



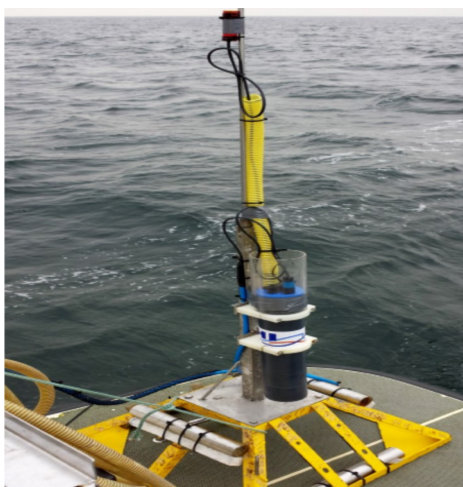
DHI SENSE

Cost-optimised miniature sensors for online monitoring

Traditionally, very expensive, high-end scientific sensors have been used for marine monitoring. This has limited the number of monitoring stations that could be deployed during a measurement campaign. The main consequence of this has been that proper observation of spatial variability is omitted in monitoring programs. With our Research, Development and Innovation (RDI) initiative leading to DHI Sense, it is now possible to produce, assemble and deploy a network of numerous sensors at a comparable cost, without compromising the data quality. The in-house design also enables seamless application in field campaigns and fast sensor adaptation to deliver tailor-made services to clients. Deploying cost-effective, reliable multiple online sensors creates unprecedented low downtime. Furthermore, comparing sensors online allows early identification of faulty sensors. The net result is an almost vanishing risk of project delays caused by sensor reliability.

DHI SENSE – NEW POSSIBILITIES

The regime shift enabled by DHI Sense effectively makes it possible to replace model-based extrapolation of few point measurements with a much more comprehensive measured data set. The net effect of this is two-fold. Firstly, the observations are directly available at more critical positions and secondly, the spatial properties of the models otherwise used are better calibrated and the remaining uncertainty better described.



DHI Sense – Wave (Sensor, Battery and Frame) minutes before deployment in Denmark, November 2013.

DHI Sense provides a new method for measurements where sensors are connected in a Master/Slave configuration. It is capable of controlling, processing and transmitting online data from a large variety of sensors. The internal network is open for integration of external sensors such as Acoustic Doppler Current Profilers (ADCPs) or multi parameter probes, as well as the growing set of new in-house sensors.

CLIENT

- Environmental authorities
- Oil & gas industry
- Offshore renewable industry
- Port and terminal operators
- Consultants and contractors
- Emergency response companies
- Universities and research institutions

CHALLENGE

- Limited flexibility and high cost of traditional sensors
- Consequent cost ineffectiveness of such sensors

SOLUTION

Inexpensive, in-house miniature sensors that can be configured to fit the project & deployed in large numbers at a reasonable cost

VALUE

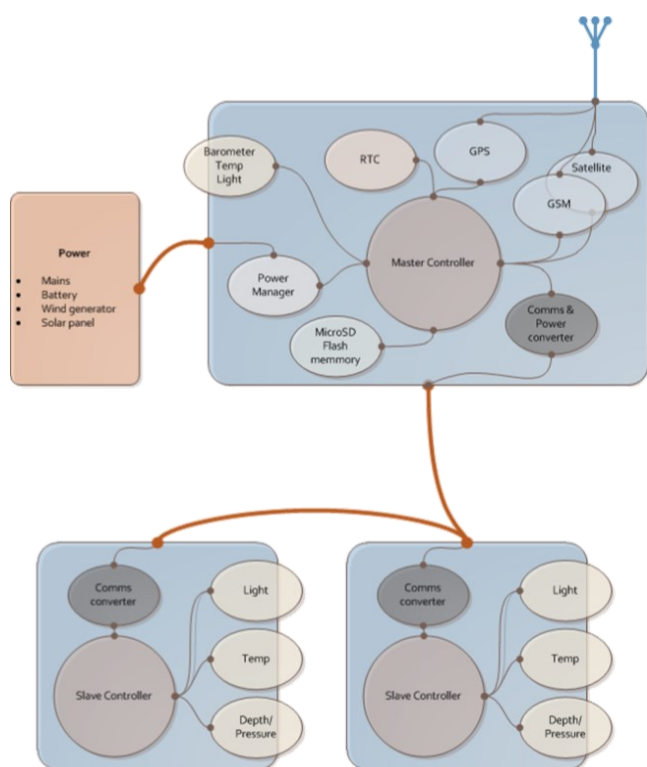
- Improved model validation with simultaneous data from multiple sensors
- Online monitoring at costs comparable to traditional offline monitoring
- Overall cost savings due to reduced downtime risk when measuring online

The cost of the in-house sensor is kept low by using Micro Electrical Mechanical Systems (MEMS) sensors from consumer electronics such as mobile phones, sports gear or industry lab equipment. The open system architecture facilitates adaption to the rapidly changing world of sensors that is evolving from the MEMS.

DHI SENSE CURRENTLY INCLUDES SENSORS FOR:

- Pressure 0 to 6 Bar @ 0.06 mBar
- Water Depth/Water Level 0 to 50 m @ 0.1 mm
- Temperature -20 to +85 @ 0.01°C
- Light 0 to 550 PAR
- Water velocity (2D) +/- 5 m/s @ 0.1 m/s
- Distance in air (ultrasonic) 0.3 to 5 m @ 1 mm

Detailed data sheets of the sensors are available on request.



DHI Sense system architecture.

STATION FLEXIBILITY

DHI Sense monitoring stations can be configured for many types of deployments, such as:

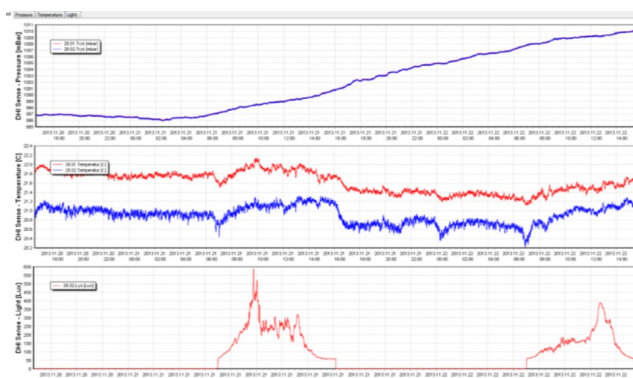
- pressure changes induced by propeller wash in Port – with 16 pressure sensors recording at 10 Hz
- wave monitoring station in coastal zone – measuring pressure at 4 Hz
- test facility measuring pressure in model basin at 100 Hz

- water level recorder in creek measuring water level, temperature and flow every 10 minutes
- light measurements in coral reef with network of light sensors recording every 10 minutes simultaneously – including water level and temperature for the area

DATA HANDLING

Data is by default stored locally on a Secure Digital (SD) card. When configured for online operation, data – or a subset of data – is transferred to our Data Integration Management System (DIMS.CORE) enabling:

- automated QA/QC routine to be implemented
- automatic data backup
- configuration of warning and alarms
- derivation of software sensors from measured data

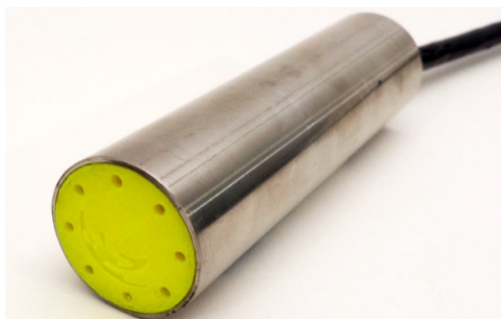


Online Pressure, Temperature and Light data presented in DIMS.CORE, Hørsholm, October 2013.

DIMS.CORE provides an operational interface that allows the end-user to perform data analyses while maintaining full traceability. It further provides a seamless interface with modelling results to facilitate easy use for model calibration and validation.

BENEFITS TO CLIENTS

DHI SENSE results in improved model validation due to the higher quality of data derived from multiple sensors and positions. The monitoring stations can also be configured to precise specifications for various purposes, contributing to overall cost savings during measurement operations.



DHI Sense—pressure and temperature.

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 For more information, visit: www.dhigroup.com