



## MERCURY DETERMINATION IN NATURAL GAS

### INTRODUCTION

High concentration of mercury occurs in the natural gas. For 70% of gas deposits mercury concentration in gas ranges from 0.3 to 30  $\mu\text{g}/\text{m}^3$ . In some regions, the mercury concentration in gas comes up to hundreds  $\mu\text{g}/\text{m}^3$ . Besides its toxicity, mercury, being present in hydrocarbon gas, initiates corrosion of pipelines and catalyst poisoning during gas transportation and processing, and these effects have serious implications for the gas-processing industry.

The use of a mercury analyzer RA-915M/RA-915+ with Zeeman background correction of nonselective absorption provides direct real-time mercury determination in natural gas within the whole range of the mercury concentration in natural gas from the  $\text{ng}/\text{m}^3$  to  $\text{mg}/\text{m}^3$  level.

### MEASUREMENT METHOD

The measuring method is based on the use of atomic absorption spectrometry with Zeeman background correction embodied in a **mercury analyzer RA-915M** with a multipath analytical cell, which provides the unique combination of the low detection limit and high selectivity of the direct continuous measurements. For example, even 25% hydrogen sulfide content in the gas (whose non-selective absorption amounts to 93%) does not produce false response.

As a result, the analyzer provides direct determination of mercury in a hydrocarbon gas flow due to the elimination of preliminary precipitation and collection of mercury in absorption traps. Therefore, analyses can be carried out with the ultralow detection limit in real time.

To perform a measurement, the analyzer is placed near a gas well or other sampling point (gas pipeline, string, separator, etc). The gas flows continuously through Teflon hoses into the **RP-91NG attachment** and then arrives at the analytical cell. The gas flow rate is controlled by a valve. The blank signal is regularly checked by passing the gas through a special filter with the Hg absorption efficiency of 98–99%.

If necessary, a simple device is mounted upstream of the instrument to separate the gas from a liquid phase (water, condensate or oil). The mercury concentration is measured once per second and is processed by a computer with a simultaneous data display.

If it is impossible to carry out direct analysis near a sampling point, the gas can be analyzed in a laboratory. In this case, it is recommended to deliver the gas samples to the laboratory in special bags made of materials that don't absorb mercury (e.g., Tedlar® gas sampling bags).

### MEASUREMENT RANGE

The measurement ranges of the mass concentration of mercury in natural gas are as follows:

- 0.005–20  $\mu\text{g}/\text{m}^3$  (with a multipath cell)
- 0.5–2,000  $\mu\text{g}/\text{m}^3$  (with a single-path cell).

### ANALYSIS FEATURES

- Simple operation and maintenance
- No sample preparation is necessary.
- Direct mercury determination without its preliminary accumulation on a gold trap.
- Real-time reporting
- Low limit of detection, high selectivity
- Wide dynamic measurement range: more than five orders of magnitude
- Stable calibration
- The measurement results are virtually independent of the gas flow rate in its wide range.
- Capability to carry out analysis in the field.
- No running cost.

### EQUIPMENT AND REAGENTS

The following equipment and materials are used for analysis:

- Mercury analyzer RA-915M with RP-91NG attachment;
- PC with Windows® XP/Vista/7/8 and RAPID software.

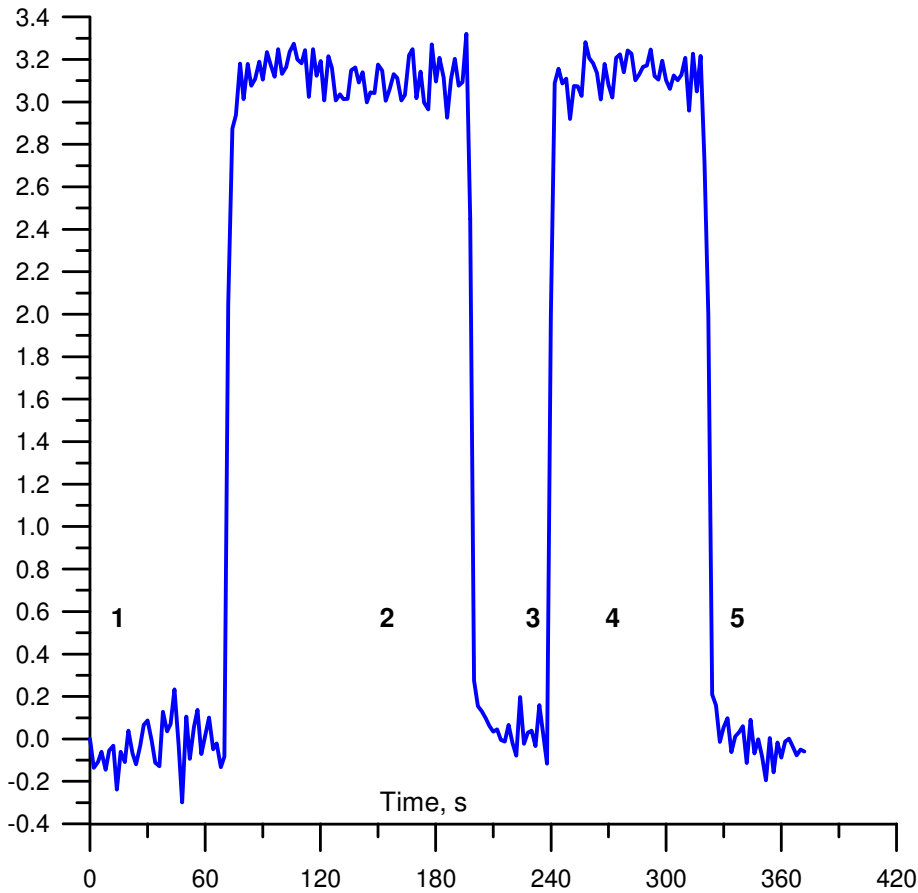




## EXAMPLES OF ANALYSIS

Mercury content in natural gas measured by RA-915M analyzer

$C_{Hg}$ ,  $\mu\text{g}/\text{m}^3$



1, 3, 5 – Zero check

2 – Natural gas (measured value 3.1, RSD 0.1  $\mu\text{g}/\text{m}^3$ )

4 – Natural gas (measured value 3.1, RSD 0.1  $\mu\text{g}/\text{m}^3$ )

The information in this leaflet is supplemental. To get more specific information on this method, please contact the developer of this method LUMEX INSTRUMENT Group.

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