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SOVIET EXPERIMENTS WITH GASIFICATION OF PECHORA BASIN COAL

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The importance of gasifying Pechora basin coal has been established in a previous article. In experiments carried out in a laboratory gas generator of VNIIT (All-Union Scientific Research Institute of Fuel) it was discovered that the most suitable coal for gas production from the Pechora area comes from mines No 1 and 2.

Coal from the deposit which is worked in these mines belongs to the long-flame type from the standpoint of its volatile substance content and the character of the bead which is formed in experimentation, but it differs from known bituminous coals in that it contains humic acid. In determining the volatile substance content of the coal, a noncaking powdery bead is formed.

Industrial experiments were conducted in a Wellman gas generator using lower ash-content coal from Mine No 2 and higher ash-content coal from Mine No 1. The chief reason for the choice of this type of generator for the first industrial experiments with the coal in question was that it has been impossible to make absolutely certain in laboratory tests that the coal was completely lacking in caking properties.

The experiments in this generator produced gas with a calorific value of 1,500-1,580 calories per cubic meter (compressed) and containing 3-5 percent of carbon dioxide and 28-30 percent of carbon monoxide. Lumps of coal in the layer being gasified did not adhere to one another, and, during the entire course of the tests no tendency to cake was observed.

However, the Wellman generator is not suitable for coal with a high ash content. It lacks a water jacket, and the lower part of the shaft is not properly constructed to permit a high productivity. The rate of the process during the experiments did not exceed 100 kilograms of natural fuel per square meter of the grate per hour.

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To reach a final decision on the suitability of coal from Mine No 2 for purposes of gasification, repeated industrial tests were made in ordinary semimechanized gas generators. A gas generator station which had been operating efficiently on Chelyabinsk coal containing 25 percent or more ash was selected as the site of the experiments. This station was equipped with Humbold-Deitz and AFG gas generators, both types 2.6 meters in diameter.

Before the start of the experiments in the AFG generator, it had been operating exclusively with Chelyabinsk coal. The transition to Pechora coal was made gradually, 15 percent being used the first day; 50 percent, the second; and 100 percent, the third. The gradual addition of the coal being tested did not lead to any great changes in the operation of the generator. The process went on continuously and no additional poking was required. The productivity of the generator declined slightly. The calorific value of the gas produced ranged from 1,400 to 1,435 calories per cubic meter (compressed)

The GD generator had also been working exclusively with Chelyabinsk coal prior to the start of experiments, and without stopping for cleaning it was immediately converted to Pechora coal. No essential change was noted in the operation of the generator after the conversion. During 7 days of experimentation the productivity of the generator was 27 tons of natural fuel per day, which is equivalent to 18 tons of standard fuel. In gasifying Chelyabinsk coal in the same generator the productivity had ranged from 18 to 20 tons of standard fuel per day. The calorific value of the gas obtained during the experiments averaged 1,360 calories per cubic meter (compressed), but in some cases it went as high as 1,460 to 1,464 calories per cubic meter (compressed). It will be possible to improve the quality of the gas obtained as methods of producing it are more thoroughly mastered.

The following conclusions may be drawn from the experiments carried out by VNIIT and from the industrial gasification of coal from Mine No 2 in semimechanized AFG and Humbold-Deitz generators

1. Coal from Mine No 2 shows no tendency to cake during the gasification process and may be used as fuel for gas production in ordinary semimechanized gas generators

2. For the near future, the technical characteristics of the gasification process and the resulting gas may be assumed to be the following:

The rate of the process is 300 kilograms per square meter per hour, in the case of fuel with an ash content of 25 percent and a moisture content of 10 to 12 percent. Calorific value of dry gas is 1,400 calories per cubic meter (compressed). Output of gas is 2.12 to 2.15 cubic meters (compressed) per kilogram of working fuel. Tar content of gas is 20 to 25 grams per cubic meter (compressed). Moisture content of gas is 100 to 110 grams per cubic meter (compressed). Temperature of gas at outlet of generator is 350 to 450 degrees centigrade. Air consumption is 1.3 to 1.4 cubic meters (compressed).

3. Careful attention must be paid to preparing the fuel (crushing and sorting)

4. Gas generators gasifying coal from Mine No 2 should have a water jacket and an efficient ash remover

5. The Pechora basin coal under discussion can be extensively used for gasification purposes in place of coal which would have to be transported from a distance.

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/The authors of this article use kilocalories and calories interchangeably and, since industrially the term calorie is often used in referring to a kilocalorie, it is presumed that that is the case here. Calorie has been used consistently throughout this report./

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