Laboratory of

Drives and Experimental Automation for Marine Systems

Laboratory Manager:
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DREAMS Lab

Drives and Experimental Automation for Marine Systems

History

1990 : born the laboratory of Fluid Power Automation and Mechatronics

2011: the laboratory, which had gradually modified its activity with prevalent orientation to marine and naval field, begins *ADRINS* (*A*utomation and *DRI*ves for *N*aval *S*ystems), at DITEN department

2012: born *DREAMS* Lab (*DR*ives and *E*xperimental *A*utomation for *M*arine *S*ystems) with a new location at the Naval Unit of DITEN department. DREAMSs joints to MAT&ST research team

All the years the laboratory supported the activities of specific courses of Fluid Power Automation and Mechatronics

"Numbers" of the Laboratory:
26 : the years of the laboratory
'90 : activation of Fluid Power Automation module (second in Italy)
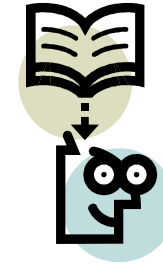'94 : activation of Mechatronics module (first in Italy)
120 : number of publications in the last 10 years

Still its first activation the Laboratory is classified as relevant interest among laboratories by MIUR

Scientific activity: Proved by 295 publications on 26 years of activity (from 1990 to 2016).

Didactic activity: Continuous support to

- Modules for Degrees and Masters
- Internships
- Degree and Master theses
- Phd

Prevalent research activities:

➢ Pneumatic and oil-hydraulic marine drives
➢ Marine and off-shore inspections
➢ Modelling and simulation of fluid power systems
➢ Diagnostics, monitoring and preventive maintenance of drives
➢ Characterization of fluidic innovative drives
➢ Experiments oriented to vibration and acoustics
➢ Applied mechatronics
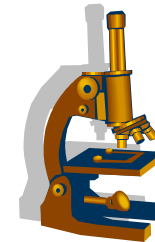
Automatized systems for marine inspections

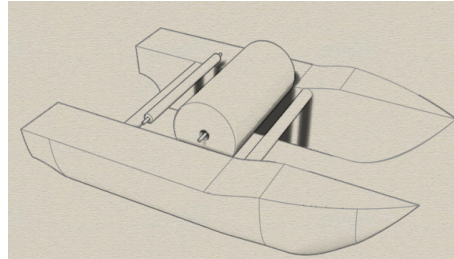Worm robots for ducts inspection driven by fluidic muscles

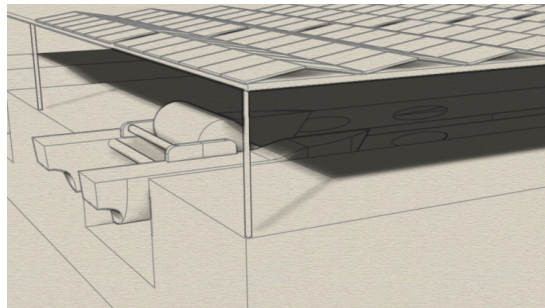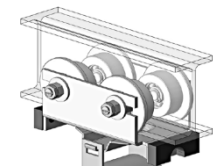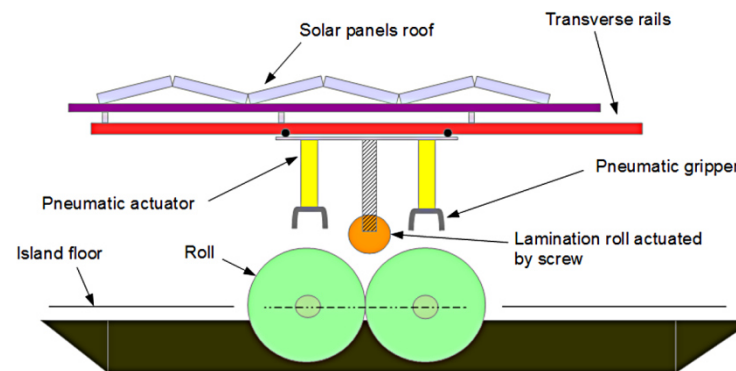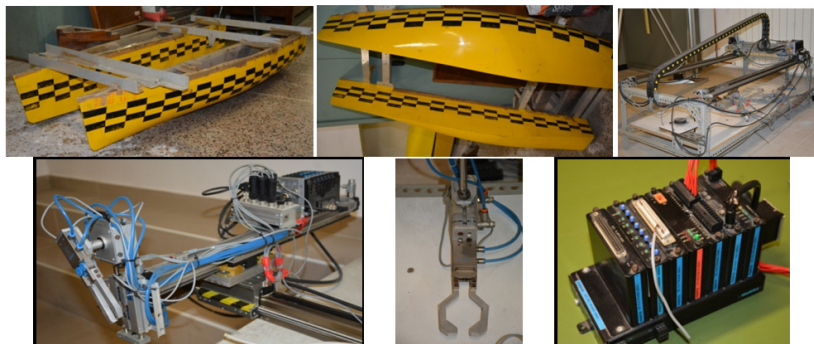Hold inspection by means of self-moving and instrumented robotized units
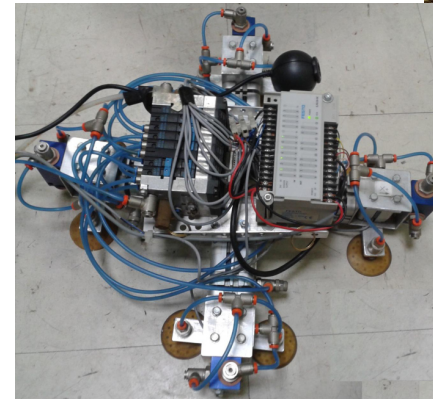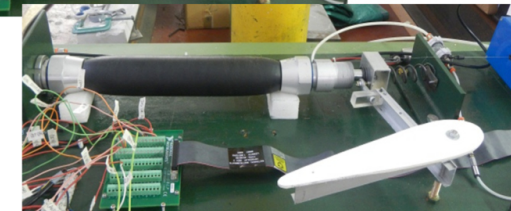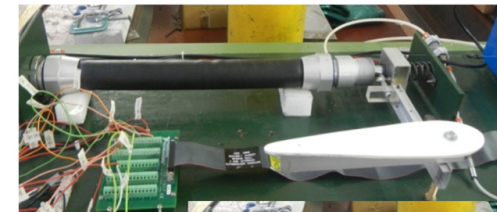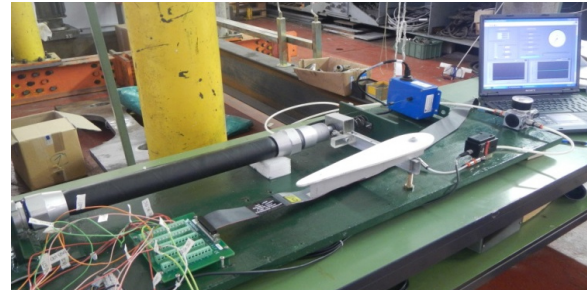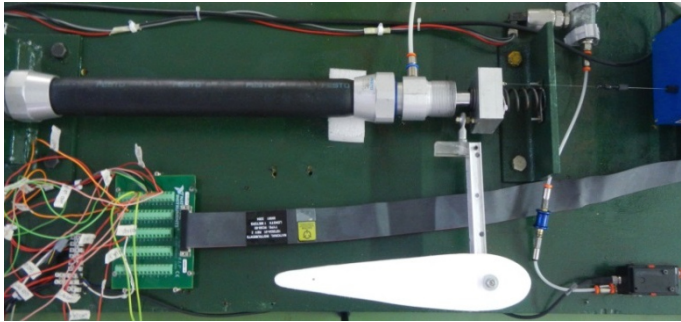
Bottom inspection
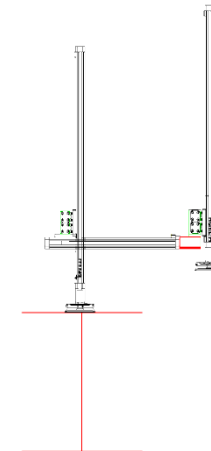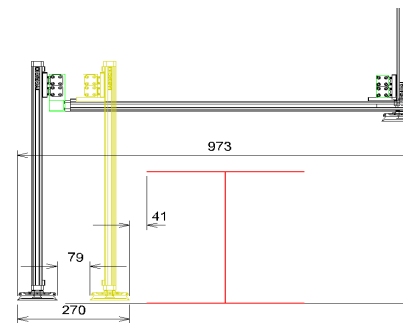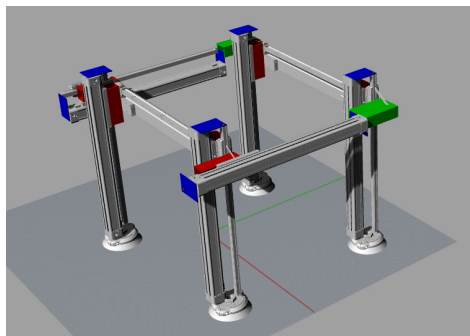
Sea-Cleaning Autonomous Units

fleet of sea-cleaning autonomous units managed by waste-recovery island
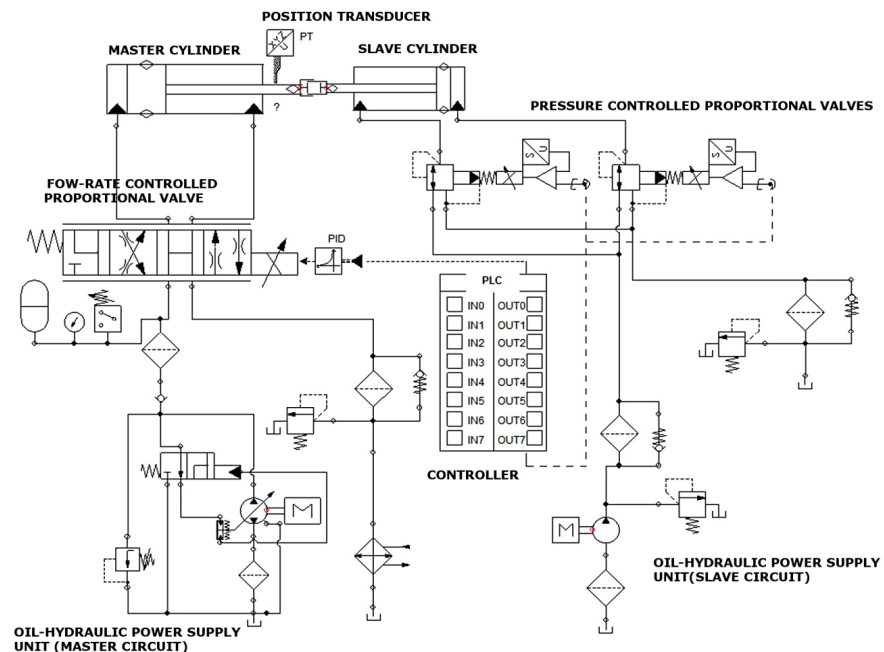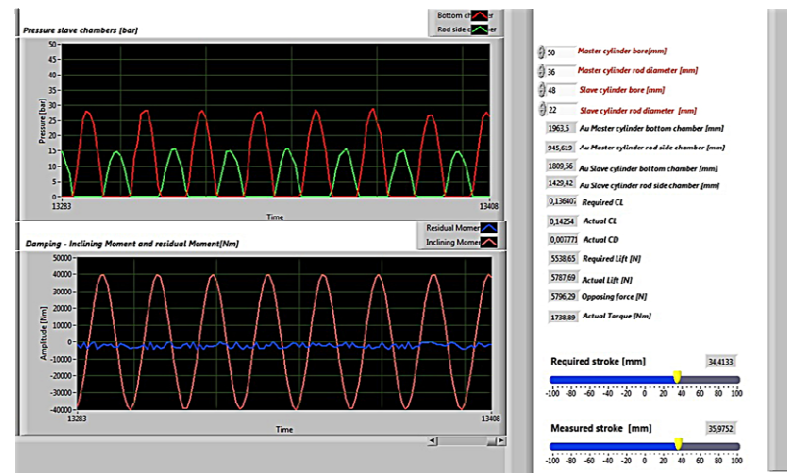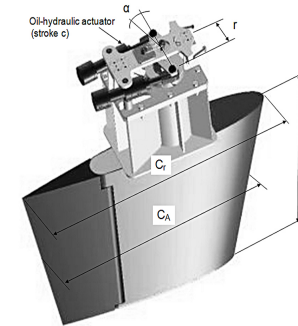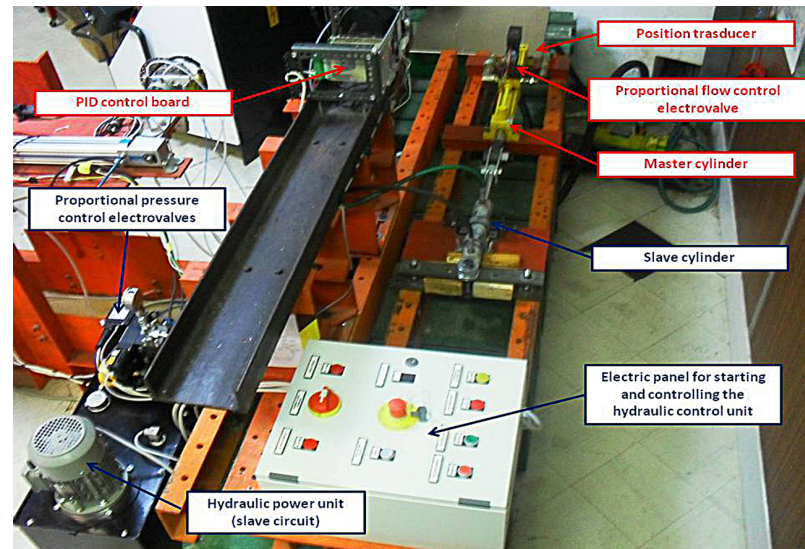
Implementation of preliminary designs of a non-conventional single unit of the "all-alike ships" fleet (BlackSheep) , assembling on board efficient wool recovery systems able to recover spilled oil from the sea surface.

Solar panels roof

Transverse rails

Pneumatic gripper

Pneumatic actuator

Island floor

Roll

Lamination roll actuated by screw
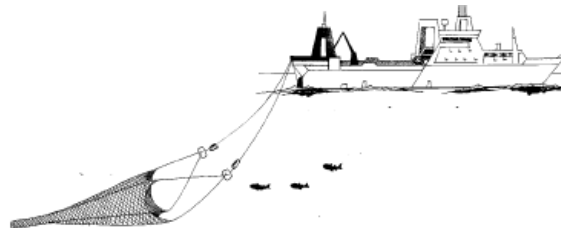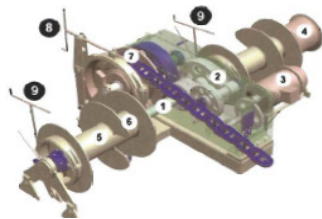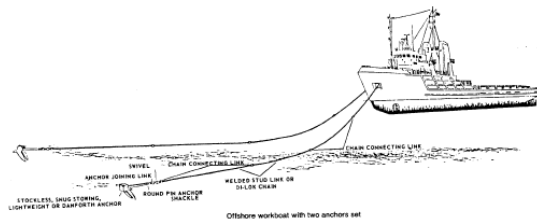
Driving of rudders with fluidic muscles
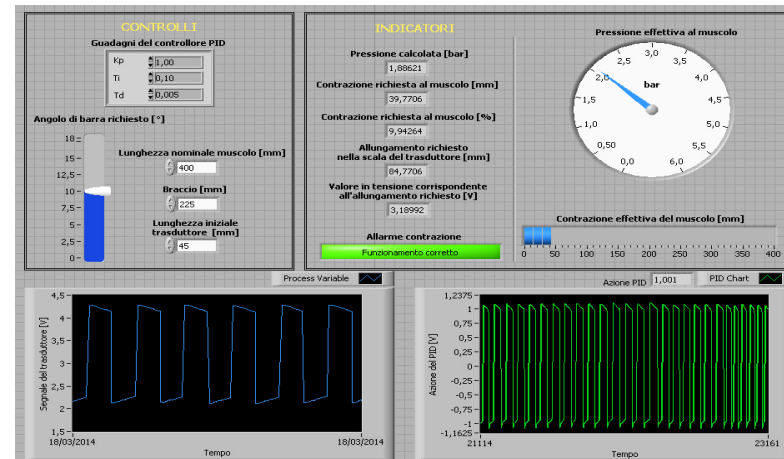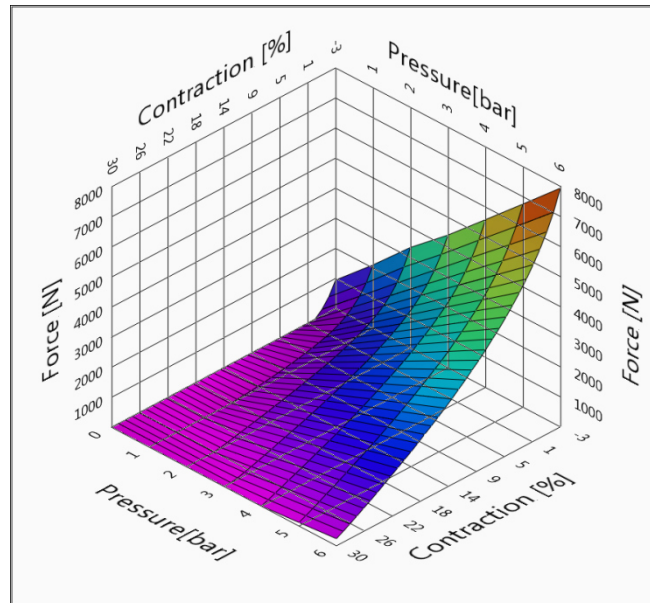
"Martronic" test bench for characterization of marine drives

DITEN
DREAMS
LAB

Position trasducer

PID control board

Proportional flow control electrovalve

Master cylinder

Proportional pressure control electrovalves

Slave cylinder

Electric panel for starting and controlling the hydraulic control unit

Hydraulic power unit (slave circuit)

Oil-hydraulic actuator (stroke c)

POSITION TRANSDUCER

MASTER CYLINDER   SLAVE CYLINDER

PRESSURE CONTROLLED PROPORTIONAL VALVES

FOW-RATE CONTROLLED PROPORTIONAL VALVE

PID

PLC

CONTROLLER

OIL-HYDRAULIC POWER SUPPLY UNIT(SLAVE CIRCUIT)

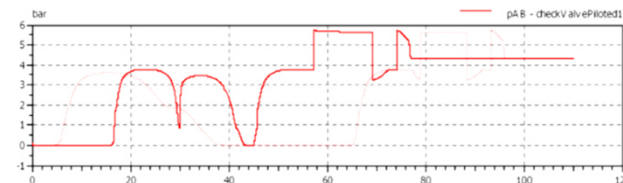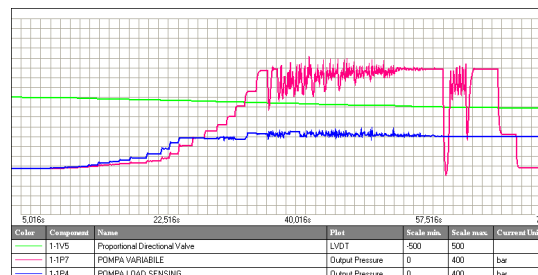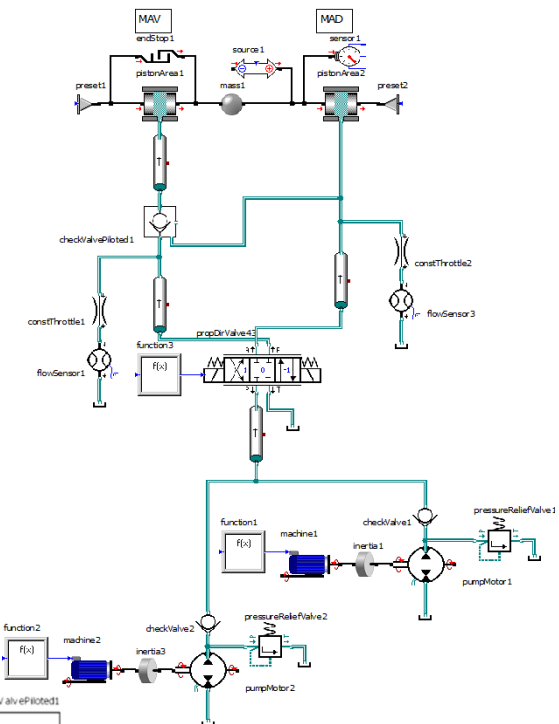OIL-HYDRAULIC POWER SUPPLY UNIT (MASTER CIRCUIT)

Automation of primary and secondary driving

Deck units: Analyses of load sensing driving
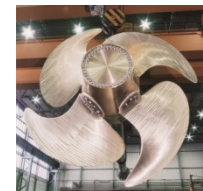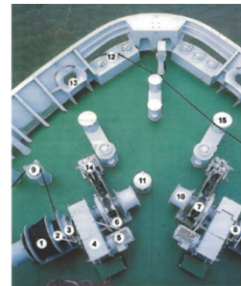
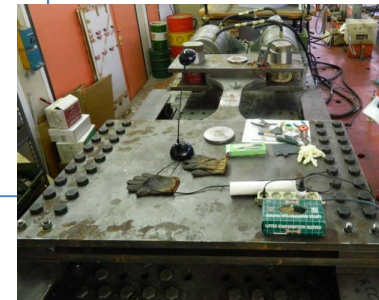Trim of blades in adjustable pitch propellers: modeling and dynamic simulation of components and circuit
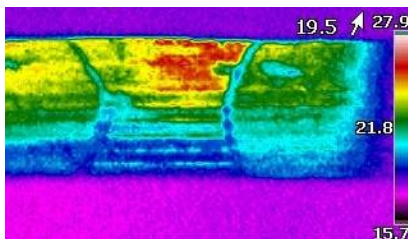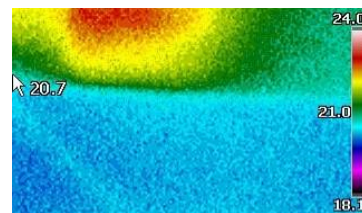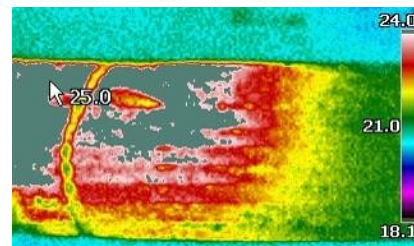
Monitoring, diagnostics and maintenance of structures, drives and marine systems
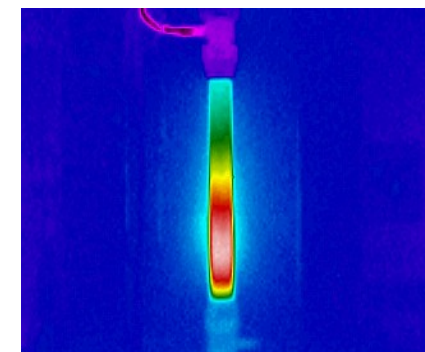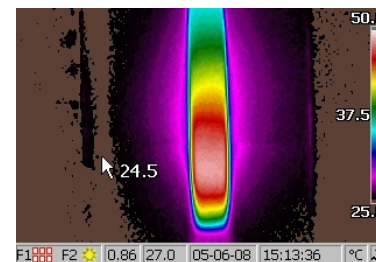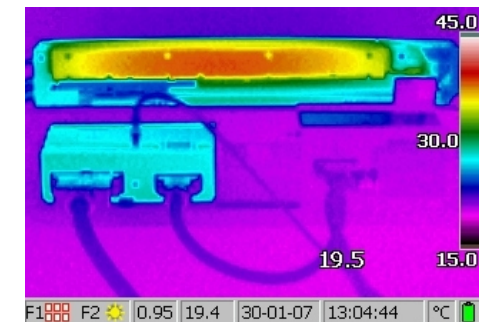

Driving of test bed for fatigue tests with servo-controlled oil-hydraulic units (in cooperation with MASTEL)

Thermo-graphic analyses of structures

Diagnostics of the dynamic response of innovative actuators for naval drives
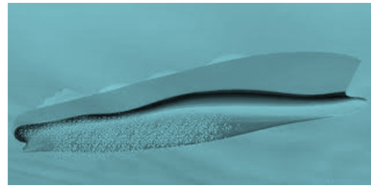
Vibratory and acoustic analyses in marine environments and on board components

- ❖ Dynamic analyses with 3D modeling
- ❖ Experimental modal analysis
- ❖ Acquisition and elaboration with portable units
- ❖ Detections with variable geometries microphones array
- ❖ Acoustic mapping
- ❖ Acoustic holography
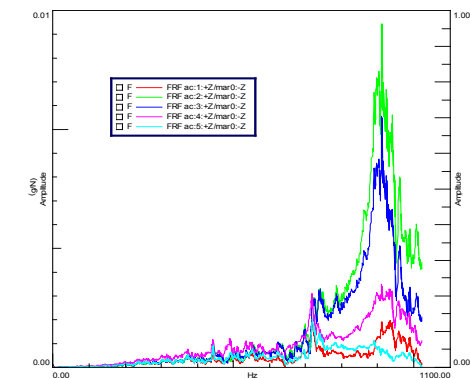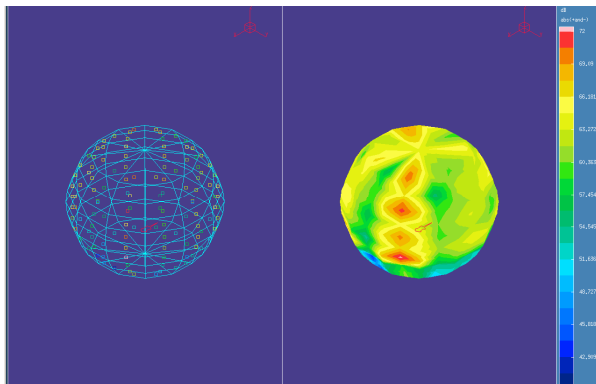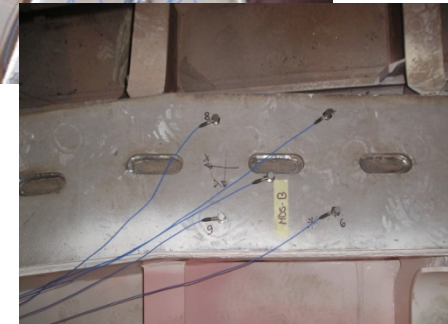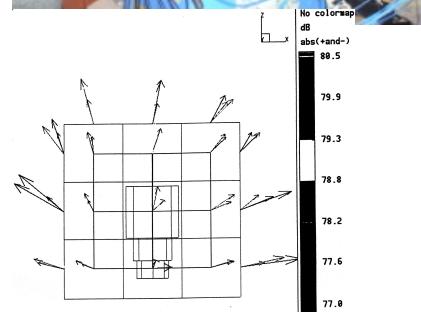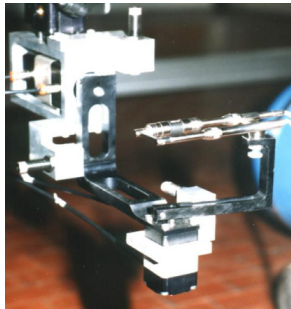
Some activities under development

Experiments of air lubrication and air bubbling on hull models

Desing of wavemaker with digital control for testing tank

Methodologies of diagnosis and maintenance of sub-systems on board (thrusters)

Simulation of platforms mooring in presence of extreme environmental conditions (squalls)
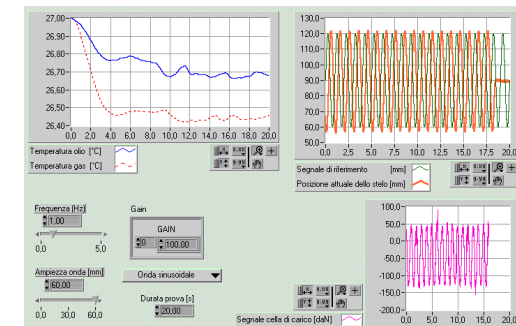
Detection of defects on marine structures by means vibro-acoustic techniques
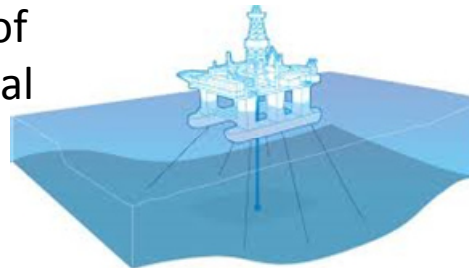
Structural dynamic interaction on supports of naval motors

Application of virtual instrumentation codes in monitoring and active control of unconventional test benches
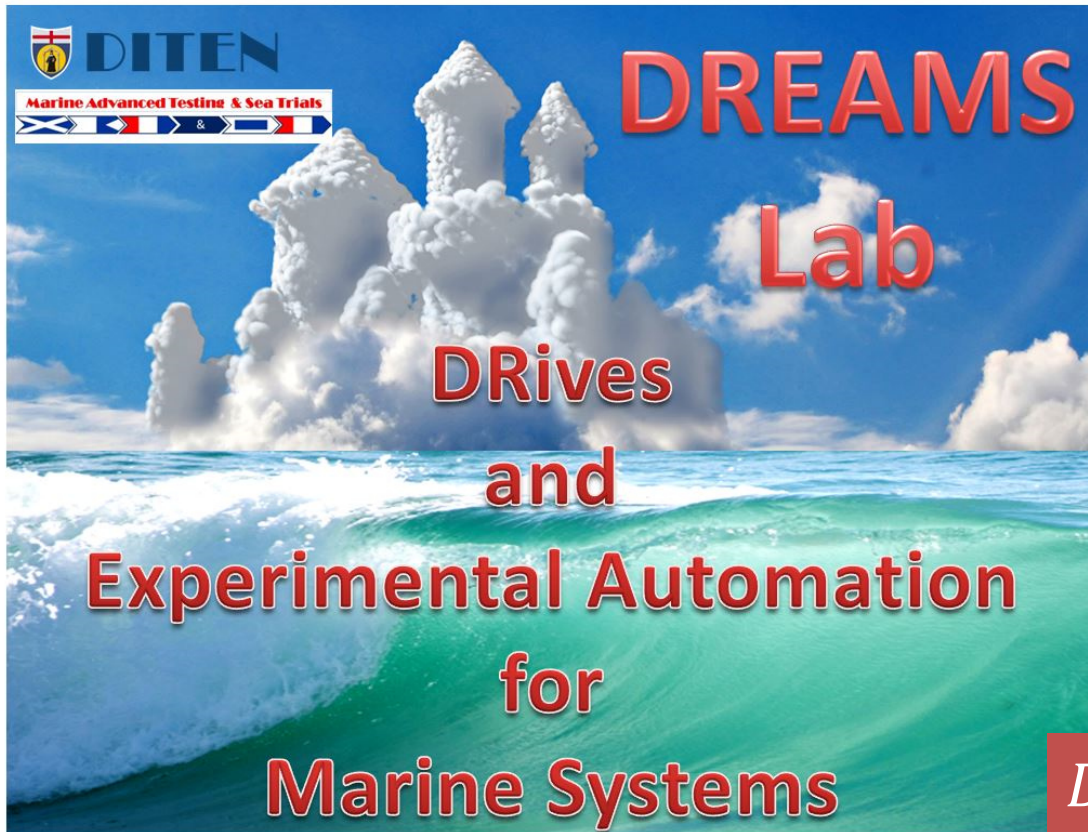
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