

TRANSVERSE EFFECTS IN AIR GAP AT EXPLOSION OF AIR-DECKING BOREHOLE CHARGE SEGMENT

P. V. Komissarov¹, V. I. Nifadev², V. A. Kovalenko², M. A. Raiymkulov², and S. S. Basakina^{1,3}

¹N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation

²Kyrgyz-Russian Slavic University, Bishkek, Kyrgyz Republic

³National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe Sh., Moscow 115409, Russian Federation

Abstract: Air-decking is a common technique to enhance rock fracturing. However, explanation of the effect is usually reduced to such hypotheses as better distribution of the explosion energy due to reduction of detonation products pressure in air gaps and the formation of various axial pulsations in air cavities. The article presents an attempt to explain the reason of the initial network of cracks in the rock by transverse shock waves in air gaps.

Keywords: distributed charge; air-decking; fracturing; transverse shock waves; gas dynamic instability

DOI: 10.30826/CE18110317

References

1. Melnikov, N. V., L. N. Marchenko, I. F. Zharkov, and N. P. Seinov. 1978. Blasting methods to improve rock fragmentation. *Acta Astronaut.* 5:1113–1127.
2. Lu, W., and W. Hustrulid. 2003. A further study on the mechanism of air decking. *Int. J. Rock Fragmentation Blasting* 7(4):231–255.
3. Andreev, S. G., I. A. Perevalov, M. M. Boiko, and V. Yu. Klimenko. 2010. Teoriya kriticheskogo diametra detonatsii neideal'nykh vzryvchatykh veshchestv [Theory of the critical diameter of detonation of nonideal detonation]. *Herald of the Bauman Moscow State Technical University. Mechanical Engineering* S:172–181.
4. Orlenko, L. P., ed. 2002. *Fizika vzriva* [Physics of explosion]. 3rd ed. Moscow: Fizmatlit. Vol. 2. 656 p.
5. Tarver, C. M., J. O. Hallquist, and L. M. Erickson. 1985. Modeling short pulse duration shock initiation of solid explosives. *8th Symposium (International) on Detonation Proceedings*. 65.
6. Century Dynamics. 2005. Autodyn: Explosive initiation users manual (Lee–Tarver ignition and growth).
7. ANSYS, Inc. 2009. ANSYS training manual.
8. Price, M. A., and A. H. Gee. 2009. Modeling for detonation and energy release from peroxides and non-ideal explosives. *Cent. Eur. J. Energ. Mat.* 6(3-4):239–254.
9. ANSYS, Inc. 2016. ANSYS Autodyn User's Manual. Release 17.2.
10. Riedel, W. 2004. Beton unter dynamischen Lasten. Meso- und makromechanische Modelle und ihre Parameter. Fraunhofer IRB Verlag. 220 p.
11. Riedel, W., N. Kawai, and K. Kondo. 2009. Numerical assessment for impact strength measurements in concrete materials. *Int. J. Impact Eng.* 36(2):283–293.
12. ANSYS Inc. 2016. ANSYS® AUTODYN® x64. Release 16.1.
13. Luccioni, B., and G. Aráoz. 2011. Erosion criteria for frictional materials under blast load. *Mecánica Computacional* XXX(21):1809–1831.
14. Labuntsov, D. A., and V. V. Yagov. 2000. *Mekhanika dvukhfaznykh sistem* [Mechanics of two-phase systems]. Moscow: MPEI Publs. 143–146.

Received February 1, 2018

Contributors

Komissarov Pavel V. (b. 1974) — Candidate of Science in physics and mathematics, senior research scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; kr_899@yahoo.com

Nifadev Vladimir I. (b. 1947) — Doctor of Science in technology, professor, Academician of the National Academy of Sciences of Kyrgyz Republic, director, Kyrgyz-Russian Slavic University, Bishkek, Kyrgyz Republic; krsu@krsu.edu.kg

Kovalenko Vitaly A. (b. 1940) — Candidate of Science in technology, director, Institute of Communications and Informatics Technologies, Kyrgyz-Russian Slavic University, Bishkek, Kyrgyz Republic; kovalenko@istc.kg

Raiymkulov Marat A. (b. 1984) — junior research scientist, Kyrgyz-Russian Slavic University, Bishkek, Kyrgyz Republic; rmarat@istc.kg

Basakina Svetlana S. (b. 1996) — engineer, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; engineer, National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe Sh., Moscow 115409, Russian Federation; basakina.s@mail.ru