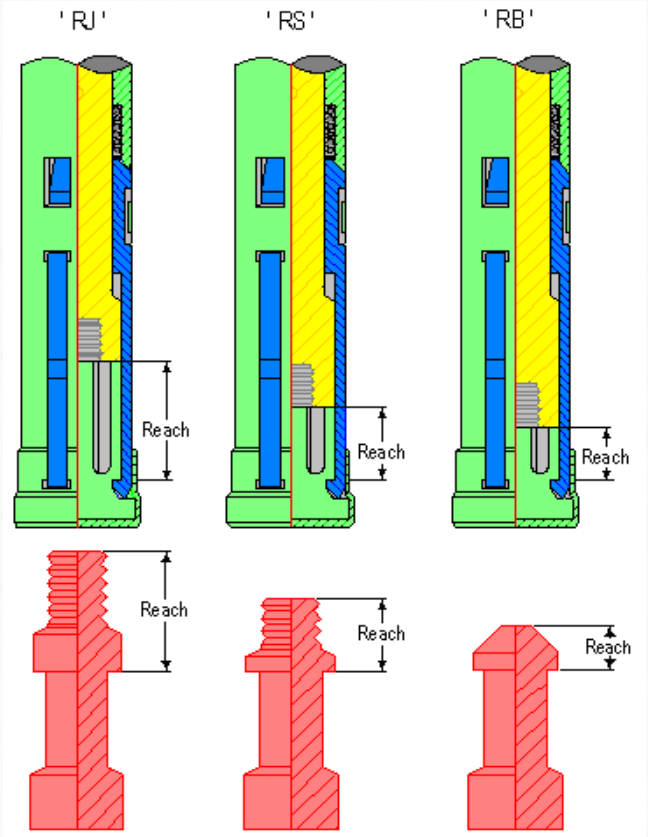


Reach

“S” Series Pulling Tool (▼)

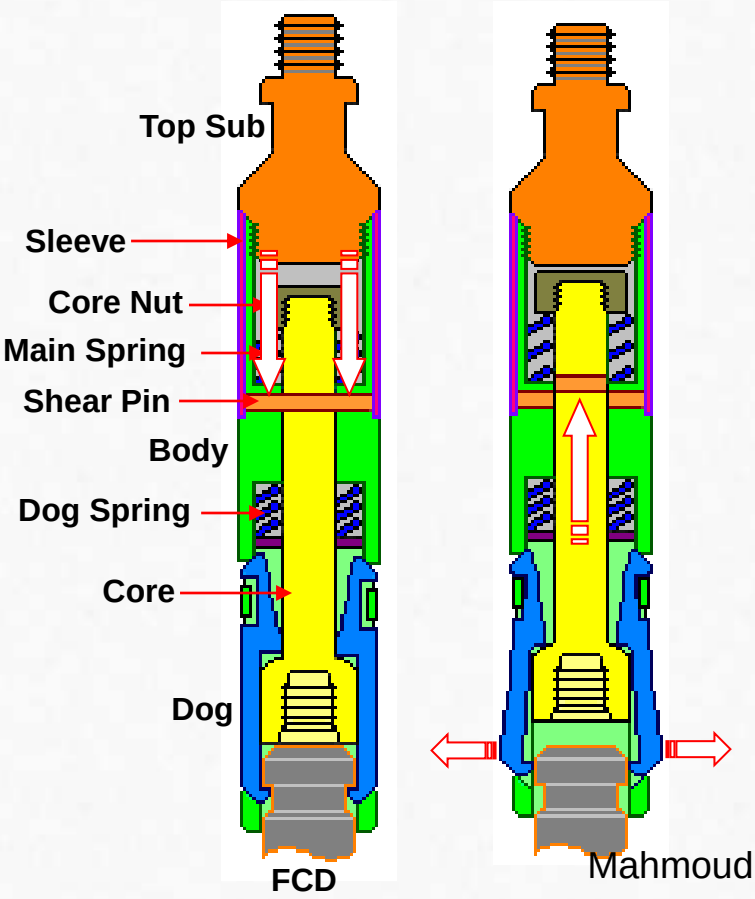


“R” Series Pulling Tool (▲)

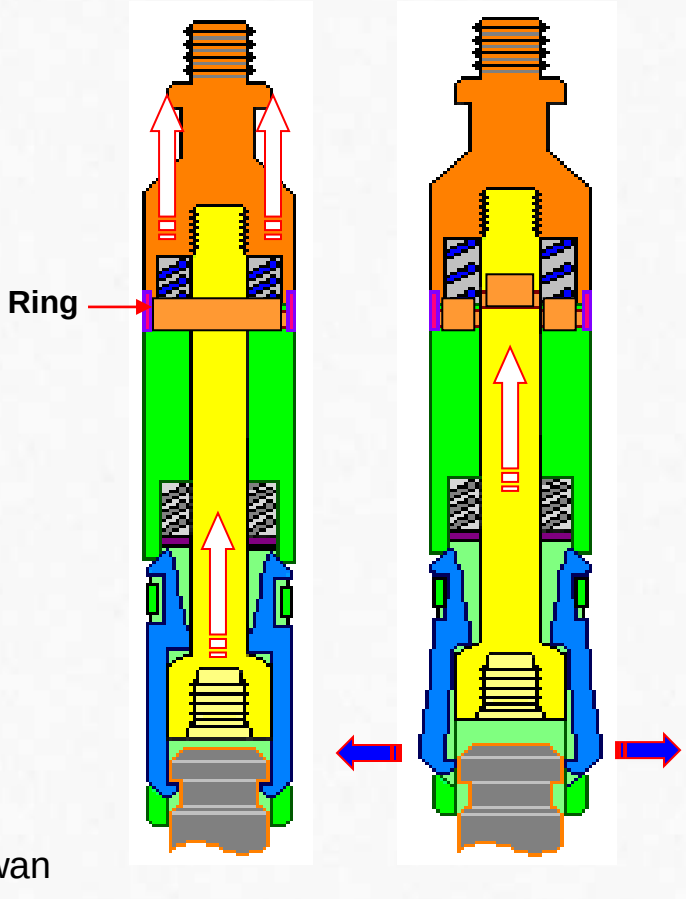


SHEARING MECHANISM

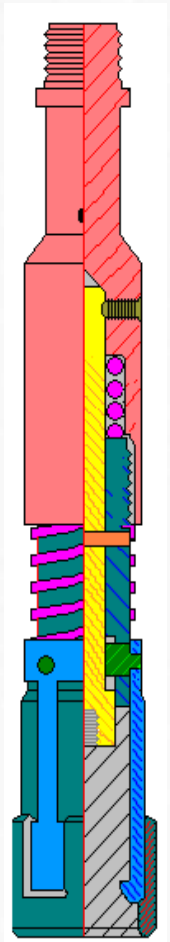
Jar ▼ Pulling Tools (S)



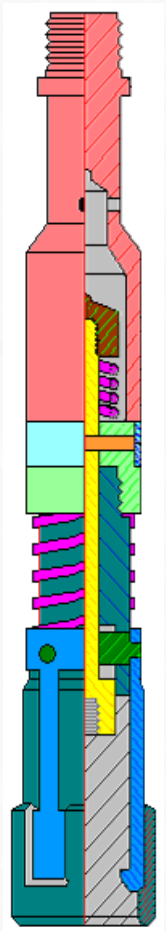
Jar ▲ Pulling Tools (R)



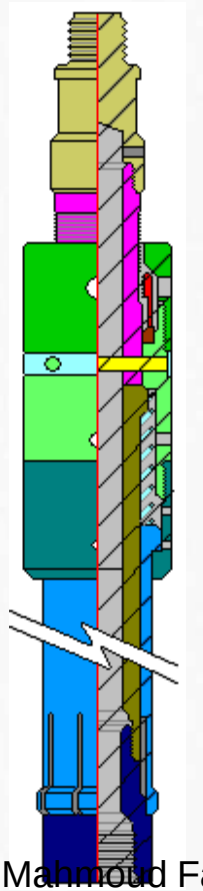
Pulling Tools



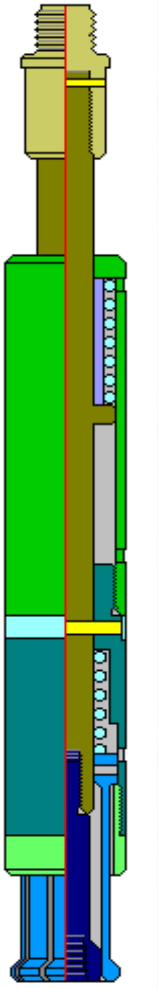
CAMCO “JD” P/T



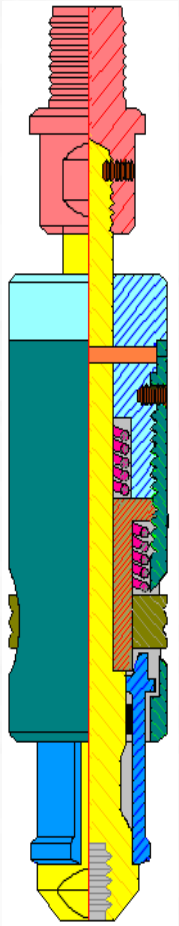
CAMCO “JU” P/T



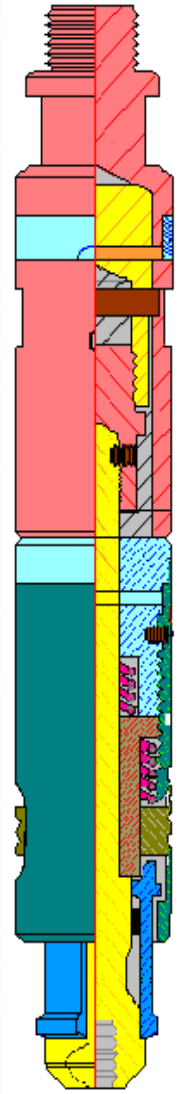
CAMCO “PRS” P/T



CAMCO “PRS-2” P/T



OTIS “GS” P/T



OTIS “GR” P/T

SUB-SURFACE EQUIPMENT

3.6 Shifting Tool

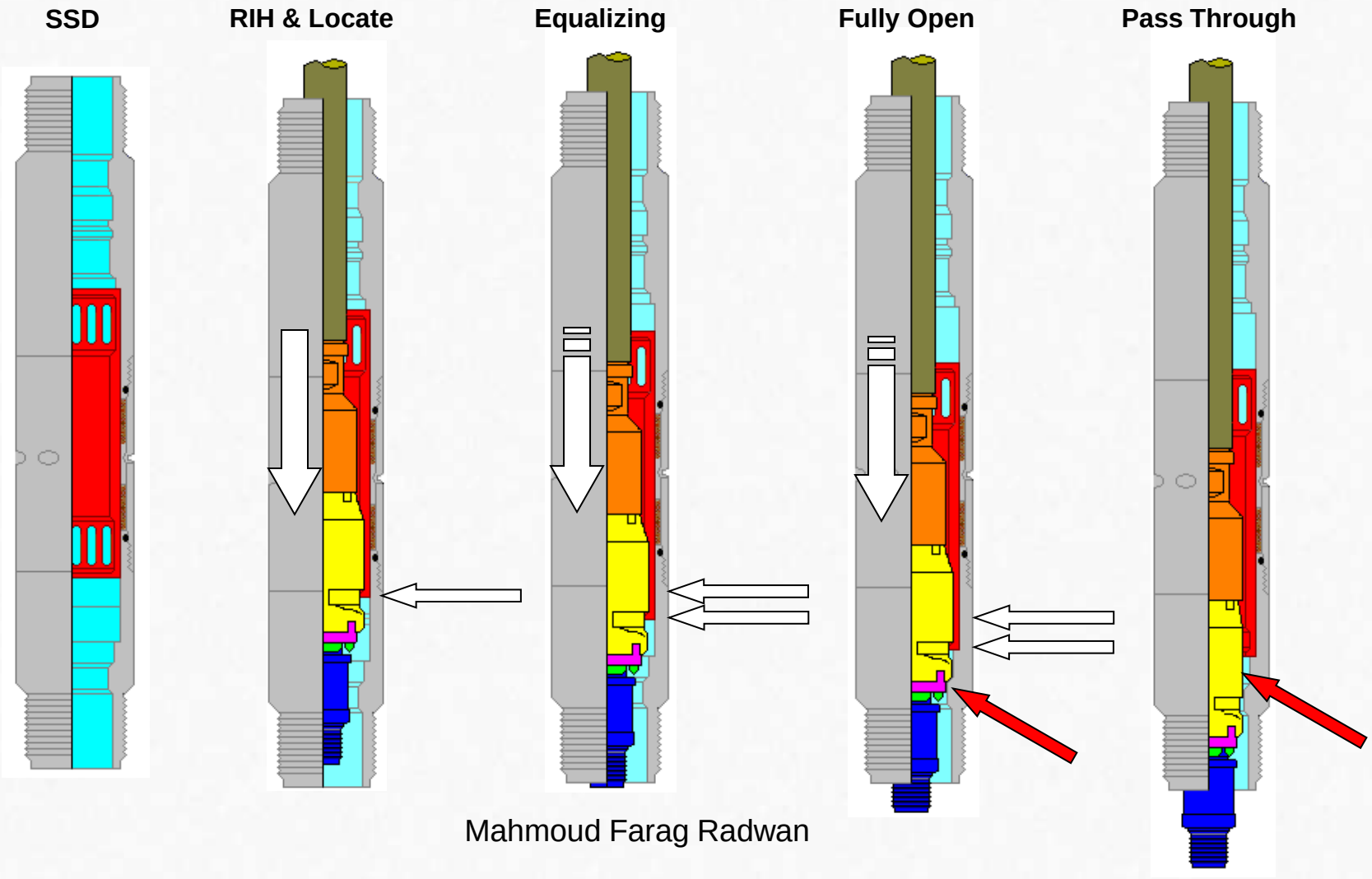
1. Serves to open or close Sliding Sleeve.

2. Selective & Non-Selective

3. Pressure equalization is compulsory prior opening SSD

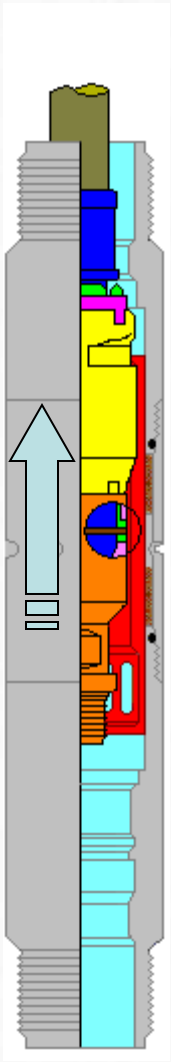
4. Feature
   - **Key or Dog**
   - **Self Releasing**
   - **Safety Release**

Shifting Operation

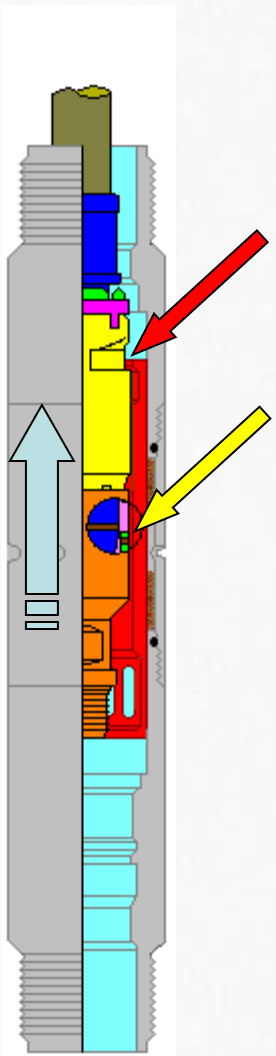


Mahmoud Farag Radwan

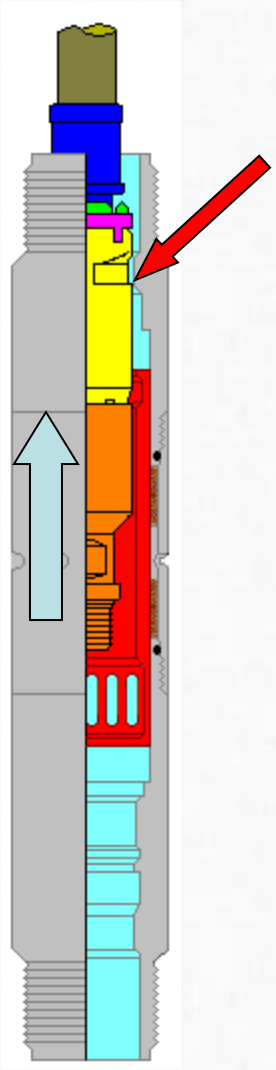
Safety RELEASE Feature



Closing

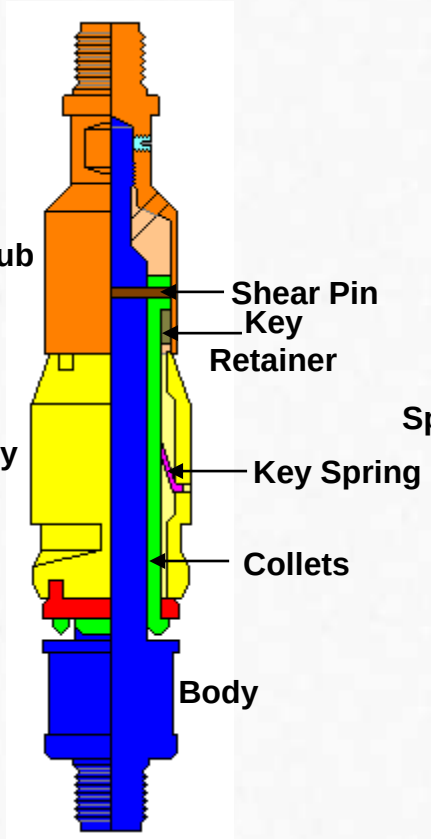


Shearing Pin

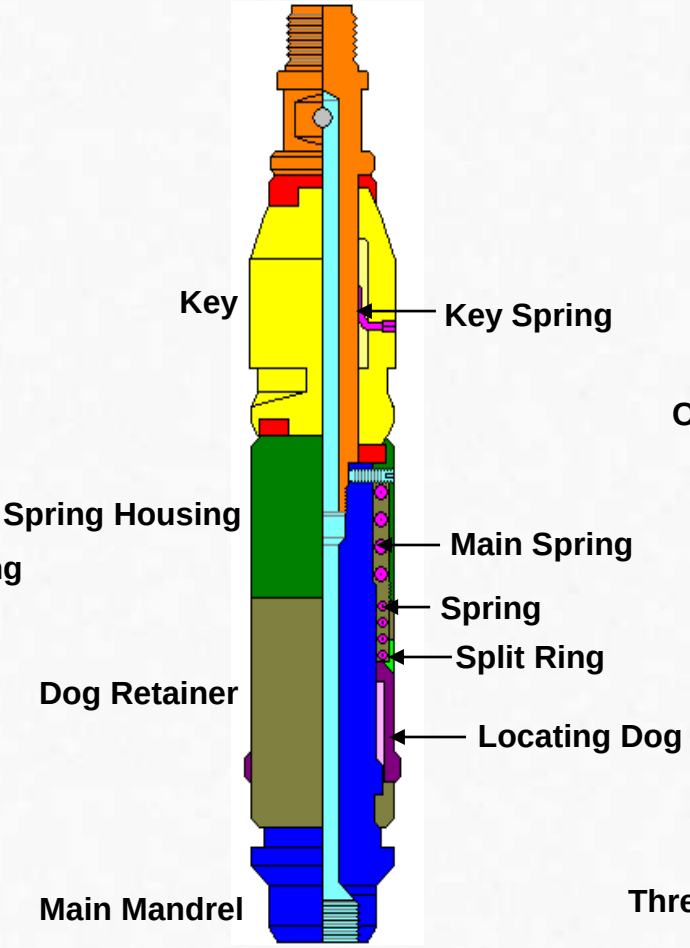


Pin Sheared

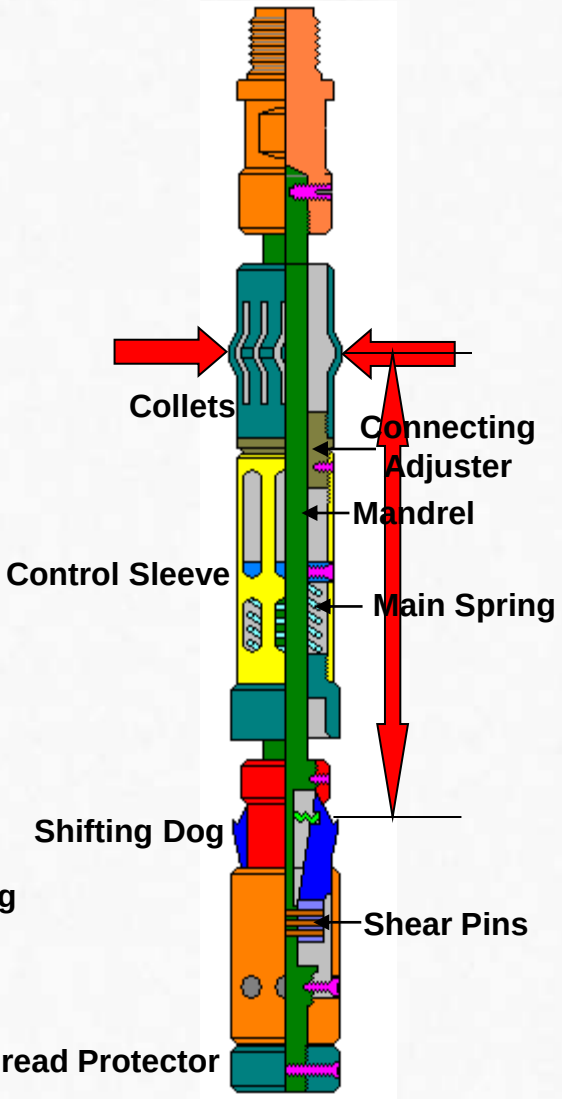
Shifting Tool



OTIS "B" Positioning Tool
(OTIS SSD)



OTIS "BO" Downshift Tool
(OTIS SSD)



BAKER "D-2" Shifting Tool
(BAKER "L" SSD)

SUB-SURFACE EQUIPMENT

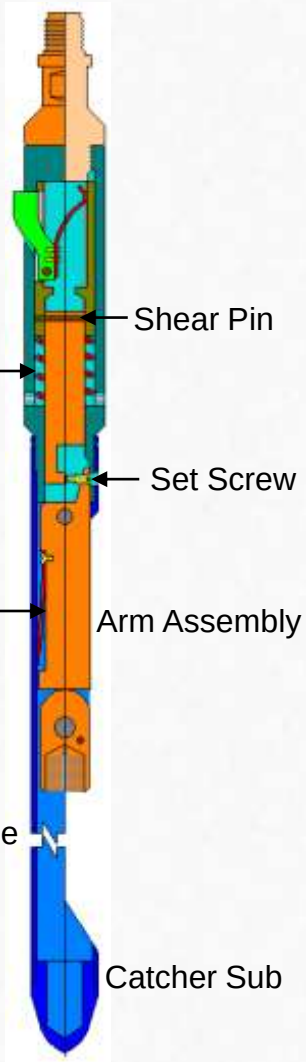
3.7 Kick Over Tools

1. Serves to set or pull valve from Side Pocket Mandrel

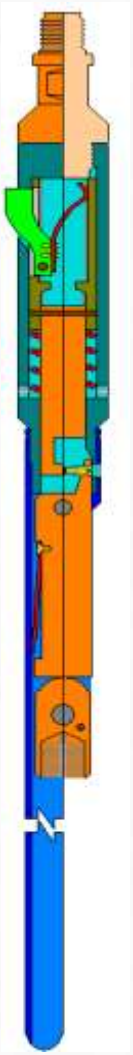
2. Pressure equalization is compulsory prior pulling valve from SPM

3. Feature:
   - **Locating Finger**
   - **Self Orient-able**
   - **Kickable Arm Assembly**
   - **Safety Release**

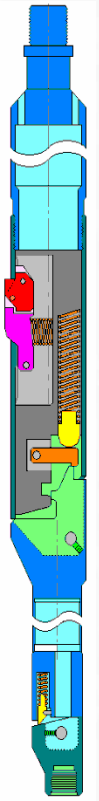
Kick Over Tool



CAMCO “OK “ Series KOT

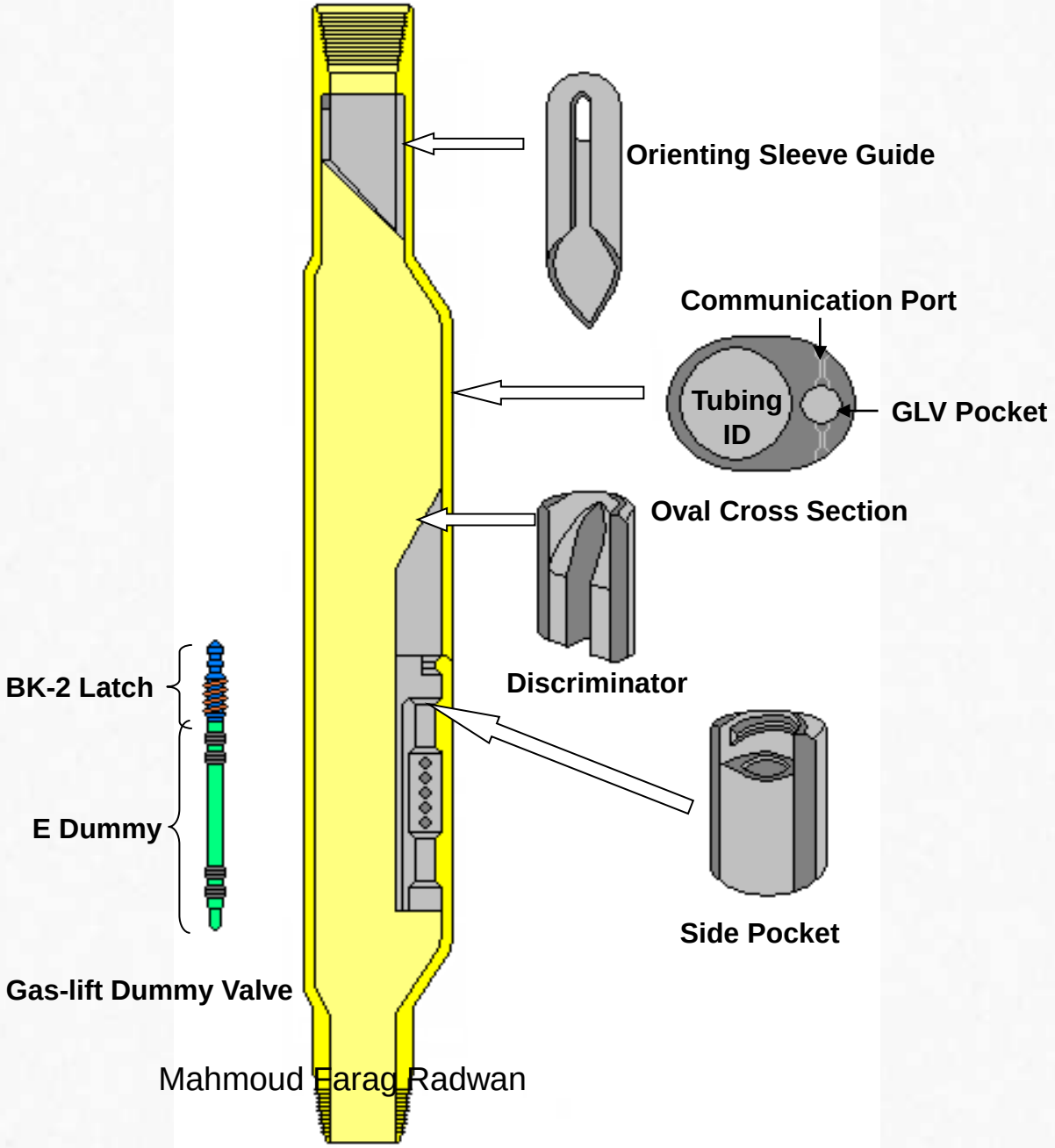


CAMCO “OMP” Series KOT



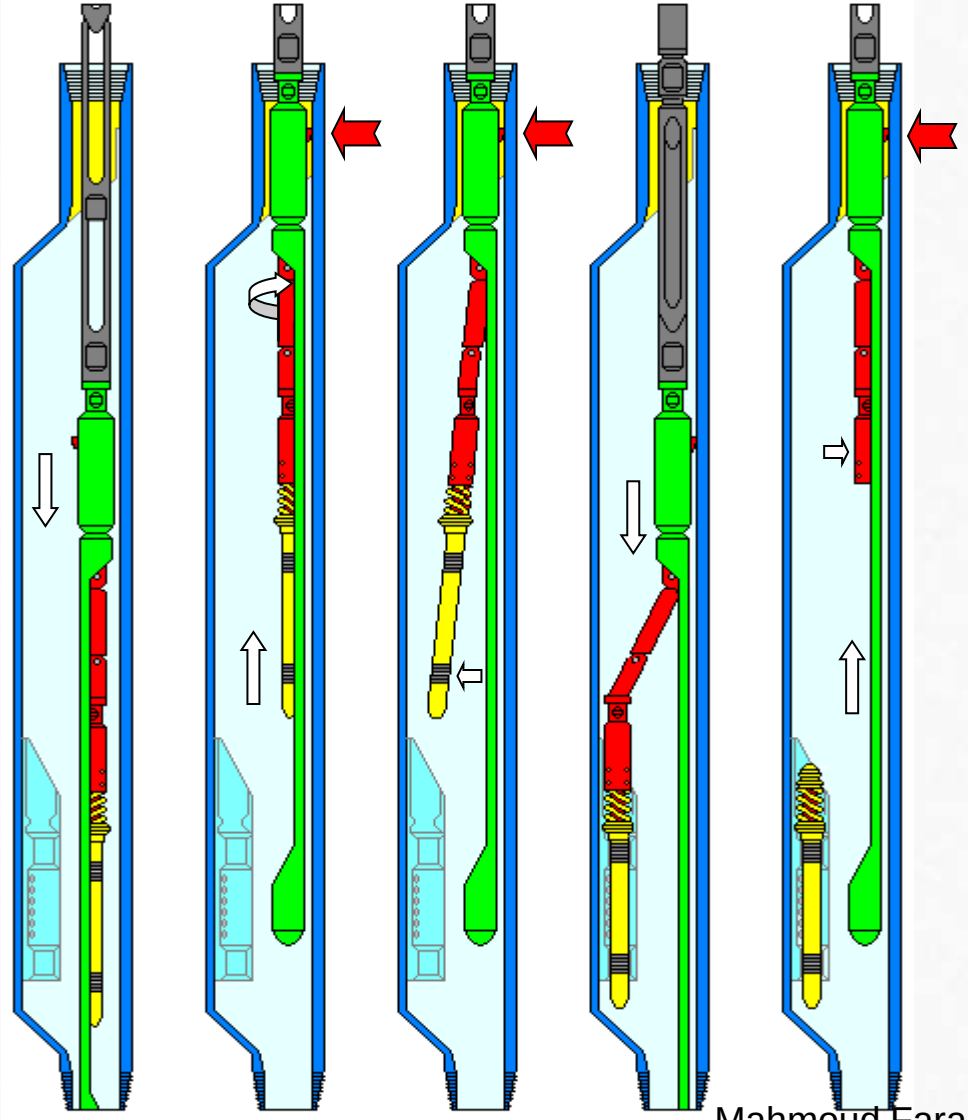
MERLA KOT

Side Pocket Mandrel



Mahmoud Farag Radwan

Kick-Over Tool Running Sequence



(a) RIH

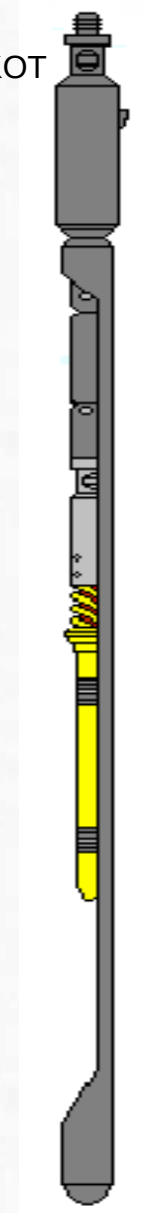
(b) Locate & orienting

(c) Trigger

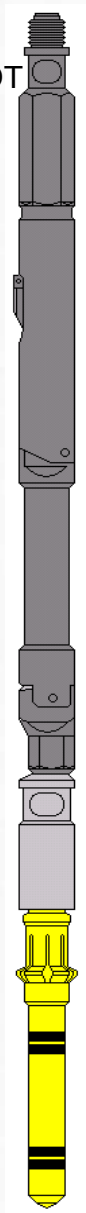
(d) Setting valve in pocket

(e) Release RT & POOH

OK Series KOT



MERLA KOT



Mahmoud Farag Radwan

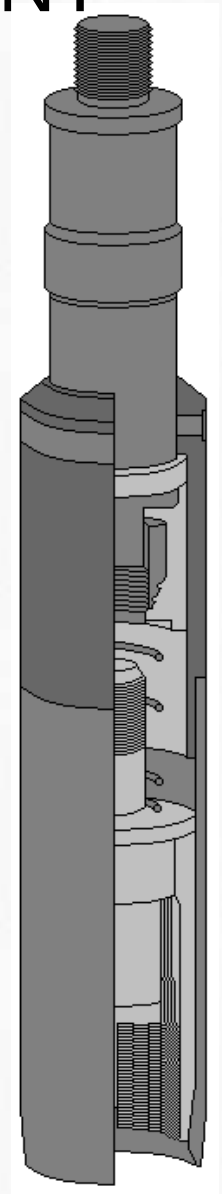
SUB-SURFACE EQUIPMENT

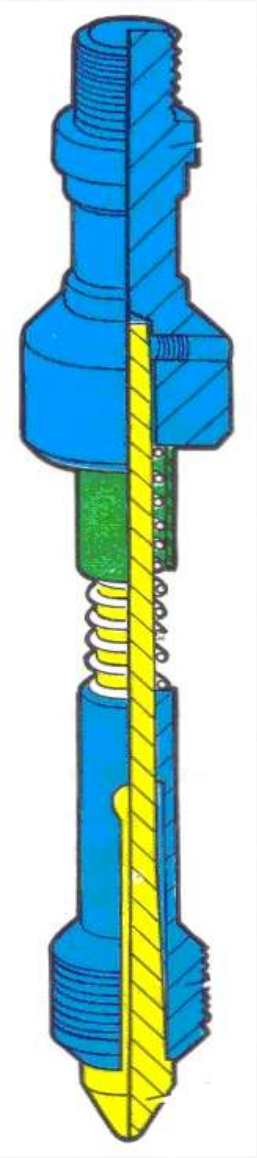
3.8 Overshot

To latch on downhole tools without External Fishing Neck

3.9 Spear

To latch on downhole tools without Internal Fishing Neck





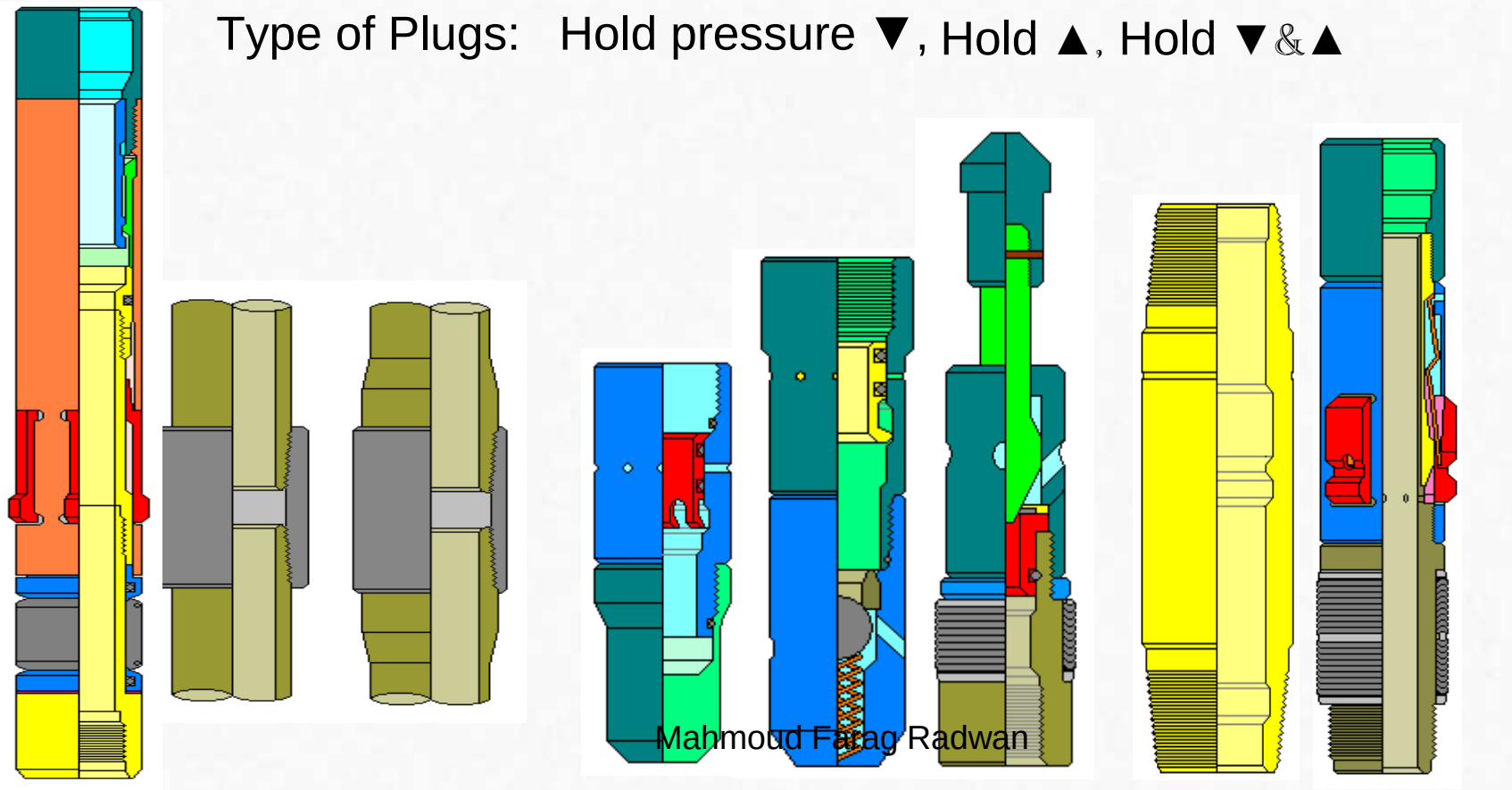
SUB-SURFACE EQUIPMENT

3.10 Flow Control Device

Lock Mandrel + Type of Plug + Equalizing Sub

Type of Lock: Slip Lock, Collar Lock & Nipple Lock

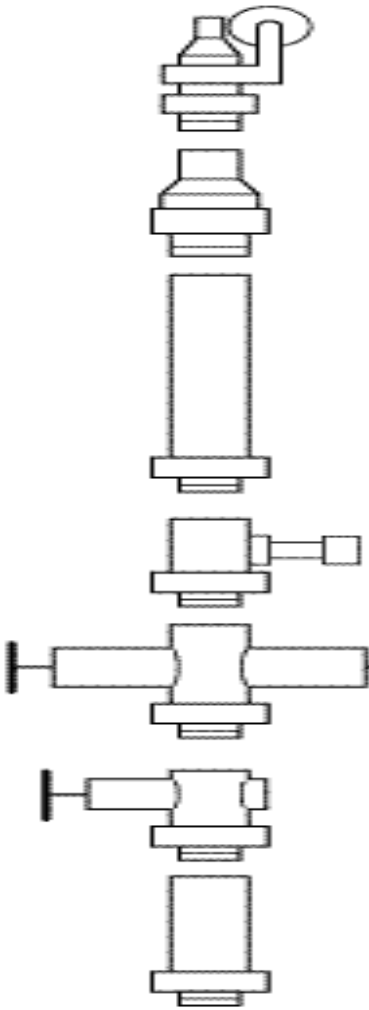
Type of Plugs: Hold pressure ▼, Hold ▲, Hold ▼&▲



Wireline Parameters

Five considerations required serious attention prior wireline operations.

1. **Job Planning**
2. **Rig-up & Rig-down**
3. **Pressure Testing**
4. **RIH Considerations**
5. **Emergency Response**



DESCRIPTION	SERIAL NUMBER	MAINT/COMMENTS
Stuffing Box	.....	.....
Crossover	.....	.....
Lubricator	.....	.....
T-piece	.....	.....
Wireline BOP	.....	.....
Tested from Below	.....	.....
Work Valve	.....	.....
Riser	.....	.....

Test Pressure .....
Well Number .....
Sign ..... Date .....

Pressure Control Equipment Test and Maintenance Record

Mahmoud Farag Radwan

Digital Slickline – The Wire

Standard core

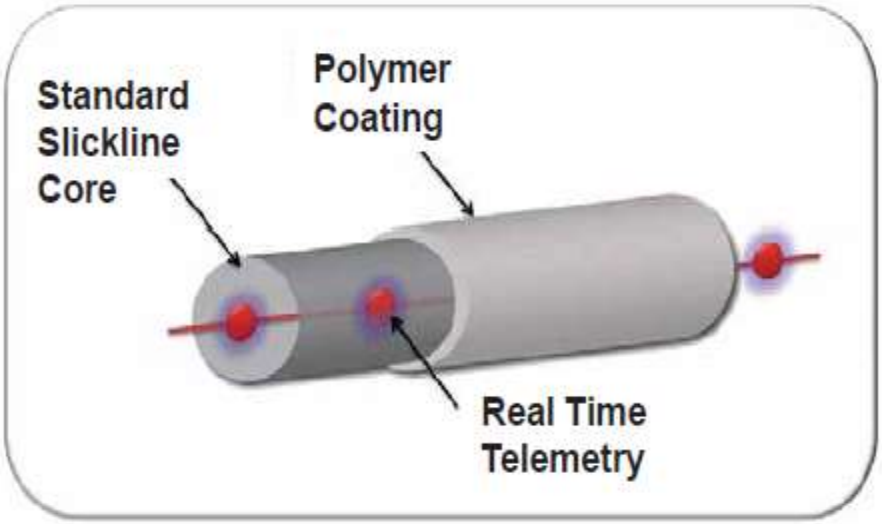
- Sandvik 0.108" and 0.125" 5R60 Stainless Steel
- Temperature range -40 C to 150 C (-40 F to 302 F)
- Pressure range 0 - 10,000 psi
- Breaking strength 1870 lbs (108) and 2500 lbs (125)

Insulation Specification

- Proprietary polymer compound
- Non reactive, H2S resistant

Sour Service Cable

- Sanicro 28 H2S cable in service



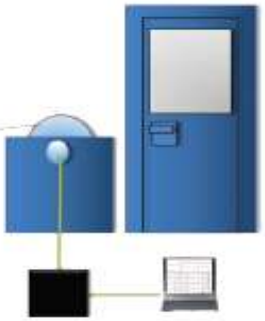
Telemetry NOT power

DIGITAL SLICKLINE CABLE

Sandvik 5R60 stainless steel alloy
Sanicro 28 H_2S
0.108 in (0.138-in OD after coating)
0.125 in (0.153-in OD after coating)

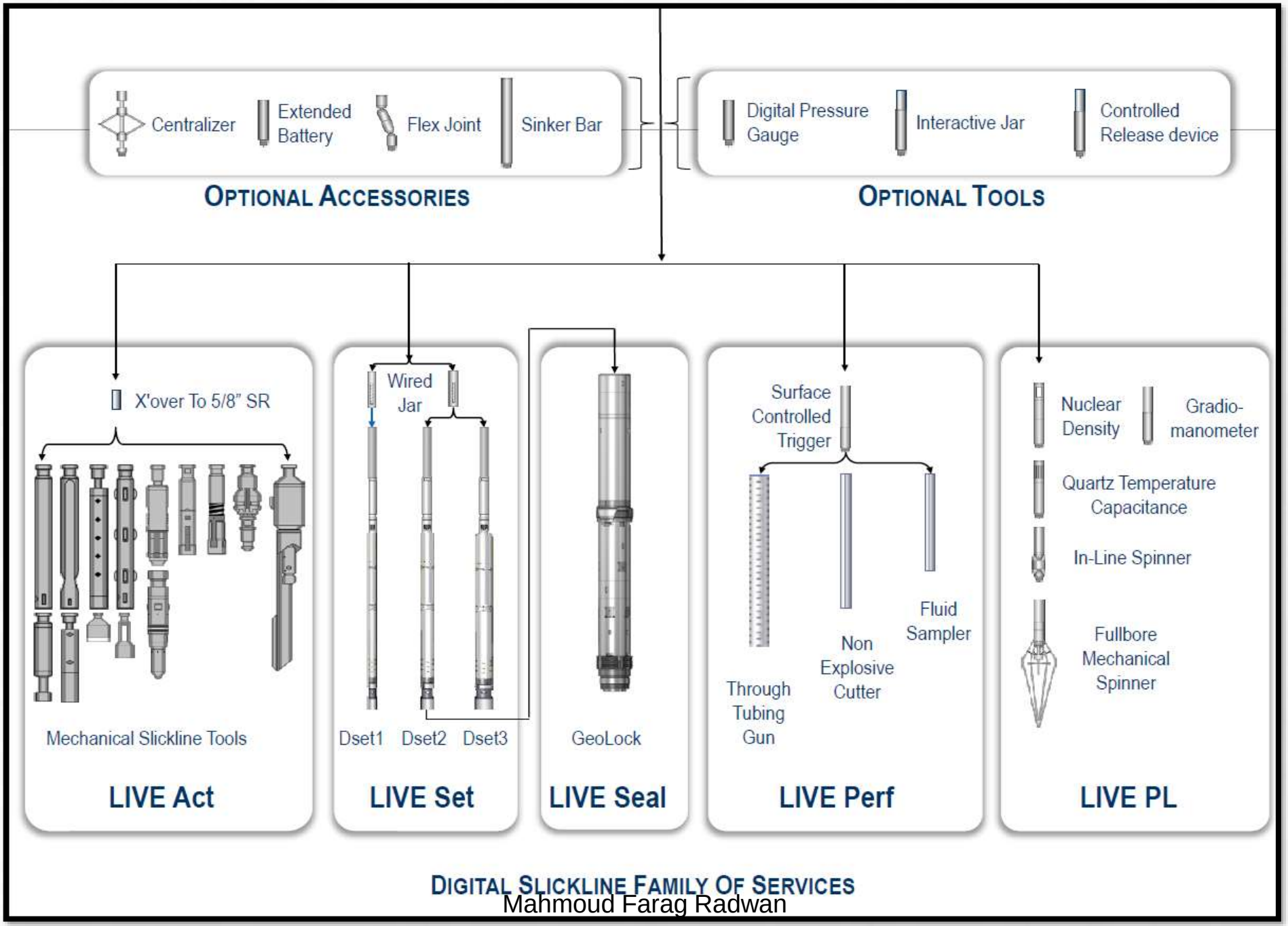
DIGITAL SLICKLINE SURFACE EQUIPMENT

Standard winch/drum/pulleys/stuffing box
Surface transceiver and PC



DIGITAL SLICKLINE CORE EQUIPMENT

- Digital pressure gauge
- Digital insulated head
- Basic measurement cartridge
- Digital correlation cartridge
- Digital measurement cartridge



Nipple-less Plug

The Nipple-less plug is a mechanically set plug used in nipples completion or used where there is a problem with setting a nipple type plug.

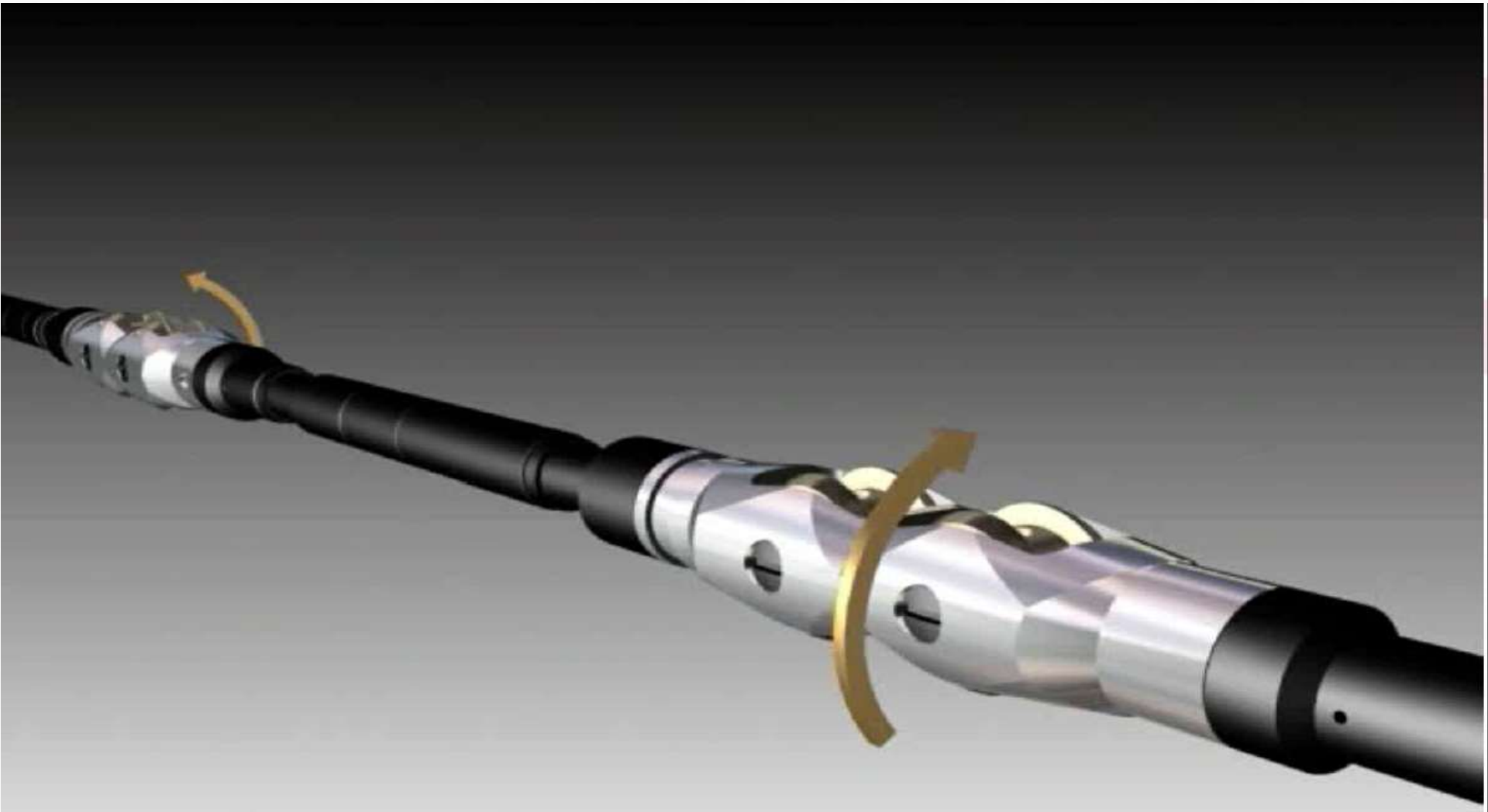
It can be set in a range of tubing weights at any depths, holds pressure from both directions.

Can be set below restrictions such as landing nipples and safety valves, can also be pulled through the restrictions.

Wireline Operations in Highly Deviated Wells

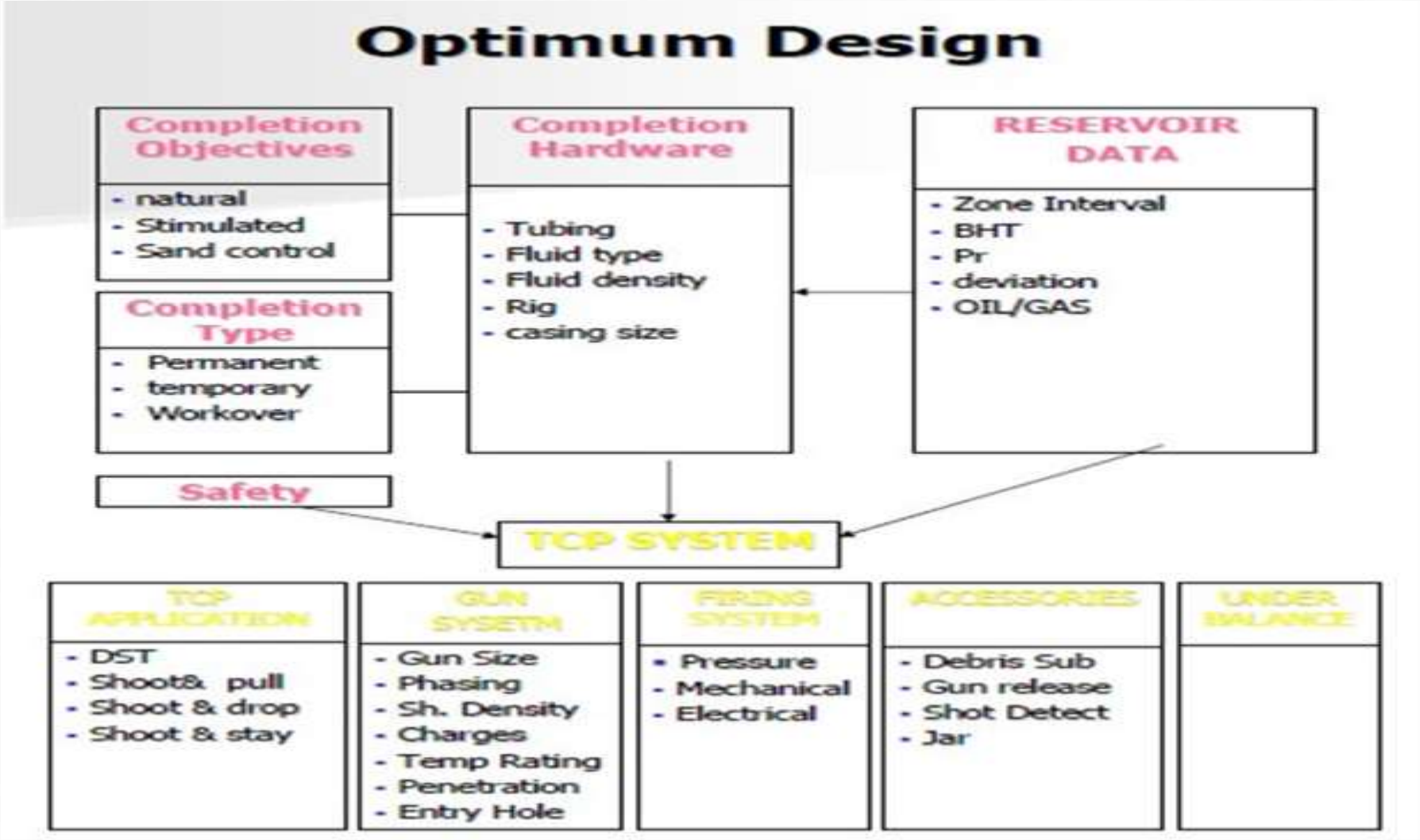
Mahmoud Farag Radwan

What is a Roller Bogie?



Mahmoud Farag Radwan

Tubing Conveyed Perforating (TCP)



Wireline Engineering Manual

(Drawings & Data Sheets)

Mahmoud Farag Radwan

References

- M. F. Radwan; Well Intervention Hand-outs in December 2018
- Halliburton Slickline Services Manual in 2010
- Schlumberger Slickline Training Manual in 2004
- D. Mitchell; Wireline Engineering, Offshore Well Intervention Conference 2014 Technology & Approach for the North sea Managing Friction, Extending the range of Wireline
- Matt Billingham; Schlumberger, Digital Trigger: Safe, On-Demand, Efficient and Recordable Perforating on Slickline in 2012; EWAPS
- George E. King Engineering Slickline Basics Presentation (www.GEKEngineering.com)
- http://www.taylormadetc.com/
- American Petroleum Institute Exploration & Production Department. Wireline Operations and Procedures.

Thank You

Mahmoud Farag Radwan