Workshop - Continuous Emissions and Fuel Monitoring Systems

Thank you all for being able to attend on the 12th of February in Gothenburg.

It is a great opportunity to meet and discuss the technological challenges etc in regards to monitoring adherence of the SECA 2015 rules.

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Preliminary program;

- 0900 @ Emerson (Saab Radar Systems) in Gothenburg, Coffee and introductions/expectations by participants
- 0930-1000 CEMS - Continuous Emissions Monitoring Systems; Consilium/Norsk Analyse
- 1000-1030 CFMS - Continuous Fuel Monitoring Systems; Emerson/ABB
- 1030-1045 Class experiences DNV GL
- 1045-1100 AIS reporting Transas
- 1100-1200 Owner's Experiences/ Technology & Competitive conditions
- 1200-1300 Lunch
- 1300 -1330 Transportstyrelsen; Challenges, International initiatives and legal issues
- 1330-1500 Additional input & discussion
- 1500 Conclusions and further work

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Marine Fuel Measurement Solutions

Per Stenhammar
per.stenhammar@emerson.com
Marine fuel measurements
Denmark – Sweden – Finland

Agenda

- SHORT presentation of Emerson
- Volume contra mass!
- Fuel measurement – How we do it!
- Density- a quality check.
- What we have done.
- Questions

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Emerson Global Presence 2013

$21 Billion in sales

Headquarters in
St. Louis, Missouri USA
NYSE: EMR

Diversified global
manufacturer
and technology provider

Approximately 130 000
employees worldwide

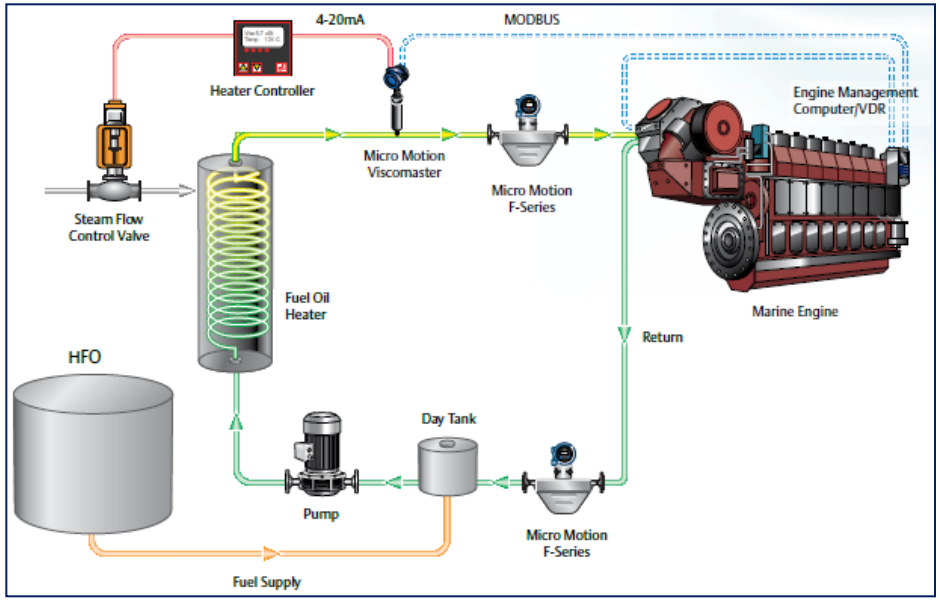
- Manufacturing and/or sales presence in more than 150 countries
- 240 manufacturing locations worldwide
- Founded in 1890

Emerson Process Management in the Nordics- North East EU

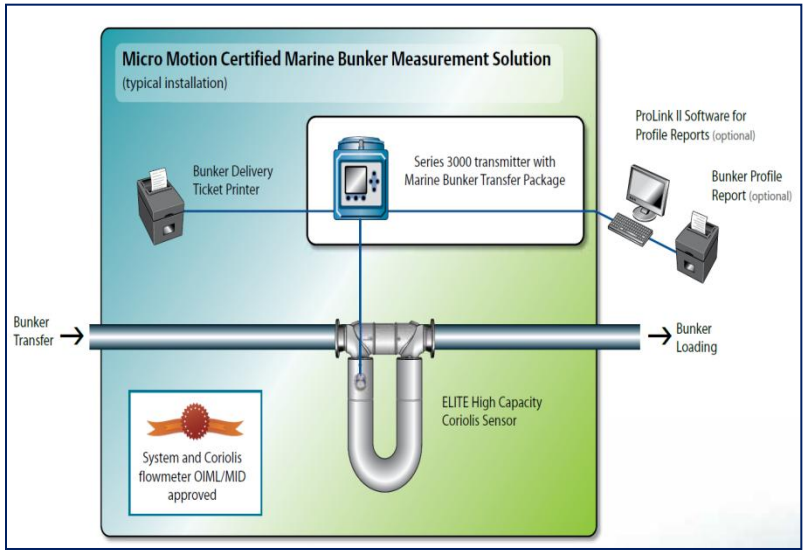
- NEE- Finland, Sweden and Denmark
- 1100 employees
- $675M revenues
- 4 manufacturing sites

Emerson provide the Marine industry with unique solutions – Fuel Measurements

Fuel Efficiency Solutions



Certified Bunker Solutions



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- ✓ *Volume contra mass! Why!??*
- ✓ *Coriolis - Technical - Function*
- ✓ Fuel measurement- how we do it.
- ✓ *Solutions- with Emerson.*
- ✓ *References.*
- ✓ *Questions*

What do you prefer?

100 litres

100 Kg

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And here??

1 liters

1 Kg

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Different fuel – different Density!

HFO- Heavy fuel oil 930- 990 kg/ m3

MDO- Marine diesel oil 850- 890 kg/ m3

MGO- Marine gas oil 830- 880 kg/ m3
(Diesel)

This is according to the standard; **API**

API do not speak about litres…

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Energy is kg/ kwh !!!
Why care about litres?

1 liter

1 Kg

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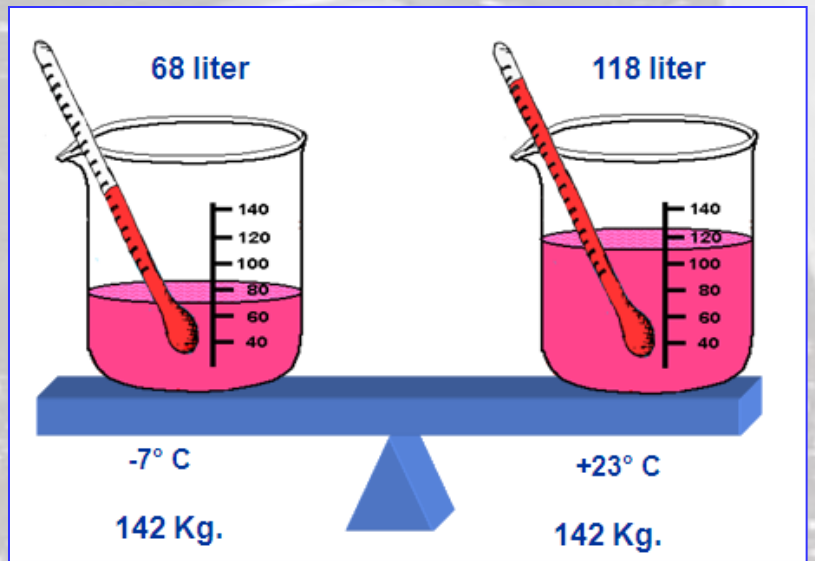
Why Coriolis mass flow meter?

- Multivariable measurement
  - Mass flow, Volume flow, Density, Temperature
  - Easy to install and use
  - No or limited maintenance
  - Long life time
  - High accuracy
  - Window to the process



Coriolis measurement principle – Mass flow

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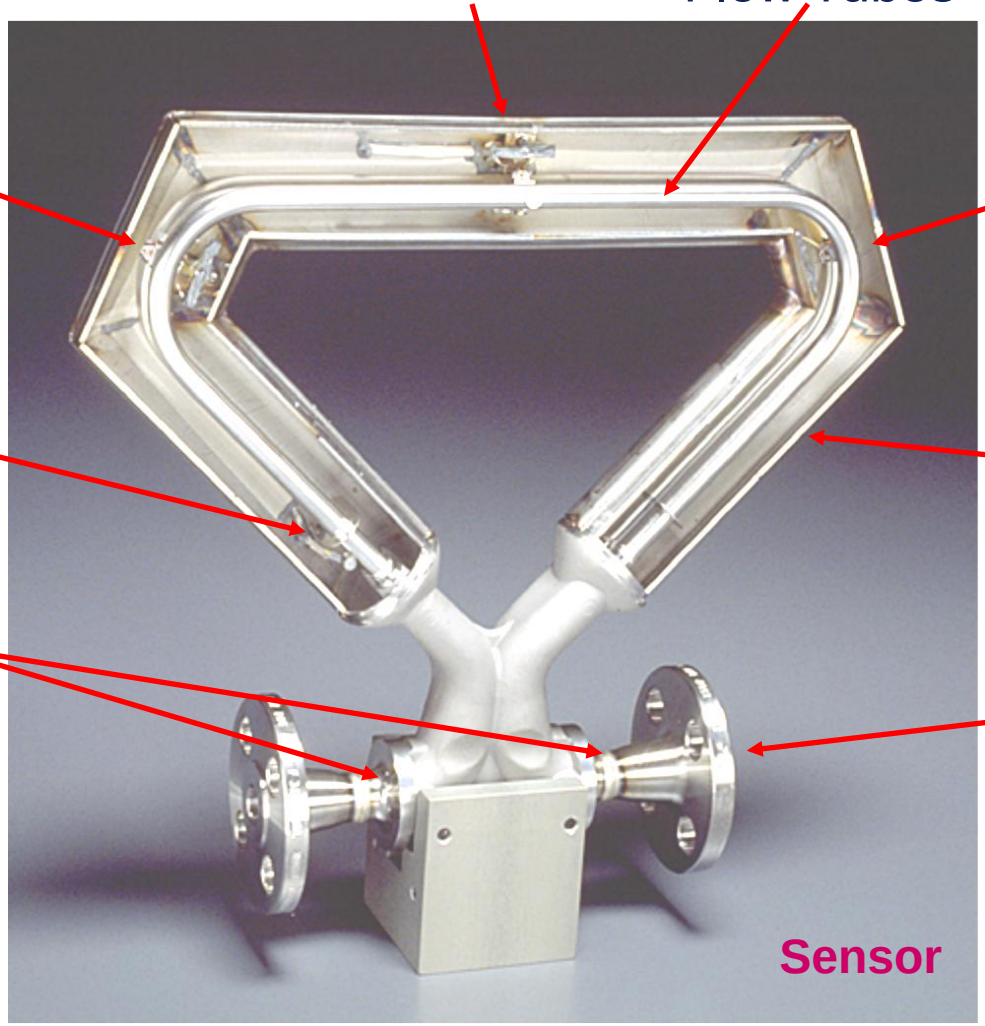
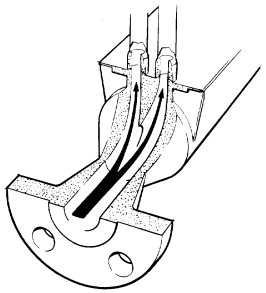
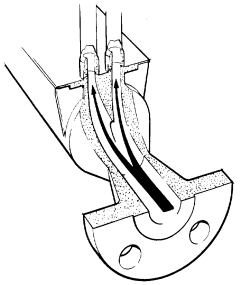
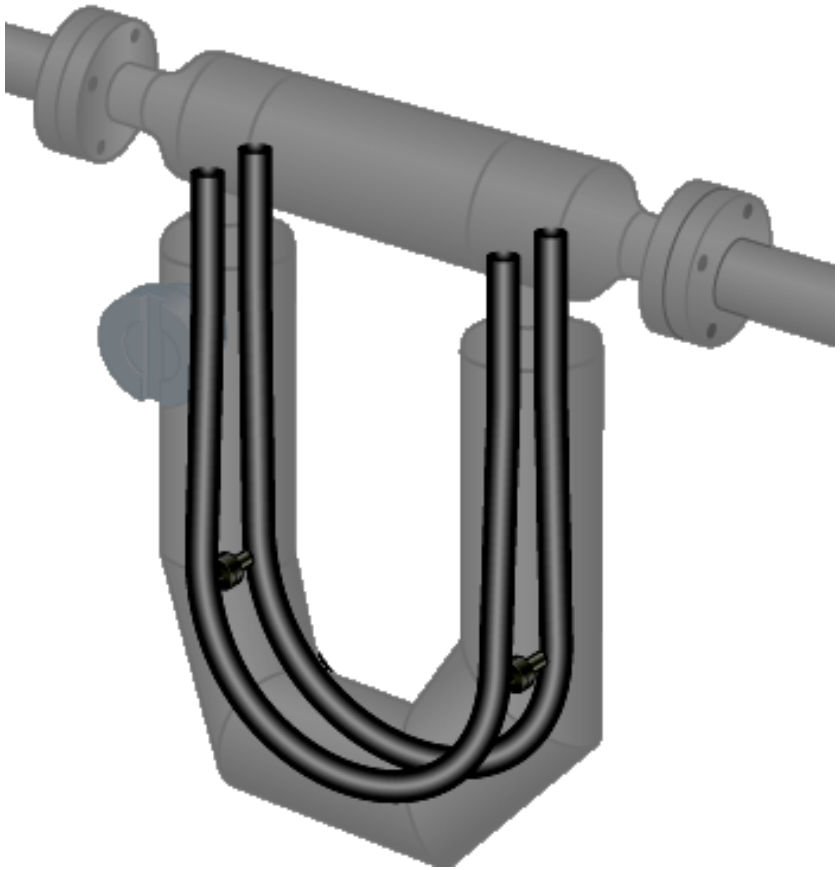
Coriolis measurement principle – Mass flow







Coriolis measurement principle – Mass flow



Coriolis force is proportional to Mass Flow

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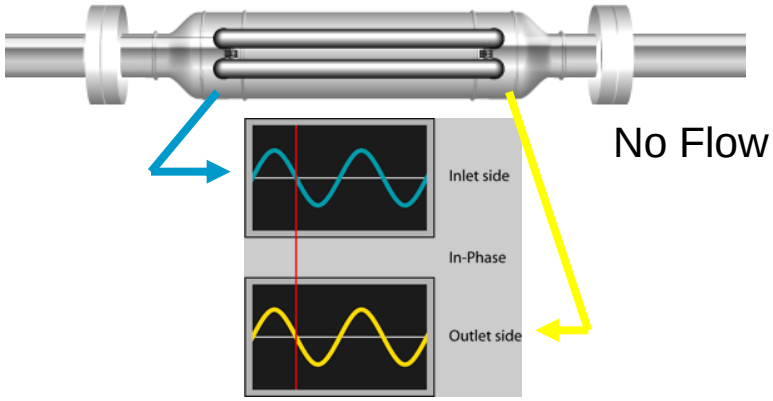
Coriolis measurement principle – Mass flow

•During a no flow condition, there is no Coriolis effect and the sine waves are in phase with each other.



No Flow

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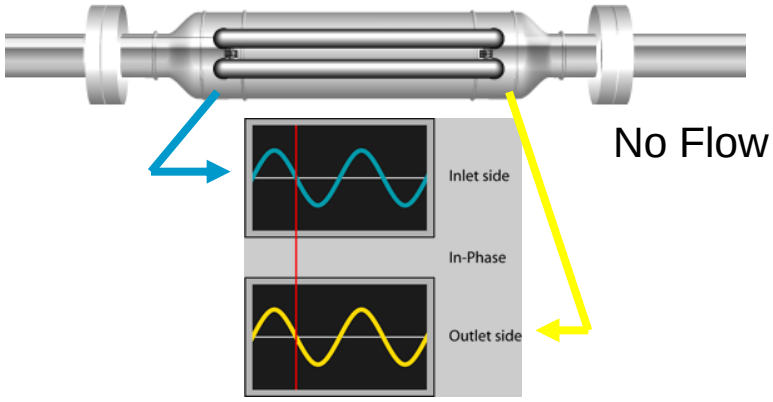
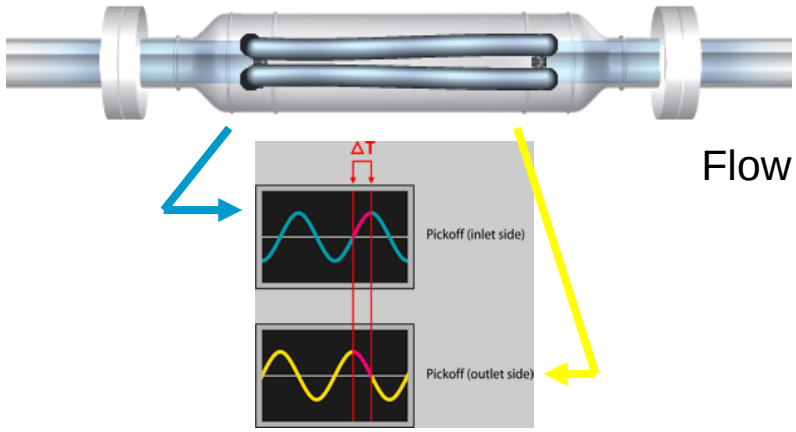
Coriolis measurement principle – Mass flow

•During a no flow condition, there is no Coriolis effect and the sine waves are in phase with each other.

•When fluid is moving through the sensor's tubes, Coriolis forces are induced causing the flow tubes to twist in opposition to each other. The time difference between the sine waves is measured and is called Delta-T which is directly proportional to the mass flow rate.



No Flow



Flow

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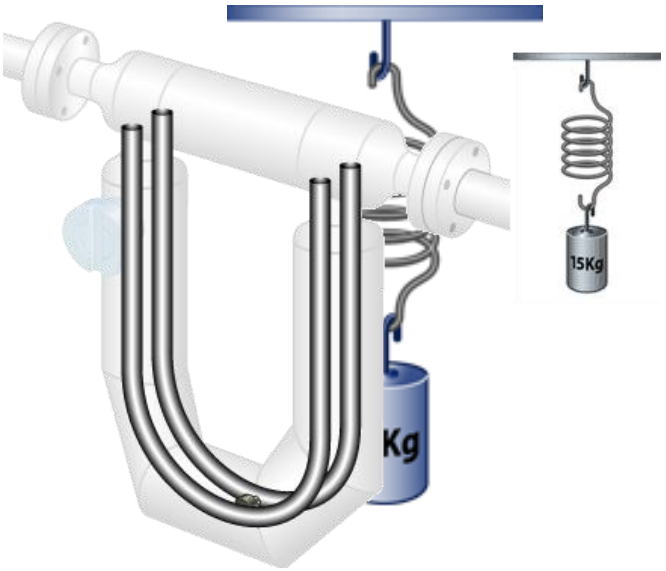
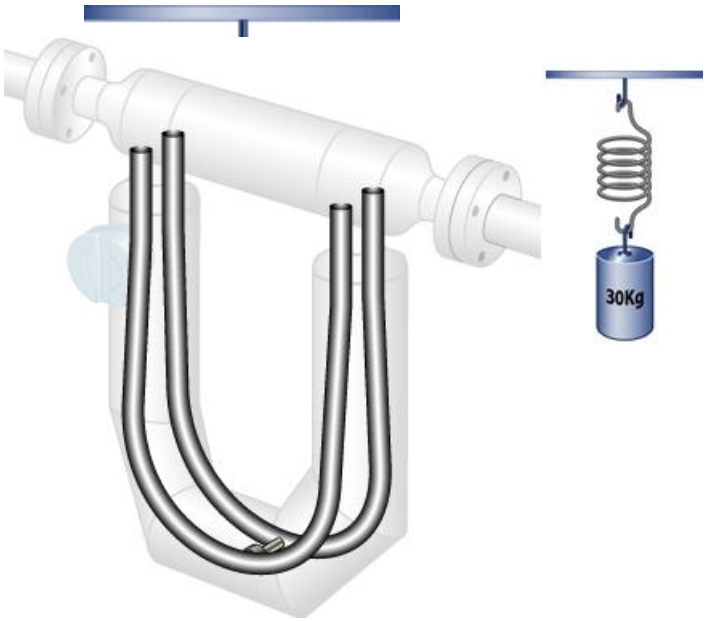
Coriolis measurement principle – Density

- Density measurement is based on the natural frequency of the system including the flow tubes and the process fluid
  - As the mass *increases*, the natural frequency of the system *decreases*
  - As the mass *decreases*, the natural frequency of the system *increases*





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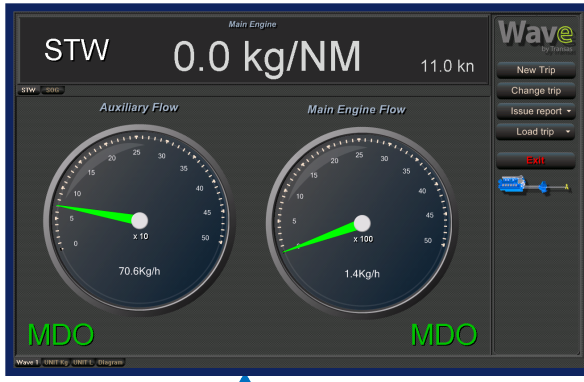
Installation - Communication

MVD™ technology

Using MVD Direct Connect architecture can reduce meter cost, footprint and weight with no loss of performance or reduction in data availability!

- ✓ Mass Flow
- ✓ Volume Flow
- ✓ Density
- ✓ Temperature
- ✓ Totalizers
- ✓ Events
- ✓ Drive Gain
- ✓ Diagnostics



Digital Modbus

Digital Communication

4-20mA, Puls

Core Processor

Fuel line

Fuel line

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- ✓ *Volume contra mass! Why!??*
- ✓ *Coriolis - Technical - Function*
- ✓ **Fuel measurement- services.**
- ✓ *Solutions- with Emerson.*
- ✓ *References.*
- ✓ *Questions*

Vessel Survey
Marine Services

- Survey Deliverables
  - Certified Emerson Marine Service Engineer
  - Identify required modifications
  - Confirm sizing and selection for best performance
  - Assess integration
  - Address questions from crew regarding modifications
  - Provide a detailed vessel survey report


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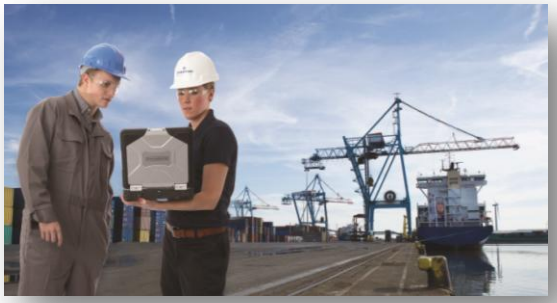
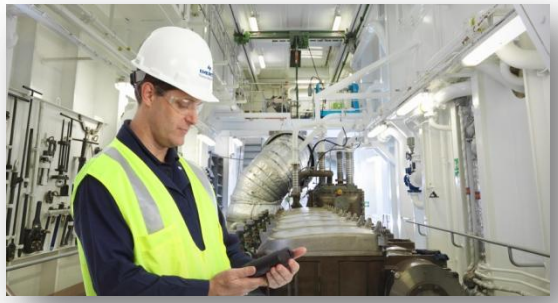
'MARINE SOLUTION'
SEACOR VIKING
Survey Report
Fuel Consumption: Main Engines, Emergency Generator, and Bunker

Company: SEACOR MARINE
Survey by: Raymond Eckelbarger w/Emerson
Chris Harkess w/Yacht Systems NW LLC
Raymond.Eckelbarger@emerson.com
+01-678-591-8346
Survey date: 20 July 2013
Survey Location: Tampico, Mexico
Contact Person:





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Installation
Marine Services

- Ship owners perspective on flowmeter Installation
  - Limited project management and global execution
  - Installation consistency and right first time
  - Time required to perform installations

- Emerson - SeaTec Installation partnership
  - Global leader in onboard marine repair services
  - Competitive ratio of quality to cost
  - Successful installations and feedback at key customers

Fuel Consumption

Bunkering

Viscosity

"The Emerson and SeaTec Repair Services relationship helps us offer installation scope, scale and speed for marine fuel measurement solutions and increased value to customers globally,"

Neal Ingram
President of Emerson's Micro Motion business

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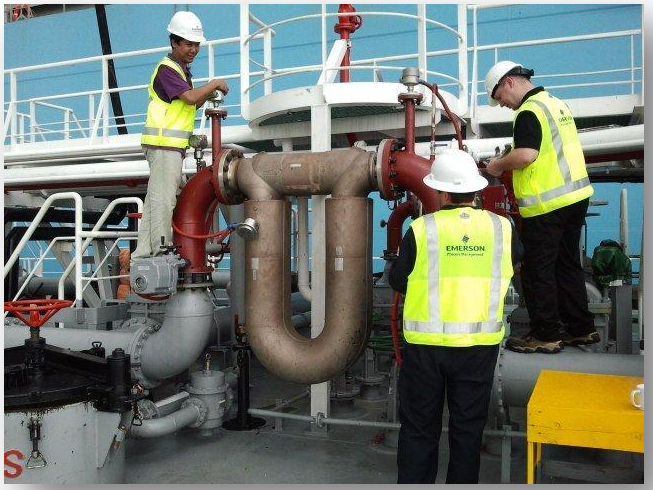
Start-Up
Marine Services

- Start-Up Deliverables
  - Certified Emerson Marine Service Engineer
  - Extensive start-up to ensure the highest accuracy
  - Inspect installation
  - Perform zero
  - Provide hands-on training for the crew
  - Provide a detailed start-up report



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Fuel Saving!

Legal requirements ?

- MARPOL
- MEPC, Marine environment protection Committee
- SEEMP, Ship energy efficiency plan , Circ 683
- EEOI , Energy Efficiency Operational Indicator , Circ 684
- **Awareness!!!**
- **Engagement!!**
- **Operation!!!**
- **$!**

IMO

Fuel Efficiency Monitoring System

Changing Mindset – Save Fuel – Lower Cost

Connects to

- Navigation sensors.
  - **Position (GPS) (MUST)**
  - **Speed Log (MUST)**
  - Gyro
  - Wind
  - Echo-sounder
- **Flow meters (MUST)**
- Trim sensor
- RPM & PITCH
- Rudder
- Torque meter and more……

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Traditional Solution –Mechanical Flow meters.

Old technology gives you:

- Volume flow
- Moving parts
- Leakage risks
- Maintenance requirements
- Flow stop with breakdowns
- Limited communication
- Manuel readings
- Limited momentary flow display
- Less accurate

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Mass Flow / Fuel Control –Efficiency

Micro Motion improve your fuel control

New Solutions –Digital Coriolis Massflow meter.

New technology gives you:

- Mass Flow: Momentary and Total
- Density measure: Fuel quality
- Temperature measurement
- Volume Flow: Momentary and Total
- Digital and Analogue communications
- No flow stops
- No leaking points
- Easy to install and use
- Limited service needs
- High flow accuracy
- Long life time cycle

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Stena Carrier, massflow meter in booster unit.

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Massflow – Fuel Efficiency

Micro Motion M/S Mariella

XPRESS with density controlled loging of HFO and/ or MDO!!

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Massflow / Fuel Control - Efficiency

- ✓ **Fleet order from Laurin.**
- ✓ **MMI massflowmeters for HFO and MDO systems.**

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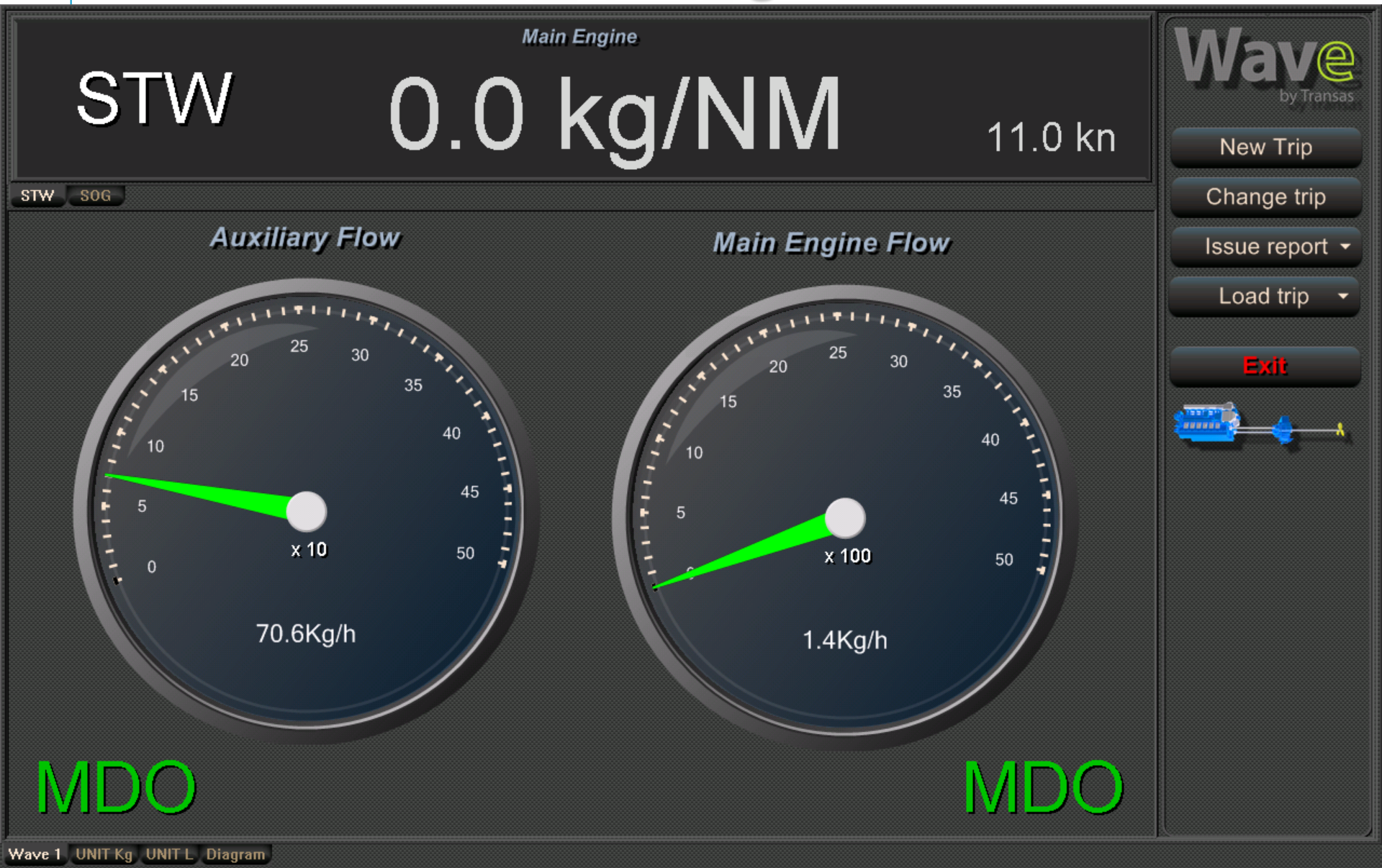
LAURIN MARITIME

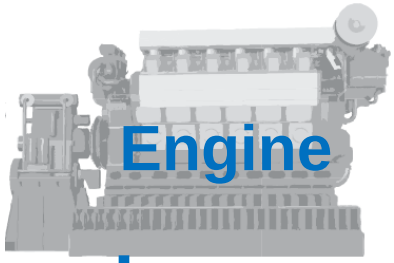
Presentation on the bridge.



Massflow Technology– Fuel Efficiency

Get into control with Micro Motion massflow.

SEND DENSITY SIGNAL TO LAND!!!!



- ✓ Mass Flow
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- ✓ Drive Gain
- ✓ Diagnostics

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- ✓ *Volume contra mass! Why!??*
- ✓ *Coriolis - Technical - Function*
- ✓ Fuel measurement- how we do it.
- ✓ *Solutions- were do Emerson fit?*
- ✓ *References.*
- ✓ *Questions*