Experimental and analytical studies of the parameters influencing the action of TBM disc tools in tunnelling

Figures_CAPTIONS

Figure 1. Relationship between spacing/penetration ratio and specific energy consumption in the excavation by means of disc tools (according to Tuncdemir et al., 2008)

Figure 2. The ILCM and its main components (left) – 6.5-inch mini-disc and detail of its geometry (right).

Figure 3. Marble sample used in the ILCM tests: dimensions, cut direction (measurements in mm), normal (F_N) and rolling (F_R) forces acting on the disc.

Figure 4. Luserna stone samples. From left to right: making the first groove; setting the spacing between the grooves; surface of the sample after two disc paths.

Figure 5. Comparison between the normal forces obtained from the ILCM tests and those estimated using CSM model.

Figure 6. Comparison between the normal forces obtained by the ILCM tests and those estimated by the NTNU model.

Figure 7. Evaluation of SE using the rolling forces calculated by the NTNU and CSM models with a 6.5-inch minidisc, p=3 mm (suitable value, considering the dimension of the disc); the volume produced is equal to $p \cdot s \cdot l$.

Figure 8. Penetration per revolution of the cutter-head as a function of s/p ratio, according to the NTNU model. The graphic was obtained by applying a normal force slightly lower than the maximum recommended for each disc type, and assuming different spacing values.

Figure 9. Number of discs as a function of s/p ratio (NTNU model).

Figure 10. Total Net Power on the cutter-head as a function of s/p ratio (NTNU model).