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REPSOL

**Press
Release**

This cutting-edge technology ensures the utmost security for energy industry operations at sea

REPSOL AND INDRA DEVELOP A SECURITY SYSTEM FOR THE DETECTION OF HYDROCARBONS THAT IS THE FIRST OF ITS KIND IN THE WORLD

- Repsol and Indra have joined forces to create *Heads*, a system for the early detection of leaks aimed at enhancing security in energy industry operations at sea (*Hydrocarbon Early Automatic Detection System* in its English acronym).
- Over twenty experts, scientists and researchers from both companies have worked together to develop this system -the first of its kind in the world- which has just successfully concluded its testing period in Repsol's Industrial Complex in Tarragona.
- This breakthrough represents a significant contribution to the oil industry: its combination of monitoring sensors, automatic interpretation and alarms launched with no human intervention enable a substantial improvement in the detection of any incident in the water, with a response time of under two minutes.
- Repsol has contributed to the project with its extensive knowledge of the exploration and production of hydrocarbons and the marine environment. It has also provided the technological resources of the Repsol Technology Center (CTR), equipped with a laboratory capable of reproducing the weather conditions prevailing on the high seas.
- Indra has provided its knowledge of image interpretation algorithms and its experience in the development of real-time data processing, construction and the use of radar and infrared cameras and command and control consoles.



Repsol and Indra have developed the first system of its kind in the world for the early detection of hydrocarbon leaks in the marine environment, representing a significant contribution to the further enhancement of the security of the energy company's facilities.

The system, known as HEADS (*Hydrocarbon Early and Automatic Detection System*), represents a major step forward worldwide in mechanisms for the early detection of hydrocarbons, and has successfully completed the testing phase in Repsol's Industrial Complex in Tarragona, including the Casablanca platform.

HEADS uses different detection sensors in combination with the automatic interpretation of infrared and radar images in addition to the capacity to launch alarms with no human intervention. The coordinated use of infrared and radar images guarantees a substantial increase in reliability, while the automated process enables continuous monitoring without the intervention of an operator, thereby minimizing the risk of human error. Radar detection is based on the difference in the rugosity of the water surface in the presence of a hydrocarbon. The infrared camera allows the detection of variations in temperature between the water and the hydrocarbon caused by the differences in the calorific properties of both elements.

The system has a console located in a control room which monitors the different operations such as perforation, production, load and security. When HEADS detects an incident, it automatically activates the alarm and is also able to gather all the associated information and record and analyze all the related parameters.


Another important feature of HEADS is its ability to identify nearby boats by means of the AIS (*Automatic Identification System*). The main purpose of the AIS is to allow ships to notify their position and other relevant data so that other ships or platforms can be aware of it and avoid possible incidents. Thus if an incident occurs caused by a craft within its radius of action, HEADS is capable of recording its "license plate" and monitoring the event.

In addition to significantly increasing the level of reliability in the detection of any type of incident that may occur on the water surface, day and night, and even in adverse climate conditions such as rain or fog, HEADS has a response time of under two minutes, which means the impact of the event can be minimized and prompt action can be taken to resolve it.

This project, which was rolled out in late 2011, was developed by a multidisciplinary team formed by over twenty top-level experts and researchers from the fields of the oil industry, physics, chemistry, radar, algorithm science and software integration.

Repsol has contributed to the HEADS project with its extensive knowledge of physical phenomena relating to hydrocarbons and the marine environment, and its experience in the exploration and production of crude oil in some of the most challenging areas of the planet. The company has also provided all the technology at its Repsol Technology Center, equipped with a laboratory capable of reproducing the climate conditions prevailing on the high seas.

Indra has supplied its knowledge of image interpretation algorithms and its experience in the development of real-time data processing, construction and use of radars and infrared

An abstract graphic consisting of several overlapping, translucent blue shapes that resemble flowing liquid or smoke, tapering off towards the right side of the page.

cameras and command and control consoles. The multinational also has long experience in the development and implementation of technological solutions for the hydrocarbons sector, in which it has a worldwide presence with 1,500 professionals and projects over the five continents.

Both companies have registered the patent by means of a Patent Cooperation Treaty (PCT) application, a one-time procedure which allows a patent to be registered in over 147 countries.

Repsol

Repsol is an integrated global energy company engaged in activities in over 30 countries, and employing 24,000 people. It is specialized in the exploration of hydrocarbons and has been responsible for some of the world's most important discoveries in recent years. Repsol operates in some of the most challenging areas on the planet -many of them inaccessible to the industry until a few years ago- requiring highly-advanced technological resources.

The Repsol Technology Center located in Móstoles (Madrid) is one of the most advanced in Europe and the largest in Spain, with a built area of some 56,000 m². Over 400 scientists and researchers work here throughout the whole of the company's value chain.

HEADS is an example of Repsol's commitment to science, technology and innovation to ensure the supply of smart energy, and is a further addition to other Repsol successes such as the Kaleidoscope project carried out in partnership with the BSC and Stanford University, and the Sherlock project which has made the CTR a byword for innovation and technology worldwide.

Indra is the leading Spanish multinational consulting and technology firm and one of the main players in Europe and Latin America. Innovation is the cornerstone of its business and sustainability, having allocated €550 million to R&D in the last three years, making it one of the leading companies in Europe in its sector in terms of investment. With sales approaching €3 billion, nearly 60% of its income is from the international market. The company employs 42,000 professionals and has customers in 128 countries.