

Guidance System to Enhance Productivity of Scaling

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Background

During excavation of mountain tunnels, uneven parts remain after blasting, so each blasting needs to be followed up by inspection for scaling. Usually, the tunnel face monitoring worker (tunnel worker) visually inspects and determines any existence of scaling, which causes mistakes. When the natural ground is chiseled more than necessary, it causes loss of cycle time and shotcrete. Also, as the manual inspection by tunnel worker would be done near the tunnel face, where the ground is loose after the blasting. This could cause dangers such as rocks falling.

Summary of the System

The system measures the shape of natural ground after blasting using a high-speed 3D scanner. Required time for measurement is 1 minute. The data is superimposed on the cross-section design of the tunnel. The scaling parts are shown in color, to make it visually understandable. As rock bolts from the design would be drawn into the analysis, it is easy to find the actual scaling. Results are shown 30 seconds after scanning, and as the whole tunnel face would be analyzed in one measurement, the time to find scaling is reduced dramatically.

Actual Usage

By using this system at actual tunnel construction sites, workers were able to locate the scaling accurately, and were able to chisel out scaling in a short time. Time necessary to remove scaling was reduced to 2/3 compared to manual inspection, and amount of shotcrete used was reduced around 15%. Safety conditions were improved as well, since workers did not have to go near the tunnel face.



Fig. 1 Scaling Detection System

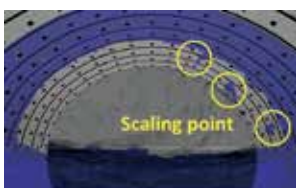


Fig. 2 Showing Scaling Points in Color



Fig. 3 Using the System at Construction Site