untitled protocol

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Abstract

The experiments mainly focus on estimating the water jet performances and the breaking oil shale efficiencies of the jet devices, so as to compare the different jet devices and propose the parameters of borehole hydraulic mining for oil shale. In fact, the jet devices' water jet performances can be evaluated by the striking force and the oil shale breaking effect of the high-pressure water jet produced by itself. Under the same experimental conditions, the greater the striking force or the oil shale breaking effect more significant, the better the water jet performance of the jet device. Moreover, the experiment of breaking oil shale can also be used for proposing the parameters of the borehole hydraulic mining for oil shale. Therefore, the main aim of the experiments are to compare the striking forces and the breaking oil shale effects with the different jet devices.

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Guidelines

This guidelines is about how to perform the experiments for estimating the water jet performances and the breaking oil shale efficiencies of the jet devices.

Before start

Before starting, it is necessary to prepare the suitable labratory, self-developed multifunctional experimental device, jet devices, and oil shale samples in advance. Moreover, the detailed experimental schemes are also needed.

Materials

- water by Contributed by users
- oil shale samples by Contributed by users

Protocol

Step 1.

The necessary preparations are needed in advance based on the actual situations of the labratory as mentioned previously.

Step 2.

First, perform the experiment of water jet's striking force testing. The detection mechanism of the water jet's striking force needs to fix in the angle-adjustable sample basket. Second, respectively use the two jet devices, i.e., the straight cone nozzle and the self-excited oscillation pulsed jet nozzle to do the following experiments, and adjust the experimental conditions based on ''Table 7. Experimental schemes and values of the high-pressure water jets' striking forces testing.''. Third, get the corresponding data of the high-pressure water jets' striking forces and synchronous record them for the following analysis.

Step 3.
Next, perform the experiment of breaking oil shale with the the straight cone nozzle. First, unload the detection mechanism of the water jet's striking force from the angle-adjustable sample basket. Second, fix the oil shale sample in the angle-adjustable sample basket, and then use the straight cone nozzle to break oil shale sample based on "Table 9. Experimental conditions of breaking oil shale with the straight cone nozzle.". Third, observe and record the experimental phenomena and data in time. Moreover, the sizes of the broken holes on the oils shale surface are measured by the standard vernier caliper.

Step 4.
Next, perform the experiment of breaking oil shale with the self-resonating cavitating jet nozzle. First, unload the straight cone nozzle, and install the self-resonating cavitating jet nozzle. Second, unload the broken oil shale sample, and fix the new one in the angle-adjustable sample basket. Third, use the self-resonating cavitating jet nozzle to break oil shale sample based on "Table 10. Experimental conditions of breaking oil shale with the self-resonating cavitating jet nozzle.". Fourth, observe and record the experimental phenomena and data in time. Similarly, the sizes of the broken holes on the oils shale surface are measured by the standard vernier caliper.

Step 5.
Next, perform the experiment of breaking oil shale with the self-excited oscillation pulsed jet nozzle. First, unload the self-resonating cavitating jet nozzle, and install the self-excited oscillation pulsed jet nozzle. Second, unload the broken oil shale sample, and fix the new one in the angle-adjustable sample basket. Third, use the self-excited oscillation pulsed jet nozzle to break oil shale sample based on "Table 11. Experimental conditions of breaking oil shale with the self-excited oscillation pulsed jet nozzle.". Fourth, observe and record the experimental phenomena and data in time. Similarly, the sizes of the broken holes on the oils shale surface are measured by the standard vernier caliper.

Step 6.
Finally, collate the data from all of the experiments. Then, process and analyze these data. In addition, it is necessary to make the scientific and rational explaination of the data and the phenomena of these experiments.

Warnings

Because the high-pressure pump is needed in the process of the experiments, the safety and reliability of connections between components must be ensured. In case of accidents, e.g., high-pressure bursting caused by the failure of connections between components, the necessary safety protection should be implemented at the periphery of the self-developed multifunctional

experimental device in advance. In addition, the reasonable evacuation plan is also needed.