

Section 02. Geotechnical Systems Stability

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Main Concept of Applying Underground Coal Gasification

It is commonly known that the process of underground coal gasification (UCG) represents industrial underground burning, which aim is converting a coal seam into gas. Basically, this technology is carried out with drilling a specific amount of boreholes where each of them has its own purpose. Such gases as hydrogen, carbon dioxide, methane and carbon monoxide are resulted due to the burning. The ratio of those may vary depending on the depth of the coal bed, the values of oxidant balance and the amount of formation pressure. In most cases outputted gas can be used at power plants as a source of fuel. However, firstly it is required to be processed and separated from undesirable impurities and then transported through the gas pipeline.

Besides, a great chemical feedstock in the form of a synthetic natural gas (syngas) is possible to obtain. To form this type of gas and accelerate the chemical reaction supplying steam and oxygen into underground is required. This synthetic gas is worth providing additional operations, as it is highly valuable resource for such fuel production as diesel, fertilizer, explosives and other products.

In terms of safety, this method wins greatly in comparison with general coal extraction due to several reasons. One of the main benefits of this technology is eliminating mining and enhancing mine safety issues. UCG does not involve human factor to ensure protection beneath the ground. Since there is no such thing as working, rock mass is no longer required to be extracted from the workings.

Now let's consider this technique in terms of economy. The technique of underground coal gasification is claimed to be significantly cheaper due to eliminating the process of building all those underground facilities. Besides, implementing this technology results in sufficient increase of reserves to be economically recoverable by several times, which presents great importance for economy of the country in general. To prove this idea, it was calculated that underground coal gasification could enlarge recoverable coal reserves in the USA by 300%, which is apparently a successful step in technological improvement.

Ecology is also of great deal when it comes to mining. Comparing to the traditional mining of coal, the underground coal gasification excludes damage to the soils, reduces most of such emissions as sulfur dioxide (SO₂) and nitrogen oxide (NO_x) contaminants that are followed by mining. Taking those data into consideration, the ash content of syngas is estimated to be at the point of 10 mg/m³ comparing to the smoke produced from normal coal combustion (up to 70 mg/m³).

Summarizing all those facts, we can assume that this technology may be reasonably applied on the coal seams having the thickness less than it is required to provide feasible extraction by means of the underground method. Moreover, it is sure to be less polluting, more efficient and far safe than the traditional techniques.