

## Shooting Gas Cylinders to Prevent Their Explosion in Fire

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**Abstract :** Gas cylinders in general and particularly cylinders containing acetylene constitute a great potential danger for fire and rescue services involved in salvage operations. Experiments show that gas cylinders with acetylene, oxygen, hydrogen, CNG, LPG or CO<sub>2</sub> may blow after short exposition to heat with very destructive effect as fragments of blown cylinder may fly even several hundred meters. In the case of acetylene, the explosion may occur also several hours after the cylinder is cooled down. One of the possible neutralization procedures that in many cases may be used to prevent explosions is shooting dangerous cylinders by rifle bullets. This technique is used to neutralize acetylene cylinders in a few European countries with great success. In Poland research project 'BLOW' was launched in 2014 with the aim to investigate phenomena related to fire influence on industrial and home used cylinders and to evaluate usefulness of the shooting technique. All together over 100 gas cylinders with different gases were experimentally tested at the military blasting grounds and in shelters. During the experiments cylinder temperature and pressure were recorded. In the case of acetylene that is subjected to thermal decomposition also concentration of hydrogen was monitored. Some of the cylinders were allowed to blow and others were shot by snipers. It was observed that shooting hot cylinders has never created more dangerous situations than letting the cylinders to explode spontaneously. In a great majority of cases cylinders that were punctured by bullets released gas in a more or less violent but relatively safe way. The paper presents detailed information about experiments and presents particularities of behavior of cylinders containing different gases. Extensive research was also done in order to select bullets that may be safely and efficiently used to puncture different cylinders. The paper shows also results of those experiments as well as gives practical information related to techniques that should be used during shooting.

**Keywords :** fire, gas cylinders, neutralization, shooting

**Conference Title :** ICFSSST 2017 : International Conference on Fire Safety Science and Technology

**Conference Location :** Sydney, Australia

**Conference Dates :** December 04-05, 2017