Additional Project for oil and chemical tanker

Appendix 3

IMU

DECK CADET

STRUCTURED SHIP BOARD TRAINING PROGRAMME

PROJECT FILE

NAME: ANUPAM KUMAR SINGH

IMU ENROLMENT No. 1642813007

INDoS No. 16NL2240

Deck Cadet Record Book No. 29101815

DATE: From - 12.09.2019

To - 19.08.2020

SWARNA MAYA CHIEF OFFICER

P: A.V.D.

PROJECT WORK

INDEX

Sr. No	PROJECT NAME	Page Nos.	Date
1.	Draw the pipeline layout for an inert gas system from engine room to deck showing all valves and safety trips/alarms including deck seal and pv breaker Explain with a diagram the working of a deck seal unit	01 to 08	18.10.2019
3.	Draw a cross section of the pressure vaccum valve and describe the operating principle.	09 to 11	26.10.2019
4.	Compile process sheets for deballasting and loading cargo.	12 to 16	05.11.2019
5.	Compile process sheets for discharging cargo, ballasting, crude oil washing, cargo heating and stripping/educting	17 to 20	13.12.2019
6.	Describe the operation of the Framo-pump system	21 to 23	06.01.2020
7	Compile process sheets for inerting, purging and aeration	24 to 26	14.03.2020
8	Compile process sheet for tank cleaning, including change of grades, and for gas freeing for man entry.	27 to 30	19.04.2020
9.	Draw the layout of Emergency shut down (ESD) system, including activation location	31 to 34	28.05.2020
10.	Gas measuring equipment- describe the principles, operation procedures and calibration of : (a) oxygen analyzer (b) explosimeter (c) tank scope- toxic gas monitor- chemical reagent tube (d) fixed gas detector system	35 to 40	06.06.2020
11	Describe/draw: oil discharging monitoring equipment	41 to	18.07.2020

STO Signature,date and stamp to be taken prior sign off from each vessel :

SWARNA MALI CHIEF OFFICER

Date : 19.08.2020

Project Work

Name :- Anupam Kumar Singh

Batch No :- IMU-36

Enrol. No :- 1642813007

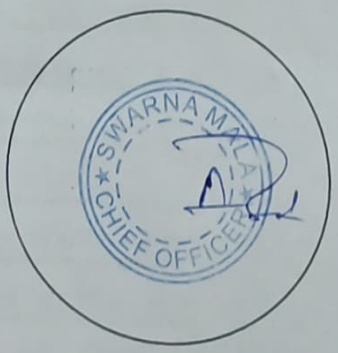
INDOS No :- 16NL2240

Deck Cadet Record Book No. :- 29101815

Project No :- 10.5.1

Project Topic:- ADDITIONAL PROJECT FOR OIL AND CHEMICAL TANKER

STO SIGN



ROJECT NAME:-

raw the pipeline layout for an inert gas system from engine room to deck showing all valves and safety trips/alarm including deck seal and or breaker. Explain with a diagram the working of a deck seal unit

M.T. SWARNA MALA

* Inert gas system

A system of preventing any explosion in the cargo tanks of a tanker by replacing the cargo(as it is pumped out) by an inert gas. Sometimes by flue gas from ship's boiler.

The inert gas system spread the inert gas over the oil cargo hydrocarbon mixture which increase the lower explosion limit (LEL) (lower concentration at which the vapour can be ignited), simultaneously decreasing the higher explosion limit (HEL) (higher concentration at which the vapour explodes). When concentration reaches around 10%, an atmosphere is created inside the tank in which hydrocarbon vapours cannot burn. The concentration of inert gas is kept 5% as a safety limit.

Components of IG system:-

1. Exhaust gas source :- Inert gas source is taken from exhaust uptakes of boiler or main engine as contains flue gases in it
2. Inert gas isolating valve :- It serves as the supply valve from uptake to the rest of the system isolating both the system when not in use.
3. Scrubbing tower : Flue gas enters the scrub tower from the bottom and passes through a series of water spray and baffle plates to clean, cool and moist the gases. The SO_2 level decreases up-to 90% and gas becomes clear of soot.
4. Demister : Normally made of polypropylene, it is used to absorb moisture and water from the treated flue gas
5. Gas blower : Normally two types of fan blowers are used, a steam driven turbine blower for I.G operation and an electrically driven blower for topping up process.
6. IG pressure regulating valve :- The pressure within the tanks varies with the property of the oil and atmospheric condition. To control this variation and to avoid overheating of the blower fan, a

pressure regulator valve is attached after blower discharge which re-circulates the excess gas back to the scrubbing tower.

7. Deck seal: The purpose of the deck seal is to stop the gases to return back which are coming from the blower to cargo tanks. Normally wet type deck seals are used. A demister is fitted to absorb the moisture carried away by the gases.

8 Mechanical non-return valve: It is an additional non-return mechanical device in line with the deck seal.

9. Deck isolating valve: The engine room system can be isolated fully with the deck system with the help of this valve.

10. Pressure vaccum (PV) breaker: The PV breaker help in controlling the over or under pressurization of cargo tanks. The PV breaker vent is fitted with a flame trap to avoid the fire igniting when loading or discharging operation is going on.

11 Cargo tank isolating valves: A vessel has number of cargo tanks and each cargo tank is provided with the isolating valve. The valve controls the flow of inert gas to hold and is operated only by a responsible officer in the vessel.

12 Mast riser: Mast riser is used to maintain a positive pressure of inert gas at the time of loading of cargo and during the loading time it is kept open to avoid pressurization of cargo tank.

13 Safety and alarm system

Following are various alarms associated with inert gas system:

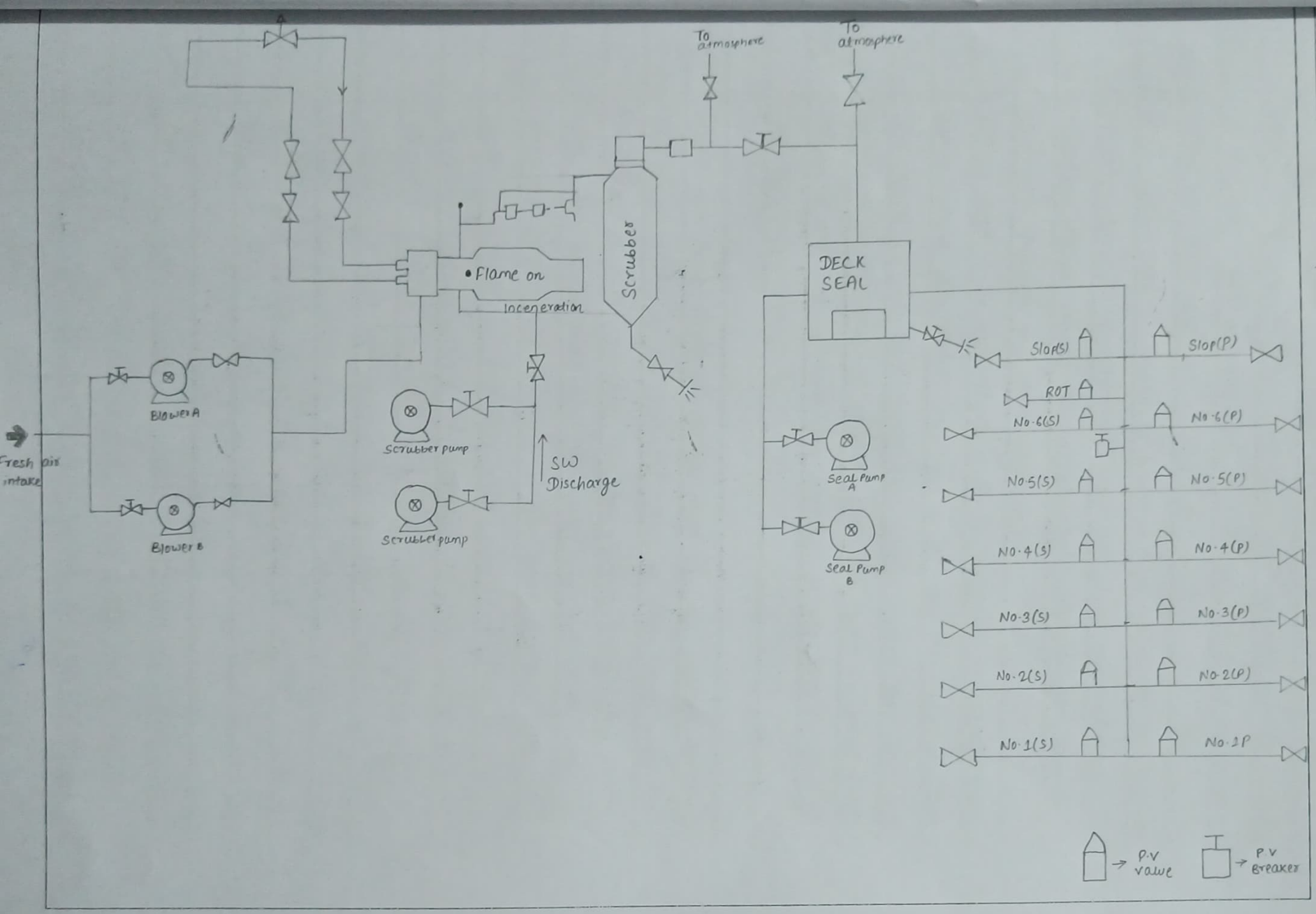
- High level in scrubber leads to alarm and shutdown of blower and scrubber tower
- low pressure seawater supply to scrubber tower leads to alarm and shutdown of blower
- low pressure seawater supply to deckseal leads to alarm and shutdown of blower
- High inert gas temperature(approx 70 deg C) leads to alarm

and shutdown of blower

- Low pressure in line after blower (approx 250 mmwg) leads to alarm and shutdown of blower
- Oxygen content high (8%) leads to alarm and shutdown of blower
- Low level in deck seals leads to alarm and shutdown of gas delivery in deck.
- Power failure leads to alarm and shutdown of blower and scrubber tower
- Emergency stops leads to alarm and shutdown of blower and scrubber tower.

Following are the various alarm associated with inert gas plant:-

- Scrubber low level
- Deck seal high level
- Low O_2 content (1%)
- High O_2 content (5%)
- Low lube oil pressure alarm.


INERT GAS SYSTEM
To atmosphere
To atmosphere
Scrubber
Flame on
Incineration
DECK SEAL
Blower A
Blower B
Fresh air intake
Scrubber pump
Scrubber pump
SW Discharge
Seal Pump A
Seal Pump B
Slop(S)
Slop(P)
ROT
No·6(S)
No·6(P)
No·5(S)
No·5(P)
No·4(S)
No·4(P)
No·3(S)
No·3(P)
No·2(S)
No·2(P)
No·1(S)
No·1P
P.V valve
P.V Breaker

* Deck water seal

Deck seal is a water seal fitted which permits inert gas to be delivered to the deck main but prevents any backflow of cargo gas even when the inert gas plant is shutdown.

It is vital that a supply of water is maintained to the seal at all times, particularly when the inert gas plant is shut down In addition, drains should be led directly overboard and should not pass through the machinery spaces.

Let us also know that there is an IG pressure regulating valve which returns any excess inert gas to the scrubber and then the gas passes to the deck water seal going through the vent valve. The vent valve should be opened when the main IG plant is shut down in order to prevent any backflow or pressure buildup in the pipelines.

There are three types of design that may be adopted, those are:-

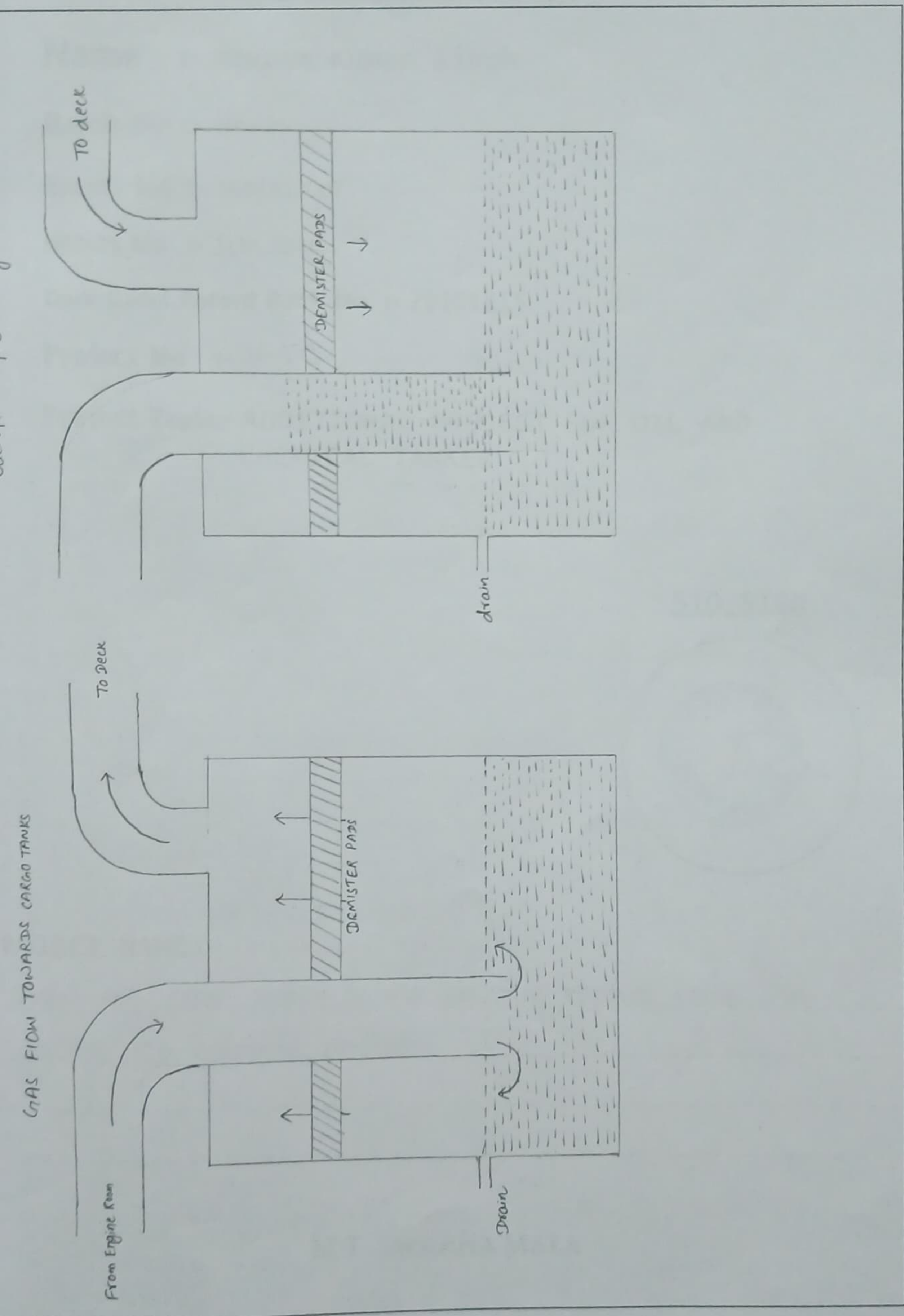
(a) Wet type :- This is the simplest type of water seal. When the inert gas plant is operating, the gas bubbles through the water from the submerged inert gas inlet pipe, but if the tank pressure exceeds the pressure in the inert gas inlet line the water is pressed up into this inlet pipe and thus prevents backflow. The drawback of this type of waterseal is that water droplets may be carried over with the inert gas, which, although it does not impair the quality of the inert gas, could increase corrosion. A demister should therefore, be fitted in the gas outlet from the water seal to reduce any carry over.

(b) Semi dry type :- Instead of bubbling through the water trap the inert gas flow draws the sealing water into a seperate holding chamber by ventun action thus avoiding or atleast

reducing the amount of water droplets being carried over. Otherwise it is functionally the same as wet type.

(C) Dry type:- In this type, the water is drained when the inert gas plant is in operation (gas flowing to the tanks) and filled with water when inert gas plant is either shut down or the tank pressure exceeds the inert gas blower discharge pressure. Filling and drainage are performed by automatically operated valves controlled by the levels in water seal and drop tanks and by the operating state of the blowers. The advantage of this type is that water carry over is prevented. The drawback could be the risk of failure of the automatic controlled valves which may render the water seal ineffective.

type deck seal unit



Project Work

Name :- Anupam Kumar Singh

Batch No :- IMU-36

Enrol. No :- 1642813007

INDOS No :- 16NL2240

Deck Cadet Record Book No. :- 29101815

Project No :- 10.5.3

Project Topic:- ADDITIONAL PROJECT FOR OIL AND CHEMICAL TANKER

STO SIGN

PROJECT NAME:-

Draw the cross section of the pressure vaccum vawe and describe the operating principle.

* Pressure vaccum valves

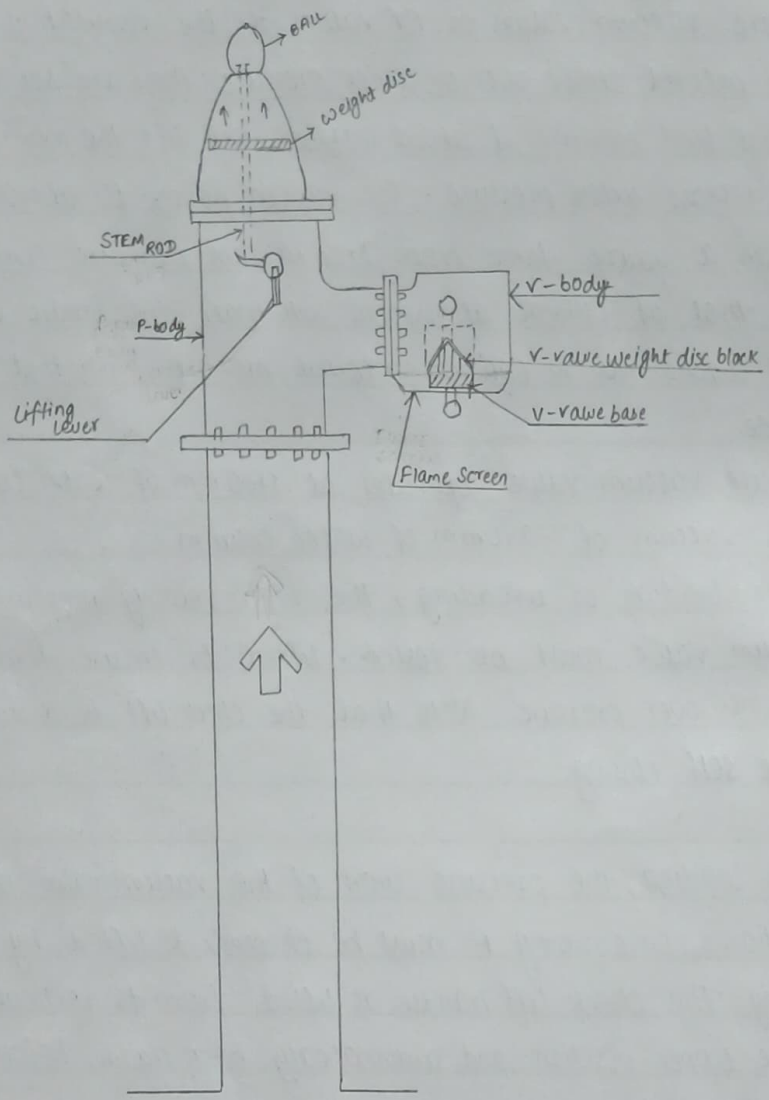
Pressure vaccum valves or PV valves is the ventilation system which prevent either over or under pressure. They are set usually so that tank pressure of about 0.14 bar will lift the main valve and release excess pressure. The vapour passes to atmosphere through a gauze flame trap. Drop in tank pressure compared with that of outside atmosphere will make the small valve open downwards to equalize internal pressure with that of outside.

Pressure vaccum valves operates at 1400 mm of water column at at a vaccum of -250 mm of water column

Before loading or unloading, the high velocity pressure vaccum valve must be tested, lifted to ensure that is movable over pressure. Note that, the check lift is designed to be self closing.

While loading, the pressure unit of the vaccum valve is in operation, consequently it must be checked & lifted by turning. The check lift handle is lifted from its vertical position to the upper position and automatically back again, before loading is commenced.

When unloading start, the vaccum unit may enter the operation consequently, it must be check lifted by pushing the vaccum back check lift under the vaccum unit and automatically back again to the normal operation


BALL
weight disc
STEM ROD
P-body
lifting lever
V-body
V-valve weight disc block
V-valve base
Flame Screen

Project Work

Name :- Anupam Kumar Singh

Batch No :- IMU-36

Enrol. No :- 1642813007

INDOS No :- 16NL2240

Deck Cadet Record Book No. :- 29101815

Project No :- 10.S.4

Project Topic:- ADDITIONAL PROJECT FOR OIL AND CHEMICAL TANKER

STO SIGN

PROJECT NAME:-

Compile process sheet for deballasting and loading cargo.

M.T. SWARNA MALA

* Deballasting

At discharge port we take sea water in ballast tank for continuous stablity of the ship but when we start loading in tanks, then we deballast for tanks for ship stablity and required draft to be maintained at all time.

In load port before deballasting c/o and terminal representative discuss the proposed operation in detail. After the permission granted, deballasting carried out.

Procedure

After commencement of loading we do deballasting by gravity as required we have to open following values:-

- Sea chest value
- line value
- Main suction value of port side
- Main suction value of starboard side
- Cross over value
- Respective tank value

Line setting of deballasting by pump

- Seachest value is shut
- Suction value for pump is opened
- Discharging value for pump is opened
- line value are opened
- Overboard value are opened.
- Pump started. The required number of tank values of ballast tank is opened
- Visual check is done on overboard discharge
- Pumprate as required can be set by CCR.

* Loading cargo

It is very important to establish a good safe cargo operation, emergency shut down signal, which must be understood and agreed

Procedure:

Prior loading all PV valves is checked, high level alarm are to checked manually of each tank.

Pre-arrival information is purged beetween ship and shore such as

- quantity of cargo
- particular of ship's trim and draught
- State of cargo tank whether inerted or washed
- Ship's manifold details including size of reducer
- Grade of cargo
- Any requirement for tank cleaning disposal of ship and for oily ballast residue
- number and size of hose or crane available
- The maximum shore pumping rate and the pressure available at the manifold

- As soon as the vessel made fast to berth, the fire fighting equipment such as foam extinguisher, CO_2 extinguisher, fire hose to be rigged forward and aft. All SOPEP equipments are kept near manifold. Deck fire lines are charged.
- Ensure that all scuppers are plugged
- Ensure mast riser are fully shut
- Prior loading ensure that inert gas with main isolation valve is shut and also check IG branch isolation valve.
- Ensure that the loading arm hose is connected properly.
- Once getting clearance from shore. Set your line:-
  - Open tank valve
  - Open drop valve
  - Ensure line master is shut
  - Ensure manifold drainer and vent valve are tightly shut
  - Open manifold valve.

- Check ullage of tank hourly. As we get cargo in tank after wards, we can gradually increase loading rate to maximum.
- Calculate hourly loading rate and compare it with shore figure
- Calculate stress and stability of the ship once in a hour with the help of a loadicator
- Open mast riser as per need, if tank pressure increases.

Topping up

- Topping up ullage must be calculated in advance
- Ask terminal to reduce the loading rate as topping up ullage has nearly comes
- Monitor tank ullage continuos manually
- If topping up ullage of one tank is coming first, monitor that tank. Once the ullage reaches, shut tank valve. And at the same time, check the manifold pressure
- Once the tank valve is shut, check ullage of the tank for some time to check and confirm that no cargo is coming.
- Give significant notice to terminal before completion of loading.
- Once the topping up ullage of the tanks comes, ask terminal to stop loading and shut tank valves as you get information from shore that they have stopped loading
- The manifold valves and drop valves are shut
- The manifold is disconnected and drained under the supervision of a responsible officer.
- The mast riser is shut & topping up to required pressure.
- Final ullaging to be done of all tanks along with the cargo surveyor

Then documentation are done such as:-

- Letter of protest
- Bill of lading
- Cargo distribution in each COT
- Ballast tank report
- Time sheet
- Ship's draft and trim
- Ship's tank report are exchanged.

Project Work

Name :- Anupam Kumar Singh

Batch No :- IMU-36

Enrol. No :- 1642813007

INDOS No :- 16NL2240

Deck Cadet Record Book No. :- 29101815

Project No :- 10·S·S

Project Topic:- ADDITIONAL PROJECT FOR OIL AND CHEMICAL TANKER

STO SIGN

PROJECT NAME:-

Comple process sheet for discharging cargo, ballasting, crude oil washing, cargo heating and stripping/educting

M.T. SWARNA MALA

* Discharging of cargo

Prior arriving at discharge port an exchange of information beetween the ship and the terminal will take place. Once the vessel is tied up at the terminal, ship shore safety checklist will have to be filled out. Since pumps will be running at discharge port, special attention will have to be given to monitor the safe running of pumps.

- Supply of I.G to cargo tanks being discharged:- Confirm that the I.G main supply oxygen level is less than 5% & supplied to tanks. The date, time, voyage number and description of operation should be entered on the IGS fixed pressure and oxygen density recorder.

- Safety confirmation and clearance:- Once chief officer is satisfied that all preparation made following the oil discharge plan and the shore facility representative have confirmed that the facility is ready to recieve cargo, he may order the designated manifold valves to be opened. The I.G output to the discharging cargo tanks and the discharge operation to commence following the discharge plan. Commence discharging at reduced speed. Follow shore instruction & increase the discharge rate once it has been confirmed that no oil leaks and shore are recieving at their end until the agreed cargo oil manifold pressure has been reached.

- Deck watch and Personnel arrangement

The deck watch shall check for oil leaks in the cargo area through the cargo oil discharge operation. At the beginning of the operation, confirm no oil leaks from piping joints and no oil inflowing into the tanks other than the tanks being used.

Continue monitoring of the oil level from the discharging tanks, until settling down of cargo pumps and flow rate. The manifold pressure to be monitored at all times and monitor portions where oil is likely to leak.

- Starting of Discharge operation pump and adjusting internal pressure of tank :- Open manifold valves, and start the first cargo pump at slow speed. After confirming the regular operation of each part, open delivery valves to start pumping oil. Then start other pumps. Only after recieving reports of all safety checks confirmed from all stations of deck/pump room watch, then follow the instruction of the terminal side to increase the manifold pressure to the agreed pressure.

- Shutting down of cargo pumps:-
The pump discharge valve should be closed at the same time as the pump RPM's are reduced. When the pump has stopped the suction valve should be closed.

* Ballasting
Fill tanks with ballast water according to the ballasting plan. Notify the terminal of the matter before commencing the ballasting operation.
Firstly, we will ballast tanks by gravity that means ballasting of tanks without involving of pumping unit. You just line up the tank by opening of seachest valve, main suction valve of port & starboard side, cross over valve and respective tank valve. Whenever the ship's ballast in level with the waterline, gravity method stops.
The we start ballasting by pump As per company standard to avoid the possibility of ballast overflow when alongside

Ballasting level of any tanks shall not exceed 90% of the tank's capacity.
Keep in mind during ballasting, never shut the tank V/V before shutting the pump.

* Stripping

In the last stage of discharging drop the number and speed of main cargo pumps and gradually reduce the opening of delivery valves to change over to stripping.
Stripping is done when level of oil in tank decreased to less than 1.0m or when the pump loses suction as the air get locked in the cargo.
Stripping is done by applying of deck air in main cargo line and hence pushing the cargo and creating suction and discharging cargo through the thin stripping line.
For further confirmation of effective stripping, a closed system of manual dipping of cargo tanks shall be done by ship's crew to ascertain the oil condition in the bottom.

* Completion of Discharge

Close the manifold valves after confirming the completion of transferring oil to the terminal. Drain hoses and arms at the manifold. All manifold valves drain are to be operated under supervision of chief officer. After draining of all oil in hoses or arms, close tank valves and vent valves. All cargo in deck cargo line should be pushed by line pushing to the hoses/arms.
The IGS recorder should be on to record and monitor tank pressure. Adjust inert gas pressure in tank, and stop the system when the pressure reaches the prescribed value (usually 1000 mmAg)

Project Work

Name :- Anupam Kumar Singh

Batch No :- IMU-36

Enrol. No :- 1642813007

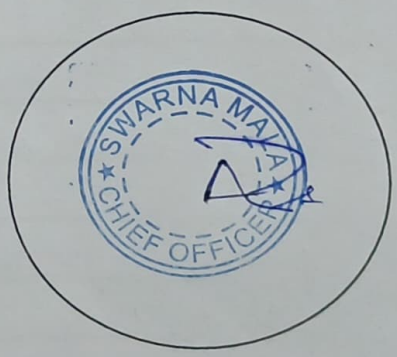
INDOS No :- 16NL2240

Deck Cadet Record Book No. :- 29101815

Project No :- 10.5.6

Project Topic:- ADDITIONAL PROJECT FOR OIL AND CHEMICAL TANKER

STO SIGN



PROJECT NAME :-

Describe the operation of a Framo-pump system

M.T. SWARNA MALA

* Framo pump system

The framo cargo pump is a vertical single stage centrifugal pump powered by a hydraulic motor & pressure of hydraulic oil from power pack for safe and efficient operation. All of the cargo pumps are made in stainless steel and designed with a smooth and easy-to-clean surface featuring a limited number of flanges for a superior ablity to pump any liquid.

The cargo pump has a built-in hydraulic motor connected to the impeller by a short independent shaft. Motor, shaft and bearing are lubricated and cooling hydraulic driving oil.

- Design features

- vertical single stages, single suction impeller axiaxy balance
- Robust hydraulic drive with short and stiff drive shaft
- Fail safe design, lubrication and cooling of pump by the hydraulic driving oil medium.
- Pump material: Stainless steel
- Concentric hydraulic pipes for maximum safety
- Cofferdam, ventilated to atmosphere, protecting the entire pump
- Mechanical seal against hydraulic oil
- Double lip seal against cargo, only exposed to static pressure.
- Anti rotation brake, loading through pump
- Smooth pump exterior, self draining and easy to clean

- Performance

The framo cargo pump is easy to operate. The hydraulic drive provides a remote and local stepless capacity control through the speed torque control (STC) valve on the pump's top plate. The STC valve automatically regulates hydraulic oil pressure and flow to the hydraulic motor according to the given discharge situation.

- Power Pack :- It can be started or stopped manually from the control panel from electric starter column. Powerpack can be started in any sequence. Maximum four powerpack can be started during one hour at interval of 15 minutes.
If more than one power pack are loaded and hydraulic oil temperature increases to 65°C, then control system will reload all power pack except one and rest are automatically reloaded when temperature of hydraulic oil decrease from 60°C.

- Stripping : When the cargo tank is empty, the speed of the cargo pump is reduced to perform the final stripping of the tank:
  - Close the cargo valve.
  - Open the small ball valve on the stripping line
  - Pressurize the pipe stack by connecting the purging hose with compressed air
  - Press cargo out through the stripping line and into the cargo line

The pump impeller rotates and acts as a non-return valve to prevent cargo from returning back to tank.

- Purging and seal monitoring from deck level.
The pump's cofferdam is purged before and after discharge operation. Any leakage across the cargo seals or hydraulic oil seals collected in the cofferdam, will be forced to the exhaust trap on deck where it can be measured.
This is a simple and reliable seal condition monitoring system. No need for any electric sensor nor any automatic control system.

Project Work

Name :- Anupam Kumar Singh

Batch No :- IMU-36

Enrol. No :- 1642813007

INDOS No :- 16NL2240

Deck Cadet Record Book No. :- 29101815

Project No :- 10.5.7

Project Topic:- ADDITIONAL PROJECT FOR OIL AND CHEMICAL TANKER

STO SIGN

PROJECT NAME:-

Compile process sheet for inerting, purging and aeration.

M.T. SWARNA MALA

* Inerting

- Inerting of inert gas (gas having O_2 less than 5%) into the tank is called inerting.
- This process displace the flammable cargo vapour with inert gas and thus reduces the chance of explosion.
- The inert gas should have oxygen content of less than 5%. Continuos monitoring of O_2 is done by fixed O_2 analyzer in IG system which displaces O_2 content in CCR and ECR. O_2 content shall be checked periodically from IG drain valve and both shall be compared. Two hour, one hour and half hour notice are given to E.R.
- Ensure that none tanks are isolated.
- Open deck main isolation valve
- Check the level of water in deck seal and inform E.R.
- Intially main control valve is shut and purge control valve is opened. When IG started and O_2 level drops to less than 5%. the main control valve automatically opens and purge control valve is shut
- Continuos monitoring of deck main pressure, O_2 content as well as level of water in deck seal to be done.
- Limit of maximum pressure and minimum O_2 content are set.
- If pressure exceed or O_2 content increases, the main control valve automatically shuts or purge control v/v open and viceversa.
- If O_2 content increases 8% or level of water in deck seal is too low, the system trips automatically.

* Purging

- The introduction of inert gas into a tank which is already in the inert condition, with the purpose of further reducing the existing oxygen content; and or reducing the existing hydrocarbon gas content to a level below which combustion cannot be supported if air is subsequently introduced into the tank.

- IG system is started and injected into the tank and it displaces HC from
- Thus process is left for suitable period of time for perfect purging.
- After stopping IG, the HC and O_2 content are measured of all the individual tanks
- If hydrocarbon still exists the process is again started.

As per ISGOTT, there are two methods of purging:

Dilution method takes place when the incoming inert gas mixes with the original tank atmosphere to form a homogeneous mixture throughout the tank so that, as the process continue the concentration of the original gas decreases progressively It is important that the inert gas has sufficient entry velocity to penetrate to the bottom of the tank. To ensure this, a limit must be placed on the number of tanks that can be inerted simultaneously.

Displacement method depends on the fact that inert gas is slightly lighter than hydrocarbon gas so that while the inert gas enters at the top of the tank, the heavier hydrocarbon gas escapes from the bottom through suitable piping. When using this method it is important that the inert gas has a very low velocity to enable a stable horizontal interface to be developed between the incoming and escaping gas. Displacement generally allow several tanks to be inerted or purged simultaneously.

* Aeration:- - When it is required to gas free a tank after washing. It is purg to minimize the HC content < 2% by volume, then it is aerated by fresh air in
- The HC content must be measured with gas detector
- Before starting gas freeing, the tank shall be isolated from other tank when portable or fixed fan are used to introduce air into the tank, the inert gas inlet for that tank should be isolated
- If the inert gas system is used for drawing fresh air, all the tanks which have to kept inerted shall be isolated.

Project Work

Name :- Anupam Kumar Singh

Batch No :- IMU-36

Enrol. No :- 1642813007

INDOS No :- 16NL2240

Deck Cadet Record Book No. :- 29101815

Project No :- 10.5.8

Project Topic:- ADDITIONAL PROJECT FOR OIL AND CHEMICAL TANKER

STO SIGN

OJECT NAME:-

Compile process sheet for tank cleaning, including for change of grades, and for gas freeing for man entry.

M.T. SWARNA MALA

(A) Tank cleaning

vessel may require to clean the cargo oil tank and oily residue in order to

- Gas free tank for man entry and repairs
- Prepare tank for change of grade
- Preparing tanks for dry docking/repair.

* Tank washing atmosphere

Water washing of cargo tanks shall be done in the following atmosphere:

a) Inert. : An atmosphere is made by inerting of flue gas from boiler and in result the overall oxygen content of the tank atmosphere should not exceed 8% by volume.

b) Purging : An atmosphere is made by introduction of inert gas into a tank which is already in the inert condition, with the purpose of further reducing the content of hydrocarbon content below lower flammable limit

* Tank washing precaution

- Tank washing shall be carried out of the vessel at maximum trim. It is to be ensured that at no stage the washing water should build up inside the tank.
- Detailed precaution laid down in ISGOTT, shall always be complied with when doing tank cleaning.

* Tank washing procedures (fixed machines):

- Tank shall be inerted upto when the O_2 content comes below 5%.
- Cleaning shall be done using the interconnected slop tank arrangement as holding tank.
- Before commencing tank cleaning the slop tank shall be filled to $\frac{2}{3}^{rd}$ their volume
- The cargo pump shall be used to supply wash water via tank cleaning line to the tank cleaning machine
- This pump shall draw water from one slop tank and simultaneously the other pump is running continuosly to discharge the washing

water to another slop tank.

- The slop tank level should be closely monitored to prevent overflow
- The tank wash machine used for washing should complete no of cycles as per the manufacturer manual.
- The no. of cycles to be used will depend on the degress of cleaning required. If necessary the water may be preheated (less than 55°C) using the cargo tank cleaning heater.

* Change of grades.

In certain circumtances it will be necessary for product tanker to undertake tank washing to avoid cargo contamination. when they change grade. In the absence of specific instruction from the charterers/company, the vessel shall follow the tank cleaning procedure from FORM CP012. As a general rule, product tanker should arrive load port, with all cargo tanks ready to receive the grade of cargo nominated for loading.

* Gas freeing for man entry

In order to be gas free for man entry without breathing apparatus, a tank or enclosed space must be ventilated until test confirm that the HC gas concentration throughout the compartment is less than 1% of the LEL and additional test have been made to confirm that the O_2 content is 21% by volume and ~~the~~ is appropriate that there is no hydrocarbon gas, sulphite, benzene, and other toxic gases.

Gas freeing to any other standard for a purpose other than a man entry without breathing apparatus must be thoroughly assessed and understood before operation commence. In order that all necessary safety measures can be established and implemented.

* Procedures and precautions

- A responsible officer must supervise the gas freeing operation
- All personnel on board should be noticed that gas freeing is about to begin
- Appropnate "NO SMOKING" regulation should be enforced
- Instrument to be used for gas freeing should be calibrated and tested in accordance with the manufacturer instruction before starting operation
- All operation should be closed until actual ventilation of the individual compartment is about to commence
- Venting of flammable gas should be by the vessel approved method where gas freeing involves the escape of the gas at deck level or through any opening.
- The number of opening should be controlled to produce an exit velocity sufficiently to carry the gas clear of deck
- If petroleum vapour persists on deck in high concentration, gas freeing should be stopped

Project Work

Name :- Anupam Kumar Singh

Batch No :- IMU-36

Enrol. No :- 1642813007

INDOS No :- 16NL2240

Deck Cadet Record Book No. :- 29101815

Project No :- 10.5.9

Project Topic:- ADDITIONAL PROJECT FOR OIL AND CHEMICAL TANKER

STO SIGN

JECT NAME:-

raw the layout of the emergency shut down (ESD) system (if provided), ncluding activation locations.

State when the E.S.D should be operated and list the circumstances when the ESD is to be activated manually

List the equipment, including valves, which trip on activation of the ESD

explain in writing, the testing procedure of ESD and record manifold valve closure timing.

M.T. SWARNA MALA

A) * The ESD should be operated in following situation :-

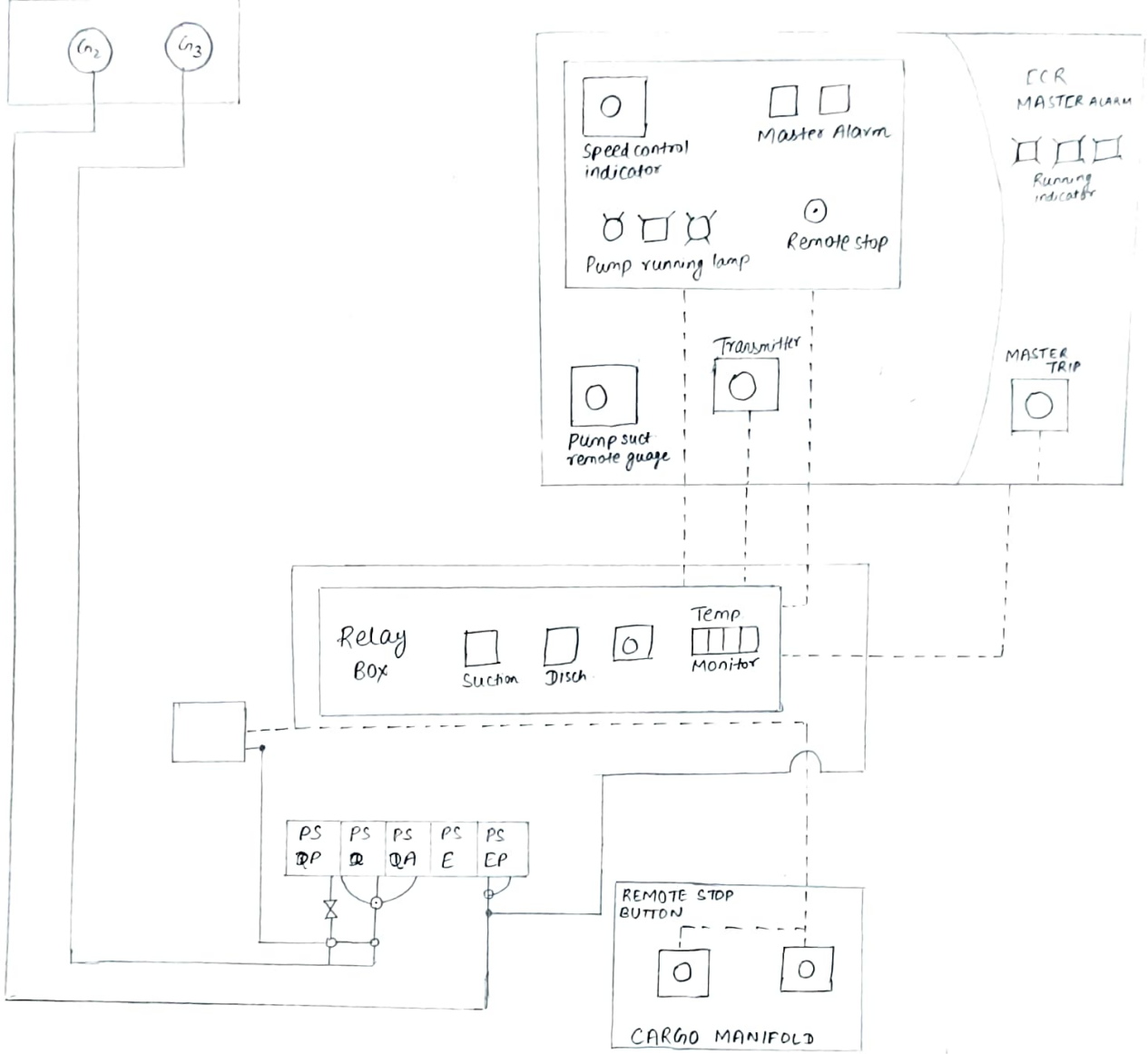
SITUATION		UNIT	ALARM TRIP VALUE
High back pressure	Alarm trip	Kpa	
Sentinel value by air		Kpa	Max 100 Min 80
High/low temperature	Alarm	°C	53 ± 3
Pump over discharge press. (by air)	Trip	Kg/cm²	actual press :- 1.57
Pump casing overheat	Alarm Trip	°C	75 ± 2
Remote speed charge	MIN MAX	MIN⁻¹	600 1261
Manual speed change	MIN MAX	MIN⁻¹	800 1261
Priming C.O pump operation	START	Kg/cm²	0.45 ~ 0.1
	STOP		0.8 ~ 1.5
low inert gas pressure			External signal

* ESD is to be activated manually when :-
- In case of oil spillage on deck
- In case of loading arm have disconnected accidently so as to prevent the oil discharge at sea.
- If shore ask for emergency stop for reason such as leakage on shore side, ESD should be manually operated
- In case of fire in accomodation or any machinery space or in deck.

(B) Upon activation of ESD, the steam governor valve will stop and will result in stopping of cargo oil pumps.

(C) Testing procedure of ESD are as follows :-
- The ESD system are tried out in pre-arrival checks of the discharge port from location such as CCR, manifold, engine room

- Firstly, start the cargo oil pump from CCR in low RPM.
- Once everything is normal with discharge valve closed.
- Now ESD system can be tried from various places.



*
PS-QP ⇒ Press suc for C O P
PS-Q ⇒ Press suc for L O press trip
PS-QA ⇒ Press suc for L O press alarm
PS-E ⇒ Press suc for back pressure
PS-EP ⇒ Press suc for back pressure Trip Alarm

Project Work

Name :- Anupam Kumar Singh

Batch No :- IMU-36

Enrol. No :- 1642813007

INDOS No :- 16NL2240

Deck Cadet Record Book No. :- 29101815

Project No :- 10.S.10

Project Topic:- ADDITIONAL PROJECT FOR OIL AND CHEMICAL TANKER

STO SIGN

ROJECT NAME:-

Gas measuring equipment - describe the principle, operation procedures and calibration of :-

1) Oxygen analyzer

2) Explosimeter - combustible gas monitor

3) tank scope - toxic gas monitor - Chemical reagent tubes - explain how reading is taken

4) fixed gas detector system

M.T. SWARNA MALA

(A) Oxygen analyzer

Oxygen analyzer used on-board ship works on magnetic type measurement system : Paramagnetic system.

This is the one of the methods utilizing the paramagnetic property of oxygen. When a sample gas contains oxygen, the oxygen is drawn into the magnetic field, thereby decreasing the flow rate of auxiliary gas in stream B. The difference in flow rates of the two streams, A and B, which is caused by the effect of flow restriction in stream B, is proportional to the oxygen concentration of the sample gas. The flow rates are determined by the thermistor and converted into electrical signals, the difference of which is computed as an oxygen signal.

Calibration :-

- The instrument is calibrated frequently throughout the operating range
- Fill the sampling bag with calibrated gas
- Connect the sampling bag to the gas inlet of the instrument
- Allow the reading to stablize, if the reading is different from zero, use the zero adjustment screw to bring the meter reading to zero
- After calibration, remove the sampling bag.
- Allow fresh air to go into the instrument till the reading stabilizes at 21%.
- Repeat above procedure one more time for final calibration
- After calibration, make a record of the calibration in the instrument log.

Limitation :-

- This instrument should be regularly calibrated
- Liquid contamination, pressure or temp effect may result in drifting of instrument response.

(B) Explosimeter - combustible gas monitor

Explosimeter is a device that is used to determine the content of hydrocarbon in the atmosphere of tank spaces on ships. The scale used in the explosimeter is marked in terms of lower explosive or flammable limits and as a percentage of the lower limit (LEL). The scale may also be marked in parts per million (ppm).

Working principle

Explosimeter works on the principle of wheatstone bridge. The wheatstone bridge is supplied with a battery and there is no flow of current through the meter when the bridge resistance is balanced. One of the four resistance in the wheatstone bridge is a hot filament. This resistance is enclosed in a chamber wherein a sample is drawn with the help of flexible tube and aspirator.

The combustion of the atmospheric sample take place in chamber in the presence of hot filament. The combustion of gas drawn from the atmosphere cause increase in the temperature, which cause changes in resistance and imbalance in wheatstone bridge. Due to this imbalance, current flows through the meter and the reading is calibrated to indicate in percentage of L.E.L OR P.P.M.

Calibration.

- Calibrating an instrument invowes spanning and zeroing the instrument using the calibration gas of known gas content to ensure the gas reading are within manufacturer's stated tolerances.
- If the instrument reading are out of tolerance, than the meter will have to be calibrated. Calibration inrolves applying the calibration gas of known gas content to the instrument and then adjusting the sensor output control to read the same as known gas content. It should be tested and if necessary re-calibrated monthly. The results of the test should be recorded in the planned maintenance system

(C)(4) Tankscope

Operating Principle

The sensing element of this instrument is usually a non-catalytic hot filament. The composition of the sorrounding gas determines the rate of loss of heat from the filament, and hence its temperature and resistance.

The sensor filament forms One arm of a wheatstone bridge. The initial zeroing operation balance the bridge and establishes the correct voltage across the filament, thus ensuring the correct operating temperature. During zeroing, the sensor filament is purged with air or inert gas that is free from hydrocarbons. The presence of hydrocarbon gases changes the resistance of the sensor filament and this is shown by a deflection on the bridge meter. The meter gives a direct reading of % volume hydrocarbons.

Reading is taken as the instrument has been initially set at zero with fresh air in content with the sensor filament, a sample is drawn into the meter by means of a rubber aspirator bulb. The bulb should be operated until the meter pointer comes to rest on the scale then aspirating should be stopped and final reading was taken.

Calibration

It requires the provision of gas mixtures known as hydrocarbon concentration. The carrier gas may be air, nitrogen or carbon dioxide. Since this instrument may be required to measure either low concentration (1% - 3% by volume) or high concentration (greater than 10% by vol), it is required to have two test mixture (like 2% and 15% by volume) or one mixture beetween these two number (like 8% by volume). These sample test gas are drawn into the instrument for analysis

(ii) Toxic gas monitor

is a battery operated detector to monitor toxic gases in ambient air. The interface and a radio transceiver are housed in a flame proof instrument enclosure. The detectors monitors a variety to toxic gases in the parts per million (ppm) range including ammonia, carbon monoxide, chlorine, hydrogen etc.

The unit is self identifiable to the network of the other wireless monitor. The unit communicates with the controller by transmitting complete data packet including the live gas concentration reading and the sensor diagnostic data such as low battery, sensor fault and calibration mode.

Available operating frequency - 900 MHz & 2.4 GHz.

Operating range (line of sight) - 900 MHz - 5 Km

2.4 GHz - 2 Km.

(iii) Chemical reagent tubes

erating... nciple:

Chemical reagent tube consist of a selected gas tube and hand pump. The hand pump the draws a fixed volume of gas by rotating the handle. A tight vacuum seal is formed by a greased plunger gasket. A colour change along the tube along the tube and the length of discolouration, which is measured as the gas concentration and is read off as scale integral with the tube.

Reading the tubes:

- The concentration of the compound being measured is read directly from the scale printed on the tube
- The reading is taken as the furthest distance along the tube that the colour change becomes visible.
- Read the tube immediately after gas sampling, as colours may change, fade or disperse with time.

(D) Fixed gas detector system

The fixed gas sampling system is intended for detection of explosive gases or toxic gases in cofferdam, stool spaces, ballast tanks, slop tanks or other area adjacent to cargo tanks.

Operating principle:-

These detectors are based on the fact that combustible gases can be oxidized to produce heat. Once they reach a certain temperature, they will ignite and burn; however in the presence of certain chemicals, the ignition temperature is much lower making the gas more susceptible to fire and explosions.

A gas sensor contains a platinum coil and is heated when it comes into contact with gaseous reactants. This raises the temperature within the coil. The sensor will sound the alarm and alert people if that temperature changes is within what is considered a dangerous range.

Calibration

Using the appropriate span gas or calibration gas for correct calibration of sensors.

Project Work

Name :- Anupam Kumar Singh

Batch No :- IMU-36

Enrol. No :- 1642813007

INDOS No :- 16NL2240

Deck Cadet Record Book No. :- 29101815

Project No :- 10.5.11

Project Topic:- ADDITIONAL PROJECT FOR OIL AND CHEMICAL TANKER

STO SIGN

PROJECT NAME:-

Oil discharging monitoring equipment - describe/draw

(a) pipeline diagram from cargo tank to overboard discharges

(b) oil-water interfaces - principle of operation

(c) operating procedures

(d) alarms, shut off, working of recording system

M.T. SWARNA MALA

O.D.M.E

1) pipeline diagram from cargo tanks to overboard discharge

(B) Principle of operation

The oily mixture is pumped out to the sea through the ODMCS by a pump. A sampler probe and a flow meter sensor is connected at the discharge pipe, before the overboard valve, to sense the oil content and the flow of mixture.

The data provided by the two sensors are fed in a control unit wherein it is analyzed and the discharge valve is controlled by the same

If the control unit senses a rise in the ppm and flow company to the permissible value, it will shut the overboard valve and open the recirculation valve which is connected to the slop tank.

(C) Operating procedure

Let us assume a tanker need to clean cargo tanks which were carrying total oil cargo 29000 MT. SO,

STEP1 Marpol limit of total oil we can discharge in wash water is 1/30000 of the cargo carried. SO the total oil from the washing can be discharged is 1 MT (1000 litres). SO set the total oil limit as 1000 litres in ODME

TEP 2
- Press "MODE SELECTION"
- Select "2) Oil Discharge"
- Under "Oil discharge set up" go to "alarm limit" and press enter
- Set the new value by up and down arrows and press enter
- It will ask to confirm, which we will and we have now set the maximum oil discharge limit

STEP 3 Allow minimum 36 hours settling time to ensure that the oil has seperated completly from water in slop tank

TEP 4 Check all other condition related to vessel being enroute, vessel is not in special area, vessel is 50 nautical miles away from land.

STEP 5 Do checks and prepare ODMS for operation

STEP 6 Start the slop tank pump in recirculation mode by keeping the overboard valve closed and monitor PPM of oil content, if it is high the stop the pump. If everthing is okay, start overboard discharge.

STEP 7 Carefully monitor discharge operation and confirm no oil sheen are visible on sea surface. You need to do the over-board discharge operation during daylight only. Monitor the oil-water interface level by UTI tape.

STEP 8 As we reach the interface level, stop the overboard discharge.

(D)(i) Alarms

- Set up error
- Memory error
- Communication error
- Overheating
- Printer time-out
- Cleaning error
- Flow min. limit
- Flow max. limit
- Failure alarm
- alarm 15 ppm
- alarm 30 L/NM
- manual overide
- GPS recievere error
- Warning printer paper end.
- High pump temperature

(ii) Auto shut-off

If the control unit senses a rise in the ppm and flow comparing to the permissible value, it will shut the overboard valve and open the recirculation valve which is connected to the slop tank

(iii) Working of recording system

The following input must be recorded by the system:-

1. Discharge rate of the pump which is discharging the oily water mixture overboard
2. The location of the ship in latitude and longitude
3. Date and time of the discharge
4. The total quantity that has been discharge overboard
5. Oil content of the discharged mixture in PPM.