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Characterization of dust emissions from Shaft VI of the “Knurów-Szczygłowice” mine in the context of VAM utilization

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Ventilation air methane (VAM) from underground hard-coal mines is increasingly regarded as a potential fuel rather than an unavoidable waste stream. The feasibility of applying thermal or catalytic VAM oxidation technologies depends not only on methane concentration and volumetric flow rate, but also on dust loading, particle-size distribution, humidity, and the composition of the exhaust air. This paper presents original measurements carried out at Shaft VI of the “Knurów-Szczygłowice” mine (Szczygłowice section) within the ProVAM project as a potential site for VAM utilization. A three-stage program was implemented: short-term mapping across the exhaust diffuser cross-section, 24-hour measurements at a selected point, and week-long dust accumulation on a bag filter for compositional analysis. The measurements yielded relatively low mass concentrations of total dust (0.07–0.36 mg/m³), high relative humidity (85–95%), and a stable methane concentration of approximately 0.3–0.4 vol.%. Dust analysis indicated an average non-combustible (inert) fraction of 59.1%, implying a combustible fraction of about 41%. These findings are directly relevant to the design of VAM thermal oxidation units: they indicate that operation without front-end dedusting is feasible with appropriate bed design, while highlighting the need to address the risk of local hot spots and the impact of high humidity on process performance.

Metryczka

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