The South African Institute of Marine Engineers and Naval Architects

SAIMENA

The Two Oceans Journal

2nd Edition 2019

National Council 2018/2019

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Editor:

Iain Armstrong

2019 2nd Edition

www.saimena.co.za

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

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President's report

The past period has seen a lot of activity in the maritime sphere; the risk to our Seafarers from the risk of South Africa losing its White List status, SAIMENA reviewing it financial status and bring all records up to date with a 100% audit, developments on the education and training front and great activity within the two SAIMENA Branches.

SAIMENA Membership growth has continued of the past year with 16 new members enrolled during 2019 so far and more in the pipe-line. I encourage all members to actively solicit new members, especially the younger generation, students/cadets and those who are currently not as active in our marine association, especially people of colour who are significantly missing from the structures of council and branch committees. I believe growing our numbers in these areas is vital to enable SAIMENA to play a more meaningful role in the maritime space in the future and to give our Institute a stronger and more representative voice.

The support from Council and the Branch Committees has been essential to ensuring that SAIMENA is robust and able to continue playing its role in the marine sphere. All SAIMENA members are again requested to please get involved at a branch and council level, more participation means a lighter work load on committee members and makes it more pleasant for all involved, it also gives you a chance to have your way and ensure that service and support you want from SAIMENA is achieved, get involved as only you can make a difference, don't sit on the side-lines.

Many thanks to the new Hon. Treasurer, Phillip Wood, in aligning and strengthening our financial management situation. I also need to thank Willem Deyzel for his services on the Membership Committee, Rogan Troon for his Hon. Secretarial support and Iain Armstrong for his drive to get our Two Oceans Journal published.

We still have many SAIMENA members who are not in email contact with us, please encourage all your shipmates to ensure that they 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.

ECSA has changed the way it registers professionals, moving to a decentralised peer review system. This places a demand for discipline specific assessors in all our geographic regions. Presently there are no Marine related assessors on the ECSA database, which means that our Marine related disciplines are not effectively or fairly evaluated when members apply for registration. Please make yourselves available for assessor training so that we can strengthen our marine representation and ensure that the standard of marine engineering is maintained at a level that we as SAIMENA, will be happy with.

The continued demise of ship repair companies in the face of regional competition and limited national support continues to be detrimental to our marine industry survival and growth.

The risk to our Seafarers from the risk of South Africa losing its White List status caused a huge stir early in the year, with SAMSA having to work hard to get alignment between the IMO requirements and national objectives. The risk appears to have been allayed for the moment but the industry has not yet been given an assurance that all problem areas have been resolved as yet. We look forward to a positive outcome in this matter.

There have been continued developments on the education and training front in the marine engineering sphere with NMU now in the second academic year of its new Marine Engineering course, and CPUT gearing up to start its new Marine Engineering course in the new year. Both of these have moved away from the National Diploma which is being phased out by Higher Education and being replaced by a B Technology Marine Engineering course. Discussion needs to be encouraged between the education sector and the industry that need the cadets to ensure that there is a smooth and happy transition to the new way that education has to take place due to legislation changes.

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

Best regards

Kevin Watson

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New Members

SAIMENA - Alphabetical Member Listing

THE SOUTH AFRICAN INSTITUTE OF MARINE ENGINEERS AND NAVAL ARCHITECTS

DIE SUID-AFRIKAANSE INSTITUUT VAN MARINE-EN SKEEPSBOUKUNDIGE INGENIEURS

SAIMENA

Member Name			*Company Name*	*City, Country*	*ECSA Grade*
Year:	**2019**				
Branch:	**Cape**				
2019002	F	ZIETSMAN, J.F.W. - JOHN	ZAA Engineering Projects & Naval Architecture (Pty) Ltd	Hout Bay	Pr.Eng
2019003	A	MABANDLA, A. - AKHONA	African Marine Solutions	Cape Town	
2019011	A	MORGAN, V.R. - VINCENT	African Marine Solutions	Cape Town	
2019013	M	ROSSOUW, S.R. - SHAUN	not known	Cape Town	
2019014	A	MONTES, S.A. - SAMANTHA	CPUT	Cape Town	
2019016	M	BAKKER, G.W. - GIJSBERT	COE International BV	Hout Bay	
2019017	M	PADAYACHEE, T. - TERENCE	African Marine Solutions	Cape Town	
2019018	F	KRUGER, D.A. - DIRK	Kruger Projects & Design cc	Strand	Pr.Tech.Eng
2019S01	S	WHEELER, M.I. - MORGAN	SAMTRA	Cape Town	
2019x15	M	SILVIS, E.J. - EMILE	SAMTRA	Bellville	
Branch:	**Durban**				
2019001	M	DE JONGE, B.B. - BENJAMIN	Critical Minds	Durban	Cand.Eng
2019004	M	MCELLIGOTT, B.M. - BRETT	Unicorn Shipping	Durban	
2019005	A	DURGAPERSAD, P. - PRITHIRAJ	African Marine Solutions	Durban	
2019006	M	AJAYI, C.O. - CYRIL	African Marine Solutions	Midrand	
2019007	M	OLDS, D.P. - DUNCAN	Nouum (Pty) Ltd	Hillcrest	
2019008	A	MTANA, L.M.M. - LONDA	Berea Technical College	Durban	
2019009	A	TURNBULL, C.A. - CHRISTOPHER	Self employed	Kloof	
2019010	A	HLANZE, M.J. - MANQOBA	SA Navy	Amanzimtoti	
Branch:	**National**				
2019012	M	RAUTENBACH, S.J. - STEPHAN	AECOM	St Francis Bay	Pr.Tech.Eng

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Contact Membership Status Changed 2019

11 September 2019
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Contact ID	Grade	Status	Last Name	Initials	AuditDate	StatusChange
1995003	M	Resigned	Mazen	R.H.	10-Sep-2019	Resigned
1975043	RF	Deceased	Hardman	D.W.	10-Sep-2019	Deceased
2019017	M	Applicant	Padayachee	T.	06-Sep-2019	Accepted as MEMBER
2019016	M	Applicant	Bakker	G.W.	27-Aug-2019	Accepted as MEMBER
2019014	A	Active	Montes	S.A.	20-Aug-2019	Accepted as ASSOCIATE
2019018	F	Active	Kruger	D.A.	20-Aug-2019	Accepted as FELLOW
2016014	M	Canc-Appl	Ogabi	O.A.	05-Aug-2019	Suspended as No member reply
2016013	M	Active	Genevieve	B.	05-Aug-2019	Accepted as MEMBER
2009009	M	Resigned	Wessels	G.D.	02-Aug-2019	Resigned
1990019	F	Deceased	King	A.J.	26-Jul-2019	Deceased
2016008	M	Resigned	van Reenen	I.A.	24-Jul-2019	Resigned
1983021	F	Resigned	Welch	R.A.	24-Jul-2019	Resigned
2011013	M	Resigned	Swan	S.J.C.	22-Jul-2019	Resigned
2019012	M	Applicant	Rautenbach	S.J.	16-Jul-2019	Accepted as MEMBER
2019013	M	Active	Rossouw	S.R.	16-Jul-2019	Accepted as MEMBER
1979030	M	Deceased	Queen	J.W.	29-May-2019	Deceased
2017xx9	Canc-Appl	Canc-Appl	Myers	A.E.	20-May-2019	Suspended as No member reply
2017x14	Canc-Appl	Canc-Appl	Mokwena	M.R.	20-May-2019	Suspended as No member reply
2019S01	S	Active	Wheeler	M.I.	14-May-2019	Accepted as STUDENT
2019006	M	Applicant	Ajayi	C.O.	12-May-2019	Accepted as MEMBER
2019010	A	Active	Hlanze	M.J.	08-May-2019	Accepted as ASSOCIATE
2007001	A	Suspended	Maher	C.E.	20-Apr-2019	Re-instated, fees paid
2019008	A	Active	Mtana	L.M.M.	14-Apr-2019	Accepted as ASSOCIATE
2009014	M	Active	Harris	R L	14-Apr-2019	Re-instated, fees paid
2019009	A	Active	Turnbull	C.A.	14-Apr-2019	Accepted as ASSOCIATE
2019004	M	Applicant	McElligott	B.M.	12-Apr-2019	Accepted as MEMBER
2019007	M	Applicant	Olds	D.P.	12-Apr-2019	Accepted as MEMBER
2019006	M	Applicant	Ajayi	C.O.	12-Apr-2019	Accepted as ASSOCIATE
2019003	A	Active	Mabandla	A.	06-Apr-2019	Accepted as ASSOCIATE
2019005	A	Applicant	Durgapersad	P.	06-Apr-2019	Accepted as ASSOCIATE
1980012	A	Resigned	Garbaccio	A.J.	01-Mar-2019	Resigned
2008019	A	Resigned	Johnsen	C.H.	27-Feb-2019	Resigned
2008008	A	Resigned	Von Brandis	R.P.	18-Feb-2019	Resigned
1975060	RM	Deceased	Mc Daid	P.H.	02-Feb-2019	Deceased

Contact ID	Grade	Status	Last Name	Initials	AuditDate	StatusChange
2019002	F	Active	Zietsman	J.F.W.	31-Jan-2019	Accepted as FELLOW
2019001	M	Active	de Jonge	B.B.	28-Jan-2019	Accepted as MEMBER
2018009	M	Active	Hlanze	H.S.	11-Jan-2019	Accepted as MEMBER
1990017	A	Resigned	Simpson	R.E.	07-Jan-2019	Resigned
1984021	A	Resigned	Manley	D.M.	07-Jan-2019	Resigned
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THE CASE FOR A LARGE DRY DOCK

An Investment Opportunity Beckons

BACKGROUND

South Africa has five drydocks :

Port	Name of Drydock	Length	Breadth	
Durban	Prince Edward Drydock	350m	33.5m	
East London	Princess Elizabeth Drydock	200m	24.5m	
Simon's Town	Selborne Drydock	240m	29m	*(Naval vessels have priority use of this drydock).*
Cape Town	Sturrock Drydock	360m	38.4m	
	Robinson Drydock	161m	17.2m	

Although these are satisfactory in terms of size to accommodate many ships that call at our ports or that pass the coast, they – and other floating drydocks and slipways are too small to accommodate large tankers or large bulkers.

The largest ship that can be accommodated in a South African drydock is 360m in length and less than 38m in beam (in Sturrock Drydock, Cape Town).

Size of Typical Ships for which a large drydock would be suitable :

NOTE : These dimensions are based on typical vessels within the various classes that pass the Cape on a regular basis

Type of Ship	***Length***	***Beam***
Containership	330m	53m
VLCC	333m	60m
Capesize bulker	305m	53m
Valemax bulker	362m	65m
LNG Carrier	294m	48m
Drillship	238m	42m

Oil rigs *Dimensions vary greatly but, while they can undergo refit alongside a wharf, most are unable to enter any South African drydock for full refit*.

REASONS FOR A THE CONSTRUCITON OF A LARGE DRYDOCK IN SOUTH AFRICA

South Africa lies on one of the world's more important shipping routes with about 29 000 ships passing the Cape of Good Hope each year.

Millions of tons of Asia-bound West African oil and South American minerals pass the Cape of Good Hope. (Ships that carry these commodities will also probably pass the Cape on their ballast voyages en route to load.), In addition, the Asia-West Africa and Asia-South America container trades have grown considerably over the past decade, and, given current trends, will continue to.

Containership	Loaded	Europe-South Africa (often terminating voyage in Durban but still with containers aboard.)
Containership	Loaded	Asia-South America
VLCC	Ballast	Asia-West Africa
VLCC	Ballast	Asia-Brazil
VLCC	Ballast	From Saldanha Bay to loading port
VLCC	Ballast	Durban SBM to loading port
Capesize	Ballast	Asia-Brazil
Capesize	Ballast	Asia (or Europe)-Saldanha Bay (to load iron ore)

Valemax	Ballast	Asia-Brazil (About 40 of these ships regularly pass the coast.)
LNG Carrier	Ballast	Asia-West Africa (to load)

Several South African ports – Saldanha Bay, Cape Town, Durban and Richards Bay, as well as Maputo (Mozambique) – are terminal ports for inward ships carrying bulk cargoes. Once they have discharged their cargoes, and before their next charter begins, will be an ideal time for drydocking to occur.

Several South African ports – Saldanha Bay, Port Elizabeth, Durban and Richards Bay, as well as Maputo (Mozambique) – are ports where charters begin. Before loading their cargoes, the ships are empty, making South Africa an ideal drydocking venue.

No African port and ***no*** southern hemisphere port has a drydock capable of accommodating ships over 300 metres in length ***and*** 38 metres in beam. The nearest large drydocks able to accommodate these classes of ship are:

Place	***Approximate distance from South Africa (Nautical Miles)****	
	** Distance from Port Elizabeth which is approximately central along the coast*	
Arabian Gulf (Bahrein)	4 575	(Takes 16 days at 12 knots)
Singapore	5 202	(Takes 18 days at 12 knots)
Lisbon	5 533	(Takes 19 days at 12 knots)

Therefore, a large South African drydock will have no competitor in the immediate area. With a dividing cassion, a large drydock can of course accommodate two (or more) smaller ships simultaneously, and therefore has the additional benefit of increasing the country's capacity for general drydocking, not only drydocking for large ships.

The Cape Route continues to be an alternative route to the Suez Canal whose transit tariffs are high. In addition, that route still suffers the threat of piracy (albeit presently reduced) in the Gulf of Aden area. This can endanger slow, low-freeboard ships, and, with the costs of ship-board guards and insurance surcharges, some owners and charterers divert their ships to the Cape Route. The civil war in Yemen and the associated random attacks on shipping off the Yemeni coast can aggravate the security situation along that sea route. These factors result in more ships – of all sizes - passing the Cape than the number transiting the Suez Canal (about 80 ships pass the Cape daily and about 45 transit Suez daily). With the exception of East London's drydock that is quieter than the others, the existing drydocks are busy and additional facilities are needed. At present, the country's ship repair industry foregoes a number of major opportunities because suitable drydocking facilities are unavailable, Even smaller vessels have to be turned away because the drydocks are occupied.

Ship repair (particularly a ship using the drydock for a refit), is a labour-intensive industry sometimes using hundreds of workers from the most highly-trained engineers and electronic experts to large numbers of unskilled workers. Although these people are employed on either a permanent basis or a temporary basis, an additional (and large) drydock will result in a significant number of jobs becoming available on a permanent or temporary basis..

As virtually all ships using South African drydocks are foreign-owned, additional drydocking facilities will see large amounts of foreign exchange enter the country. Some drydockings could engender about R500 million, all in foreign exchange.

A *force majeur* drydocking for a large ship with hull damage or rudder or propeller problems off the southern African coast impossible locally, and with no suitable facilities available, such a vessel could be lost. If the vessel survives, the repair contract (and the associated revenue) will go to a foreign drydock and ship repair contractors.
With expansion in the ship repair industry will come training in a number of associated fields. This will help to expand the skills base in the country (of major importance in a country that has serious skills shortages).

POSSIBLE SITE(S) FOR A LARGE DRYDOCK

While the existing drydocks in Durban or Cape Town could be enlarged, at least one other modern, large drydock would increase the country's ship repair capacity with all the benefits of job creation and foreign exchange earnings.

Although Richards Bay has a significant amount of space for a large drydock and its associated repair yards and workshops, the port is off the great-circle route between Asia and South America or between Asia and West Africa, two key routes for large ships. The port does not have a significantly large repair industry that would form the backbone of an enlarged operation centred on a large drydock.

Durban has no space for a new drydock plus its ancillary repair and workshop facilities.

East London is too small for the purpose.

Ngqura is ear-marked for normal container and bulk cargo expansion, excluding the construction of a large drydock and its ancillary repair yards and workshops.

Port Elizabeth, located closest to the great circle route between Asia and South America and central to the South African coast, is a distinct possibility for the site of the large drydock. Once the manganese terminal has been relocated to Ngqura, the entire area between it and Pier Number Two could be converted into a drydock. However, activities such as grit-blasting and spray-painting of ships may cause considerable inconvenience to residents in parts of Port Elizabeth and also to any envisaged "waterfront" development in the harbour.

Mossel Bay lacks significant ship repair infrastructure and expansion of the port to accommodate a large drydock will probably not be economically viable.

A carefully-selected site on the northern coast of False Bay has merit as it is located close to large residential areas from which large numbers of unskilled workers could be recruited. Considerable expense will be incurred regarding construction and careful research will be necessary to ensure that any potential site is environmentally friendly and is suitable in terms of wind, wind-blown sand other factors that could detract from its use for ship refits and repairs.

Cape Town, with a well-established and well-known ship repair industry, as well as being well-located in terms of its geographical position on the sea routes, is perhaps the best position for a large drydock. Several sites within the existing port have potential to be upgraded and modified for a large drydock.

Saldanha Bay, an existing deep water port with large ships calling (tankers and ore carriers), has many attributes that make it suitable for the location of a large drydock. However, as iron ore dust presents a major problem for ship refitting, a site to windward of the ore terminal (or elsewhere within the bay) will need to be found.

If a dug-out concrete drydock is difficult to build, an alternative is a floating drydock of similar size to those on which the largest of ships are now built. Some of these are over 400m in length and over 64 metres in width and require an adequate depth of water to allow for them to semi-submerge to enable the vessel to float onto the drydock before it is de-ballasted to lift the vessel clear of the water. This should not be an obstacle to development. Advantages of using a floating drydock :

Its local construction in itself would be a training and development project.

Local steel can be used in its construction.

It can be readily moved to another location if desired.

CHALLENGES TO EXPANSION OF THE SOUTH AFRICAN SHIP REPAIR INDUSTRY

A national shortage of suitably-skilled workers (especially heavy current electricians, shipwrights, fitters, and specialised welders) may be problematic to any expansion of the ship repair industry. Training is essential, although it also takes time. Bringing in foreign workers will be more expensive, but could be a short-term solution, and represent a training force.

The highest quality of work is non-negotiable in ship repairs. While many projects have been handled successfully, some have been inferior, including poor welding on an oil rig, requiring the work to be redone. This is expensive, causes delays in completion of the project and could have serious implications if poor workmanship should result in failure of machinery or repaired steel structures when the ship is back as sea.

Work ethic within South Africa is generally inferior to Asian countries whose drydocks pose the greatest competition to any new South African drydock.

Labour problems, often stemming from the intransigence of Unions and consequential strike action, will have a negative effect on any major industry, especially on the ship repair industry as it is so time-bound to finish projects

Meeting budget is a weakness among some South African companies. A major project (e.g. refit of an oil rig) involves much time and outlay of capital to get the vessel to a South African repair yard. Owners do not want to be presented with budget overruns at the conclusion of a project,

Meeting contract time is not a strong point of some South African enterprises. Daily charter rates for specialised vessels such as oil rigs and drill ships are extremely high (some reaching $700 000 per day, depending on the oil price and other factors) while other ships will lose revenue if delayed during refits.

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Transnet National Port Authority is intransigent regarding its role as the only harbour operator and seems not to understand its role as a catalyst for other development and ventures, including ship repair. Therefore its port tariffs are not competitive with other ports that will be vying for the same business as South African ship repairers.

SUMMARY

It is strategically imperative that a large drydock be provided to take the market initiative, to exploit the advantage of the country's strategic geographical position on a busy trade route, to employ hundreds of people (during its construction and after completion), and to earn valuable foreign exchange.

The beneficial spin-offs of a large drydock in South Africa in terms of skills training, development of satellite industries and ancillary services will be significant.

If South Africa fails to take up the project and secure the initiative very soon, another country will do so, will capture the large-ship market, will provide employment for its own citizens, and will earn valuable foreign exchange – and South Africa will miss out.

Acknowledgements: Brian Ingpen

Down Memory Lane

It was suggested that **TOJ** start a series of articles focusing on the life story or interesting experiences of our members .. Of course I cannot do that without your help– so if you wish to let people know of your legacy and life, please send me your story to iainfran1@gmail.com and I promise to print it (subject to editing), in the mag. Got pictures? Send them too.

To continue my story:

At the end of the last edition of TOJ we had reached the stage where I had joined the passenger division of the P & O.S.N.Co and joined the liner Orcades.

The Orcades was an oil fired, steam turbine propelled vessel of 28,164 GRT and 34000 SHP. Small by todays standards, to me she was huge and in those days crew and officers wore uniform of the day. No flip flops or T shirts on passenger decks then.

I was on Orcades for 2 years and after that Arcadia and Orsova

Finally leaving P&O as Senior 4th engineer in charge of the 4 –8 boiler room watch.

Iain Armstrong

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Open Manholes and Displaced Deck Gratings

.Open manholes and displaced gratings pose considerable hazards to crew on offshore installations as evidenced by two recent incidents reported by a environmental enforcement agency

The first incident involved a night-time production operator on a fixed facility who was found to be missing from the platform during morning rounds. The personnel onboard noticed a section of grating displaced in the upright position with the missing person's hardhat and clipboard next to the grating. It is thought that prior to the incident the deck area was taped off with red "DANGER" tape but was not hard barricaded to prevent a flow of personnel.

In the second incident a crew member had completed work on a well which was properly barricaded. At nighttime twoemployees went to replace the well access hatch cover over the well on the drill deck. It appears that each of the twoemployees inadvertently picked up the wrong hatch cover (identified in the second photograph below with a red arrow). Each employee grabbed one handle of the cover, which was the same color as the deck and had no well identifying information on it. This action unknowingly created an open hole; and as the employees moved the hatch, one of the employees stepped andfell through the hole to the deck below.

Watch out for open manholes and displaced deck gratings http://www.gard.no/web/updates/content/28084883/watch-out-for-open...

In a safety alert of 4 June 2019 the US Bureau of Safety and Environmental Enforcement agency issued a warning to all offshore operators and contractors to inspect their facilities and communicate the associated hazards to all personnel.

Additionally, it recommends that operators consider the following:

Review the Safety Alert with crew and discuss any hazardous areas and encourage feedback from those present to ensure the issues are fully understood.

Conduct a review on the integrity of decks, gratings, and structural and support beams on their facility. If the inspection identifies an area of marginal or suspect strength, it must be clearly marked, appropriate mitigation actions taken, and employees be informed of these zones.

Conduct a review of the facility to identify any open holes or surfaces that cannot support personnel and, if such an area or open hole is identified, ensure that it is properly barricaded and/or covered. Conduct a review of their facility to make sure that all grating and flooring sections are securely fastened to the underlying structural members. Access should be prevented to areas where the grating and flooring sections are not securely fastened to the underlying structural members or barricaded as described below.

To prevent the flow of personnel into hazardous areas, all barricades should have a top rail and middle rail and be in compliance with the Regulatory height and load requirements.

If an open hole is found that cannot be immediately barricaded as described above, post an Open Hole Attendant / Hole Watch, with no other duties – and ensure that the person is equipped with adequate fall protection at all times.

Management and facility supervisors should ensure the workspace organization, proper labeling of equipment and the conduct of operations are fully and constantly reviewed for safety hazards before and during operations.

Operators should ensure that all personnel wear fall protection when necessary and that a secure connection for the fall protection is provided and used.

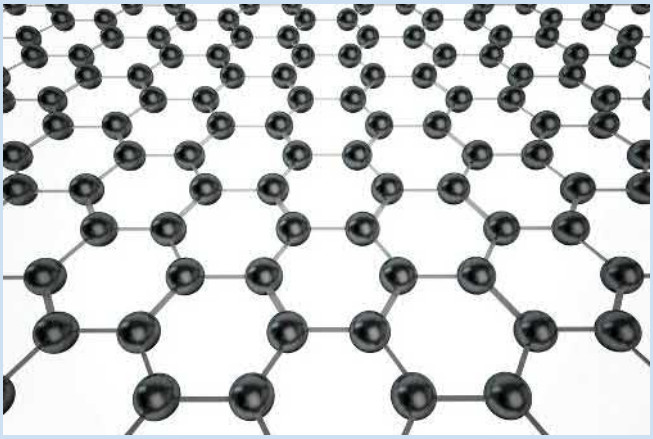
Personnel must confirm that job safety analyses comply with the approved procedures and address the hazards specific to the job. The task should be supervised to ensure an orderly completion of job steps.

Submitted by Kevin Watson

Graphene

Graphene has many uses as an additive to improve adhesives, concrete, polymers and many more. It is thought of as the new wonder material but what is it?

Today, this material has the potential to alter the future. Dubbed a super material, graphene has researchers the world over scrambling to better understand it. The material's long list of superlative traits make it seem almost magical, but it could have very real and drastic implications for the future of physics and engineering. The simplest way to describe graphene is that it is a single, thin layer of graphite. Graphite is an allotrope of the element carbon, meaning it possesses the same atoms but they're arranged in a different way, giving the material different properties. For example, both diamond and graphite are forms of carbon, yet they have wildly different natures. Diamonds are incredibly strong, while graphite is brittle. Graphene's atoms are arranged in a hexagonal arrangement.



Graphene is a single atom thick and is a 2D material stronger than steel with extraordinary electrical and thermal properties. Graphene is the strongest material ever discovered, with an ultimate tensile strength of 130,000,000,000 Pascals, compared to 400,000,000 for A36 structural steel, or 375,700,000 for Kevlar. Not only is graphene extraordinarily strong, it is also very light at 0.77milligrams per square metre (for comparison purposes, 1 square metre of paper is roughly 1000 times heavier). It is often said that a single sheet of graphene (being only 1 atom thick), can cover a whole football field and would weigh under 1 gram.

What makes this material particularly special is that graphene also contains elastic properties, being able to retain its initial size after strain.

In 2007, tests were carried out on graphene sheets that showed graphene sheets (with thicknesses of between 2 and 8 Nm) had spring constants in the region of 1-5 N/m and a Young's modulus (different to that of three-dimensional graphite) of 0.5 TPa. These figures are based on theoretical prospects using graphene that is unflawed containing no imperfections whatsoever and currently very expensive and difficult to artificially reproduce, though production techniques are steadily improving, ultimately reducing costs and complexity.

Graphene is the basic building block for other graphitic materials; it also represents a conceptually new class of materials being only one atom thick, so-called two-dimensional (2D) materials (they are called *2D* because they extends in only two dimensions: length and width; as the material is only one atom thick, the third dimension, height, is considered to be zero).

Graphene is a transparent and flexible conductor that holds great promise for various material/device applications, including solar cells, light-emitting diodes (LED), touch panels, and smart windows or phones.

Graphene's other characteristics are its high electron mobility, its 100x faster than silicon; it conducts heat 2x better than diamond; its electrical conductivity is 13x better than copper; it absorbs only 2.3% of reflecting light; it is impervious so that even the smallest atom (helium) can't pass through a defect-free monolayer graphene sheet.

With respect to marine engineering there is s ferry operating around Finland electrically powered with batteries fitted on its foredeck and based on Graphene technology, plus a Danish ferry called "Ellen" similarly powered as well.

Due to the rapid charging of the batteries enabled by graphene technology, these vessels literally plug in at their terminal ports and operate the propulsion, all auxiliary, and any other electrical power requirements solely from its batteries.

There are a few other vessels proclaiming they are electric powered but they are mostly hybrids such as the below polar cruise vessel Roald Amundsen.

The navies of the world are sure to be thinking about graphene technology for conventional submarines and may even be using it already.

Iain Armstrong

THE CRANKSHAFT

HISTORY, PARTS AND CONSTRUCTION

DEFINITION

The crankshaft, sometimes casually abbreviated to crank, is the part of an engine which translates reciprocating linear piston motion into rotation. To convert the reciprocating motion into rotation, the crankshaft has "crank throws" or "crankpins", additional bearing surfaces whose axis is offset from that of the crank, to which the "big ends" of the connecting rods from each cylinder attach. It typically connects to a flywheel, to reduce the pulsation characteristic of the engine, and sometimes a torsional or vibrational damper at the opposite end, to reduce the torsion vibrations often caused along the length of the crankshaft by the cylinders farthest from the output end acting on the torsional elasticity of the metal.

HISTORY

The earliest evidence, anywhere in the world, for a crank and connecting rod in a machine appears in the late Roman Hierapolis sawmill from the 3rd century AD and two Roman stone sawmills at Gerasa, Roman Syria, and Ephesus, Asia Minor (both 6th century AD). On the pediment of the Hierapolis mill, a waterwheel fed by a mill race is shown powering via a gear train two frame saws which cut rectangular blocks by the way of some kind of connecting rods and, through mechanical necessity, cranks. The accompanying inscription is in Greek. The crank and connecting rod mechanisms of the other two archaeologically attested sawmills worked without a gear train. In ancient literature, we find a reference to the workings of water powered marble saws close to Trier, now Germany, by the late 4th century poet Ausonius; about the same time, these mill types seem also to be indicated by the Christian saint Gregory of Nyssa from Anatolia, demonstrating a diversified use of water-power in many parts of the Roman Empire. The three finds push back the date of the invention of the crank and connecting rod back by a full millennium; for the first time, all essential components of the much later steam engine were assembled by one technological culture: With the crank and connecting rod system, all elements for constructing a steam engine (invented in 1712) — Hero's aeolipile (generating steam power), the cylinder and piston (in metal force pumps), non-return valves (in water pumps), gearing (in water mills and clocks) — were known in Roman times.

Water-raising pump powered by crank and connecting rod mechanism

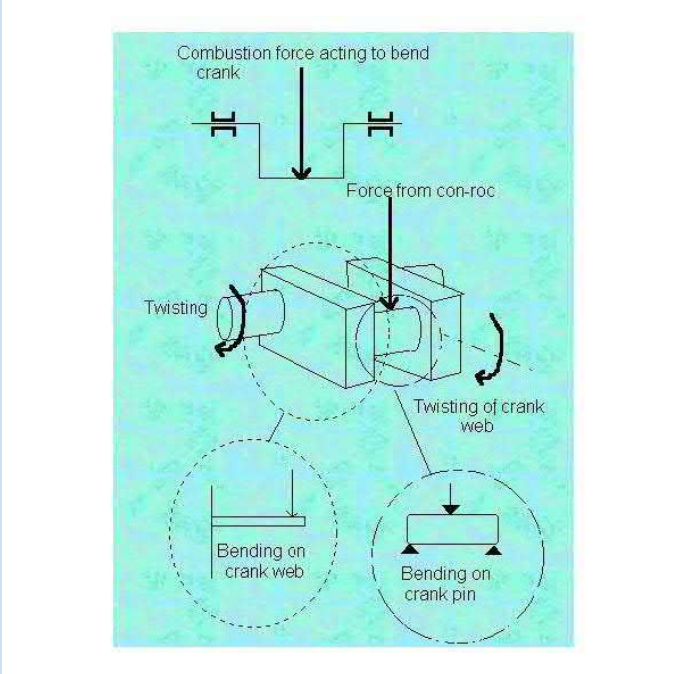
Forging and casting

Crankshafts can be forged from a steel bar usually through roll forging or cast in ductile steel. Today more and more manufacturers tend to favor the use of forged crankshafts due to their lighter weight, more compact dimensions and better inherent damping. With forged crankshafts, vanadium micro alloyed steels are mostly used as these steels can be air cooled after reaching high strengths without additional heat treatment, with exception to the surface hardening of the bearing surfaces. The low alloy content also makes the material cheaper than high alloy steels. Carbon steels are also used, but these may require additional heat treatment to reach the desired properties.

Forged crankshaft

Forces on the Crankshaft.

Due to its nature of operation, there are several types of forces which come to act upon the crankshaft of engines used in marine propulsion. You will get a better idea about these forces if you take a close look at the image shown below which shows the various twisting and bending forces.

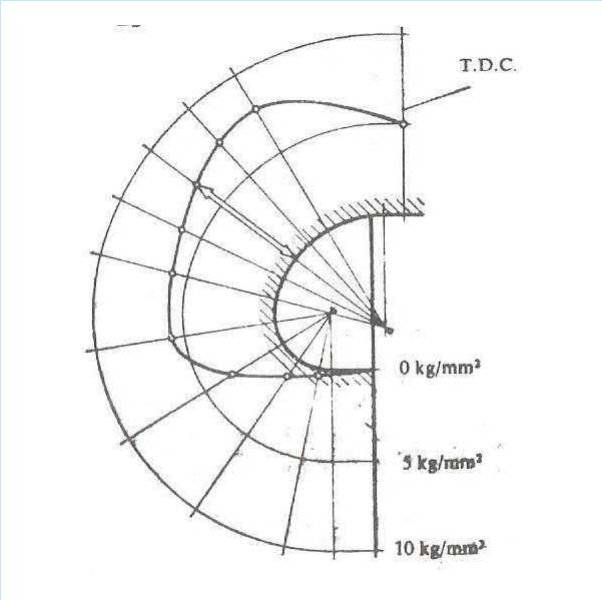


As can be seen from the figure on the previous page, these forces are due to a variety of factors including but not limited to the weight of the pistons, combustion loads, the axial load from the propeller which is immersed in the sea, compressive loads of webs on journals and so forth.

Most of these forces have alternating patterns which gives rise to fatigue and the materials used for construction need to have substantial Ultimate Tensile Strength. Apart from that the other properties required in the material of a crankshaft are wear resistance, tensile strength, and ductility.

The material for construction also depends on the speed on the engine and slow speed marine diesel engines have crankshafts fabricated out of plain carbon steel with a percentage of carbon lying between 0.2 & 0.4%, while the alloy steels are used for engines having a relatively higher speed.

The stress diagram of a crankshaft (below), would also help to show the stresses in a web fillet



Fabrication of Crankshaft

Crankshaft manufacture is a complex and elaborate process and the exact procedure would vary with the type and size of the crankshaft under consideration but a few things would be good to know.

Fully-built Crankshafts are those in which all the various components are shrink-fitted after separate fabrication
Semi-built Crankshafts are those in which several parts such as crank-throw and pins are cast out of a single piece.
Welded Crankshafts are those in which the crank-shaft is made by welding case web crank pins and half journal units.
Flanged Coupling Crankshafts are made out in two pieces joined together by flanged couplings

Acknowledgements Bright Hub Enginering

Cape Branch Luncheon

Some Photos

News Snippets

1. UN Secretary-General Antonio Guterres called the Climate Action Summit in late 2018, aware that global efforts to tackle climate change are running off-track - a fact underlined by the dire warnings in the IPCC 1.5°C report. He said he wanted a summit where leaders would only get to speak if they have plans in line with 1.5°C. It's not the same as the annual COP: this will still take place in 2019, in Chile [COP25].

2. The White House is keeping up its push for allies to join an international military coalition to protect commercial shipping in the vital waterway that connects the oil-rich Persian Gulf to the rest of the world. Iran warned on Tuesday that such a bolstered naval presence in the Strait of Hormuz would only increase the "risk of combustion" in the region.

3. For 40 years, Mercy Ships have used customized hospital ships to provide hope, healing and empowerment to the forgotten poor of Africa. This is about to be scaled up, with helping hands from the maritime industry.

4. The Symphony of the Seas is the world's largest passenger cruise ship.
Measuring 362m (1,188ft) long, the ship has a capacity of nearly 9,000 passengers and crew, features 23 swimming pools and 18 decks.

5.It may take weeks for salvage teams to move the M/W Golden Ray from St. Simons Sound. The channel leading to the Port of Brunswick is closed and a Coast Guard spokesman said it's uncertain how long it will take salvage crews to upright the vessel. A Coast Guard spokesman, said the investigation into the cause of the accident is still unknown, but it is obviously a concern when a 656-foot cargo ship, only 2 years old, capsizes.

6.Indonesia's state-owned oil and gas company PT Pertamina has opened a trading and marketing office in Singapore, returning to the city-state four years after closing its previous office over a corruption scandal.

7.A Greek ferry returned to the port of Igoumenitsa in Greece with over 600 people aboard after a fire started aboard the vessel. According to the Hellenic Coast Guard, the fire started in the garage section of the 2000-built ferry Olympic Champion shortly after it departed the port en route to Venice.

8.Pan-European ferry and logistics company P&O Ferries has signed a contract with China's shipbuilder Guangzhou Shipyard International worth EUR 260 million (USD 286.13 million) to deliver a new generation of ships on the English Channel.

9. Armed pirates have abducted eight crew members from a German multipurpose (MPP) ship at the Douala Anchorage, Cameroon. On August 14, 2019, the 2002-built ship MarMalaita was attacked by pirates, Hamburg-based shipping company MC-Schiffahrt confirmed. After boarding the vessel, pirates kidnapped eight out of the vessel's twelve crew members.

10, Crew members of a 7,541 cbm tanker have been evacuated after their ship caught fire off the Nigerian coast. The incident involving the vessel Sea Voyager occurred at the Lagos anchorage on August 15,

11. Certain ports in China and Ireland have started to implement a ban on wash water discharge from open-loop scrubbers as of the beginning of 2019, while major bunkering hubs Singapore and Fujairah have announced plans to do the same starting from January 1, 2020, when the sulphur cap rule comes into force.

12.After assuring the maritime industry in July this year that they would fast-track legislation into place to give effect to MARPOL Annex VI by before the January 2020 deadline, the Department of Transport (DOT) South Africa, is delivering on their promise and has released the MARPOL Amendment Bill 2019 for public comment.

TOJ Crossword

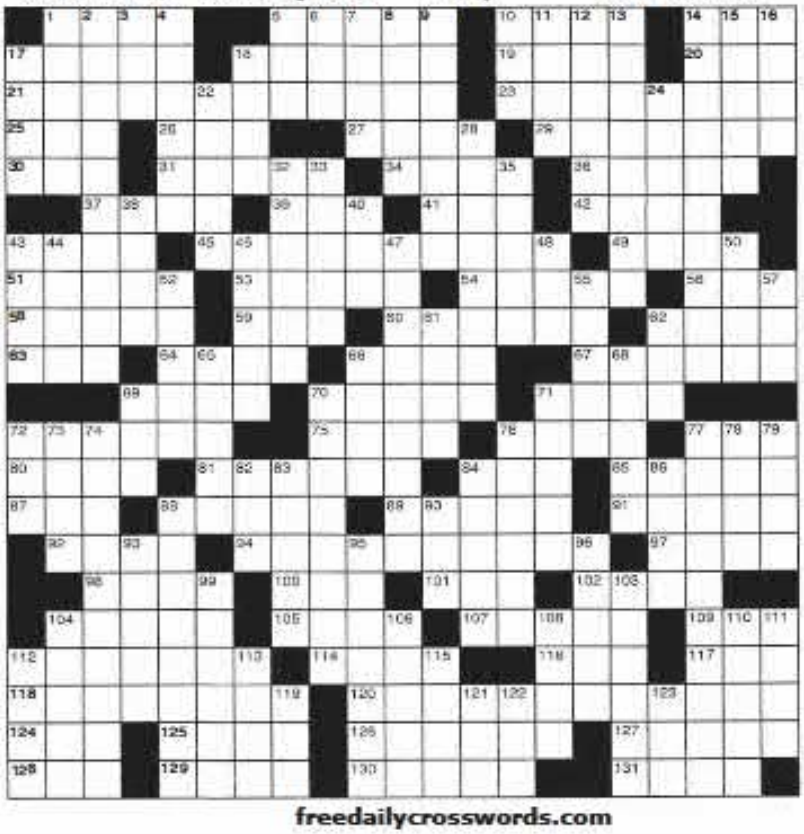
24th September

ACROSS

1 Kaffiyeh cord
5 Copier maker
10 Wood sorrels
14 Drama division
17 Ensign wannabe
18 __ Dry
19 Hopeless square
20 Bleating sound
21 Rabbit stew, on the Rhine
23 Blockhead, in Bavaria
25 Flightless bird
26 Galleon gold
27 Airport abbrs.
29 Pantomime character
30 Took the cake
31 Ascends
34 Jedi's counterpart
36 Finn's creator
37 Middle's middle
39 Chou En-__
41 Madrid Mrs.
42 Catch flies
43 Actress Arlene
45 Pipe, in Potsdam
49 Came down
51 Briny deep
53 Mall, of yore
54 Not fitting
56 Quick drink
58 Nose: prefix
59 Disencumber
60 Grumble
62 Prune
63 Ready
64 __ log
66 Staff
67 Stable worker
69 Say no to
70 Child's co-cook
71 Crème __ crème
72 Most like Solon
75 Snorkeling spot
76 Church section
77 Slingshot shape
80 Dune swoopers
81 "A Star __"
84 Adams or Ameche
85 Like Herod
87 Short life?
88 Morning sound
89 Works for wages
91 Royalty
92 Did the crawl
94 Knickers, in Koblenz
97 Sidle
98 Advertising flier, informally
100 Roomy vehicle
101 __ mode
102 Gawk
104 Singer Patsy
105 Razor name
107 Cotton thread
109 Train mailbox: abbr.
112 Brain-picking
114 __ Indies
116 Mai __
117 Nickelodeon's "Kenan and __"
118 Cannon, in Cologne
120 Band instrument, in Berlin
124 Made of: suffix
125 Flight: prefix
126 Lafayette College town
127 Tear dabber
128 Sun. speech
129 Winter coaster
130 Extends over
131 Totals

DOWN

1 Avis competitor
2 "Good health!," in Göttingen
3 Grampa Simpson
4 Poe poem
5 Field portrayal
6 Foot troops: abbr.
7 French eatery
8 Playwright Clifford
9 Not yet fully set
10 Aberrant
11 Overthrow event
12 Concedes
13 To a degree
14 Primitive
15 Fowl type
16 Ohio-born prez
17 Toiler's word
18 Corp. bigwigs
22 Spectrum glass
24 Bantu village
28 Put into financial difficulties
32 Final tribute to Napoleon
33 Indian lute
35 Go to often
38 Verve
40 Leb. neighbor
43 Buzzing insects
44 Charley horse
46 Premature
47 Kitchen appliance
48 Actress Marsh
50 Wear out
52 "Drake" poet
55 Introduction
57 For each
61 Arabic letter
62 Bake-sale gp.
65 Up to
66 Jury member
68 Leeway
69 __ Plaines
70 William Katt's "Carrie" role
71 Like osmium
72 Spider's snare
73 Author Murdoch
74 Winter driveway-clearing tool
76 Tree in a tray
77 Prodigy, in Prenzlau
78 Peterman
79 Option word
82 "My Gal __"
83 Large cigar
84 Humorous
86 Cambodian money
88 Poisonous fungi
90 Finder's cry
93 DA's concern
95 Makes furious
96 Pitcher Ryan
99 Washington of "Fallen"
103 Tokyo entertainer
104 Witch
106 "__-up gal in a bang-up chariot" (Dickens)
108 Tommy's gun
110 Little looks
111 "..__ Oxen Free" (K. Hepburn film)
112 Greek letters
113 Crawford's ex
115 13th-century school of Japanese painting
119 Scepter
121 Ten pks. of smokes
122 Bout enders: abbr.
123 Writing sheets



freedailycrosswords.com

Advanced real time diagnostics for ship engines

The core principle of this technology is the concept of the digital copy of the physical engine. That's what is called the 'digital twin', a term that is also becoming quite trendy in the maritime industry. The digital twin onboard helps us assess the performance of the physical engine.
The parts of the solution are the physical engine generating signals during operation, which are fed to the analysis layer, finally yielding support for the onboard crew in terms of trouble shooting, maintenance, and spare parts.

The first step in the process is the analysis of the signals coming out of built-in sensors of the engine. Data, both slow as well as high frequency signals, are fed into the analysis every single minute. We go through three stages of analysis:

1. Thermodynamic analysis
2. Engine subsystem diagnostics based on expert know-how, and Machine learning, where applicable.

Initially, the thermodynamic digital model of the engine is working in parallel to the physical engine and based on the differences of the signals from the physical engine to the corresponding parameters given by the digital twin for the exact conditions, we can assess performance and diagnose possible issues. The model for each engine -is customized for each onboard installation, using exact geometry, engine settings, controls and Shop test results to create the "Digital Twin".

The second part of the analysis is called subsystem diagnostics. You break down the engine in components, as per below and analyze each one based on know-how of the engine designers' experts.

- Servo oil system
- Fuel injection system
- Piston running
- Scavenge air and exhaust gas system
- Engine control & automation system
- Gas admission system (for dual fuel engines)

That allows us to look at details. Once an issue is detected it actually gives an alarm on the onboard screen to the crew and the crew can dive in and look at details.

Finally, once operational data is collected, algorithms are then applied to detect abnormal operation.

This typically involves two steps:

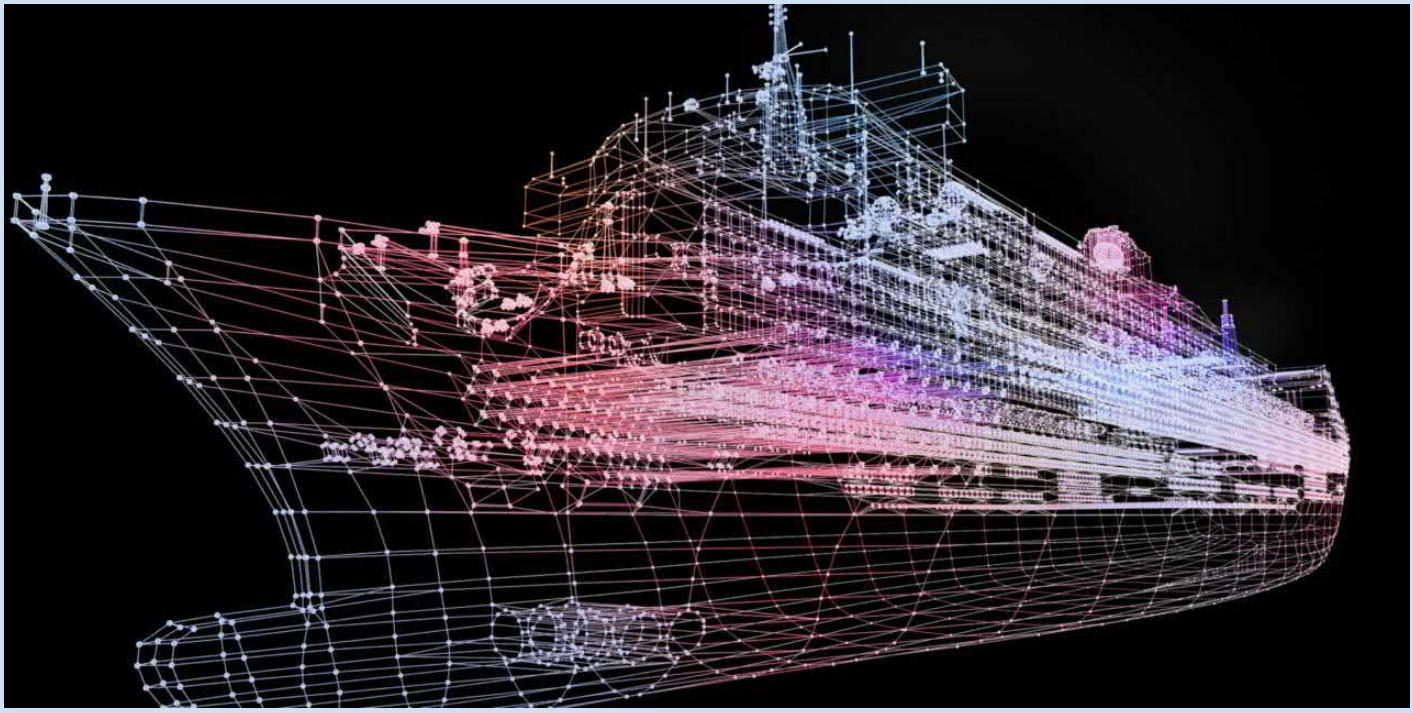
- Step 1: Use historical data & expert's knowledge to train the Machine Learning algorithm.
- Step 2: Apply the algorithm to predict future events

Once all the above steps are completed, one has to consolidate the outcomes of the three stages of analysis and orchestrate the actions to follow, of troubleshooting, planning of maintenance tasks/events and handling of spare parts. This is the tangible value to the onboard crew.

Troubleshooting is more or less as one expects. It provides the list of possible causes based on the finding and presents a set of corrective actions to the onboard crew through digital access to operation and maintenance manuals.

With respect to maintenance, the current practices dictate that overhauling and maintenance events are based on the running hours of the component. Extending that approach in order to take into account the condition and the status of the asset is now considered. This in principle allows the operator to extend or advance overhauling and maintenance events.

Using a spare parts module will concludes the process, through an automatic creation of the relevant spare part list for each maintenance task identified.



Acknowledgements Panos Theodossopoulos

The Stirling Engine

The Stirling engine is an external combustion reciprocating engine that is able to use various types of fuels. It operates quietly and produces less air pollution. A Stirling engine is classified in three main configurations: α type, β type, and γ type (Figures 2.25 to 2.27). In an α type configuration the engine has two separate pistons and cylinders. The β type engine has a piston and a displacer in one single cylinder, and in the γ type a piston and a displacer reciprocate in separate cylinders. In all three types there are a cooler and heater to contract and expand the working gas, respectively. The working gas may be air, nitrogen, helium, or hydrogen. A system based on an α type Stirling engine is shown in Figure 2.25. It shows the main components: cylinders, pistons, cooler, heater, crankshaft, gearbox, generator, and cooling and heating systems.

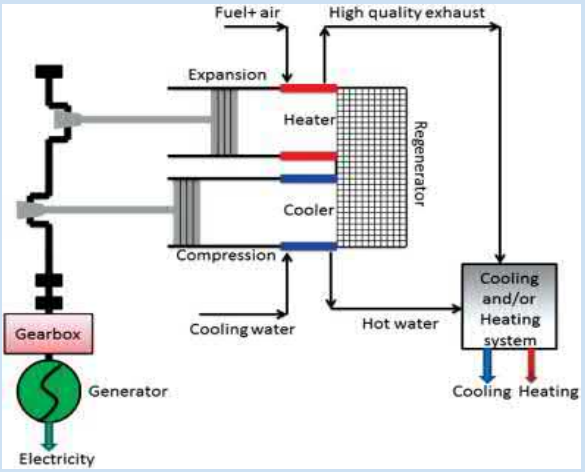


Figure 2.25. System based on an α type Stirling engine.

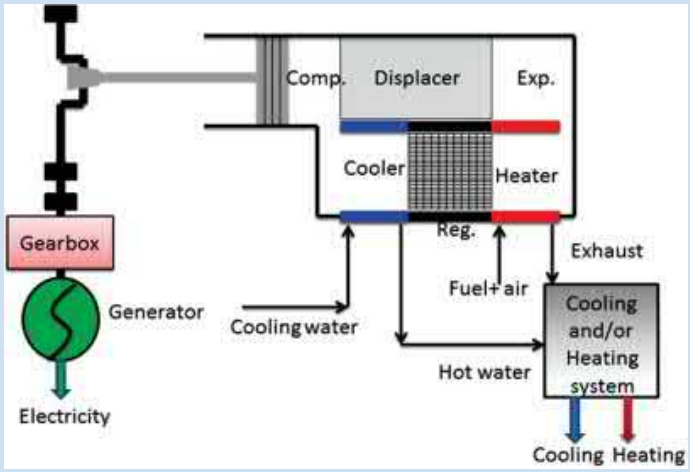


Figure 2.26. System based on a β type Stirling engine.

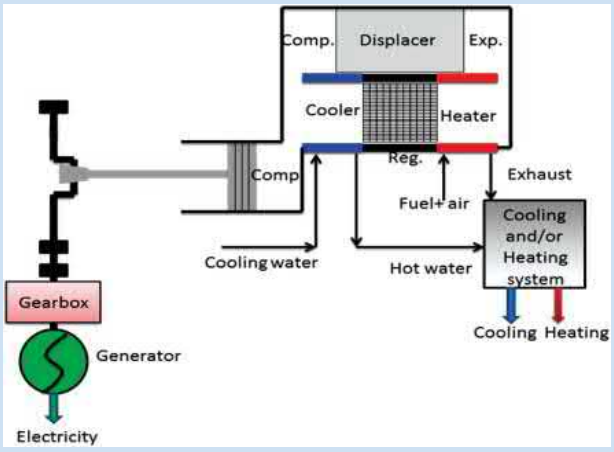


Figure 2.27. A system based on a γ type Stirling engine.

The principals of operation of an α type Stirling engine can be described as follows:

1.The gas is heated by the heater, which results in gas expansion to the maximum volume and pressure reduction (to maintain the maximum constant temperature). This gas expansion pushes the expansion piston back to rotate the crankshaft.

2. As the crankshaft rotates it pushes the expansion piston forward, pushing the gas into the regenerator, leaving its thermal energy in the regenerator to be used later.

3. Then gas is cooled in the cooler, losing its thermal energy and making compression easier. As the expansion piston moves forward, the compression piston moves back to keep the available volume for the gas constant. At this stage the crankshaft mechanism rotates and pushes the compression piston forward to compress the gas and push it back to the regenerator.

4. As the gas flows through the regenerator, it captures the thermal energy stored in the regenerator in step 2; its temperature increases and reaches the maximum. The pressure increases as well. This high pressure pushes the expansion piston back, the gas pressure reduces, and this causes the temperature to decrease as well. To avoid more temperature reduction, the gas must be heated to maintain the exit temperature from the regenerator. This completes the cycle and the next cycle starts and ends the same.

As can be seen, the Stirling engine described above can be operated in a closed cycle. Sealing is very crucial for this engine to avoid leakage of working fluid. However, it has no valves such as those that can be found in internal combustion engines. This will result in much less downtime and maintenance costs. In addition, due to external combustion, no combustion product touches the internal parts of the engine, such as the pistons and sealing system.

This also helps to create a clean process inside the engine and pressurized gases from the engine will not exhaust into the ambient. This results in less corrosion, oxidation, and energy loss.

Heat sources to be recovered for systems in Stirling engines include heater exhaust gases, hot water leaving the cooler, and lube oil cooler. In the Figures 2.25 to 2.27, the systems based on an α type, β type, and γ type Stirling engine are presented. In these three systems, heater exhaust and the hot water of the engine are used to produce the heating and cooling load of the consumer. These engines are small, clean, and silent . For large power outputs the Stirling engine needs to be considerably larger and will be very heavy therefore making it impractical for many uses.

Interestingly Stirling engines are suitable for use on submarines do to the fact that they are silent. It is believed the Swedish Navy use this type of engine in their fleet.

Acknowledgements: Science Direct.

Safmarine Ships

A lot of our members are ex seafarers who sailed on the many Safmarine ships over the decades. I thought you would like a series highlighting SAF ships in each edition of the TOJ. Do you have any interesting stories to tell when you sailed with SAF?

If so, please send it to me at my email address of iainfran1@gmail.com and I will include your story in the TOJ.
My next couple of ships are: :

S A Shipper

In 1961 the "South African Statesman", "South African Seafarer", and "South African Shipper" joined the fleet. They were designed for carrying general dry cargo, and were built in Scotland in the 1950s for the Clan Line then the Springbok Shipping Co. In 1966 they all had South African prefix changed to S.A. One of the most obvious features of these ships was the fitting of a distinctive cowl top on the funnel. In the engine room there were two Babcock & Wilcox water tube boilers supplying super heated steam to three Parson type turbines geared down to a single shaft, giving approximately 10,000 shp. and a speed of 17 knots. For electrical power three Ruston Hornsby diesel engines drove DC generators.

S A. Hexrivier

One of three refrigerated motor ships "S.A. Langkloof ", "S.A. Zebediela", and "S.A.Hexrivier" were built for the export of frozen fruit from South Africa to the UK and Europe. They were built in Dutch yards and entered service in early to the mid-1960s. This class of ships were the first to be powered by diesel engines, fitted with an eight cylinder M.A.N K8Z70/120 low speed two stroke diesel engine developing approx. 9,600 BHP and a speed of 17 knots. For electrical power four MAN diesel engines drove AC alternators.