

ACOUSTIC ANALYSIS OF FIREARMS WITH OSS SUPPRESSORS

One of OSS Suppressor's main tasks is to determine whether the installation of their in-house manufactured suppressors results in a 'perceptible' reduction of the sound pressure level of a gunshot. Having used a Brüel & Kjær solution for many years, OSS is now looking to optimize their workflow even further. Enter BK Connect™.



CHALLENGE

To accurately depict the sound pressure level (SPL) of a suppressor product that is unlike anything in the industry and compare the results against competitor technologies

SOLUTION

Capturing impulse SPL of 10 rounds (1 round/second), data post-processing and analysis using BK Connect software and LAN-XI data acquisition hardware platform

RESULTS

- Accurate and quick analysis of the data producing results that can determine the direction of the product's R&D process
- Instant results that are immediately sent to a report



“SERVICE AND SUPPORT IS VERY IMPORTANT TO OSS. ALTHOUGH LAN-XI IS A WORKHORSE OF A PRODUCT, WE KNOW THAT IT WILL NEED TO BE SERVICED AND CALIBRATED TO MAKE OUR RESEARCH ACCURATE AND RELIABLE.”

*Jimmy Miklavcic, Lead Test Engineer,
OSS Suppressors LLC*

BACKGROUND

Suppressors are devices that reduce the sound level and muzzle flash when a firearm is discharged. Founded in 2007, OSS Suppressors LLC designs and manufactures advanced weapon suppressor systems, and has introduced an innovative suppressor design that incorporates their patented flow-through technology instead of the traditional baffle technology. The company also develops and executes programmes for testing all suppressor models on various weapons platforms including sound pressure levels, bolt velocity (back pressure measurements), muzzle flash, accuracy and velocity, durability and particulate density (gas blow back) and more. Customers include military, law enforcement and civilian consumers.

CHALLENGE

When measuring sound pressure levels (SPL), the suppressor industry and reviewers have historically used various hand-held sound measuring systems to record at one metre from, and at 90° to the muzzle, according to MIL-STD-1474E. However, this method does have its shortcomings. Colleen G. Le

Prell, PhD, Professor of Hearing Science, at the School of Behavioral and Brain Sciences, University of Texas, has researched firearm discharge levels and reductions in discharge level via suppressor devices. She says, “Most commercially available and professional sound level meters have a sampling rate on the order of 50 kHz. This is significantly lower than the recommended 200 kHz sampling rate identified as best practice (Kardous et al., 2005). In field tests, we have used both a Larson-Davis model 831 sound level meter set for impulse noise and a Pulse spectrum analyzer (3052-A-030, Brüel and Kjær) [sic] with a 256-kHz sampling rate. A comparison of both systems demonstrated approximately a 6-dB increase (or more) in the measured sound level when using the Pulse system relative to the sound level meter.” [Ref. 1]

Aware of this research, long-standing Brüel & Kjær customer, OSS Suppressors, has been using PULSE™ Time Data Recorder, PULSE Reflex™ software and LAN-XI hardware to test and analyse their in-house manufactured suppressors. And as there are no standardized techniques for the testing and



evaluation of suppressors, OSS has become a strong advocate of a method of testing developed by Colleen G. Le Prell and Edward Lobarinas, in collaboration with American Suppressor Association, which focuses on the user's ear level sound exposure, focus that is lacking in the military standard. "We believe that measuring at the operator's left and right ears tells the more important story," says Jimmy Miklavcic, Lead Test Engineer at OSS.

Therefore, when making measurements, OSS combines both methods, with a typical test set up as follows:

- **Sensor 1:** MILSTD 1 m left of muzzle 1.6 m up from ground
- **Sensor 2:** 38.1 cm (15") for rifles, or 48.26 cm (19") for pistols, to the rear of breech and 13.335 cm (5.25") to the left of centerline of rifle/pistol
- **Sensor 3:** 38.1 cm (15") for rifles, or 48.26 cm (19") for pistols, to the rear of breech and 13.335 cm (5.25") to the right of centerline of rifle/pistol

Jimmy continues, "Our suppressor decibel readings are taken with microphones located at the shooter's ear ensuring compliance with both military and OSHA safety requirements. If the suppressor industry could only agree on a standard SPL testing procedure, customers could have a more honest method of choosing a suppressor that fits their needs."

For Jimmy's team, the job at hand involves capturing impulse SPL of 10 rounds (1 round/second) and then analyzing the average peak [dB(A)] over the 10 rounds. Using PULSE Time Data Recorder, test engineers start a measurement, fire a round of shots, and later, in PULSE Reflex, manually separate each shot by creating custom regions for each. Overall, they love their system, but often voice displeasure at the amount of time it takes to switch back and forth between PULSE Time Data Recorder and PULSE Reflex when making and then analyzing measurements. Managing two software programmes with different user interfaces and different terminology isn't always easy and can be time-consuming. To improve efficiency, the OSS test shooters wanted to be able to take a few shots and get instant results in

the field. Unfortunately, they were unable to achieve this with their current PULSE system.

SOLUTION

To help optimize the workflow, OSS test engineers were introduced to BK Connect software. A self-contained solution, BK Connect was easily adaptable to the test and analysis tasks of the OSS team offering data acquisition, real-time monitoring, post-processing, multiple analysis, data viewing and reporting in the same system.

By creating a template designed around OSS's workflow, the test engineers could set triggers for a finite number of shots. Each time the gun was fired, the trigger threshold was reached, and a measurement made. When the set number of shots were taken, the data could be seen instantly and immediately sent to a report – all just using BK Connect. This flexibility lowers the risk of error and ensures a high level of efficiency when performing repeated tests.



"I CAN SEE HOW BK CONNECT CAN SPEED UP MY ANALYSIS PROCESS AND KEEP THE TEST SHOOTERS HAPPY. WE GAVE BK CONNECT A SHOT...AND LOVE IT."

Jimmy Miklavcic, Lead Test Engineer, OSS Suppressors LLC



RESULTS

Having seen the new capabilities of BK Connect, lead engineer Jimmy said, "The ability to accurately and quickly analyze the data to produce results that can determine the direction of the product's R&D process is a key benefit for us. SPL analysis is the primary test that determines whether R&D moves forward or not."

And for ease of mind, OSS also signed up for a 5-year maintenance and support agreement. "Service and support is very important to OSS," says Jimmy. "Although the Brüel & Kjær LAN-XI is a workhorse of a product, we know that it will need to be serviced and calibrated in order to make our research accurate and reliable."

CONCLUSION

Jimmy concluded, "I can see how BK Connect can speed up my analysis process and keep the test shooters happy. We gave BK Connect a shot...and love it."

Reference 1:

www.canadianaudiologist.ca/issue/volume-1-issue-6-2014/impulse-noise-produced-by-weapons-implications-for-hearing-conservation/



www.bksv.com/casestudies

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