Ship Energy Efficiency Management Plan
SEEMP
What, Why and How?

MARPOL COMPLIANT

Implement and Monitor
Identify Improvement Potential
Establish a Baseline
Evaluate and Update

EVALUATE AND UPDATE
ESTABLISH A BASELINE
IMPLEMENT AND MONITOR
IDENTIFY IMPROVEMENT POTENTIAL

Evaluation
Planning

People - Ideas - Solutions
SEEMP System

SEEMP is a management tool and should limit the onboard administrative burden. It is important to examine data, tools and processes in order to determine a credible baseline from which goals, plans and actions grow.

Why SEEMP?
• Ticket to trade
• Decision support
• Optimise operation
• Creates added value for shipowners if vessel performs above average

IMO Implementation guidelines
Planning
• Current status of ship energy usage and the expected improvement of ship energy efficiency is determined. Establish a baseline!
• Define and prioritize initiatives
• Both ship internal processes and operational aspects should be covered. (Speed optimization, weather routing, hull maintenance, “just in time” etc.)

Identify
• Define how much you can save and just as importantly, what initiatives you need to undertake to make the improvements.

Evaluation
• Progress of different improvement initiatives should regularly be followed up
• Establishing well defined self-evaluation periods will give an understanding of causation and effect that will improve the efficiency of future investments.
• An understanding of the overall characteristics of the ships operation will result in a better prioritization of future stages of the management plan.
• Self-evaluation and improvement
• Evaluate the effectiveness of the implemented improvements
• Set new goals and implement the next cycle of the plan.
• SEEMP is not a static tool, but a continuous “work in progress”

Why SEEMP?
• SEEMP will become mandatory for all vessels at their first renewal or intermediate survey after 1 January 2013. (IMO MEPC 62, July 2011)
• Under the proposed amendments to MARPOL Annex 6, Regulation 22, all ships must have an International Energy Efficiency Certificate (IEEC).
• The IEEC requires, amongst other things, the presence of a SEEMP on board.
• The SEEMP may form part of the ships Safety Management System (SMS).

Who should implement SEEMP?
• SEEMP is a ship specific plan to be developed by the owner, operator or charterer
• The plan should be adjusted for the characteristics of individual companies and ships
• SEEMP is a management tool and should limit the onboard administrative burden

What is SEEMP?

SEEMP 4 steps to success

The Insatech SEEMP system

The Insatech approach to developing an efficient SEEMP

A practical approach that is “proven in use”

SEEMP planning
• Establishing a good and repeatable baseline is the key for implementation of SEEMP
• Define the requirements for data acquisition, ensuring the system is expandable to handle all future requirements
• Define how data will be transferred from the vessel, data safety requirements, storage and use at HQ
• Minimize crew involvement i.e. automate data acquisition and transfer
• Start with “the low hanging fruit” the largest energy consumers on board

Defining a good baseline
• One approach is to use design documents or sea trial data if these have the necessary values
• Main energy consumers are: Main engine(s), electrical production and boilers
• Define an operational profile including Routing (plan and weather), Trim, cargo operations, autopilot use etc.

The practical baseline
• Start with “the low hanging fruit” the largest energy consumers on board.
• Evaluate the quality of the information currently available on-board.
• Typical fuel flow measurement systems have low accuracy and repeatability that will make evaluation of the results a waste of time!

Data Aquisition System on board

The Insatech SEEMP system

• Information display onboard in realtime
• Aid in on-board decision making
• Only useful information is sent to HQ
• Ensures responses by use of “guidance system” for vessel operations

IBM Application

Improve performance, reduce costs, and take advantage of the latest technology. The Insatech approach to developing an efficient SEEMP

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Challenges to achieve repeatable fuel flow measurements
• Most vessels are equipped with volumetric flowmeters – typically a sliding vane meter
• These have a full scale accuracy
• Correct sizing is important.
• Volumetric flowmeters need to compensate for density variations as we require a readout in kgs or tons
• Base density can vary up to 100 kg/m³! This is 10%

Lowering the uncertainty of flow measurements
• Correct sizing of flowmeters
• Calibration of temperature sensors
• Manual input of the correct base density in the flowcomputer!
• Not practical!

The optimal solution for measuring fuel flow
• Use a Coriolis massflowmeter that can handle the vibrations and flow pulsations. (Not all designs can)
• Pipe stress is a challenge for some types.
• Uncertainty of a Rotamass system is: 0.1% of actual value
• Density output can be monitored for alarming of “capuccino effect” in fuels

Data Acquisition
• Use industrial grade systems that can handle the tough environment found on board
• Challenges: Vibration, quality of power supply, ambient atmosphere, expandability
• Data collection speeds vary greatly. e.g. wave monitoring needs higher speed than COG
• Interconnectivity to other systems e.g. navigation systems (NMEA)
• Access to reports/KPIs on board is a must
• Data compression and encryption to save costs

Advantages of the Insatech SEEMP
Data Acquisition system
• Minimises necessary data volumes without losing crucial details. Event based detailing
• Open Industrial system for ease of integration to existing systems
• Built in Report functions
• Encrypted data – Read only format.
• Modular and expandable
• Manual inputs and local operator interfaces

Event based logging
The use of event based logging ensures the detail required for the specific channel, without collecting unnecessary data

KPI values in realtime
Built in report functions for on board use – influences behaviour
• The built in report functions enable us to make locally viewable reports that can be designed to have a positive influence on crew behaviour and decision making.
• No need to send data to HQ, make reports and send them out again.
• Strong mathematical functions allow real time calculated values to be displayed e.g. Tons fuel/NM/Ton displacement
• Such values can be used to create new baselines for performance if wind and sea state values are compensated.

Minimising data
• Even though all values are read e.g. every second, we can minimise data amounts.

Important features for data retrieval
• Automatic system sends encrypted Noon Reports. (Push)
• Automatic archiving – based on vessel and time/data stamp
• Conversion to “open format” and use in standard systems e.g. SQL databases

Influence decisions on board

Correct fuel consumption is vital
Realtime values on board influences crew behavior

On board fuel blender optimises costs.

Data Aquisition

Event Data

Thinning Data

(Standard Data / Interval)

Pre Trigger

Event based logging gives detailed information when required.

Coriolis flowmeters accurately measures mass flow and density.

Fuel consumption in real time.

The “improvement loop”.

New Target

Define/understand

Measure

Evaluate

Action/Change

Minimising data without loosing the details
Key Performance Indicators - KPI’s
- We recommend the use of KPI’s as the base for easy comparison of performance.
- Use KPI’s to influence on board behaviour as well as for monitoring performance degradation.
- Easy access to KPI’s with a strong graphic presentation, and warning/alarm alerts can ensure due diligence on board.

KPI main groups
- Main engine performance (g/kWh)
- Aux. engine performance (g/kWh)
- Vessel performance:
  - Thrust/displacement (if available)
  - Fuel consumption (kg/NM/ton)
- Electrical power consumption per area
- Vessel Trim especially in Ballast mode

Overview of all relevant KPI’s giving decision support
- Buffer time, idle time
- Speed / RPM div. 
- Propeller & Hull maintenance
- Weather effect
- Lube oil consumption
- Fuel statistics/ Bunker
- Fuel alerts
- Anti-fouling evaluation
- Speed / consumption prediction, speed optimization
- Engine efficiency, engine utilization and optimizing
- Energy profiles
- Voyage optimization
- Operational profiles
- Warnings and triggers
- Environmental statistics & EEOI

Key features of the Insatech SEEMP System
- Industrial proven in use components
- Data transfer to shore minimised
- Real time KPI’s on board
- Built in guidance on board requiring crew acknowledgement ensures actions are taken. If not the responsible crewmember can be found

Other features
- Data accessible on board, HQ and “home”
- Ranking system for the fleet – competition = motivation

Credible measurements = Better decisions
- For crew to take responsibility, it is important that the values displayed are credible
- Take “Raw” values and normalise them for display. (speed/ Power curve to be normalised for displacement, wind speed/ direction and wave action)
- Less scatter and a better aid in decision making
- Advisory messages e.g. best power plant configuration at the given operating conditions

Key Performance Indicators - KPI’s
- We suggest the use of predefined speed tests where the following factors are included:
  - Speed and SOG (define current/wind influence)
  - Displacement (wetted surface area and wind exposure)
  - Wind speed, True and Relative (wind resistance)
  - Sea state/wave height (WSA and WIR)
  - Rudder activity
  - Defined minimum run times to ensure repeatability

Continuous improvement is necessary
- Define/understand -> Measure-> Action/Change -> Evaluate -> New Target
- On board tools using real time consumption and performance figures against targets
- “Drill down” functionality for main units or consumers.
- Power generation vs actual use and safety factors
- EEOI (Energy Efficiency Operational Indicator) tons CO₂/ transport work – see IMO guideline
- EPI
- Costs
- Bunker composition
- Fuel costs and quality
- Selected Fuel

Screen menus
- Voyage Performance
- Main & Aux Engine
- Energy Consumers
- Vessel Performance
- Fuel Management
- Environmental
- Operations
- Guidance / Warning
- Boiler(s) and Incinerator
- Vessel KPI’s
- Trends & Tests
- Administration Setup

Decision support
- on board as well!

CO₂ emission reporting

Fuel consumption vs. speed.

Mileage per ton fuel vs reference.
About us

In 2005 Insatech A/S became a part of the Addtech Group of companies – Addtech AB, Stockholm, and since the company was established in 1989, we have had a positive business development. Today we are nearly 50 employees.

Our mission is to be a trustworthy and competent partner, who supply technical solutions and engineering within process automation.

As a result of our longstanding partnership with some of the world’s leading manufacturers within instrumentation and automation, we are able to provide a global service.

We work as a professional partner for our suppliers and for our customers – we believe in long relationships.

Our main markets are in the Pharmaceutical, Food, Energy, Marine/Oil & Gas Industry, which means we have a strong knowledge of the special applications, as well as the requirements for documentation in these areas.

Our main business areas:

- Process instrumentation and calibration equipment
- Automation, control and data acquisition
- System design, engineering and validation (DCS and Safety Systems)
- Service/maintenance and calibration (ISO 17025 accreditation)
- Site surveys and evaluation of process optimization based on better control practices
- Marine- and ship solutions, Cargo Management Systems
- Project Management
- Flow rigs/calibration rigs
- Special fittings
- Product enhancements
- Wireless solutions for monitoring and control
- Complete solutions including panels and commissioning
- Seminars and training

Products and Services

- **Accredited Calibration:**
  - Conductivity (Master meter)
- **Analysis of gases:**
  - Ammonia - NH₃
  - Moisture - H₂O
  - Oxygen - O₂
  - Carbon dioxide - CO₂
  - Carbon monoxide - CO
  - Methane - CH₄
  - Hydrochloric acid - HCl
  - Water - H₂O
- **Analysis of liquids:**
  - Cell density
  - Density
  - Color
  - Conductivity
  - Concentration
  - Carbon dioxide - CO₂
  - Live Cells
  - Sound speed
  - NIR
  - Dissolved Oxygen
  - pH
  - Plato
  - Protein
  - Refractive index
  - Turbidity
  - Solids Viscosity
- **Analysis of solids:**
  - Moisture
  - Fat
  - Protein
- **Calibration:**
  - Flow
  - Temperature
  - Pressure
  - Simulators
- **Control and Systems:**
  - DCS Systems
  - Shut Down & security systems
  - MES systems
  - Blending Systems
  - MID Solutions
  - SEEMP
- **Controllers:**
  - Auto-tuning
  - Fuzzy-logic
  - Single- and multi-loop
- **Flow Measurement:**
  - Bunker Control
  - Bunker Blending
  - Custody transfer
  - Coriolis massflow
  - Differential - orifice/pitot
  - Tube
  - Flowswitch
  - Magnetic inductive
  - Mechanical
  - Rotameters
  - V/A
  - Thermal massflow
  - Ultrasonic (Clamp-on and in-line)
  - Vortex
- **Flow Measurement Solids:**
  - Microwaves
- **Level Measurement:**
  - Electromechanical
  - Displacement
  - Hydrostatic pressure
  - Capacitive
  - Conductive
  - Microwave
  - Radar
  - Radiometric
  - Ultrasonic
  - Vibration
- **Pressure Measurement:**
  - Absolute
  - Differential
  - Relative
  - Calibrators
  - Diaphragm seal
  - Level
  - Pressureswitch
- **Registration & Data Collection:**
  - Data loggers
  - Data Acquisition Systems
  - GPRS - wireless transmission
  - Recorders
  - Paperless recorders
- **Single Use Technology:**
  - Flow
  - Pressure
  - Temperature
  - UV
  - Conductivity
  - Live Cells
  - Turbidity
- **Services:**
  - Calibration:
    - Flow - gases and liquids
    - Conductivity
    - pH
    - Temperature
    - Pressure
  - Accredited Calibration:
    - Conductivity
    - Temperature
    - Electrical
- **Service:**
  - Project Solutions
  - Control / Periodic maintenance
  - Services and inspections
- **Temperature:**
  - Flow
  - Pressure
  - Temperature
  - UV
  - Conductivity
  - Live Cell Counting
  - Turbidity
- **Temperature:**
  - Calibrators
  - Sensors
  - Thermoelements
  - Transmitters
- **Training:**
  - Customized seminars
  - and training session
  - www.instrumenteringskursus.dk