



GAS REINJECTION



Oil & Gas/Upstream

“The meter installed at Well 9866 technically works perfectly fine and to the satisfaction of Operations.”

*Johannes Gruntjes,
Senior Instrument Engineer,
Karachaganak Petroleum Operating B.V.*



Measuring Task

Non-intrusive sour gas flow measurement with high pressure and flow rate on the reinjection well pipe with thick walls

A typical gas or oil well produces at its highest production rate mainly at the beginning of the production cycle. Over time, the pressure in the reservoir naturally decreases. In order to maintain the initial pressure and production rate, the gas reinjection technique is used in both natural gas and crude oil reservoirs. For this purpose, natural gas recovered from the reservoir is reinjected into the gas injection well which requires the corresponding pipe dimensions and flow metering technology. On the other hand, in-line instrumentation at these process parameters are mainly unsuccessful and useless. Therefore, operator companies are increasingly opting for clamp-on flow meters.

Karachaganak Petroleum Operating B.V. (KPO) is the main operator of the Karachaganak gas condensate field in northwest Kazakhstan. Unit 2 at Karachaganak is home to an innovative high pressure gas injection system. It processes and re-injects sour gas (H₂S content of 4 per cent) at pressures of up to 550 bar and produces oil for stabilisation within the Karachaganak Processing Complex. KPO engineers contacted Flexim in order to find a solution for the problem on a gas reinjection well with high

pressure and flow rate where a clamp-on ultrasonic flowmeter from another provider failed.

Johannes Gruntjes, Senior Instrument Engineer at KPO, stated the problem as follows: "Gas flow measurement is not possible with the existing clamp-on sensors. A major concern is the pipe wall thickness – i.e. will the flowmeter being proposed by Flexim work with the given line size, wall thickness and process conditions accurately?"

If Flexim's measuring technology proves to be successful on the given line, the customer promised to purchase five more flowmeters from Flexim.



Solution

After discussion and clarification of all the details of the measurement task with the customer, Tekknow, Flexim's sales partner for Russia, suggested the FLUXUS® G809 together with K transducers as an appropriate solution.

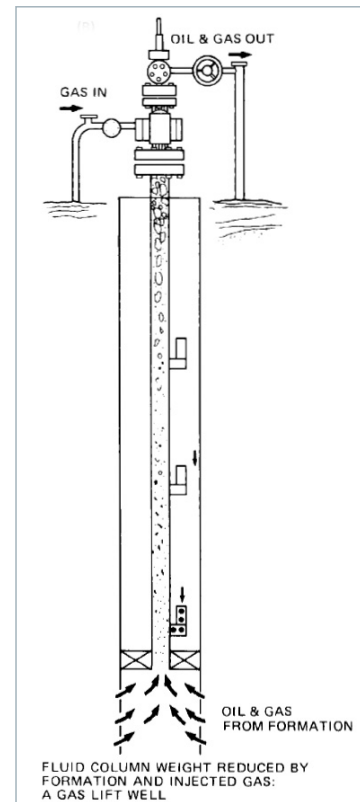
Tekknow also provided good reference list of similar applications. A very similar installation was performed by Tekknow in Kazakhstan, for NCOC in the Kashagan field and its details were shared with KPO engineers.

Up until the last moment before the purchase, the customer asked various questions about the FLUXUS® flowmeter, showing his doubts about the success of the measurement due to previous bad experience. Eventually, the FLUXUS® G809 was purchased and installed on the reinjection well pipe at the customer's site and showed flawless performance over the entire operating range of the process.

After installation, the customer expressed his satisfaction as follows: "Together with the instrumentation service specialists, the ultrasonic flow meter FLUXUS® G809 was installed and commissioned. No deviations in operation were observed, the device operates in accordance with the declared metrological characteristics."

Thanks to Flexim's leading ultrasonic measuring technology, all customer doubts regarding the success of the clamp-on flowmeters vanished. Flexim has proven that the large wall thickness and high flow rates, even in the harsh climate of Kazakhstan, are not a problem for its flowmeters.

As a result, the KPO team expressed their gratitude to Flexim and Tekknow team and has requested an additional gas flowmeter from Flexim.



Schematic of the gas lift process.

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The FLUXUS® G809 is used as a measuring transmitter, here in operation during commissioning.



The non-working clamp-on ultrasonic flow measurement system which was intended to measure the reinjected gas quantities at the well.

Measuring Points and Instrumentation

Pipe	8" carbon steel, wall thickness 2.1"
Medium	Dry Sour gas
Temperature	32 °F ... 175 °F
Pressure	5,200 ... 6,000 psi
Flow Rates:	80 ... 285 t/h
Measuring Device	1 stationary clamp-on ultrasonic FLUXUS® G809 gas flowmeter for use in hazardous areas
	1 pair of clamp-on ultrasonic transducers type K (shear wave), mounted in Variofix C

Advantages

- Easy installation and replacement of existing clamp-on flowmeter
- No process shutdown required
- Reliable, accurate and robust measurement
- Excellent support from Flexim HQ and local distributor

Customer

Karachaganak Petroleum Operating B.V., Karachaganak Gas Condensate Field, Aksai, Kazakhstan

The Karachaganak field, discovered in 1979, is one of the world's largest gas and condensate fields. Located in north-west Kazakhstan and covering an area of over 280 square kilometres, it holds estimated hydrocarbons initially in place (HIIP) of 9 billion barrels of condensate and 48 trillion cubic feet (tcf) of gas, with estimated gross reserves of over 2.4 billion barrels of condensate and 16 tcf of gas.

The Karachaganak Venture brings expertise and knowledge from five oil & gas companies – ENI (29.25%), Royal Dutch Shell plc (29.25%), Chevron (18%), Lukoil (13.5%) and KazMunaiGas (10%). Together they share their experience and expertise with the Republic in looking at both domestic and export options for maximising the value of these resources.

In 2020, hydrocarbon production in Karachaganak reached 143.9 million barrels of oil equivalent. 10.4 billion cubic metres of gas, which is approximately 51.3% of the total gas produced, were re-injected to maintain reservoir pressure.



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