INSA Tech

Performance Monitoring System

Get total insight into your ship's performance with real-time performance monitoring

MARINE

www.insatechmarine.com

A valid baseline for performance optimisation

Insatech – taking the guesswork out of it!

Get an overview of your vessel performance and improve it
Don't act on guesses – act on knowledge

Want to stay competitive in a tough market? “Pick the low hanging fruits” and increase your competitive advantage by improving performance and efficiency on your vessels.

Introduction

Continuously increasing the operational efficiency in shipping is a condition for staying in business. Increasing crew awareness and knowledge of accurate fuel consumption is key to get most out of improvement projects and new procedures. Data driven decision making in real-time is the cornerstone of securing the added profit when optimising the operation.

Comply with SEEMP and ensure continuous improvements

Under the proposed amendments to MARPOL Annex VI, Regulation 22, all ships must have an International Energy Efficiency Certificate (IEEC), which requires the presence of a Ship Energy Efficiency Management Plan (SEEMP) on board. The SEEMP is a ship specific plan developed by the ship owner, operator or charterer; the objective is to improve the energy efficiency of a ships operation. Using our Performance Monitoring System you can continuously log performance data, establish a valid baseline and have an easy-to-use management tool that minimizes the administrative burden on board related to the SEEMP. The system helps you evaluate your performance as well as providing you with input to setting new SEEMP goals. This enables you to track the benefits of each of your initiatives.

We secure your measurement accuracy and operational efficiency – with more than 400 installations world wide.

A valid baseline is key to performance optimisation and decision making

Performance management systems will be an integrated part of (most) ship systems within the foreseeable future, because the decision-making process is made easier and more tangible when based on real-time ship data, as opposed to manually gathered data (noon-reports) and hard-to-transfer experiences of chiefs on board.

Because no performance system is better than the data it is based on, our system uses data gathered from different consumers. The system provides a valuable and efficient management tool for crew on board and shore. It provides the operator with real-time indications of the vessel's immediate fuel efficiency and consumption in an environment with ever-changing dynamics. When the crew understands how internal and external factors affects the vessel's fuel consumption the most cost-effective optimisation projects can be implemented and your competitive advantage maximized, as the crew has a tool to accomplish their primary task – to optimize the efficiency of the ship and thereby the added profit. The crew now have the necessary information to take action, when sailing conditions or routes change.

The Performance Monitoring System is a further development of the Fuel Consumption System, which consists of mainly flow meter data. The additional data input for the performance system are, torque meter, speed log and power meters from generators, further the system is able to draw and log existing NMEA signals, e.g. speed log, position, wind, gyro and underwater clearance.

How it works

The Performance Monitoring System allows deep insight into your vessel's performance. Use it to increase crew awareness, reduce consumption, trending, maintenance planning, etc. It works by gathering consumer signals and displaying real-time data on the bridge, in the engine control room or headquarters, for your organisation's benefit.

Direct measurement of fuel efficiency
By installing one or more mass flow meters, depending on engine supply line layout and desired insight, fuel consumption can be monitored closely in real-time. The main principle is to measure the flow of fuel before and after the engine and/or generators. When you combine the consumption data with measurements of actual speed and position (based on speed log and GPS signals) you are able to directly measure the fuel efficiency. If you require more detailed readings, additional flow meters can be installed. Combine our system with on board data from a propeller shaft torque meter, speed log, motion sensor and power meters on generators, and get for instance KPI's (Key Performance Indicators) for engine and hull performance calculated and visualized.

- Fuel Consumption [ton/hour]
- Specific Fuel Oil Consumption (SFOC) [g/kWh]
- Slip [%]
- Fuel Oil per Nautical Mile [kg/Nm]
- Speed [Knots]
- Shaft Power [kW]
- Shaft Rotation [rpm]
- Torque [kN]
- Weather Influences

Easy access to measured data
The measurements from the Performance Monitoring System will be sent through Modbus signals to a collecting and processing cabinet, where the performance data will be calculated, logged and displayed on a touch screen.

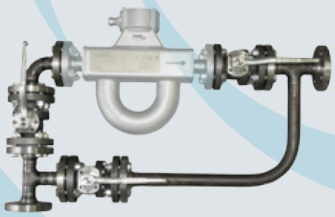
Getting the data to headquarter requires the data link option. It consists of two databases: One on board the ship and one in headquarters. Data will be sent at the frequency chosen between the two databases. If the ship does not have an internet connection for a time, data will merely be stored and sent home once the connection is stable.

Make the data work for you
Once the data is acquired and displayed – use them for instance to:
- Optimise operational efficiency by testing your trim tool
- Implement and maintain your SEEMP
- Create KPI's for each voyage
- Evaluate improvement projects before fleet roll out
- Monitor the ship's consumption trend over time to improve your maintenance planning

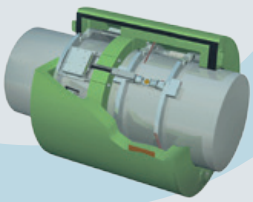
And most importantly let the crew get data insight to increase crew awareness as well as improving knowledge of operational performance.

Below is shown some of the main components of the performance system. All instrument signals are collected centrally in the control cabinet, where data processing is carried out. Most data can be collected, and we are able to use already installed instruments (to the extent it is possible).

Coriolis mass flow meter

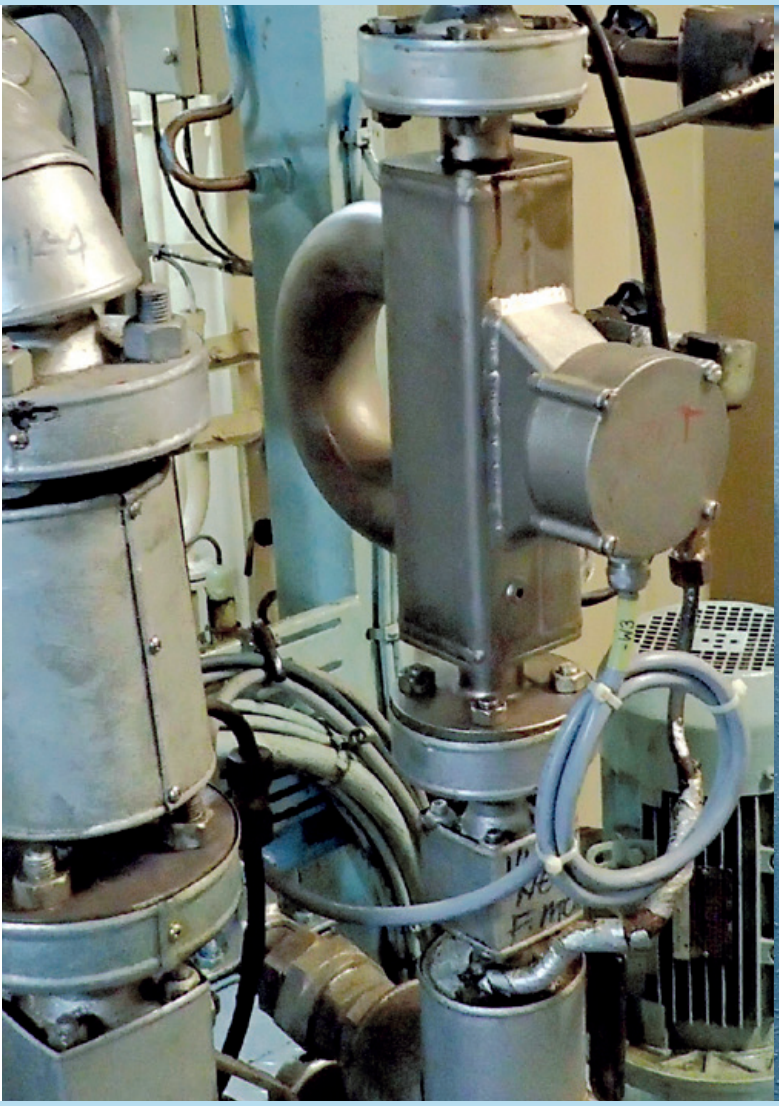


Bypass



Torque & thrust meter

Power & energy meter



Wind sensor anemometer

Control cabinet

Accelerometer motion detector

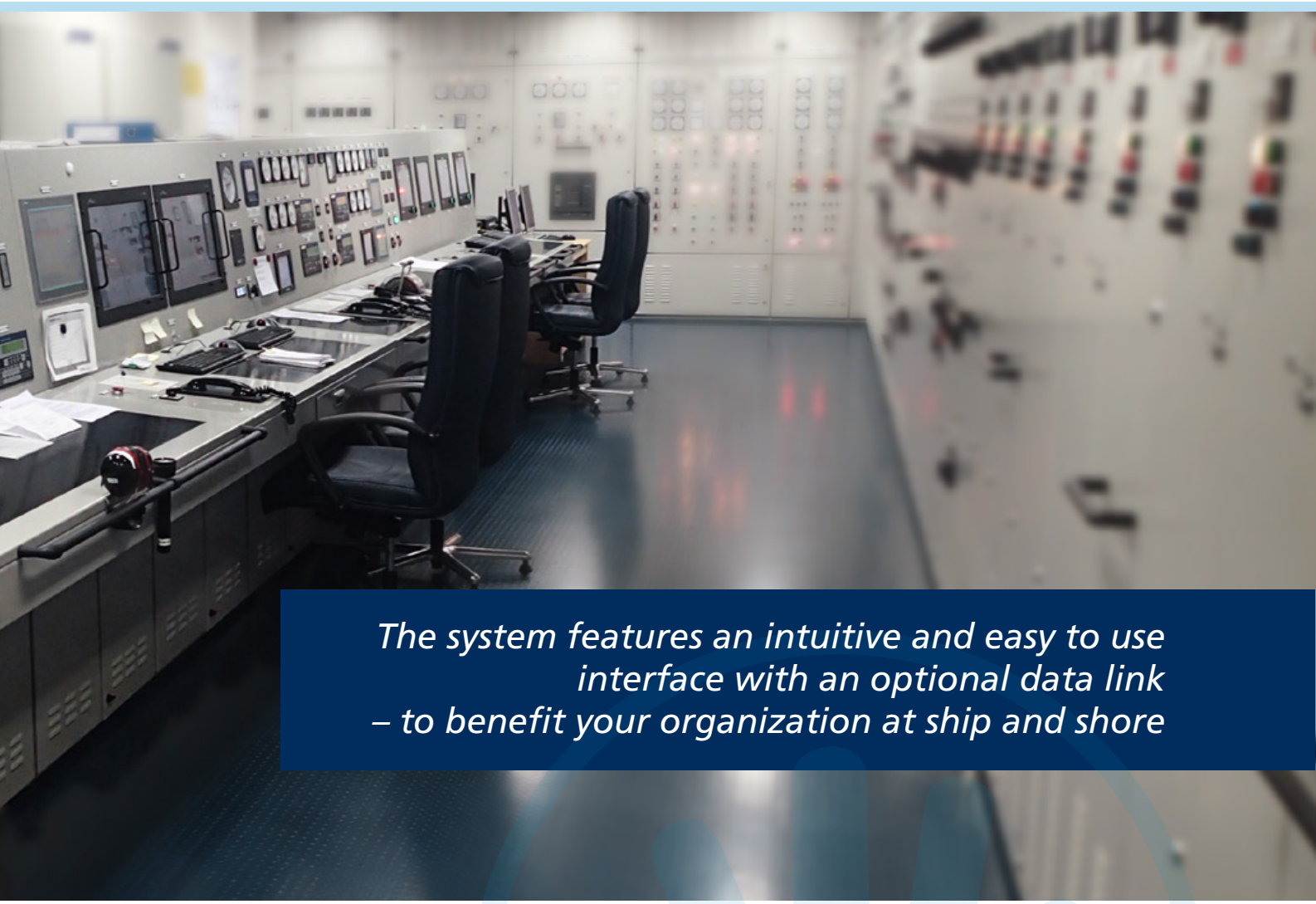
Display panel

Operation

The Performance Monitoring System is a fully automated system which requires little attention after set up – no active operation during normal conditions. The operator panel displaying the measured data can be customized to show your desired data.

Spending less time operating equipment or reading manuals, means more time for improving the current operational status of the vessel. Therefore the Performance Monitoring System draws all the signals from instruments to a central processing station, the control cabinet. Here the values are used for calculations indicating the vessel's real-time performance. They are presented as KPI's such as Specific Fuel Oil Consumption (SFOC) and kg of fuel per nautical mile (kg/Nm).

Immediate processing and presentation of KPI's, rather than relying on manual readings and noon-reports, provides several advantages. Noon reports are a commonly accepted tool for headquarters to analyse data over longer periods of time, but gives the crew on board little to act upon. The immediate gain, as opposed to manual check and reading of meters, frees up the crew's time to do more pressing work. Automation also eliminates the margin of error in readings, as data is collected directly from the instruments.



The system features an intuitive and easy to use interface with an optional data link – to benefit your organization at ship and shore

Manually collected data tends to be prone to delays and varying factors in the calculations on which the vessel is evaluated. The noon report based monitoring process can be very inaccurate due to the time lag from when the instruments are read to the report is sent, as well as accuracy of the readings.

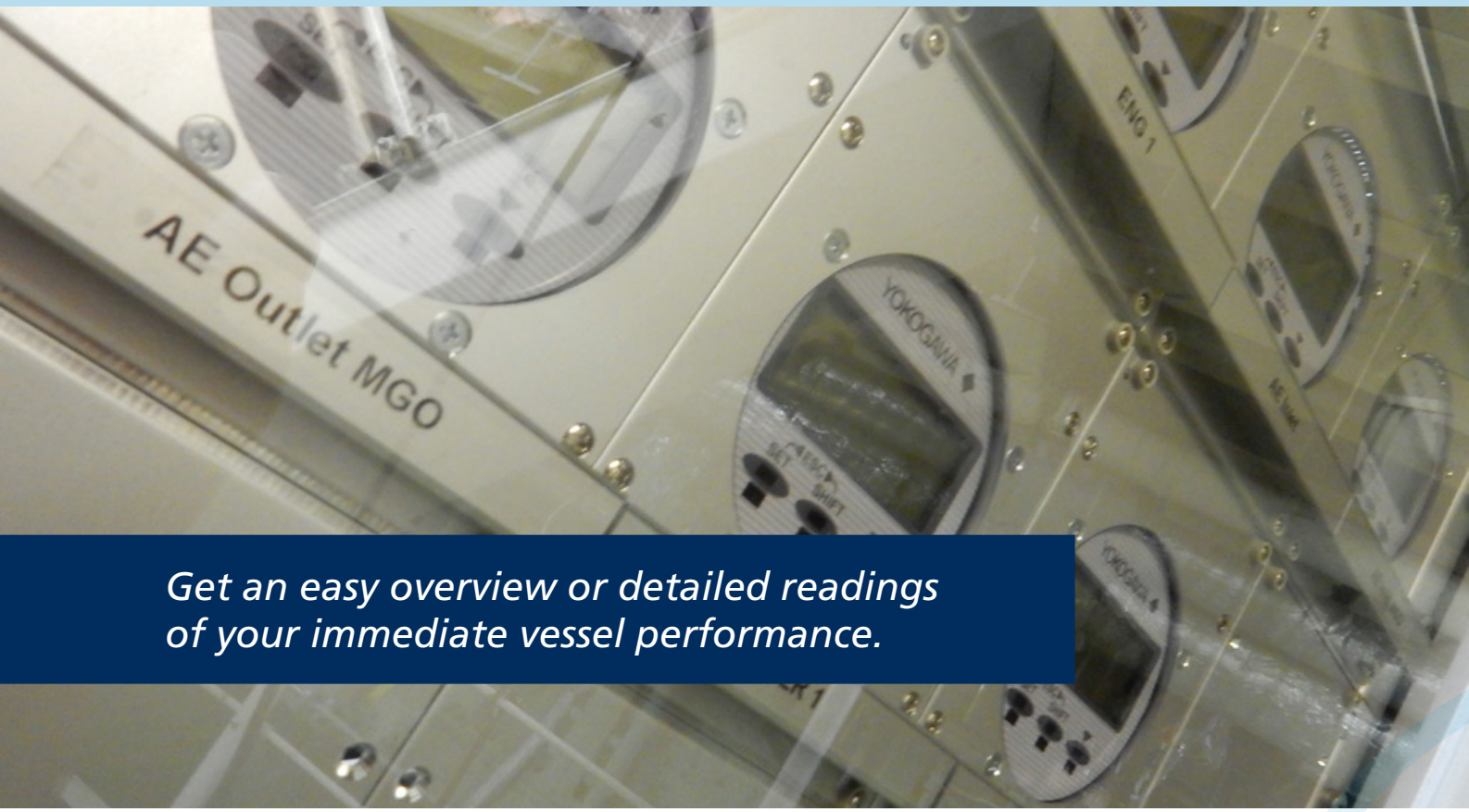
Determine the influence of weather
With the motion sensor installed it is possible to determine the influences of weather on the ship. This is done by determining the state of weather (waves and wind) for a limited period of time after the installation and manually inputting it into the system. Afterwards it will be possible to use the in putted data to calculate the ship's performance under different weather conditions.

Decision making tool on board
When the crew has the information available at all times, it allows them to view the immediate consequences of any actions taken and how it affects the vessel's overall performance.

Using the KPI's as main indicators of the vessel's performance means that any change in conditions or operation affecting performance, will result in KPI changes.

As all readings are available centrally, running conditions of monitored vessel components can be checked right away. Troubleshooting as well as corrective and optimising actions can be identified a lot easier compared to manual visual inspections, and potentially lead to savings in fuel and crew resources.

Operation of interface



Get an easy overview or detailed readings of your immediate vessel performance.

Vessel performance

The operator interface is designed to be easy to use. The main screen will immediately show the relevant information regarding current vessel performance such as consumption of the main engine, consumption pr. nautical mile, propeller slip etc. The user will also be able to see the development over time via the chart.

Engine performance

The *Engine performance* screen shows information about the specific fuel oil consumption of the main engines as well as shaft power in kW and %. The data is logged and shown in the chart below in order to give a historical insight into the engine performance.

Torque meter

In *Details* you can see an overview of the torque meter data such as power in kW, total power in MWh, RPM, total revolutions as well as torque in kNm. All the data are plotted in the chart in order to show the development over time.

Detailed fuel overview

In *Details* you will also find the *Detailed fuel overview* which shows the daily, actual and total consumption of each consumer, for example Main Engine(s), Auxiliary Engines and Boilers. Furthermore the view also shows the raw values from the flow meters (if available) such as mass flow, volume flow, density and temperature for both inlet and outlet.

Navigation data

The navigational data includes GPS coordinates, true course and speed, wind direction and wind speed, true heading and rate of turn, under keel clearance, rudder position and movement as well as draft signals.

Service parameters

The *Service parameters* displays raw data for each flow meter related to consumers. It shows the main menu data and provides the possibility for a manual totalizer. From here the alarm status screens are set up.

Performance Monitoring in Details

The Performance Monitoring System is able to collect and store data from various instruments. You can choose to collect all your data or just some of it, depending on your preferences or requirements. Some of the data might already be available like GPS or Wind, and some may be purchased with the system like consumption, torque and thrust etc.

Data collected by the system

Bridge

GPS
Position and Speed Over Ground (SOG)

Anemometer
Wind speed and direction, Relative wind speed and direction

Speed Log
Speed Through Water (STW)

Gyro
True Heading

Panel
Shows all the data both collected and calculated. Can be installed in engine room, engine control room and bridge.

Draft
Draft signals

Echo Sounder
Depth and under Keel Clearance

Rudder
Movement and angle

Propeller
Pitch

Engine Control Room

Ethernet
In order to send data to shore the system needs access to the internet.

Power Meter
Power output data from the auxiliary engines, kW, current and cos phi

Motion Sensor
Measures weather influences

Engine Room

Torque and Thrust
Torque or Torque and Thrust measurements, as well as RPM and power

Flow Meter
Consumption (Main Engines, Auxiliary Engines and Boilers etc.)

Cabinet
The cabinet functions as a central processing station which takes in signals as well as save them to the internal database

On board

3. Act

Performance Management System

- Same as Performance Monitoring System
  PLUS Management tool
  PLUS Data based predictions / help

2. Learn

This is the system featured in this brochure.

Performance Monitoring System

- Same as Fuel Consumption System
  PLUS Signals for Wind, Depth, Torque, Thrust, Draft, Rudder, Propeller, Motion Sensor and more...
  PLUS Databases and Data Link

1. Measure

Fuel Consumption System

- Real-time fuel measurement
- Data saved locally on memory card
- Optional database and Data Link

On board computer with database containing ship data.

Data Link

On shore

4. Manage

Fleet Viewer

- Access all your data on shore
- Help your captains optimize their sailing

On shore database with data from entire fleet connected to the system.

Our modular performance concept

Build your performance systems according to your company's needs – upgrade gradually.

1. Fuel Consumption System

The entry model to the performance concept. Start with basic measuring and get knowledge of your fuel consumption.

2. Performance Monitoring System

Get more sophisticated insight into your vessel performance by adding bridge and engine room data to the system.

3. Performance Management System

Ease management decision making on board by getting performance predictions based on current data, weather and next voyage.

4. Fleet Viewer

Get the complete overview of your fleet's performance and consumption, use it to optimize in large scale.

Data Link

The database on board sends data to shore. In case of no connection, the accumulated data will be sent when online.

Installation setup

As different owners, charters and operators have different requirements and needs, Insatech Marine's Performance Monitoring System is manufactured in just as many variations; according to the needed and requested properties. The setup is largely dependent on the level of insight you want.

Coriolis flow meter DN25

Flow	MGO	HFO
Circulated Flow Min.	0,275 m³/h	0,21 m³/h
Circulated Flow Max.	2,750 m³/h	2,10 m³/h
Consumption Min.	0,092 m³/h	0,07 m³/h
Consumption Max.	0,920 m³/h	0,70 m³/h

Coriolis flow meter DN40

Flow	MGO	HFO
Circulated Flow Min.	1,02 m³/h	0,820 m³/h
Circulated Flow Max.	10,20 m³/h	8,20 m³/h
Consumption Min.	0,34 m³/h	0,273 m³/h
Consumption Max.	3,40 m³/h	2,730 m³/h

Coriolis flow meter DN50

Flow	MGO	HFO
Circulated Flow Min.	3,0 m³/h	2,73 m³/h
Circulated Flow Max.	30,0 m³/h	27,30 m³/h
Consumption Min.	1,0 m³/h	0,91 m³/h
Consumption Max.	10,0 m³/h	9,10 m³/h

1-meter setup
The simplest way of measuring fuel consumption is by installing a single flow meter, which measures the fuel transferred from the day tank to the mix tank. The level of fuel in the mix tank is typically maintained by level sensors, and therefore the flow to the mix tank is equal to what is consumed.

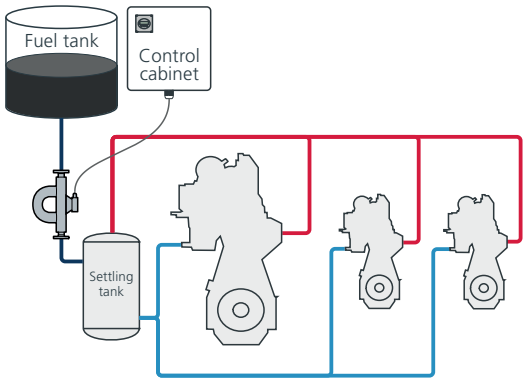
3-meter setup
If a more detailed monitoring is desired, then a 3-meter setup can be introduced. With the 3-meter system, the total fuel consumption is monitored by flow from day tank to mix tank. A set of flow meters are installed on the common auxiliary fuel supply line and return line, will provide the total consumption measurement of the auxiliary engines. By subtraction, the main engine fuel consumption can be calculated. By splitting the main engine and the auxiliary engines, the crew on board as well as on shore has a much more detailed overview of how the consumers perform.

Full consumer insight
To gain full understanding of the fuel consumption, you measure on each consumer inlet and outlet. This will provide a complete insight into each consumer's fuel consumption, and any deviations from performance expectations or norms, can easily be pinpointed. This can potentially aid in preventative maintenance planning and better utilisation of auxiliary engines.

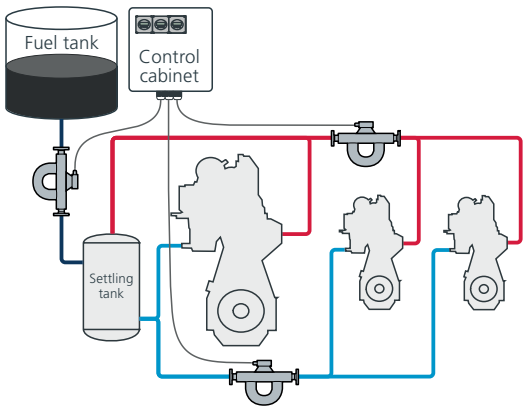
Your own setup
Insatech Marine is not restricted regarding setups. Therefore, if you have your own specific setup that you would prefer, we can accommodate a corresponding setup or install the system using existing flow meters. In such cases we will typically include an engine pre-inspection to ensure technical feasibility of the setup.

◀ **The flow ranges are calculated under the following conditions:**
HFO: 985 kg/m³, 12 Cst, 1 bar pressure loss at circulated max flow.
MGO: 895 kg/m³, 8 Cst, 1 bar pressure loss at circulated max flow.

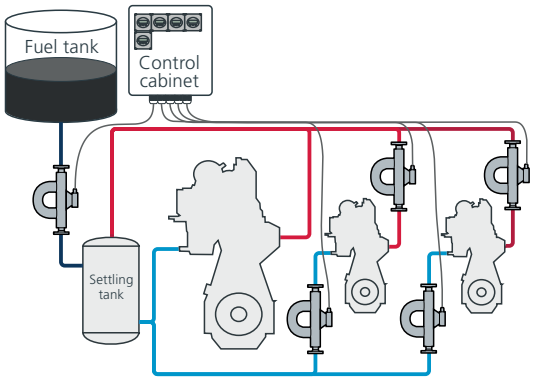
1-meter setup



3-meter setup



Full measurement setup



Main supply line
Feed line
Return line
Flow meter

Installation

The system installation does not inflict you with unnecessary costs, it will not alter your schedule or put your vessel out of service. Our experienced technicians install and commission the system while you are in service, whether at sea, in port or dry dock. We are ready to move out at your preferred destination and time.

Do it yourself – or let us install
The system is programmed, calibrated and has been initially setup by our technician to minimize installation time on board. The crew on board will in some cases be able to install the equipment under the guidance of Insatech Marine's technicians to ensure correct placement and electrical installation. This minimizes costs and required man-hours, while ensuring maximum benefit of the system during use. However, we are also able to provide installation with commissioning, tests and training of the crew. We complete the installation at sea, in port or dry dock at your preference.

Turnkey solutions and installations;
at sea, in port or dry dock at your preference.

Service maintenance and support

If you require a service agreement as part of the system our skilled technicians are ready to service your vessel at all times. While the system requires minimal maintenance an occasional calibration of equipment is recommended.

Service and support is readily accessible
To constantly get highly accurate measurements, your marine equipment must function optimally. This means it must be calibrated according to its purpose and therefore we provide service options, should the need arise. This is why Insatech Marine has our own technicians ready for service on board your vessel at all times, whether it is a planned service visit or a pressing and acute matter that needs immediate attention.

Minimal maintenance required
As the equipment used for the Performance Monitoring System is mostly constituted by components without moving parts, the need for active maintenance is minimal. Nonetheless there might be equipment in need of calibration or service from time to time, and depending on the specific setup, a service and maintenance plan will be issued with each individual Performance Monitoring System.

What we do

Below is a short recap of our different solutions. Our performance concept can be entered at your preferred stage depending on the level of insight and sophistication wanted. We can also help you out with ODME and bunker systems. All systems can be delivered as turnkey solutions.

Fuel Consumption System
In addition to real-time fuel consumption the system enables logging of fuel consumption data. Historical views and over time developed trend lines provides you with a better analysis of performance and effect of new initiatives. Furthermore, the Fuel Consumption System is ready for upgrade to a Performance Monitoring System and/or addition of an on board database synchronizing with another at the headquarter.

Performance Management System
When fully developed it will become an upgraded version of the Performance Monitoring System and complete the on board management layer of the performance concept. It is a decision making oriented and an open input based concept, where more factors are taken into account when evaluating the ships performance. All factors taken into the system are converted into KPI's. The crew will experience a tool that effectively allows them to contribute to a more cost effective operation.

Fleet Viewer
When fully developed it will become a system for visualizing and creating overview of fleet performance. It enables comparisons, voyage statistics, KPI generation via consumption, performance and maintenance planning. As such it is a tool for the headquarter to plan, optimize and manage the fleet. The system is built on top of the Performance Monitoring System.

Bunker Management System
Is a Coriolis Mass Flow Meter-based Bunker Management System with a highly accurate and volume insensitive measurement of transferred bunker. The system ensures an efficient bunker operation and is a pro-active tool to ensure you get the amount of bunker you pay for.

ODME Systems/15 PPM Bilge alarm
By regulations under MARPOL, all vessels must be equipped with a system for Bilge Water Discharge Monitoring as well as Oil Discharge Monitoring and Control Equipment (ODME). Both systems monitor the oil content of over board discharged ballast water and controls the discharge allowance based on whether the level of oil content is below the set limits.

A trustworthy and competent partner

Insatech Marine offers field-tested and proven solutions that meet international rules and regulations as well as helping you save money. We provide comprehensive installation, commissioning, training, service and maintenance to ensure you as little downtime as possible.

Insatech was established in 1989, and has since then grown to +70 employees. With more than 25 years of experience in the field of automation and instrumentation we are a strong partner for both our customers and suppliers. As a result of our longstanding partnerships with some of the world's leading manufacturers within instrumentation and automation, we are able to provide you with global service.

Our system users include:

Our international agent network

In order to provide the best possible customer support Insatech Marine works closely together with selected agents. This network of dedicated agents will help to ensure your positive experience with our systems and support functions. The agent network will be developed continuously to serve you locally wherever you may operate.

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Increase your competitive advantage by reducing costs via performance and efficiency improvements on your vessels.

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