The South African Institute of Marine Engineers and Naval Architects

SAIMENA

The Two Oceans Journal

3rd Edition 2022

National Council 2022/2023

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2022 3rd Edition

The opinions expressed in this Newsletter are those of the writers and not necessarily those of SAIMENA or this newsletter's editor . All submitted articles are subject to edit.

Presidents Report

Greetings to all SAIMENA members and associates reading this edition of our Two Oceans Journal, the third edition for 2022.

Branch meetings and activities in the past couple of months has been very slow. A couple of meetings were held, and the Cape Branch organised the annual Froude Memorial event in conjunction with the Lawhill Maritime College in Simon's Town many thanks to the organisers and participants of this event.

Some online activities, mainly CPD events, continued to be presented, which is great as it enable all SAIMENA members to participate in a single event.

SAIMENA had 10 new members in 2022. I request all members to review their changed circumstances and apply to revise their member grade where they can according to the SAIMENA Constitution (ie new qualifications, years of experience or professional registration).

SAIMENA currently has 384 members of various grades of which 141 are registered with ECSA.

Please support your Branch committees as the year comes to an end and especially in the new year, if you want SAIMENA to progress and influence the status of maritime affairs in South Africa then get active and voice your opinion by participation in your Branch Committee.

We still have some SAIMENA members who are not in email contact with us, please encourage all your shipmates to ensure that the make electronic contact with SAIMENA to ensure that we can deliver on-time and relevant contact with our members, the use of the postal system is very expensive and highly unreliable. Many members also fail to update their details resulting in a breakdown of contact, please keep SAIMENA up to date so that we can be of service to you our members.

SAIMENA supported the Nautical Institute with a webinar on Simulator Training, however very few SAIMENA members participated. These online webinar events give attendees easy ECSA CPD points; not a bad way to get your annual CPD points for free!

The work on the new Oceans Economy Master Plan has finished as far as inputs are concerned. Now we wait to see what will be published by the responsible Government Department. The segments focused on were Shipbuilding and Repairs, Maritime Engineering and Design, Skills development and Technology and R&D. My thanks to those members who contributed comments for use in these discussions to ensure that an alternative and rational industry opinion was raised against the current institutional Operation Phakisa position and limited progress.

I was pleased to see that South Africa has retained its IMO White List status, and concluded a training agreement for s South African Cadet Training Programme for 2023. Congratulations to all involved – SAMSA, SAIMI and SAMTRA for their respective work.

I would like to review the Strategic Focus Areas we set for 2022

The development of Mentoring by our senior members for students and developing members in both the STCW and Professional Engineering areas has not really taken off yet this year. We hope for better progress as the year proceeds.

The bursary / sponsorship of training by SAIMENA has also not got off the ground effectively. A Council worksession was held on the matter, with some positive outcomes but these must still be put into effect so that we can have an impact on the maritime sector.

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There was no progress made in the intent to grow student and junior member numbers to join SAIMENA and become active participants in SAIMENA affairs. Council has now appointed 2 members to a sub-committee to initiate these efforts with greater vigour.

The Key Challenges Facing SAIMENA.

Getting students and junior members involved and getting them to accept an active role in the organisation.

Developing a greater understanding of maritime engineering at ECSA and getting experienced SAIMENA members to take an active role in the activities of ECSA in enhancing and growing maritime engineering in South Africa.

I have been disappointed in the low level of involvement of most SAIMENA members in the organisation via feedback, comment or opinions of the various messages sent out. This is a pity as with no feedback or involvement it means that the SAIMENA Council has no idea of the direction that members would like the Association to take in the years ahead. What do you want from SAIMENA ? please let us know.

Other Matters

I see that the second of the 3 x Inshore Patrol Vessels for the South African Navy has been launched already and is busy with final outfitting alongside. The work on the Hydrographic Survey Ship continues but nothing is reported on the progress.
It would be great if the industry and Navy are willing share more information and progress reports on these new builds with the maritime community.

Active participation in public events (online or live) by SAIMENA members enables the opinions and experience of SAIMENA to be shared and through that we can enhance the status and professionalism of the maritime sector in South Africa.

Take note the agm's and election of new council and branch committee members will take place early next year, please give consideration to join the stewardship of SAIMENA and helping us get to be more effective.

Many thanks also to the Council members who have supported during the year and put in hard work to keep SAIMENA running, well done.

Thank you for the support during the past year, and I look forward to enhanced levels of participation and interaction with SAIMENA members in 2023.

Best regards

Kevin Watson
President SAIMENA

The Editors Desk

Well it has been a hell of a year.

The ridiculous war in Ukraine goes on with an obscene amount of death and destruction, but now with an economic fallout (thankfully not a nuclear one), affecting all of us on this globe,

China is casting a covetfull eye on Taiwan.

Donald Trump running for President of the U.S again,

Climate change heading the agenda for many.

Our Cyril running around Europe hoping perhaps for some loose change nobody wants (he should check his furniture), and so on and so on.

Closer to home there is a draft bill going before Parliament for the creation of a "South African Shipping Company". This draft is basically a proposal to create a government owned company and outlines its management structure, ownership, and objectives. Where it would get the finance (perhaps Cyril's wanderings can help), or the high ideals of its proposed staffing. (technical management and vessel manning), I don't know.

Should this take off would it be trading, ship management, ship owners, or is cabotage etc. the objective? There are an awful lot of questions.

It takes many years to establish a shipping company of note, and an awful lot of expertise.

But I think the one thing most of us would be thinking is, how could it recreate a SA Merchant Marine perhaps somewhat along the line of the old SAFMARINE? without private input I do not see how it would be possible.

Perhaps there is some sort of powerplay going on to put all the Transnet and DEA vessels under a single roof who knows? But I am keeping my eye on the cabotage angle.

Also of note is the recent announcement that a South African Cadet Training Programme will be held by the IMEC (International Maritime Employers Council)) in 2023. It is not clear if the cadet training is exclusively for OOW Deck and Engine, or also for other grades.

SAIMENA is slowly coming out of the Covid closet with a couple of meetings but it's time now I think for us to get back onto a normal routine with presentations, functions, site visits, golf days, branch and council meetings plus event days like ladies night etc..

I would love to see us doing some of the stuff we used to do such as the annual SAIMENA /SOMSA, Botha old boys cricket match (it might be difficult to get a team together).

This is the third edition of TOJ this year and the purpose is to keep it a triannual thing but I cannot do it without your help. Please if you can send me articles , interesting events or experiences, stories of your travels, technical papers etc. I would really appreciate it.

Finally may I wish you all the best for the upcoming holidays and may the new year bring you health, happiness and all that you wish for.

The Editor

Heating, Ventilation and Air Conditioning (HVAC)

In this HVAC series consisiting of 5 parts we are going to take a closer look at what it takes for marine HVAC engineers to design and implement a working ventilation system on board a ship. The series is broken up into 5 main articles. It starts with an overview thereafter certain subjects will be hand picked and be discussed in more detail. The topics include:

Article 1: Ventilation on Board Vessels - An Overview

Article 2: Psychrometry Principles and Load Calculations

Article 3: Refrigeration Cycle and Refrigeration Gases

Article 4: Chilled Water Circulation

Article 5: HVAC Equipment Selection

Article 1: Ventilation on Board Vessels: An Overview

A question often asked is "How do mariners breathe fresh air within the enclosed ship?" The answer is a ventilation system that adds fresh air and removes old air while keeping the climatic conditions comfortable. The focus of this first article is ventilation systems on larger ships, but the principles are similar in smaller

While the concept is simple, ship ventilation requires an intricate and iterative design process combining engineering principles and practical experience to ensure that mariners have enough fresh air to breathe and are comfortable in their working environments. One does not simply go to the local retailer and buy a few air conditioning units, install them and call it a day. It is a complicated system of chiller plants, chilled water circuits, air handling units and peripheral equipment. So where does one start?

Step one in the design process is to determine the climatic conditions that are ideally suited to the

vessels users of the vessel. This includes a combination of the temperature, the relative humidity and the speed of air movement within the compartment. While there are also other variables at play, these three vital elements will remain our focus for now.

So, what is comfortable and for whom? Fortunately for us, this is a well-researched topic with results showing that a temperature range of 22°C to 27°C, relative humidity of 40% to 60% and an air flow speed of 15m/min is ideal. It is important to be mindful of the fact that the ideal conditions may differ from compartment to compartment - for example, engine rooms are warmer and computer rooms are colder, while certain cargo may need to be preserved in a particular climate. The details of these variables are focused on in the second article of this series.

Various standards are used to design ventilation systems. Some local standards include SANS 1238, 10147 and 10173. Two common American standards used are produced by Carrier and the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE). There are also international standards like ISO 7547, 8861 and 9785.

The next step is to carry out cooling and heating load calculations. This process focuses on a specific compartment and takes into account the:

1. equipment;
2. surrounding compartments;
3. expected number of people in the compartment;
4. type of compartment;
5. seasons; and
6. exposure to elements

to determine the cooling and/or heating requirements to maintain the set point climatic conditions. It is repeated for each and every compartment. This used to be a tedious and iterative process done by hand, but fortunately is done by software nowadays.

After all compartments have been accounted for, the total cooling and heating load is calculated. After a safety factor is added, the final load which the ventilation system must be able to handle is calculated. This final value is then used to purchase the equipment, focussing on the chiller plant's cooling capability.

A chiller plant is a large refrigeration system that is used to cool chilled water. Chilled water systems are more efficient at cooling on a larger scale. The chiller plant consists primarily of:

1. a compressor;
2. oil separator;
3. condenser;
4. thermal expansion valve (TXV); and
5. evaporator

The compressor compresses the refrigeration gas to a high pressure and high temperature. The oil separator removes oil in the gas that was used to lubricate the compressor. The condenser allows the refrigeration gas to cool down and condense through the removal of heat. The heat is typically removed by a sea water interface inside the condenser. The gas is then rapidly expanded through the thermal expansion valve and passed to the evaporator. The gas is now very cold and is used to remove heat from the chilled water circuit. The evaporator has an interface with the chilled water circuit and typically cools the chilled water to below 10°C. See Figure 1 for basic chiller plant setup.

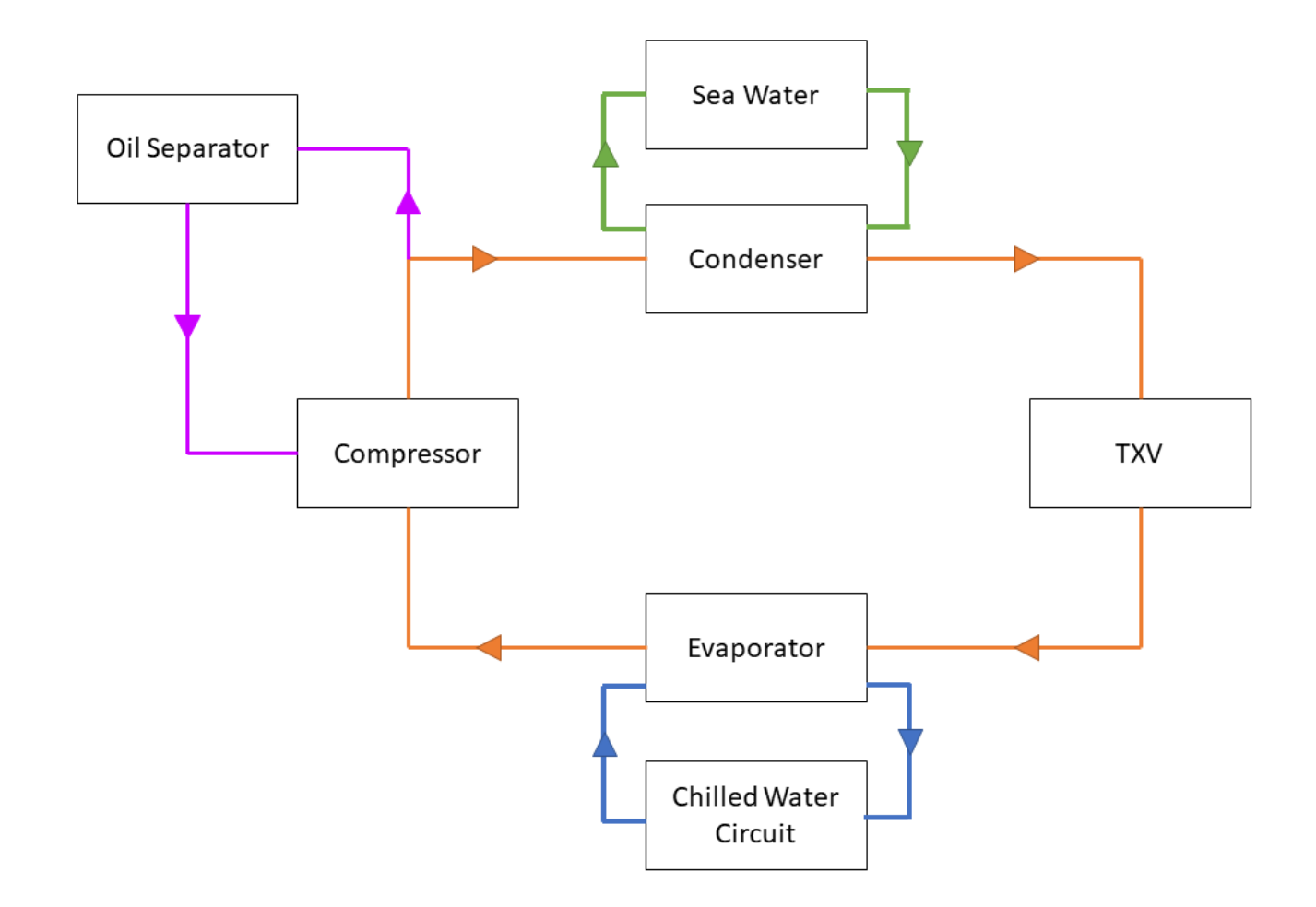


Figure 1: Basic Chiller Plant Setup

The chilled water is then used to cool down the compartments through air handling units. Air handling units differ depending on their location. There are air conditioning units used for compartments with higher concentrations of people, sanitary units for heads and bathrooms and recirculating units for unmanned compartments. In warships there are additional units that treat biological and chemical agents.

The cooled chilled water flows from the chiller plant to the different air handling units. The air handling units treat the air in the compartment with the cooled chilled water. This air treatment process removes heat from the compartment, which in turn heats up the chilled water. The heated chilled water is then returned to the chiller plant to be cooled again.

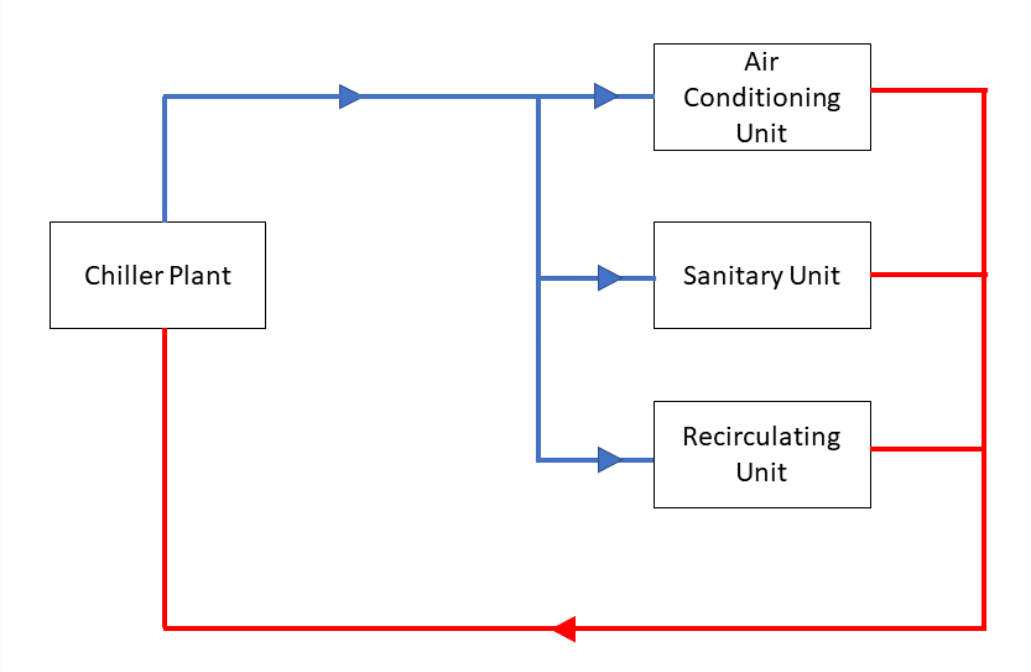


Figure 2: Chilled Water Circuit to Air Handling Units

The air handling unit typically consists of 5 main components: fan, dust filter, cooler, heater and odour filter. Sanitary air handling units normally have an additional dehumidifier to assist in removing moisture from the air. The number and sequence of these components may differ depending on the compartment.

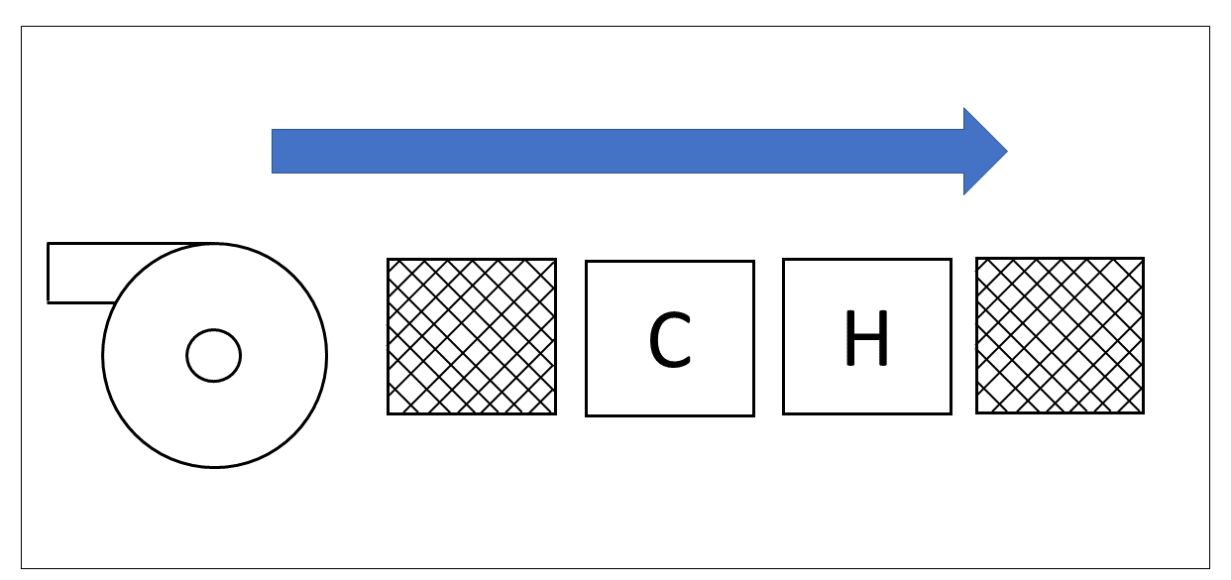


Figure 3: Air Handling Unit Components

The fan draws air in from the compartment and/or outside, which is then filtered. The air then passes over the cooler (which interfaces with the chilled water circuit) and heater to condition the air to the correct temperature and humidity before finally passing through the odour filter to remove offensive smells from the air. The type of filtration may also change to prevent the spread of toxins, fumes and diseases. Recently with the Covid-19 pandemic, HVAC engineers had to adopt different design techniques to prevent the spread of disease within a ship by increasing recirculation and installation of additional filtration within a compartment. After the final filtration, the conditioned air is blown into the compartment at a pre-set speed.

Air handling units typically serve multiple compartments with air being discharged into one or two compartments which naturally overflows to the surrounding compartments. This type of ventilation where air is moved by a fan is called forced ventilation. When air is moved by changes in buoyancy (due to change in temperature) it is called natural ventilation.

The final consideration to complete the ventilation in a compartment is to balance the pressure. The air handling units drawing air in from outside will increase the pressure in the compartment. To balance the pressure, air needs to be exhausted. This is typically done by natural overflows, air balancing lines and/or additional exhaust fans.

In conclusion, HVAC inside a ship is designed to maintain predetermined climatic conditions within a compartment. The conditions differ depending on the type of compartment and what is stored and/or used within the compartment. In the next article, the physical processes happening at each system component will be investigated in more detail.

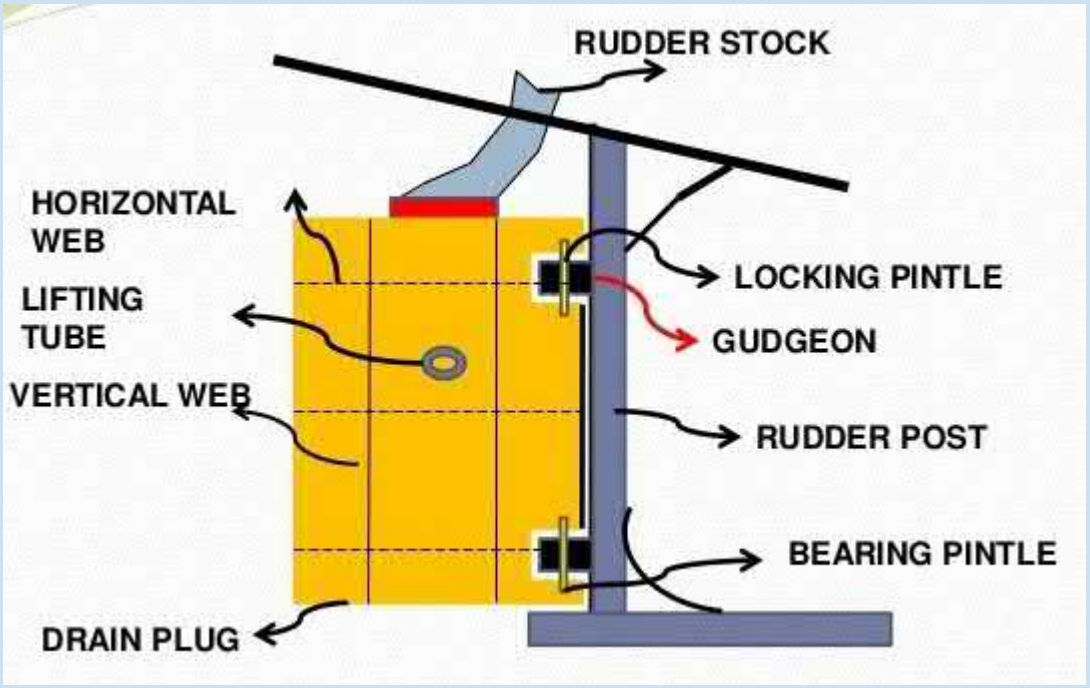
The remaining articles will follow in future issuer of the TOJ.

Acknowledgements: Jacques de Klerk

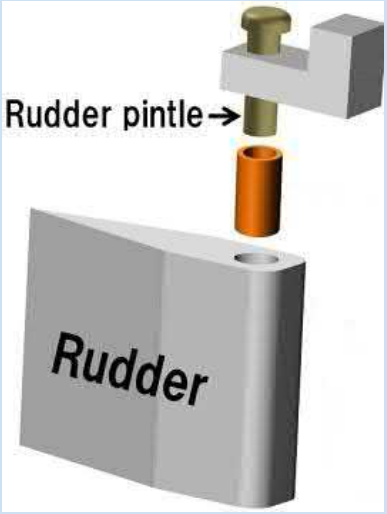
Ships Rudders: Parts, Function, Types

The basic form of a rudder is a flat plate or sheet of material which is used to steer the ships, boats, submarine etc. Rudder operates by
directing the flow of water thereby making a turning moment which make the ship turn. Rudder is a steel structure formed by two plates of 10-20mm thickness. Modern rudders are streamlined to reduce the water resistance.

Below you can see a simple diagram of rudder,



Stock: It turns the rudder, passing vertically upwards to the steering gear through a watertight rudder trunk. The rudder stock is usually connected by a bolted coupling so that the rudder can be removed for maintenance without disturbing the stock



Bearings: Weight of the rudder is taken by the combination of the upper and lower bearing.

Drain Plug: Drain plugs are provided for the drainage of water,

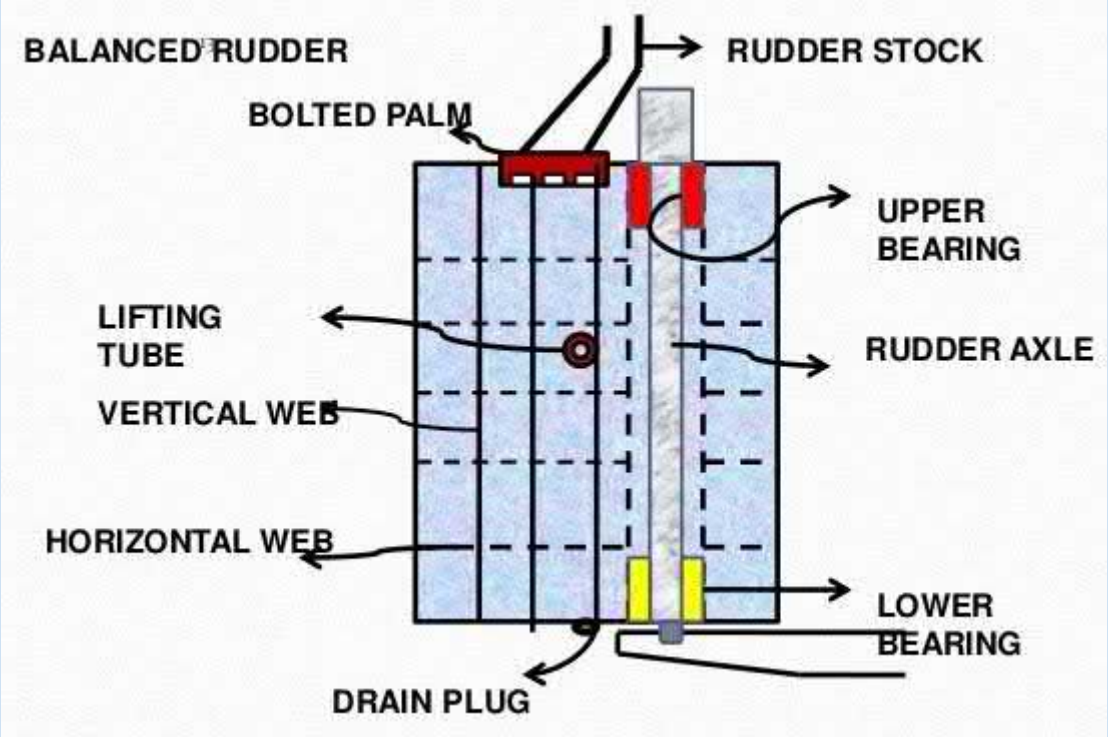
Rudder Pintle: The Pintle ia a pin or bolt which is used as a part of a pivot or hinge.

Types of Rudders

1. Spade or balanced rudder
2. Semi balanced rudder
3. Unbalanced

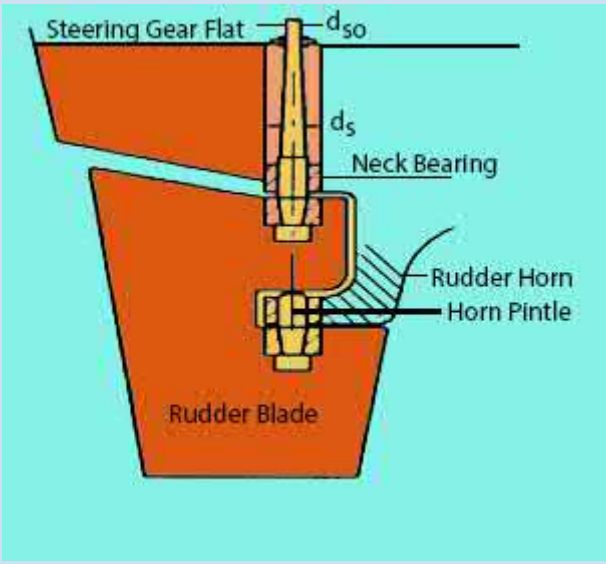
Balanced rudders or spade rudder

This rudder has 20-40% of the area forward of the stock, similarly there is no torque on the rudder stock at certain angles, this type of rudder is called balanced rudder. The axis of the rudder is placed near to the center of gravity, so the torque required to move the rudder will be much less.

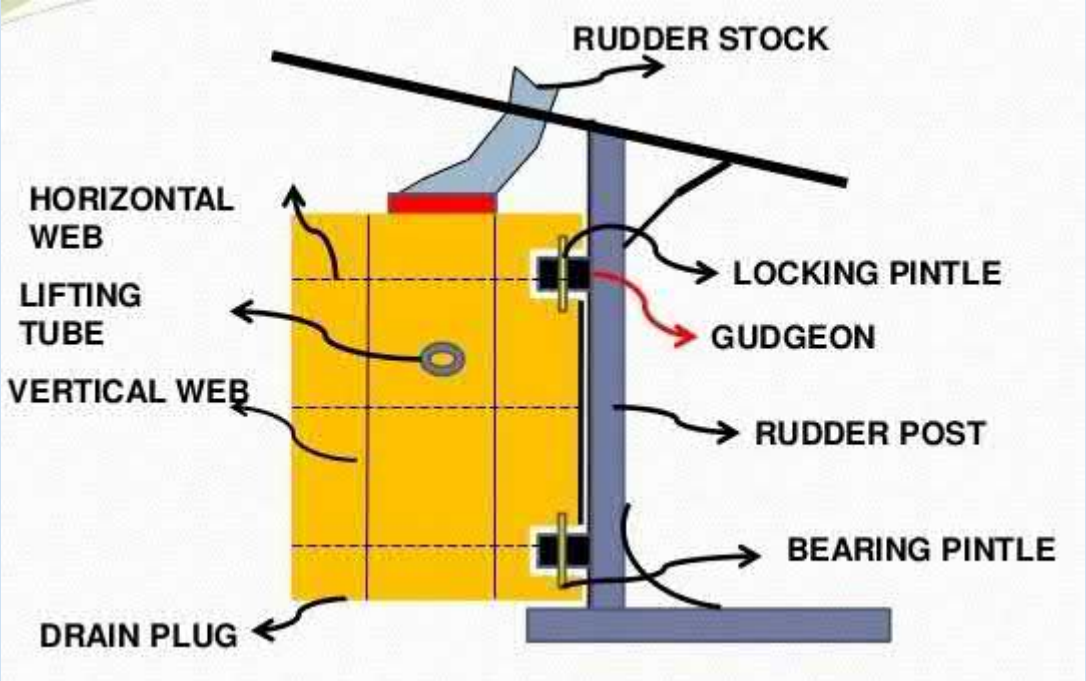


Semi balanced

A rudder with 20% of its area forward of its stock is called a semi balanced rudder. It is often found on twin screw ships.



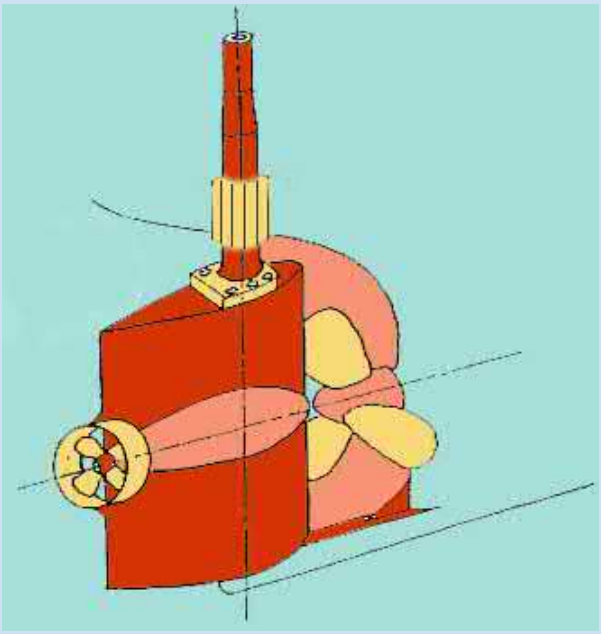
Unbalanced rudder
A rudder with whole of its area aft of its stock is called unbalanced.



Pleuger Rudder:

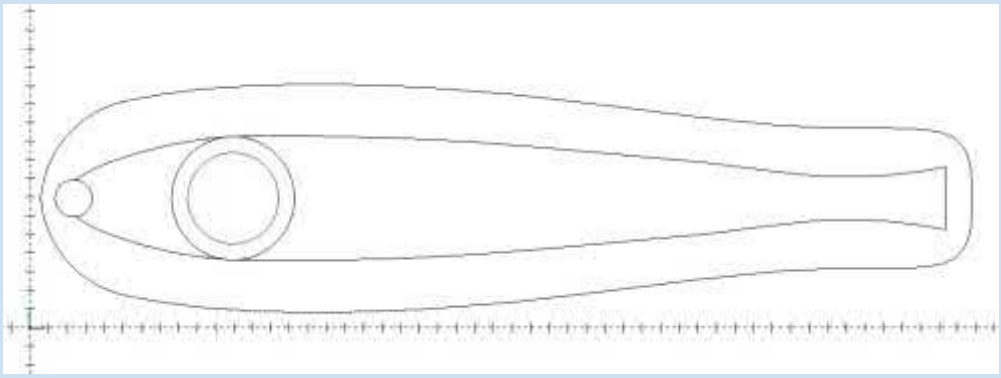
Perhaps one of the most innovative rudder mechanisms you will ever come across. Suppose you have a ship, too large to be manoeuvre in a basin with size constraints, such that the ship cannot use its propeller during the manoeuvre. This situation often arises in case of large ships operating in space-constrained basins, or in any case of low-speed manoeuvres.

So, a Pleuger rudder (as you can see in the figure below), has a smaller auxiliary propeller housed within it (which runs by a motor). As this housing is mounted on the rudder itself, it generates a thrust (which is smaller than what is generated by the ship's main engine propeller) in a direction that is oriented along the rudder, therefore allowing effective manoeuvre in slow speed condition.

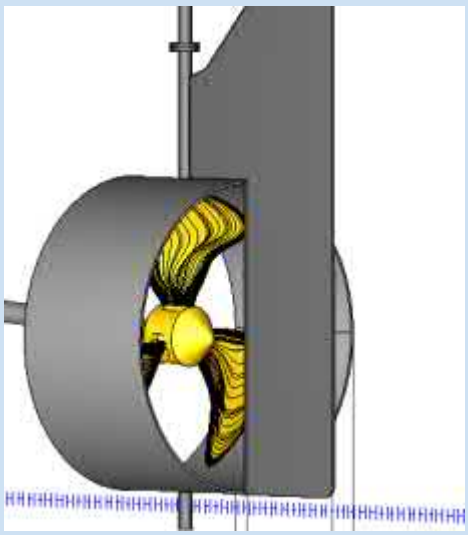


Such a rudder can be used in normal conditions also. Just that, in normal speeds, the Pleuger is not operated. However, when the Pleuger is run, the main engine propeller must not be operated simultaneously, which will otherwise cause the Pleuger to be torn away.

Fishtail Rudder: There are two advantages of this design. First is manoeuvrability. Most rudders, stall and become useless once they are turned more than 33 degrees to either side. But the fishtail rudder can be turned 45 degrees before it stalls. Secondly, as a workboat you canwe run the risk of bumping into things like a rocks. The large forward width of the fishtail rudder allows the use of a very strong 6 inch diameter XXHW rudder post. While we may damage the rudder's surface, we will not likely harm the rudder post which will make repairs much easier. Found mostly on sailboats and pleasure craft operating in shallow waters



Ducted propellers: Even simple pipe like propeller shrouds become much more interesting when they are steerable. It will not realize the 15 to 20% increased thrust offered by a nozzle, but even a simple duct can boast a 10% increase, and there are plenty of additional advantages. * 10% more thrust * Improved towing capacity. * 60 to 70% tighter turning radius * Better fuel efficiency * Protection for the blades * Less ingestion of bottom debris when working in shallow water * Improved reverse thrust



Various Rudder Area Size Calculations

A rudder area of between 8 and 10 per cent of the total lateral plane or underwater profile is the desirable size for a sailboat. of about 304 sq feet * .08 = 24.6 sq ft Down to 6% will do for rudders with high aspect ratios. (Tall)

With a skeg in front of a rudder, up to 12% of the rudder can be considered to be on the skeg. Unless the skeg is 80% of the rudder area and then it no longer counts because it acts more like a long keel.

The submerged portion of the rudder is typically 1% to as much as 2% of the sail area.
A an example for a a sailboat 2196 sq ft of sail, would be 22 to 44 sq ft of rudder.

Displacement Boat Rudder Area = .03 to .04 * Waterline Length * Draft Including Keel:

Traditional Full Long Keel = .068 * Waterline Length * Draft Including Keel:

Acknowledgements: Sailboat, MarineSiteinfo

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Some Ship and Boat Terminology

Tipping Centre

Or LONGITUDINAL CENTER OF FLOTATION (LCF) These two terms are essentially the same and refer to the point around which a vessel "trims". Trim is defined as the difference between the draft forward and the draft aft

Buttock Lines

A curve indicating the shape of an air foil or nautical equivalent in a vertical plane parallel to the longitudinal axis of the craft or vessel. Marine lines obtained by cutting the hull surface with longitudinal planes parallel to the ship's centre line.

Hump Speed

Found by taking the boat's waterline length in feet (usually about 90 percent of the boat's length get the square root of that length, and multiply it by 1.34. That's the hull speed in knots. The peak of the hump speed will usually lie 4 to 6 knots above that.

Hull Speed

Hull speed or displacement speed is the speed at which the wavelength of a vessel's bow wave is equal to the waterline length of the vessel. As boat speed .

Abaft

Toward the stern, relative to some object (e.g. "abaft the bridge").[3]

Abeam

On the beam; a relative bearing at right angles to the ship's keel; e.g. describing an object located at a bearing of 90 degrees (starboard) or 270 degrees (port) as measured clockwise from the ship's bow

After brow

On larger ships, a secondary gangway rigged in the area aft of midship.

Aloft

Above the ship's uppermost solid structure.[

Kellet.

A separate weight on a separate line that is loosely attached to the anchor rode so that it can slide down it easily. It is made fast at a distance slightly longer than the draft of the boat. It is used to prevent the anchor rode from becoming fouled on the keel or other underwater structures when the boat is resting at anchor and moving randomly during slack tide.

Arc of visibility

The portion of the horizon over which a lighted aid to navigation is visible from seaward.

Tumblehome

Tumblehome is a term describing a hull which grows narrower above the waterline than its beam. The opposite of tumble-home is flare.

Catenary

A mathematical term which describes the shape of a flexible line (like A chain) hung between two points (like the bow of your ship and the seabed, or the anchor).

Yaw

To deviate erratically from a course (as when struck by a heavy sea) especially : to turn by angular motion about the vertical axis.

Pitch

The up/down rotation of a vessel about its transverse/Y (side-to-side or port-starboard) axis. An offset or deviation from normal on this axis is referred to as *trim* or *out of trim*. A vessel that is pitching back and forth is usually termed to be hobby horsing.

Parametric Rolling Movement

PRM occurs when the vessel is sailing in head or stern seas or with a small heading angle relative to the wave direction, and where the length of waves is about the length of the vessel and the encounter period of the wave is equal or close to half the ship's natural roll period. In these conditions the vessel's underwater hull geometry is changing, which leads to changes in the vessel's stability. The situation is especially prominent when the wave crest is amidship. PRM can cause a ship to roll at extreme angles of up to 30-40 degrees or more and may in extreme cases lead to capsizing of the vessel.

Sway

Sliding motion when the hull of a ship is pushed by the wind or current. Surge occurs when the vessel is being followed by larger swells, which can push the vessel forward and impact the front to back motion of the ship

Heave

The up and down motion of a ship as large swells move a vessel vertically up and down on the crests and troughs of waves.

Slamming

Slamming is used to describe the motion where he bottom of the ship hull crashes into wave crests, then abruptly becomes immersed in the sea. Slamming occurs when ships travel through the water and are forced to move up and down in large waves. The bow of the ship rises from the water as it goes over the crest of a wave, then drops to impact on the water below.

Boot Top

This is the part of the ship that transitions between being submerged in water when the vessel is fully laden with cargo and is exposed above water when the vessel is not carrying any cargo.

Margin line

An imaginary line used in making calculations regarding the flooding of hulls, running fore-and-aft 3 inches (8 centimetres) below the upper surface of the bulkhead deck at the side.

Air Draft

Is the distance from the surface of the water to the highest point on a vessel

Module Depth

Is the vertical distance measured from the top of the keel to the top of the freeboard deck beam at side

The Nuclear Diamond Battery

The short lifespan of conventional batteries means they either cannot be used or have significant drawbacks in situations where it is not feasible to charge or replace them. For example, pacemakers, satellites, high-altitude drones or even spacecraft low-power electrical devices where long life of the energy source is needed.

A team of physicists and chemists have grown a man-made diamond that, when placed in a radioactive field, is able to generate a small electrical current.

Unlike the majority of electricity-generation technologies, which use energy to move a magnet through a coil of wire to generate a current, the man-made diamond is able to produce a charge simply by being placed in close proximity to a radioactive source.

A prototype 'diamond battery' using Nickel-63 as the radiation source was demonstrated, but work is now underway to significantly improve efficiency by utilising carbon-14, a radioactive version of carbon which is generated in graphite blocks used to moderate the reaction in nuclear power plants. Research has shown that the radioactive carbon-14 is concentrated at the surface of these blocks, making it possible to process it to remove the majority of the radioactive material. The extracted carbon-14 is then incorporated into a diamond to produce a nuclear-powered battery.

Despite their low-power, relative to current battery technologies, the life-time of these diamond batteries could revolutionise the powering of devices over long timescales. The actual amount of carbon-14 in each battery has yet to be decided but one battery, containing 1g of carbon-14, would deliver 15 Joules per day. This is less than an AA battery.

Standard alkaline AA batteries are designed for short timeframe discharge: one battery weighing about 20g has an energy storage rating of 700J/g. If operated continuously, this would run out in 24 hours. Using carbon-14 the battery would take 5,730 years to reach 50 per cent power, which is about as long as human civilization has existed.

Acknowledgements: University of Bristol

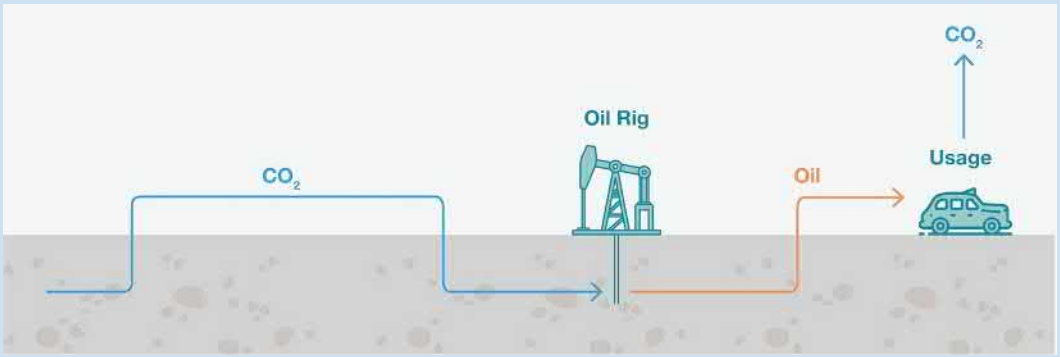
Carbon Negative Oil

This process of injecting CO2 into existing oil fields is a well-known “enhanced oil recovery” (EOR) technique: the addition of CO2 increases the overall pressure of an oil reservoir, forcing the oil towards production wells. The CO2 can also blend with the oil, improving its mobility and so allowing it to flow more easily.

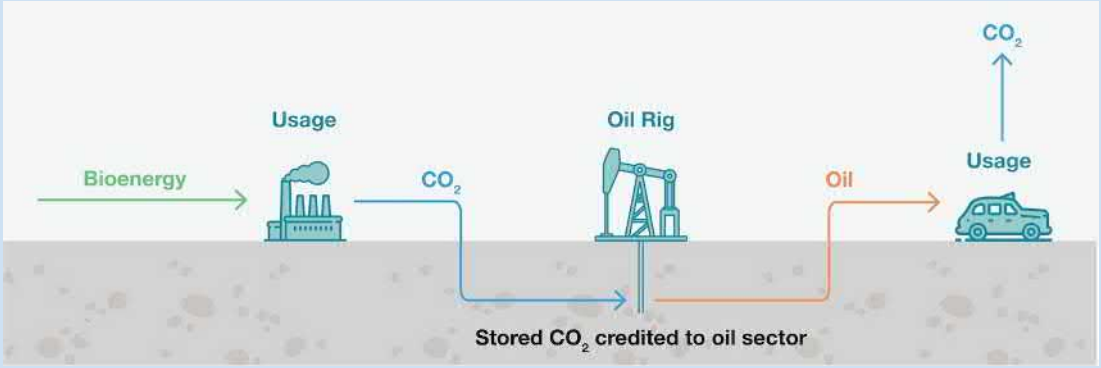
In CO2-EOR, some portion of the injected CO2 remains below the ground. If the CO2 that returns to the surface is separated and reinjected to form a closed loop, this results in permanent CO2 storage.

The idea of “carbon-negative” oil is attractive. It could help reduce emissions from hard-to-decarbonise sectors such as aviation and trucks that are heavily dependent on energy-dense, liquid fuels. However, the logic of “carbon-negative oil” critically depends on the boundaries of the analysis and the origin of the CO2.

Today the majority of CO2 injected in CO2-EOR projects is produced from naturally occurring underground CO2 deposits. This may appear a somewhat ironic situation, but the reason for this is the absence of available CO2 close to oil fields. Using natural sources clearly provides no benefit in terms of the emissions intensity of the produced oil.

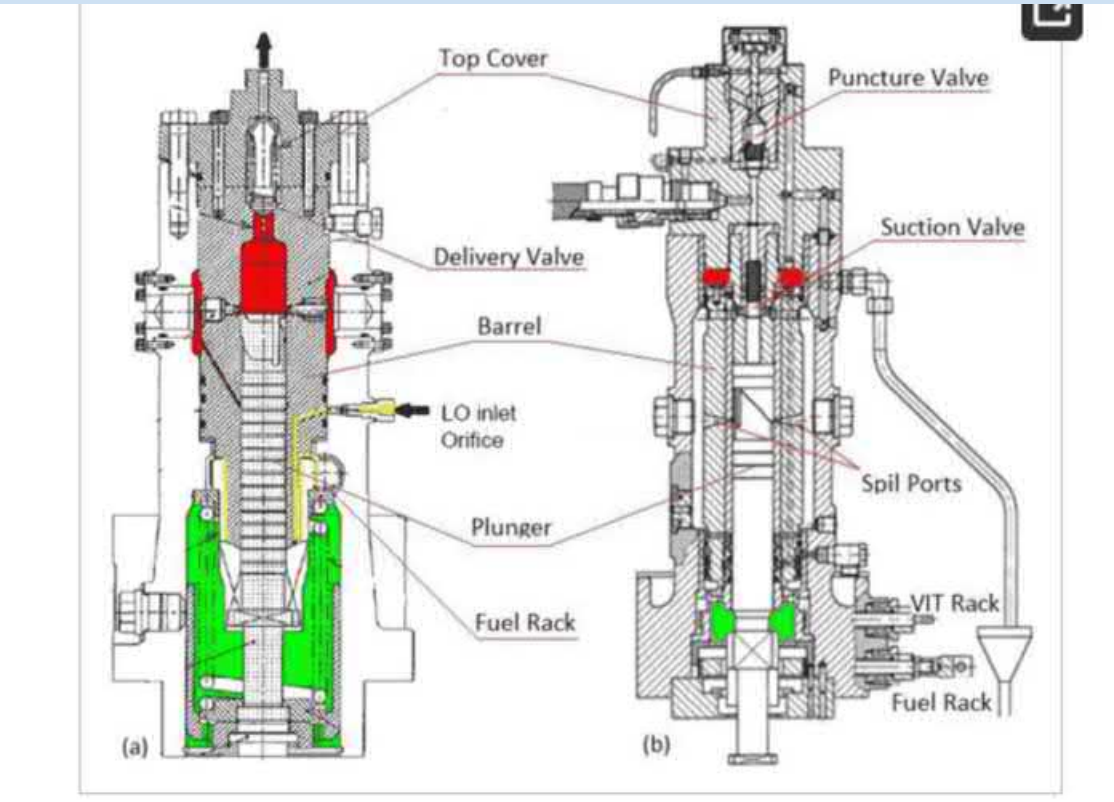


To produce “carbon-negative oil” – that is for CO2-EOR actually to reduce the stock of CO2 in the atmosphere – EOR projects would need to inject CO2 that has either come from the combustion or conversion of biomass or has been captured directly from the air.



Puncture Valve

A puncture valve is fitted in the top cover of the pump. It is opened when compressed air from the control air system acts on top of a piston fitted in the top cover. Fuel oil from the discharge side is then returned to the suction side of the pump and no injection takes place. The puncture valve is operated in the event of actuation of the shut down system (all units), during the air start sequence or when excessive leakage is detected from the double skinned fuel pipes.
The puncture valve consists of a piston which communicates with the control air system of the engine. In the event of actuation of the shut-down system, and when 'STOP' is activated, compressed air causes the piston with pin to be pressed downward and 'puncture' the oil flow to the fuel valve. As long as the puncture valve is activated, the fuel oil is returned through a pipe to the pump housing, and no injection takes place.



A Puncture valve is used to stop the Fuel Injection. It is a device to positively stop the engine irrespective of the rack position.

A Puncture valve is operated with starting air which is sent during Stop, Emergency Stop or in event of actuation of the shut-down system of the main engine.

It reduces the high pressure of the fuel oil by connecting the high-pressure side to the pump body, thereby stopping the injection of the fuel.

Acknowledgements: MarineSite.Info Brightmariner.com

Antimatter Propulsion

What is Antimatter?

- Compared to it's matter counterpart, antimatter has: – The same mass & lifetime – Opposite electrical charge – Opposite magnetic moment
- Every particle has an antiparticle (photons, π 0 and μ 0 mesons are their own antiparticles)
- Anti-elements can be built up from antiparticles
- Antihydrogen (): - Positron (antielectron) orbiting an antiproton – Fleetingly created at the CERN accelerator in 1995 – Stably created and studied by ATHENA/CERN in 2002 – Neutral antihydrogen atoms briefly trapped by ALPHA/CERN in 2010 – Antihydrogen atoms can now be routinely trapped for 1000's seconds

When antimatter comes into contact with normal matter, these equal but opposite particles collide to produce an explosion emitting pure radiation, which travels out of the point of the explosion at the speed of light. Both particles that created the explosion are completely annihilated, leaving behind other subatomic particles. The explosion that occurs when antimatter and matter interact transfers the entire mass of both objects into energy. Scientists believe that this energy is more powerful than any that can be generated by other propulsion methods.

Matter-antimatter propulsion will be the most efficient propulsion ever developed, because 100 percent of the mass of the matter and antimatter is converted into energy. When matter and antimatter collide, the energy released by their annihilation releases about 10 billion times the energy that chemical energy such as hydrogen and oxygen combustion, the kind used by the space shuttle, releases. Matter-antimatter reactions are 1,000 times more powerful than the nuclear fission produced in nuclear power plants and 300 times more powerful than nuclear fusion energy. So, matter-antimatter engines have the potential to take us farther with less fuel. The problem is creating and storing the antimatter. There are three main components to a matter-antimatter engine:

Magnetic storage rings - Antimatter must be separated from normal matter so storage rings with magnetic fields can move the antimatter around the ring until it is needed to create energy.

Feed system - When the spacecraft needs more power, the antimatter will be released to collide with a target of matter, which releases energy.

Magnetic rocket nozzle thruster - Like a particle collider on Earth, a long magnetic nozzle will move the energy created by the matter-antimatter through a thruster.

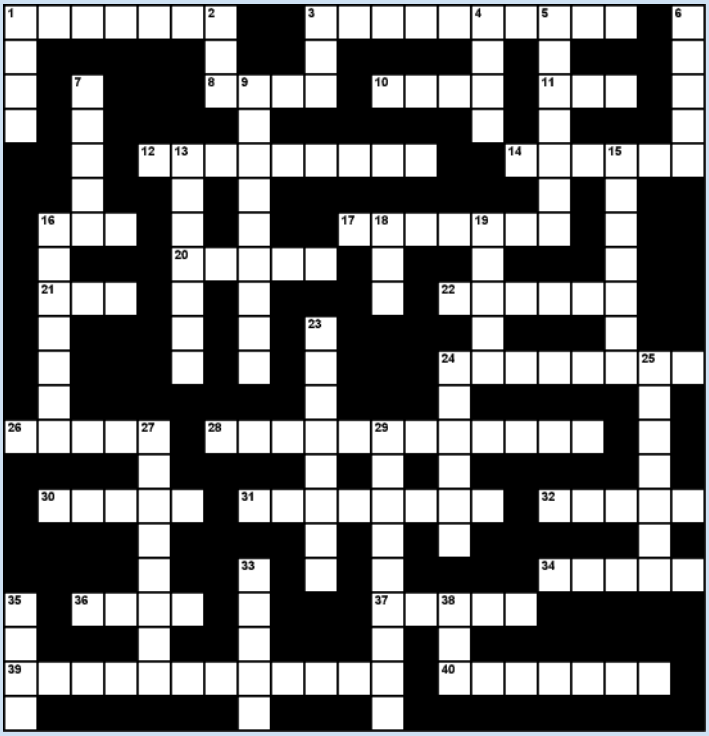
Approximately 10 grams of antiprotons would be enough fuel to send a manned spacecraft to Mars in one month.

Acknowledgements: How stuff works

TOJ CROSSWORD

Across

1. a large member of the cat family, often tan with black spots
3. a very large mammal of Africa, India, and SE Asia with one or two horns on its nose
8. a small four-legged animal, related to a sheep, that has horns and a rough coat and gives milk
10. the male of cattle that can produce young
11. the adult female of cattle and some other large animals
12. an animal that digs for food and shelter in the ground and has tough skin made of hard plates
14. small animal of North America that makes holes in the ground
16. flying animal active at night that looks like a rat with wings
17. a farm bird raised for its eggs and meat**20.** a small animal with black fur and white stripes that gives off a bad-smelling liquid when frightened or attacked
21. a variety of small dog-like animal with a thick furry tail, considered to be clever
22. a small animal with long ears, a small fuzzy tail, and soft white, gray, or brown fur
24. a two-legged animal from Australia that hops very fast and has a long tail
26. a large, four-footed, domesticated animal with hard hooves used for riding, work, and in some places for meat
28. a large African animal with a heavy body, gray skin, and a very large head and mouth
30. an animal often seen on farms, kept for its wool and for meat
31. a small, usu. gray animal with a long fluffy tail
32. the largest member of the deer family with dark brown coat, short neck, and long nose, living in northern North America, Europe, and Asia
34. a South American animal, like a small camel without a hump, used to carry loads
36. a large animal with thick fur, sharp teeth, and claws
37. a young dog not fully grown
39. a large cat with a long tail and tan coat, found from western Canada to the tip of South America
40. an African animal with long legs, a very long neck, and a spotted coat



Down

1. a large member of the cat family, found mainly in Africa
2. any of a variety of four-legged meat-eating animals usu. kept as pets or to work (for farmers, police, etc.)
3. a kind of rodent with a long hairless tail, a pointed nose, and very sharp teeth
4. a baby cow or bull
5. an animal with a gray furry body, a ringed fuzzy tail, and dark rings around its eyes
6. large, fierce, wild yellow cat that lives in Asia
7. a large mammal from China that looks like a bear with black-and-white fur
9. a large monkey with a reddish brown coat and no tail, found in Sumatra and Borneo
13. a male chicken
15. a tool with a handle and metal head used for pounding
16. a large, four-legged, hoofed animal
24. a baby cat
25. an American marsupial animal with a pointed nose and a long bare tail that is active mostly at night and may pretend to be dead when in danger
27. the largest earthbound mammal, with four legs, usu. gray skin, a trunk, and long tusks
29. an animal of the rodent family, found widely in the Americas, that moves slowly and has stiff, sharp quills that can be raised to drive off enemies
33. a meat-eating, wild, dog-like animal of Africa and southeast Asia that is active at night
35. a young sheep or the meat from one
38. a common farm animal of the swine family, valued for its meat, with a fat round body, thick skin, short nose, legs, and tail

News Snippets

1. Three migrants were found atop the rudder of "Alithini II" when it arrived in Spain's Canary Islands after completing a 2700 nautical mile journey. The stowaways were exhibiting symptoms of dehydration and hypothermia
2. British Insurers are forbidden by the UK Treasury to provide insurance coverage to ships carrying Russian oil cargoes from December 5th, 2022.
3. Fire erupted on board of general cargo ship AZOV CONFIDENCE in the evening Nov 2, shortly after the ship left Samsun Turkey, Black, sea, bound for Novorossiysk. Ship's engineer of Ukrainian nationality (rank unknown) was engulfed in flames and jumped overboard.
4. Carnival to implement air-lubrication technology to reduce fuel consumption
5. Container ship RAGNA ran aground late at night Oct 27 shortly after leaving Frederica Denmark, Little Belt, bound for Bremerhaven Germany. "NUC". Coordinates don't change since around 2230 UTC Oct 27. Reportedly ship's sailing after she left Frederica was suspicious and the ship was boarded by the police, finding Master to be intoxicated.
6. UK Royal Navy Orders Crewless Submarine from MSubs.
7. South African fines for polluting ships hiked by 2 000% in new proposed law
8. A new statue, to be based near Durban's Port Natal Maritime Museum, has been announced by the Department of Transport, which emphasised that it wouldn't be footing the bill.
9. Paramount Maritime Holdings subsidiary, Nautic Africa has announced the launch of its new flagship 35m Sentinel vessel,
10. The South African Navy (SA Navy) is looking back at past acquisition strategies to see what lessons can be learnt for the future
11. Novatech, trading as Hesper Engineering, a ship repair and general engineering company based in Cape Town, has purchased a 51% shareholding in Swift Engineering.
12. India is exploring a plan to subsidize its Shipbuilding industry in its latest push for industrialization
13. Wartsila: "Our New Generation Engines Will be Futureproof, Regardless of Which Propulsion technology Will Prevail"
14. MOL and team to conduct trial of hydrogen-powered engine
15. Cape Town manufacturer claims s outboard engine design breakthrough
16. Dutch firm studies more widespread use of nuclear propulsion in commercial shipping
17. **Without immediate action in the form of retrofits or power limitation, much of today's global fleet faces the prospect of non-compliance with the IMO's Carbon Intensity Indicator (CII) regulations, which enter into force in January 2023. Fleet owners face the additional risk of stranded assets caused by uncertainty around the availability, quality and price of future fuels.**
18. The integration of hybrid propulsion systems is now seen as a strategic investment in the shortsea shipping segment, according to a November 2022 Wärtsilä webinar Future proof solutions for short sea shipping vessels.
19. Türkiye's 1st unmanned marine craft to have domestic diesel engine

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Thankyou

The Editor..