

## Case Study:

# First wireless completion system deployed in the Bakken

Tendeka's PulseEight system proves the feasibility of a truly wireless intelligent completion.

### Well Data

**Location:** North Dakota, USA

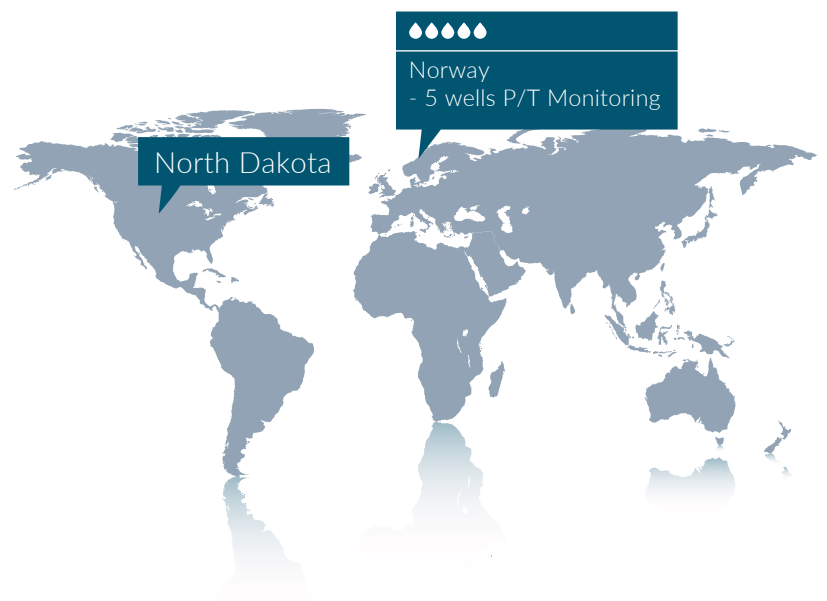
**Well Type:** Oil Producer - Shale

**Tubing Size:** 2-7/8"

**Fluid:** 1,500BOPD, 1,500BWPD,  
2MMscf/d, 45API

**Pressure:** 3,700psi

**Temperature:** 125°C



### Project Overview

Tendeka's PulseEight dynamic downhole reservoir management system uses proprietary Fluid Harmonics telemetry to turn produced fluids into a two-way communication platform. Previously, Tendeka installed the PulseEight wireless gauge proving the efficiency of the communication from the wellbore to the wellhead.

Fluid Harmonics relayed critical reservoir pressure and temperature data which the client used for depletion monitoring and for the planning of an infill drilling campaign.

To unlock the full potential of the system and allow for greater control, Tendeka embarked on a project to prove bi-directional communication via a PulseEight Interval Control Valve (ICV).

The device was required to send the pressure / temperature data up the well, and receive and interpret data commands sent from surface using Fluid Harmonics system in a multi-phase environment.

An oil producing shale well in the Bakken was completed with a PulseEight ICV system for a large overseas National Oil Company (NOC).

### Tendeka Solution

To prove the suitability of Fluid Harmonics communicating from surface to the PulseEight ICV downhole device, Tendeka assessed the many variables and how changes in these would affect the wireless signal detected. The wellhead choke was cycled several times to assess the telemetry wave peaks. Monitoring of the surface response provided indications of successful communication links whilst analysis of the data recorded by the device's memory showed the make-up of the wave form and any signal distortion.

The device was deployed as part of the 2-7/8" completion and set at 7,000ft TVD. A shroud was used to house the device and provide bypass to a pump out sub below. The system was deployed through a snubbing unit and after blowing the pump out sub, the well was shut-in until the surface handling system was installed. Standard completion installation procedures were adhered to and due to the simplicity of the system there was no additional operational time.



## Project Results

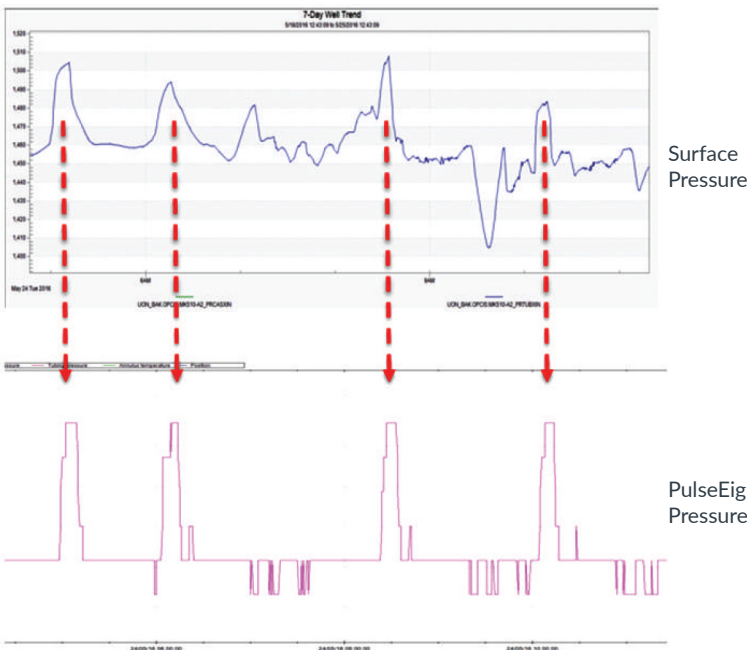
After 5 months, the PulseEight ICV was retrieved from the well and the downhole data analysed. Results showed that all Fluid Harmonics signals were recorded and decoded by the ICV, as seen in the graph below. Detection of telemetry communications were achieved with minimal losses whilst no distortion in the signal was evident.

Pressure trends from the wellhead showed production was unstable and was regularly experiencing slugging. Also, a number of unplanned shut-downs occurred due to a newly installed surface system. None of these occurrences were inadvertently picked up by the PulseEight ICV as a Fluid Harmonics command, proving the system is suitable for both multi-phase environments and unstable production regimes.

PulseEight dynamic downhole reservoir management system offers cost and HSE benefits over conventional cabled systems. Removing the requirement to run cables to surface reduces feed-through connections and potential leak paths, improving barrier integrity and quicken deployment times. Personnel time on site is minimised, reducing exposure to risks.

Tendeka can now offer a robust, field proven downhole systems that can be used to bring greater flexibility to many applications, including:

- Pressure / temperature profiling
- Interval control
- Ambient valve replacement
- Multi-lateral control
- Autonomous gas-lift optimisation
- Water and gas control shut-off
- Formation integrity
- Gas hydrate prevention
- Cross-flow prevention



Four pressure pulses generated using surface choke modifications

