

RESINEX **n**ews

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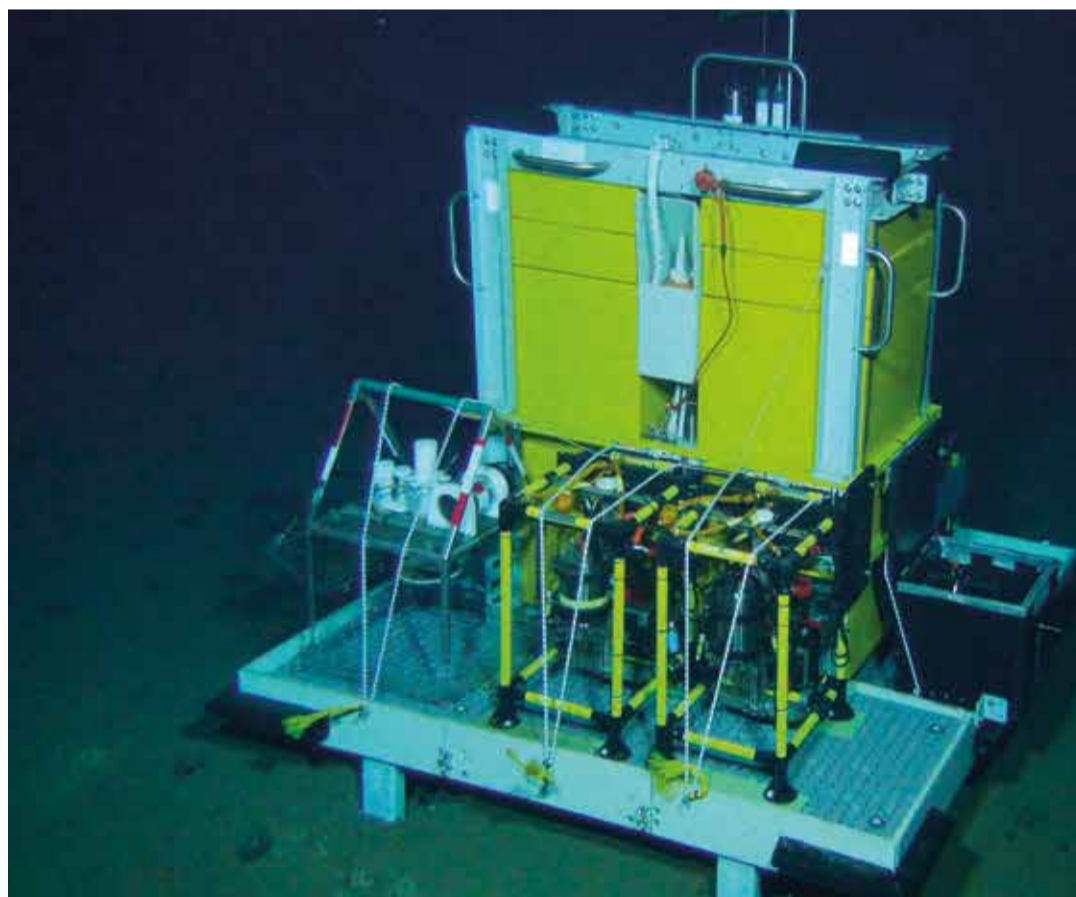
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Oceans 2

Resinex confirms its versatility for the Oceanology needs



Again Resinex versatility is the Key Success Factor to match the different needs coming from the wide and spread Oceanology Industry. Requests from all the Underwater World are constantly customized by our technical and production departments. Germany, Korea, Italy, USA, France and UK are still the main markets of Resinex Oceanology wide range.

GEOMAR 



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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 \varnothing 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.

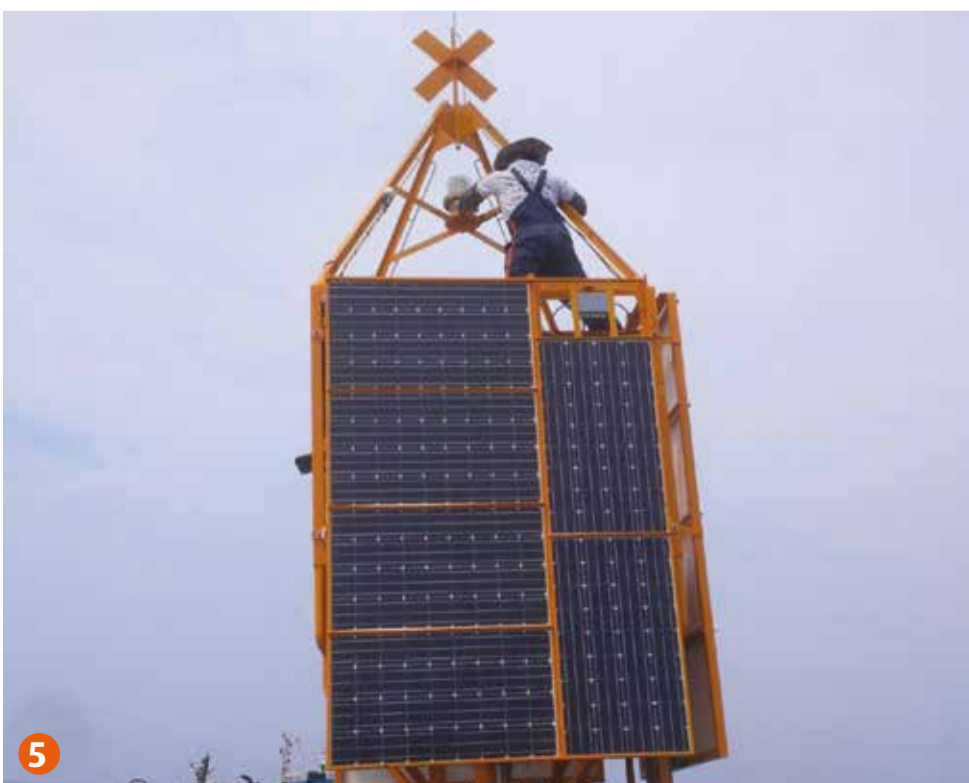


Photo 4, 5 and 6: assembly of the upper part, able to host the power system and the electronic equipment.



Elevators in ultra deep water

Syntactic foam modules at 6000 m

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.

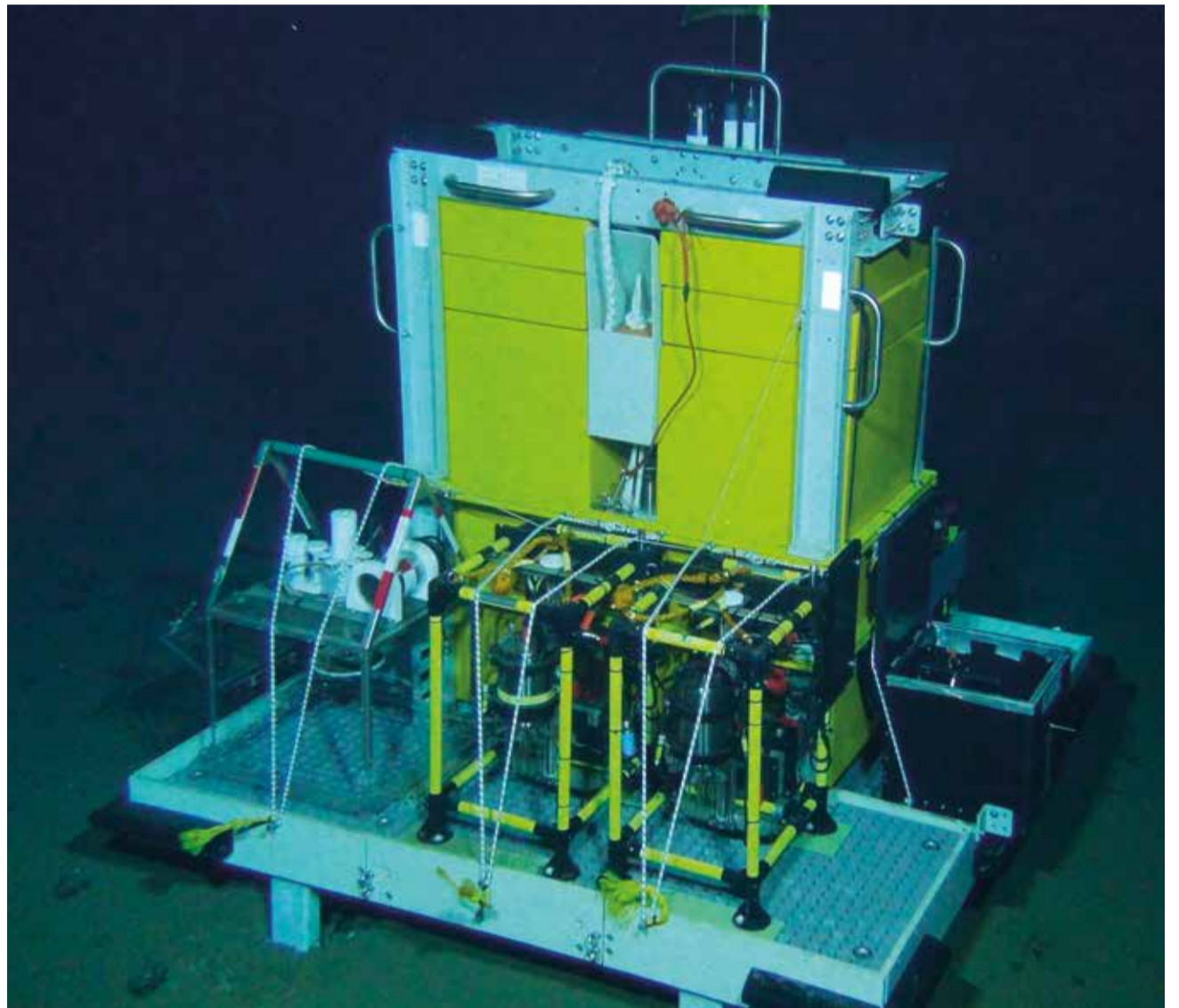
The Geomar expedition SO242-2 took place between 28th of August and 1st of October 2015 and led from Guyayaquil, Ecuador, into the Peru Basin in the southern tropical Pacific and back to Guyayaquil.

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.

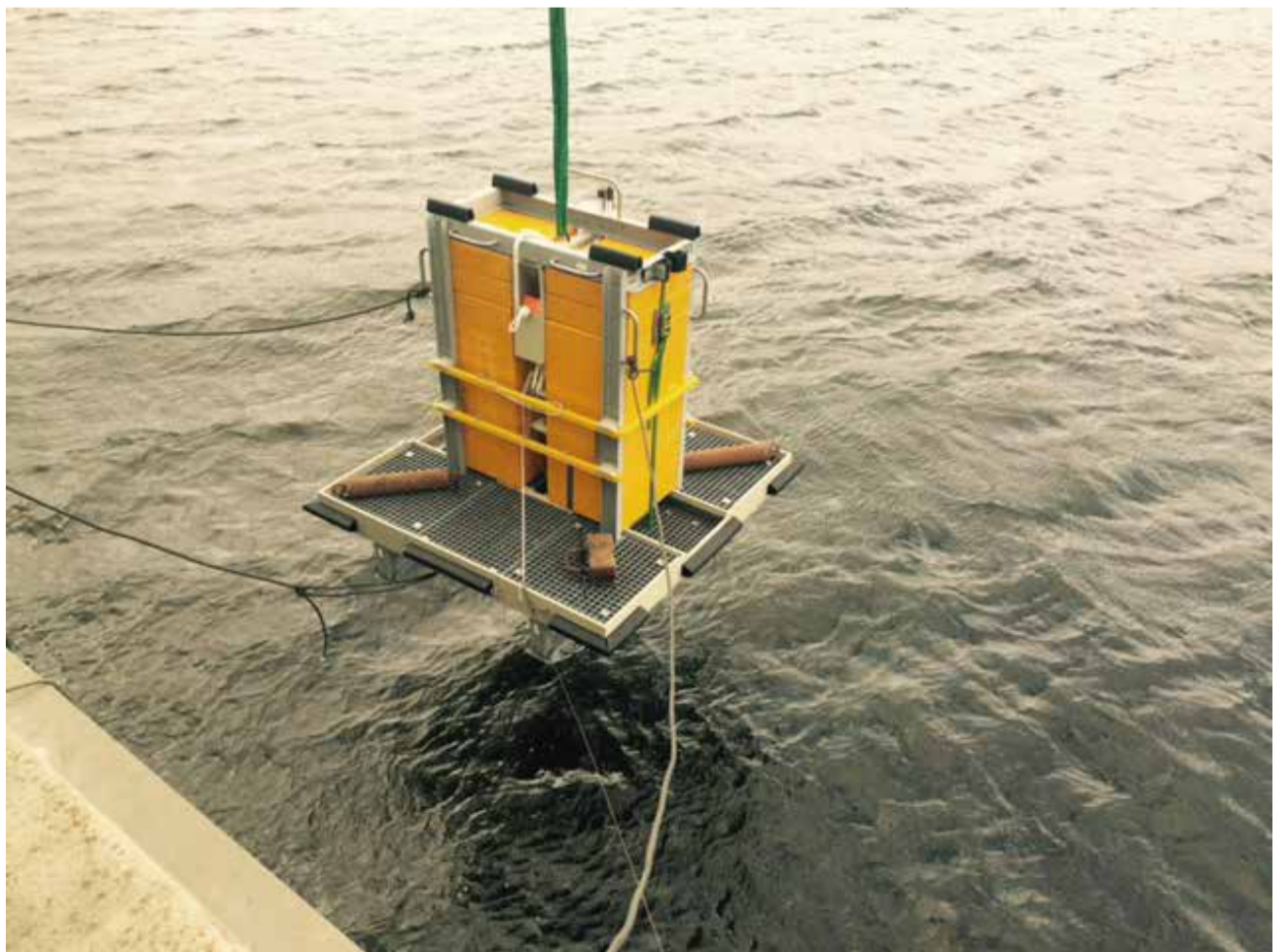
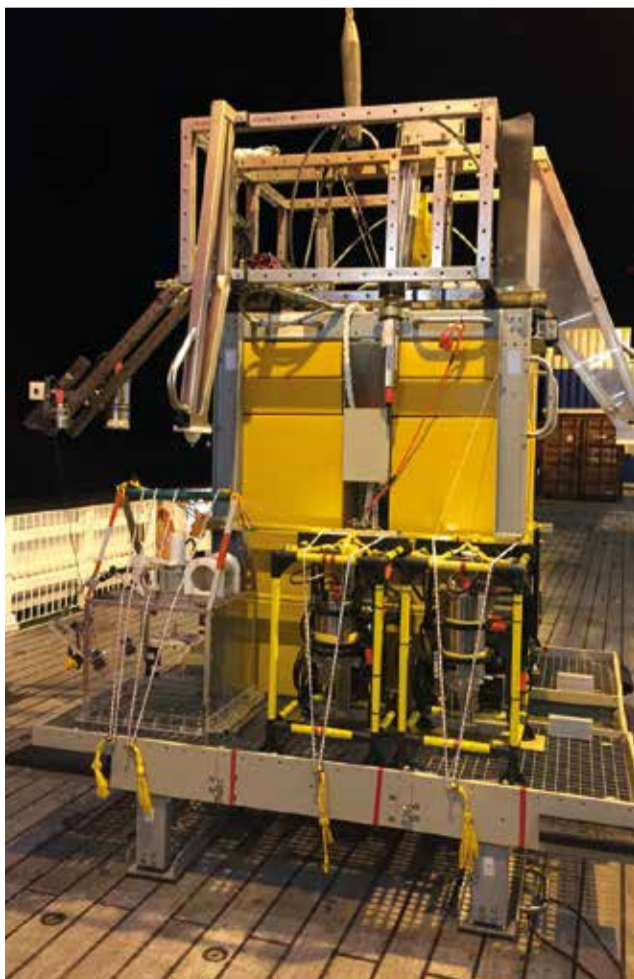
During the cruise, various equipment in different combination had to be transported by both elevators, either to be deployed and put back on the elevator by the ROV and/or used mounted permanently on the elevator and filled with samples by the ROV or attracted by bait.

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 floatation 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-Medit 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-

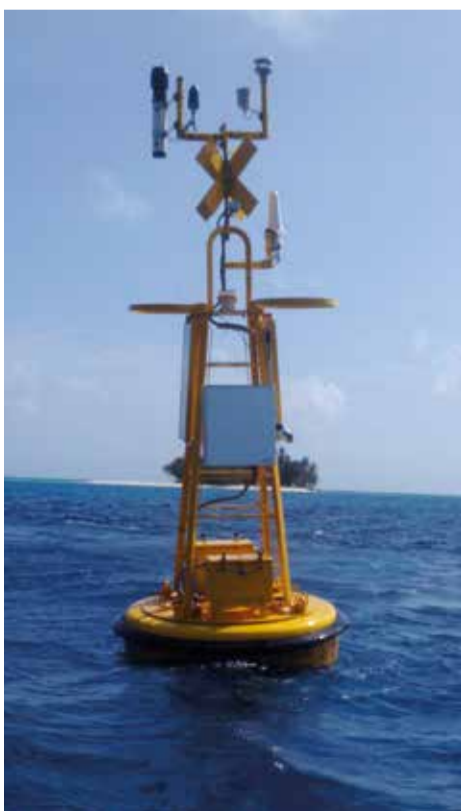


canotecnica Riesi requested 88 syntactic foam floats with different sizes to realise two EMSO MedIT Projects. Deep water syntactic foam floats have been manufactured with a special syntactic material that does not absorb water. Moreover, the floats are able to reach 6000 metre depth and to withstand 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 Desarrollo (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.

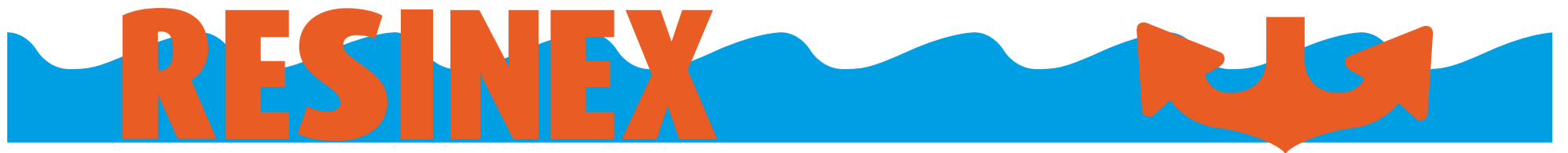
iXBlue is a leading global provider of innovative solutions and services for navigation, positioning, and imaging. Civil and defense customers rely on our systems, operations, and services for the challenges they face at sea, on land, in the air or in space.

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.



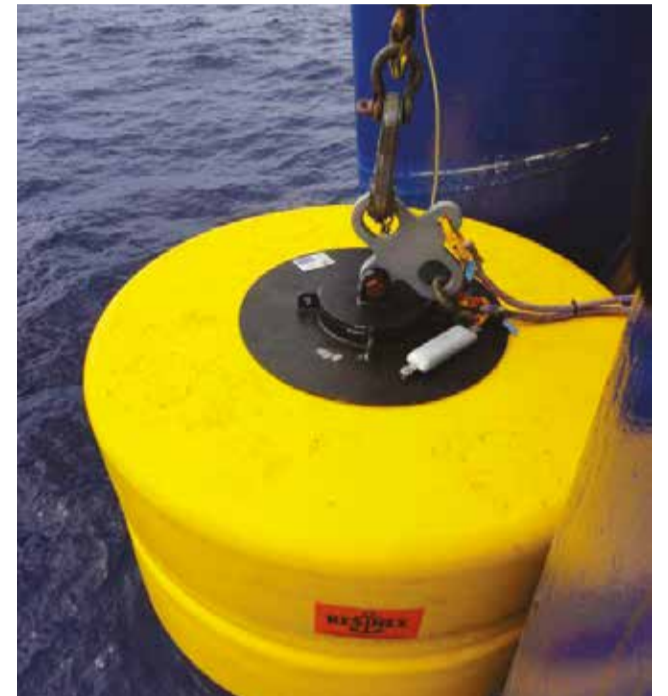


US Navy acoustic array

Atlantic Undersea Test (AUTEK) 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 (AUTEK). 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 AUTEK 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.

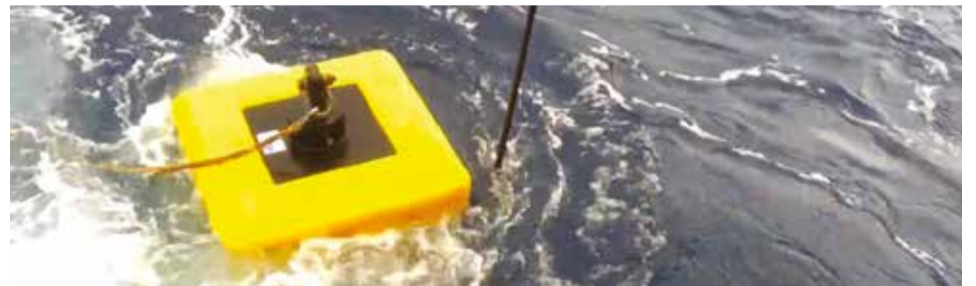


Compact buoys for seismic activity in Brazilian waters

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.



In partnership with Polarcus for the study of the seabed



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 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.



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.





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 CO² Monitoring and wave measuring sensors were installed. Besides these, even an acoustic transducer 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 meteorological 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 thin-

ner, 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

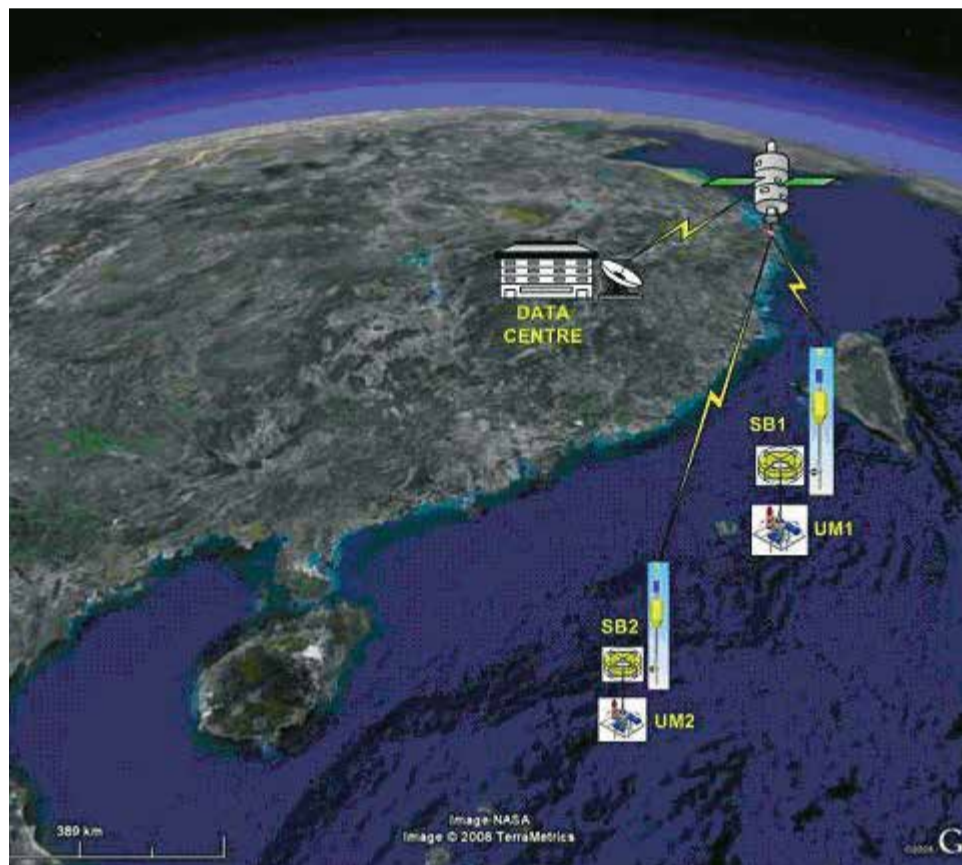
The two early warning anti tsunami systems consigned to the state oceanographic administration of the People's Republic of China that are to be positioned in the South China Sea will use Resinex buoys. This is the marine component of the system and is made up of two Poseidon class Envirtech tsunami-metres 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 bom-

barded 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 potentially 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.

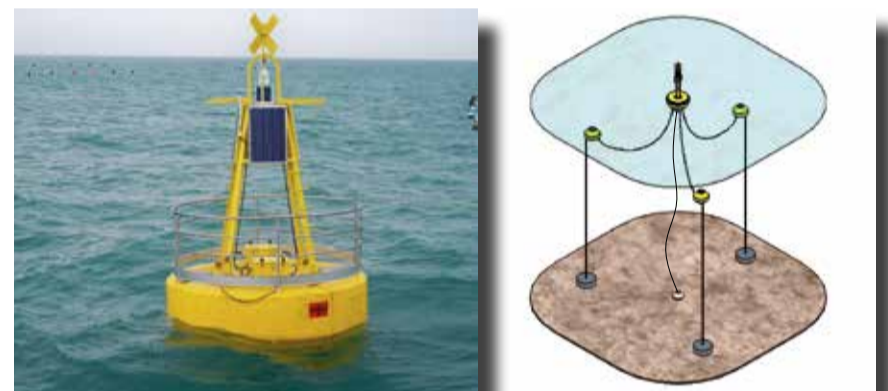


Deployment of the buoys in the China Sea.



Above, the monitoring system diagram.

A non-rotation anchorage



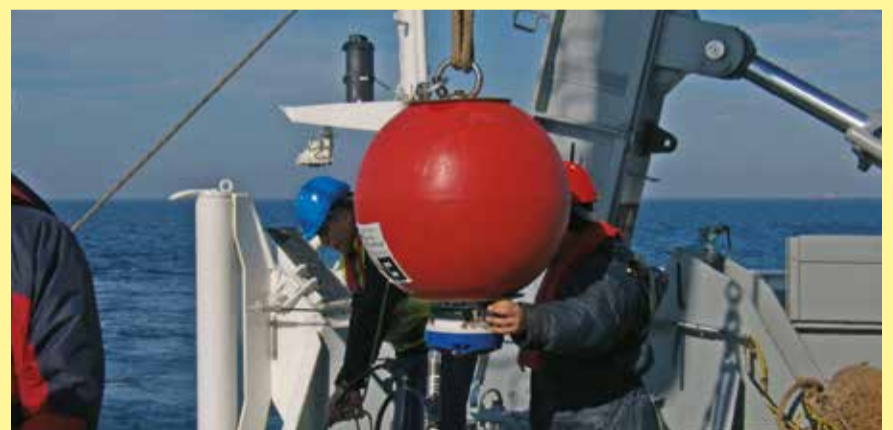
Corr-Tek is a company which is involved in the production of scientific measuring instruments for water monitoring as well as planning and installation of plants for measuring drainage and in controlling physical and chemical water parameters. It had to project a marine survey station, particularly stable, 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 Tavorara. 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.

RESINEX

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.



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

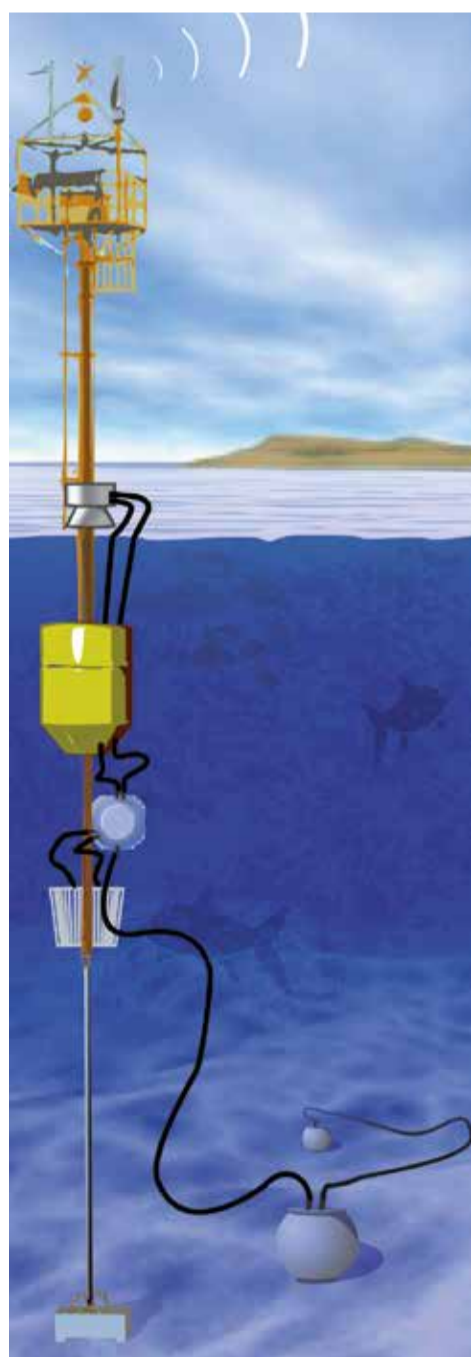
provided by the sismometres and also records pressure variations, directly correlated to the indications of an expected tsunami or to the passage of one. The buoy, through the modem which remains connected to the platform on the bottom, transmits the data via satellite to Les Immarsat of Fucino which 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 Res-

inex 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 applications.



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

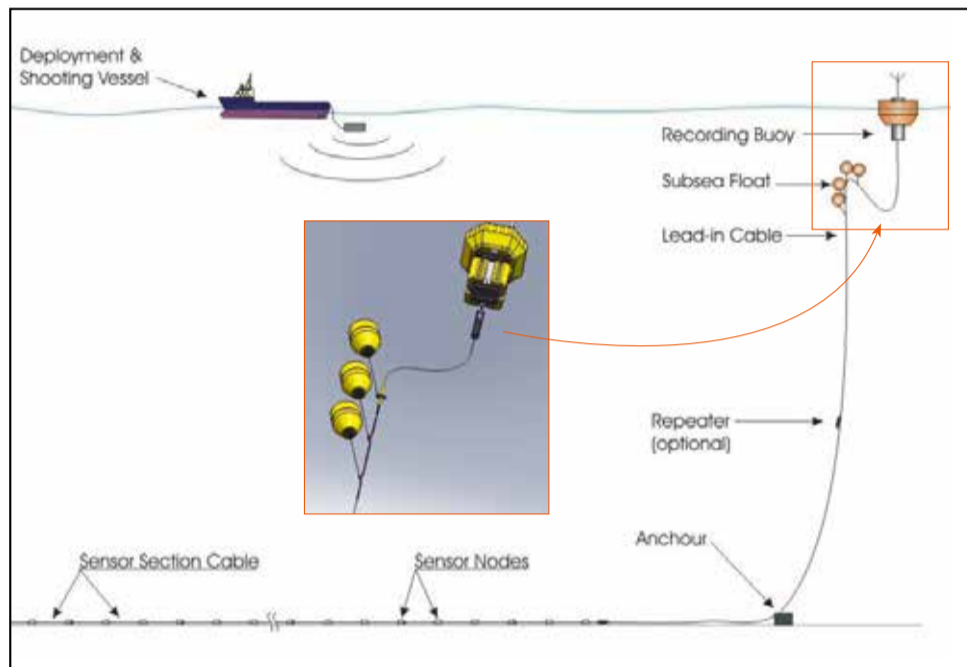
Resinex has supplied 2 Spar buoys for the Thailand tsunami warning system designed and developed by Envirtech. The buoys are installed in the Andaman sea at about 200 nautical miles from the Thai coasts at 2300 and 2700 metres of water depth. Each buoy is equipped with redundant acoustic link and satellite 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.

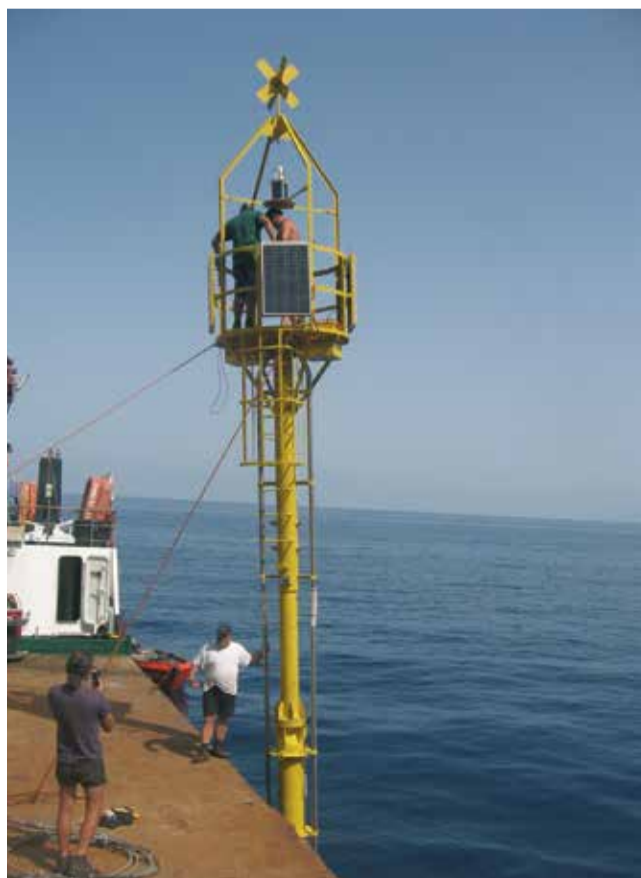
Thanks to a sinker of about 15 tons, connected by means of an anti-torsion cable, the beacon is anchored some 200 metres off the coast to a depth of 43 metres.

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 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 total-

ly 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.



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