RESINEX News

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Oceans 4

Oceanographic production is on point

Resinex manufactures the widest range of products and guarantees high reliability, quality and versatility. As for the manufacturing of oceanographic buoys, Resinex can furnish both the hardware and software components, offering the most complete package possible.
Along with the classic large ocean buoys, Resinex produces small-size instrumental ones that can be used for monitoring purposes in port areas, lakes, and shallow waters in general.
In 2020, we also celebrate 25 years of Resinex syntactic foam for ultra-deep water projects, till 11.000 m: even the deepest point of the ocean is within our reach.

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Floats for a revolutionary ocean bottom seismometer

In 2019 Resinex supplied Güralp, provider of seismic instrumentation and monitoring systems, with special syntactic floats for an innovative project on earthquake and tsunami early warning for their customer, the **Dublin Institute for Advanced Studies** (DIAS).

In response to the project requirements Güralp developed **Aquarius**, a revolutionary **ocean bottom seismometer (OBS)** that delivers near real-time seismic data of earth motion from the ocean floor to the surface.

It is the most compact OBS, equipped with an acoustic modem, available in the market. The low profile and compact design is optimized to minimise the noise generated by the current flow.

The syntactic foam floats around the aluminium pressure vessel of the OBS provide the lifting force to bring the instrument back to the surface and it guarantees an **extended life and durability up to 6.000 m** of depth. Resinex supplied more than **40 syntactic floats** for the Aquarius, 10 of which have been used for the DIAS project, the remainder have been used for prototypes and for OBS development for other projects.

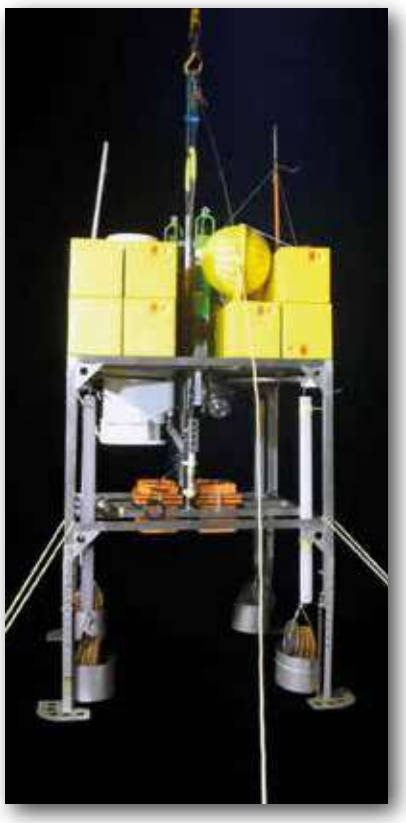
How does it work exactly? The Aquarius pressure vessel, that houses the sensor, digitizer and battery pack, is linked to a subsurface acoustic modem located on a weather buoy on the surface.

When the OBS sensor is triggered, it activates the acoustic modem; the surface buoy system then detects acoustic modem activity, collects the data from the OBS, which it then relays to DIAS via satellite modem. DIAS researchers can also send a request via satellite link to the surface buoy system requesting data from the OBS, the buoy then relays the data back to DIAS.

Deepwater buoys for the ESTOC in the Canary Islands

Located in the North of Gran Canaria up to 3.600 m of depth in the Atlantic Ocean, the **ESTOC (European Station for Time series in the Ocean)** has been monitoring the ocean for 25 years, contributing to many international programmes related to the ocean observation. It monitors meteorological, physical and biogeochemical data that are highly relevant with reference to the studies on the impact of the climate change, a topic that has becoming more and more relevant: international organizations are continuously asking for a global and stable ocean observation, both in the ocean surface and in the water column. Resinex has played a role in this important project thanks to its long experience as a manufacturer of floats for deepwater applications: 2 **subsurface buoys** rated to a depth of 500 m and 2 **ultra-deepwater buoys** rated to a depth of 3.700 m, with a net buoyancy of 200/225 kg and **filled with syntactic foam**, were supplied to **Plocan** (**Plataforma Oceánica de Canarias** – The Oceanic Platform of the Canary Islands), the scientific infrastructure in charge with the project, between 2018 and 2019. They are now part of the deep ocean mooring system operated by Plocan at the ESTOC observatory.

6.000 metres for NIWA



In 2018 Resinex supplied NIWA, the National Institute of Water and Atmospheric Research of New Zealand, with 30 syntactic foam half blocks for a research on the resilience of deep-sea benthic communities to the effects of sedimentation. The purpose of this project was to undertake a sediment disturbance experiment to investigate the impacts of a sediment plume on deep-sea benthic communities. This type of investigation is highly relevant given the current world-wide interest in the deep-sea mining of minerals. The work was undertaken on the Chatham Rise, in the south-east of Wellington, New Zealand. Three landers were each equipped with Resinex syntactic foam floats rated 6.000 m, and a variety of instruments were attached.
This was the first time these landers had been used, and their deployment and recovery were a complete success.

Instrumental elastic beacon in Tuscany

At the end of 2019 Resinex supplied Siap+Micros with one instrumental elastic beacon for environmental monitoring to be placed in the Gombo site in the north of Marina di Pisa (Tuscany), around 1 mile from the coast. The aim is the measurement of direction and speed of sea currents and the monitoring of wave motion. The project is managed by Regione Toscana, the administrative authority of the Italian central region.
The instrumental beacon reaches the depth of 13 m and is equipped with all the devices for data collection and transmission. The structure has an ample space on the tower and it's notably stable. This guarantees a monitoring accuracy that can not be reached with traditional buoys: the beacon actually replaced some instrumental buoys installed years before.

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Safe mooring in the Bahamas

Ocean buoys for marine condition monitoring

Ocean Cay, part of the Bimini islands in the Western Bahamas, has been recently transformed from an industrial sand excavation site into an extraordinary marine reserve, with the aim to revitalize the surrounding marine life and be an unmissable attraction for tourists. The company responsible for the transformation is MSC Cruises, that now owns the island and considers it one of the best destinations in the Caribbean Sea.

Thanks to the cooperation with Wärtsilä APSS, Resinex has recently taken part in the **Ocean Cay project** and has made an important contribution to its success.

At the end of November 2019, **5 Resinex oceanographic buoys** have been supplied to Wärtsilä APSS (with **MSC as final client**) and then installed around the entrance channel that leads to the port of Ocean Cay, where cruise ships bring every day thousands and thousands of tourists from all over the world. The buoys are powered by solar panels and equipped with a current profiler that **collects speed and direction of the sea currents** every metre over 10-metre water column. All this information is transmitted every 30 minutes from the buoys to onshore thanks to a radio telemetry system and then shared to the ship's control rooms.

Resinex furnished **not only the hardware components but the software too**, offering the most complete package possible.

Additional meteorological measurements such as temperature, wind direction, wind speed, along with pressure and humidity of the air are performed on the lighthouse of the island and transmitted.

All these data allow to coordinate operations and manoeuvres of the ships in the best possible way, according to sea and weather conditions, **preserving the safety** of passengers and of the crew on board.

Installation works started at the end of November 2019 and were completed quickly, despite the bad weather conditions: the first cruise ship was moored at Ocean Cay on December 5.

Instrumental buoys: small is beautiful

Along with the large oceanographic buoys, Resinex can manufacture **smaller instrumental buoys** usually used for monitoring purposes in lakes, port areas and shallow waters in general.

In search of innovative monitoring tools, in 2019 Corr-Tek required 4 instrumental buoys with a net buoyancy of 76,5 kg in order to implement the live water quality monitoring, with the aim to maintain the natural ecosystem and facilitate the sustainable growth of the Mincio River Regional Park (Mantua, Northern Italy).

In the same year, Colmar installed 3 Resinex buoys for environmental monitoring in the port area of La Spezia (Liguria, Northern Italy). The buoys were equipped with a multi-parametric CTD probe and a data acquisition and transmission system. Oxygen concentration, turbidity and pH of water were the main monitored parameters.

Other companies that Resinex has recently supplied with small instrumental buoys are the Italian Apphia and Biosurvey, an academic spin-off of the University of Palermo specialized in advanced technologies applied to aquatic systems.

An environmental monitoring station in Lake Garda

The University of Brescia has recently requested spherical and cylindrical buoys for the creation of a fixed floating station to be placed in Lake Garda, close to the Natural Park of Manerba. The aim is the real-time measurement of air temperature and humidity, wind speed and direction, solar radiation and temperature of the water column. The station is composed by a section emerging from the surface for about 2 m, where meteorological sensors are housed. The support column, that dives in for about 6 m of depth, is connected to the floating system composed of 4 floats. Moreover, 2 surface and 2 subsurface buoys allow compensation when the water level changes. The submerged part of the station is composed of a chain of 12 thermistors and an oxygen indicator. A data logger connected with a modem and an antenna for the data transfer via GPRS is placed just below the water surface.

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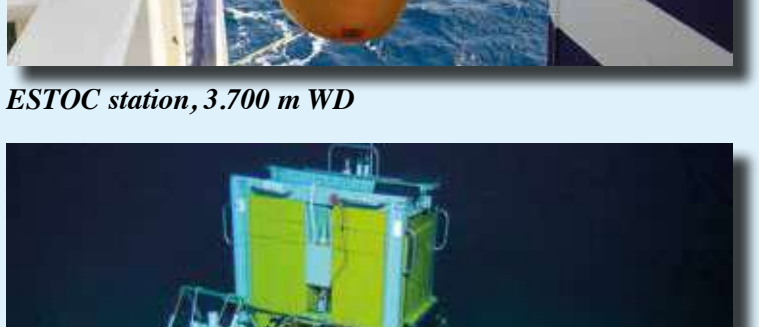
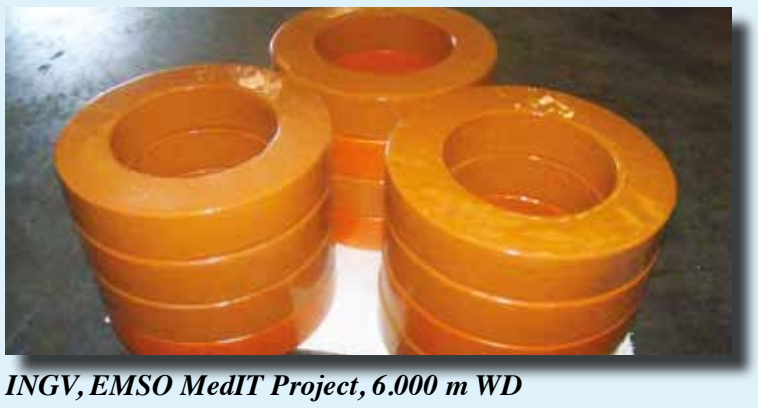
ESTOC station, 3.700 m WD



Geomar, Expedition SO242-2, 6.000 m WD

NIOT, 3.000 m WD

University of Southern Denmark, Hades Project, 11.000 m WD



INGV, EMSO MedIT Project, 6.000 m WD

LOCEAN, 3.000 m WD

High resistance up to 11.000 metres of depth

Resinex started manufacturing syntactic foam buoys in the early 1990s: after years of research and experimentations, it succeeded in creating the perfect compound suitable for floats that have to reach the deepest areas of the oceans.

The specific composition of Resinex syntactic foam allows the **underwater use up to 11.000 metres of depth**, where a high resistance to pressure and to different external factors are necessary: even the deepest point of the ocean is within our reach.

The key points are a very **high strength of the material** and a **zero water absorption rate**. The excellent performance of Resinex syntactic foam modules is always confirmed by the routine quality tests carried out at Resinex Marine Research Centre in Adro (Brescia).

Resinex synt 1000 at electronic microscope

The quality tests are essential, as Resinex always looks for improvement and product refinement. Another company's key point is the excellent **versatility**: Resinex can customize the syntactic floats according to the specific application and the depth of positioning.

Syntactic foam buoys are mainly requested in Oceanography and also in the Oil&Gas Industry. In O&G, Resinex floats are used for anchoring, medium and long-term positioning of submarine structures and pipeline installation at different depths.

After the first medium-small projects in the 1990s and early 2000s, Resinex acquired the necessary experience to deal with the major projects all over the world.

Tanks for hydrostatic pressure, hydrostatic crush and net buoyancy tests

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Resinex's Oceanography: an overview

Resinex supplies syntactic floats for Oceanography, both for business activities and scientific studies, where floats' application depth can be up to 11.000 metres. Projects are usually related to sea and environmental monitoring, tsunami warning and seabed studies.

The British company **Sonardyne**, the world market leader in underwater positioning, has been cooperating with Resinex for more than 20 years, asking for high performance floatation collars for its range of subsea acoustic transponders.

Through the years, **iXBlue** often required float collars and spherical buoys too, for the deployment of acoustic releases.

Resinex supplied **PLOCAN** with syntactic foam floats for the **ESTOC station** in the Canary Islands, a point of study and monitoring of oceanic activity.

Over time, also **Güralp** has often required special syntactic floats for a wide range of projects related to studies on earthquake/tsunami warning and ocean monitoring.

Among the most important Italian customers in the scientific field we can mention the **National Institute for Nuclear Physics (INFN)**, that carried out a study on high energy neutrinos by placing a submarine telescope on the seabed in the Mediterranean Sea **(NEMO Project)**, and the **National Institute of Geophysics and Volcanology (INGV)**, that required different special floats for the enhancement of multidisciplinary marine research infrastructures in Southern Italy **(EMSO MedIT Project)**. The cooperation with universities has always been really frequent.

Deep water buoys were delivered to the **University of Azores**, ordered by the Department of Oceanography and Fisheries: they were positioned off Ponta Delgada in the island of San Miguel as a support for the study of ocean currents and fish movements in the area.

The **University of Naples "Parthenope"**, in Southern Italy, requested deep water buoys too.

Another recent noteworthy project is certainly the one carried out for the study of deep-sea ecosystems by the **University of Southern Denmark (HADES Project)** in the Mariana, Kermadec and Atacama trenches at a depth of 11.000 metres.

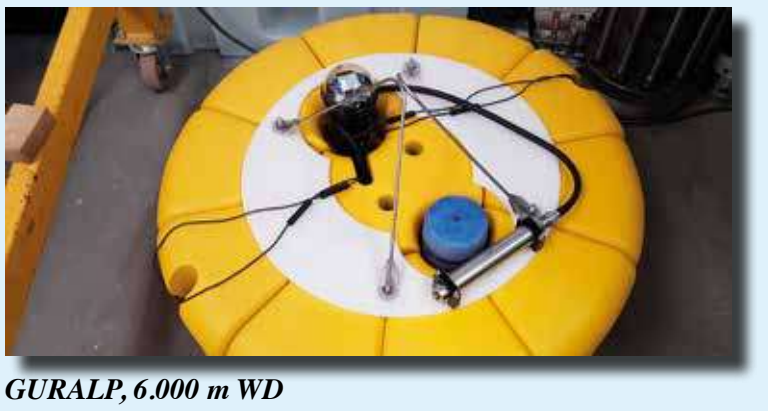
A similar project has been held by the **National Institute of Water and Atmospheric Research - NIWA** (New Zealand), that required syntactic modules to perform an experiment on the resilience of deep-sea benthic communities to the effects of sedimentation.

Through the years, also German scientists have often chosen Resinex's quality: the German institute **Geomar** required syntactic foam modules and floats for the **SO242-2 Expedition** in South America, in order to guarantee buoyancy for two elevators used to transport ROV-modules, sampling and experimental gears to the seafloor and back to the surface. The **Leibniz Institute**, one of the most prestigious European research institute, asked for various Resinex syntactic foam blocks for innovative experiments in ultra deepwater. Other German relevant clients are the **Alfred Wegener Institut** of Bremerhaven and the **Max Planck Institute** of Bremen.

As for Asia, one of the most relevant Resinex's client is the Indian **National Institute of Ocean Technology – NIOT**, that over the years has required hundreds of umbilical cable floats, cable risers and support buoys for various deepwater projects.

A dozen cable floats were also manufactured for **LOCEAN**, the **Laboratoire d'Oceanographie et du Climat** based in Paris.

Resinex is proud of having participated in some of the most important oceanographic projects all around the world, consolidating year after year the partnership with a wide variety of companies, institutes and universities.



GURALP, 6.000 m WD

NIWA, 6.000 m WD

Sonardyne, 3.000 m WD

INFN, Nemo Project, 3.500 m WD

University of Azores, 500 m WD

iXBlue, 3.000 m WD

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Instrumental elastic beacons

Resinex invented the elastic beacon in the 1960's. Through the years Resinex has projected innumerable applications for the beacons, adaptable for the most diverse usages (from signalling to environment control) in all sea conditions and of any depth. The elastic beacon is a semi-rigid structure with a metallic pole of variable length, fixed to the bottom by a concrete weight. The pole is kept vertical by a very big submerged float which can have various shapes and dimensions, according to the different sea conditions. Normally, the elastic beacons are equipped with a tower which is able to host at least two operators. The structure is extremely stable: this permits a high level of precision and monitoring unobtainable with alternative support systems such as traditional buoys. The particular characteristic of the Resinex elastic beacon makes it the ideal support for the instruments necessary for a correct and constant monitoring of the marine environment.

South Korean Western Coast: high reliability in extreme conditions

Resinex has accepted the challenge to supply elastic beacons which withstand extreme meteorological marine conditions.

After the supply of 3 instrumental elastic beacons in 2015, installed in the South Korean Eastern Coast, in 2017 Resinex has replayed with the manufacturing of further 3 big elastic beacons for monitoring, destined to the Western coast (Yellow Sea).

The South Korean Western Coast is known to be subject to extreme tides and typhoons.

Kigam (The Korean Institute for Geoscience and Mineral Resources) contacted Resinex to have the best support for the geophysical research and monitoring activities.

During the initial phase of the project, Resinex technical department received from Kigam real information about the meteorogical marine conditions during a typhoon: wave height 11.2 m, wind speed 180 km/h, current speed 4 knots.

Once completed the framework of the technical information, Resinex has ad hoc studied and projected three instrumental elastic beacons with peculiar characteristics. Two types of innovative software have been utilized: Orcaflex and Resinex Tethered Buoy System, specifically developed for Resinex from the Politecnico of Milan.

The intersection of the data coming from the two software programmes of simulation, has allowed to identify the best solution for the given parameters.

Then, ad hoc elastic beacons have been projected with a float of 4.3 m of diameter, 2.5 m of height and 16 tonnes of net buoyancy. Beacons have an average height of 51 m, a focal plane of 14 m to keep the visibility against high tide variations and have been realized for depths of 34.5 m, 34.6 m and 35.5 m.

They are also complete of an upper platform on which the necessary instruments for the monitoring are applied.

The installation in the Yellow Sea has been locally supervised by Resinex technicians.

A second elastic beacon for Stromboli Volcano control

In 2017 the Department of Earth Science of the University of Florence, required a second Resinex elastic beacon to monitor the Sciara del Fuoco, the zone of the submerged side of the Stromboli volcano. The first supply of the instrumental elastic beacon went back to summer 2008, as a mere experimental proposal for the analysis of the activity of the monitoring of the stability of the active side of the volcano, which following the effusive eruption in December 2002, it poured in the sea around 20 million cubic metre, causing an abnormal tsunami wave of 10 metre of height, which reached the Siciliy coasts and the Calabria coasts damaging the port of Milazzo and other areas of the Eolie Islands. The experimental phase with the first elastic beacon has met with success and above all, it has represented a turning point for the monitoring of the stability of the active side of the volcano. Through the instrumentations

applied on the beacon, it is possible to provide in real time the parameters of the control of the beacon, the inclination, the height above sea level and the geographical position. Moreover, all the parameters for the meteo-marine characterisation (significant height, wave period, wave movement direction, sea status, water temperature) and the potential tsunami waves produced by the landslide in the water of the emerged and submerged portions of the Sciara del Fuoco. The second Resinex elastic beacon was installed in October 2017 on the other side of the Sciara to have a complete monitoring of the stability grade of the volcano. The two elastic beacons have the main purpose of being "sentinels" and will have the task to automatically transmit and in real time the final alert in case of tsunami. The two elastic beacons are thus the cornerstone of the system of Early-Warning of anti-tsunami for the southern Tyrrhenian sea.

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Monitoring buoys and beacons in Jordan, Tunisia and Italy for the S&T Med Project

In summer 2016, respectively in Aqaba (Jordan) and in Mahdia (Tunisia), two Resinex light buoys for instruments were installed, while Resinex instrumental elastic beacon was deployed in Oristano (Sardinia) in 2017.

These supplies have been developed by two Italian companies: Idromarambiente and Bioethic. They are inserted in a wide project of environment monitoring named Sustainability and Tourism in the Mediterranean (S&T Med).

It is a strategic project co-financed by the European Union (through the ENPI CBC Mediterranean Sea Basin Programme 2007-2013) which aims to engage tourists and local communities in environmental monitoring and protection, by increasing their awareness of the values of coastal ecosystems with their associated services and, therefore, proposing an all-out experience of the destinations. This is key to ensure the sustainable development and management in areas where attractiveness depends by and large on the good environmental status of the coastal areas, its biodiversity and habitats.

Resinex buoys provide the necessary support to the instrumentations, which measure the environmental and meteo-marine parameters.

Buoys have a diameter of 2.1 m, a focal plane of 3 m and a net buoyancy of 2500 kg. They are complete of top mark (Saint Andrew Cross) with radar reflector, of a self powered marine lantern (3 NM of range) with solar panels and batteries incorporated.

The instrumentation on the buoys is composed of: weather station to measure wind, air temperature and humidity; submerged multi-parameter probe which detects the sea characteristics such as temperature, salinity, dissolved oxygen, pH, turbidity, chlorophyll, pollution; current meter and wavemeter to take the evolution of currents and the features of the wave-motion.

Buoys are equipped with webcams to provide information on maritime traffic, marine flora and fauna conditions and weather conditions.

The elastic beacon installed in Oristano is composed of a submerged float constituted by two modules in linear polyethylene of 2.1 m of diameter filled with polyurethane foam which guarantees a high resistance. It has a focal plane of 5 m with an operative depth of 11.7 m.

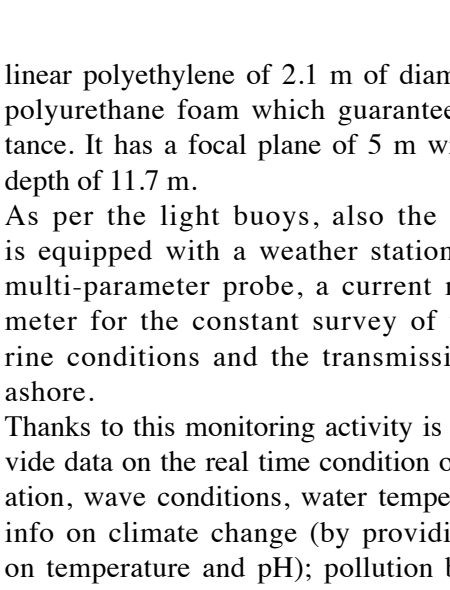
As per the light buoys, also the elastic beacon is equipped with a weather station, an immersed multi-parameter probe, a current meter, a wavemeter for the constant survey of the meteo-marine conditions and the transmission of the data ashore.

Thanks to this monitoring activity is possible to provide data on the real time condition of the solar radiation, wave conditions, water temperature, streams; info on climate change (by providing information on temperature and pH); pollution by hydrocarbon (industrial harbour, vessel tracks, oil dumping, etc.) and organic pollution.

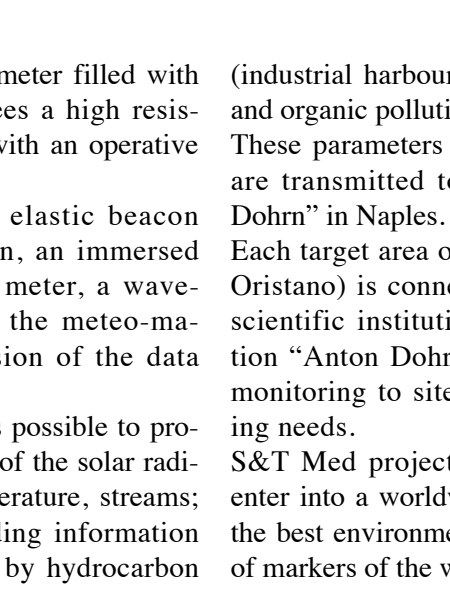
These parameters are acquired in a data logger and are transmitted to the zoological Station “Anton Dohrn” in Naples.

Each target area of the Project (Aqaba, Mahdia and Oristano) is connected to and supported by a local scientific institution that cooperates with the Station “Anton Dohrn” in customizing environmental monitoring to sites’ specific features and monitoring needs.

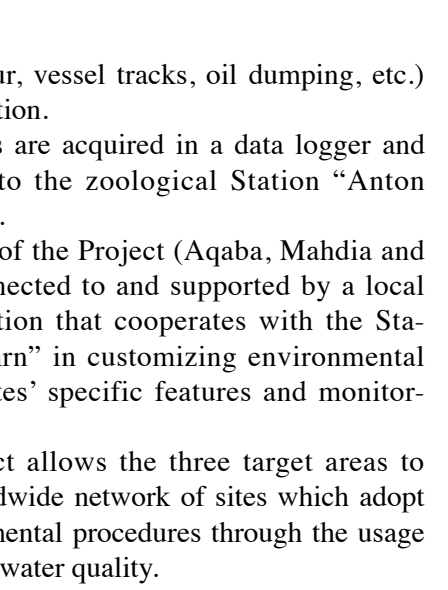
S&T Med project allows the three target areas to enter into a worldwide network of sites which adopt the best environmental procedures through the usage of markers of the water quality.



Aqaba, Jordan



Mahdia, Tunisia



Oristano, Sardinia

Wave and Wind control in Portofino

The Port Authority of Santa Margherita Ligure (province of Genoa) has changed the coordinates of the mooring area of the cruise ships which dock at Portofino. To signal and to create a safe zone for the mooring of the cruise ships, Marina of Portofino required the Resinex cooperation in supplying 2 elastic beacons type PEM 21, equipped with subsurface float with a net buoyancy of 4700 kg and a platform able to host two operators. The elastic beacons are 7 m high on the sea level and are positioned at a depth of 18 m and visible at 4 NM around the horizon. One elastic beacon is complete of a position transmitter for the A.I.S. localisation of the beacon itself, of an anemometer for the detection of speed and direction of surface wind (placed at 7 m from the sea level) and a wave height device with an ultrasound probe.

Monitoring natural hazards in the Black Sea

GeoEcoMar (Romania) has requested Resinex an instrumental elastic beacon for its first major initiative related to a regional early-warning system for marine geohazards of risk to the western Black Sea coastal area.

The need to kickstart this activity came from the proven vulnerability of the Black Sea area to the natural extreme events, such as earthquakes, submarine landslides, extreme storms, some of them with a high tsunamigenic risk. The elastic beacon is anchored to the sea bottom at 15 m depth, through a shackle SWL 35 tons, two stabilizing chains, connected to a concrete sinker of 20 tons. The emerged side is a steel platform that can host a high number of solar panels with a top mark, radar reflector and a self contained marine lantern with a range of 4 NM. The focal plane is 6 metres.

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Ultra deep blocks at 11.000 metres depth in the Mariana Trench

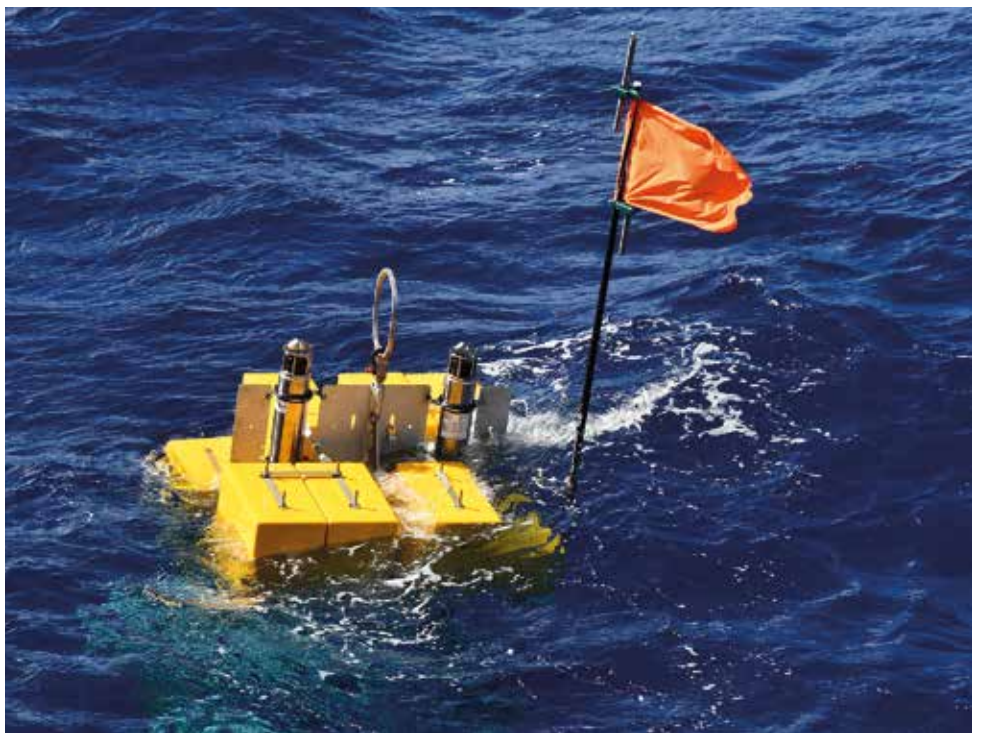
Resinex, with its wide experience in high depths, has been chosen to support each phase of the important project HADES granted to Prof. Ronnie N Glud at University of Southern Denmark, through the supply of syntactic foam blocks tested at 11.500 metres and used at 11.000 metres of depth to explore the deepest marine habitats on Earth.

The purpose is to analyze the processes responsible for the transport of organic material to the trenches, the mineralization processes in the trench sediments and characterization of the unique microbial communities mediating these processes. This project is 5-years-long and includes various cruises.

The first cruise was at the end of 2016 in the Mariana Trench, located in the Western Pacific East of Philippines, for which Resinex provided 10 syntactic foam blocks rated 11.500 metres. The blocks are rotationally moulded, manufactured in linear polyethylene and filled with Resinex syntactic foam which guarantees resistance at 1150 bars.

The blocks were tested in the Resinex Marine Research Centre with a hydrostatic pressure of 900 bar and then they were tested again by the University of Southern Denmark at 1100 bar in Japan at the Japan Agency for Marine-Earth Science and Technology. All the tests were successful.

The aim of the expeditions is to provide the first detailed analysis of deposition and mineralization of organic material in some of the most scarcely explored regions of the ocean: the deep hadal trenches.



The hadal depth zone reaches from 6.000 metres depth to the deepest sites on Earth at 11.000 metres in the Challenger Deep of the Mariana trench.

The trenches are virtually unexplored, but preliminary investigations suggest that trench bottom represents hotspots for the deep ocean with intensified turnover of organic carbon and nitrogen– presumably mediated by specialized microbes that are adapted to the extreme conditions at these depths. Given the extreme hydrostatic pressure, recovered biogeochemical and microbial samples are prone to be affected recovery artifacts. Therefore trustworthy measurements have to be realized directly at the trench bottom and microbial samples have to be fixed at depth before recovery.

In Summer 2017 Resinex provided 34 more syntactic foam blocks for new cruises in sites of Kermadec (November – December 2017) and Atacama Trench (March 2018) with a depth ranging from 8.100 to 10.900 metres.

During the research cruise to the Kemadec Trench, north of New Zealand, was carried out a detailed study of the biological processes in the trench using freefalling autonomous instruments. All instruments were equipped with syntactic foam from Resinex.

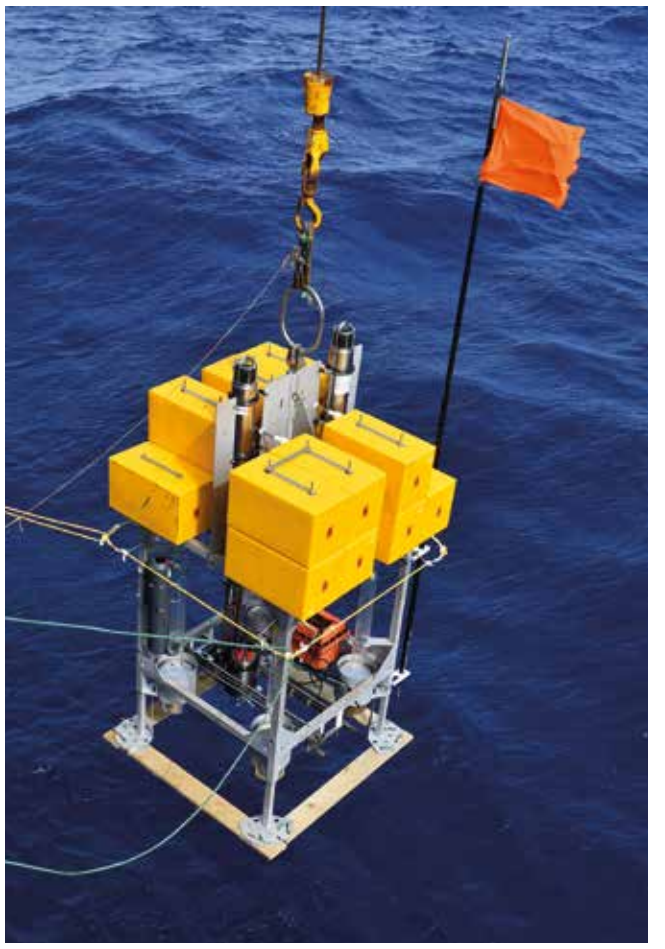
The instruments were deployed to depths greater than 9000 m and were used to study oxygen distribution in the seabed and recover sediment for ship based studies of biological processes and microbial diversity.

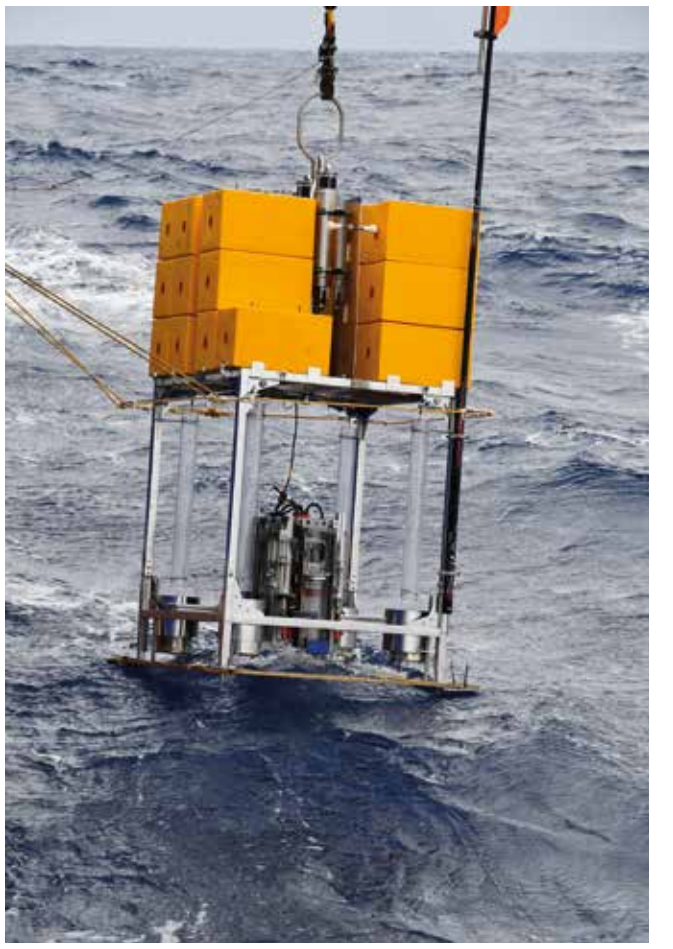
The first preliminary results from the expedition demonstrate that the Kermadec Trench hosted intensified biological activity with a surprising high degree of variability in the metabolic activity among the basins along the trench axis.

In March 2018, the study of hadal trenches will proceed during a research cruise to the Atacama Trench off the coast of Chile-Peru.

The three trenches, Mariana Trench, Kermadec Trench and Atacama Trench, are selected as they underlay waters of very different productivity that ultimately feed the benthic communities and thus represent three different hadal environments.

Apart from the lead partner at University of Southern Denmark, the research team includes researchers from Max-Planck Institute for Marine Science (Germany), Marine Biological Laboratory at University of Copenhagen (Denmark).





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Wave energy: the future

Wave energy belongs to the category of the renewable energies and its usage is increasing more and more in the last years. It is a resource of huge availability, high density of energy and stable over time.
Wave energy field needs always buoys of different sizes and various water depths to support the activity of transformation of the wave-motion into electric power.
For this reason, the new operators address to Resinex, as with its wide range of products constantly avant-garde, guarantees excellent results in terms of highest versatility, resistance and safety. Resinex has recently provided its experience for wave energy projects in Denmark, Spain and Sweden. The Danish company Wave Piston, in 2016, requested 4 Resinex buoys for the redeployment of its prototype wave energy system off the west coast of Denmark.
Wavepiston's wave energy system has been placed in the waters of DanWEC (Danish Wave Energy Center) testing site on May 11, 2017.
The wave energy prototype is comprised of a steel wire stretched between two anchored buoys which have a net buoyancy of 855 kg. Resinex buoyancy modules have been projected to be used in a horizontal position according to the request of the customer. The buoys are installed over a horizontal metallic structure which supports an automatic system check. Moreover, 120-meter long string has 8 optimized energy collectors planned to be mounted onboard. The device works when waves roll along the wire moving the plates back and forth. The moving plates pump seawater into pipe which leads it to a turbine that produces electricity. The expected output of the prototype is 12kW.
It was developed by a consortium which in addition to Wavepiston includes the Technical University of Denmark, Global Maritime Vryhof and Nurmi Cylinders.
In 2016, for the Spanish company Oceantec, Resinex projected and supplied a mooring system composed of 4 buoys for the installation of an energy converter from wave-motion along the coast of the Basque country with a seabed of 90 m.
A high resistance of the buoys is fundamental, as these are constantly exposed to strains and immersions by waves which are then transformed from the plant into electrical power.
The projected buoys have a net buoyancy of 3100 kg and weigh 560 kg/each.
In 2015, Resinex developed for Seaflex Energy Systems AB, 3 support buoys type PEM 21 installed near Landskrona in Sweden.
Buoys have a diameter of 2.1 m, a weight of 2020 kg, and a net buoyancy of 7500 kg. They are used at a water depth of 100 m.

Resinex at the Museum

In a period of great emergency, due to the frequent earthquakes which lashed our country, Resinex was invited to be a part of the earthquake exhibition, organized by the Municipality of Milan at the Museum of Natural History. The exhibition was held from the end of October 2016 to the end of April 2017. Resinex was asked to become a scientific partner of this exhibit, thanks to its wide experience in the field of the Oceanology projects, and of tsunami alert.
For this special event, Resinex made a model of Tsunami Alarm Elastic Beacon positioned in a tank, which simulates the wave movements in case of tsunami and earthquakes and its immediate alarm transmission at shore.
Specifically for this occurence, Resinex realized also a buoy 1800 x 3600 mm suitable to be equipped with sensors for the wave monitoring, which are able to launch in real time alert signals ashore.
Resinex buoys and elastic beacons, in fact, through specific instrumentations (powered by solar panels installed on the elastic beacon tower or on the buoy body) are able to reveal and to measure different parameters, such as: direction, speed and height of the wave. In case of irregular activity, they can immediately send warning signals. This exhibition on earthquakes has ranged from the anatomy of the Earth planet to the movements of the continents and plate, from the faults and earthquakes to tsunami and cover-drop-hold on prevention to the geophysical instruments, ending with the structural defense from earthquakes and the creation of earthquake proof buildings. Resinex has been chosen to represent the excellence of the Italian manufacture in the field of the sea seismic detection.
Its large experience all over the world, above all in countries with the highest seismic risk, has ensured the creation of models able to faithfully show to everybody the instrumentations nowadays used to control the sea activity.

RESINEX

Great results achieved offshore the Korean oriental coast

Photo 1, 2 and 3: assembly of the lower part at sea. The beacon structure is more than 40 metres long.

Resinex has specifically manufactured for Kigam (the Korean Institute for Geoscience and Mineral Resources), 3 big elastic beacons for instruments. They have been projected taking into consideration simulations using TetherBuoy 2 (a software for the numerical simulation of the dynamics of floating-moored structures), studied by Resinex with the cooperation of MOX (the Laboratory for Modelling and Scientific Computing).

The elastic beacons were manufactured at the beginning of 2015 and delivered in Korea last May, then installed in July 2015 under the supervision of Resinex personnel, offshore the Korean oriental coast in the Sea of Japan, at a depth of 80 metres.

The beacons are equipped with a huge turret (2x2 metres), able to host the power system (solar panels and batteries) and the electronic equipment which controls the devices placed on the sea bed by Guralp Systems Ltd, for surveying the geophysical activity and the transmission of data to-land.

Moreover, the beacon structure is more than 40 metres long and it is linked to the seabed through an anti-torsion wire rope ø 52 mm fixed to a concrete sinker of 25 tons.

The 3 beacons are placed at the vertices of a triangle and spaced out 300 metres each other.

Resinex quality and technology have fully satisfied the requirement of the well-known Korean Research Centre.

Photo 4, 5 and 6: assembly of the upper part, able to host the power system and the electronic equipment.

RESINEX

Elevators in ultra deep water

Syntactic foam modules at 6000 metres

Resinex has provided syntactic foam modules and floats to guarantee buoyancy at 6000 m depth for two elevators used by Geomar Institute during the expedition SO242-2 in Ecuador in summer 2015.

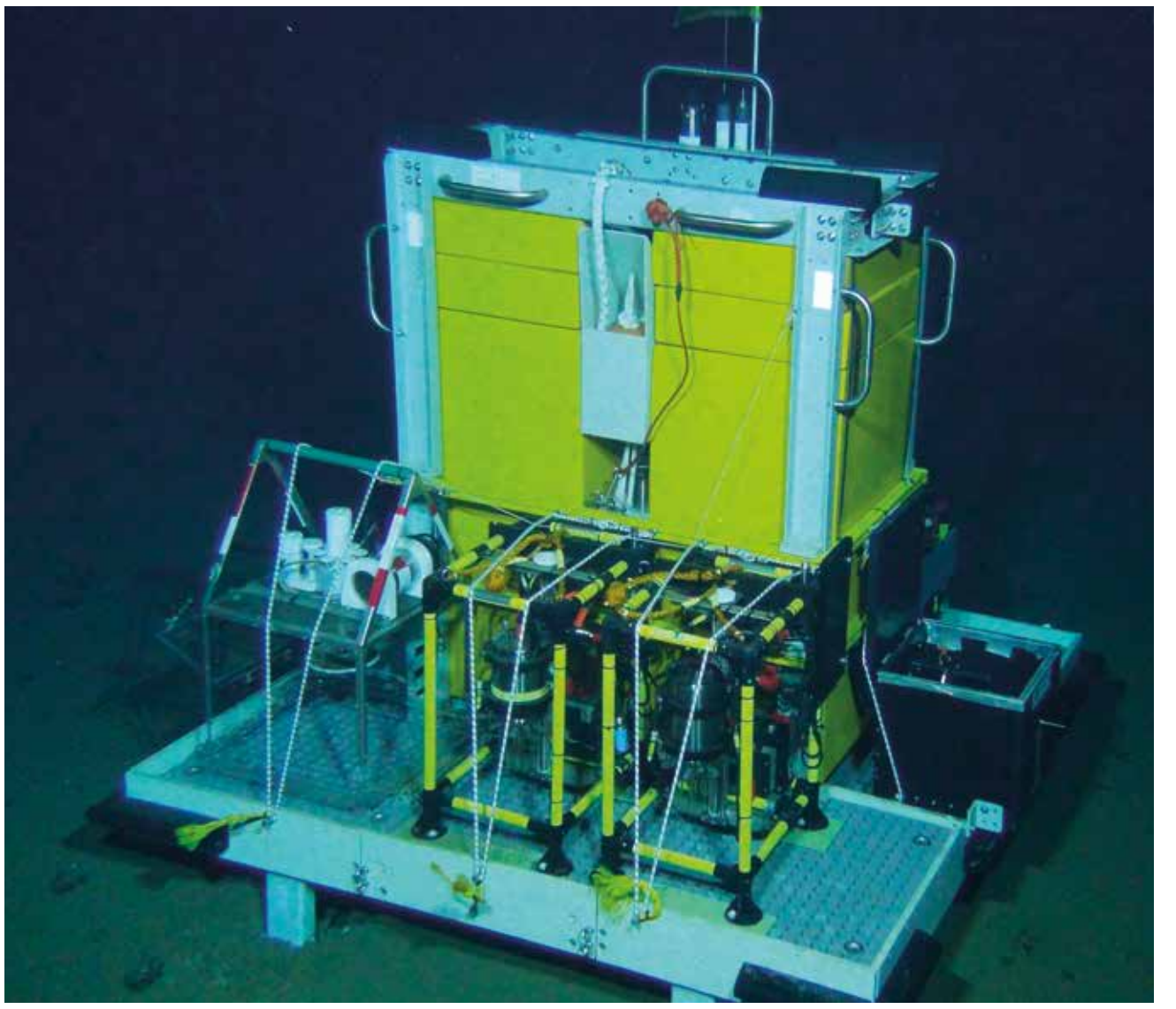
The Geomar expedition SO242-2 took place between 28th of August and 1st of October 2015 and led from Guyayaquil, Ecuador, into the Peru Basin in the southern tropical Pacific and back to Guyayaquil.

The two elevators were used to transport ROV-modules, sampling and experimental gear to the seafloor and back to the surface and to increase the efficiency of the ROV's bottom time, during cruise SO242-2. Whereas the first elevator has been used already on several cruises together with ROV KIEL 6000, the second one was newly designed in view of the large number and variety of different modules to be used during this cruise.

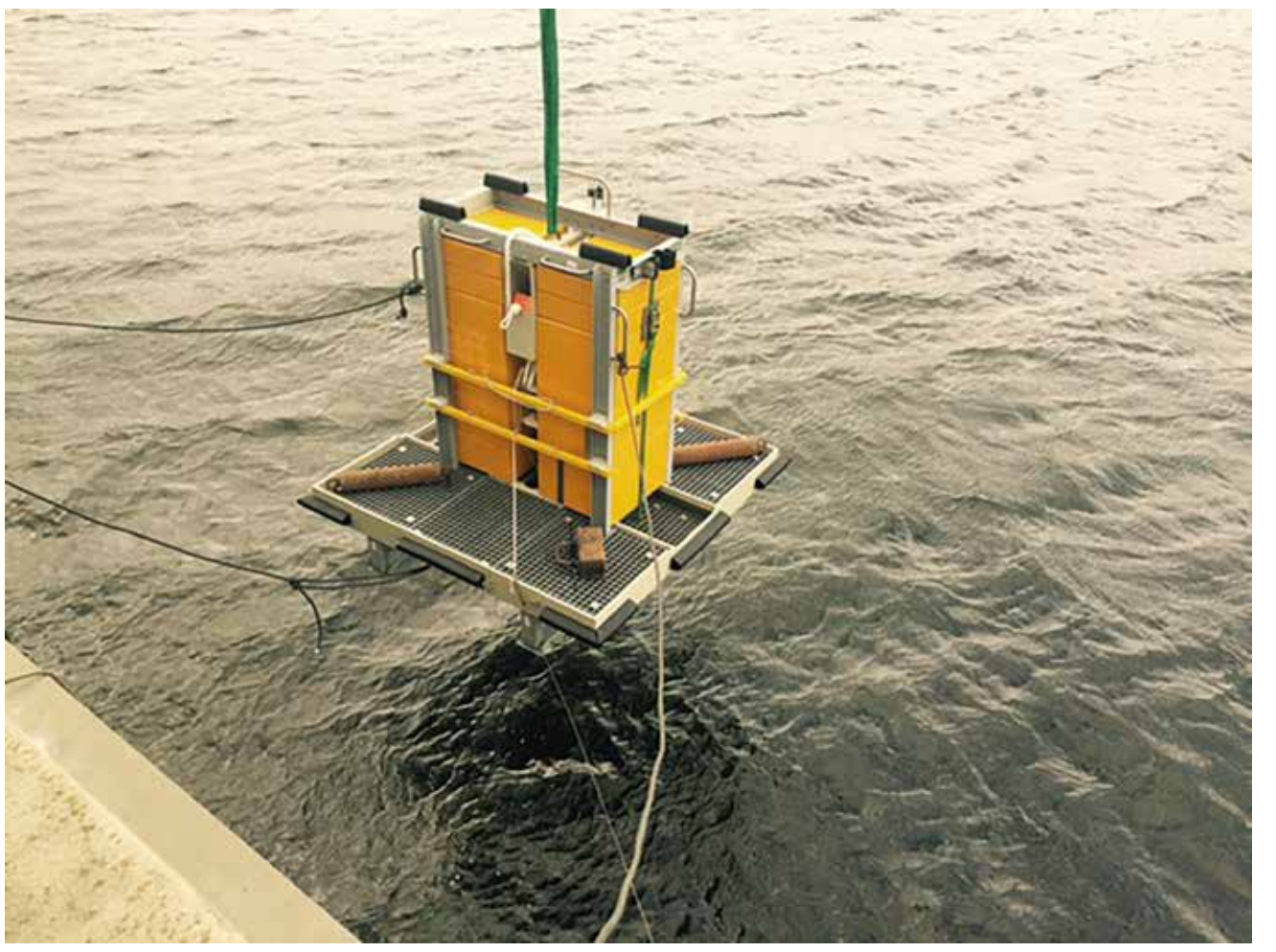
Both elevators were equipped with Resinex blocks of syntactic foam for floatation rated at 6000 m depth, with direction finding beacons for location at the seafloor, with dual KUM releasers and manual emergency release with ROV, together with flasher and radio beacon for relocation on the sea surface during recovery by using Resinex floatation line.

During the cruise, various equipment in different combination had to be transported by both elevators, either to be deployed and put back on the elevator by the ROV and/or used mounted permanently on the elevator and filled with samples by the ROV or attracted by bait.

Careful planning was needed to use the available space and payload of both elevators, secure the equipment during descent and recovery as well during ROV operations by the pilots.



In the middle of the elevator a box with a Resinex flotation line is visible, which can be released by the ROV pulling the orange line to facilitate the recovery of the elevator at the sea surface. Resinex confirms its capacity to produce syntactic foam modules up to 10000 m with ad-hoc shapes for customers.



RESINEX

6000 metres depth for geophysical and volcanic researches

The cooperation between Resinex and the Italian volcano experts is not a new thing. Indeed, our company has supplied various floats from 2010 to 2015. In 2010, as a matter of fact, INGV (National Institute of Geophysics and Volcanology) used Resinex technological support to create floats able to reach high depths and to withstand pressures up to 600 bars. The high performance of Resinex floats has brought INGV to choose Resinex again. This time, the Resinex contribution has concerned the supply of 24 special floats for the Emso-Med-IT project, the ambitious INGV project started in 2013 for the reinforcement of the infrastructures of marine research in Sicily, Campania and Apulia. Specifically, Emso-MEdIT is an aspiring project, coordinated by INGV and involves other research partners such as CNR (National Research Centre), ISPRA and INFN, whose main aim is to strengthen the marine infrastructures for monitoring sea beds of sites of particular strategic interest. It is about special ring floats, having a body in syntactic foam and a cover made of elastomer polyurethane, able to arrive at 6000 metres of water depth. Floats were installed during the summer 2014 off Cefalù coast during the TOMO ETNA campaign. In July 2015 Resinex was called again to supply high depth floats for EMSO MedIT Project after the successful results achieved last years. This time INGV through Mec-

canotecnica Riesi requested 88 syntactic foam floats with different sizes to realise two EMSO MedIT Projects. Deep water syntactic foam floats have been manufactured with a special syntactic material that does not absorb water. Moreover, the floats are able to reach 6000 metre depth and to withstand pressures up to 600 bars. Our quality always guarantees a proper support for important projects.

Resinex buoy to monitor the climate change

In 2015 Resinex created a special buoy for a Colombian Oceanography project in cooperation with Vansolix.

Resinex supplied an Oceanographic buoy PEM 18x1200 for 20 m depth built with special features able to support the instruments for measuring wind speed and wind direction, temperature, relative humidity, atmospheric pressure, pH, conductivity, salinity, water temperature, chlorophyll. This project, financed by Banco Interamericano de Desarollo (BID), was designed to monitor weather conditions and water quality in the archipelago of San Andres-Colombia specifically in Bolivar Cay to check the effects of climate change on the marine reserve “Seaflower”. The Seaflower MPA (Marine Protected Area) is located in the Southwestern Caribbean eco-region and, at this time, is the 7th largest MPA in the world at just over 6,500,000 ha. It includes diverse coastal and marine ecosystems of the Archipelago of San Andres, Old Providence and Santa Catalina. These surveys are very important nowadays to monitor the increase of surface temperature. These phenomena are linked to the bleaching of corals in the Caribbean and are expected to induce a pole-ward shift of local fisheries. Higher sea surface temperature is already threatening the viability of corals in the western Caribbean, much of it located in the Colombian territorial sea, which constitutes the nursery of an estimated 65% of fish species in the area. The project development objective is to support Colombia’s efforts to define and implement specific pilot adaptation measures and policy options to meet the anticipated impacts from climate change. For this reason, Resinex, strong in its experience about the supply of numerous MPAs in the world, has been chosen to provide the Oceanographic buoy guaranteeing a specific ad-hoc support for the weather surveys.

Resinex float collars 3000 m depth onboard subsea vehicles

In 2014 Resinex provided float collars to iXBlue equipped with stainless steel inserts and rated at 3000 m.

iXBlue is a leading global provider of innovative solutions and services for navigation, positioning, and imaging. Civil and defense customers rely on our systems, operations, and services for the challenges they face at sea, on land, in the air or in space.

The supplied floats were actually intended to be mounted around the body of an Acoustic Miniature Transponders from MT9x2 series.

These transponders are usually integrated onboard subsea vehicles for positioning through an USBL system under the hull of a surface vessel.

The MT9x2 devices were ordered by iXBlue featuring Fugro Survey in UAE.

RESINEX

US Navy acoustic array

Atlantic Undersea Test (AUTEC) uses Resinex buoys

In early 2012 Resinex supplied to Sound and Sea Technology (SST) of Lynnwood – WA – 4 big buoys for underwater usage (between 150 and 360 m depth). Maximum net buoyancy 2950 kg. The buoys were installed in summer 2012 in the South Atlantic Ocean. The end user is the Naval Facilities Engineering Services Center (NFESC) of US Navy that designed a Surface Ship Radiated Noise Measurement (SSRNM) array to be installed at the Atlantic Undersea Test and Evaluation Center (AUTEC). After that, Resinex received from SST a twin order of four buoys also to be deployed from 150 and 360 m depth. Maximum buoyancy 3600 kg. This time the four buoys were installed in 2014. NFESC is the utilizer of this mid-Pacific Surface Ship Radiated Noise Measurement (SSRNM MID-PAC) array off Oahu, Hawaii. The SSRNM MID-PAC system will be similar to the SSRNM AUTEC system with the hydrophone arrays and electronics being identical.

Resinex support buoys for Osean and French Navy project

In 2014 Resinex provided 51 floats RS3x700 rated at 1000 m to Osean to be used to support the sea-shore cable.
Osean is a company specialized in the survey and manufacture of innovative systems performing in harsh environment, including the design of scientific and military underwater systems.
With a second supply, we have provided one buoy E11x900 up to 1000 m to be used as support of underwater acoustic transmitter.
Both kind of buoys have been realized for an underwater measurement station for the French Navy, the maritime arm of the French Forces.

Advanced monitoring in the Black Sea

At the end of February 2015, the first of the 5 buoys commissioned to Resinex by Envirtech (on demand of the Turkish Meteorological General Direction), was installed.
Thanks to the cooperation of Resinex, Envirtech has achieved and positioned in the waters of the Black Sea, more precisely at 10 nautical miles northward Samsun, one hi-tech buoy for meteorological surveys. The buoy (type FP 2500 Monitor) is composed of a three module float (1800 mm wide, 1600 mm high) which supports a stainless steel structure able to host the survey system and data transmission system.
The supplied buoys are part of the ambitious project which aims to make a wide net of automatic stations for the environmental monitoring through buoys.
A project which started in 2014 with the installation of a similar system in the Marmara Sea (served by the Turkish Petroleum Corporation) and which now will be extended to all the Turkish waters. After Samsun, the same system will

be adopted in the Bosphorus, in Antalya Port and in Tasucu Port. The above mentioned buoys, besides giving a constant meteo monitoring, are able to make a considerable variety of surveys: from the water salinity, to the marine current measurements, passing through the wave measurement and the tsunami prevention.

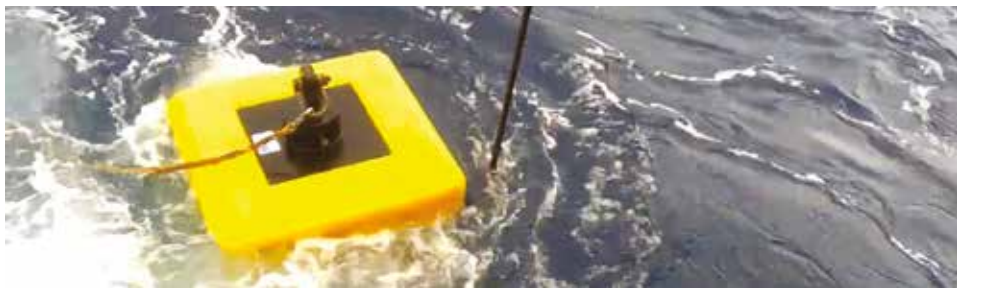
RESINEX

Wind monitoring with elastic beacon

RSE SpA - Research on Energy System - is a corporation of the GSE Group SpA (controlled by the Italian Ministry of Economic Development).
The company develops its research activities in the field of electro-energy, with particular reference to national strategic projects of general public interest.
RSE, in mid-2012, installed a large elastic beacon off the coast of Mazara del Vallo (Sicily Channel) to constantly monitor the marine weather data with particular attention to the wind.
This beacon, deployed at 50 metres depth, continuously provides data that will be used to provide guidelines for the installation of wind farms for the production of electricity.
Resinex has also supplied small buoys installed at the seabed of 50 metres.

Compact buoys for seismic activity in Brazilian waters

In early 2013 Resinex supplied 31 Deep Water buoyancy elements to GeoRxt-Brazil (now part of Georadar Group) for their seismic activity in Brazilian waters.
The buoys were especially designed to match the needs of the Brazilian competitor: they had to be reliable, compact, squared and able to go till 400 metres underwater.
Nett Buoyancy 1000 kg.



Tail buoys in partnership with Polarcus

The field of oil exploration is still one of the most important for Resinex. During 2012, we signed a major partnership with Polarcus, a company listed on the Oslo Stock Exchange, but with operational headquarters in Dubai, which creates seismic analysis in the sea with its own fleet of vessels. The two companies have studied and developed an innovative tail buoy, designed specifically for the study and the data transmission. Resinex has developed new moulds and created the prototype, following step by step, all the technical specifications of the customer.
The buoys will be used in the course of study of the seabed, to detect the presence of oil fields. At regular intervals the sound waves generated by underwater air compressed explosions will be gathered by the instruments positioned on the floats and then transmitted to the main vessel. About twenty prototypes were made and then placed along the west coast of Norway for a series of tests. The supply started in 2012 and has continued in the following years.

3000 metres under Indian waters

In the second half of 2011 Resinex supplied 150 pieces of umbilical cable floats to NIOT (National Institute of Ocean Technology) of India. The floats have been designed to maximize hydrodynamics and resistance under pressure at 3000 metres operational depth. The floats are used to generate a Lazy S curve during deployment operations of an Autonomous Coring System (ACS) using steel aramid umbilical. Nett buoyancy is 20 kg at 3000 m operative depth. Autonomous Coring System (ACS) is deployed by NIOT in joint collaboration with M/s Williamson & Associates, Seattle, USA. System is capable to take 100 m long cores from ocean basins up-to the maximum depth of 3000 m. System is integrated with pressure core sampler for the recovery of gas hydrates at in situ pressure condition.

RESINEX

Tsunami Alarm in Korea

With 12 very special Resinex PEM 43 buoys

From 2010 to 2015, Resinex has been supplying giant buoys to be used in an integrated system and anti-tsunami alert in Korea.

They were ordered by Oceantech, a specialized company, in order to be dislocated off the South Korean coast. We are referring to 12 buoys type PEM 43, 4,3 metres of diameter, 2 metres in height, which were delivered by our company throughout these years to the port of Busan. They were able to get a nett buoyancy of 23 tons and were positioned in the sea (with seabed of 150 metres) in a stretch of water where currents reach 1 meter per second with waves up to eight metres of height. On the marine component, Meteo CO^2 Monitoring and wave measuring sensors were installed. Besides these, even an acoustic transductor was positioned in order to receive signals from the submerged monitoring system. This supply goes together with many others of the recent years, all coming from Asia concerning tsunami alarm system.

German Oceanology up to 6000 meter depth

The Leibniz Institute at University of Kiel in Germany is one of the most prestigious European research institute. It has 750 technical and scientific employees all involved in marine science, geology and meteorogical researches. For new experiments in ultra deepwater also the Leibniz Institute uses Resinex syntactic foam blocks. During 2010 various blocks were supplied by Resinex to be used at a depth of 4000 metres and at 6000 metres.

The syntactic foam products are produced by Resinex in its specialized plant of Torbiato. Then, they are tested in the other specialized plant of Adro where the pressure and buoyancy test are performed. The pressure tanks at Adro plant can tests till 880 bars (8800 metres). The Leibniz Institute makes research in all the oceans' world. The four division studies: Ocean Circulation and Climate Dynamics, Marine Biogeochemistry, Marine Ecology and Dynamics of the Ocean Floor.

During 2013 Resinex supplied another important actor of German Oceanology. 140 squared floats with a nett buoyancy from 17 to 21 kg were supplied to Geomar.

The operative water depth is 6000 metres.

RESINEX

From the depths to the stars

A telescope in the Mediterranean to look at the sky

Descending until and beyond 3000 metres under the level of the sea even though it was projected to sustain pressures until 400 bars can be found the experimental Nemo project (Neutrino Mediterranean Observatory) which the Institute of Nuclear Physics (INFN) has in course to create a telescope of a new conception, baptised "Kilometro cubo" (Cubic kilometre).
The syntactic foam floats which support this installation are Resinex products, just as those used in 2005 during the first phase of the experiment. In the light of experience the new buoys have been made thinner, obtaining greater modularity. Purposely studied for deep water, they were positioned at the base of the mini towers which give support to the structure and are currently in the test phase. The Nemo project foresees the construction of a big submerged antenna in order to reveal high energy neutrins coming from astrophysic sources. Revealing the presence of neutrins could extend the knowledge of the actual astronomy which is based on the revealing of photons, that is light and electromagnetic radiation.
It also represents the biggest monitoring station (oceanographic, geophysical, chemical and acoustic) in the marine environment as well as a pole of technology development for the exploration of the abyss. The definite location will probably be off Cape Passero (Sicily), which will permit the telescope to be positioned at a depth of about 3500 metres and some 100 kilometres off the coast of Sicily. Under this stretch of water, the telescope will be in optimum position of darkness in respect to low energy cosmic radiation that at a more shallow level would counter it and not allow the observation of the neutrinos. It will extend for two square kilometres and is made up of 81750 metre high towers with about 5000 light sensors.

Buoy modules for RXT in Brazil

Reservoir Exploration Technology (RXT), the Norwegian company specializing in geophysic relief of the seabed exploration on behalf of the oil industry and seismic control has been furnished with Resinex support floats assembled on surface buoys destined for the new operational field in Brazil.
These are floating modules which support an installation for registering signals from the seabed. After the delivery of 40 medium depth buoys (300 metres) the Scandinavian company confirms the choice of Resinex buoys for its seabed mapping operation.

The Nemo module with Resinex orange buoys rated 4000 metre water depth.

Vulcanology at 6000 metres

The National Institute of Geophysic and Vulcanology of Rome (INGV), which carries out a precious work regarding seismic research and vulcanology is also involved in the study of underwater telluric phenomena. It manages among others a large band Mediterranean MedNet seismic nett which continuously monitors in deep water, reaching depths of 6000 metres. Also INGV turns to Resinex technology to have reliable and sure deep water syntactic foam modules. Resinex is able to produce floats which can support pressures of up to 1100 bars.

CNR uses Resinex deep water

The image refers to an oceanic moorage with a Resinex buoy by Cnr-Issia of Genoa and Enea-Cram of La Spezia near the Odas Italia 1 buoy-laboratory anchored in the middle of the Ligurian Sea at a depth of 1200 metres.
The positioning was carried out by technicians from the National Research Centre (CNR) and the Italian Navy ship Tavolara. The Resinex buoy was studied to operate at a depth of 300 metres and will be utilized in the sphere of the CNR experiments.

RESINEX

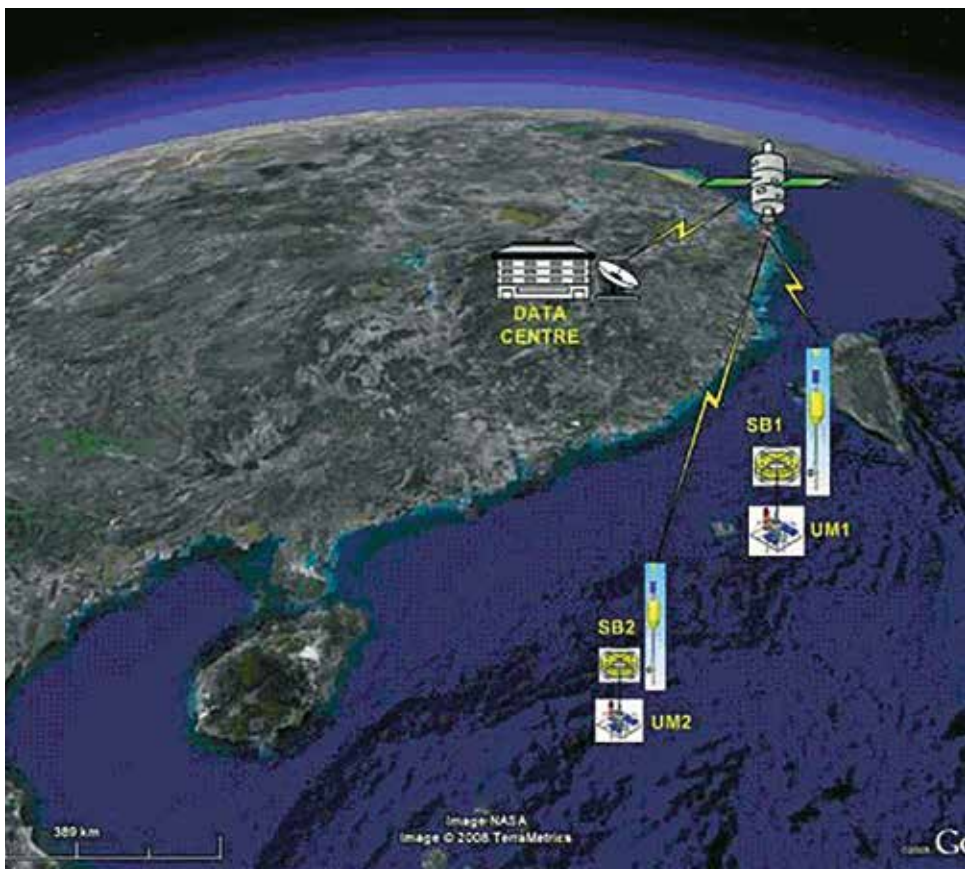
Tsunami sentinels

Warning system in the southern Chinese Sea

The two early warning anti tsunami systems consigned to the state oceanographic administration of the People's Republic of China that are to be positioned in the South China Sea will use Resinex buoys. This is the marine component of the system and is made up of two Poseidon class Envirtech tsunamimetres positioned at a depth of about 4000 metres and supported by two oceanic Resinex buoys built to resist force 12 seas and of two mooring lines formed by Resinex Synt floats studied for 4000 metre depths. The system will have to remain the sea for two consecutive years without maintenance in a zone continually bombarded by tropical typhoons. The buoys, extremely stable, will have to withstand more than 120 kilometre winds and 12 m waves, conditions which are, by now, very frequent in the South China Sea.

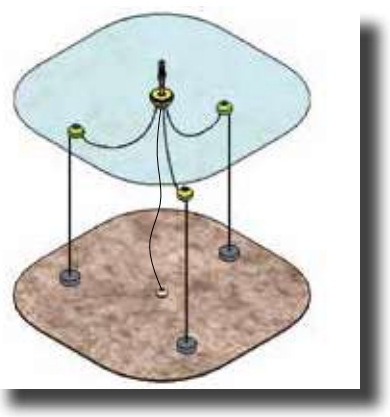
The system is composed of two monitoring stations dislocated at a depth potentionally covering between 500 and 7000 metres which transmits pressure parameters taken from the seabed and relays them to the surface buoy which in turn transmits the information via satellite to a control centre situated in Beijing therefore giving the alarm for a tsunami generated off the southern Chinese coast.

Deployment of the buoys in the China Sea.



Above, the monitoring system diagram.

A non-rotation anchorage

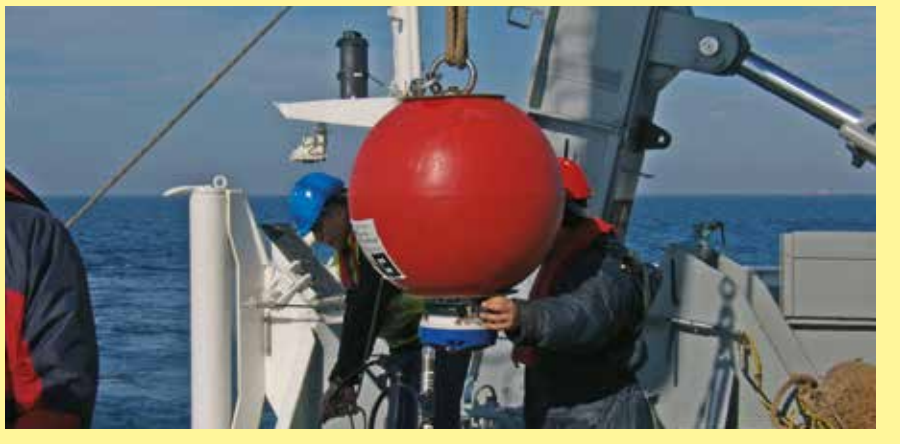


Corr-Tek is a company which is involved in the production of scientific measuring instruments for water monitoring as well as planning and installation of plants for measuring drainage and in controlling physical and chemical water parameters.
It had to project a marine surrey station, particularly stable, positioned off the port of Goro (North Adriatic). Our technical office, as a result, created a floating laboratory formed by a central buoy with three anchorage points supported by jumpers which guaranteed both stability and resilience.

Otranto: canal monitoring

The National Institute of Oceanography and Experimental Geophysics (OGS) of Trieste has installed an instrument monitoring buoy in the Otranto canal as part of a European project.
This is a floating system connected to a depth of 1200 metres and fitted instruments and sensors in order to carry out profiles of the wind and water.
For this project a Resinex model PEM 18 buoy was used with a float of 1.8 metre diameter with a signalling lantern.
The power is guaranteed by solar panels.

Among the Antarctic ice



It was tested twice. The first time in February 2009 in the Black Sea by the Nato alliance research ship.
The second time in the central Ligurian Sea by the Italian naval ship Tavolara.
We are speaking about the Resinex model RS6 buoy which is destined to carry out scientific experiments in the gelid waters of the Antarctica.
It will be part of the national research programme in Antarctica, an Italian project which is studying planetary phenomena.

A sonar in the Alaskan fiord

Resinex buoys for measuring acoustic health of U.S. Submarines

Its name is SEAFAC, which stands for Southeast Alaska Acoustic Measurement Facility, and it is an important and continuing U.S. Navy project developed by Naval Surface Warfare Center (NSWC) for the purpose of measuring the acoustic signatures of naval vessels. Science Applications International Corporation recently upgraded the measurement capabilities at the facility on behalf of NSWC. As part of these facility upgrades, SAIC opted to use Resinex support buoys.

The SEAFAC site, in operation since 1991, is located in the Behm Canal, a fiord in an isolated area of Alaska, near Ketchikan. The location and depth of this fiord provide low environmental noise levels, without acoustic interference. In this remote, quiet environment, advanced measurements are carried out to assess the noise levels generated by American submarines while navigating at full speed in deep water. The aim was to reduce noise levels to a minimum for the latest Seawolf and Virginia classes of submarines. SAIC will mount these highly sensitive hydrophone arrays on two cables supported by two large Resinex support buoys suspended 45 metres below the sea surface. When the submarine passes between the two arrays, the system will acquire all of the necessary acoustic measurements. This process involves the use of costly, sophisticated, and advanced electronic equipment, and Resinex is pleased that SAIC has chosen to use its Resinex type PEM 21 floats (2.1 metres width by 3.1 metres height, tested to operate at a depth of 60 metres and produce 6 tons of nett buoyancy).

Reliability: Resinex buoys keep the sensor lines under tension at 45 m depth.

Sound in depth with Sonardyne

The British company Sonardyne, the world market leader in underwater positioning continues to cooperate with Resinex for the supply of high performance floatation collars for its range of subsea acoustic transponders. The smaller floatation collar is able to support transponders to depths of 500 metres while the larger float is designed for transponders operating at depths of 3000, 5000 and 7000 metres.

University deepens its study in the abyss

The buoys on the deck before deployment.

Tested to operate in total safety to a level of 500 metres below sea level, 2 deep water buoys were delivered in Autumn 2008 to the University of Azores. The 2 buoys were ordered by the Oceanographic and Fish department of the said University and are positioned off Ponta Delgada in the island of San Miguel as a support for its study of ocean currents and fish movements in the area.

They are 2 floats formed by an external shell in polyethylene rotationally moulded filled with syntactic foam capable of resisting at great depths.

Both buoys are vertically crossed by a steel bar.

The bigger one measures 1.2 metres in diameter by 1.24 metres in height and has a swivel type hook for every extremity that can become 1.75 high (produces 745 kg of nett buoyancy).

The other, 1.15 metres in diameter by 1.15 metres in height, which in its upper part can accommodate a sensor, generates a nett buoyancy of 710 kg.

RESINEX

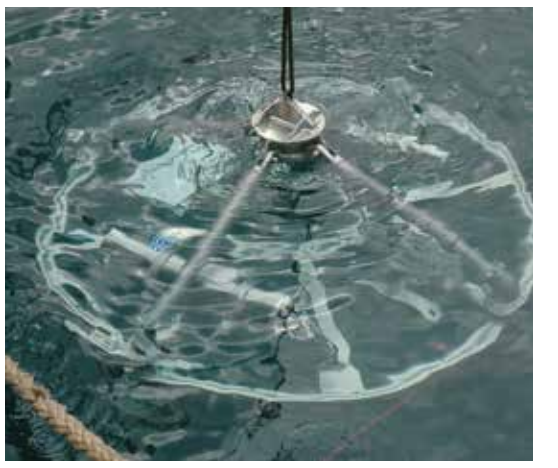
Telecom test at 2090 metres depth

The first tsunami warning system in the Mediterranean Sea

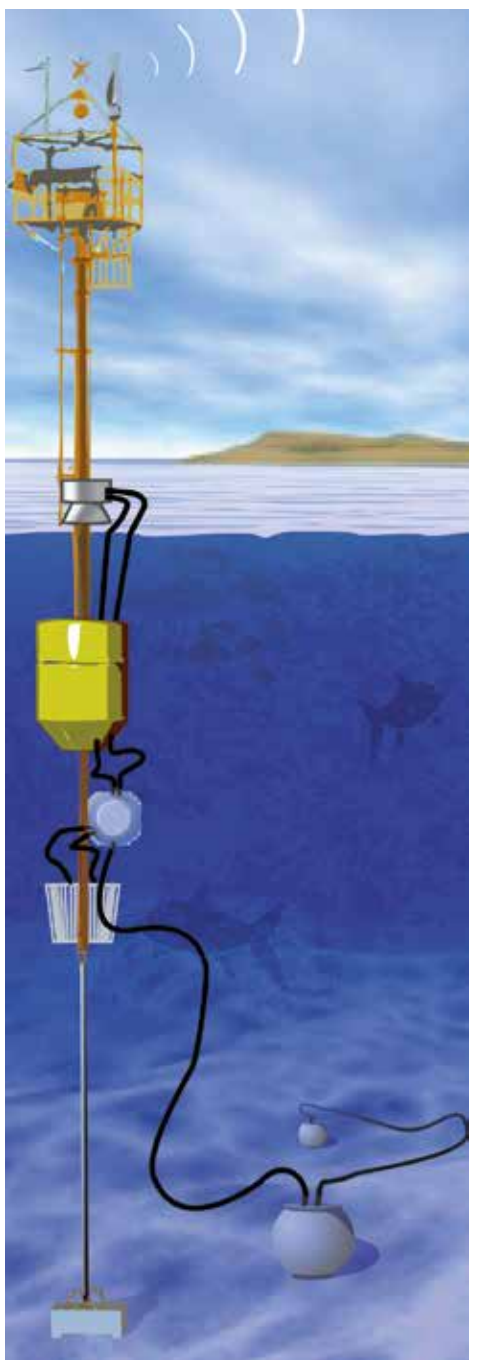
The first step, towards the end of 2006, consisted of the positioning of the system in the South Tyrrhenian, a few kilometres off Palermo at a water depth of 2090 metres. This was the test system for the Me Tas Mediterranean Tsunami Alarm System, a project for the monitoring of the water and sea bed instituted by Telecom Italia using Resinex buoys.

The prototype consists of two principle components, always linked together by a bi-directional acoustic modem: a platform is situated in deep water and float for satellite transmission. The platform collects the data provided by the sismometres and also records pressure variations, directly correlated to the indications of an expected tsunami or to the passage of one. The buoy, through the modem which remains connected to the platform on the bottom, transmits the data via satellite to Les Immarsat of Fucino which in turn passes it onto the Envirtech laboratories for preliminary tests.

Finally everything is elaborated by the Environmental Agency and Technical Services (Apat) which gives scientific support and approval of the results. This experiment, which makes use of giant Resinex floats (a buoy of 1.3 metres in diameter and 13 metres long assigned to the receiving and transmission of data plus another 11 deep water buoys for the buoyancy of the mooring system), has the scope to calibrate the measuring procedure and alarm. The data and any danger warnings flow directly to a control centre which in turn passes such information to the competent authority. The system can be transferred to every port of the world and positioned at any sea depth and has therefore a vast range of potential appliacations.



Above, the long Resinex buoy on the deck. Right, positioning of the deep water platform.



Alenia controls the bradyseism

The bradyseism of the Gulf of Pozzuoli is the old phenomenon which produces the upward slide of the coast and the slow but inexorable deterioration of the inhabited area.

This zone is scrutinied by every type of monitoring and it is exactly here that Resinex, in Autumn 2006, gave its own contribution with a big beacon which made up the floating competent of the project developed by Alenia (www.alenia-aeronautica.it) through Meg Sud.

It is a system of control and analysis positioned at a depth of about 100 metres and linked to a central exchange situated on a square metal tower which transmits all collected data to a land base. The equipment is powered by solar panels able to generate a power of 200 watts with a tension of 12 volts.

The choice of Alenia to use an elastic beacon anchored in 100 metre deep water is the most recent testimony of the reliability and versatility of Resinex elastic beacons “invented” by our company in the 70’s and used in hundreds of installations throughout the world.

Rogue waves, the Thai organisation

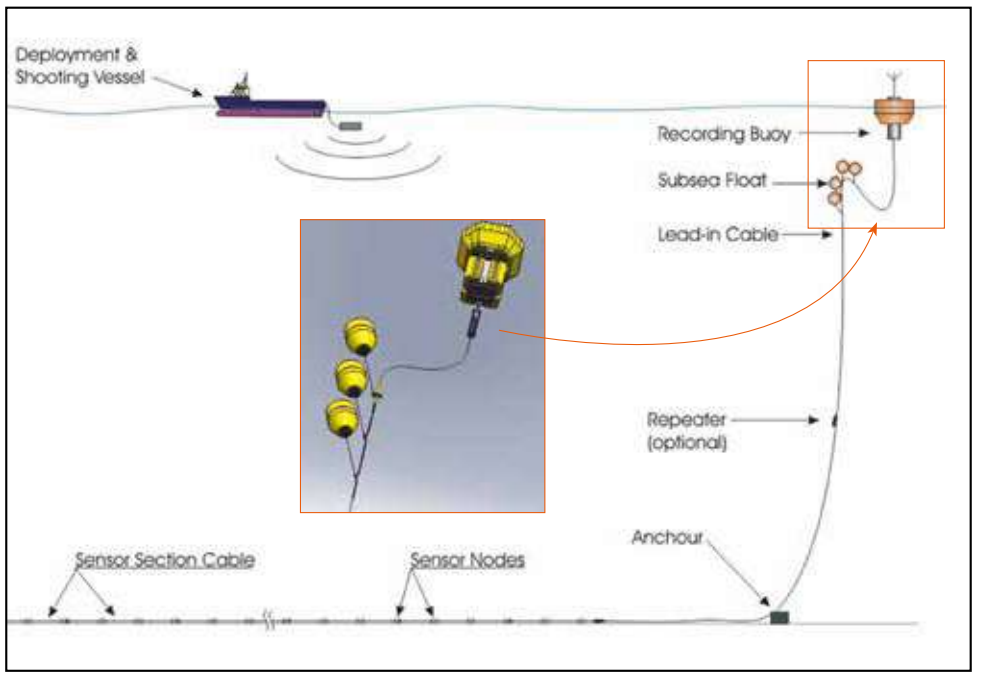
Resinex has supplied 2 Spar buoys for the Thailand tsunami warning system designed and developed by Envirtech. The buoys are installed in the Andaman sea at about 200 nautical miles from the Thai coasts at 2300 and 2700 metres of water depth. Each buoy is equipped with redundant acoustic link and satellite link for the communication with underwater module for the detection of tsunami waves and with a data centre located in Bangkok for the reception of tide data and alarm messages. Each buoy is equipped with solar panels autonomous power supply system, with wireless link for data communication, Gps receiver, signalling light and radar reflector Iala compliant.

The stability of the Spar configuration allows to get reliable acoustic communication also in case of high sea states. The implemented system allows to increase the safety of the Thai coasts providing an alarm one hour in advance in case of detection of anomalous waves over the normal tide.

RESINEX

Seismic activity in the seven seas

40 buoys for sea mapping

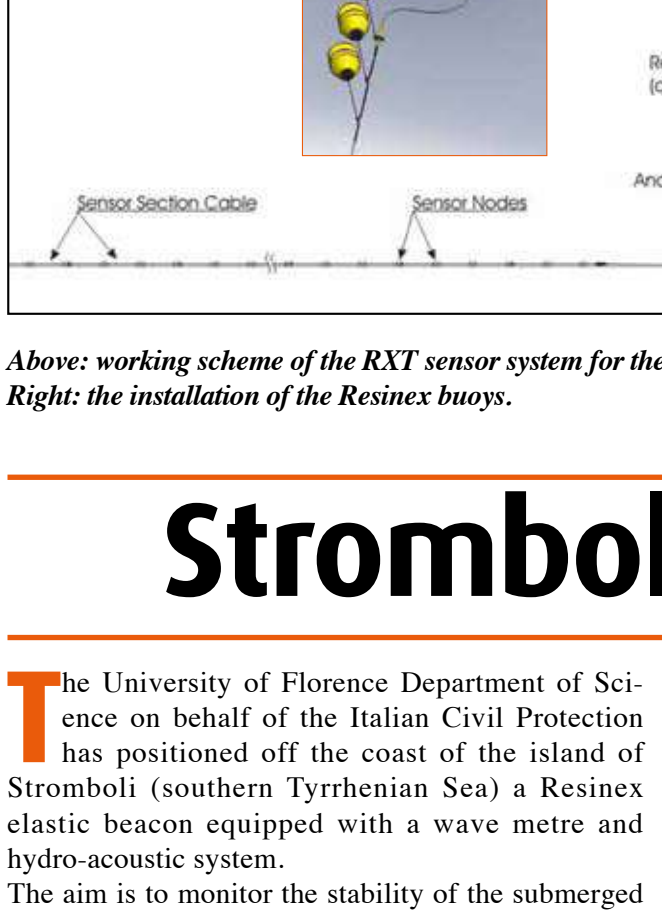


Above: working scheme of the RXT sensor system for the sea bed detections. Right: the installation of the Resinex buoys.

Reservoir Exploration Technology (RXT) was a Norwegian company extremely specialized, with branches all over the world.
They deal with geo-physical relief and with the acquisition of data about the sea bed for the various usages, from the checking of the sounding depths, to the positioning of cables and hoses, to the detections for the oil industry.
RXT puts on the sea bed the sensors, arranging a series of special cables which communicate with the signals emitted by the support vessel and send the data to a surface buoy which records them. The sensors grant a precise and detailed analysis of the ground.
Since 2007 also RXT has discovered the reliability of Resinex deep water floats. They ordered 40 pieces to use them for different seismic detections which they have to make up to 1000 metres water depth for the oil reconnaissance. Resinex floats are used at about 300 metres under sea level to support the weight of the cables, full of sensors positioned at the bottom.
In the last years of activity the marine operations took place in Nigeria, in the Gulf of Mexico, in Brazil and in the Caspian Sea.

Stromboli, under the volcano

The University of Florence Department of Science on behalf of the Italian Civil Protection has positioned off the coast of the island of Stromboli (southern Tyrrhenian Sea) a Resinex elastic beacon equipped with a wave metre and hydro-acoustic system.
The aim is to monitor the stability of the submerged flank of the Stromboli volcano, the famous "Sciara" of fire. In December 2002 a volcanic eruption did in effect produce an instability of the said "Sciara" of fire which, sliding into the sea (about 10 million cubic metres), created a tsunami wave which invested the southern Tyrrhenian Sea causing substantial damage to all the Eolie islands as well as along the Calabrian and Sicilian coastlines.
Thanks to a sinker of about 15 tons, connected by means of an anti-torsion cable, the beacon is anchored some 200 metres off the coast to a depth of 43 metres.
The set of instruments mounted on the Resinex beacon is made up of a large band hydrostatic pressure sensor, a water temperature sensor, a hydro-acoustic sensor (positioned at 14 metre depth), two tiltimeters and a Gps (on the tower).



The beacon is equipped with many monitoring systems powered by solar panels.

The beacon is therefore able to provide immediately variables of hydrostatic pressure and consent the complete monitoring of marine fluctuations. The hydrophone, positioned at a 14 metre depth, is used to register any possible hydro-acoustic waves resulting from the underwater sliding of the volcano and which propagates in the water at speeds of 1500 metres per second. The Gps receiver ensures the correct temporal synchronization of all data on board and monitors the geographical position. All the equipment on board is monitored by an electronic control system totally developed by the National Institute of Applied Optics of Florence in collaboration with Bioage S.r.l. The signals transmitted by the beacon also contain a series of diagnostic parameters which enable the immediate and continuous monitoring of the on board instrumentation and timely maintenance procedures.
The entire monitoring system is powered by three solar panels but has the capacity to operate autonomously for long periods (about 6 months) without the aid of the panels.