



SIMS R&D – History and Future

SIMS is a world leading maritime training institute with the vision:

“We aspire to be the leading maritime institute known for its excellence in training and innovations in the field of marine and allied industries of the world”

SIMS R&D department was established in September 2007 with the holistic view of providing technical solutions to the parent organization Executive Ship Management Pte. Ltd. Singapore (ESM), other maritime and allied industries, and developing and facilitating a complete learning experience in Samundra Institute of Maritime Studies (SIMS). The R&D department functions primarily in SIMS, Lonavala, amply complemented by the research facilities established in SIMS, Mumbai.

Since its inception, the R&D department has been actively involved in many faceted research & development activities. While the R&D facilities were, and remain, committed to the in-house demands of its parent organization for various technical solutions, it has not shied away from the role it is envisaged to play for the global maritime industry as a whole. Further, the R&D department has contributed handsomely towards the training effectiveness of the next generation seafarers here at SIMS, thus facilitating a sound investment in quality manpower for the future of the industry.

SIMS is now poised to fulfilling its vision to expand to a new height towards contributing to Sustainable Shipping through applied R&D.

This document gives you a brief overview of SIMS R&D’s accomplishments since its inception.



LIST OF COMPLETED R&D PROJECTS AT SIMS, LONAVLA

1. Feasibility study of wave flume (In house project)
2. Investigation of Ingression of Alumina Powder through a vent pipe (ClassNK, Japan)
3. Development of wave flume in all aspect (In house project)
4. Experimentation and analysis of damaged ship stability in the wave flume (for cadets)
5. Development of in-house towing tank facility (In house project)
6. Demonstration of resistance and powering for scaled down model (for cadets)
7. Resistance and powering test for scaled down model of mini bulk carrier (for SVS Groups, Mumbai, India)
8. Providing technical solutions to undisclosed automobile manufacturer (conducting towing tests for stability and resistance of the model in Towing tank facility)
9. Development of main engine performance analyser software (for ESM)
10. Software development of EEOI calculator and analyser –EcoGauge V1.0 (for ESM)
11. Manufacturing of Model of Stern Tube (for cadets)
12. Developing a panel for trips and alarms system (for cadets and for EP course)
13. Study on the method of tightness test of air pipe automatic closing device (For class NK, Japan)
14. Study on the cleaning-up operation for corrosive cargo residue in stainless steel cargo tanks (For class NK, Japan)
15. Software development EcoGauge V2.0 for calculating ESI (for ESM)
16. Model of Sun-Dial (for cadets)
17. Software development for 'Framo Pump performance Analysis' (for ESM)
18. Draft Marking measurement device for bulk carriers (for ESM)

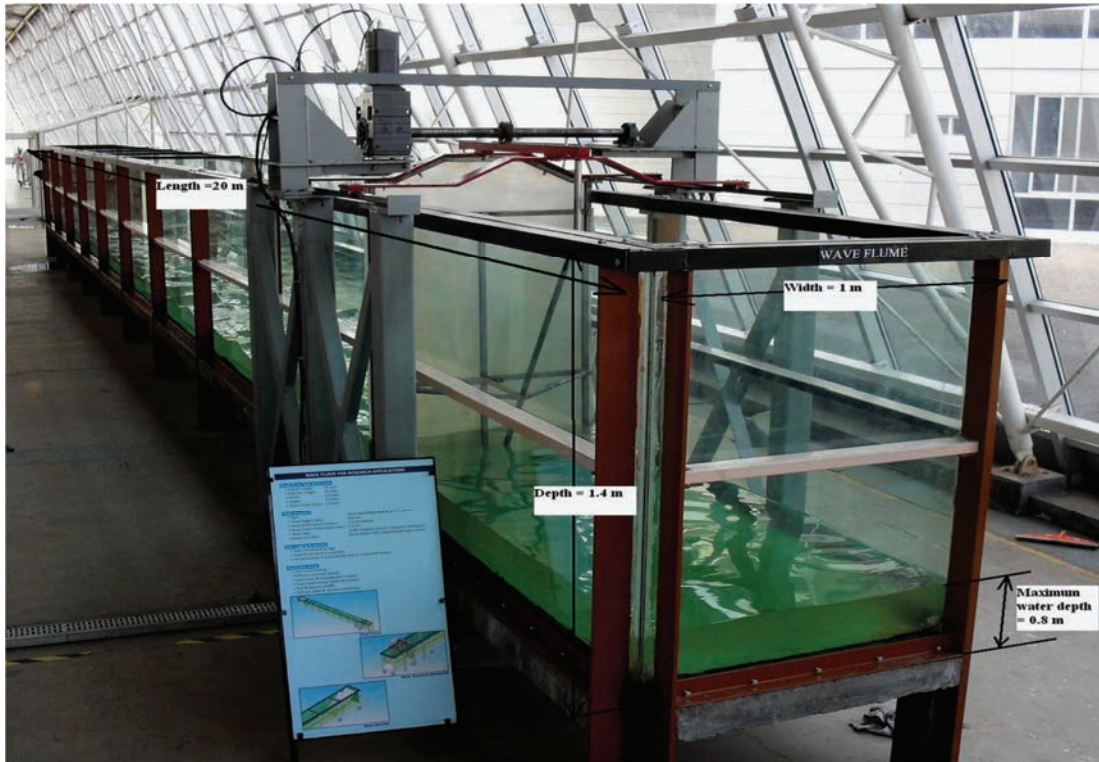
LIST OF ONGOING R&D PROJECTS AT SIMS LONAVLA:

19. Design and development of Ballast Water Treatment System (for ESM)
20. Draft Marking measurement device for tankers (for ESM)
21. Automatic filtration system for STP in SIMS campus. (In house project)



IN-HOUSE PROJECTS

1. DEVELOPMENT OF IN-HOUSE WAVE FLUME ARRANGEMENT



Wave flume, designed and built by R&D SIMS

Wave flume is an ambitious project, conceptualized and developed by SIMS R&D team at SIMS, Lonavala. Wave Flume is a closed water channel primarily used to test water-borne structures & to provide solutions to problems related to coastal engineering. The experimental set up consists of an in-house developed wave actuation system where actual sea conditions can be simulated by generating regular and irregular wave patterns. The wave maker is realized by a wetback, piston type wave maker, driven by an AC servo geared motor of 10 HP. This set up is in use for the following purposes:

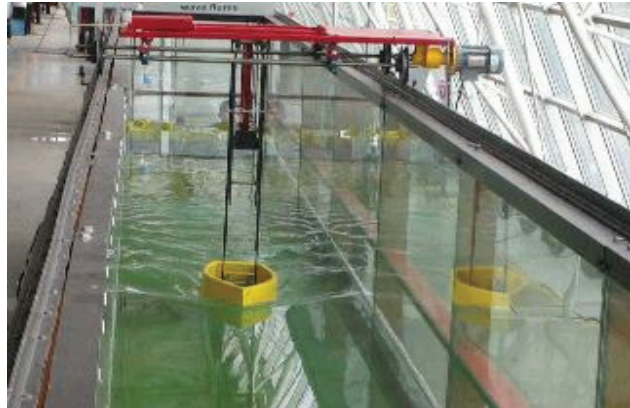
- Coastal Engineering: Break water study, Wave run up & overtopping, scour, sediment transportation.
- Marine structure: Ship model tests such as stability and sea keeping.
- Marine energy: wave energy extraction.



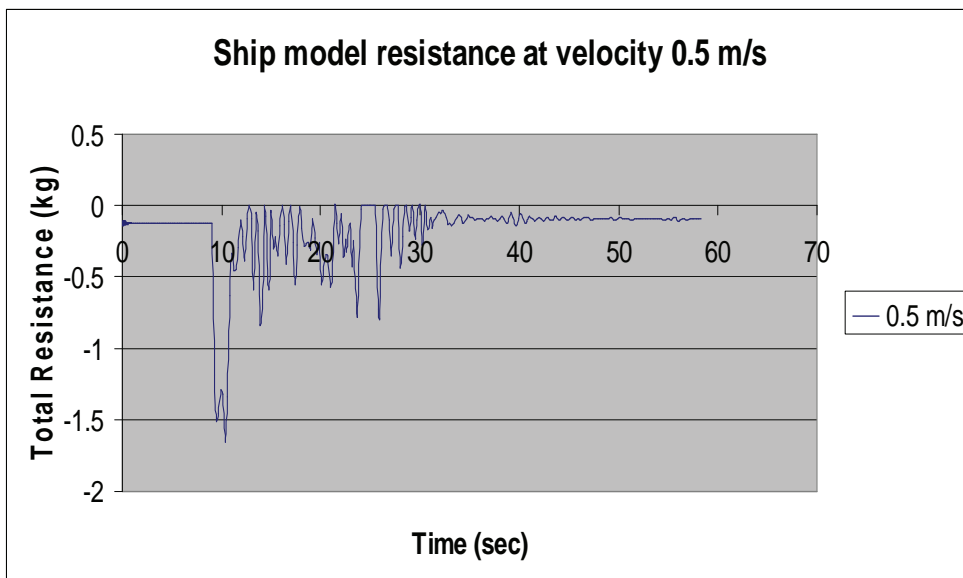
2. DEVELOPMENT OF IN-HOUSE TOWING TANK ARRANGEMENT

Capability of Wave Flume was further enhanced by incorporation of a Towing Facility with the ability to measure,

- Ship resistance (Total drag) of ship models
- Stability of a moving vessel
- Heave, Roll and Pitch
- Sea-keeping behaviour
- Hydrodynamic forces on submerged bodies, foils etc.



The system incorporated a programmable speed control drive, Programmable stop, Electrical start & stop at both ends, Electric and Mechanical automatic Overrun stops at both ends etc. Further a wireless data acquisition system is implemented for measurement of force, heave, and roll & pitch angles.

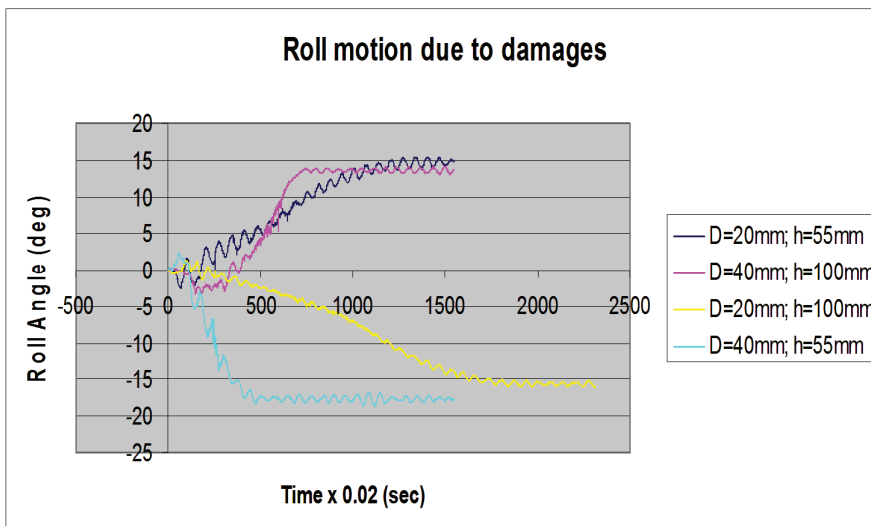
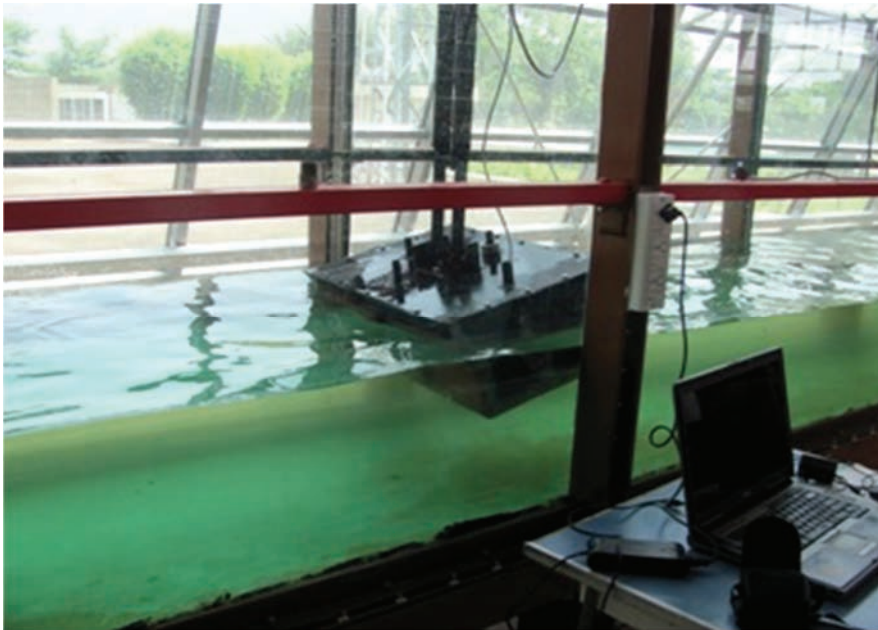


Wireless Data Acquisition system for force measurement



3. EXPERIMENTATION & ANALYSIS OF DAMAGED SHIP STABILITY IN THE WAVE FLUME

Experimental set up for the analysis of damaged ship stability in the wave flume was developed for finding out the rolling behaviour of a damaged ship. These findings are used to establish guidelines for immediate actions to counter the risk of sinking damaged ship.





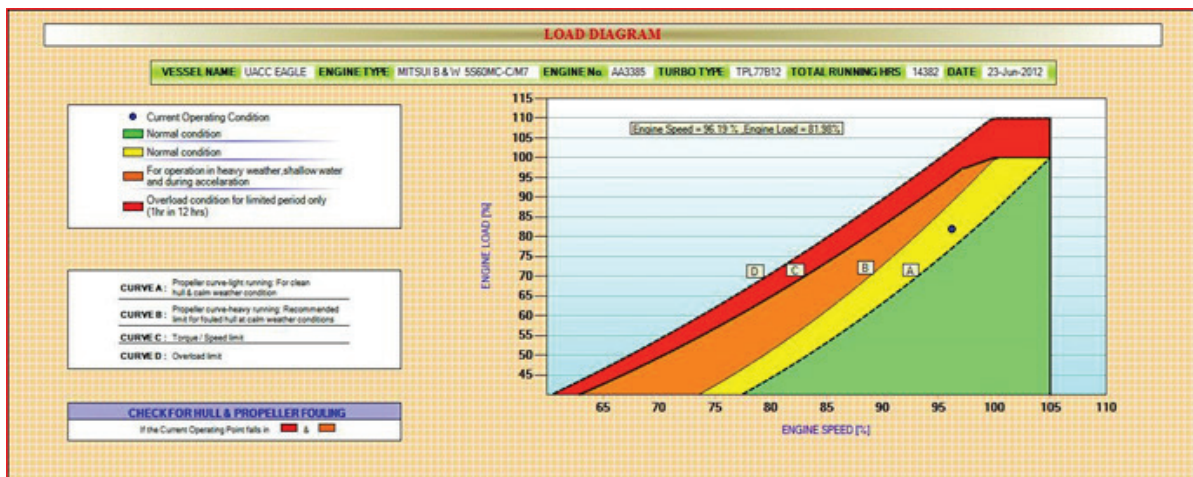
PROJECTS FOR EXECUTIVE SHIP MANAGEMENT (ESM)

1. DEVELOPMENT OF MAIN ENGINE PERFORMANCE ANALYSER SOFTWARE

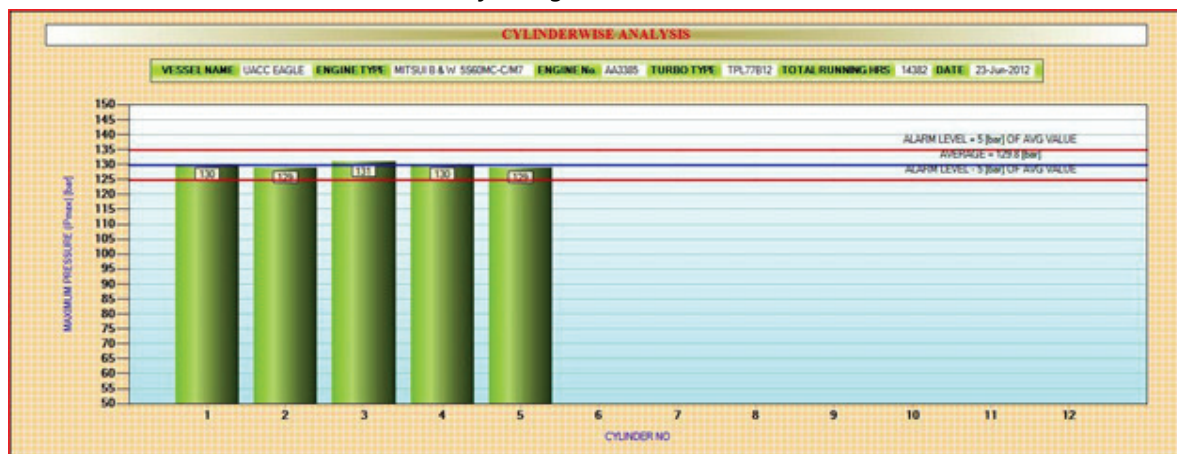
Main Engine Performance Analyser is an on board software developed for entire ESM fleet primarily designed to monitor the performance of Main Engine and auxiliaries. It is also well equipped to predict hull and propeller fouling. The reference of shop trial as well as sea trial data have been considered as standard database for individual vessels.

The main Engine Performance Analyser incorporates the following salient features:

- Analysis of Engine and Auxiliaries
- Display in numerical/graphical form
- Comparison with Sea trial data
- Trends over a period of time
- Diagnostic hints for abnormal performance
- Cylinder-wise analysis
- Identification of hull fouling



Hull fouling indicator screen



Cylinder-wise analysis snapshot

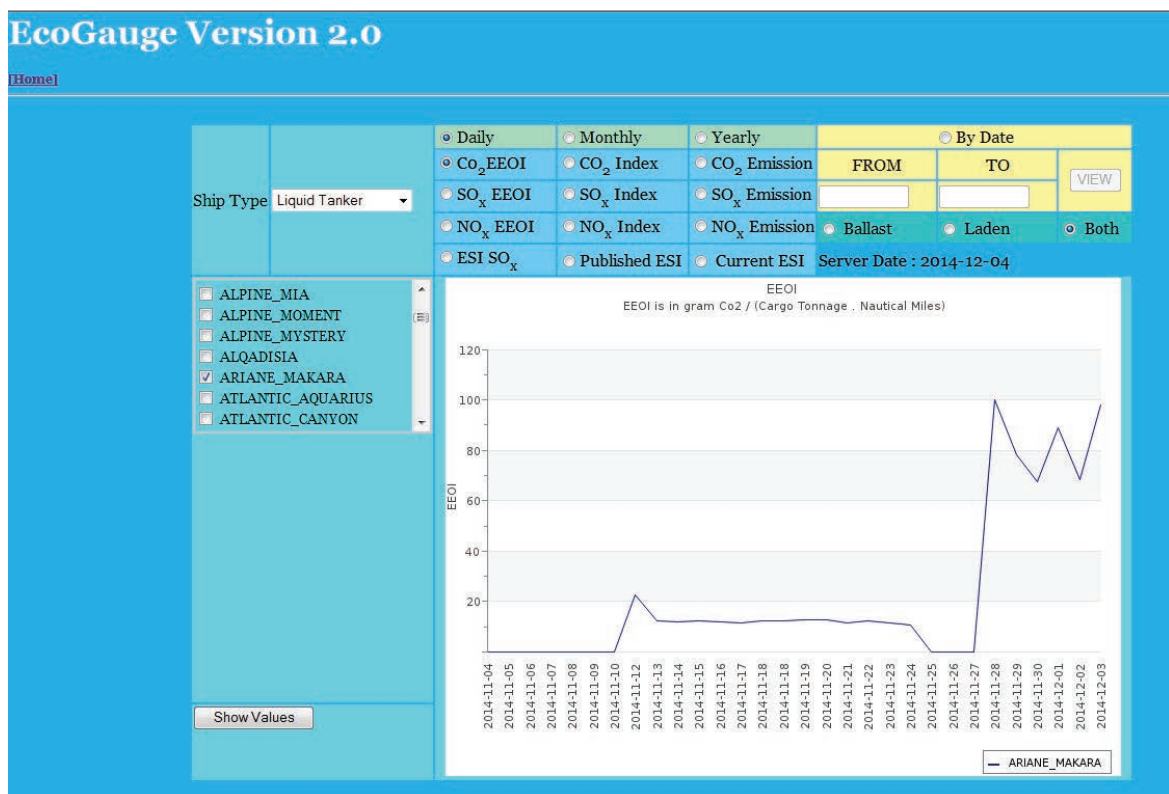


2. DEVELOPMENT OF ECOGAUGE SOFTWARE

The ECOGAUGE software developed by the SIMS R&D team is an integration of existing DNR (Daily Noon Report) and the EEOI calculator. EEOI (Energy Efficiency Operational Indicator) is a measuring tool to measure the effectiveness of SEEMP (Ship Efficiency Management Plan) developed by ESM and made mandatory from 1st of January 2013 as per IMO regulations.

The web-based module calculates EEOI, CO₂ index and CO₂ emission of individual vessels on daily, monthly and yearly basis and analyses the results. Graphical representations of the same make the software user friendly.

ECOGAUGE V2.0 is an upgraded version which will calculate the SO_x, NO_x and ultimately the ESI (Environmental Ship Index) defined by WPCI (World Port Climate Initiatives). In this version, operational features such as setting target for individual vessels have been incorporated. Currently the software is installed in nine test vessels with excellent feedback.



Output window of EcoGauge software



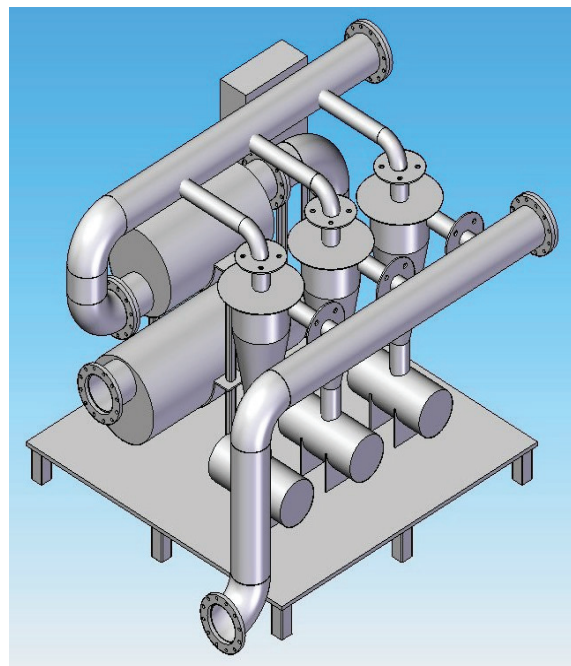
3. BALLAST WATER TREATMENT SYSTEM (BWTS)

ESM R&D is well on course to complete an ambitious project of developing a low cost, maintenance free and compact BWTS for the benefit of maritime industry as a whole. Technical feasibility study has been completed successfully on BWTS pilot plant as IMO D-2 regulations. The R&D has already designed and developed the pilot plant of 20m³/hr flow rate. Development of BWTS plant for treating ballast water at flow rate of 300m³/hr is nearing completion. The plant has been designed taking in to consideration not only the IMO regulations but also the most stringent California Code of Regulation, USA.

BWTS is designed on the principles of hydro-cyclone filtration, ultrasonic filtration system and ultraviolet disinfection plant. Details may be disclosed to potential customers, manufacturers and distributors upon signing of non-disclosure agreement.



BWTS-pilot project



3D model of BWTS-300m³/hr plant

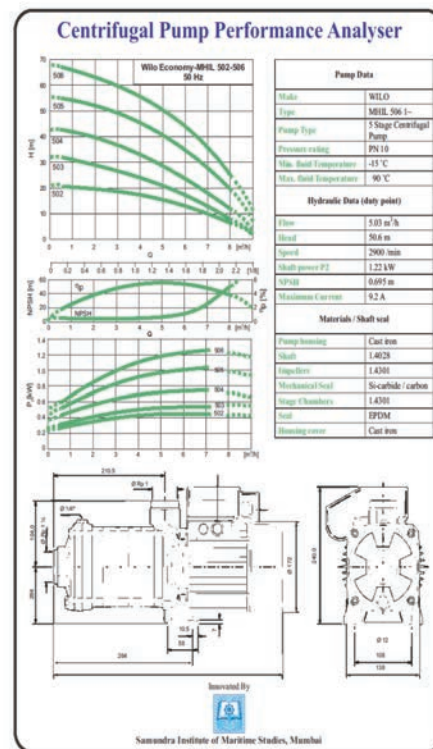


4. CENTRIFUGAL PUMP ANALYSER

Centrifugal pumps are widely used in shipping and other industries. In practice, optimum operation of pumps has always been a challenge due to complexities involved in the interpretation of pumps data and at times due to insufficient knowledge of the operator. This analyser has been developed to provide user-friendly information for the pumps in operation so that the operator can optimize the pump performance and use this analyser as diagnostic tool in case of troubles.



Experimental set up



Output Window

This product has many features that the user will find beneficial. The information displayed will assist in obtaining energy efficient operation of the pumps. This Pump Performance analyser has been endorsed by ClassNK and a patent has been filed at Indian patenting office. This product can be used for any type of centrifugal pump working at constant rpm in clean and low viscosity fluids e.g. fresh water, seawater, LPG, LNG, petroleum products etc.

Features:

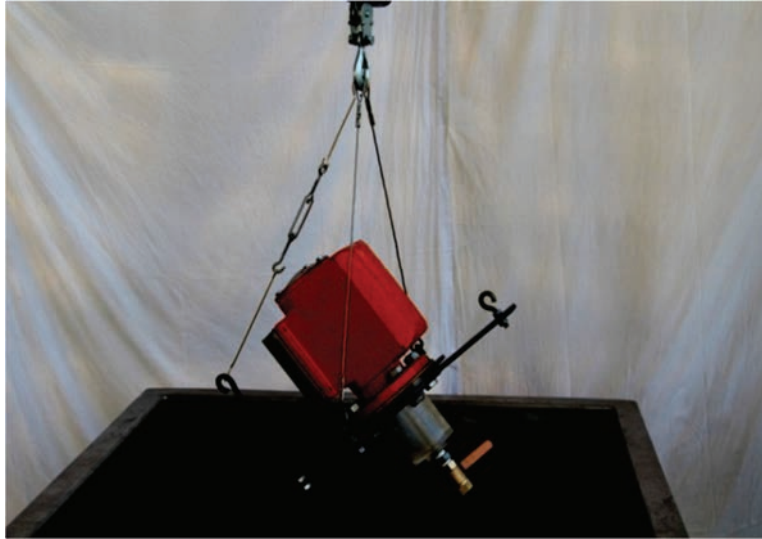
- Display of the flow rate
- Raise cavitation alarm
- Compare drawn power with ideal power and raise alarm in case of deviation
- Diagnosis of pump problems without dismantling
- Alert operator in the event of operating away from the best efficiency point
- Plot the shore characteristic curve



PROJECTS FOR EXTERNAL MARITIME AND ALLIED INDUSTRIES

1. THE METHOD OF TIGHTNESS TEST OF AIR PIPE AUTOMATIC CLOSING DEVICE

Automatic Closing Devices (ACDs) are fitted on the weather decks of ships. These are expected to be reasonably leak proof in order that seawater ingress does not take place at all or would be minimum during wave action when the sea is rough. As desired by Class NK selected Korean and Chinese makes of ACDs have been tested as per existing IACS UR P3 guidelines to find whether these ACDs are meeting the unified regulations.



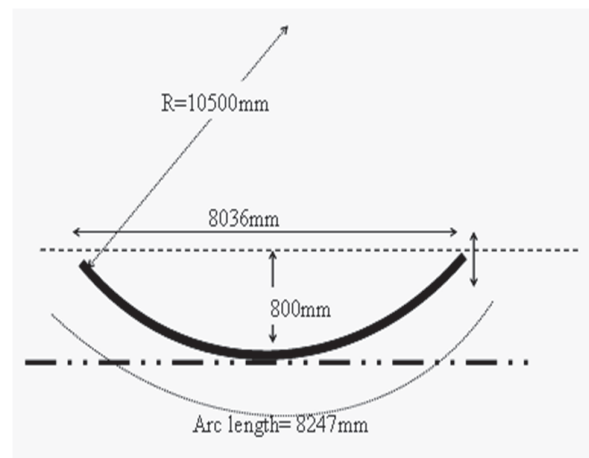
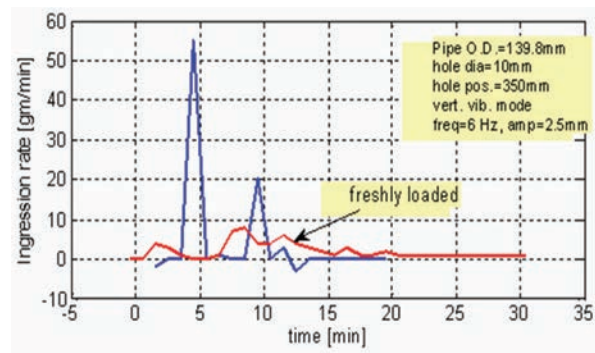
During experimentation

It has been realized while conducting tests that test procedures in IACS UR P3 are somewhat brief and more in the form of advisory/indicative in nature. ESM R&D has come out with procedure/guidelines, which are more convenient and well-directed methodology for leak testing of ACDs. Class-NK conveyed that the recommendations suggested by ESM R&D in the existing ACD tightness test would be incorporated in the next revision of IACS P-3 regulation



2. INVESTIGATION OF INGRESSION OF ALUMINA POWDER THROUGH VENT PIPE

Class NK experienced engine damage in vessels under Class NK and carrying Alumina powder as cargo. SIMS R&D conducted experiments to investigate the ingress of alumina cargo through the perforations on the surface of the vent tube considering the ship's motion and vibration of the vent pipe. Experiments were simulated based on the actual relative motion between vent tube and alumina cargo. By simulating various conditions of relative motion, trend of ingress of alumina has been established.



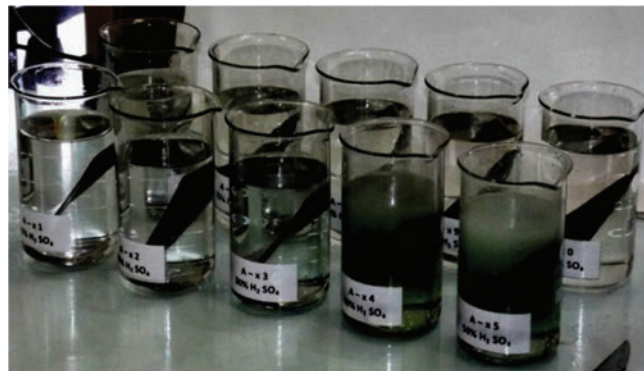
The experimental set up has the capability to establish the relation between the rate of ingress and various parameters such as,

- Rolling behaviour of the vessel
- Various modes of frequency of vibrations to air vent pipe
- Different loading of Alumina cargo
- Various orientations and positioning of hole in the pipe etc.



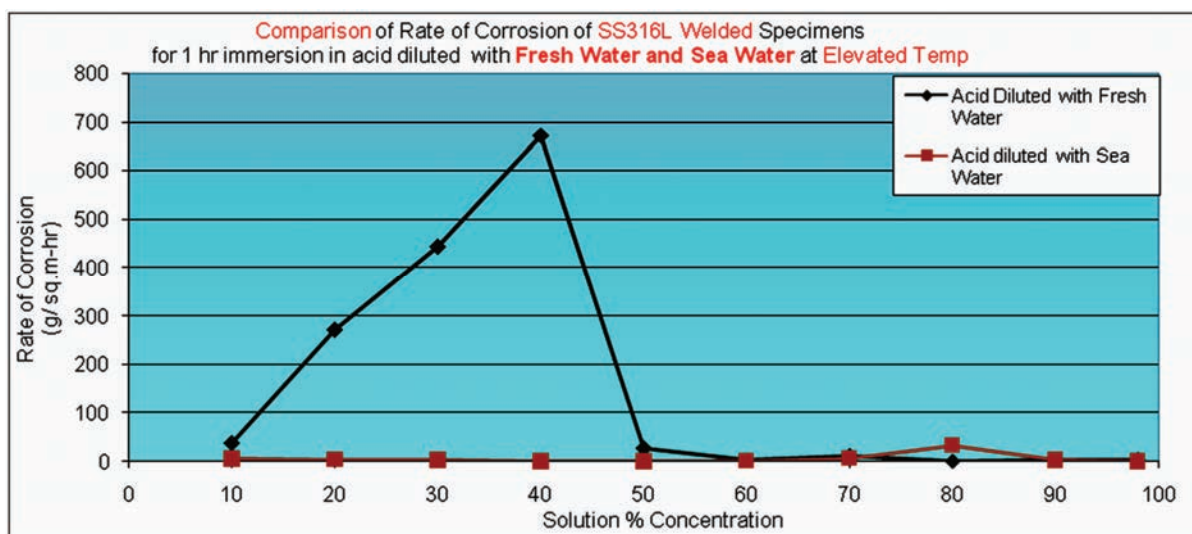
3. STUDY ON THE CLEANING UP OPERATION FOR CORROSIVE CARGO RESIDUE IN STAINLESS STEEL CARGO TANKS

Different ship operators/owners follow different tank washing procedures, as evolved by them over years of experience, all in an effort to clean the tank quickly and satisfactorily. It is to be noted that cleaning and rinsing of the tanks need large quantities of fresh water, which is costly and is in limited supply on board the vessel. The project work comprised of a study to compare different cleaning procedures as followed by different ship operators/owners as well as methods suggested in certain guidebooks.



Laboratory experimental set up

The project work also includes conducting such set of experiments by which different corrosion levels are to be created with various dilution ratios of sulphuric acid with respect to time. All these efforts helped to establish procedure/guidelines for convenient and speedy cleaning of the tanks while preventing corrosion. The efforts and results of both the projects were highly appreciated by Class-NK.

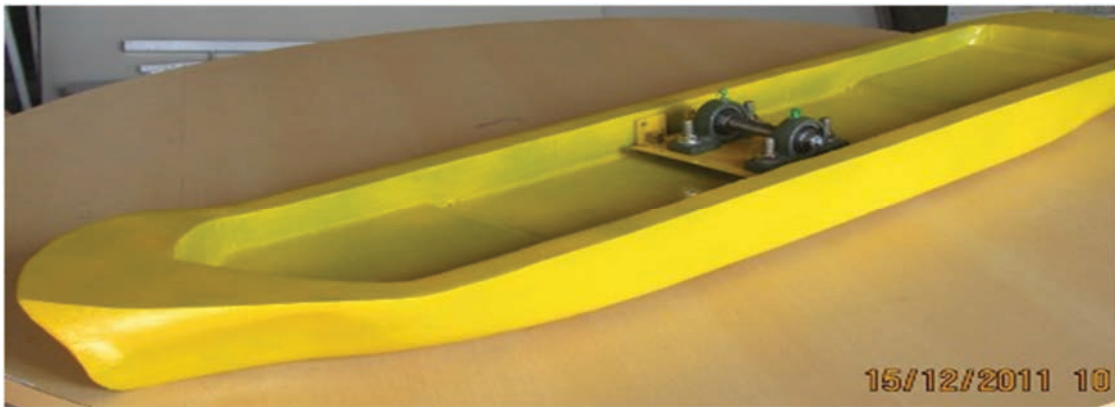


Rate of corrosion

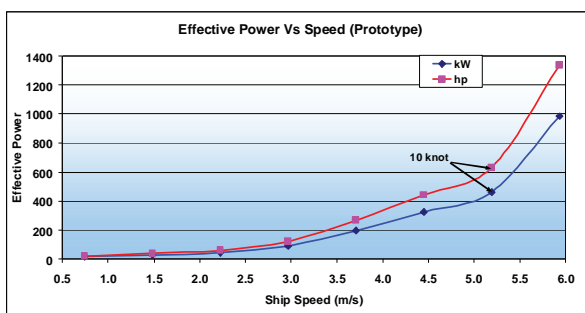


4. "TOWING TEST OF MBC-3000 DWT FOR RESISTANCE AND POWERING PREDICTION" FOR SHIP OWNING COMPANY, INDIA

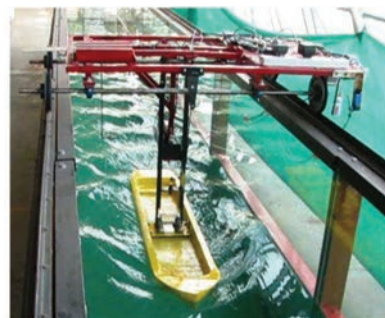
- Designed Hull shape from GA plan provided.
- In-house manufacturing of scaled down model.
- "Total resistance and propulsion power calculation" experiment performed in towing tank.
- Computational results validated with experimental result.
- Suggested to reduce the Installed Engine Power to 1600hp from 2000hp - initially envisaged by the client.



Model manufactured in-house



Effective power experimental values



Model towed in towing tank



5. TOWING TESTS FOR PREDICTION OF RESISTANCE AND STABILITY TEST ON A SCALED DOWN MODEL IN WAVE FLUME-TOWING TANK FOR AN UNDISCLOSED AUTOMOTIVE COMPANY

SIMS R&D provided in-house wave flume and towing tank facility to an undisclosed automotive company, along with the consultancy services for predicting resistance power and stability of model of a new amphibian vessel designed by them. The project was completed in June 2012.