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From the Chairman's Desk

Dear Readers,

Season's Greetings

You all know the most used words over the last few months are 'Environment & Greenhouse gases'. Shipping is one of the most regulated sectors and is doing its bit to cut emissions, not only carbon but also Sulphur and Nitrogen, despite being the lowest contributor. This is probably one of the reasons why shipping is left out of the recently concluded COP 21.

As part of Indian delegation, IRCLASS has made a presentation on "GHG emissions from Indian Shipping – Impact & Mitigation Measures".

International maritime industry is at the forefront in terms of research and adopting new technologies to reduce emissions, which considering the scale is an enormous task. These include shifting to other fossil fuels, like LNG. In order to aide our research into cryogenic technologies and to offer value added services to our stakeholders, we have recently acquired Safess Quality Management Pvt. Ltd (SQML).

Another source of emissions is the Oil and Gas sector, where IRCLASS is actively engaging all the stakeholders and developing a methodology to assess and subsequently reduce these emissions. A paper is included in this edition of the Touch of Class on the same.

A very difficult year has come to an end. Let me thank all our stakeholders who stood by us and supported us. We look forward to your continued support and assure that we at IRCLASS are committed to continuously upgrade and provide quality services to all our clients.

Arun Sharma
Chairman & Managing Director

Energy Efficiency- Can it be a key driver for the Offshore Sector

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INTRODUCTION:

Energy is one of the most precious resources provided by the oceans and coastal bodies worldwide. While offshore activities like oil & gas exploration, production and energy generation act as a solution to the growing consumption demands across the world, it is imperative to ensure that such activities themselves are carried out in an energy efficient manner. This requires the offshore installation to be designed, built and operated in a manner which will ensure sustainability and which will minimize adverse effects on the marine ecosystem.

According to International Energy Agency's (IEA) World Energy Outlook 2012 report, global energy demand is projected to increase by 35% between 2010 and 2035, rising from nearly 13000 Million tonnes of oil equivalent (Mtoe) to around 17000 Mtoe. Fossil fuels will remain dominant accounting for 59% of the overall increase in the energy demand in this period.

In such a context, climate change and emission management present big challenges for all industrial sectors. Demands for action to stabilize greenhouse gas emissions are stronger and when looking at different options for their mitigation, energy efficiency will have a major role to play.

This paper aims to study and analyse the energy consumption on offshore installations and the resultant emissions. It further proposes areas where energy efficiency can be improved. Finally it introduces the idea of applying a concept similar to the "Ship Energy Efficiency Management Plan (SEEMP)" to the offshore platforms.

OFFSHORE PLATFORMS – AN OVERVIEW

Offshore oil production and storage

In offshore production, oil and gas are extracted from the wells and brought to the surface to a host facility above the ocean surface. The type of facility depends on the location, water depth, climate and the facility's size and capabilities. The process consists of exploratory drilling, development drilling, production, processing, storage and transport.

Exploratory drilling is carried out with a mobile drilling rig to confirm or rule out the presence of hydrocarbons. Large self-contained stationary platforms are not used for exploratory drilling. Development drilling is the process of drilling holes into known accumulations of oil and/or gas and is done from a self-contained platform. In the past, oil wells were drilled straight down into the Earth. One of the greatest oil-industry advances is the ability to drill horizontally.

This "directional drilling" allows the operator to reach many reservoirs from one drilling rig, maximizing the amount of oil or gas that can be produced from one location. A platform will occupy only a small portion of the whole oil field, which can stretch over many square miles. Directional drilling allows wells to extend out from a central platform into multiple reservoir locations like a system of tree roots.

Once development drilling is completed, production of the oil is begun. The oil, water and gas travel from the reservoir to the surface under their own pressure (natural drive). If reservoir pressures are low, however, artificial lift is employed. Artificial lift can be in the form of in-well or sea floor pumps and is sometimes accompanied with in-well heating and/or gas lift systems.

Once at the surface, production from the well is sent to a separator to be divided into its base components - oil, gas and water. The oil is dehydrated in a bulk oil treater before being sent to storage.It is then evacuated through a crude oil pipeline or a shuttle tanker to a refinery.

In deep water, the production and processing equipment is put on the same self-contained platform used for development drilling. In shallow water, drilling platforms are usually quite small and a separate platform adjacent to the well-protector platform is constructed for the processing or treatment equipment.

Types of Offshore structures

There are two main categories of offshore structures namely "Bottom supported Platforms" and "Floating Rigs" **as shown in Table 1 and 2 below**

Table - 1 Bottom Supported Platforms

Type of Structure	Brief Description
Gravel Islands	Man-made gravel islands may be used year-round in water depths of up to 50 feet and can support large drilling rigs and oil and gas production equipment.
Gravity-Based Structures	These platforms take advantage of their large size and heavy mass to support large facilities in water depths of up to 1,000 feet.
Steel Jacket	Typical fixed steel platforms consist of large pipe legs and tubular steel cross bracing that form a "jacket." The jacket is supported by piles driven into the sea floor to transmit wave, wind, current or ice forces into the ground. Steel jacket platforms can operate in up to 1,400 feet of water.
Compliant Towers	These platforms may be used for operating in depths of 1,000 to 3,000 feet. The platforms are slender and so flexible that they sway when hit with small waves so that they don't experience the fatigue that a fixed platform would see in these great depths.

Table -2 Floating Rigs

Type of Structure	Brief Description
Tension Leg Platforms	These floating platforms can support a drilling rig and production facilities. The TLPs are similar to fixed platforms except they use a floating hull tethered to the seafloor by a mooring system made of tension legs.
Semi-Submersibles	A semi-submersible production platform consists of a deck supported by four columns and connected underwater by four pontoons. Similar to TLPs, semi-submersibles can support living quarters and production equipment. Unlike TLPs, their floating hull uses conventional lateral mooring system of steel cables to keep the platform in position and is connected to subsea wells via flow lines.
SPARS	Much like the TLP, Spars are moored to the sea floor, but with a more conventional lateral mooring anchoring system instead of tension legs. They are supported by a floating, hollow cylinder containing extra weight in the bottom, similar to a huge buoy. About 90 percent of the structure is underwater, so it has great stability in very deep waters — as much as 10,000 feet
FPSO	Floating production storage and offloading units (FPSOs) can operate in water depths up to 10,000 feet and are best suited for milder climates or where there is limited pipeline systems to transport oil to shore. These ship-like vessels can process all of the oil or gas produced from a reservoir, separating the oil and gas and storing the oil until it can be offloaded to tankers.

The above tables 1 & 2, give a general classification of offshore platforms. In Bombay High, India approximately 240 well platforms of steel jacket type are operational. These are catered to by around 14 process platforms. Drilling rigs are around 35, of which majority are jack-up type, while two are floating rigs.

Energy Production and consumption:

The purpose of offshore production platforms is to extract, process, and transport petroleum & natural gas. A typical offshore platform consists of a processing section, well streams consisting of a mixture of light and heavy hydrocarbons as well as water are separated into water, oil/condensate and gas. The water is purified and discharged or disposed. The petroleum is processed and delivered at the required quality.

In addition, seawater may be compressed and injected to enhance oil recovery. Power is needed for compression and pumping, and heat may be needed to ease separation and for gas dehydration. Power and heat are delivered by the utility system, normally by combusting gas produced at the platform. The utility system also delivers power to the living quarter and to the drilling modules.

As mentioned earlier in this paper, energy demand is estimated to increase substantially. As the world's energy reserves keep depleting, more energy is required to extract what remains.

Increasing energy efficiency is widely recognised as a key option to meet energy security as well as to limit the global temperature rise to 2°C by 2050. But according to the International Energy Agency's (IEA) World Energy outlook 2012, this option is still not used to its full potential. It states that energy efficiency must help reduce the energy intensity
(i.e. energy input per unit of gross domestic product)

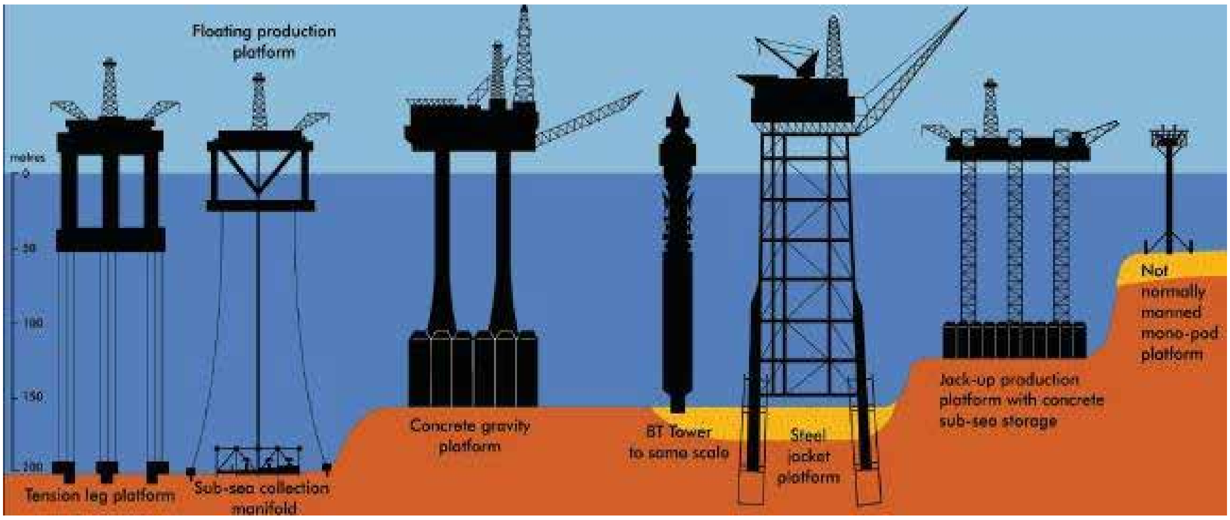

Fig.1: Types of offshore platforms. Source: http://www.oilandgasuk.co.uk/

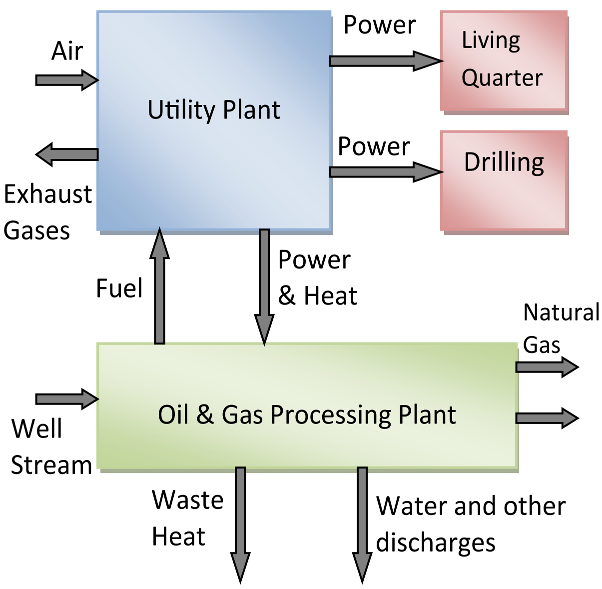

Fig.2 – Energy Production & Consumption

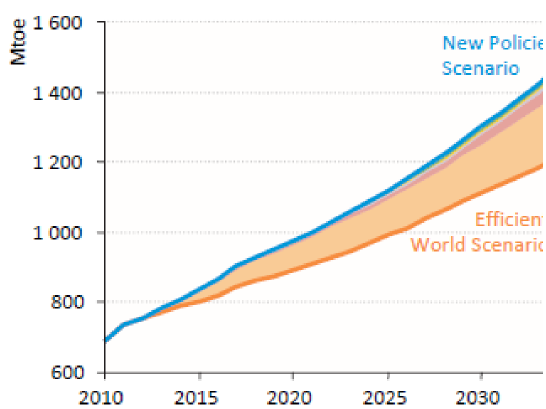

Fig.3: India's Energy Demand. Source: "International Energy Agency (IEA), World Energy Outlook 2012 Report"

of the global economy by two-thirds by 2050, and that the annual improvements in energy intensity must double, from 1.2% over the last 40 years to 2.4% in the coming four decades.

In order to systematically reduce the energy consumption and improve the energy efficiency, it is imperative that the current status and future predictions of energy consumption are estimated. Then, areas can be identified where there is a scope for improving the energy efficiency.

In the subsequent sections of this paper, forecasting method is described for estimating energy consumption and related emissions. Furthermore, some of the energy efficiency improvement measures are discussed.

RESEARCH METHODOLOGY:

1.Quantify the use of energy and identify the main energy consuming processes

2.Identify opportunities to reduce the consumptions and losses

3.Prepare an Energy Efficiency Management Plan with a focus on short, medium and long term goals

Quantify the use of energy and identify the main energy consuming processes

Fuel is required for the gas turbines, diesel and gas engines, and boilers. These devices produce energy in the form of heat, electricity or mechanical drive, often feeding all energy consuming equipment on the offshore installation in consideration.

The methodology covers forecasting of:

•Energy requirements
•Fuel requirements
•Emissions

While, the energy requirement forecasts are independent of type of fuel, the fuel and emissions forecasts are based on type of fuel such as diesel oil and/or natural gas.

Emission Sources:

Following are the emission sources from a typical offshore rig or platform:

•Emissions from power generation and energy utilization on permanent and mobile production facilities

•Emissions from power generation and energy utilization on permanent and mobile drilling units

•Emissions from gas flaring

•Emissions from oil and gas burning during well testing or well maintenance work (wellstream disposal)

•Emissions from power generation and energy utilisation on installations tied in for well maintenance work

•Hydrocarbon emissions from cold vents and fugitive emissions

•Hydrocarbon emissions from crude oil storage and offshore loading

Emission Constituents:

The emissions from the various activities are mainly the following:

•Exhaust gases from energy conversion in boilers, turbines and engines (such as CO_2, NO_X, CH_4, NMVOC (Non-methane volatile organic compounds), SO_2, N_2O, particles etc.)

•Exhaust gases from natural gas flaring (same components as above)

•Cold venting of natural gas (CH_4, NMVOC)

•Fugitive emissions (CH_4, NMVOC)

•Hydrocarbon emissions from offshore crude oil storage operations (CH_4, NMVOC)

•Hydrocarbon emissions from offshore crude oil loading operations (CH_4, NMVOC)

•Exhaust gases from well-stream burn-off during well testing and maintenance operations, and from any additional energy conversion on mobile units related to drilling and well maintenance work (such as CO_2, NO_X, CH_4, NMVOC, SO_2, N_2O, particles etc.)

Steps involved in forecasting:

Step 1. Calculating the Energy Consumption (Energy Output)

Step 2. Calculating the Fuel Energy Required (Energy Input)

Step 3. Calculating the Fuel Volumes Required

Step 4. Calculating Related Emissions

Oil and gas production often apply fossil fuels in the form of natural gas and diesel fuel for their heat, power and energy generation. In such cases the associated emissions to air will be generated from:

•Turbine driven and engine driven generators (gas and/or diesel fuelled)

•Turbines or engines used as direct drive for large pumps and compressors (gas and/or diesel fuelled)

•Boilers and heaters (gas and/or diesel/oil fuelled)
If the energy is supplied by electricity, emissions may take place where the electricity is generated.

The amount of emissions is a function of the amount of fuel used, which again – for all practical purposes - is proportional to the energy needs.

Step 1: Calculating the Energy Consumption (Energy Output)

The energy consumption (measured in MJ or kWh) over a time period for a unit operation can be calculated from the throughput (activity level, production level, etc.) and an energy factor or function. Mathematically, this may be expressed by the following equation:

$$E_i = T_i * e_i \qquad (1)$$

i = unit operation no.
E = Energy output [kWh]
T = Throughput [m^3] (production and injection volume)
e = energy factor or function [kWh/m^3]

For some unit operations, the throughput can be in other units. This will also be reflected in the energy factor. If the throughput is m^3 water, the energy factor will be in [kWh/m^3].

Step 2. Calculating the Fuel Energy Required (Energy Input)

The energy in the fuel (energy input) is invariably higher than the energy output. In all energy conversion processes some energy is lost during the conversion. The fraction of energy that can be utilized is determined by the efficiency factor, which is the relation between the energy output and the energy input. The energy input can be calculated as the energy output divided by the efficiency factor.

Mathematically this may be expressed as follows:

$$C_i = E_i * 1/\eta_i = T_i * e_i * 1/\eta_i \qquad (2)$$

i = unit operation no.
C = Fuel energy (energy input) [kWh] (input)
E = Energy output [kWh] (output)
η = total efficiency factor (for the relevant equipment used)

Step 3 Calculating the Fuel Quantity Required

When the input energy is known, the quantity of fuel can be calculated by dividing it by the specific energy content in that fuel. This is a physical property expressing the amount of energy released when the fuel is burnt, compared to the amount of fuel consumed in the process.

A mathematical expression of this may be as follows:

$$F_{i,j} = C_i * 1/NCV_j = T_i * e_i * 1/\eta_i * 1/NCV_j \quad (3)$$

i = unit operation no.
j = fuel type indicator
F = fuel consumption [m3 gas fuel] or [tonne diesel]
C = energy input [kWh] (input)
NCV = fuel Net Calorific Value [kWh/m3 gas fuel] or [kWh/tonne diesel]

As indicated by the equation above, the specific energy content should be represented by the Net Calorific Value (NCV)

The calorific values of a certain fuel sample may be determined by standardized laboratory methods. However, for natural gas with a known composition, the calorific values may be calculated as specified in ISO 6976.

Step 4 Calculating Related Emissions

The emissions to air from the use of fossil fuels to generate the above energy requirements would now be found based on the fuel consumption and a relevant emission factor.

However, most emission factors are established with no concern for any possible actions taken in order to mitigate the emissions. To correct for such actions, one could include the mitigation efficiency. Mathematically, this may be expressed by the following equation:

$$G_{i,x} = F_i * f_{i,x} * (1-\varepsilon_{i,x}) \quad (4)$$

Gi,x = Exhaust gas emission [tonnes of x from unit operation i] x is the GHG gas for which emissions are to be calculated. In this case it is CO_2, but same relationship is applicable for any other gas for which emission is required to be calculated

F = Fuel consumption [m3 gas fuel] or [tonne diesel]
f = Emission factor [tonnes/m3 gas fuel] or [tonnes/tonne diesel]
ε = Energy efficiency technology factor (in the range {0,1})
If no mitigation is in use, ε = 0.

Emissions from Gas Flaring:

The gas flaring related emissions can be considered proportional to the gas volumes being flared. The emissions would be expressed by an equation, as follows:

$$G = F * f \quad (5)$$

G = Exhaust gas emission [tonnes]
F = Flared volumes of natural gas [m3 gas fuel]
f = emission factor [tonnes/m3 natural gas flared]

The flared volume of natural gas is normally measured, or it can be calculated based upon the quantity extracted and the quantity transported.

Other Sources of emissions:

i.Well Testing and Maintenance Work

ii.Low-Pressure Vents and Fugitive Emissions

iii.Crude Oil Storage and Offshore Loading

CASE STUDY:

For the purpose of this study, data was collected from a well known oil & gas company having drilling, production, processing facilities.

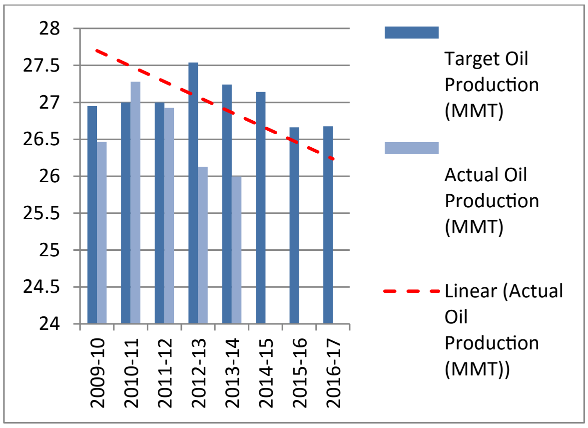

Fig.4 - Annual Oil Production

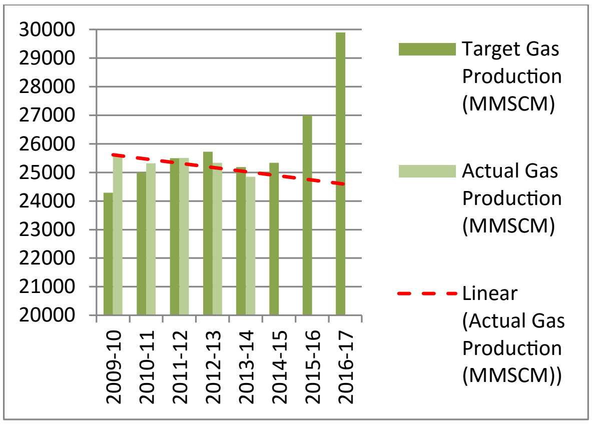

Fig.5 - Annual Gas Production

The data collected comprises of:

•Target Oil Production

•Target Gas Production

•Actual Oil Production

•Actual Gas Production

•Fuel Oil Consumption

From the above data, a volume equivalent of the oil production was determined and added to the gas production volume to arrive at a total targeted production (Oil+Gas).

Furthermore annual fuel consumption data was collected for the years 2009 to 2014. From the fuel consumption trend, expected consumption values for future years, i.e. 2014 to 2017 were determined. Based on the available literature, the emission factor for fuel oil is taken as 3.2 Tonnes of CO2/ Tonne of fuel oil

Year	Total Production (Million MT)	Fuel Consumption (Tonnes)	CO_2 Emissions (Tonnes)
2009-10	44.05563	192860.3275	617153
2010-11	44.60563	198491.1605	635171.7
2011-12	44.95775	202456.2257	647859.9
2012-13	45.65972	204284.9137	653711.7
2014-15	44.97944	200000	640000
2015-16	44.98507	201188.6384	643803.6
2016-17	45.67479	214356.3554	685940.3

Table 3: Fuel Consumption & CO2 emissions

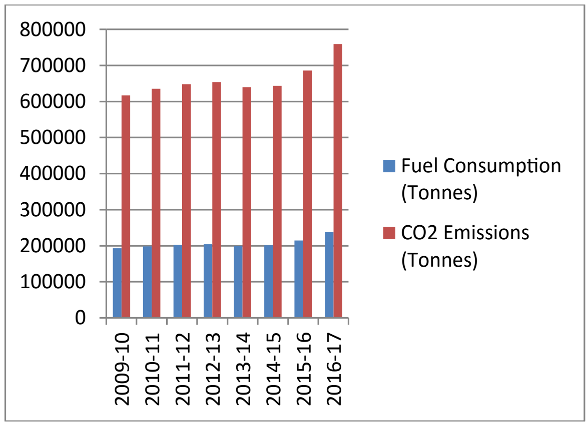

Fig.6 Fuel Consumption & CO2 Emissions

burnt. Using this relation, CO2 emission values were calculated for each year. Table 3, shows the production, fuel consumption and associated emission values.

Table 3 shows the company's year wise total targeted production of oil & gas. Using fuel consumption data for the years 2009-2014, the values for 2015-2017 were estimated by extrapolation. The CO2 emissions were obtained by multiplying the fuel consumption quantity by the emission factor, i.e. 3.2.

Based on the target production; the fuel oil consumption is expected to rise to around 2.15 Lakh tonnes from the current level of 2L tonnes. This would result in an increase of 45000 tonnes of CO2 emissions. The estimated emissions can be reduced if the activities on a platform are focused on reducing fuel consumption and minimizing energy wastage.

It is imperative that an effort is made to identify available opportunities to reduce emissions and measures are implemented to achieve the same.

Some of the measures which can be used are discussed in the succeeding paragraphs.

IDENTIFY OPPORTUNITIES TO REDUCE EMISSIONS

A prerequisite to monitoring and identifying areas of improvements is to establish performance indicators. Various methods are used by the industry to establish performance indicators Some of them are:

i.Fuel Consumption
ii.Energy Efficiency

The following two points present mature technologies that can significantly contribute towards enhancing energy efficiency and reducing emissions:

❖Limit flaring by installing gas recovery systems
❖Utilize exhaust gases from the waste heat recovery system

1.Limit Flaring:

When oil is produced from a field, gas is also released as a by-product. This allied/associated gas can be sold or used to generate power and then resold as units of electrical power. But this requires heavy investment in pipelines, power plants, and other infrastructure. Therefore, in practice, some oil producers opt to sell the oil and burn the gas. This is known as gas flaring.

Every year, approximately 140-150 billion cubic meters (bcm) of natural gas is flared into the atmosphere. (Zoheir Ebrahim et al, Reslience.org)

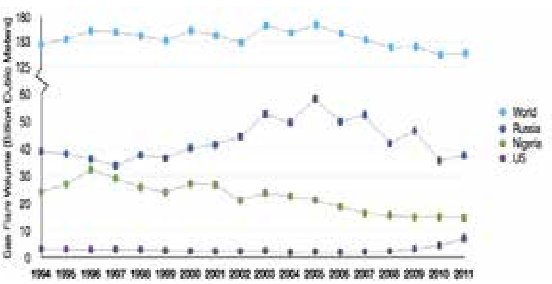

Figure 7: Gas flaring trends. Sources: NOAA (1994-2006); World Bank (2007-2011).

Within the Oil & Gas Industry, approximately 2/3 of today's greenhouse gases emissions are due to flaring/venting.

Gas flaring is a loss from an economic viewpoint because a valuable resource is wasted. It is even more serious from an environmental angle because 140-150 bcm of flared natural gas translates into 270-290 million tons of C02 emissions per year.

Accounting for approximately 1% of global carbon emissions, gas flaring is a tiny contributor to climate change. However, the practice is still wasteful because no economic wealth and/or human welfare is generated in the process.

Fig.8 – Gas Flaring

Fig.9 – Gas Pipeline

Flaring can occur in the oil and gas industry for many reasons, ranging from initial start-up testing of a facility to unplanned equipment malfunctions.

The amount of gas released from each barrel of oil is determined by the gas-to-oil ratio (GOR). The GOR can vary dramatically in different oil fields and can change in the same field over time.

Some technological measures that can be used to limit flaring are:

- •Gas re-injection
- •Gas recovery using an internal combustion (IC) engine
- •Gas recovery via a gas ejector
- •Gas recovery in a vapour recovery unit
- •Gas recovery in vapour recovery compressors

2. Waste heat recovery systems:

Waste Heat Recovery (WHR) systems are a proven technology that enables better use of available energy. By using waste heat from the engines, the efficiency of the combustion process can be considerably improved.

The fuel efficiency of many I.C engines is approximately 50% – only half of the energy content of the fuel is converted into power generation, while the rest is lost as heat energy. Up to half of this waste heat goes into hot exhaust gases released to the atmosphere.

These exhaust gases can be used to increase the power that the engine can produce. In a typical arrangement, the gases leaving the engine are passed through a turbocharger, which uses the energy of the gas to spin a turbine that forms part of an air compressor. This compressor increases the mass of air that flows into the engine, enabling large quantities of fuel to be burnt more efficiently.

The exhaust gas energy can be used in other ways also. It can be used to drive a power turbine which produces electricity. It can also be used to produce steam which can then be used in a gas-fired boiler to meet heat demand. Waste heat can also be used to generate fresh water. Systems that incorporate one or more of the above are termed as Waste Heat Recovery (WHR) systems.

In essence, the major advantage of WHR systems is to further increase the power generated without using more fuel.

There are typically three main options for installing a WHR system:

- ❖(STG) Steam Turbine Generator
- ❖(PTG) Power Turbine Generator
- ❖(ST-PT) Steam Turbine-Power Turbine generator

In a PTG system, a turbine is installed in the exhaust gas bypass, and this turbine produces electricity when the gas passes through. According to manufacturers, PTG systems are capable of recovering 3-5% of the energy content of the fuel.

The STG system uses the exhaust gas for onboard heating. Part of the gas flow is channeled through an exhaust gas bypass, which raises the temperature of the gas for producing steam in a gas-fired boiler. Approximately 5-8% of the energy content of the fuel can be recovered with an STG system. In ST-PT the power turbine and steam turbine form part of a combined system which produces both additional electricity and heat. 8-11% recovery of the fuel energy is possible by using a ST-PT system.

WHR is a feasible technology and has been installed in various platforms. One such example is ONGC's Mumbai South Platform (MSP), wherein a Waste Heat Recovery System is installed with the Process Gas Compressor (PGC). Waste heat recovery units (WHRU) have been installed at each of the PGC exhaust points, and the waste heat is being used to heat process oil which is further used to heat various process streams in the crude oil production activities.

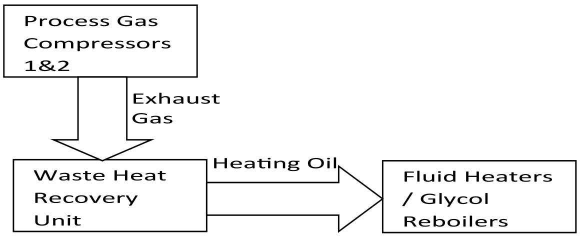

Fig. 10 Waste heat recovery block diagram

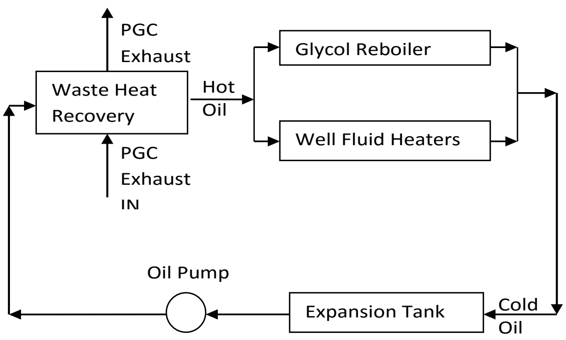

Fig.11 Process Flow Diagram of Waste Heat Recovery System

The project has resulted in reducing the consumption of fossil fuels (natural gas), which would otherwise be used for heating of process oil for crude oil production activities. It is estimated that by end of 2015, the project would have resulted in reducing approximately 53000Tonnes of CO2 emissions in a period of 10 years.

ENERGY EFFICIENCY MANAGEMENT PLAN (EEMP) IN OFFSHORE INDUSTRY

The idea of this paper is to extend the concept of SEEMP to offshore platforms. Oil and gas industry is one of the important energy suppliers to an economy. However energy conservation and best management practice for the offshore platforms have been left to the operators of such platforms. Improvement in energy efficiency may be achieved by following the stages similar to SEEMP.

Planning: This is the most crucial stage of the EEMP, in that it primarily determines both the current status of energy usage and the expected improvement of energy efficiency.

Therefore, it is encouraged to devote sufficient time to planning so that the most appropriate, effective and implementable plans can be developed. Planning involves platform-specific measures, company-specific measures, human resource development and goal setting.

Implementation: After planning, it is essential to establish a system for implementation of the identified and selected measures by developing the procedures for energy management, by defining tasks and by assigning them to qualified personnel. Thus, the EEMP should describe how each measure should be implemented and who the responsible person(s) is/are.

The implementation period (start and end dates) of each selected measure should be indicated. The development of such a system can be considered as a part of planning, and therefore may be completed at the planning stage. It involves implementation and record-keeping.

Monitoring: The energy efficiency of an offshore platform should be monitored quantitatively by establishing a monitoring tool. It should be noted that whatever measurement tools are used, continuous and consistent data collection is the foundation of monitoring.

To allow for meaningful and consistent monitoring, the monitoring system, including the procedures for collecting data and the assignment of responsible personnel, should be developed.

The development of such a system can be considered as a part of planning, and therefore should be completed at the planning stage. It involves monitoring tools and establishment of monitoring system.

Self-evaluation and improvement: This is the final phase of the management cycle. This phase should produce meaningful feedback for the coming first stage, i.e. planning stage of the next improvement cycle.

The purpose of self-evaluation is to evaluate the effectiveness of the planned measures and of their implementation, to deepen the understanding on the overall characteristics of the platform's operation such as what types of measures can/cannot function effectively, and how and/or why, to comprehend the trend of the efficiency improvement of that platform and to develop the improved EEMP for the next cycle.

CONCLUSION:

As Indian economy grows, so does its appetite for energy. Majority of its energy demands is expected to be supplied by hydrocarbons. Experience suggests that as the energy reserves keep depleting, more energy is required to extract whatever remains. These activities, if carried out with a focus on energy efficiency can play a significant role in CO2 abatement as well as fuel cost savings.

Through this paper it was endeavored to use a forecasting method for estimating CO2 emissions based on the target oil & gas production. The results reflect that an increase of 45000 tonnes of CO2 emissions is expected because of fuel oil consumption pertaining to Oil & Gas production. Furthermore, the paper highlighted the advantages of two measures i.e.

Limiting Flaring and use of Waste Heat Recovery; both having mature technologies for achieving CO2 emission reduction and fuel savings. The Energy Efficiency Management Plan can be a useful tool for monitoring and improving energy efficiency. Harnessing energy and improving energy efficiency can be cheaper than treating/processing the emissions for CO2 abatement.

The growing energy intensity of oil and gas production accompanied by rising extraction costs is giving new impetus to industry efforts to improve the efficiency of the different operations involved in the production process, combat waste and reduce emissions.

Technological developments promise to offer energy efficient solutions. However, profitability of investing in energy efficient technologies is often questioned and justifiably so. Independent bodies such as Classification societies can possibly undertake unbiased studies with focus on abatement potential and cost benefit analysis. Energy efficiency demands long term commitment and it is imperative that all stakeholders play their role in ensuring a sustainable future.

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IRClass Restructuring

-Suman K Jha, HR Manager

IRClass embarked on a journey to redefine organization structure and operating model with an aim to achieve its strategic vision and aspirations for 2020, mainly for the following external and internal factors;

•External Environment – increasing competition, changing customer needs- changing technologies regulatory changes in the marine industry

•Growth Opportunities – Geographical and technological; Need to aid innovation and need for horizontal expansion in industrial business considering India's growth story

•Managing, developing and addressing career aspirations; and

•Providing value added services "Beyond Class";

As a part of this journey, IRS partnered with Accenture and a structured approach was made to evaluate the right Operating Model for achieving 5 year business goals, assess and design the organization structure to support Vision 2020 and beyond. The Scope of organization restructuring exercise was limited to corporate functions, Marine and Industrial businesses covering around 800 employees, globally.

Several key recommendations based on inputs gathered from multiple sources including, stakeholders were made to the management resulting in the new organisation structure. The organisation also revisited its Strategic Value Discipline, which was evolved in consultation with the key internal stakeholders and senior members of IRClass. The role of corporate core and Line of Business were also discussed and agreed upon.

The new organization structure of IRClass has been designed and developed to fulfill following Organization's needs and aspirations:

•Achievement of organization long term goals

•Operate in the new strategic value discipline –, aim to ensure high quality service and solution delivery

•Decentralization, empowerment and accountability of role in managing key processes

•Deepen technical and functional expertise;

•Maximize productivity and efficiency by improving utilization of skill and scale

•Incubate new businesses to self -sufficiency and ensure ease of acquisition/divestiture

•Stay nimble by pro-active and speedy response with the right capital, commercial decisions, resources and actions to external and internal environment; and

•Demonstrate collaborative working relationships; and

•Aid innovative research

IRClass with these changes aims to be the preferred service provider in all sectors and verticals, where we operate.

Note: The new structure with the respective Heads can be found on the IRClass website. **www.irclass.org**

News from IRClass Europe

IRClass Europe, headquartered at London, has been actively undertaking surveys on existing ships, management system audits, marine component inspections, work approval and type approvals of major marine components including diesel engines and gear boxes.

Widening our bouqet of serivces in Europe, IRClass has started approval of service suppliers for services including:

•Ultrasonic thickness measurements of ship structures

•Service of radio communication equipment

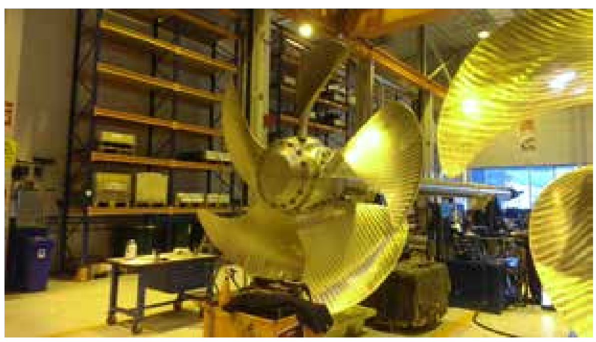
•Service of inflatable life boats, rescue boats and more

IRClass has been busy catering to the needs of the stakeholders by inspecting and certifing marine components, for various shipards and owners.

Additionally, activities of type approval for major machinery have also increased. Recently, we concluded type approval of Diesel Engines manufactured by Volvo-Penta, Sweden; Scania, Sweden and MTU, Germany and Marine Gear boxes manufactured at ZF Friedrichshafen and ZF Padova.

IRClass Europe is in continuous dialogue with the local ship owners and recently undertook class entry surveys for 4 general cargo ships , one bulk carrier and one supply vessel.

IRClass Europe, is geared up to provide services to all the stakeholders and aims to deal with their demands.



IRClass acquires Safess Quality Management

Adds cryogenic vessel inspection unit to its portfolio

IRClass Systems and Solutions Pvt Ltd (promoted by Indian Register of Shipping), has acquired cryogenic vessel inspection firm Safess Quality Management Pvt Ltd (SQML) and its subsidiary, Arun Abhiyantey Pvt. Ltd. (AA).

SQML was founded in 1993 and has offices in Mumbai, Bangalore, Chennai, Kolkata, Hyderabad, Kochi, Kota and Ahmedabad. SQML is certified for ISO 9001-2008 by the British Standard Institution and registered with National Small Scale Industries (NSCME) department.

The company is well known for its activities in the inspection of cryogenic vessels (low temperature storage facility), insulation, fire proofing, calibration, repair, restoration, and the modification of related piping and pressure vessels and consultancy. Its customer include major oil companies like ONGC, IOCL, HPCL, NPC amongst others.

This acquisition adds two new units with excellent track records in the completion of complex and high-end projects to the portfolio of services at IRClass' command.

IRClass expects, through these new acquisitions, that its top line of business will be enhanced via an ability to bid for more high value jobs and contracts through the upgradation of its technological knowledge.

IRClass has acquired a 51% stake of SQML & AA. The balance of 49% would be acquired within one year.
Mr. Arun Sharma, Chairman – IRClass Systems and Solutions Pvt. Ltd. stated 'This is the first time in our history that IRClass is taking the inorganic route for expansion of its services.

This will enhance IRClass' ability to both test and validate research in the zone of cryogenics and consequently help our research related to LNG & LPG.'

IRClass Academy Delivers Training for Naval Shipbuilding Sector

IRClass Academy, the training arm of the Indian Register of Shipping (IRClass), has delivered a customised, six-day training programme on naval shipbuilding for the officers and members of the Warship Overseeing Team of the Indian Navy and managers from India's leading naval shipyards.

Training - Naval Shipbuilding

This initiative further strengthens IRClass' ongoing engagement with the Indian Navy and naval shipbuilding sector.

Organised in parallel streams for Hull and Machinery, the training programme focused on supervision of naval ship construction and integrated a wide range of specialist processes from steel-forming, welding and hull fabrication, to installation and commissioning of machinery and systems – and finally, tests and acceptance trials. Features that are specific to naval ships such as propulsion plant configurations and gas turbines were also covered.

Under the spotlight were compliance with Naval and Class Rules and Standards and understanding of tolerances and acceptance criteria for materials, fabrication, and machinery installation. The training emphasised the need for clear understanding of applicable rules and standards by the supervising Warship Overseeing Team for ensuring quality of construction, smooth workflow and successful and timely completion of complex shipbuilding projects.

Speaking during the inaugural ceremony, Chief Guest Rear Admiral S.P. Lal, Admiral Superintendent of Mumbai Dockyard, welcomed the initiative by IRClass. Participants commented on the benefits of the training in terms of insights gained into critical areas of naval shipbuilding and the scope and applicability of Rules and Standards.

Since establishing in 1975, it has been the endeavour of IRClass to promote national maritime interests and serve as a knowledge base for the maritime sector. Having previously developed a series of rules for non-combatant vessels, IRClass also released rules for combatant vessels earlier this year.

At a time when the Indian Government is focusing on Make in India, skill development, and employment generation, IRClass' services to India's shipbuilding industry are considered appropriate and timely.

Facilitation of knowledge transfer, sharing of project experiences and adherence to global standards and Best Practices in this specialist area means IRClass is poised to play an even bigger role in the design and construction of Naval and Coastguard vessels in the coming years.

Significance of Vessel Cosmetics

-Vijay Arora, Technical Head

Vessel's cosmetics make a huge impact on impression of the vessel. A ship with rusted look is likely to lead to lower earnings and more headaches for owners.

A well maintained vessel including areas and machinery systems, will not only protect the owners reputation, but also lead to higher earnings. The assessment of the vessel together with the owners and crew starts with the vessel's exterior.

The cosmetics side is critical as that of the machinery and is the representative of Company's image. It not only motivates the Crew of the ship, but also leaves an important first impression on other stakeholders, be it a Charterer, a Vetting Inspector or a Banker going onboard.

It should be understood that customers never really get to know the technical side of a vessel and here the external cosmetic condition of a ship matters, while deciding to do business.

Further, first impression is one of the deciding factors, especially when it comes to Port Sate Inspections. If the vessel looks like a rust bucket and the vessel will be treated like one, no matter how good are the crew onboard and the systems of the ship.

Many customers require even the chartered vessels to appear cosmetically attractive, to protect their reputation and in an unfortunate event, to avoid any negative media. With the vetting regime reaching a saturation point, technically, a ship can be rejected by an owner or an oil major for cosmetic appearance. Not to forget, even a rust streak may be classed as heavy corrosion.

A motivated crew will ensure that the vessel's operations are efficient and towards this, the maintenance of the ship plays a very vital role and can also have a positive effect on the physical and mental health of the crew. Moreover, adherence to the Maritime Labour Convention's requirements on decent living and working conditions onboard, will no doubt enhance crew efficiency.

It is a proven fact that simple steps like application and maintenance of underwater coating systems would lead not only to savings in the fuel cost, but also reduction in carbon footprint. With the limited crew onboard the vessel, the 'mantra' for maintaining a vessel are preparation, preparation and preparation only.

For example, deck corrosion is an issue while maintaining a vessel, particularly the period in between dry-docking. With hectic voyages, impact damages in ports, during cargo handling and sea spray acting as a catalyst, deck corrosion, if not addressed, transforms even the best ship into a rust bucket very rapidly. Quick rate of deterioration of fixtures/fittings, pipe clamps and brackets can cause rapid and widespread unattractive deck staining.

Proper surface preparation prior to application of paint is essential and similarly selection of the paint. Weeks' worth of surface preparation may get wasted, if the paint is not applied as prescribed in the Paint Scheme.

Rustspots, if found, should be tackled immediately to avoid it from spreading. This ensures substantial savings in repair, if left unattended. It is often recommended that continual touch-up maintenance on a prioritised basis performed on long ocean passages goes a long way in protecting the ship from corrosion.

Likewise thoughtful area preparation and product selection during dry-docking, coupled with considerately placed markings that avoid high abrasion impact areas such as tug pushing areas etc. assists in the longevity.

Similarly, maintaining the pumping, piping, electrical and propulsion systems in timely manner, would lead to smooth functioning of the vessel, thereby leading to better dividends to the stakeholders.

This can be done by using Planned Maintenance System tools, which are efficient and will assist the crew to maintain the vessel. These softwares are a boon to ship owners, which not only assists in planning the necessary costs, but also helps in timely maintenance, thereby ensuring the asset condition.

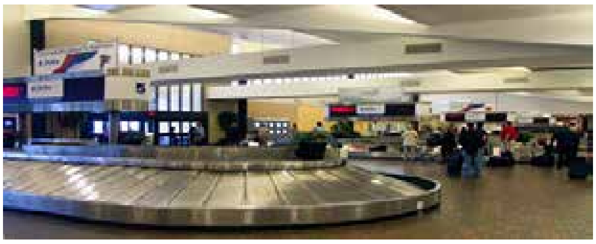
Thus in conclusion, maintenance always cannot be interpreted as a cost and should be looked more as an investment. A good looking and well maintained ship will reward the owner with better return on investment. Being proactive, applying early detection, diagnosis and preventative maintenance in all areas is the key to good maintenance of the ship.

BOLD VOYAGER

MV CORALS

Time & Motion Study of Passenger Baggage Handling System

Terminal-2 at Chhatrapati Shivaji International Airport (CISA), Mumbai



The new Terminal 2 at Mumbai's Chhatrapati Shivaji International Airport, was designed to a requirement of the Operation Management Development Agreement to deliver arrival baggage within the following parameters:-

First Bag – Delivery within 15 minute of on chocks

Last Bag – Delivery within 40 minutes of on chocks

ISSPL was tasked to study the existing processes and suggest Ideal & Realistic Capabilities.

ISSPL went about analyzing the existing processes, process owner and preparation of logistic matrix for various processes involved.

Further, the time involved in each individual processes including the route taken by baggage tractors from the aircraft parking bay to the baggage handling backroom and the road traffic conditions is established. This study is mainly focused to analyze the difficulties in the process, find bottlenecks and give a capability matrix defining the timings for all possible routing combinations considering

- Best possible time, which can be achieved in perfect/ideal conditions

- Realistically achievable time on a consistent basis with constraint, variable and allowances

As with any logistic chain this capability matrix is sensitive with a number of parties involved and their interdependencies. It is therefore very difficult to quantify absolute time. However, all possible efforts were made in order to be as accurate as possible in constructing the capability/solution matrix.

Work measurement techniques such as stop watch-time study and work sampling methods have been used to identify the critical parameters and flow of arrival baggage handling system.

Mathematical model techniques have been used to identify the root cause, using operations research we have arrived at optimal or near-optimal solutions, to ensure the OMDA requirements are met.

A detailed report including the suggestions were submitted and the same implemented, ensuring the timeliness and overall passenger satisfaction.

Fire Safety Audit of JNPT

Jawaharlal Nehru Port ("JN Port"), a Major Port, is developed and operated by the Jawaharlal Nehru Port Trust ("JNPT"), a body corporate established by the GOI under MPT Act.

JN Port provides various services and facilities pertaining to the handling of diverse types of cargo, including container cargo, dry bulk cargo, break-bulk cargo and liquid bulk cargo.

JN Port also provides other value-added port services like container freight stations and facilitation of rail handling.

In fiscal year 2012, JN Port handled 55.60% of the total container cargo traffic handled by all Major
Ports (in terms of TEUs), thus making it the leading port in India for handling of container cargo in that period. This is based on the aggregate amount of container cargo traffic handled at Major Ports (in terms of TEUs) as available on the website of Indian Ports Association (http://ipa.nic.in). JN Port is open for operations throughout the year.

Scope of Audit:
ISSPL was tasked with undertaking the fire audit at
JNPT, covering : Inside Port areas : JNPT container terminal and Shallow berth terminal, Port Operation Centre, Container yard, Fire control Station, Electrical Substations, Workshops, Hazardous bund area.

Outside Port areas: Tank farm areas, JNPT Hospital, Customs House, Port User building, JNPT owned container freight station.

Purpose
Generally fires at work happens due to following causes;

•Deliberate act or

•lack of alertness to the fire hazard

These causes can be eliminated by systematic critical identification of fire risk, evaluating them based on their impact and review of existing active and passive measures. A Fire safety audit is a structured and systematic examination of work place to identify the hazards from fire. This includes all components of systems such as management policy, awareness, training, design aspect (electrical /mechanical), layout and construction of building and maintenance procedures, personal protective standards, emergency and evacuation plan, accident records etc.

The purpose of this report is to provide a fire safety, assessment of the JNPT (port designated areas inside and outside port) to identify any current areas of deficiency and non-compliance with the deemed-to-satisfy provisions of the Applicable regulations, standards and guidelines as mentioned in part 2 (and local statutory bodies as applicable) taking into consideration the proposed future use of the premises.

Additionally, requirements for upgrading the equipment/processes to ensure Fire Safety are also to be provided, where found deficient.

IRClass consolidates its position in India and looks to Middle East and South East Asia for expansion

Sets up Advisory Committees in India, UAE and Singapore

INDIA ADVISORY COMMITTEE

SINGAPORE ADVISORY COMMITTEE

UAE ADVISORY COMMITTEE

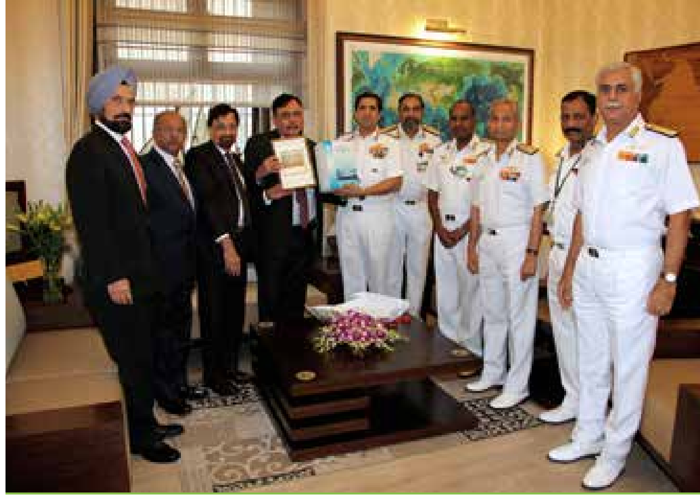
IRClass has set its sight on Middle East and South East Asia for its growth plans in the near future. It is now ready to move forward, expand its footprint and pitch its competence and credibility to globally. As a part of its ongoing program of engaging with various stakeholders in the maritime fraternity,

IRClass has set up Advisory Committees in UAE, India and Singapore. Committee members are eminent management professionals from the maritime industry in these regions.

The purpose of these Committees is to help align IRClass services in line with the requirements of various markets as well as provide guidance on adaptation of technical requirements and procedures with the regional practices or obligations.

These Committees represent a wide spectrum of the maritime fraternity which includes ship owners, shipyards, offshore, ship management companies, consultants and eminent shipping personalities.

With the help of these Committees IRClass intends to deepen its ties within the maritime clusters in UAE and South East Asia.



IDBIBANK 27001 CERTIFICATION

CHIEF OF NAVAL STAFF ADMIRAL R K DHOWAN RELEASES IRS RULES FOR NAVAL COMBATANT SHIPS

NAVRATRI CELEBRATIONS AT IRCLASS

IRCLASS AT SEATRADE OFFSHORE MARINE & WORKBOATS ABU DHABI

IRCLASS AWARDS SHRI VENKITESWARAN SCHOLARSHIPS TO LAW STUDENTS OF MUMBAI UNIVERSITY

IRCLASS
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