

## Section 02. Geotechnical Systems Stability

Dmitriy Nalivayko  
V.V. Kovalenko, research supervisor  
M. L. Isakova, language adviser  
National Mining University, Dnipro, Ukraine

### Injection of Rock around Excavation

In connection with the complication of mining and geological conditions to maintain, associated with the increase in the depth of mining operations, the number of repair workings increases. As a result of the unsatisfactory condition of the support, about 7 ... 15% of all supported and more than 65% of new excavations are repaired annually in Ukraine's mines.

A way of ensuring sustainability of development in a fractured rocks involves the creation of hardened rocks on a roof (or around) excavation zone, due to the formation of rock-concrete layer.

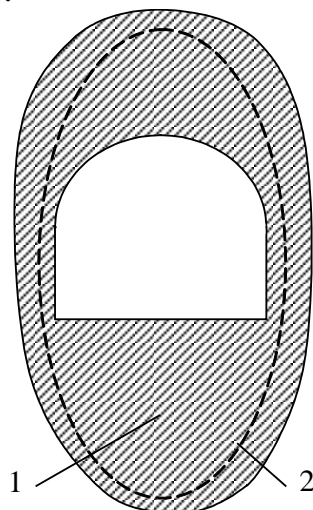


Fig.1 Injection of rock around excavation  
(1 – area of natural balance, 2 – area of injection)

Injection of surrounding rock mass involves the formation of loosened rocks around the excavation zone, then gluing the shattered rocks around the workings.

To ensure the stability of mining in the contour area of the goaf at the depth of large areas of natural balance, zone of fractured rock is formed with the help of camouflet blasting charges, which is filled with cement mortar, creating a strengthened area around an excavation. Reinforced by an injection of a bonding solution of the rock, aged for 3 days under the protection of the bolting pattern, in the future it provide long-term stability of the excavation without the need of using standard metal fasteners or anchors.

A reinforced rock zone provides excavation stability. Such layer prevents the development of swelling processes of the collapse and propagation of cracks in the roof.