Methane ($\text{CH}_4$) is the second most prevalent greenhouse gas emitted from human activities. In 2014, $\text{CH}_4$ was responsible for around 11 percent of all US greenhouse gas emissions caused by human actions.

Methane is emitted by a range of natural sources such as marshlands, leakage from natural gas systems and livestock farming [1]. Domestic livestock such as cattle, sheep and goats, produce significant amounts of $\text{CH}_4$ as part of the normal digestive processes in the ruminant stomach system. Ruminant animals host bacteria in their gastrointestinal systems to aid in the breakdown of plant material and some of these microorganisms (methanogens) use the acetate from the Methane ($\text{CH}_4$) is the second most prevalent greenhouse gas emitted from human activities. In 2014, $\text{CH}_4$ was responsible for around 11 percent of all US greenhouse gas emissions caused by human actions. Methane monitoring is important producers of methane. The quantification of the methane gas produced is difficult to accurately determine without the use of proctored experiments involving a cow in a respiration chamber for several days. One of the methods in development is the use of gas sensors in milking parlours and cow sheds to monitor the methane produced by individual animals over a set time. While the respiration chamber remains as the benchmark, the gas sensor method is able to produce rapid and accurate estimates of methane emissions which, unlike a respiratory chamber, are not disruptive to agricultural activities [7]. The measurements are usually made during ‘milking’, which takes place between 3 and 6 times per day and are invaluable in the development of methane reducing diets and to identify low emission cow species.

Recent research [8,9] at the University of Queensland, Australia has examined the development of a vaccine from kangaroo stomach bacteria against methane-producing bacteria in ruminant digestive systems (kangaroos produce no stomach methane). According to Professor Philip Garnsworthy of the University of Nottingham, School of Biosciences, “On-farm monitoring has the potential to decrease uncertainty, or at least to quantify sources of variation, and to test the outcomes of mitigation strategies, by measuring indicators of emissions under commercial conditions” [10,11]. The study was also able to establish the validity of the IR method by comparing cows fed a high methane diet with a control group with a normal diet.

A further 2012 study [14] of 215 cows examined the methane emission rate during milking over a period of five months using automatic gas analyzers in milking stalls. The study was able to give additional validation to the non-invasive IR gas analyser regimen and also compare methane production from different cow species on different diets. IR gas analysis has proven to be useful, inexpensive and rapid in providing accurate measurements for methane from ruminants [15].

The Gascard NG for Agricultural Gas Monitoring
The Gascard NG Infrared Gas Sensor (Edinburgh Sensors Ltd.) is the ideal adjunct to any automatic gas detection system for measuring methane levels during milking (it can be used alongside other gas detection technologies if required). The Gascard NG infrared gas sensor has been designed to be easily integrated with gas detection systems that require high quality, accurate and reliable concentration measurement of a range of common gases including CO, CO$_2$, and CH$_4$. The system incorporates flexibility and a range of important features including:

- Real-time temperature compensation
- On-board Barometric Pressure Correction across the 800 mbar – 1150 mbar range
- True on-board RS232 communications as well as the option of TCP/IP communications protocol
- Operating voltage range from 7-30v
- Field serviceable IR source

The Gascard NG uses patented dual wavelength Infra-Red (NDIR) sensor technology that provides accurate temperature and pressure compensation for methane gas levels, compatibility with a range of data handling systems as well as consistency of measurement.
The Gascard NG is an ideal IR sensor for use in a farm environment as it is robust, accurate and reliable.

References