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Despite overcoming many hurdles, wireless technology is still criticised by many in the communications sector. **Dr Gareth Evans** explores how it is working hard to win over the offshore industry.

**T**he advance of wireless technology has been one of the great success stories of the 21st century. With the main technical barriers largely overcome and the affordability issue comprehensively addressed, wireless systems are as familiar today as they are ubiquitous.

Our homes and lives have become routinely wireless, through mobile phones and broadband routers, at the same time that industrial applications have burgeoned. It is estimated that one in three companies use wireless sensors and almost half are actively investigating them for the future.

The industrial networking market is, in general, quick to adopt rising technologies that offer increased reliability and its attitude to wireless communication has been no exception. But the situation with regard to its use offshore has always been a little different.

This is partly as a result of the unique challenges of the environment itself and partly because of the historical limitations of the technology. However, if the latest generation systems live up to their promise in practice, then all of this may be about to change.

This is the message that the technology vendors are trying to push but not everyone is convinced. Although few in the

## [ Key Facts ]

- Going wireless can save up to 90% in costs.
- An estimated one in three companies use wireless sensors.
- The latest systems promise to overcome offshore challenges.

traditional cable communications world seem to want to say much in public, off the record, some individuals express serious doubts about the whole issue.

Networking consultant Bjorn Hesskan says: 'There's a lot of commercial protectionism going on right now but neither side's going to cut ties too much in case they need to make alliances in the future.'

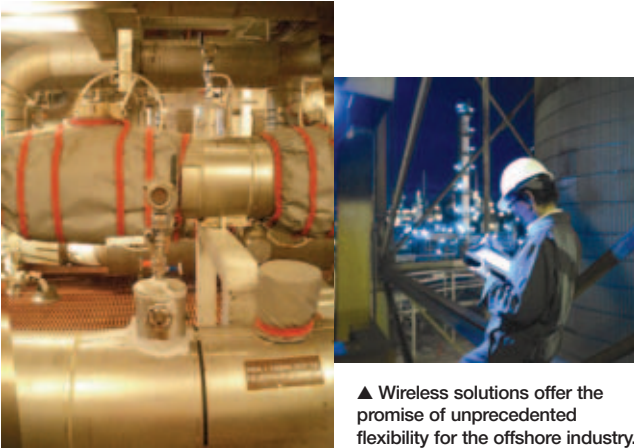
At the core of the debate lies the same persistent question; can wireless technology really work in an offshore environment?

## Appropriate technology

The original wireless solutions were not seen as entirely appropriate for a variety of reasons. Initially the range and availability of data acquisition sensors and associated transmitters was limited and there were misgivings over their reliability.

There were also issues surrounding the effective powering of field-deployed devices, while the nascent nature of the technology made accurate cost determinations imprecise at best.

In the development of wireless communications three main constraints were to present particular problems for offshore



▲ Wireless solutions offer the promise of unprecedented flexibility for the offshore industry.

▲ On Grane, Rosemount Smart Wireless pressure transmitters are successfully used to measure pressure drop over the platform heat exchangers.

operations – the lack of standards, security and options for expansion. These soon became seen as the central problems, surfacing repeatedly in any discussion of the technology – and with good reason.

With standards incompletely defined and overall architecture non-existent, conflicts were commonplace.

Overlapping wireless frequencies and system protocols led to regular clashes, leaving network security unpredictable and far below the levels demanded by the offshore industry. Moreover, with only proprietary single-point solutions available, the idea of ultimate expansion to plant-wide – and conflict-free – integration remained a distant hope.

In the words of Hesskan, ‘things were definitely a bit flaky in the early days.’

Since then, technological advances have led to many of these problems being largely resolved. Open standards and tight frequency allocations underpin wireless networks.

A broad spectrum of measurement devices and controllers can now integrate with digital automation and process management software, providing the security and expansion potential that had previously been missing. With vendors keen to showcase these new advances, many argue that the time has come for oil and gas companies to embrace wireless technology for the challenging environment of offshore production.

‘The advance of wireless technology has been one of the great success stories of the 21st century.’

### Life without wires

The potential benefits of wireless systems for offshore applications are clear. Long-range radio modems and gateways are enabling remote devices at inaccessible or unmanned locations to become readily available.

The increased range of these devices also means that manual readings at other sites can be removed. As a result, vastly more real-time data can be gathered than previously and with

### [ The Grane oil field ]



The oil field Grane in the North Sea has been developed with an integrated accommodation, processing and drilling platform with a fixed steel frame construction resting on the sea bed. The platform is located about 185km west of Haugesund, where sea depth is 127m. The field was discovered by Hydro in 1991, and came on stream on 23 September 2003. Grane is the first field on the Norwegian continental shelf to produce heavy crude oil.

This oil differs from other types in that it is found in younger geological formations than what is usual on the continental shelf, namely in sandstone from the Tertiary period, deposited about 60m years ago. The oil is transported by pipeline to the Sture terminal, where it is stored in large rock caverns in the mountainside prior to shipment to the world market.

The field receives natural gas from the Heimdal Gas Centre through a 50km-long pipeline. The gas is injected as pressure support into the reservoir, to ensure high production and extraction rates. After about 25 years of oil production, large quantities of the injected gas will be able to be produced and sold.

When the Grane field came on stream, its recoverable reserves were estimated to total 700m barrels of oil. Production has stabilised at more than 200,000 barrels of oil per day.

#### Transport

The Grane oil is transported through a 212km-long pipeline to StatoilHydro's Sture terminal in Øygarden, west of Bergen.

Photo credit: Helge Hansen / StatoilHydro

obvious improvements to operator safety and productivity.

In addition, freed from the need to lay cables to each individual device, extending coverage by installing further sampling or monitoring points is also made simple.

Although many of these functions can be achieved with wires, going wire-free adds up to a considerable cost saving – some estimate up to 90%.

Such an attractive bottom line, the vendors argue, opens up the possibilities for many uses that would otherwise prove prohibitively expensive. There's no denying that their reasoning is compelling but nevertheless, there remains some dissent.

Critics of wireless offshore technology say that, despite the obvious simplicity of its appeal, it is not a one-size-fits-all solution. The peculiarities of individual platforms will inevitably complicate system design – aside from the inherent problems of signal transmission on a huge metal structure.

Oponents say that, even with the advances in standards that have largely harmonised functional networking, wireless security remains problematic within the offshore environment, principally as a result of network overlaps.

Between the dangers of non- or partly compatible devices, ambient or incidental radio frequency noise and the potential for echoing signals, the objectors claim that wireless networks can never truly be classed as interference-free. Undoubtedly, ▶

some of their criticism can be put down to precisely the kind of commercial protectionism that Hesskan described but, if they are right, the dawn of the offshore wireless age may need to be delayed.

Proponents of offshore wireless would argue that these objections are old hat and contribute little to understanding how much the technology has advanced. Back in 2006, for instance, Stan DeVries of Invensys Process Systems recognised the need to engineer preventative measures into the network from the outset and to manage 'all wireless network technology in a unified, coherent architecture.' This back-and-forth debate looks set to run, with both sides talking up their own approach with an eye to their commercial futures.

'Many argue that the time has come for oil and gas companies to embrace wireless technology.'

#### Offshore mesh networks

StatoilHydro's Grane platform, off Norway's coast, provides one of the most telling hints of the future of wireless technology within the offshore industry by exploiting one of its most important developments – the self-organising mesh network.

While each node in a traditional point-to-point wireless system demands its own clear line of sight – which can be difficult given a rig's crowded metalwork – in a self-organising network, any device out of range of a gateway simply routes its transmissions through other devices. This ability to piggyback signals makes adding new nodes simplicity itself, and obstacles can be circumvented with ease.

Any disruption of intra-network communication is swiftly recognised and alternative routing arranged automatically. Data reliability exceeds 99% as a result.

The installer of the Grane network, Emerson, says that it is the first offshore wireless installation in Europe. It monitors the platform's wellhead annular pressure and heat exchanger pressures.

Operationally, the system has been a big success. On initial power-up each device correctly located the gateway, allowing the network mesh to be successfully established despite a typical wellhead area full of pipe-work.

StatoilHydro instrument lead, Grane operations Geir Leon Vadheim says that the company is 'delighted with the performance of the Emerson Smart Wireless network in these challenging conditions.' Unsurprisingly it now plans to install similar transmitters on its other offshore platforms, while in mid-2008 Emerson announced a partnership with Cisco to develop open-standard solutions for wireless process and plant management applications.

Although there have been significant advances in many aspects of the technology, wireless approaches do not – for now – offer a complete alternative to conventional communication cabling. If there is a place for both, perhaps they are best used synergistically with wireless networks forming a 'last mile' technique alongside a wire or fibre optic backbone.

However, it is in the nature of all technologies to evolve. With communication ever more vital as new fields are developed at greater distances offshore, only time will tell the direction and the effectiveness of that evolutionary process.

This will likely prove a better indication of how well wireless systems are suited to the offshore challenge than any amount of debate, sales puff or protectionism ever can. ●

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