



## Permasense solution for offshore gas platforms

### 1. Offshore gas production application

Produced gas often includes significant sand hold-up, posing an integrity risk through erosion of platform pipework. The rate of erosion depends on gas velocity, level of sand hold-up and particle size, but if hold-up and particle size vary unpredictably with time the rate of erosion is difficult to predict.

Typically, the highest erosion rates will occur in areas of highest velocity or where the flow direction changes suddenly. In gas production platforms, this is usually:

- directly after the choke, where the flow rate is increased;
- on the outside radius of bends;
- just downstream of bends, especially straight after the choke or downstream of blind tees.

Generally, selecting monitoring locations would involve some analysis of the piping geometry and/or involve some computation fluid dynamics (CFD) analysis.

For a given level of sand hold-up, erosion rates increase dramatically as production rates are increased. This can cause the platform operator to have to limit production rates to minimise the integrity risk.

Installing a wall thickness monitoring system is an extremely cost-effective alternative for managing this risk – such a system provides a direct measurement of an increase in erosion rate, in good time to take corrective action.

### 2. Confidence to sustain high production rate through integrity monitoring

A gas producer operating one of several wells on an unmanned platform at 250 mmscfd ( $2.5 \times 10^5$  MBTU per day) was already employing an external acoustic sand detector and an intrusive ER probe on the platform for this well. These devices did not provide sufficiently direct and real time integrity monitoring, constraining the production rate for fear of unacceptable levels of sand erosion.

A Permasense system of ~30 sensors was installed at locations downstream of the choke and downstream of the first bend - blind tee - after the choke. This enabled continuous tracking of wall thickness in these areas, giving confidence to increase production on this well to 280 mmscfd ( $2.8 \times 10^5$  MBTU/day), a 12% increase, with confirmation that erosion rates did not increase. The

higher production rate was maintained even when the acoustic sand detector and ER probe were down due to maintenance activities, by increasing the measurement acquisition rate - configured by operators onshore - of the Permasense sensors.

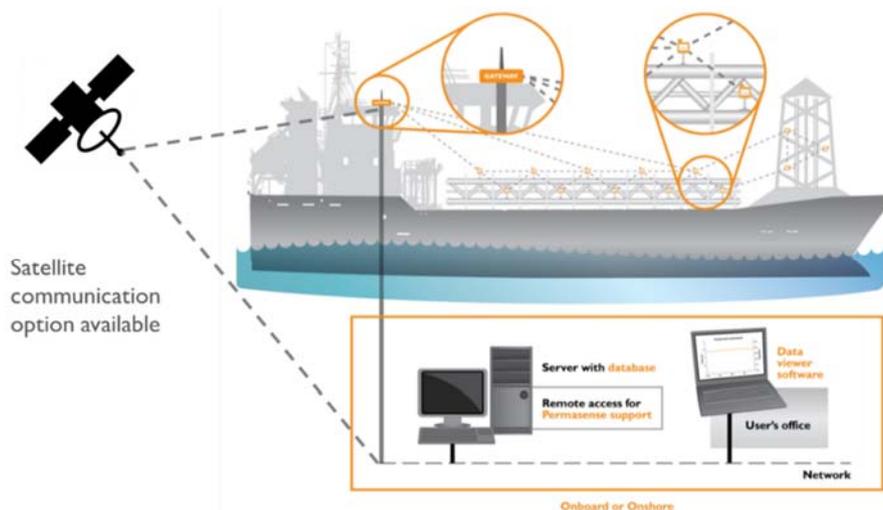
This increase in production rate equates to an increase in saleable gas of 30 mmscfd (30,000 MBTU / day), or US\$120,000 / day at \$4 USD / MBTU, resulting in a payback period of days for the Permasense system.

This customer has now installed a similar Permasense solution, onstream, on each of the wells on this platform and is extending the solution to other gas production platforms in the field, unmanned and manned.

### 3. Permasense solution for offshore environments

Permasense wireless systems are ideally suited to platforms as they avoid the prohibitive expense of cabling monitoring devices in offshore zoned areas. The wireless sensors communicate to one wired gateway which, when connected to existing cabled network infrastructure or a satellite communication module, delivers the data to the desk of the integrity engineer or operations engineer, either on the platform or on land.

The picture below shows an example application on an FPSO.



Permasense supplies its non-intrusive ultrasonic ET210 sensors for offshore environments. This sensor version features:

- compact form factor - the compact form factor sensor features a height from pipe wall of only 200mm (8 inch);
- IP67 rating;
- flexibility to mount practically anywhere;
- completely non-intrusive – easy and safe to install;
- no need to remove external corrosion protection – maintain external corrosion protection;
- magnetic mounting with lightweight plastic securing strap;
- wireless data retrieval using industry standard WirelessHART – no need for cabling.

#### 4. Example deployments

The pictures below show ET210 sensors deployed offshore on various piping and vessels.



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