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The methods use of the heterogeneous engineering-geological conditions diagnostic during shield underground tunneling

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Abstract

An analysis of using modern methods of heterogeneous engineering-geological conditions diagnostic during shield underground tunneling. Measurement of technological indicators penetrations may use to diagnose address characteristics of ground array: groundwater flow and level, as well as the type of soil and its physical properties (density and specific cohesion). Level sensors and suspension data may determine the filling speed camera dirt water at different pressures of air in the chamber. This water rate, measured in a particular location and corrected to normal atmospheric pressure conditions, can be used to select special techniques of tunnel structures in the vicinity of the measurements. Excavation volume measurement to diagnose the actual situation of the underground water level and adjust modes of penetration for improving the sustainability of the face. Information exploration wells from the surface can complement the geological descriptions of excavated material from the shield, and the ratio of the allocated two lithological differences horizontal bedding can be used to define boundaries between them in the vertical face plane. To diagnose soil density determined that the amount recoverable sandy soil per cycle has a direct relationship with a significant measure of the density of sand samples. Also during the sinking of the measured torque indicators rotor can diagnose value of specific cohesion of conglomerate rocks in the mine.

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1. Introduction

The emergence of new technologies in the field of tunneling equipment led to the presentation of adequate approaches and requirements to use engineering-geological information (regarding its optimality, targeting, redundancy) and improve the technological capabilities of mechanized shield TBMS.

Currently identified some tunneling indicators the most dependent on interactions with geological conditions: extractable soil weight, cutterhead force and torque, etc.

When the excluded indicators, of which there is no need, for example, the rate of filtration, as the tightness of the working part of the shield and traversed the tunnel part excludes groundwater into the tunnel.

The specifics of the technology to the construction of tunnels using shield TBMs substantially changes not only to the quality and quantity of geological information about the array of subterranean shopping, but also to the use of new methods of diagnosing engineering-geological conditions of tunnel construction and structures.

Excavation of underground tunnels in Moscow different sections is carried out tight shields with Earth Pressure Balance and universal set of cutting tools for tunneling in sandy, clayey and rocky grounds (Fig. 1). In addition, modern boards are equipped with the latest measuring devices to determine indicators of shield technology associated with reactions of various ground arrays.

But such information feedbacks (influence on measured parameters array property technology) -unaddressed and investigated only sporadically. So to put such research on a permanent basis, it is proposed to examine the possibility of using methods of diagnosing heterogeneous and complex engineering-geological conditions with shield tunneling currently intensively for subways of Moscow.

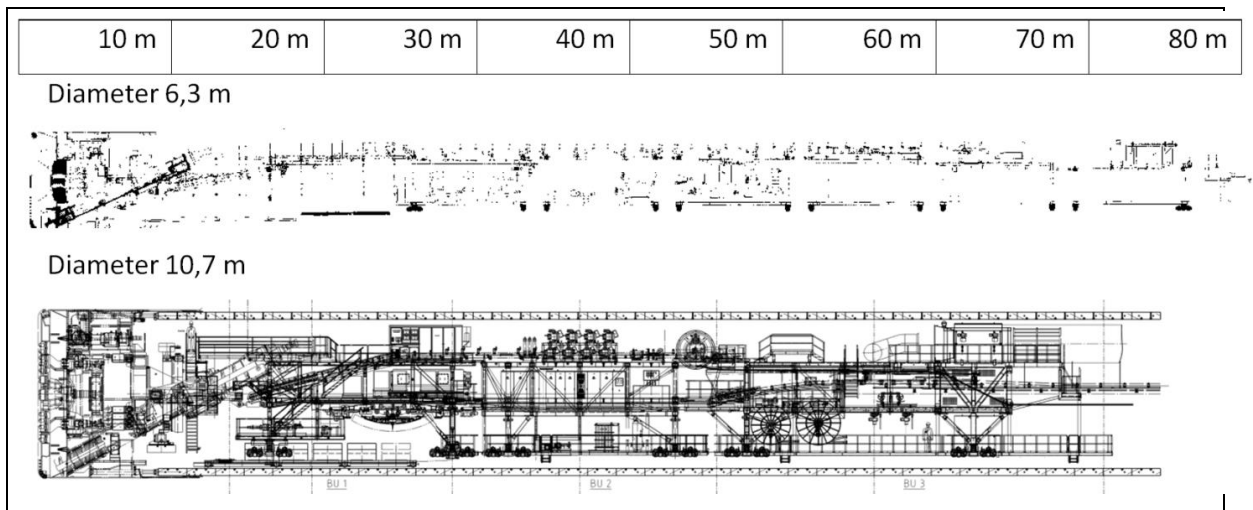


Fig. 1. EPB TBM dimensions.

2. Diagnostics to identify complex engineering and geological conditions in shield tunneling

Moscow area studied sufficiently not only by the number of wells selected samples of experienced field research, but many cases of emergencies. Emergency cases have opened a weak "painful" places in collaboration built tunnels and vulnerabilities in the geological space city, which created difficulties in drilling the tunnels. For example, Flint nodules formed by quartz, or chalcedony in the limestone of the upper and middle carbon in the form of lenses and the origin of power up to a few tens of centimeters, and sometimes up to 1.0 m, rarely as ball diameter of 8-12 cm are not allowed in 60-ies of the last century to use in these sediments tunnel shields.

This and dips in the development zones paleo karst (span tunnels on theatre square); this collapse and dips in areas crossing flooded man-made soil filling the pre-glacial and pre-jurassic valleys of the Moskva River and its

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