Risk minimizing trough Self-life modelling

One of the benefits of knowing the shelf life of ammunition and the propellant powder it contains is being able to compare the in-service lifetime of the ammunition with the in-service lifetime of the weapon. This helps to minimize the risk for interim capital expenditure during the standard service life.

As part of a degree thesis at Fribourg University of Applied Sciences in 2017, shelf-life models were produced for three types of small-calibre ammunition. Propellant powder from artificially aged ammunition was analysed using various test procedures (chemical shelf life to avoid storage explosion) and the results were used to develop models. In addition to analysing the propellant powder, artificially aged ammunition was also fired in order to determine muzzle velocity and pressure (ballistic shelf life to avoid overpressure accident). All the results were subsequently employed, using simulation techniques, to create Time Temperature Transformation diagrams (TTT). The number of years that a particular ammunition (propellant powder) can be stored at a given temperature can be read off from a TTT diagram. The diagram also shows which of the tests represents the limiting factor, i.e. which indicates the shortest time that a propellant powder can be stored or used. Also for the first time, the thesis simulated the pressure in a weapon when the ammunition was fired and integrated it into the model.

Over the long term, these models will play a part in sustainable development at armasuisse, since simulating shelf life clearly helps to avoid intermediate acquisition.

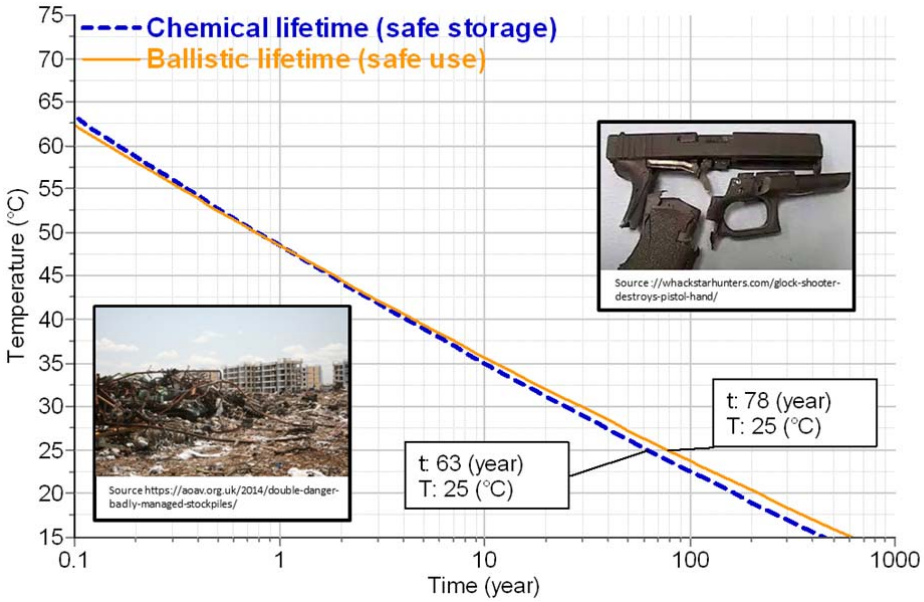

Chart above: Both shelf lives (chemical and ballistic) can be seen at a glance. In this instance, the chemical shelf life is the shorter.

Author: Samuel Niederhauser, WTE