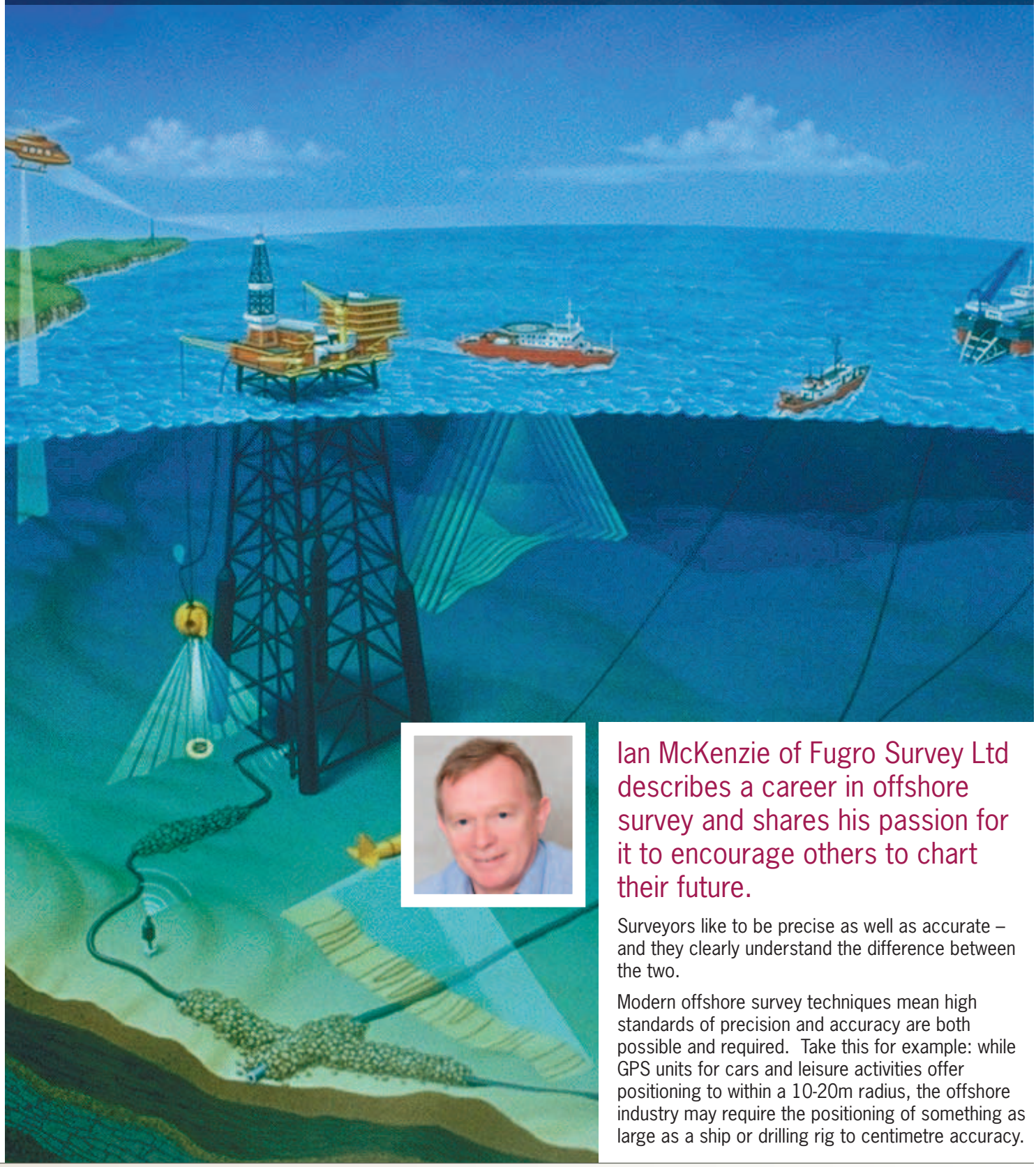
Passionate about ...

Offshore Survey



Ian McKenzie of Fugro Survey Ltd describes a career in offshore survey and shares his passion for it to encourage others to chart their future.

Surveyors like to be precise as well as accurate – and they clearly understand the difference between the two.

Modern offshore survey techniques mean high standards of precision and accuracy are both possible and required. Take this for example: while GPS units for cars and leisure activities offer positioning to within a 10-20m radius, the offshore industry may require the positioning of something as large as a ship or drilling rig to centimetre accuracy.



The seven-figure log tables may have gone but the space-age equipment to do this has arrived. It exists partly in space and on earth as a component of the GPS satellite network, partly on vessels and rigs in the form of powerful computer systems that leave even the fastest modern PCs standing and partly underwater as acoustic positioning systems which use sound waves to provide remarkable standards of accurate positioning for equipment which can be kilometres below the surface.

The skill of the surveyor is to be able to use this technology to best advantage, distinguishing between good and bad results, recording data in an economical, recoverable and readable fashion, and then fashioning and delivering the complex reports that clients can understand and use.

In the offshore world there are added complexities for the team and for the equipment. On a vessel, solving problems can rely solely on the expertise of the team onboard. The marine environment creates further challenges, as delicate instruments and computers must be hardened against the motion of the vessel, and equipment used above deck, such as antennas, must be able to withstand the effects of wind and salt water.

I joined UDI Group Ltd as a Survey Engineer in July 1976, after graduating from Robert Gordon's in Aberdeen and I must admit the decision was based on the financial package offered which had beaten all others by the grand sum of two hundred pounds sterling!

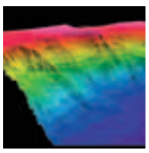
UDI became Fugro Survey Ltd and survey has become my career. At that time the North Sea survey industry was in its infancy with several companies eager to achieve the technical high ground. Survey engineers and hydrographic surveyors were in short supply, as they are today.

Over 30 years later I still get the same reaction when asked "What do you do?" with that puzzled look. That word 'survey' covers a wide range of services conducted offshore from survey vessels, rigs and barges, but the main operations are:

- **Positioning**, which is the provision of precise offshore positioning using GPS (global positioning satellites)
- **Geophysical surveys**, which provide detailed information and assessment of the seabed and sub-seabed in preparation for pipelaying, or the installation of subsea equipment or even a platform
- **Construction support** during the positioning of offshore infrastructure like pipelines, subsea equipment and production platforms
- **Inspection services**, which include acoustic and visual inspections of subsea pipelines and associated structures, sometimes using sonar, sometimes advanced underwater digital video cameras

AUV surveys conducting deepwater pipeline route surveys.

> While GPS units for cars and leisure activities offer positioning to within a 10–20m radius, the offshore industry may require the positioning of something as large as a ship or drilling rig to centimetre accuracy ... the space-age equipment to do this has arrived.


I will describe each of these more fully below.

Positioning

Positioning offshore is provided by using the US Department of Defense's GPS based on a 'constellation' of over twenty satellites in orbit around the earth. Other similar systems are the Russian GLONASS, Galileo (European), Compass (China) and IRNSS (India), but they are not yet all complete.

GPS makes most people think of their in-car satellite navigation systems but in the oil industry a much more precise solution is required using land-based reference stations providing differential GPS. DGPS is used in seismic survey, seabed survey, moving drilling rigs, dredging, sub-sea acoustic positioning and installing the offshore infrastructure.

Geophysical surveys

Geophysical surveys are carried out from vessels to acquire seismic, sonar, bathymetry, oceanographic and environmental data which is used by the oil, telecommunications, dredging and subsea mining industries. The surveys identify drilling hazards and establish corridors for pipelines and cables as well as the seabed conditions for sub-ocean mining. This requires cutting-edge technology as the water depths vary from 5 metres to 3,500 metres – yes 3.5 kilometres straight down!

Construction support

Services here include the use of remotely-operated vehicles (ROVs) and acoustic positioning during the installation of platforms and sub-sea structures, as well as pipe-lay support, 'as-built' surveys, trenching support and project management.

Some truly exciting new challenges lie ahead in construction support as oil is discovered and extracted in ever deeper waters. This is inspiring the development of inertial navigation systems to aid acoustic positioning at these greater depths.

Inspection services

Inspections services include ROV television surveys on pipelines, subsea structures and platforms. Data is gathered and processed to give the owner an accurate report on the condition of their infrastructure, whether it is old or new.

Initially an acoustic survey is conducted by towed high-resolution sonar using conventional tow fish or ROTVs (remotely operated towed vehicles), both of which are towed from a support survey vessel but with the acoustic method being some four times faster.

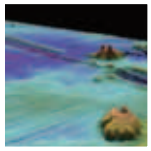
Most data are processed offshore on the survey vessel where the results are compared with data gathered in previous years. The high-resolution sonar gives local seabed conditions adjacent to the pipelines and can monitor fishing activity.

If potential damage is identified it may require further visual inspection or investigation by an ROV. The ROV survey is predominantly visual and the vehicle is tracked acoustically so that precise positioning of any incident is accurately known. The ROV will also carry instrumentation to monitor the cathodic protection given by sacrificial anodes attached to the structures and pipelines. Should any pipeline be buried then a remote sensing device called a Pipeline Tracker can be used to locate its position. This is a very sophisticated underwater metal detector which uses sensing coils to detect the magnetic field changes due to the steel pipe.

AUV technology

AUV is an acronym for autonomous underwater vehicle. These vehicles work on their own and have no tether or electrical cable attaching them to a surface support vessel unlike the tow fish, ROTVs and ROVs described above.





AUVs are self-contained robot devices similar to the space probes currently being used to explore the solar system and the technology surrounding them has developed as the offshore oil industry has ventured into much deeper waters where conventional techniques are no longer practical.

A typical AUV will carry acoustic side-scan, profilers and swathe systems as well as inertial navigation systems and acoustic telemetry for communication with the mother vessel, all leading edge technology. AUV propulsion is supplied by onboard batteries or fuel cells which have to be able to operate for up to 60 hours without changes. These are not like typical torch batteries as the electrical power is provided from the reaction of chemicals stored in the vehicle.

All this equipment has to be physically strong to withstand the pressures at depths of 3,500 metres. The technologies being used are right at the cutting edge and are complex, sophisticated and expensive, but the survey results being achieved from the sonars, profilers and swathe systems are startling.

Conclusion

The above does not describe all of the survey operations conducted offshore but does give an indication of the variety. The client's end product will always be the final report which is now delivered in the format of CAD charts and databases with integrated positioning and video information.

Modern integrated computer networks, access to the web through satellite broadband, and the availability of hi-tech underwater digital cameras mean that what used to be delivered as hand-drawn charts, boxes of VHS tapes and endless paper reports can now be delivered straight to the client's desktop as a multi-media presentation.

The offshore survey industry provides many career opportunities. The variety of work delivers daily challenges and offers careers involving travel all over the world. Not only does the industry require offshore personnel but also the onshore staff to back up the field operations.

Individuals often have both onshore and offshore careers - some prefer to work offshore and some will eventually come onshore. But there are always opportunities in the following roles:

- Offshore: Vessel managers, party chiefs, geophysicists, electronic and mechanical engineers, hydrographic surveyors and data processors.
- Onshore: Business line managers, project managers and specialists in IT, marketing, software, data management, reporting and interpretation.

Further information

IMCA has developed an extensive range of factsheets in this series on the offshore survey sector, setting out job profiles, training and education requirements, career prospects and personal case studies.

For further information on the work of the Offshore Survey Division, visit our website at www.imca-int.com/survey

Also available from IMCA:

In depth feature articles:
- Passionate about
  - Cranes and lifting
  - Diving
  - Dynamic positioning
  - Materials
  - ROVs
  - Safety
  - Survey
- Your exciting future

plus:
- *I want to be ...* factsheets
- *My story* case studies
- *Make the move* guides
- *In depth* feature articles

and much more online at:
www.imca-int.com/careers