

Summary of the doctoral dissertation on "*Removal of hydrogen sulphide during variable biogas flow through a filter with bog iron ore*"

The presence of hydrogen sulphide in biogas is undesirable due to the corrosive properties of this gas. In contact with water, hydrogen sulphide forms a corrosive condensate, which is the most common reason for the loss of the guarantee provided by the cogeneration unit manufacturers. The paper discusses the removal of hydrogen sulphide during variable biogas flow due to the lack of literature data on the effect of flow on hydrogen sulphide absorption on solid filters. As a research material, bog iron ore (modified and unmodified) was selected as the cheapest and generally available hydrogen sulfide filter.

The work addresses two research problems formulated in the form of questions about the missing knowledge in the subject literature:

- how will the biogas flow affect the absorption of H₂S by bog iron ore?
- will the type of bog iron ore used have an impact on H₂S removal from biogas, with changing flow parameters?

In order to carry out the research, a test stand was built, consisting of a flexible annular biogas tank, a laboratory cylinder filled with bog iron ore and a gas analyzer. Technical hydrogen sulphide was added to the flexible ring biogas tank to obtain hydrogen sulfide concentration in biogas at the level of 3000 ppm. Measurements using GA 2000 gas analyzer were performed at 10-minute intervals for 120 minutes. Five trials were tested with modified bog iron ore and five trials with unmodified bog iron ore.

The obtained test results are as follows:

In the first minutes of measurement, the H₂S content in the purified biogas was high, gradually decreasing with the duration of the test. This means that the amount of H₂S absorbed by the filters increased with the time of exposure to sulphated biogas.

The biogas flow had an effect on H₂S suction on the bog iron ore. With the decreasing flow time, the amount of H₂S absorbed by the ore was increased. While the flow had a greater

impact on absorption on unmodified bog iron ore (very strong correlation for 4 out of 5 tests) than on modified bog iron ore (very strong correlation for 2 out of 5 attempts).

The type of bog iron ore used had an effect on H₂S absorption. Within 120 minutes of the study, the modified bog iron ore had a larger range of difference in the content of hydrogen sulphide in the purified biogas, which was 260 - 837 ppm H₂S between the first and last measurement. In the case of unmodified bog iron ore this range was smaller and amounted to 300 - 474 ppm H₂S between the first and last measurement.