# Coiled Tubing Technology, Principles, Procedures & Troubleshooting

# Agenda

- ❑Introduction to CT
- ❑Introduction to IWCF certification
- ❑Well control calculations
- ❑Well and completion types
- ❑Completion components
- ❑Wellhead – Xmas tree components
- ❑Wireline operation before moving CT to the well site
- ❑CT definition and uses
- ❑Safety of CT
- ❑Components of CT package
- ❑Standard rig up of CT equipment
- ❑CT barrier theory

- Pressure containment devices (primary barrier):
  1. Stripper
  2. Check valve
- Pressure containment devices (secondary barrier):
  1. Dual
  2. Triple
  3. Quad
- Pressure containment devices (secondary barrier):
  Shear/seal BOP
- Typical CT surface stack
- CT applications:
  1. CT cement plug
  2. N2 kick off or lifting
  3. CT conveyed perforation
  4. Open and close SSD's in horizontal completion

5. Well stimulation:
   - ❑ Acidizing
   - ❑ Hydraulic fracturing
   - ❑ Fracture acidizing
6. Hydraulic fracturing
7. Scale and sand clean out
8. Milling
9. Fishing
10. Pumping: applications

❑Working in H2S environment

❑Risk assessment matrix

❑Hazards zone classification

❑Personal protective equipment PPE

- ❑Life saving roles
- ❑Macondo well-Deep horizon disaster
- ❑3 persons died in H2S incident
- ❑CT emergency response procedures:
  1. CT parted at surface between reel and injector head
  2. CT parted downhole
  3. CT Parted between injector head and stripper assembly
  4. Stripper assembly leaks
  5. Hole in CT above stripper at surface
  6. Surface leak above shear/seal BOP
  7. Pump Failure
  8. Check valves are not holding pressure
  9. Power pack failure
  10. Platform shut down

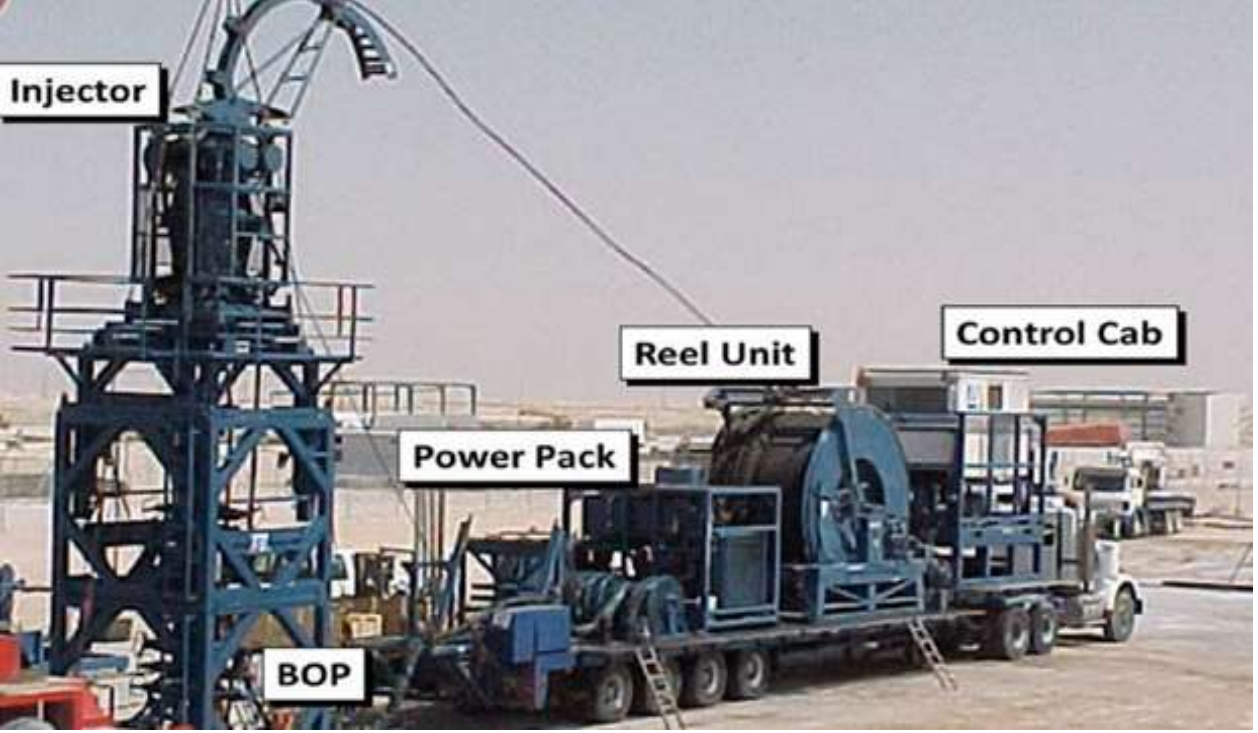
# Introduction:

- Coiled tubing provides well intervention services that substantially reduce costs for many workovers, remedial & specialized drilling operations formerly requiring a rig

- Common CT size ranges from 1-1¾ inch. Due to current economical changes & CT advance technology larger size ranges from 2-3½inch

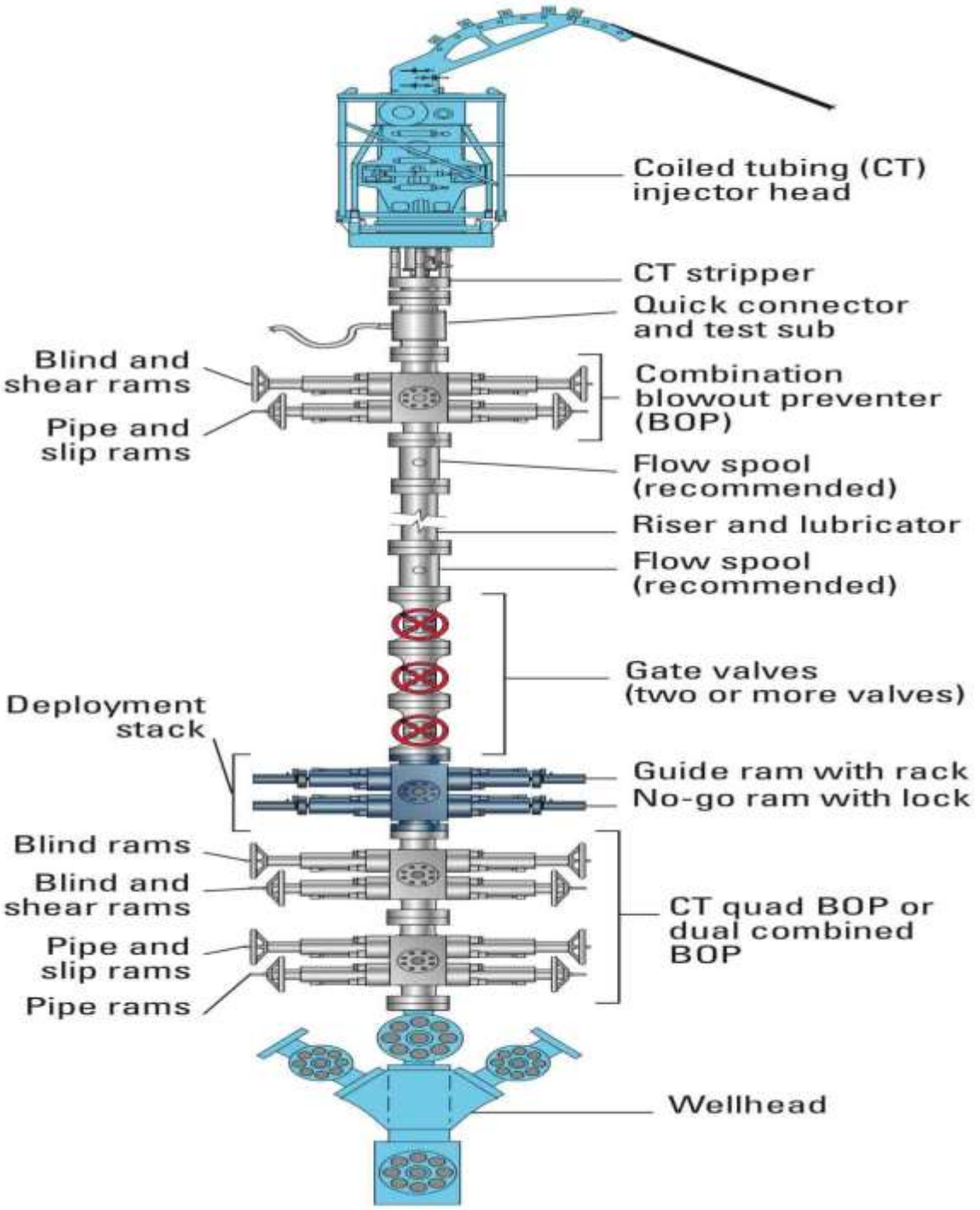
- CT can easily be transported, rigged–up & rigged-down in a short period of time, Offshore - 3hrs & Onshore 1½hrs

- Currently maximum working depth is 25K feet @ 250 ft/min running speed
- CT is cheaper & faster
- Alternative method to perform downhole works compared to conventional methods


Injector
Reel Unit
Control Cab
Power Pack
BOP

## CT rig up for logging on high pressure wells

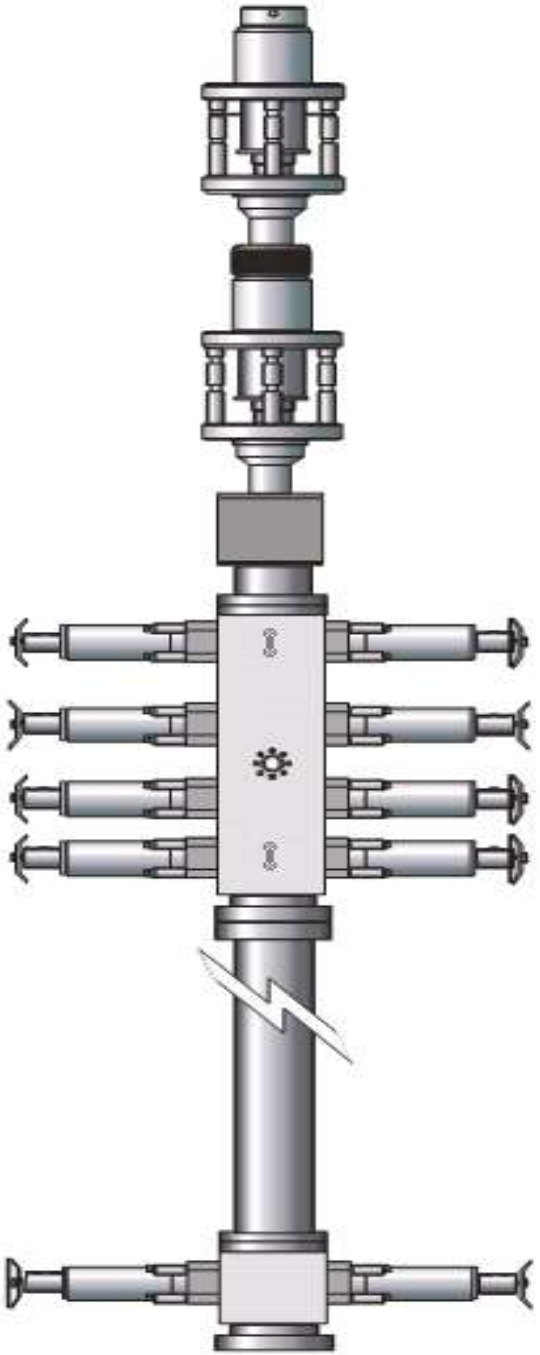
- The rig up shown identifies the PCE required for this operation.
- Rig up sequence from below to up: Quad BOP or dual combi BOP, above it there is deployment stack then 2-3 gate valves then flow spools then combi BOP then stripper then injector head.
- After making up wireline tool string in the lubricator, rig up lubricator and RIH tool string in hole, stop wireline till deployment bar is against deployment stack, close deployment stack on deployment bar, bleed off pressure in lubricator, rig down lubricator, rig up injector head and PCE blow it, connect CT to deployment bar, equalize pressure then open deployment stack and start RIH.



Primary Barrier

Secondary Barrier

Tertiary Barrier

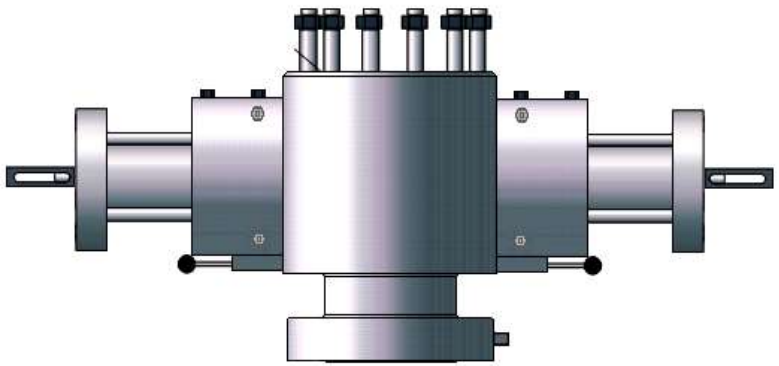


Upper side door stripper

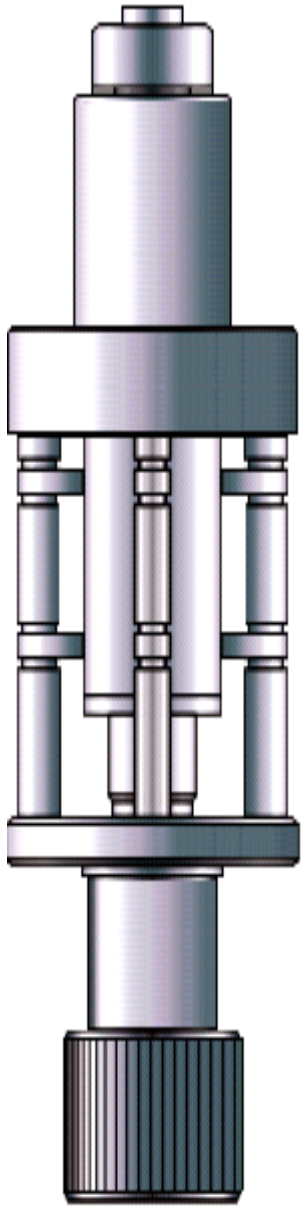
Lower side door stripper

Blind ram
Shear ram
Slip ram
Pipe ram

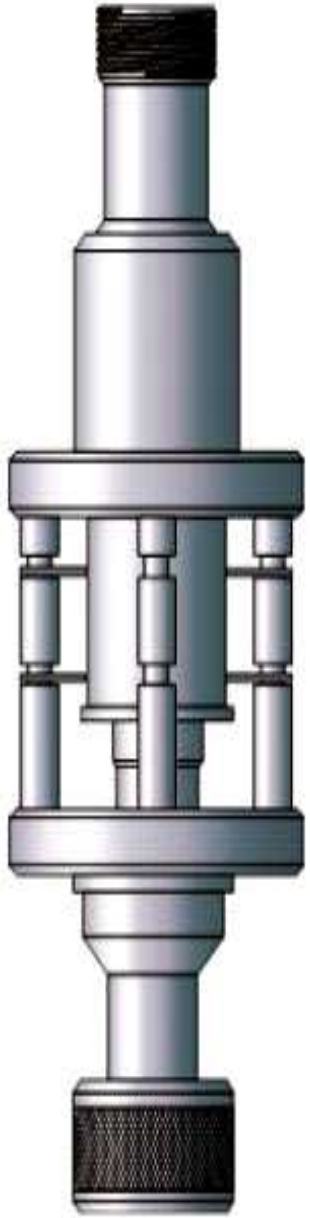
Shear/Seal BOP



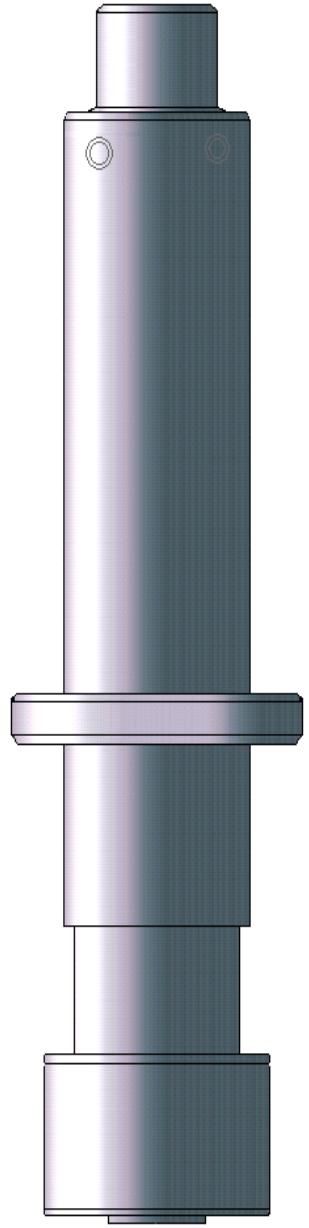
Radial stripper



Side door stripper

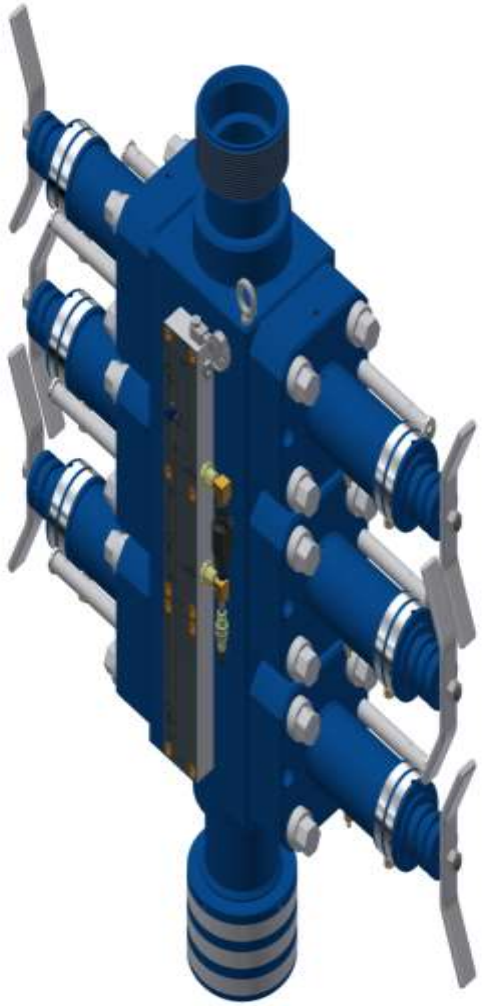


Tandem stripper

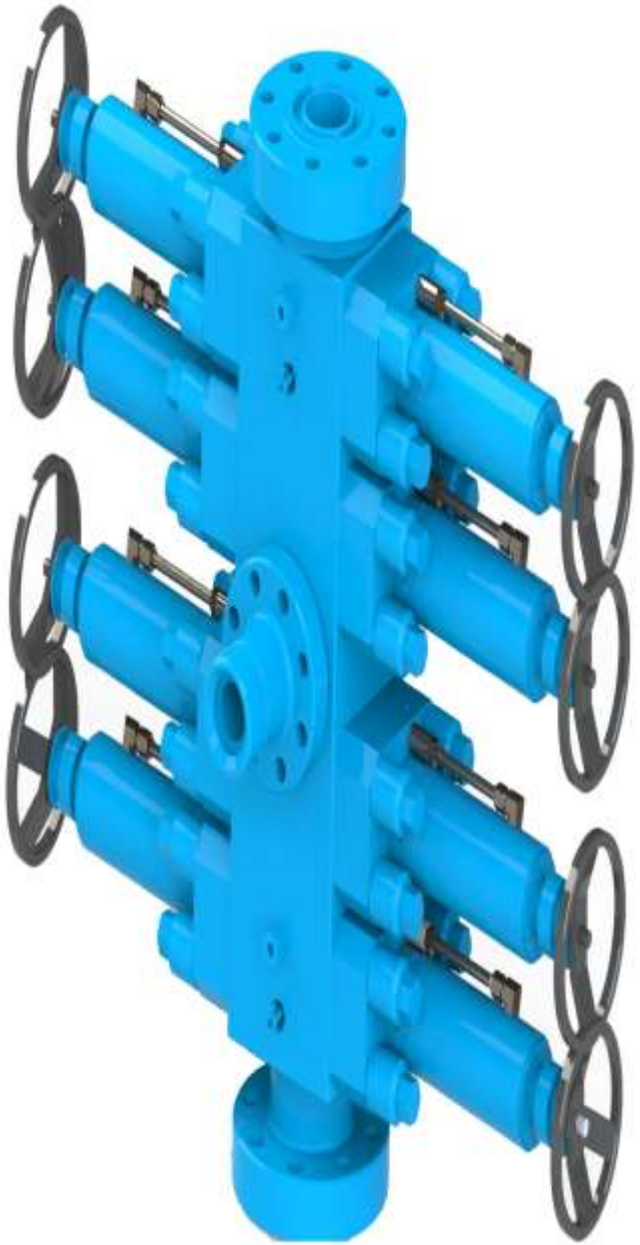


Conventional stripper

Combi



Triple



Quad

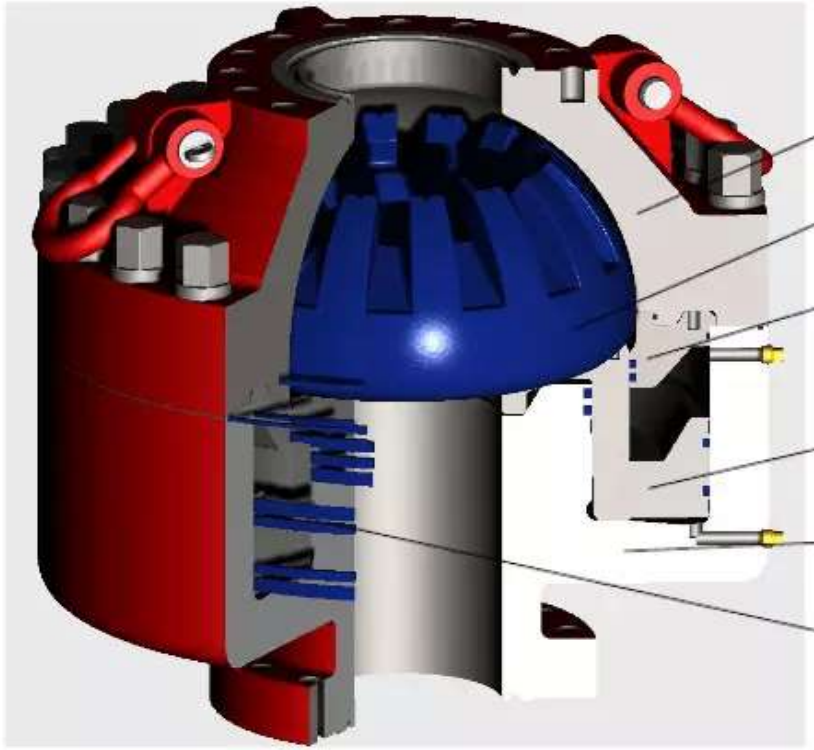
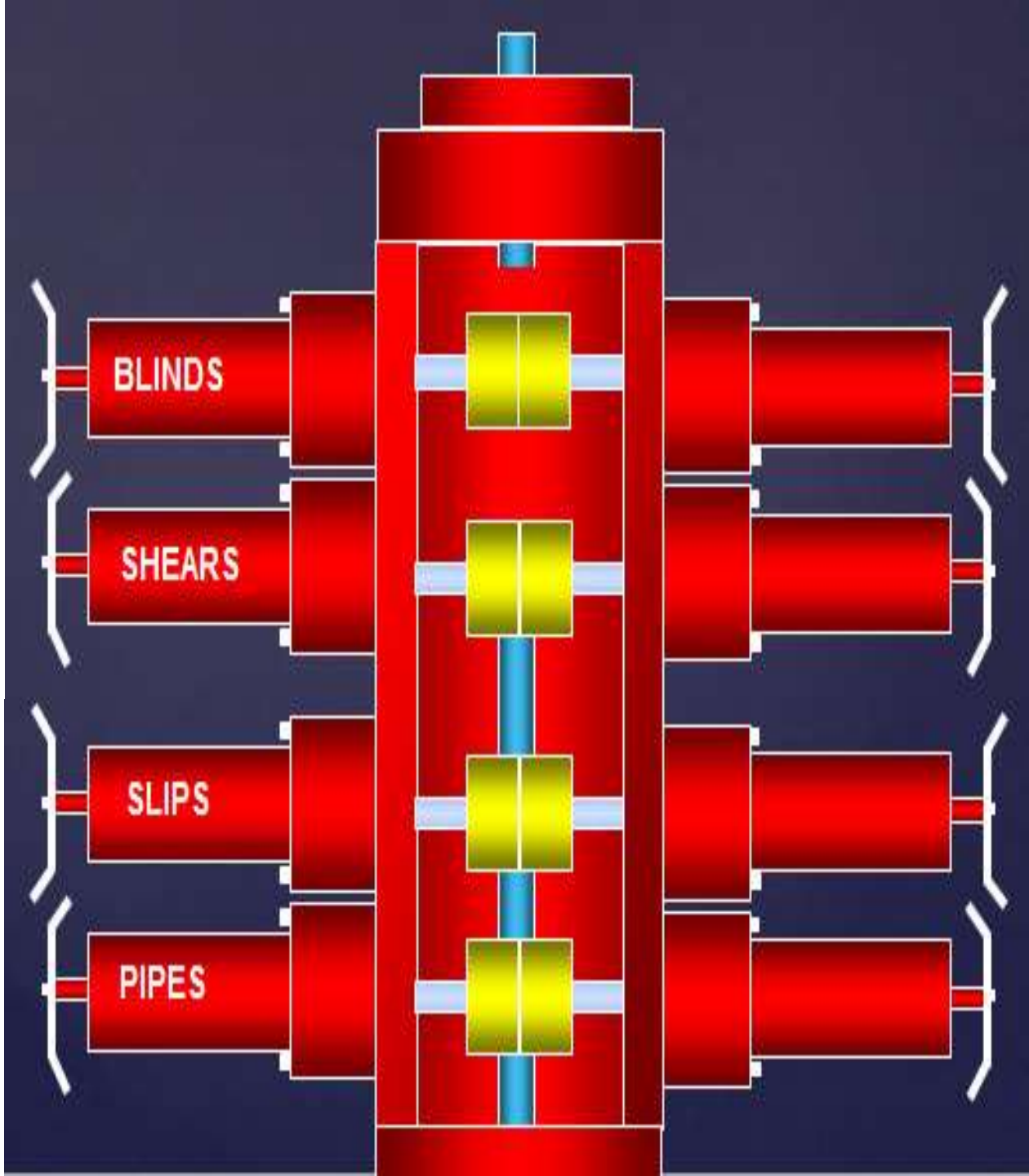


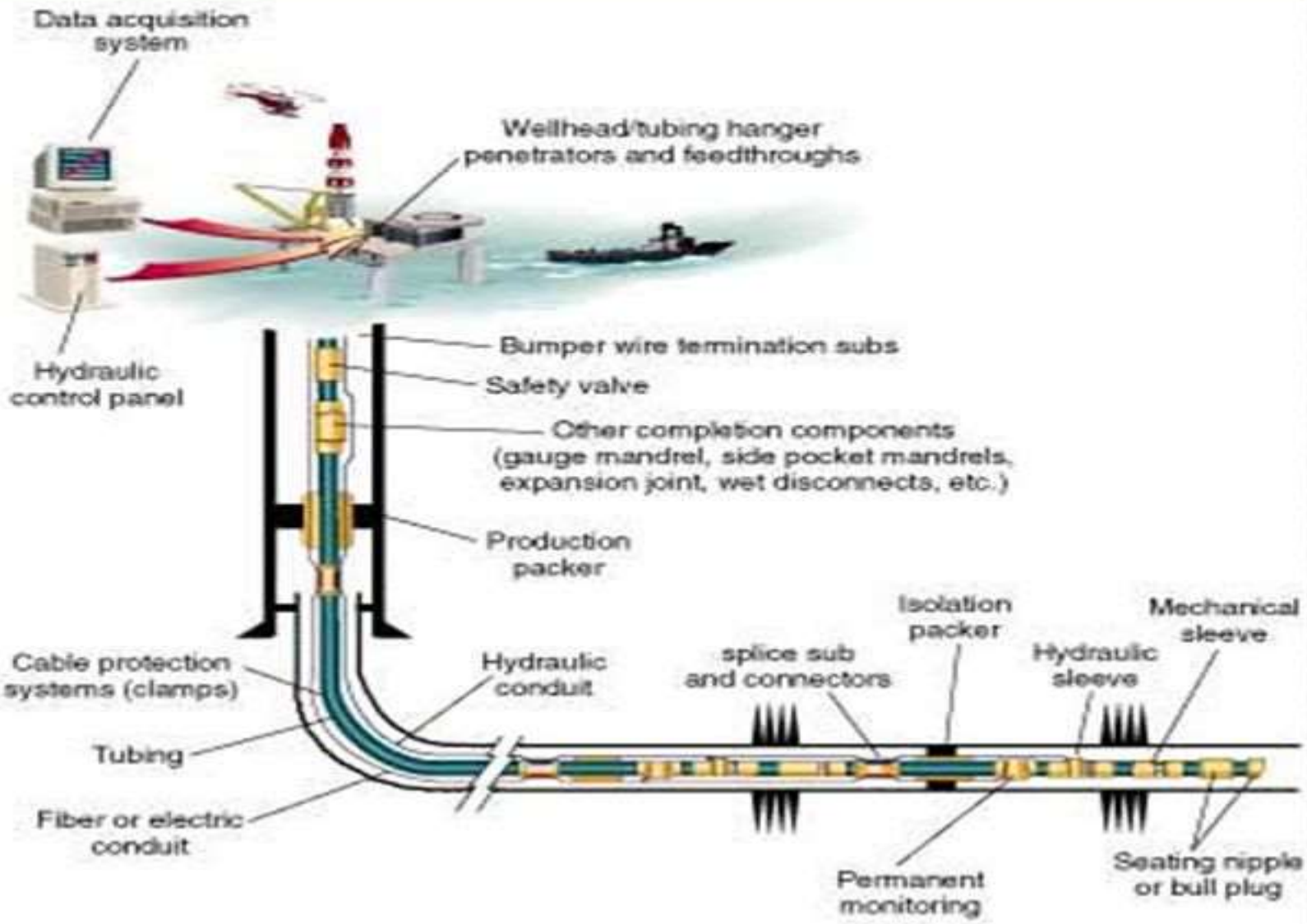

Figure 1 FH35-35/70 Annular BOP (Between bonnet and shell is flange connection)

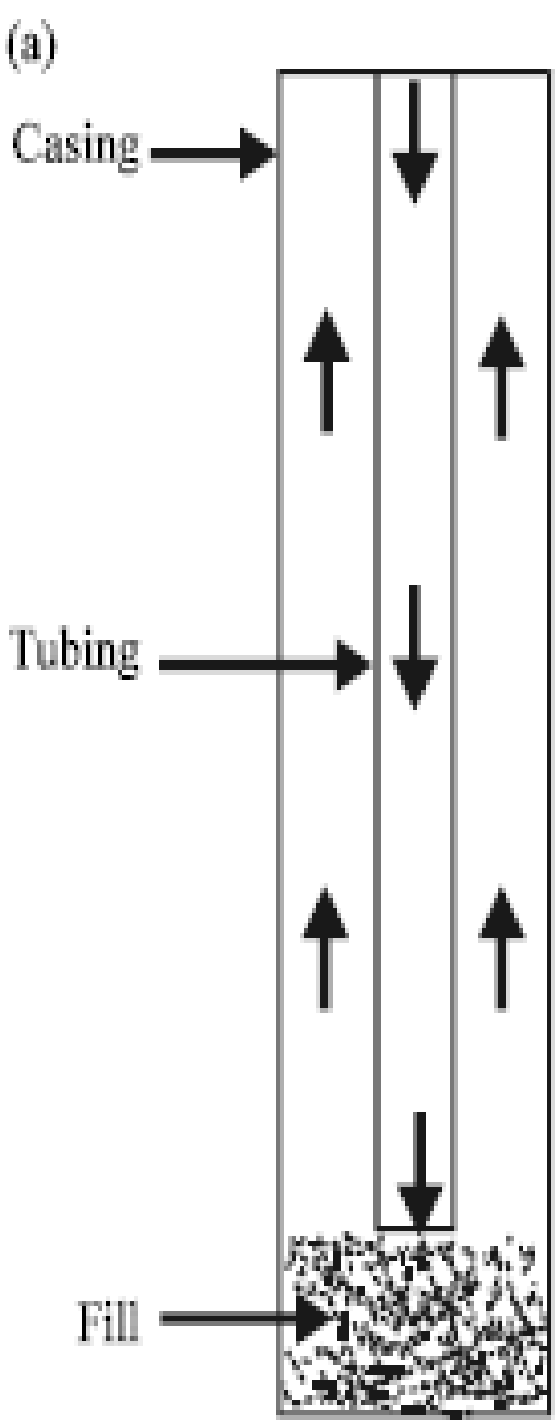



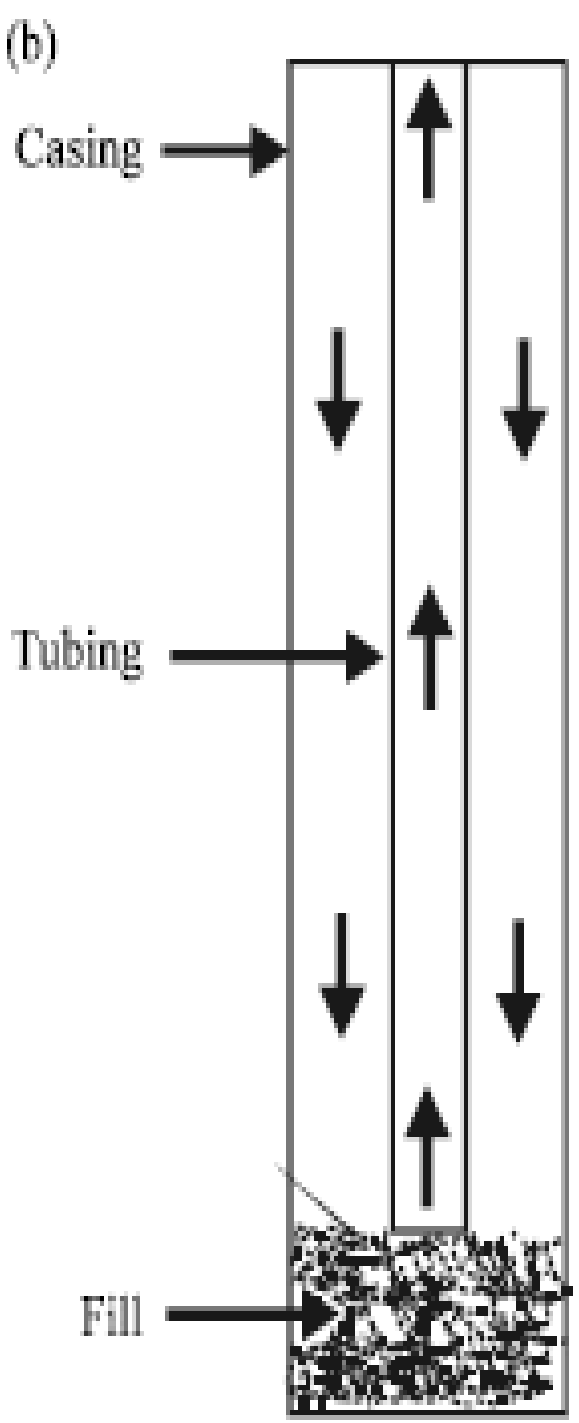
N2 tank


N2 pump

# Horizontal Completion




(a)
Casing
Tubing
Fill


(b)
Casing
Tubing
Fill

## CT emergency response procedures

1. CT parted at surface between reel and injector head
2. CT parted downhole
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4. Stripper assembly leaks
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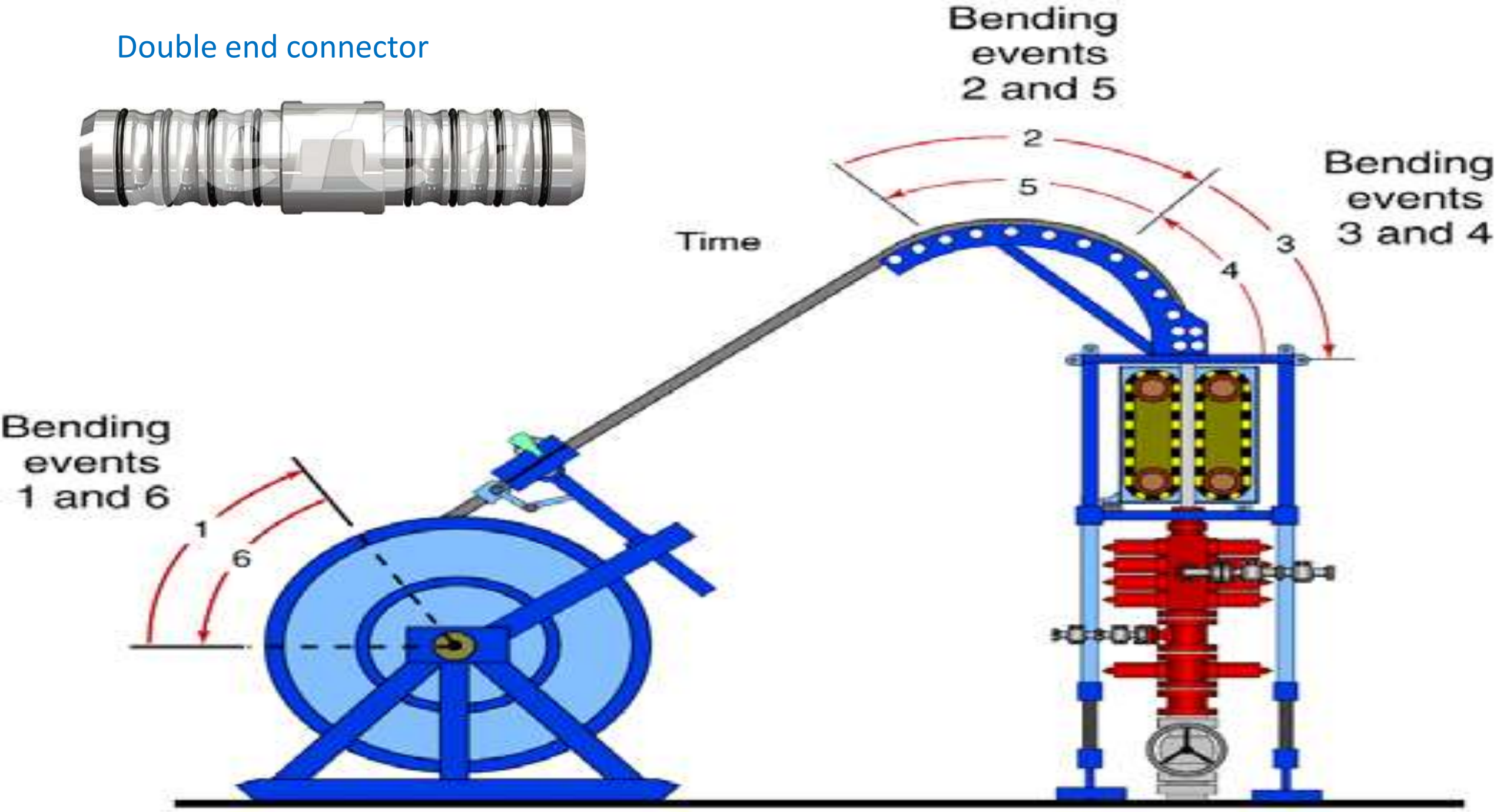
Double end connector





## ➢ Power pack failure:


1. Close slip ram hydraulically then manually
2. Close pipe ram hydraulically then manually
3. Apply reel brake if it is not fail safe applied (should be automatic lock)
4. Maintain circulation if required, as pump source is independent
5. Repair or replace power pack and resume operation