

Identificatie van geluidsbronnen in schepen door middel van OTPA en stand-alone meetsystemen









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Project

Static and Dynamic Tests

- Underwater Sound Measurements
- On-Board Measurements
- Cavitation Observation
- OTPA



Pressures



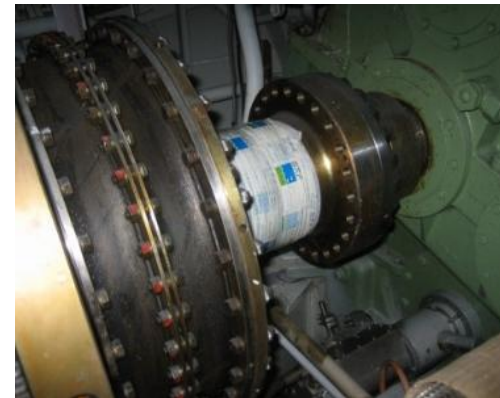
- 5 Pressure sensors
- In aft peak ballast tank:
 - Above the propeller plane
 - Aft of the propeller plane

Cavitation Observations



- Boroscope (2 locations)
- In aft peak ballast tank

Shaft Power



- Strain gauges on spacer
- Shaft rpm

Underwater Sound (Static)



- Hydrophone hanging from side of ship (several depths)

Underwater Sound (Dyn.)



- Hydrophone on sea bottom (45m depth, 125m to the side)
- Measuring from side (car)

Hydrophone Location



- Handheld GPS

Structure Borne Sound



- 30 Glued Accelerometers:
 - Diesel engine
 - Diesel generator
 - Shell plating
 - Gearbox
 - Shaft generator

Airborne Sound



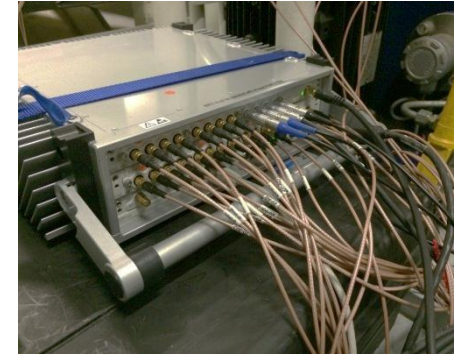
- Engine room
- Wheelhouse

Shaker



- Shaker hanging in ty down straps
- Exciting engine foundation
- Sine
- 1/12th OBCF:
 - 45 Hz - 5.6 kHz

Data acquisitioning



- Simultaneously sampling of all channels

Machinery conditions



Ship Location



Data acquisitioning



GPS repeater



- Written log:
 - Propeller pitch
 - Electric power
 - Engine settings
- Running conditions
 - Compressor
 - Fans
 - Fuel separators
 - St. gear pumps

- Hemisphere V102
GPS Compass
- Centerline at fwd
railing on the top deck

- Hydrophone
- Synchronized with ship

- GPS repeater
- Synchronization

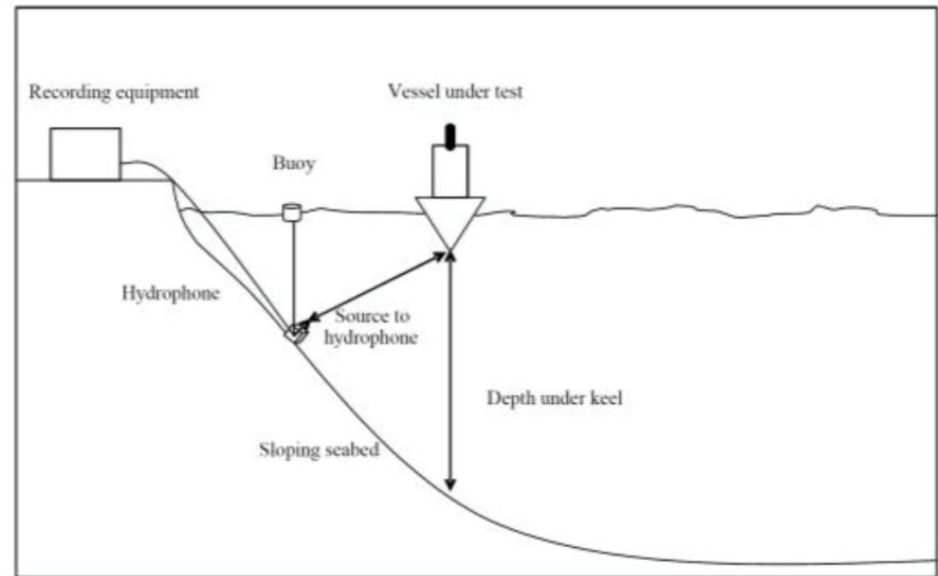


Fig. 1
Schematic drawing of measuring situation for surface vessel

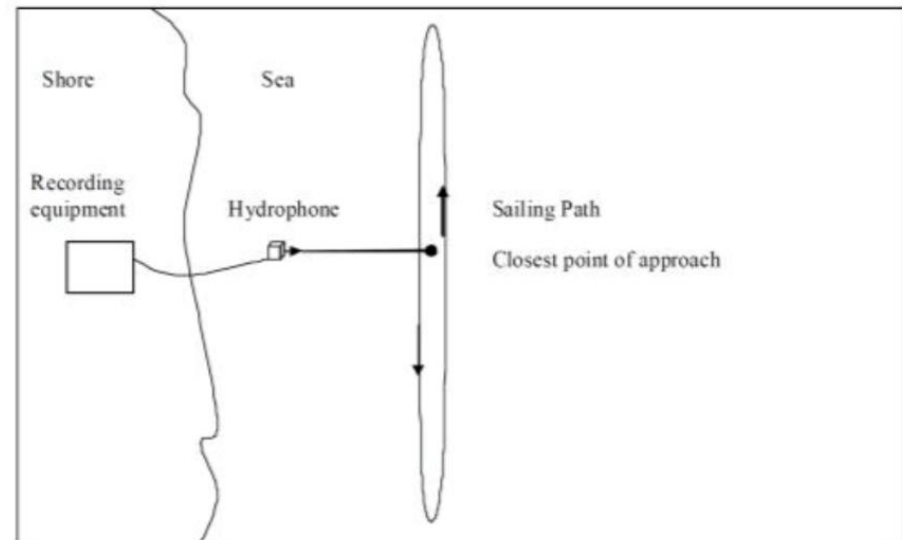


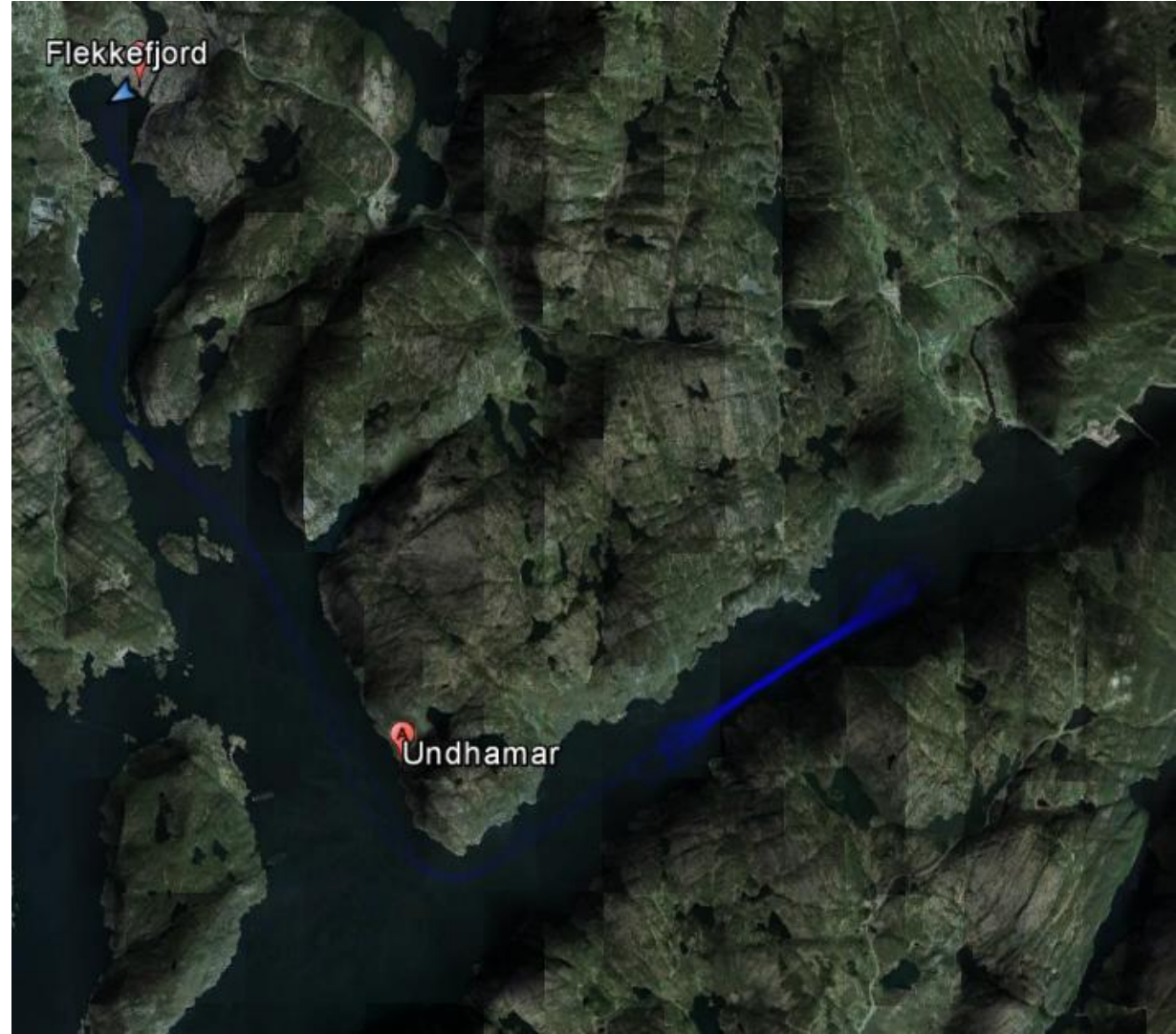
Fig. 2
Measuring situation seen from above, free sailing tests

Static Tests

- Individual Sources
- Different Hydrophone Depths
- Shaker

Dynamic Tests

- Different Propeller Speed & Propeller Pitch
- Vibration Source Isolation
- Underwater Sound
- Fluid-Structure Interaction

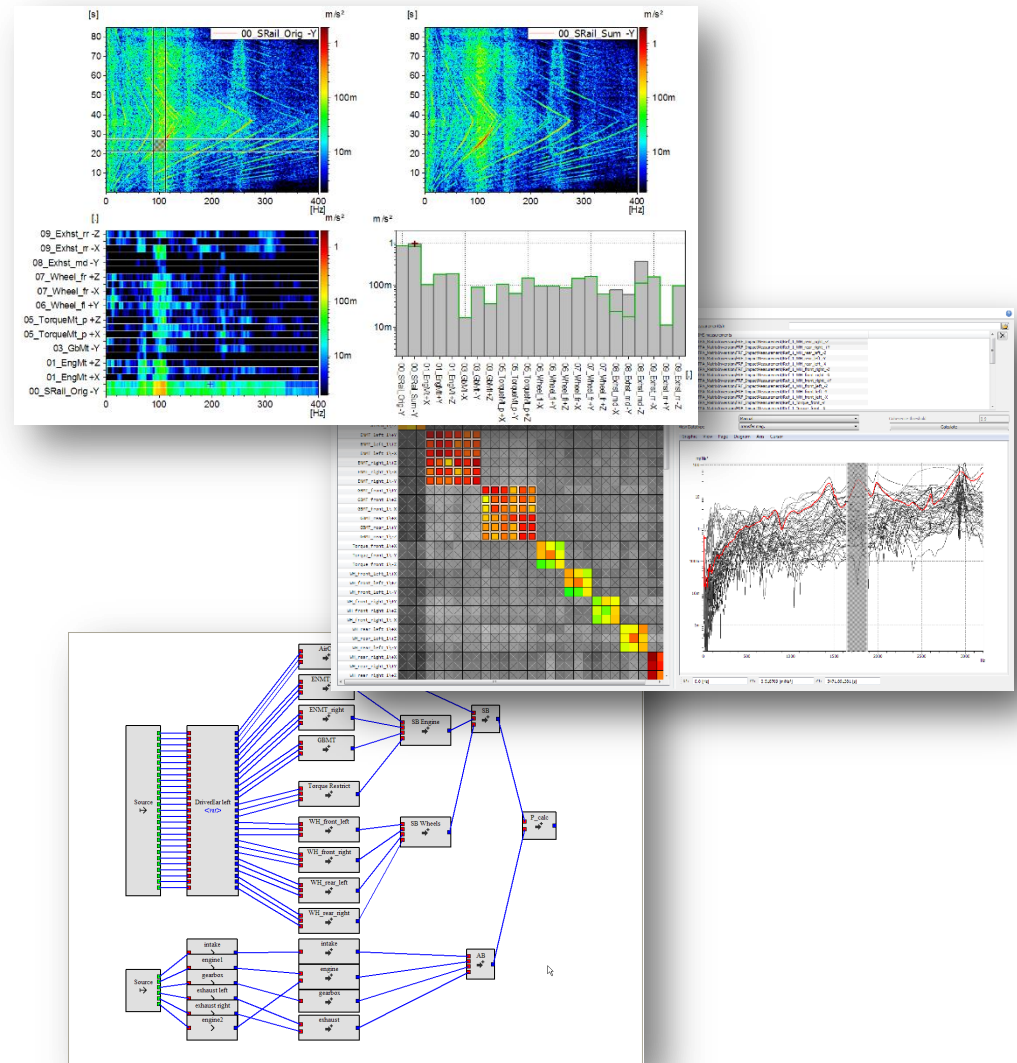


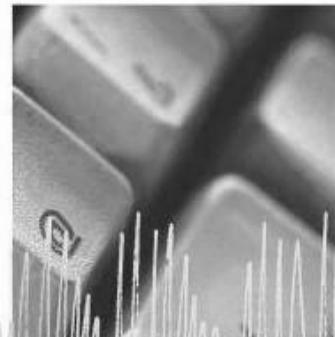
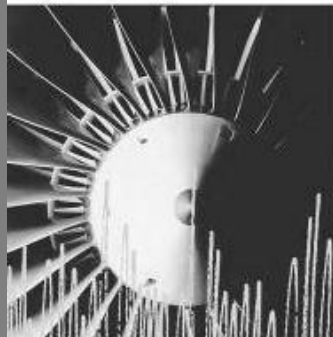
OTPA

Operational Transfer Path Analysis

- Engineering Tool in Noise and Vibration
- Contribution Analysis based on operational data
- Distinction Structure-borne & Air-borne

General framework for transfer path analysis:
History, theory and classification of techniques –
M. vd Seijs, D. de Klerk, D.J. Rixen





... Thank you for your attention!

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