V.Ships Offshore

V.Group

Riding a Low Tide …..

Decommissioning, Lay-Up and Preservation

Sanford D'Souza
Offshore Division Manager
Singapore

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V.Group

- Recap on the current climate and options
- Information on V.Ships' capabilities to help
- Project references
- Lay Up Legislation
- Global Assistance
- Our experience with VpCIs
- Project Illustrations

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Oil Prices ……. Crises

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"Perhaps the Oil Price is the index most subscribed to in this day."

Bottom's Up

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The International Energy Agency isn't the first to call a bottom in oil prices.

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What does 2016 look like?

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Look Ahead ??

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"There does not seem to be any light at the end of the tunnel"

1. **Merger and Acquisitions in the first half of 2016**
2. **Companies re-evaluating their order backlogs**
3. **Expected escalation of scrapping and lay-ups**
   - Estimated to 340 AHTSs and 254 PSVs
4. **Many current operators expected to exit the market**

Source: splash247.com

Lay Up and Utilization statistics

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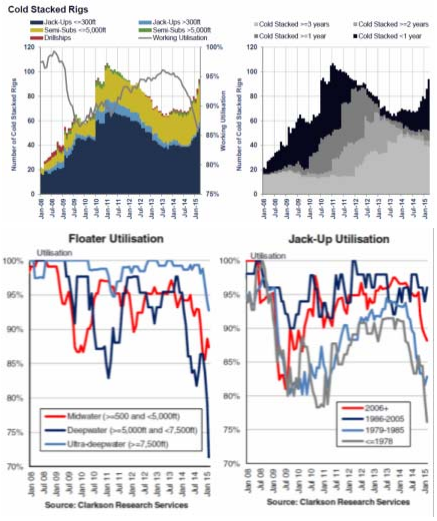
Source: splash247.com and EMA Floating Production Report

- 433 existing competitive jack-ups; Fleet utilisation is 58% with 250 units under contract
- There are 183 idle jack-ups, 56 of which are cold stacked
- Within the 127 ready stacked jack-ups – 27 of those are 35 years old or more, many of those will likely get cold stacked.
- Between 75 and 100 more jack-ups will be removed from services in the next few years
- Expected to see an escalation of scrapping and lay-ups with an expectation of 340 AHTSs and 254 PSVs being laid up (Worst downturn since mid 1980s, PSVs in particular day rate down to $4,600 a day)
- 12 FPSOs currently available / stacked (Azurite, Brotojoyo, Falcon, Four Rainbow, Glas Dowr, North Sea Producer, OSX 1, OSX 2, Stybarrow Venture MV16, Opportunity, Armada Intrepid, Munin)
- 3 FSOs currently available / stacked (Avare, Queensway and Cendor)
- 2 floaters recently decommissioned (Paragon FPSO 1 and Sourena FSO



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while we… Watch and Wait

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Here's how we can help

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Limited Options

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"Owners have limited options and none of them are appealing"

- **Pitch for work at prices ……ALARP**

Limited Options

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"Owners have limited options and none of them are appealing"

- Pitch for work at prices ……ALARP

- **Scrapping their Assets**

Asset Integrity Preservation

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Riding the low tide ……waiting for the upturn ?

- **Decommissioning Assets**
- **Relocation of Assets**
- **Warm Stacking**
- **Cold Stacking &**
- **Reactivation**

Asset Integrity Preservation

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The V. Group have had ample experience in these activities

- Decommissioning Assets
- Relocation of Assets
- Warm Stacking
- Cold Stacking &
- Reactivation

Decommissioning

Relocation

Lay Up & Preservation

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Introduction to the V.Group "Re Branded"

V.Group

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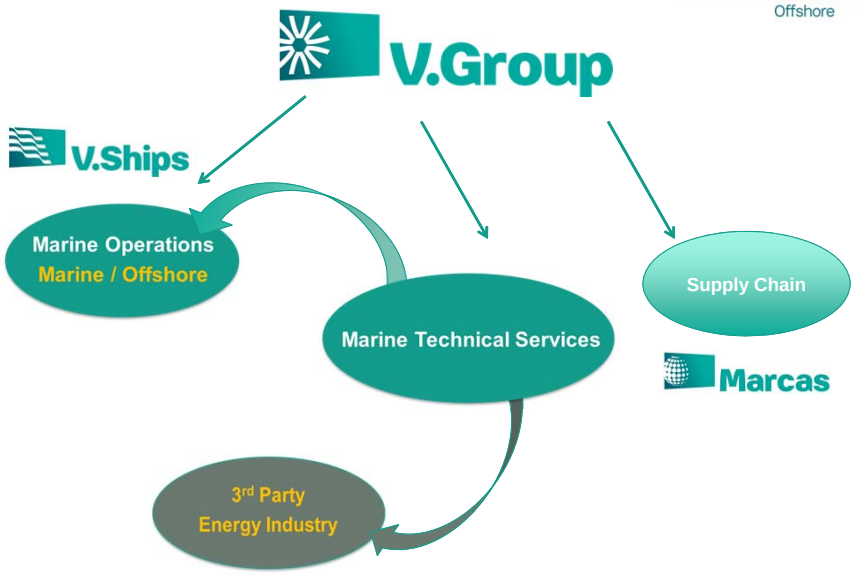
Group Structure



Marine Operations:

V.Ships	V.Ships is today the world's largest ship management company.
V.Ships Leisure	V.Ships Leisure is a specialised passenger ship management company providing services to cruise vessels, ferries and large yachts.
V.Ships Offshore	V.Ships Offshore delivers Offshore Technical / Operations Management and Repair services to the Marine & Energy sector.
ITM	International Tanker Management is a specialised provider of management services to tankers.
CISM	China International Ship Management is a joint venture with China Shipping Group for whom it manages large container ships and tankers from Shanghai.
V.Ships Crew	V.Ships Crew encompasses a broad range of activities including recruitment, deployment, training and on-going management of officers and ratings.
BGI	Baltic Group International is specialised in recruiting from the Baltic States with particular emphasis on the energy sector.

Marine Technical Services:

V.Ships Offshore

SeaTec	SeaTec is a leading provider of maritime services, including project management, engineering, inspections, communication, training, repair services & condition monitoring.
UMC	UMC specialises in delivering global solutions for underwater and afloat inspection, repair & maintenance services to the maritime industry.
Core-IRM	Core-IRM offers an integrated range of inspection, repair and maintenance services with a particular focus on the energy sector.
Marlins	Marlins is the leading brand in training and language testing solutions for crew.
V.Delta	V.Delta is specialised in conversions, project management, refurbishments and energy conservation with particular focus on passenger ships and the energy sector.
V.Ships Agency	V.Ships Agency operates a global agency network from hubs in Singapore and Rotterdam.
V.Scope	V.Scope Risk Management provides sophisticated insurance solutions to the shipping industry.
V.Travel	V.Travel is a leader in travel management services to the shipping and energy sector worldwide.
Marcas	Marcas is an association of shipping companies, whose purpose is aggregating purchasing volume to obtain maximum value for goods and services.
Oceanic Catering	Oceanic Catering is one of the world's largest specialist marine catering companies.

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Experience with a Range of Assets

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A variety of Other Assets

The V.Group has been involved with assets as diverse as the list below.

1. **FPSOs**
2. **Drill Ships**
3. **Self Elevating Units** ***(Lift Boats)***
4. **Tankers**
5. **Bulk Carriers**

A diversity of experience

We have effectively worked on these Assets

1. **FPSOs** **OSX 2**

Bibby acquisition by the V.Group

V.Ships Offshore

VNewsFlash V.Group

Issue Number: 574, March 8 2016

V.Group acquisition of Bibby Ship Management extends our market leading position to the offshore sector

BIBBY SHIP MANAGEMENT

V.Ships

Bibby acquisition by the V.Group

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VNewsFlash V.Group

Issue Number: 574, March 8 2016

V.Group acquisition of Bibby Ship Management extends our market leading position to the offshore sector

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Experience on FPSOs

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Owners / Lenders have entrusted these other FPSOs to us

FPSOs OSX 4 & OSX 5

Experience on FPSOs

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Owners / Lenders have entrusted these other FPSOs to us

FPSOs OSX 1

FPSO OSX 1

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De comm, Reactivation of Marine Systems and Relocation - Brazil to Norway

Drill Ship Sertao

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Take over , reactivation of Marine Systems and relocation - Brazil to UK

Experience on FPSOs

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Our current project

FPSOs OSX 3

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Customised Documentation in compliance with Legislation

DNV·GL

BUREAU VERITAS

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Lay –Up Legislation

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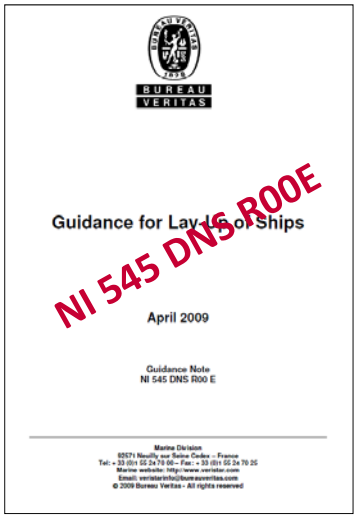
Classification and MWS have established guidelines

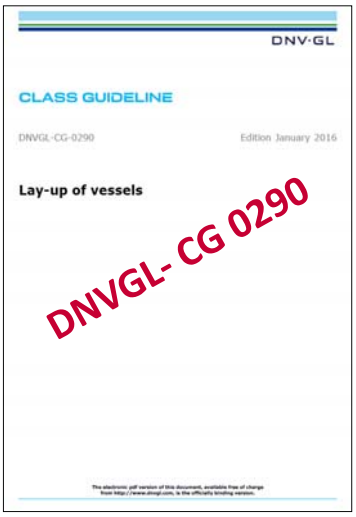

BUREAU VERITAS

Guidance for Lay-Up of Ships

NI 545 DNS R00E

April 2009

Guidance Note
NI 545 DNS R00 E


DNV·GL

CLASS GUIDELINE

DNVGL-CG-0290 Edition January 2016

Lay-up of vessels

DNVGL- CG 0290

Classification Guidelines

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Lay-Up guidelines define the parameters that standardise the Lay-Up process

1. Propose definitions of Warm v/s Cold Lay Up
2. Directives for Warm v/s Cold Lay up.
3. Specific Survey requirements.
4. Insurance / MWS requirements
5. Flag State and Port regulations
6. Safety considerations
7. Preservation recommendations
8. Re Commissioning requirements

Classification Guidelines

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An Emphasis on Safety

1. **Lay Up Declaration**
2. **Lay-Up Site**
3. **Mooring Arrangements**
4. **Ballasting**
5. **Stability**
6. **Power Supply**
7. **Antipollution considerations**
8. **Security**

Complimenting our capabilities

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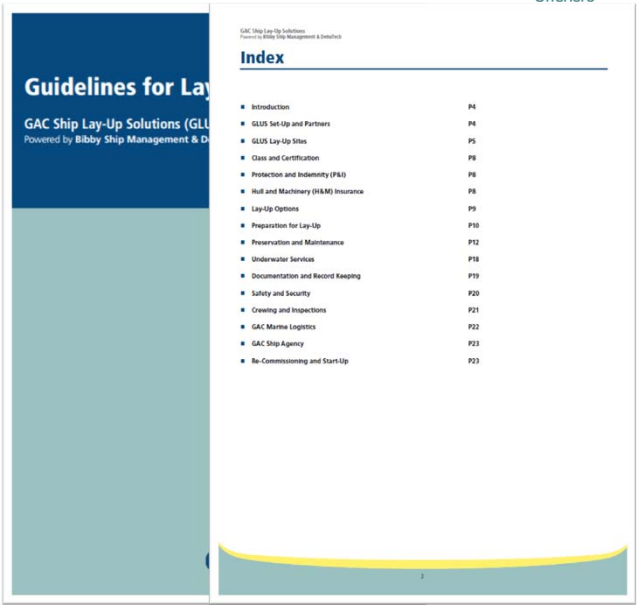

Guidelines for Lay

GAC Ship Lay-Up Solutions (GLU

Powered by Bibby Ship Management & D

GAC Ship Lay-Up Solutions
Powered by Bibby Ship Management & DeltaTack

Index

- Introduction P4
- GLUS Set-Up and Partners P4
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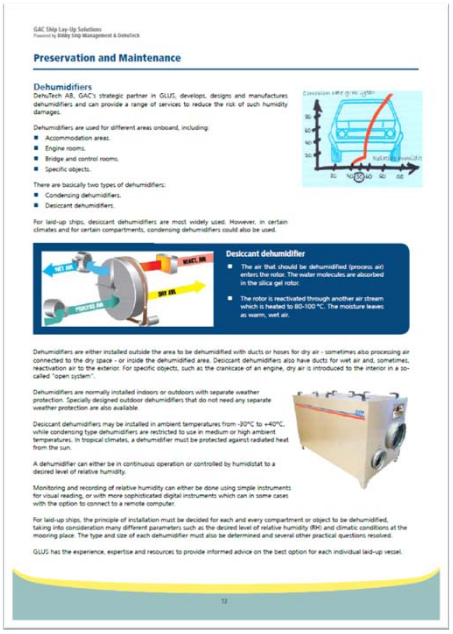
Complimenting our capabilities

V.Ships Offshore



GAC Ship Lay-Up Solutions
Powered by Bibby Ship Management & DehuTech

Preservation and Maintenance

Dehumidifiers

DehuTech AB, GAC's strategic partner in GLUS, develops, designs and manufactures dehumidifiers and can provide a range of services to reduce the risk of such humidity damages.

Dehumidifiers are used for different areas onboard, including:

- Accommodation areas.
- Engine rooms.
- Bridge and control rooms.
- Specific objects.

There are basically two types of dehumidifiers:

- Condensing dehumidifiers.
- Desiccant dehumidifiers.

For laid-up ships, desiccant dehumidifiers are most widely used. However, in certain climates and for certain compartments, condensing dehumidifiers could also be used.

Desiccant dehumidifier

- The air that should be dehumidified (process air) enters the rotor. The water molecules are absorbed in the silica gel rotor.
- The rotor is reactivated through another air stream which is heated to 80-100 °C. The moisture leaves as warm, wet air.

Dehumidifiers are either installed outside the area to be dehumidified with ducts or hoses for dry air - sometimes also processing air connected to the dry space - or inside the dehumidified area. Desiccant dehumidifiers also have ducts for wet air and, sometimes, reactivation air to the exterior. For specific objects, such as the crankcase of an engine, dry air is introduced to the interior in a so-called "open system".

Dehumidifiers are normally installed indoors or outdoors with separate weather protection. Specially designed outdoor dehumidifiers that do not need any separate weather protection are also available.

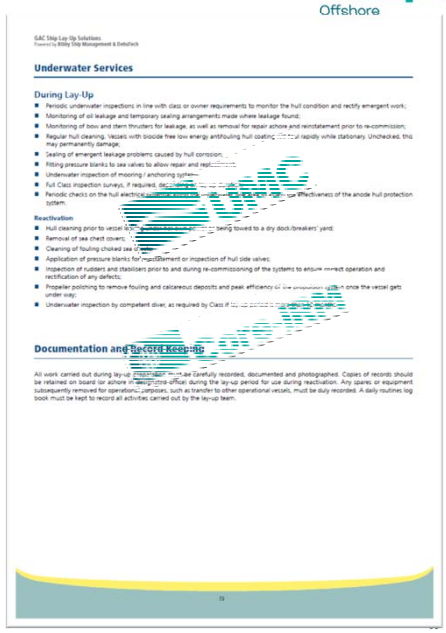
Desiccant dehumidifiers may be installed in ambient temperatures from -30°C to +40°C, while condensing type dehumidifiers are restricted to use in medium or high ambient temperatures. In tropical climates, a dehumidifier must be protected against radiated heat from the sun.

A dehumidifier can either be in continuous operation or controlled by humidistat to a desired level of relative humidity.

Monitoring and recording of relative humidity can either be done using simple instruments for visual reading, or with more sophisticated digital instruments which can in some cases with the option to connect to a remote computer.

For laid-up ships, the principle of installation must be decided for each and every compartment or object to be dehumidified, taking into consideration many different parameters such as the desired level of relative humidity (RH) and climatic conditions at the mooring place. The type and size of each dehumidifier must also be determined and several other practical questions resolved.

GLUS has the experience, expertise and resources to provide informed advice on the best option for each individual laid-up vessel.



GAC Ship Lay-Up Solutions
Powered by Bibby Ship Management & DehuTech

Underwater Services

During Lay-Up

- Periodic underwater inspections in line with class or owner requirements to monitor the hull condition and rectify emergent work;
- Monitoring of oil leakage and temporary sealing arrangements made where leakage found;
- Monitoring of bow and stern thrusters for leakage, as well as removal for repair ashore and reinstatement prior to re-commission;
- Regular hull cleaning. Vessels with biocide free low energy antifouling hull coating [illegible] rapidly while stationary. Unchecked, this may permanently damage;
- Sealing of emergent leakage problems caused by hull corrosion;
- Fitting pressure blanks to sea valves to allow repair and rep[illegible]
- Underwater inspection of mooring / anchoring syste[illegible]
- Full Class inspection surveys, if required, de[illegible]
- Periodic checks on the hull electro[illegible] effectiveness of the anode hull protection system.

Reactivation

- Hull cleaning prior to vessel [illegible] being towed to a dry dock/breakers' yard;
- Removal of sea chest covers;
- Cleaning of fouling choked sea [illegible]
- Application of pressure blanks for [illegible]tainment or inspection of hull side valves;
- Inspection of rudders and stabilisers prior to and during re-commissioning of the systems to ensure correct operation and rectification of any defects;
- Propeller polishing to remove fouling and calcareous deposits and peak efficiency [illegible] once the vessel gets under way;
- Underwater inspection by competent diver, as required by Class if [illegible]

Documentation and Record Keeping

All work carried out during lay-up [illegible] carefully recorded, documented and photographed. Copies of records should be retained on board (or ashore in [illegible] office) during the lay-up period for use during reactivation. Any spares or equipment subsequently removed for operational purposes, such as transfer to other operational vessels, must be duly recorded. A daily routines log book must be kept to record all activities carried out by the lay-up team.

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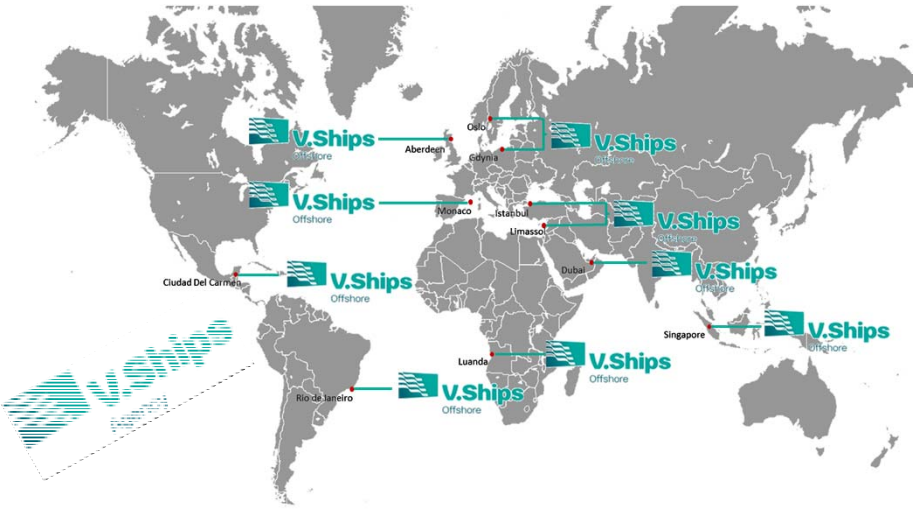
Global Footprint .... *Local* Solutions

V.Ships Offshore

"Our Operational teams, are *Globally* located and *Locally* ready to deliver."



Global Footprint for Solutions worldwide

V.Ships Offshore

"We are your Global partners Locally"

Thanks to the GAC Group's global network of offices and agencies, GAC Ship Lay-Up Solutions has the local experience, expertise and resources to offer informed advice on the best lay-up locations, as well as a wide range of secure, safe and cost-effective solutions for vessels laying-up wherever you go, including:

- Australia
- Malaysia
- Sri Lanka
- Thailand
- Vietnam
- Philippines
- China
- Dubai
- Greecen
- Poland
- Sweden
- Norway
- United Kingdom
- United States
- Trinidad

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Customized Solutions

Performance assured

Customized Methodology

V.Ships Offshore

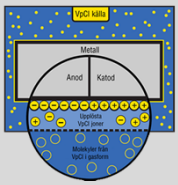
Each customer will have specific requirements

This will be dependant on -

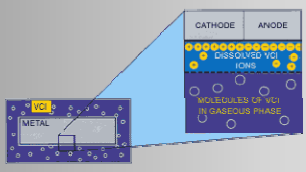
1. **Geographic Re-location**
2. **Budgets**
3. **Sub-component criticality**
4. **Duration**
5. **Start up lead time for Recommissioning**

V.Ships
Offshore

Technology



VpCIs - Vapour phase Corrosion Inhibitors

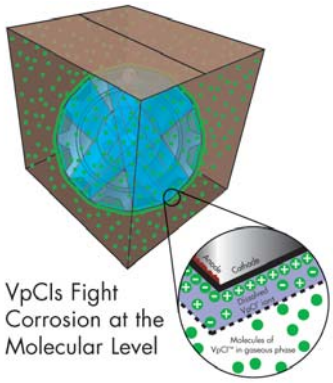


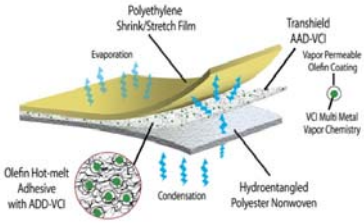
Performance assured

Short summary on VCIs

V.Ships
Offshore

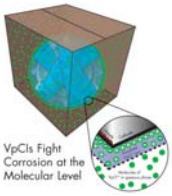
Probably the most cost effective solution with a range of applications

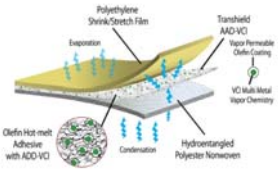




VCIs

V.Ships Offshore





- **Inorganic Salts derived from Amines**
- **They vaporize and saturate the equipment surface**
- **Form an invisible monomolecular layer**
- **Protect against corrosion by forming a barrier**
- **Provide dual phase protection Liquid and Vapour**

Summary of VCIs

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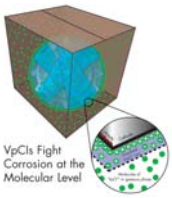

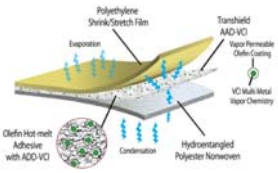

- **Ease of application (even with moisture present)**
- **They arrest corrosion in remote recesses**
- **Non Toxic**
- **Are environmentally friendly**
- **Long Term preservation**

Sample Cases

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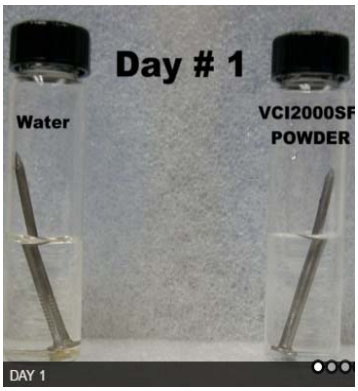
Illustration of VCIs inhibiting rusting



Test Cases

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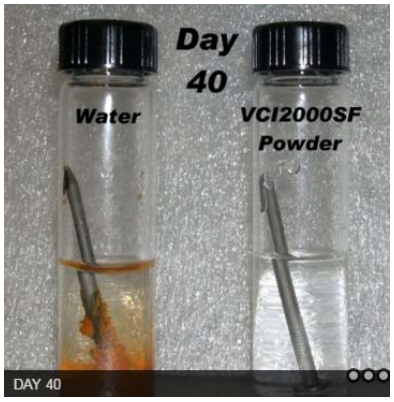
Illustration of VCIs inhibiting rusting

Test Cases

V.Ships Offshore

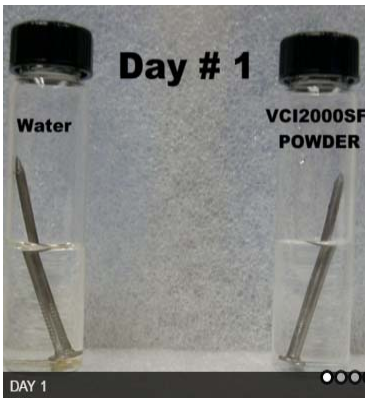
Illustration of VCIs inhibiting rusting



Test Cases

V.Ships Offshore

Illustration of VCIs inhibiting rusting



Test Cases

V.Ships Offshore

Condition assessment over 8 months !!!

…and this is a test with fresh water !!

Market Specialists

V.Ships Offshore

These are companies we work with currently

CORTEC CORPORATION
Environmentally Safe VpCI®/MCI® Technologies

VCI brasil

Forms of applications

V.Ships Offshore

Produced in the following forms -

- Liquids
- Emitters
- Wrapping Paper
- Shrink wraps
- Automatic Aerosol Dispensers

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Applications on an FPSO

Performance assured

Turbine Packages

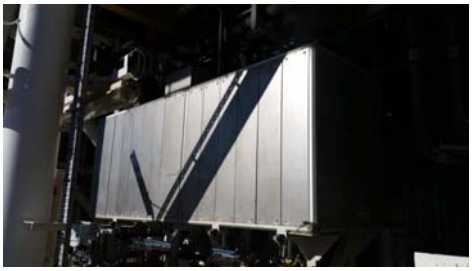
M380, M400 Solar Gas Turbine Generators

VCI preservation.
Monitoring and regular replacement of VCI
VActive product.
Variable Guide Vane actuation.
Battery checks etc.

Water Injection Modules

M200 Water Injection Module
Preserved with VCI.
Weekly lube oil pump running and motor turning.

Fuel Gas Compression Unit



M320 LP Compressor
Preserved with VCI.
Weekly lube oil pump running and motor turning by hand.

M350 Fuel Gas Compression
Preserved with VCI.
Weekly lube oil pump running and turning by hand.

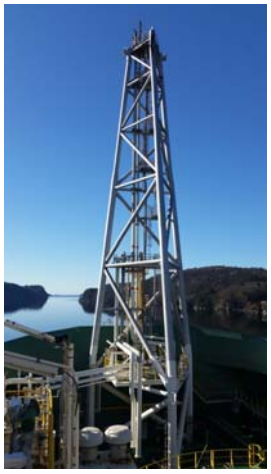
HP Compressor

M290 HP Compressor
Instrumentation under preservation by VCI products.
Motor monitoring.

Flare and K.O. Drums

V.Ships Offshore

N130 HP/LP Flare & K.O Drum.
VCI injection and monitoring.



Offshore Cranes

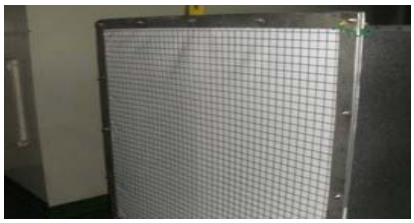
V.Ships Offshore

3 x National Oilwell Varco® Knuckle Boom Crane
SWL 30t – 30m
SWL 15t – 45m

VCI preservative added to hydraulic system.

NATIONAL OILWELL VARCO

Marine Boiler Systems



Boiler Air Intakes & Exhausts sealed

Perspex seal to monitor VCI corrosion Coupons

Boiler Internal washing prior to VCI Injection

Main and Aux Engines

Cylinder head covers removed and rocker gear cleaned.

Remove Injectors and Starting air valves for preservation. Cleaned and tag. Apply lube oil thin film, wrap by VCI paper and packed with Plastic.

HT drained, blinded and preserved with VCI Injectors

Head covers replaced after preservation.

Electrical Cabinets / Switch Boards

VCI Linter plates give electrical cabinets protection for 2 years. One Linter plate per cubic foot.

Use of VCI VActive dispensers in Switchboard rooms to give area coverage.
VCI spray activated every 30 minutes

Motors and JBs

Electric motors, junction boxes, and instrumentation cleaned, protected with VCI LQS500, neutralized with MV Aqua 350, and wrapped in VCI impregnated UV resistant shrink film.

In Conclusion

We are with you Globally - happy to assist

Performance assured

V.Ships Offshore

V.Ships Offshore

V.Ships Offshore

V.Ships Offshore

What is really happening in the offshore marine market?

Source: splash247.com

- Moody's has downgraded six major offshore rig providers (Ensco, Diamond, Transocean, etc.) as they see oversupply and cutbacks in capex and opex by majors
- Global offshore spend is set to decline significantly, with the big impacts being Western Europe (19%), SE Asia (17%), US (20%)
- The majors are cutting capex, with ExxonMobil down (20%), Conoco Philips (30%), BP (16%), Chevron (12%)
- Of the 433 odd existing rigs, only 58% (250) are under contract
- There are 183 idle jack-ups, 56 of which are cold stacked
- The two most impacted areas are the shallow water of the GOM (31% decline in rig utilisation) and SE Asia (38% decline)
- Average charter rates are down, between 20% and 40% - in the jack-up market beyond 375 ft (115 metres) are down by as much as 38%
- Of the 97 jack-ups under construction, only 11 have contracts and more importantly, 63 have had delivery dates extended
- BW Offshore cutting staff levels by 35%
- General charter rates in the OSV markets have fallen by 27% since January 2015
- Only 96 offshore fields discovered globally in 2015, down 19% on 2014
- Only 68 offshore fields started in 2015, down by 41% on 2014
- The OSV market has declined by 11% between 2014 to end 2015
- The oversupply of OSV vessels with 198 new vessels expected to enter the market.

V.Ships Offshore

Lay-Up / Preservation

Performance assured

Why Lay-Up?

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A laid-up vessel is a vessel which has been taken out of commercial operation for an undefined period of time.

Laying-up a ship is designed to:

- Preserve and maintain the vessel structure and machinery by protecting against corrosion and static seizure.
- Maintain the security and protection of the vessel crew and environment.

The extent to which a vessel will be laid-up depends on several factors including:

- Estimated time in lay-up condition
- Operational cost savings
- Re-commissioning time and cost
- Next intended destination after re-commissioning e.g. normal operation, repair yard or other
- Age of vessel and recycling value

Technical Management of Lay-up

Technical management during the lay-up will include the following:

- Produce a lay-up plan and submit to Class for approval
- Source the necessary resources for implementing the plan
- Liaise with Class throughout the lay-up procedure and report back to owners regularly
- Completion of regular inspection sheets which are submitted on a regular basis for review

Routines				
Weekly	Monthly	Three Monthly	Six Monthly	Annually
1. Test active bilge and fire alarms, run emergency fire pump and generator 2. Inspect M/E, D/G and boiler air/gas side spaces, heat exchangers, open piping etc. 3. Check battery electrolyte levels and state of change 4. Soundings of tanks 5. Liftboat engine and emergency air compressor run of test	1. Run M/E and stern tube lubricating oil pumps 2. Check oil level in machinery 3. Motor insulation readings recorded 4. Air conditioning & refrigeration plant refrigerant liquid level and leakage checks 5. Fire extinguisher inspections 6. Fire dampers operated and greased 7. Check and record cargo tank, insulation space and cargo pipeline humidity levels 8. Monthly report to complete and submit to head office	1. Lubricating oil sample taken for analysis	1. Underwater hull inspection	1. Fixed fire fighting equipment checks 2. Portable fire fighting equipment service checks

Hot / Warm Lay-Up

Hot / Warm Lay-Up covers the following conditions:

- Lay-up time is usually less than 12 months.
- Machinery is kept in operation.
- Relevant cargo may be kept on board, but the owner should check about acceptance from their insurance company.
- Held within Classification and Flag State requirements.
- Crew numbers may be reduced to minimum safe manning limits. (Hot Lay-Up)
- Vessel manning is reduced to below the trading limit and in agreement with Flag State, Classification Society, Insurers and local authorities. (Warm Lay-Up)
- Most ports will only grant a temporary permit to lay-up a vessel in this condition in port, provided that Class and Flag surveys are conducted. (Warm Lay-Up)
- Local restrictions on vessel operations such as restrictions on the transfer of oily bilge water. (Warm Lay-Up)

Cold Lay-Up

Cold Lay-Up covers the following conditions:

- Lay-up time is usually more than 12 months.
- Machinery is out of operation; only emergency generators are in operation or temporary deck generators are installed.
- Reduced manning.
- In line with emergency requirements to deal with fire, flooding mooring and security watch.
- Lay-up locations are generally remote so access to vessel can be limited.
- Upon reactivation, the vessel may need to go direct to dry dock before trading, depending on the extent of any hull marine growth
- All preparations and processes during cold lay-up have to be well documented as crew changes may be significant.

Hot vs Cold Lay-Up (Summary)

Source: DNV-GL Class Guidelines – Lay-up of vessels (January 2016 Edition)

Item	Hot / Warm Lay-Up	Cold Lay-Up
Class status	Laid-Up	Laid-Up
Certificates	To be suspended from first overdue annual survey	Put on hold, no requirement for condition follow up; conditions, if found will be issued during annual lay-up survey
Machinery	In Operation	Out of service, electrically dead, but running emergency generator
Cargo	Cargo as relevant may be onboard; owner to check with insurance company	Normally no cargo; power kept to a minimum level
Maintenance	Limited operational maintenance	Preservation and its documentation, especially when returning to normal trade
Survey Requirements	Annual survey of laid-up vessel	Annual survey of laid-up vessel
Assumed time of re-commissioning	1 week	Usually more than 3 weeks; depending on vessel's age and value, preservation and further duties: • Normal operation • Sailing to repair or scrap yard
Manning	Engineering and Navigation officers	Fire, leakage, mooring and security watch

Hot vs Cold Lay-Up (Summary)

V.Ships Offshore

Source: DNV-GL Class Guidelines – Lay-up of vessels (January 2016 Edition)

Item	Hot / Warm Lay-Up	Cold Lay-Up
Insurance	Port risk only. Lay-up return may apply.	Port risk only. Lay-up return may apply.
Fire Safety	As in operation, may be limited to E/R and high risk areas.	As in operation, may be limited to E/R and high risk areas.
Lifesaving appliances	As in operation, may reduce due to reduced manning.	Operational for lay-up personnel
Lay-up declaration	Yes	Yes
Preservation declaration	To be considered	To be considered
ISM and ISPS (if relevant)	Suspended after 3 months; reactivation audit needed	Invalid; interim audit needed
Flag	Flag requirements for Laid-Up	Flag requirements for Laid-Up
Characteristics	Flag state may allow reduced manning	Challenge with humidity (especially RH >50%); minimum manning (no requirements) covering fire, leakage, mooring and security watches

Risk and challenges

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- Choosing a safe lay-up site avoiding dragging, drifting, collision or grounding
- Collision by another vessel
- Safe mooring
- Flooding
- Fire and cumulative damage
- Security
- Competence level of service suppliers
- Preservation
- Choice of maintenance strategy vs re-commissioning and mobilisation time
- Own experienced personnel

Survey requirements during lay-up

Source: DNV-GL Class Guidelines – Lay-up of vessels (January 2016 Edition)

1. A reduced annual survey is to be carried out, covering watertight integrity, the bilge system, fire hazards and equipment in use. Vessels manned during lay-up shall comply with class requirements regarding fire safety. The requirements may be limited to engine room areas and any high-risk area in use, assuming vessels are laid up in ballast condition and that the cargo area is clean and gas free.
2. Prolonged survey intervals may be applied to vessels being laid up directly after completion of construction.
3. Maintenance and preservation during the lay-up period is not a class requirement, but it may affect the scope of the re-commissioning survey. If during the lay-up period the vessel has been preserved and maintained according to a program accepted by DNV GL, the scope of the re-commissioning survey will be specially considered.
4. There is no time limit for how long a vessel can be laid-up, provided the required surveys as above are carried out.

Re-commissioning Survey

Source: DNV-GL Class Guidelines – Lay-up of vessels (January 2016 Edition)

Re-commissioning survey depends on:

- Time in lay-up
- Maintenance
- Preservative measures taken during lay-up
- Survey status at the time of re-commissioning
- The purpose of re-commissioning
- Type and age of vessel

Surveys should include at least the following equipment:

- Main engine safety alarms
- Engine should be run ahead and astern by engine room and bridge controls, including testing of shut-down and slow-down functions
- Auxiliary engines with connected automation equipment
- All pumping, pneumatic and hydraulic systems
- All alarms covering main engines, auxiliaries with steering gear
- Remote operation of fuel oil and lube oil, pumps and valves
- Cargo and ballast pumps
- Bilge pumping systems
- All navigation / communication systems
- Steering gear, including emergency operation
- All deck machinery and equipment
- Special survey / testing of equipment / systems based on class notations

Re-commissioning Survey

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Source: DNV-GL Class Guidelines – Lay-up of vessels (January 2016 Edition)

Lay-up time	Consideration	Preservation	Class scope
< 12 months	To be considered as operated continuously	• Assumed to be under normal operating conditions • If vessel has been subject to no preservation	• Case-by-case; typically only latest overdue surveys and conditions • Case-by-case; typically sighting and overdue survey
> 12 months	Extent of survey depends on: • The time the unit has been out of commission • Maintenance and preservative measures taken during lay-up • The extent of surveys carried out during commission	Not required, but will be considered for scope of re-commissioning surveys	Case-by case, with at least: • Latest overdue surveys • Sea trial for function testing of machinery installations

Preservation Methods

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Source: The Journal of Science and Engineering Corrosion Vol. 60 No. 6

Method	Product Type	Benefits	Disadvantages
Water-displacing products	Petroleum-based (light oils or thixotropic greases)	• Relatively inexpensive • Water displacement • Create a barrier coating on metal surfaces • Excellent permanent protection	• Costs increase with additives needed to enhance protection • High labour and material costs for application and removal of products • Use of solvent-based cleaners for product removal makes these products unsafe for the worker and environment
Water-absorption products	Silica gel (desiccants)	• Economical alternatives for temporary protection • Effective for storage and shipping • Effective in electronic and electrical operations	• Difficult to calculate specific moisture will be present Cost increase with the addition of more desiccants and inspections • Airtight seal is required but difficult and expensive to achieve
Dehumidification	• Dehumidifier • Vapour barrier bags	• Can be successful if air flow to the metal is totally restricted • Vapour barrier bags are excellent for one-time use • Good way to protect electronics	Dehumidifier • Electricity mandatory for dehumidifier • Difficult to keep a seal on the metal object • High cost of equipment and associated upkeep Vapour barrier bags • High costs of materials and labour needed for air tight protection
Volatile corrosion inhibitor (VCI)	• Anodic inhibitors • Cathodic inhibitors • Mixed inhibitors	Anodic inhibitors • Prevent metal corrosion Cathodic inhibitors • Slow cathodic reaction • Precipitate onto cathodic sites, restricting diffusion of corrosive species Mixed inhibitors • Absorbed onto metal surface, creating a monomolecular layer • Monomolecular film acts as a buffer, maintaining pH for corrosion resistance	Anodic inhibitors • Negative effect on worker safety • Negative effect on environment

V.Ships Offshore

Case Study
OSX 1 FPSO

Performance assured

Project Experience

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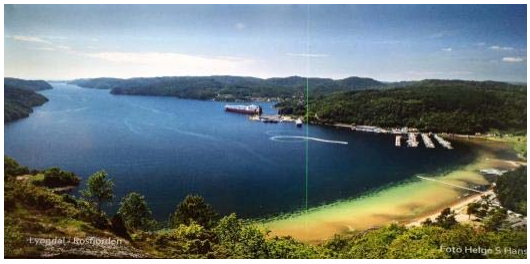
OSX 1

- V.Ships Offshore has jus t been awarded the project to take over the OSX1 for full technical management
- This involves taking over during decommissioning, activating marine / ISM certification and systems under our COC.
- Sailing the vessel to Lyngdal Norway and maintain her under warm preservation for over 12 months



Decommissioning / Preservation

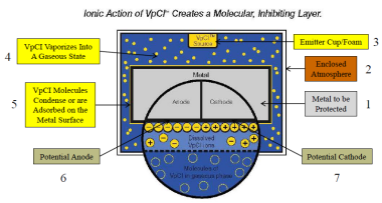
"Decommissioning arises when the end of the economic life of an hydrocarbon reservoir is reached. Various decommissioning activities may be carried out depending on the nature of petroleum production activities that have been undertaken."

"Preservation is defined as maintaining the current vessel as it-is condition, not degrading the condition and reduces the re-commissioning scope of classed vessels."

Volatile corrosion inhibitor (VCI)

VCI are organic salts derived from amines which gradually volatilize saturating the internal environment of the package by depositing these salts on the metal surface. It will form an invisible monomolecular layer which protects against corrosion.

V-active is an innovative organic compound with differentiated molecular structure, safe for people and the environment, which remains active in the substrate where it is applied: paints, resins, varnishes, plastics, process fluids and cellulosic products, among others. The V-active in the presence of metals, acts effectively in the vapor phase and by contact, interfering in the electrical activity, which confers the stability of the metallic surface.



VCI Brasil V-Active

No.	Forms	Application
1	Liquid	Piping and connected equipment internals (e.g. heater exchanger – water side)
2	Liquid	External protection of equipment and materials
3	Liquid	Empty oil system equipment
4	Liquid	Equipment / System with oil (e.g. Hydraulic system)
5	Plastic	Piping and connected equipment internals (outdoor) Junction boxes and panels (outdoor)
6	Paper	Internals of junction boxes and lighting fixtures
7	Paper	Electrical and instrumentation panels in covered area (Internals)
8	Emitters	Crane engine room
9	Liquid	SS surface panels and junction boxes
10	Liquid	Remove oxidation.
11	Liquid	Excellent degreasing power and guaranteed anti-corrosive action

Preservation / Monitoring Procedure

An sample preservation / monitoring procedure for separators, coalescer, scrubber, heat exchangers oil side and oil system piping is as shown:

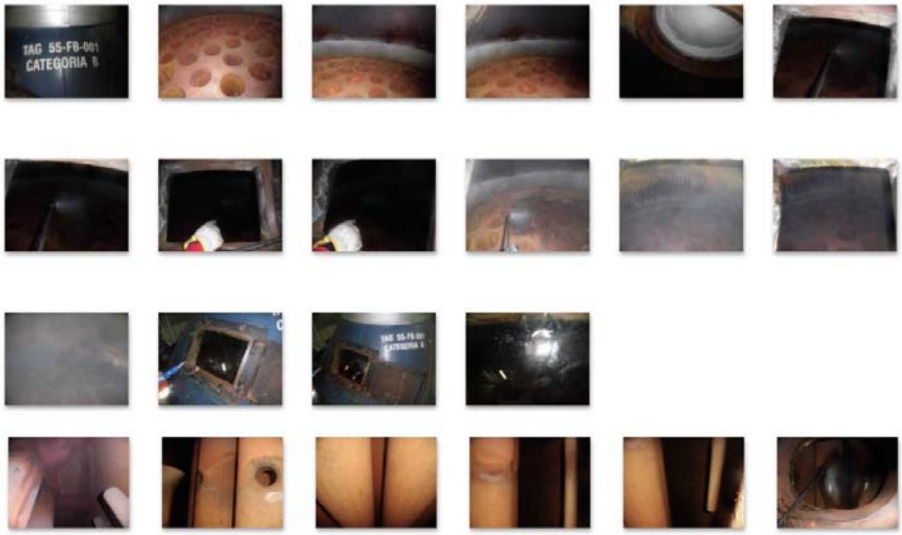
Preservation

a) Internal pictures will be taken from takeover document whichever is available for record.
b) It is assumed that is free from oily water / sludge contamination. The salinity shall also be record from takeover document where available.
c) Isolation of the identified equipment from first isolation valve to be carried out. System's valves are to be sealed with Shrink film (plastics).
d) Prepare and spray MV Oil XXX (liquid) in vapour form. This considers vapour phase preservation method.

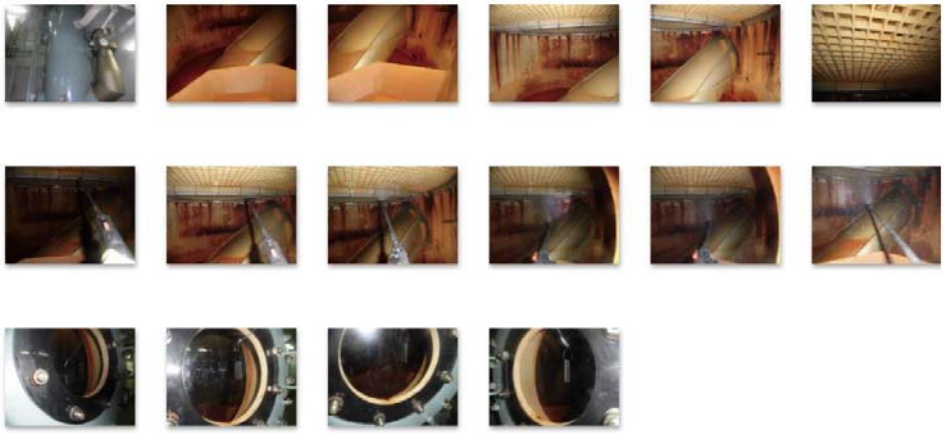
Monitoring

a) Corrosion coupon shall be installed for monitoring. The coupons will be inspected weekly and pictures to be taken for record.
b) Upon satisfaction of the application, the monitoring will be considered on monthly basis.
c) Gas check will be carried out on monthly basis. Readings to be submitted in Monthly Report.

Preservation photos (Boiler - Water / Fire side)



Preservation photos (IG Scrubber)



Preservation photos (IG Deck Seal)

Preservation photos (Liftboat davit & winch)

Preservation photos (Emergency Generator)

Bio Emitter

Inhibitors (VpCIs) to migrate throughout the surrounding space to form an invisible molecular shield on metal surfaces, sealing off air and moisture - even in the hardest to reach areas. The BioEmitter™ provides long-term protection against corrosion even in the presence of adverse conditions including salt, moisture, airborne contaminants, H_2S, SO_2, NH_3, and others.

Cortec's BioEmitter™ offers easy-to-use protection from rust and corrosion on metals stored in enclosed spaces as large as 50 cubic feet (1.4m^3). Simply attach the environmentally safe BioEmitter™ onto a clean surface inside an enclosed area, then relax knowing your tools, electric panels, or other metallic valuables are protected.

The BioEmitter™ protects a wide variety of metals from rust and corrosion. These metals include mild steel, galvanized steel, brass, solder, cast iron, silver, aluminum alloys, magnesium alloys, copper, and copper-nickel alloys.