

From the very big to the very small

Robotic applications in Ex environments

Potentially explosive environments are obvious terrains in which to choose to deploy robots. During the 2010 oil spill in the Gulf of Mexico, robotic submersibles were sent underwater to contain and ultimately cap the spill on the sea floor, where direct human intervention was impossible. But most robots used in Ex atmospheres don't operate in such difficult and extreme conditions.

From robot submarines...

ROVs (remotely operated vehicles), often described as "robot submarines", have been used by the oil and gas industry for more than 30 years, mainly for underwater construction and for installation, maintenance and repair jobs in the wells of offshore oil platforms. Equipped with very sophisticated electronic devices, they are the eyes, ears and hands of those who operate them from ships or offshore platforms.

They can reach depths to which no human diver could descend and look like a giant steel box, about the size of a small car. Their manipulator arms can pick up tools and some are capable of lifting weights of up to a tonne. They are deployed in a protective cage which

carries them to their subsea location, from where they operate in harsh conditions and low visibility to complete numerous subsea missions, from turning bolts to closing valves.

...and crisis management...

These ROVs played a major role very early on in the Gulf of Mexico oil spill crisis. They were sent down to locate the leak and to attempt to activate the malfunctioning blowout preventer. They were used to position the huge cofferdam that was supposed to contain the flow and channel oil to the surface for collection, to drill relief wells, and finally to pump in cement to permanently seal the leaking well.

...to spray painting

Robots are widely used in Ex environments in a variety of other industries, such as automotive and food. Industrial robots are used in assembly lines, in materials handling, loading and unloading of machines, palletizing, arc welding and painting.

Spray painting was actually one of the first uses for industrial robots. Because close contact with solvent-based paint is a serious health hazard for workers, employing robots to perform the tasks



Painting robot (Photo credits: ABB)

greatly minimizes risks to humans. Manufacturers have designed and produced painting robots that are impervious to paint shop conditions and present no hazard when in proximity to flammable compounds or explosive atmospheres.

The robots that operate in such hazardous environments are "explosion-proof". They are sealed units, many have their arm pressurized with air to prevent the ingress of explosive solvents and their motor designed with Ex protection covered by International Standards prepared by IEC TC (Technical Committee 31: Equipment for explosive atmospheres.



ROV on vessel, ready to be deployed



ROV lifted onto oil rig



The Cougar underwater ROV (remotely operated vehicle) by Saab Seaeeye

Safety is all

Safety in hazardous areas or hazardous locations is non-negotiable. When equipment is not installed, maintained, inspected or repaired by competent persons and according to strict Ex standards, the outcome can be devastating. What may be tolerable in non-explosive atmospheres can lead directly to explosions that not only destroy property but can cost human lives or cause severe injuries, all in an incident, without warning.

While robots may take the place of humans to perform highly dangerous tasks, the human factor has still to be taken into consideration. Even with remote control, a human is still needed to operate the equipment, whether it is a simple painting robot or a highly sophisticated ROV. This is why it is essential for all equipment used in Ex areas to be designed and manufactured according to very specific requirements.

The IEC solution

The IEC has been at the forefront of Ex standardization for many years, preparing International Standards and establishing a CA (Conformity Assessment) System that provides testing and certification for Ex equipment.

International Standards

IEC TC 31: Equipment for explosive atmospheres, has a complete series of International Standards that cover all specific requirements for Ex equipment and systems, from general requirements to protection levels for apparatus used by all sectors that operate in hazardous environments, such as oil refineries, offshore oil rigs, gas plants, mines, sugar refineries, flour mills, grain silos and the paper and textile sectors. And because a high percentage

of all painting processes require Ex protection, other industries – automotive for instance – also have a need for Ex equipment and systems.

Safe access to global markets

Producing devices and equipment based on Ex standards is not enough. Most manufacturers and suppliers trade on the global scene and have to meet the very strict requirements put in place by national regulations and legislation. Proving their adherence to those requirements can be costly and time-intensive.

IECEX, the IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres, has the perfect solution: one test and one certificate that open many doors.

Testing and assessment under the IECEX Certified Equipment Scheme are accepted in all its member countries and way beyond. The System is widely recognized as the truly international system for Ex equipment, which provides access to global markets and drastically reduces costs by eliminating multiple re-testing and certification. This recognition was demonstrated at the highest level with the United Nations UNECE (Economic Commission for Europe) issuing a new UN Publication, *A Common Regulatory Framework for Equipment Used in Environments with an Explosive Atmosphere*, identifying the use of IEC TC 31 International Standards supported by IECEX Certification as representing the world's best practice and recommended model for national regulations.