

Section 3. Geology

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Application of detailed seismography in coal exploration activities

Abstract: To search for coal seams on the example of the Angren career is proposed to use the method detailed seismic tomography.

Keywords: The career, the roof, Seismotomography, well.

Introduction

The method of detailed seismography can be used for the exploration of coal from coal-bearing layers. The inspection of the effectiveness of this Method was carried out at the producing field — Angren mine.

Methodology. The working technique is not different from the one specified in Fig. 1. The span between receiver positions was 2 m., and between the signal source points — 23 m. Observation was carried out using 24-channel station. Seismic signal production method was mechanical shock. Seismic line laid on the bed of the mine (Fig. 1).

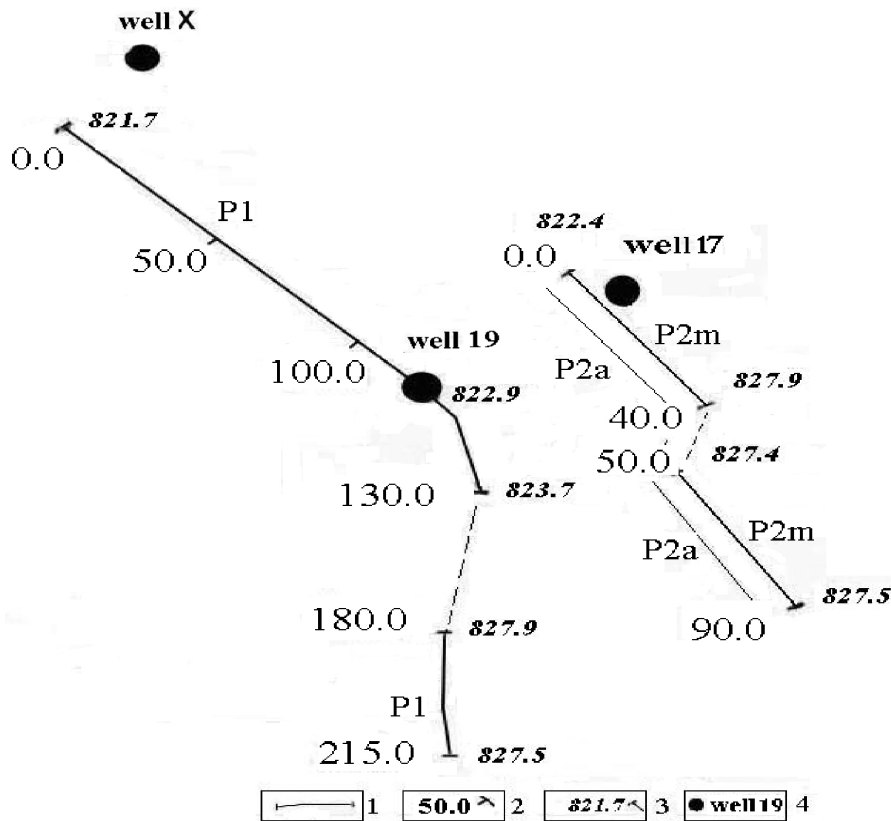


Fig. 1. Schematic of seismic profiles at the bottom of the quarry Angren. 1 — seismic profiles; 2 — pickets; 3 — the absolute level of all profiles; 4 — drilled wells; P2m — Profile 2 — main; P2a — Profile 2a — additional; P1 — Profile 1

Results of the study

Analyzed geologic environment is sedimentation mass with competency of 25–30 m. As considered, the bottom layer is overlying bed of mouldy kaoline. The absolute indicators of latter fluctuate ranging from 790 to 800 m. Daylight surface is located at the level of 820–830 m. Geologic environment was formed by the complex of semimetal rocks of Jurassic period: chalkstone, schist, sandstone with clay interlayer. Layer thickness fluctuates within 3–5 m., and in some cases — 8–10 m. Research target horizon was so called

“previously reserved coal bed”. It occurs directly at the overlying bed of mouldy kaoline. Previously the bed was penetrated by wells, three of which were located at the working sites — No. X, No. 19 and No. 17. According to the drilling data, layer thickness was 3–5 m., stratification depth — 2 530 m. Basing on field seismic observation section of profiles No. 1 and No. 2 it can be concluded that “main” was prepared, as well as No. 2 — “additional” which is underlying in parallel with No. 2. “Main” is 5 m. away on the west. Profiles of previously reserved coal bed are given in Figures 2 and 3.

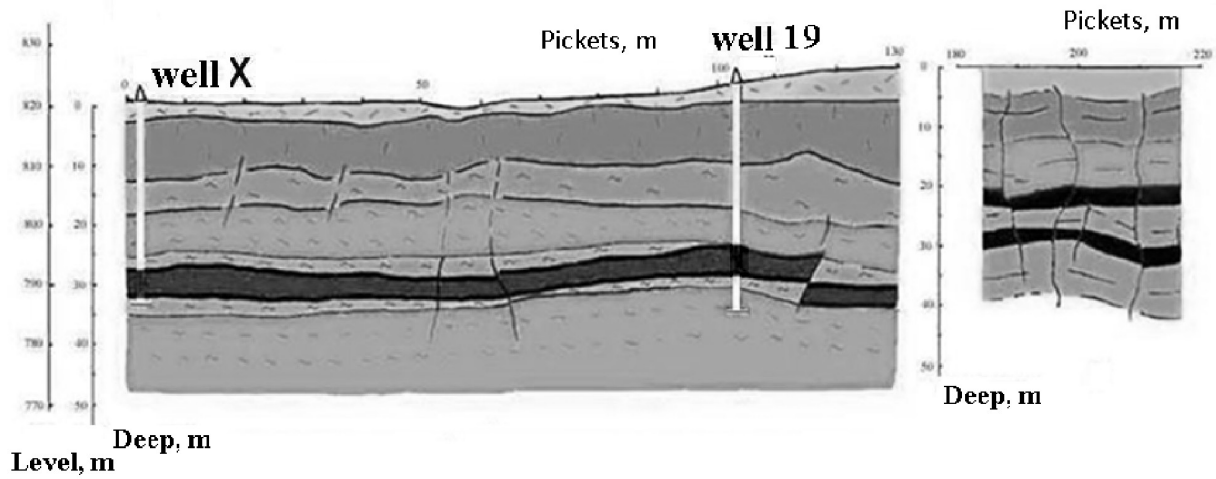


Fig. 2. Projected cuts in the coal seams previously installed on a profile 1.

■ — Plasty coal according to seismic tomography; — Coal, tapped by drilling

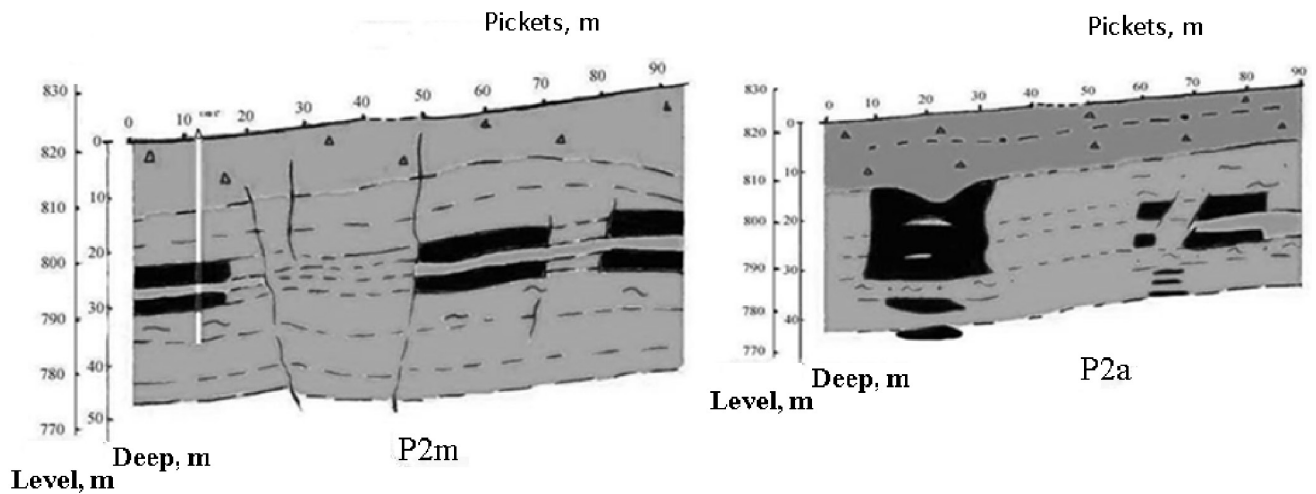


Fig. 3. Projected cuts in the coal seams previously installed on a profile 2.

■ — Plasty coal according to seismic tomography; — Coal, tapped by drilling

The bed has the following distribution limits. Overlying bed of Profile No.1 is traced at the absolute depth of 795 m. (SD 00) and 790 m. (SD 50). Farther the bed elevates up to the level of 800 m. (SD 120) and through the interruption sink up to 195–794 m. (PK120–130). The bed thickness varies from 2 m. to 1.5 m. from the north to the south (SD 50) and to 2–2.5 m. (SD 70–130) (?). Two interruptions are recorded along the bed: at PK60 (range — 1.5 m.) and at PK120 (range — 5 m). The bed was penetrated by the following

wells: X — near to PK00 and No. 19 — PK104 (Fig. 2.). Our scheme matches the drilling data in a practical way. The south end of profile 1 (SD 180–220) in the previously reserved coal bed is traced in form of two layers. Overlying bed of the top layer occurs at the limits of 805, 807, 805 m.; the second layer — at 800–803 m. There is an interlayer of barren rocks with thickness of 1.5–2 m. between the layers. Displacement is recorded throughout the layers with range of 1.5–2 m. (PK205). Overall thickness of both layers is 5–6 m.

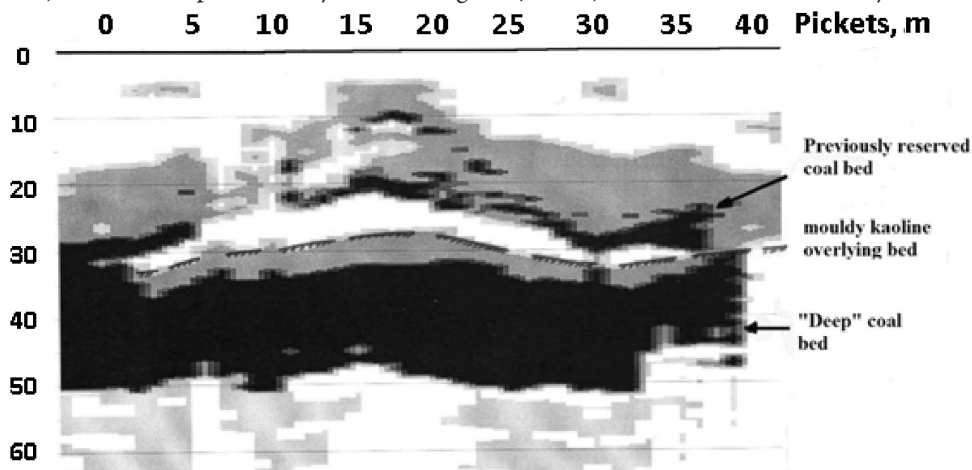


Fig. 4. Example of coal bed under kaoline beds ("Deep" coal bed)

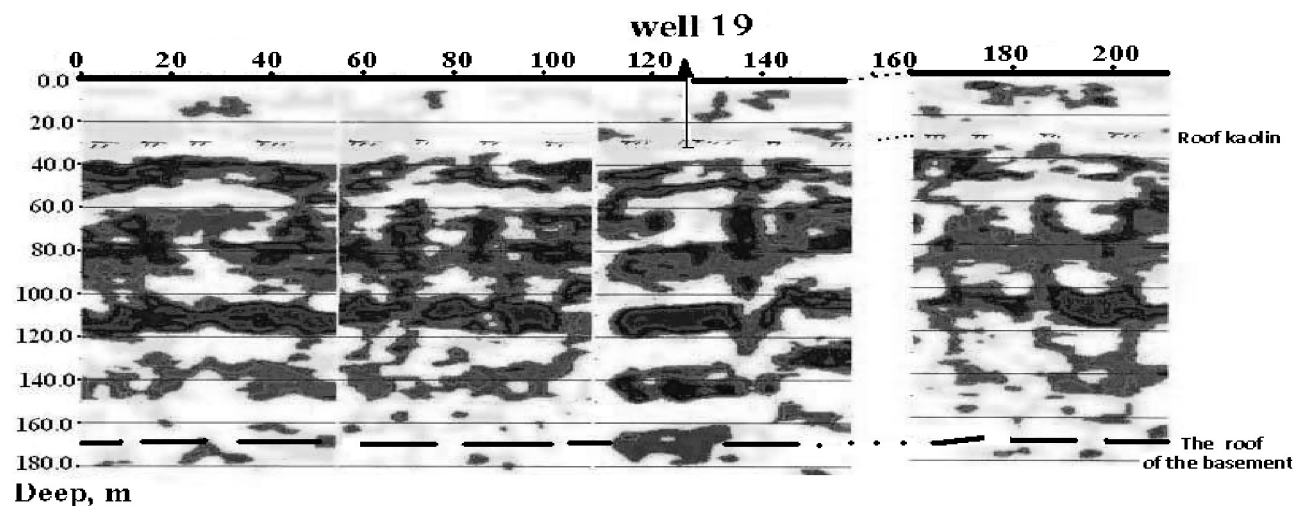


Fig. 5. Select all the coal in the thickness of the sedimentary cover from the bottom of the quarry to the roof of the basement along the profile 1

The “main” profile 2 has the following coal seams plan. Two layers are clearly tracked with an interlayer of 2–3 m. Thickness of coal beds fluctuates from 1–2 m. at SD 0–5 and 50–55 up to 5–6 m. at SD 15 and 85. Second “additional” profile is more complicated. Within the intervals of 15–40 station distances, the coal beds form series of three beds with total thickness of 15–20 m. Farther to the southeast, the patch thickness considerably shrinks to 10 m. Top edge of coal bed is underlies at the limits of 800 m. (SD 00–10) and 803 (SD 50–80). The beds at SD 10 are penetrated by well No. 17. Our data fully match the drilling materials.

As the result, previously reserved coal is traced throughout all observation line. Absolute limits its top edges have uneven values — northern part of profile No.1 (SD 00–100) equals to 791–795, and at other parts increases up to 800 m. and 802–810 m. Thickness of beds is not also constant. Within the intervals SD 00–100 of profile No. 1 thickness is minimal: 2–1 m. Layer thickness in the south area (SD 180–200 profile No. 1 and profile No. 2) considerably expands, the coal bed is tracked in form of two and three (at some places) layer series, with total thickness of 7–10 m., and on occasion 15–20 m.

Apart from previously reserved coal beds, research works explored other coal beds: “deep” and “ultra deep”.

“Deep” and “ultra deep” coal beds. As described above, target bed underlies at the layer of mouldy kaoline. As it was considered, this layer corresponds to the overlying bed of Paleozoic foundation bed, thus the coal beds are not expected to be found below. Our materials can overturn this opinion. The coal bed profile, which overlying bed is located 5–6 m. below the kaolin level is given in Fig. 4. The bed, or possibly the coal series can possibly have the thickness of 15 m. Stratification depth of overlying bed is about 40 m., which corresponds to the absolute limit of 780 m. On attempt to research the deeper levels, the series of coal beds are explored, which expands up to deepness of 140–150 m. with minor bracts (Fig. 5) (“ultra deep coal beds”). Thickness of beds is considerable — from 5 to 10 m. Layer gaps do not exceed 10–15 m. This information shows the following. The mouldy kaoline, generally, does not relate to the overlying bed and the heavy layer of sedimentary rock is underlying below. This implies that the coal productive depth considerably exceeds the values, known so far.

Conclusion. As the result of research works the forecast profiles of previously reserved coal beds were prepared, results match the drilling data; new perspective horizons were explored; coal hosted area is considerably expanded. Data on effective use of detailed seismography in coal exploration activities are acquired.

References:

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