

Risk recognition keeps industry safely wrapped up against the cold

Risktec Solutions Limited is bringing its consultancy expertise to bear in some of the planet's harshest environments.

The company has won contracts providing HSE (Health, Safety and the Environment) Cases in two areas of the world – Sakhalin, off the east coast of Russia, and Kazakhstan's sector of the Caspian Sea – where plummeting winter temperatures spell a potential hazard to both employee and business.

Each location places major hazardous industries in areas of outstanding natural beauty and extreme environmental sensitivity.

Risktec Consultant Andy Lidstone said: "An HSE Case is designed to ensure operations are carried out without endangering personnel, the environment, the asset or the company's reputation. By observing and assessing a number of industrial installations in areas of extreme climatic change, we have gained a body of knowledge of potentially hazardous effects of extreme cold on operations and employees.

"For instance, there are limits for when you can and cannot use cranes due to the weakening effect on steel of freezing temperatures, while people working at temperatures below -40°C, even with full PPE, will perhaps have a 20 to 30-minute work window before they need to go to a heated shelter."

Sakhalin Island

The breathtaking beauty of Sakhalin's north island, with its mountains, miles of silver birch forests, and coastal waters extraordinarily rich in sealife, masks a hostile climate. The island, in a corner of the Sea of Okhotsk, is snow-covered from December until May. The north-east of the island, where the Vityaz complex is located, is ice-bound for most of this period and temperatures can fall to below -30°C.

Vityaz, which is made up of the Molikpaq drilling and production platform and Okha FSO (Floating Storage Offloading vessel), is



operated by the Sakhalin Energy Investment Company (SEIC).

Last year, it produced 15 million barrels of crude oil and is Russia's first offshore facility to supply crude to the international market. SEIC plans to expand the operation to three platforms, supplying crude oil and liquefied natural gas all-year-round from an ice-free port on Sakhalin's south island.

Risktec is preparing an HSE Case for the operation and support of the Vityaz complex, including interfacing with an accommodation platform during construction work.

Risktec consultant Rob Steer said: "The proposed development of oil and gas fields off the coast of Sakhalin presents significant technical challenges. Managing the risk to the environment is very

important. The sea is rich with marine life, notably salmon, and is a summer feeding ground for western grey whales. The complex must operate to high HSE standards for the safety and health of company and contractor employees and the protection of the environment.

"The climate is a major consideration all-year-round. In the winter, ice formed in an 'ice kitchen' to the north of the Complex flows down the eastern side of the island, surrounding the Molikpaq in flowing ice. The FSO has to leave the area during the winter.

"The area is very remote, and logistics for getting equipment to Vityaz are complex. Equipment from off the island is brought into

Korsakov, the island's southernmost port, and is then transferred by road to Kholmsk, on the eastern seaboard. A further three-day sea journey in a supply vessel with ice-breaking capabilities then follows."

Caspian Sea

Agip Kazakhstan North Caspian Operating Company (Agip KCO), operator of the Kashagan development on behalf of a consortium of international companies; Eni's Agip Caspian Sea, BP, BG Group, ExxonMobil, Inpex, Phillips, Shell, Statoil and TotalFinaElf, has constructed a 150 metre by 100 metre artificial island in the Kazakhstan-owned north-east corner of the Caspian Sea, for a land-based oil and gas drilling operation by drilling contractor KCA Deutag.

The Caspian Sea's very shallow waters, only four metres around the island, ruled out traditional floating or jack-up offshore drilling rigs - and also presented Risktec with a challenging job in helping to assess the potential risks in the operation and

ensuring the right controls and recovery measures are in place.

The HSE Case took account of the environmentally sensitive ecosystem of that corner of the Caspian Sea, which is home to a high percentage of the world's sturgeon population – probably the most important natural resource of the region – and is subject to zero discharge regulations.

Once again, temperatures as high as +40°C in summer and as low as -30°C in winter became major operational and safety considerations. In winter, the sea around the island freezes and the wind can move the ice sheets at speeds up to five knots, building ice rubble mounds six-metres high in less than 24 hours and requiring pro-active ice-management procedures.

Consultant Ian Woodward said: "The HSE Case and Safety Operations Plan we helped prepare covered specifically the drilling of wells and well testing. Using local knowledge of wind direction and ice flow patterns several scenarios were developed for emergency evacuation in the unlikely event of a hydrogen sulphide gas release. There are three designed Arktos vehicles, a Canadian designed motorised amphibious people carrier, which would move cross-wind across a mixture of water and ice to evacuate personnel. This requires the vehicles' drivers to be highly trained and skilled."

Risktec consultants have successfully completed HSE Cases for drilling rigs, logistics/supply bases, offshore production platforms, onshore terminals, pipelines, gathering stations, marine vessels, chemical facilities, gas plant and distribution, refinery units and mines.

Andy Lidstone added: "We base solutions on understanding the client's business and the issues it faces, and the best way to do this often involves putting on your warmest clothing and seeing – and feeling – for yourself just what those issues are."

Choice questions

Deterministic or probabilistic analysis?

The goal of safety assessment is to demonstrate that the risk associated with the construction, operation or decommissioning of any facility is at an acceptable level. One of the questions that people sometimes ask is, "which analysis techniques should be used to determine whether this goal is achieved?"

In essence, there are two main types of analysis which could be used:

Deterministic Analysis, which aims to demonstrate that a facility is tolerant to identified faults/hazards that are within the "design basis", thereby defining the limits of safe operation.

Probabilistic Analysis, which aims to provide a realistic estimate of the risk presented by the facility. This can also be used to confirm the validity of the deterministic safety assessment.

PROS AND CONS OF THE APPLICATIONS

| | Qualitative or Deterministic | Probabilistic |
|-------------------------|--|--|
| Hazard/Initiating Event | <ul style="list-style-type: none"> Limited to consideration of relatively frequent events, commonly called "Design Basis accidents". | <ul style="list-style-type: none"> All potential credible accidents are included |
| Analysis Method | <ul style="list-style-type: none"> Utilises conservative rules, standards and guidelines Arguments may use a variety of techniques, including engineering judgement, factors of safety, incredibility of failure arguments, etc. | <ul style="list-style-type: none"> Arguments follow a well established methodology Best estimate assumptions |
| Common Cause Failure | <ul style="list-style-type: none"> Not normally assessed in detail | <ul style="list-style-type: none"> Multiple and Common Cause Failures easily assessed |
| Design | <ul style="list-style-type: none"> Able to support the design process. | <ul style="list-style-type: none"> A design concept is required and probabilistic analysis is unlikely to be available in time to support the detailed design phase. Aids in identifying cost effective safety improvements to existing facilities |
| Results | <ul style="list-style-type: none"> Compliance with the rules, standards and guidelines infers a safe facility Does not determine residual risk | <ul style="list-style-type: none"> The risk from the facility may be determined Allows the targeting of maintenance |
| Cost/Time | <ul style="list-style-type: none"> Relatively quick and economical | <ul style="list-style-type: none"> May be time consuming especially if full PSA /QRA is used |

In practice, modern safety assessments tend to make use of both deterministic and probabilistic techniques because of their complementary approaches.

Further Reading

Engineering Safety Management, Volumes 1 & 2, Fundamentals and Guidance, Issue 3, Railtrack, January 2000.

UK Offshore Operations Association, Industry Guidelines of a Framework for Risk Related Decision Support, Issue 1, April 1999.

HSE, Safety Assessment Principles for Nuclear Plants.

Reducing Risks, Protecting People, HSE's Decision-Making Process, 2001.



Risktec applies REPPIR to radiation emergency planning

Risktec Solutions is working with a number of nuclear industry clients, both in the civil and military sectors, to apply REPPIR – the Radiation (Emergency Preparedness and Public Information) Regulations – to existing plans for coping with an offsite radiation emergency.

The legislation, which came into effect in September 2001, complements existing requirements for contingency planning (IRR99).

Its application is based on the quantities of radioactive substances involved in work, process or transportation, and consideration of "reasonably foreseeable" incidents that could result in a significant release of radiation off-site.

The definition of "reasonably foreseeable" and the specification of a "radiation emergency" in terms of off-site dose uptake has effectively required the re-examination of the hazard identification and risk evaluation,

and therefore emergency planning, for a great many nuclear licensed sites.

It also redefines the general requirement on local authorities to provide information to the public in the event of a radiation emergency.

"REPPIR was intended to have minimal impact, but was designed to formalise current emergency arrangements for establishments handling radioactive materials and make them consistent with emergency

arrangements for other hazardous materials industries," said Greg Davidson, of Risktec.

"We are helping a number of clients to revisit their emergency plans and public information procedures, and to re-assess in detail emergency scenarios where there is potential risk of an offsite release of radiation.

"Whilst most nuclear installations already have a quantified risk assessment, relating to this what is 'reasonably foreseeable' generated some debate."

DID YOU KNOW? Some facts about Nutec Global

- Nutec Global is the world's largest provider of safety and emergency response training services.
- The organisation has about 20 consulting offices and training centres, and more than 275 people around the world
- The group has training centres in The Netherlands, Norway, Ireland, the Middle East and Malaysia, as

well as in England and Scotland.

- Centres offer 75 different basic courses, in each case satisfying the approval standards of the appropriate regulating authority

- Operating in the UK since 1994, Nutec has internationally-recognised centres for excellence in workplace safety at Teesside and Aberdeen, where

more than 40,000 people a year receive industry-accredited training across six industry sectors offshore, maritime, aviation, military, onshore industrial and medical services

- Nutec Global's consulting activities not only provide risk management services (Risktec), they also provide crisis management services