

Prediction of Damage to Cutting Tools in an Earth Pressure Balance Tunnel Boring Machine EPB TBM: A Case Study L3 Guadalajara Metro Line (Mexico)

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Abstract : The wear of cutting tools is one of the most decisive elements when planning tunneling works, programming the maintenance stops and saving the optimum stock of spare parts during the evolution of the excavation. Being able to predict the behavior of cutting tools can give a very competitive advantage in terms of costs and excavation performance, optimized to the needs of the TBM itself. The incredible evolution of data science in recent years gives the option to implement it at the time of analyzing the key and most critical parameters related to machinery with the purpose of knowing how the cutting head is performing in front of the excavated ground. Taking this as a case study, Metro Line 3 of Guadalajara in Mexico will develop the feasibility of using Specific Energy versus data science applied over parameters of Torque, Penetration, and Contact Force, among others, to predict the behavior and status of cutting tools. The results obtained through both techniques are analyzed and verified in the function of the wear and the field situations observed in the excavation in order to determine its effectiveness regarding its predictive capacity. In conclusion, the possibilities and improvements offered by the application of digital tools and the programming of calculation algorithms for the analysis of wear of cutting head elements compared to purely empirical methods allow early detection of possible damage to cutting tools, which is reflected in optimization of excavation performance and a significant improvement in costs and deadlines.

Keywords : cutting tools, data science, prediction, TBM, wear

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