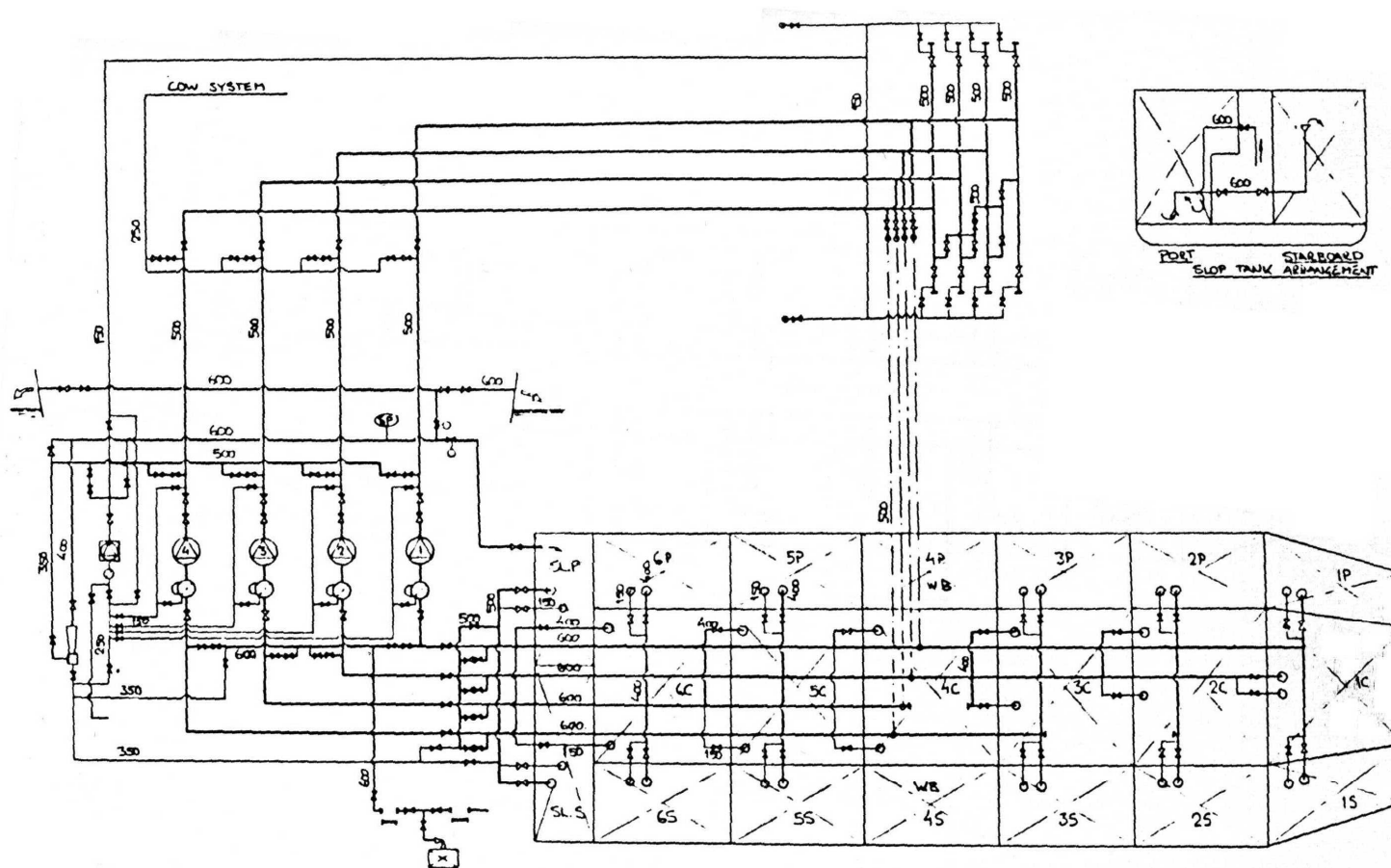


BRODSKI POMOĆNI SUSTAVI

Sustavi na tankerima

Sustav tereta



Posušivanje i ocjeđivanje

- sustav s pumpnom stanicom
 - više tankova na jednu pumpu, posušivanje se vrši ejektorom ili stapnom pumpom ili vakuum pumpom i odjeljivačem plinova
- sustav s uronjenom pumpom
 - regulacijom broja okretaja uronjene pumpe i posebnim cjevovodom
- sustav s bunarskom pumpom
 - posebnim cjevovodom za posušivanje (propuhivanjem)

Smještaj pumpi

- pumpna stanica
 - sirova n., derivati, OBO
- mini PS
 - “shuttle t.”, kemikal-tankeri
- strukturna pregrada - “cofferdam”
 - OBO, kemikal-tankeri
- uronjene i bunarske pumpe
 - derivati

Posušivanje i ocjeđivanje

- Prednosti sustava s PS

- veliki kapacitet i η
- različiti pogoni
- manje pokretnih dijelova
- pristup i održavanje
- redundancija

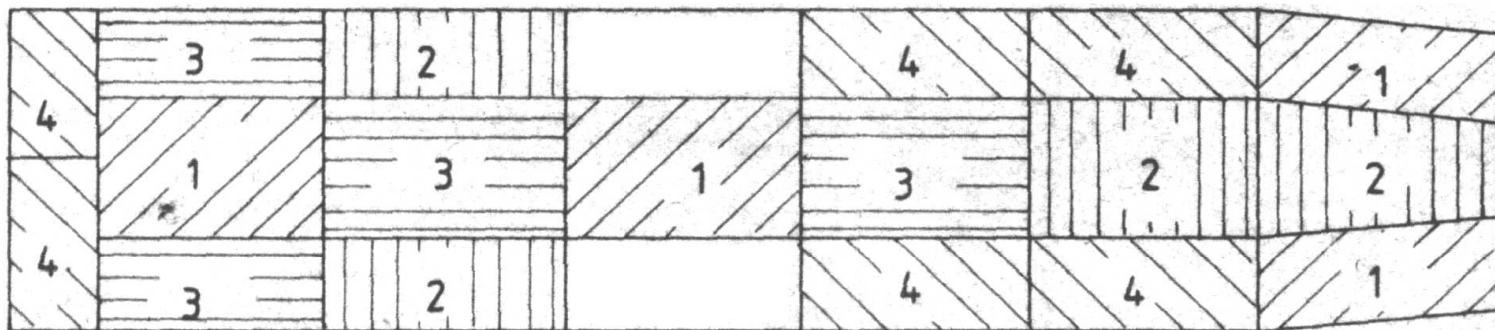
Shuttle t. i za veće udaljenosti

- Prednosti sustava s UP

- manje pumpne j.
- jednostavna regulacija broja okr.
Veliki broj segregacija

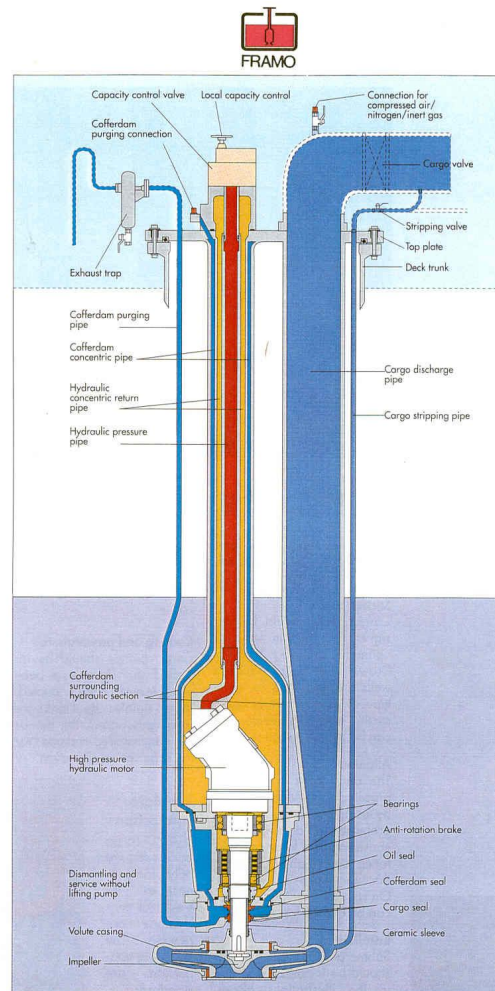
Mogućnost kontaminacije tereta uljem iz hidrauličkog s.

GRUPIRANJE TANKOVA

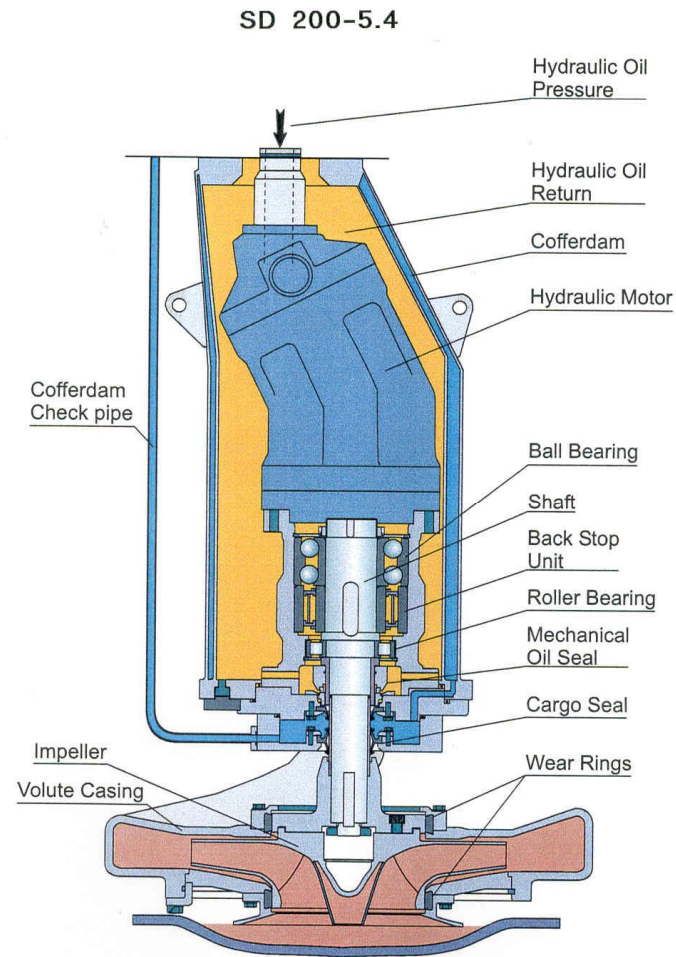


CARGO TANKS SEGREGATIONS

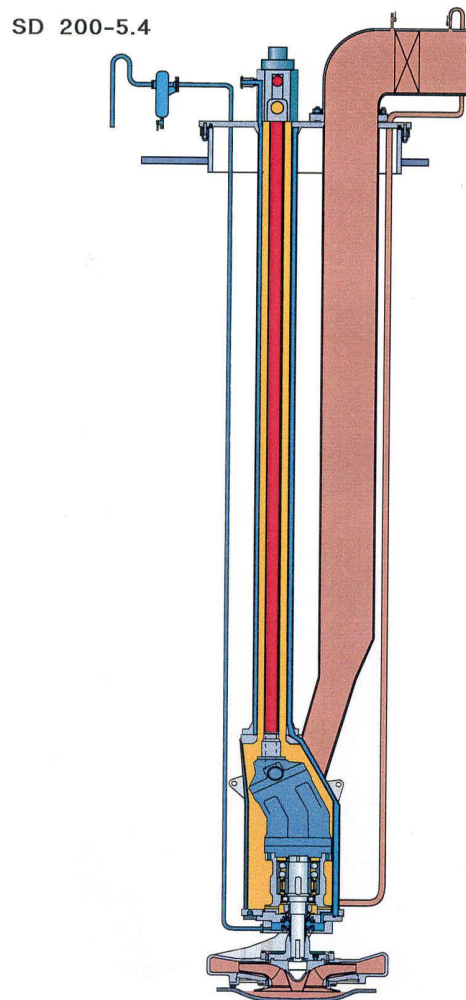
Posušivanje i ocjeđivanje



Posušivanje i ocjeđivanje

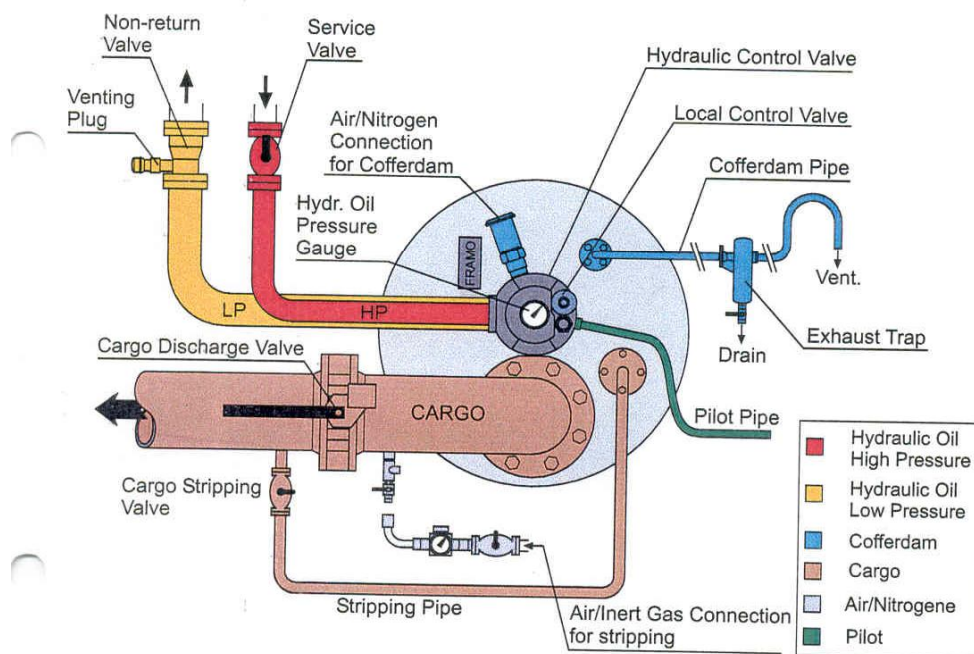


Posušivanje i ocjeđivanje

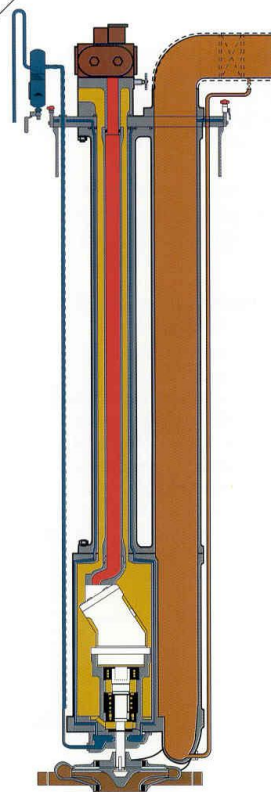


Posušivanje i ocjeđivanje

SD 200-5.4



Posušivanje i ocjeđivanje



Routine when servicing the pump **USE OF STANDARD TESTING FLANGES**

- ✓ Prior to dismantling of the cargo pump pressure test the cofferdam to identify any leak.
- ✓ Use soapy water for better leak detection.
- ✓ If leakage is difficult to identify, split the pump in major parts and pressure test separately.
- ✓ Use of FRAMO standard test flanges will ensure an efficient service job.
- ✓ After assembling of the cargo pump pressure test to confirm that the leakage is corrected.

Posušivanje i ocjeđivanje

PRESSURE TESTING ROUTINES - FRAMO CARGO PUMP

Figure 1
Testing of complete cofferdam

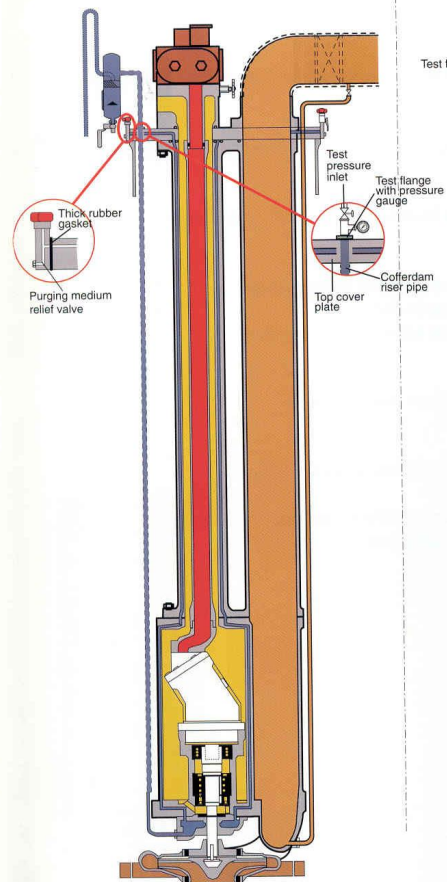
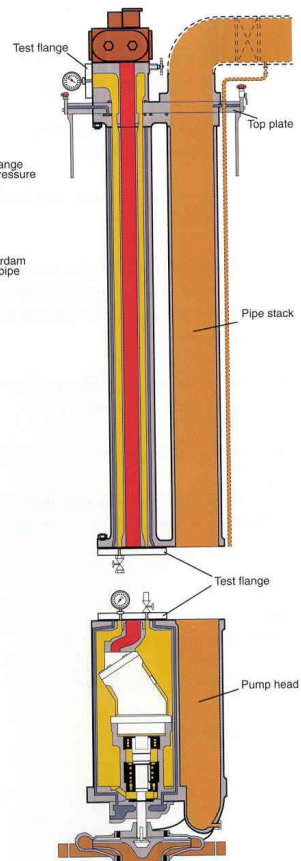
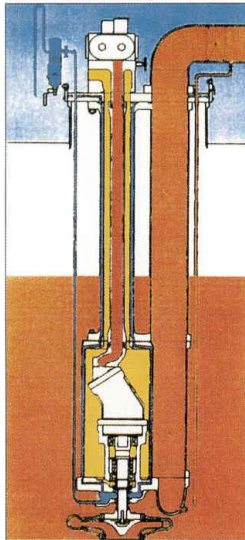


Figure 2
Hydraulic leak detection



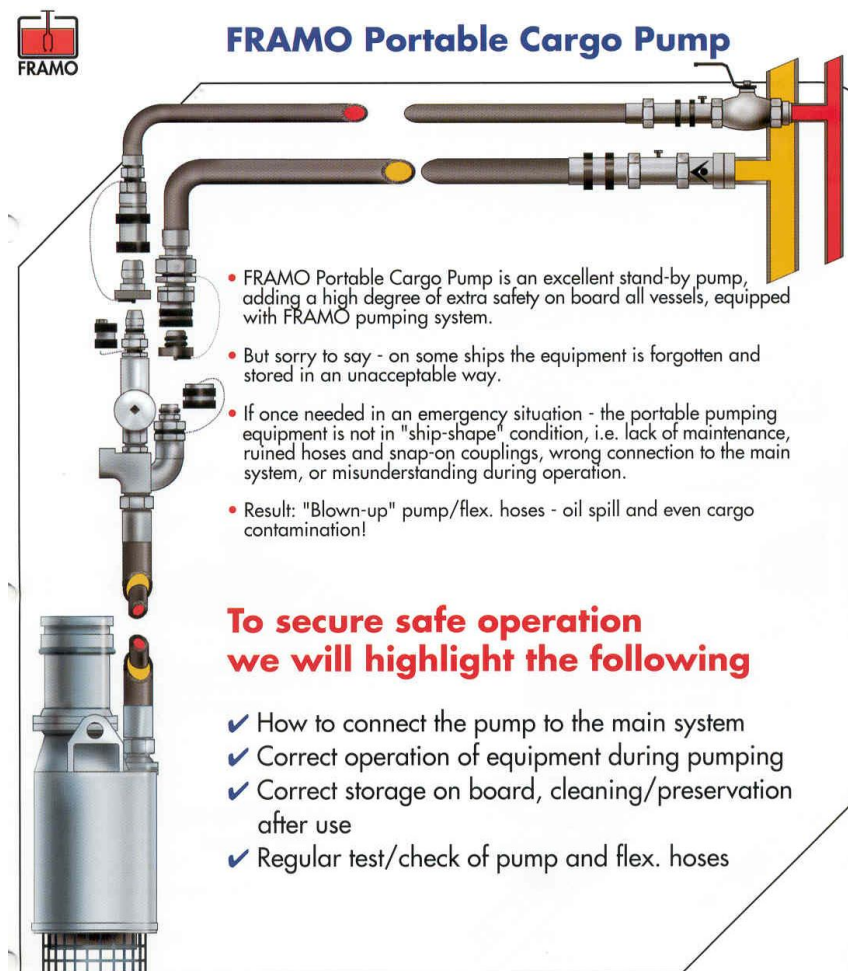
Posušivanje i ocjeđivanje

Operation of FRAMO Cargo Pumps

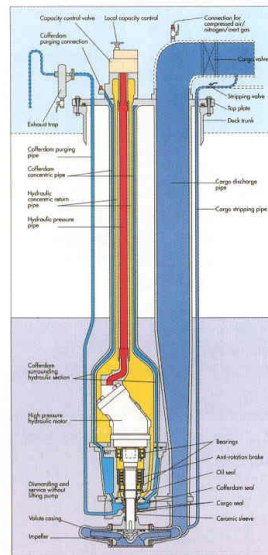


- ✓ **Filling through pump**
Note max. 8 bar cargo pressure
- ✓ **Before and after discharging**
Purge pump's cofferdam
- ✓ **Discharging**
Regulate cargo flow & pressure by pump speed, not by cargo valve
- ✓ **Circulation through deck heater**
Start pump before heat medium is on
Stop pump after heat medium is off
- ✓ **Stripping**
At lowest possible back pressure
- ✓ **Tank washing**
Adjust pump capacity to meet flow from washing machines

Posušivanje i ocjeđivanje



New routine for distribution and filing.



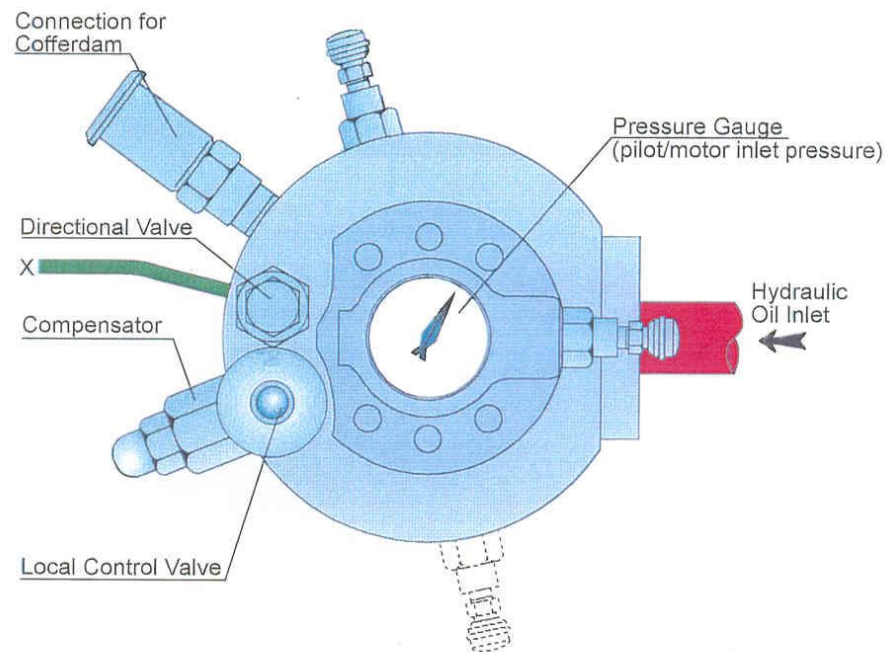
- ✓ Purge the pumps cofferdam regularly.
- ✓ Log and evaluate the purging result.
- ✓ A clean and open cofferdam gives trouble free cargo pumping.
- ✓ The ship's staff on board have the primary responsibility for purging and necessary action to be taken, – knowing the actual operation and running conditions.
- ✓ If in doubt fax FMS AS for advise, and a quick answer will be returned.
- ✓ Send the purging diagram to Shipowner and FRAMO for control and filing. According to new routines for 1995, they will normally not be answered by FRAMO due to time of delay.

PURGING ROUTINE FOR FRAMO SUBMERGED- CARGO PUMPS

[illegible]

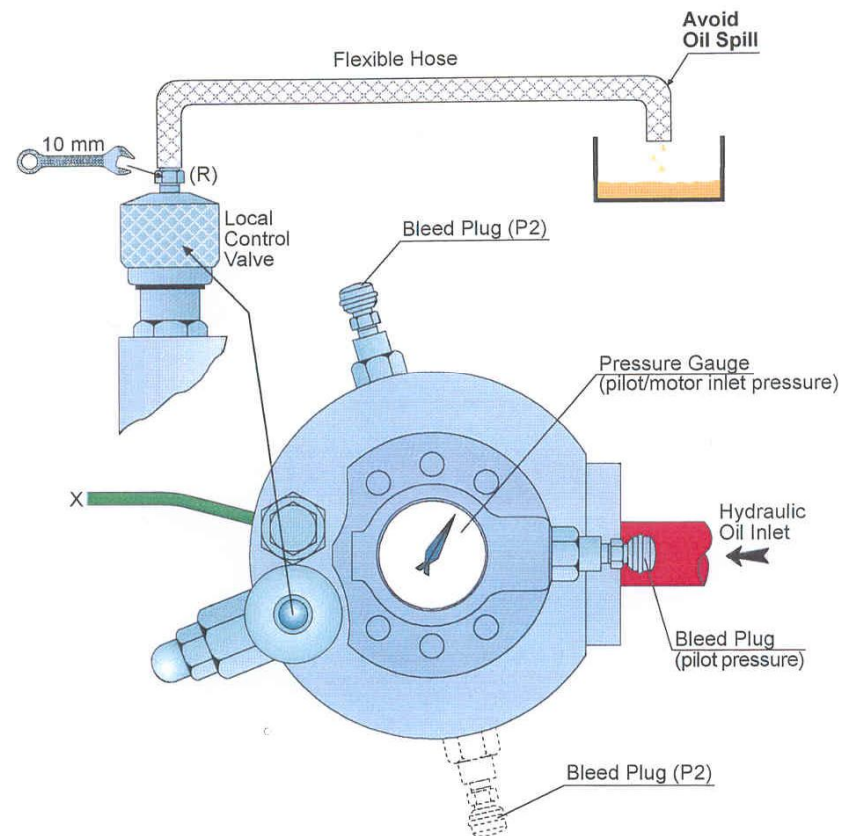
Posušivanje i ocjeđivanje

FRAMO Speed Torque Controller



Posušivanje i ocjeđivanje

FRAMO Speed Torque Controller

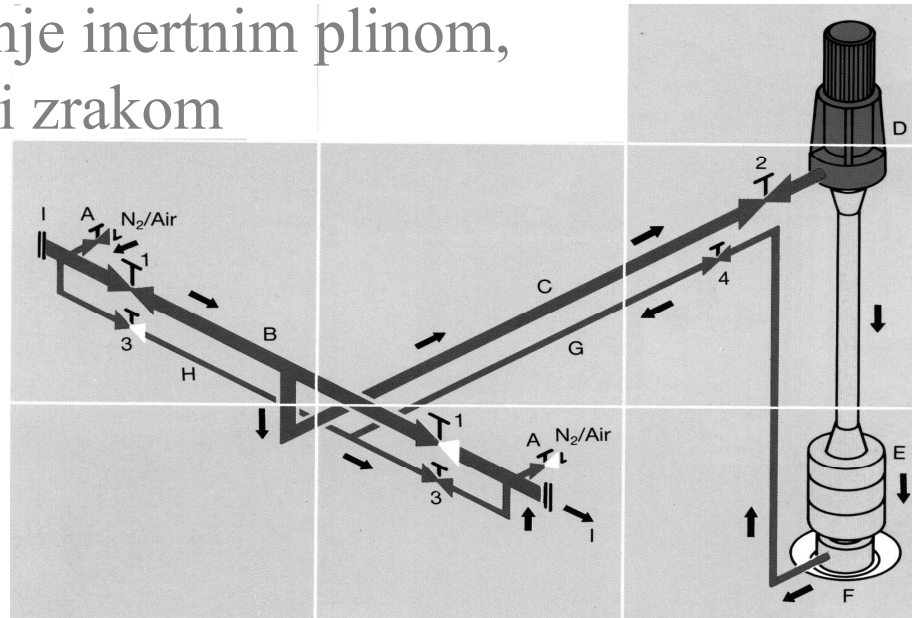


Posušivanje i ocjeđivanje

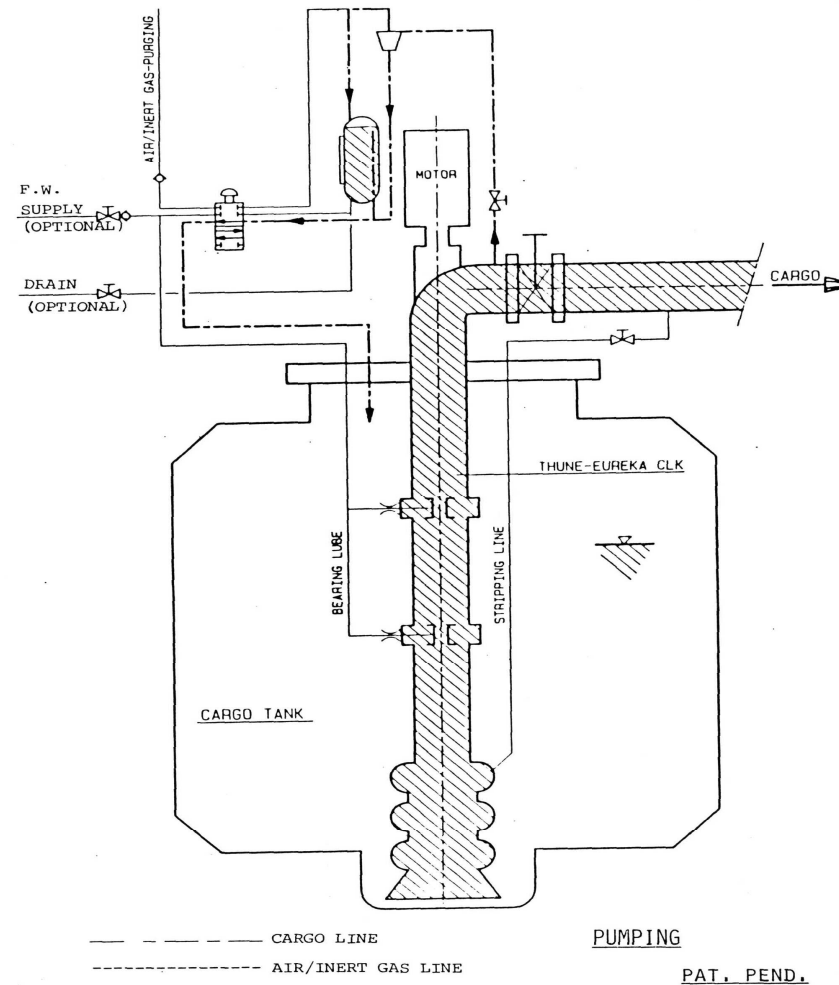
- Annex II Marpol konvencije
- Test posušivanja
- Sprječavanje povratnog strujanja
 - *mjerenje količine zaostale **vode** u usisnom zdencu, pumpi tereta te cjevovodu*
 - *nepovratnim ventilom (klapnom)*
 - *radom pumpe (pokretnim rotorom)*

Posušivanje i ocjeđivanje

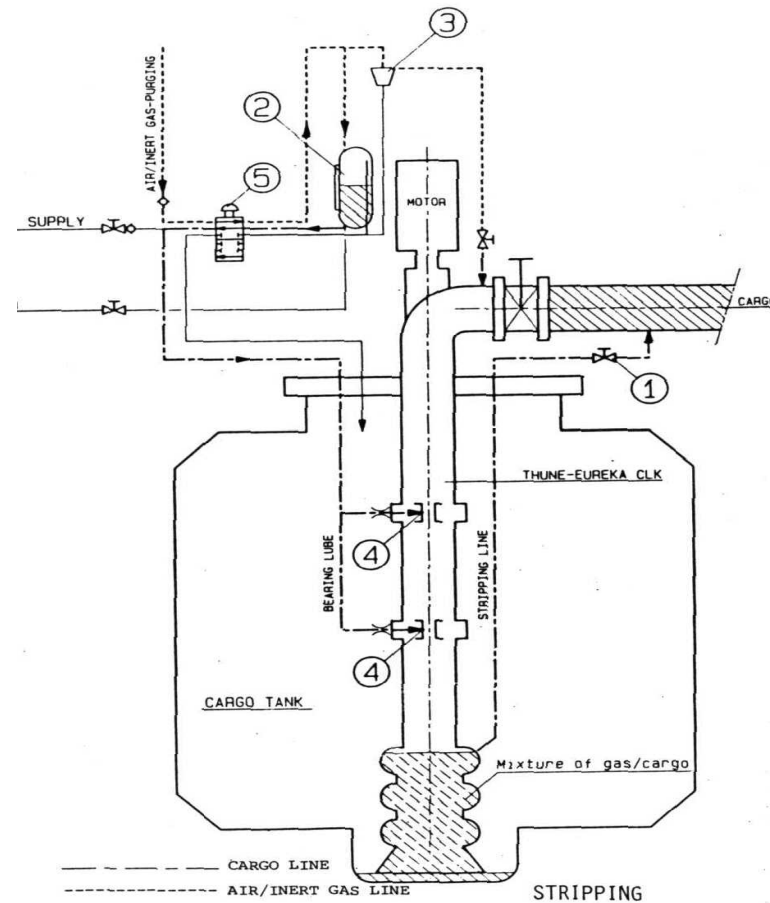
- posušivanje inertnim plinom,
dušikom ili zrakom



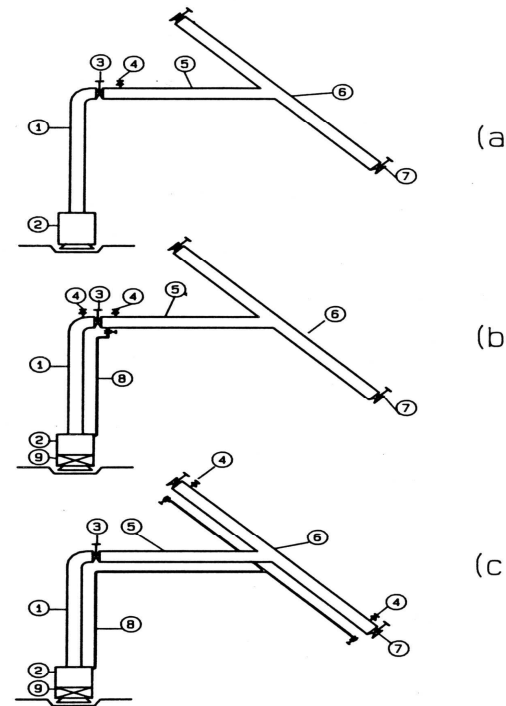
Posušivanje i ocjeđivanje



Posušivanje i ocjeđivanje

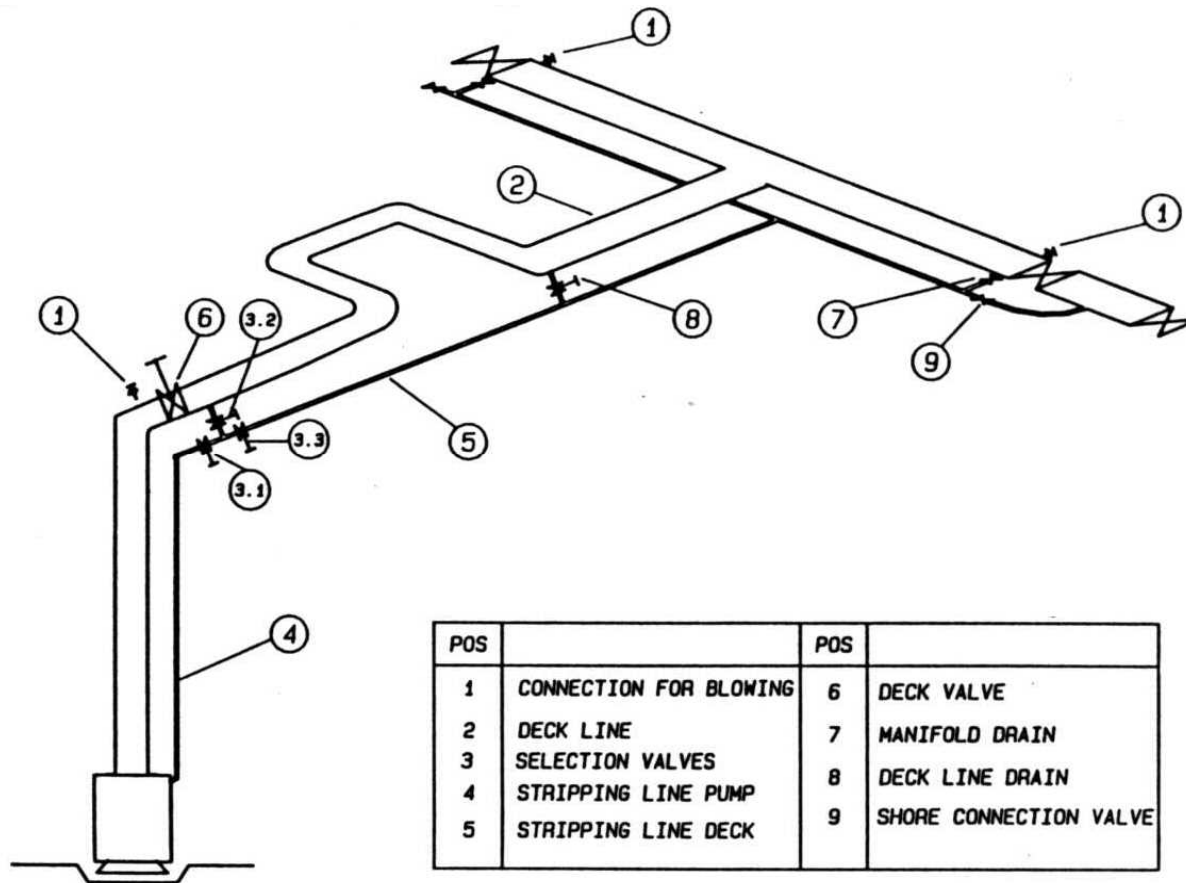


Posušivanje i ocjeđivanje



POS			
1	PUMP COLUMN	5	DECK LINE
2	PUMP STACK	6	CARGO MANIFOLD
3	DECK VALVE	7	SHORE CONNECTIONS
4	CONNECTION FOR BLOWING	8	STRIPPING LINE
		9	NON RETURN VALVE FUNCTION

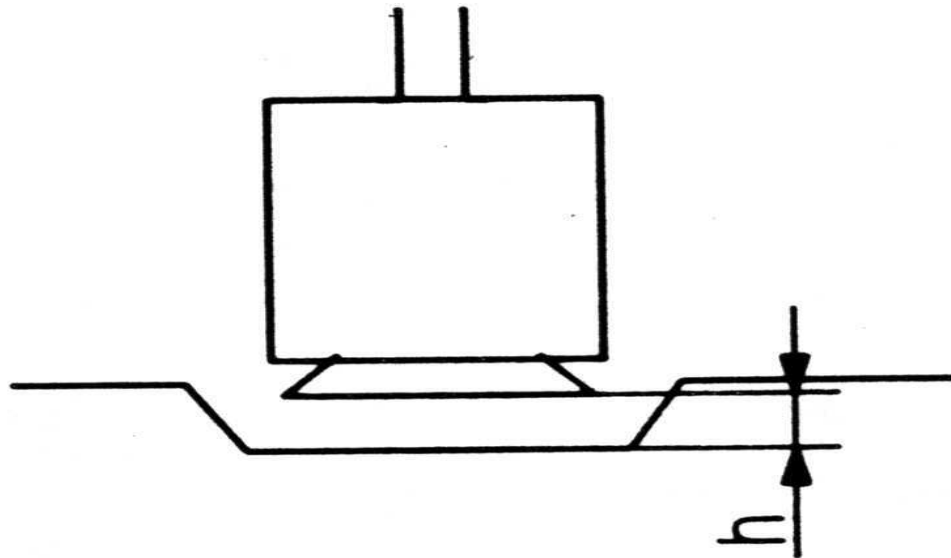
Posušivanje i ocjeđivanje



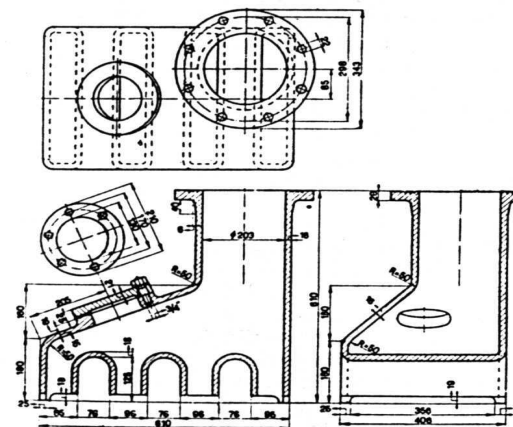
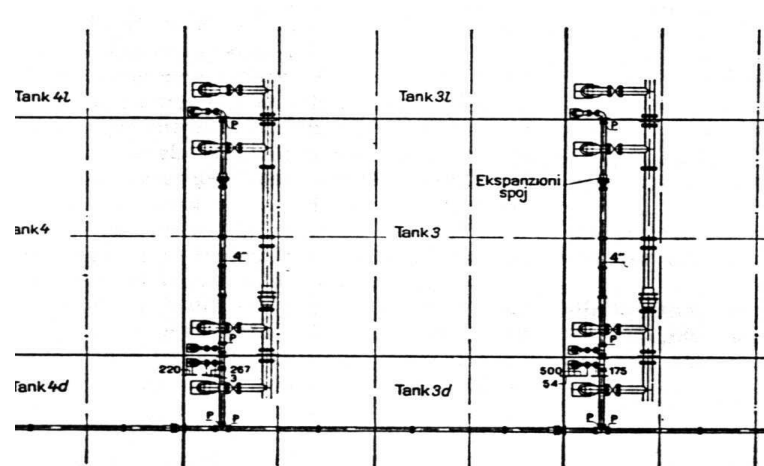
Posušivanje i ocjeđivanje

Količina zaostalih tekućina u usisnom zdencu ovisi o:

- obliku i veličini zdenca
- udaljenosti h (prema slici)



Posušivanje i ocjeđivanje



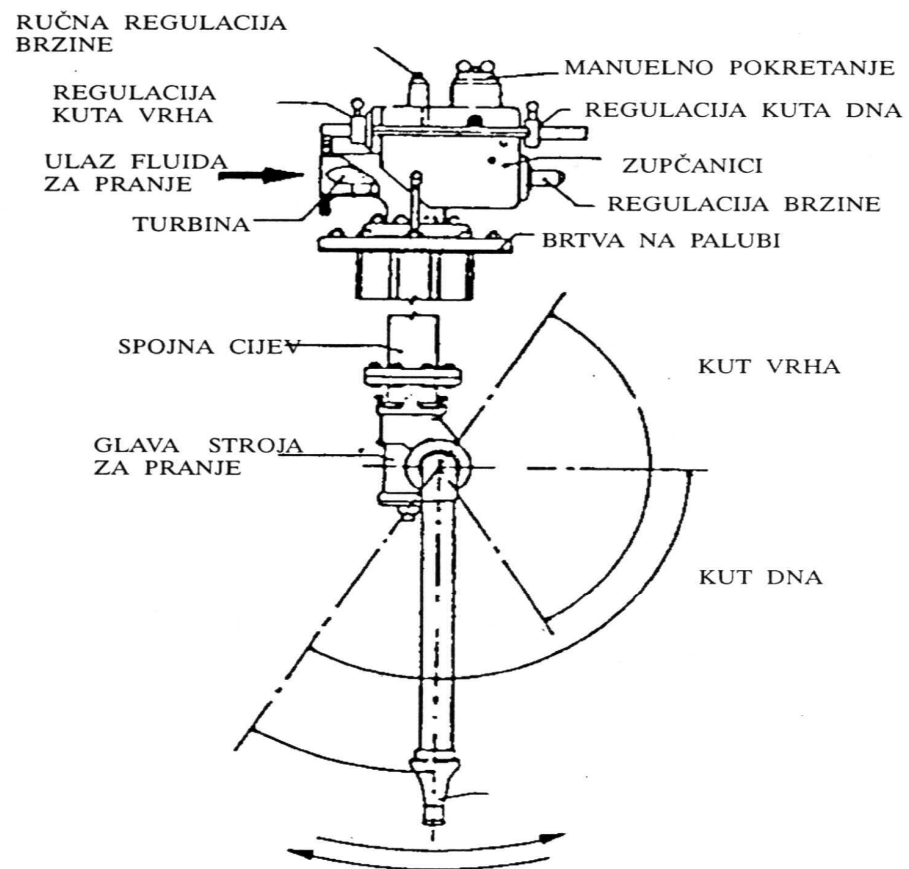
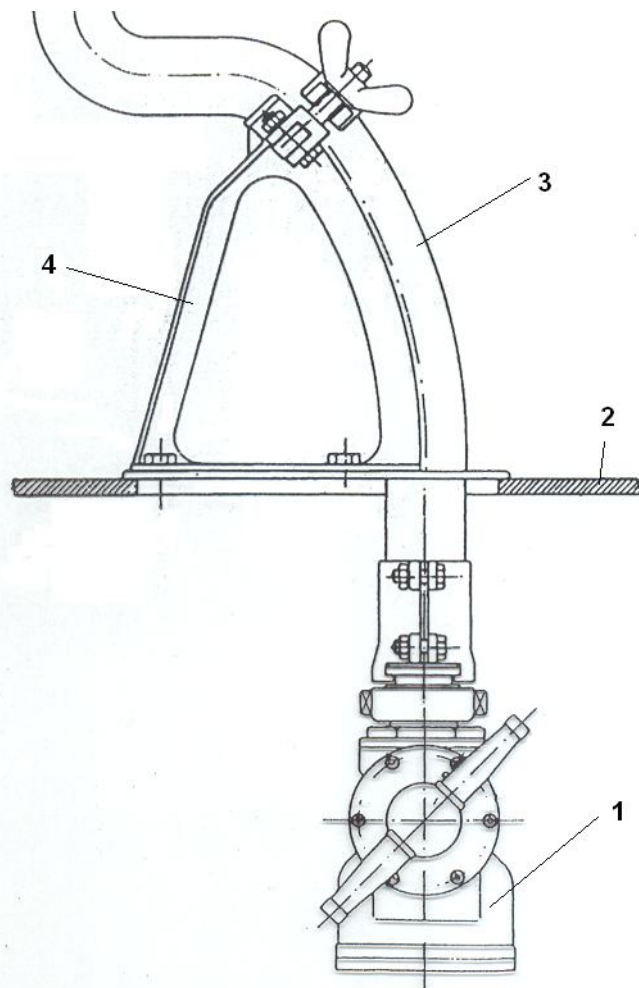
COW - međunarodni propisi

- svrha: nosivost, kalo, okoliš, korozija TT
- 1983. - IMO Code for COW systems
- od '79 tankeri nosivosti 20000 t i postojeći od 40000 t
- djelotvornost: horizontalne 90% direktni mlaz, okomite 85%
- 0,00085% ulja na povr. vode - čist tank

COW sustav

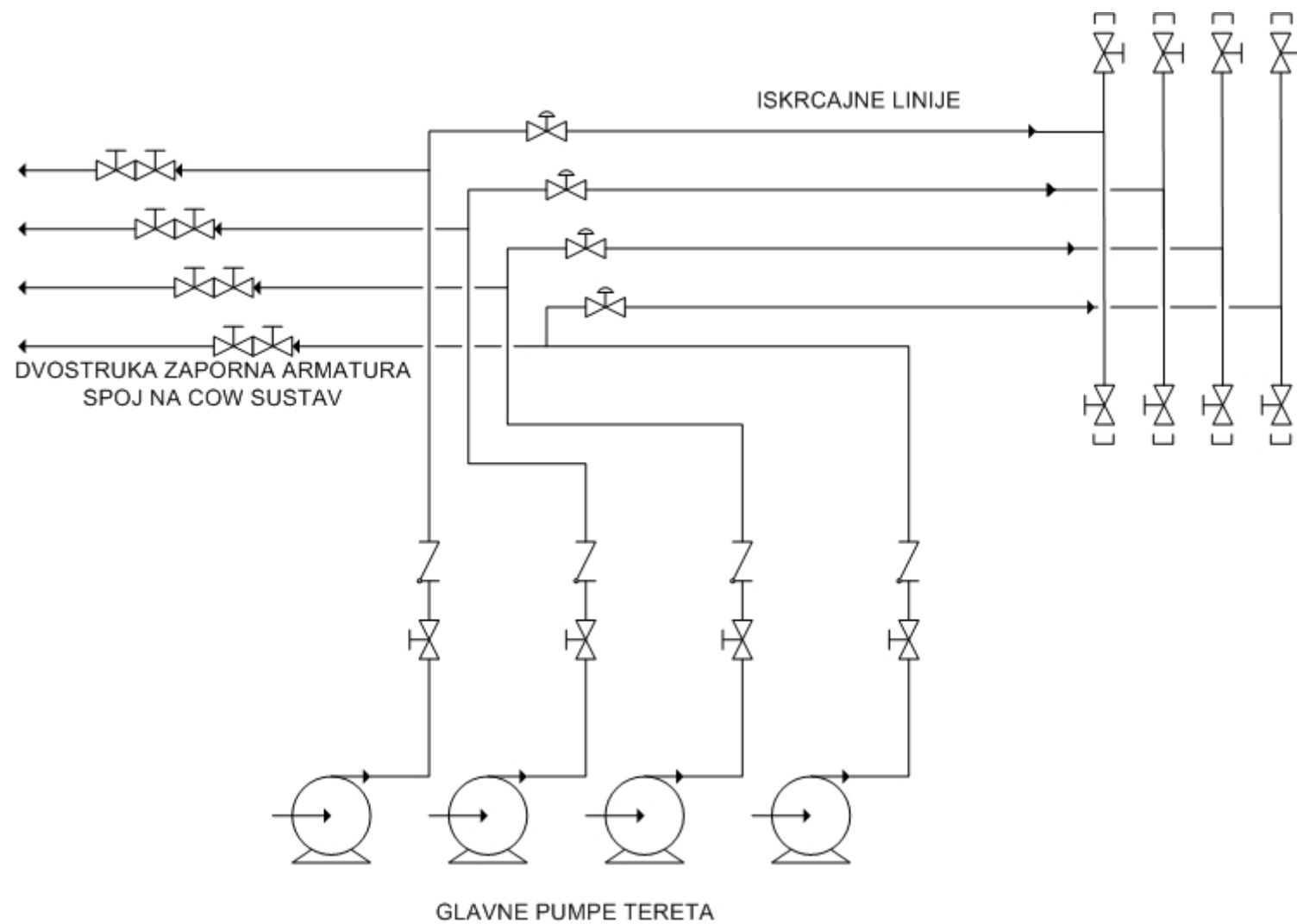
- fiksni cjevovod (nepropusnost)
- sigurnosni v. vode na usis PT
- odvojenost od prost. posade
- strojevi za pranje: promjer mlaznice, radni tlak, gibanje
- $p=10,5$ bar uz promjer od 25-38 mm daje domet 30-50 m
- brzina okretanja $0-3^{\circ}/\text{min}$ (1,5), a kut elevacije 3° po okretaju

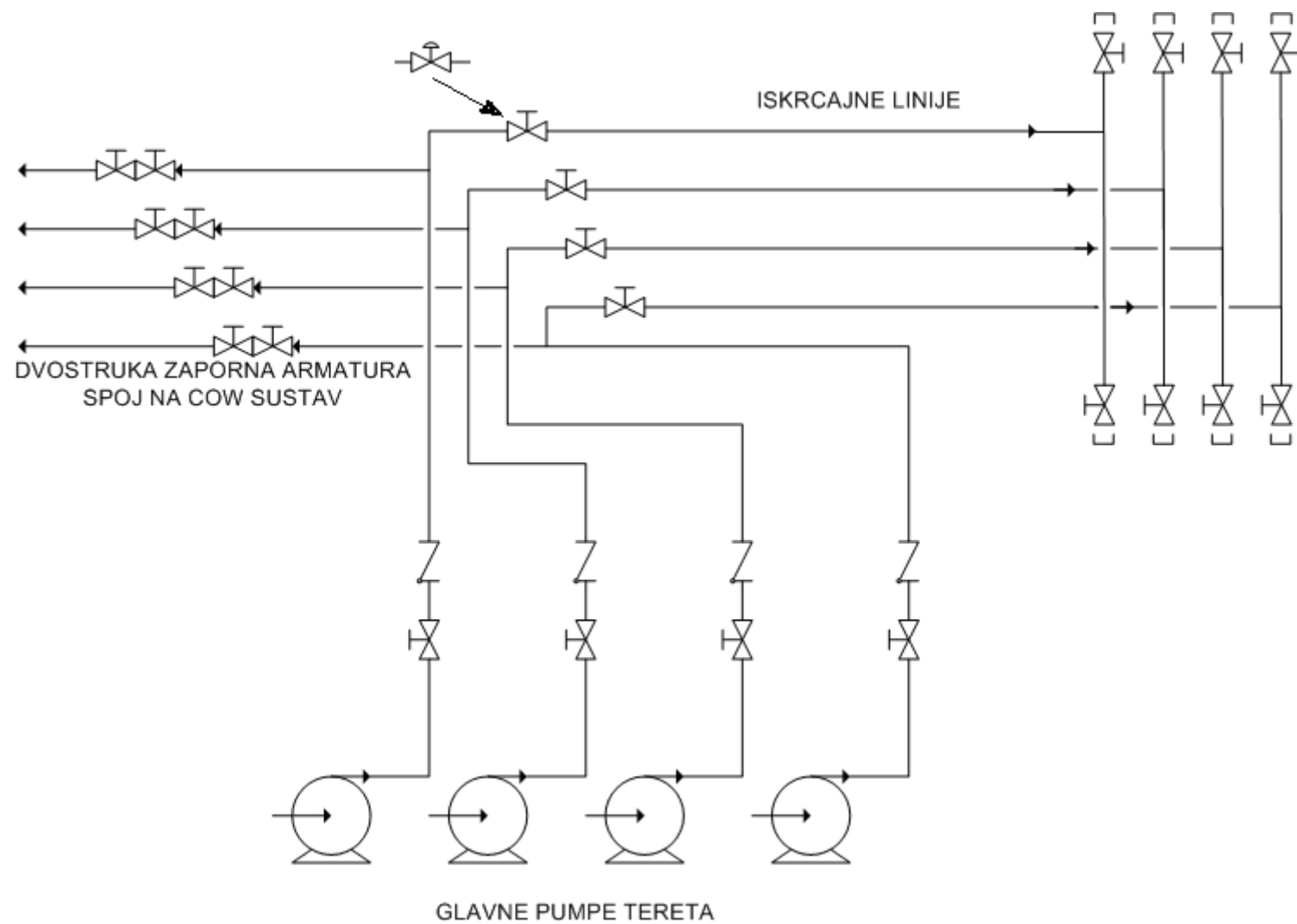
Stroj za pranje



COW - dobava nafte

- “bleed off” metoda
- 1 pumpa tereta
- recirkulacija nafte (kasnije faze pranja tankova)





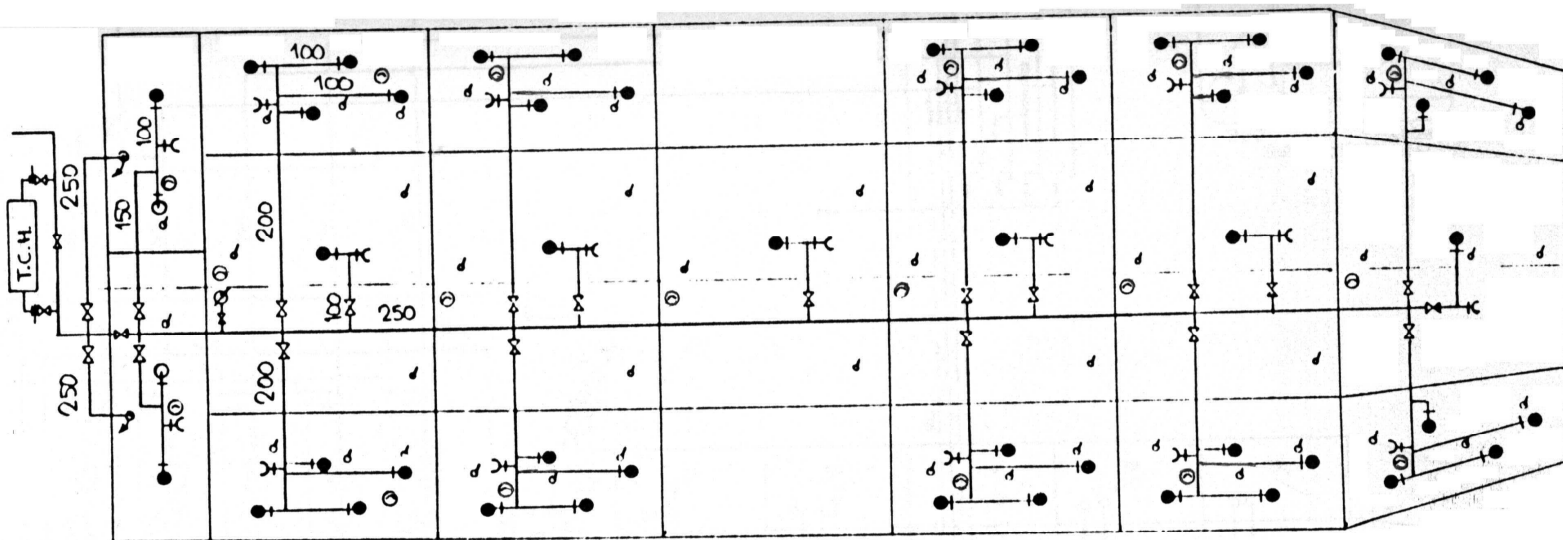
COW - predostrožnost

- IGS
- ispravnost opreme
- “suha” nafta (ispuštanje 1-2m)
- pridržavanje uputstva
- pogodnost nafte za COW (viskozitet ili točka tečenja)

Pogodnost nafte

- viskozitet pri temperaturi iskrcaja ne večí od 600 cSt
- temperatura iskrcaja za barem 10 K viša od točke tečenja
- Što ako nije pogodna?

COW - paluba



- — Deck mounted COW machine with stop valve
- ⊕ — Downpipe for submerged COW machines with stop valve
- ⋈ — Water washing hydrant valve with spectacle blank
- ⊖ — Level gauge
- ∠ — Hand dipping valve