EFEE

NEWSLETTER

March 2022

EFEE

11th WORLD CONFERENCE ON EXPLOSIVES AND BLASTING

Maastricht

Register Today at www.efee2022.com

MECC, Maastricht, Netherlands | 15th - 17th May 2022

March 2022 edition

We in EFEE hope you will enjoy the present EFEE-Newsletter. The next edition will be published in May 2022. Please feel free to contact the EFEE secretariat or write to newsletter@efee.eu in case:

- You have a story you want to bring in the Newsletter
- You have a future event for the next EFEE Newsletter upcoming events list
- You want to advertise in an upcoming Newsletter edition

or any other matter.

Viive Tuuna, Chairman of the Newsletter Committee and the Vice President of EFEE and

Teele Tuuna, Editor of EFEE Newsletter - newsletter@efee.eu

**The articles that appear in this newsletter are the sole opinion of the authors. EFEE takes no responsibility for the accuracy or integrity of the content, and persons who rely on the content of articles do so at their own risk. EFEE encourages persons engaging in complex or hazardous activities to seek appropriate professional advice.*

March 2022

Dear friends,
the President's voice

Have the courage to take a chance on yourself.....

We seem to be fighting through one crisis after another – is this the new normal? Should we live in fear of the future?

Your efforts and the results of your work weigh a lot and they matter much more than the fear.

This is the lesson I learned during the pandemic. And one more. A powerful and scary one, if I may say so: no matter how afraid you are of what is to come, go ahead! No matter how many fears we have - because, unfortunately, we have. I say unfortunately because that's how we are built. Or that is how I was raised. With many fears about who we are and what we can do. With the desire to be liked and accepted, but from this crisis I understood that the most important thing about ourselves is to have the courage to take a chance on yourself!

Those of you who visited Vegas for the ISEE conference perhaps felt a timid approach to a slightly forgotten normality. I have met some of you and you also have fears, but as I said above... we do not stop. Life is not easy. Nothing is ever just granted to us.

Even if some are lucky (what happens in Vegas, stays in Vegas... the greeting message from the airport), let's not fall into the trap that people are lucky all their lives. And that success comes overnight. It takes years and years of hard work to be "lucky" / successful. And the wheel is spinning, and we all have to prove and show who we are. Every day. Not just at a certain point. Because, as it is most easily seen in athletes, it does not matter that you were No. 1 yesterday, today you must reach the same heights or even better!

These times require a lot of moral and backbone from us as individuals and explosives engineers and every corporation and association. We must defend our way of living, our common future. Even if it requires taking vaccines or wearing a mask or paying more for the gasoline because we do not want to support an unmoral supplier. Explosives, fuels, and other energy are all getting more expensive, and we need to adapt, but it is worth it.

This is how I end this term, with confidence and with the conviction that no matter what crisis and difficult moments we go through, the most important thing is to be honest with yourself and to be able to rest your head on the pillow in the evening. But specially to know who you are and to be able to take a chance on yourself!

We will be able to prove ourselves in May on the 11th EFEE World Conference in Maastricht. We are going to have to take our vaccines and masks and have courage to start living our lives as we want to. The ISEE conference in February was a huge success with 1500 participants from all over the world and it proved that travelling and social events can be experienced safely again if we are careful and take necessary precautions.

I am hoping to see all explosives engineers there. We might not able to hug each other, but we are able to prove ourselves and continue developing for the better.

I am especially thankful to our former EFEE President Jari Honkanen - I lacked inspiration and upon my simple and basic ideas he helped me to wite this Foreword ...
Again, THANK YOU Jari Honkanen!

Lets all meet in Maastricht!

Doru Anghelache,
President of EFEE

Dear EFEE members

Due to the current crisis in Ukraine the EFEE board has decided to let the Ukrainian Union of Explosives Engineers have a free membership until the crisis is over.

We, your blasting colleagues, follow your bravery with great respect and are truly supporting your heroic fight against the unjustified invasion of your country, which the EFEE board visited in 2010.

We look forward to seeing our Ukrainian colleagues again at our meetings when they have overcome the aggression and struggles and, as a democratic and free country, can retake its rightful place among us the European Federation of Explosive Engineers.

The EFEE board

Sensitivity of electric igniter-fused fireworks

By Charles S Unwin, Skyfiller Fireworks Codicote, UK

The transportation of fireworks with electric igniters fitted, presents a potential risk of accidental ignition. Representative impact / friction testing was carried out on three different makes of electric igniter, with four types of quickmatch fuse in different configurations (over 170 tests were conducted). The results show that some configuration have a higher potential for accidental ignition. Recommendations are made for improved safety when transporting fireworks.

Background

Electric igniters (aka 'electric matches' or 'Igniter Safety Fuse Electric - ISFEs') are used mainly by professional display companies to fuse and initiate (fire) devices electrically rather than using the long-standing tradition of lighting a delay fuse from a naked flame. They are also becoming more common in the domestic market as cheap remote firing systems become more available.

The two main reasons for using electric igniters are for remote firing and split-second timings in choreographed displays. These allow firing via an electronic system to remove operators from the immediate danger area and immediate, direct initiation of the fireworks without the inaccuracies introduced by hand lighting delay fuses.

From experience within the industry, it appears that general practice with the exception of shells, especially on larger shows, is to pre- fuse as many of the firework devices as possible.

Electric igniters

An electric igniter consists of a copper clad insulating board with a lead wire soldered to either side (Figure 1). This then either has a small high resistance nichrome bridge-wire soldered to join the two copper sides and is then dipped into a heat sensitive composition or the heat sensitive composition is formulated to conduct electricity and acts as its own bridge, negating the need for a nichrome wire. Either way they are then coated in a second layer consisting of metal fuels to generate hot sparks to ignite the next element in the explosive train. Finally, it is coated in a lacquer to strengthen the head, protect it from light abrasions and give it some resistance to water. Most electric igniters then have some sort of plastic shroud fitted to protect them further from physical damage and to direct the flame when functioned.

The very nature of the compositions used to make the electric igniter head sensitive to the ohmic heating of the bridge wire, also makes them sensitive to impact and friction.

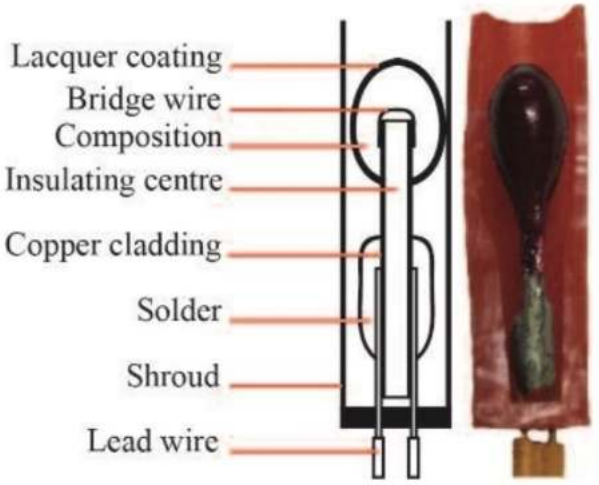


Figure 1. Diagram and cut-through of electric igniter components.

Quickmatch

Quickmatch (aka 'pipematch' or 'fuse instantaneous') burns at around 10 metres per second and is used on most professional display fireworks to transfer flame from a delay fuse or electric igniter to the first effect of the device. Quickmatch is a paper tube with one or more strands of blackmatch (string caked in black powder - Figure 2). Traditionally quickmatch was all black powder based but in america under The Federal explosives law 27 CFR, Part 555—Commerce in Explosives, an aTF explosives license is required to possess blackpowder based quickmatch2. It is understood but not confirmed, that a Chinese manufacturer found a loop hole by using a perchlorate as the oxidiser for the composition and this enabled them to get a 1.4 UN0336 designation which is exempt aTf licensing. This perchlorate based quickmatch is significantly more sensitive to friction and has found its way into the uK market not only as full reels of quickmatch but also as ready assembled component parts of fireworks such as aerial shells, roman candles and multi-shot cakes.

Figure 2. four varieties of quickmatch. from the top; 5 strand black powder, 5 strand perchlorate, single strand black powder and double strand black powder.

Cakes

Cakes utilise rows of single effect firework shot tubes arranged and fused together to produce a multi- shot barrage. cakes can come in many sizes and shapes, but a basic 20 shot cake is shown (figure 3).

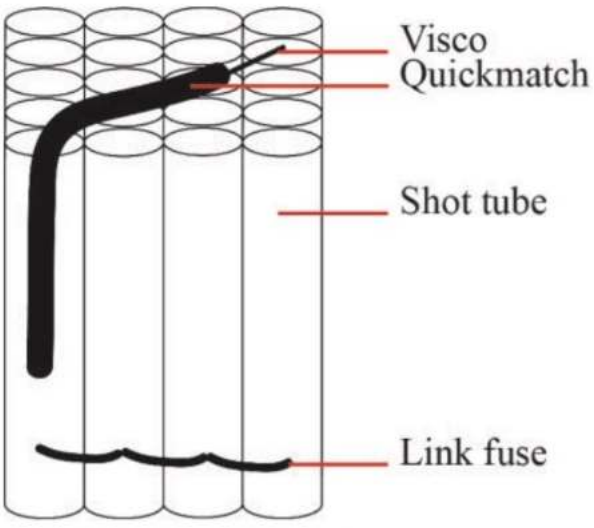


Figure 3. a simple 20 shot cake.

The firework effect tubes that make up a cake consist of a stout cardboard tube, closed with a clay bung at one end, usually containing a single firework effect propelled by a lift charge (figure 4).

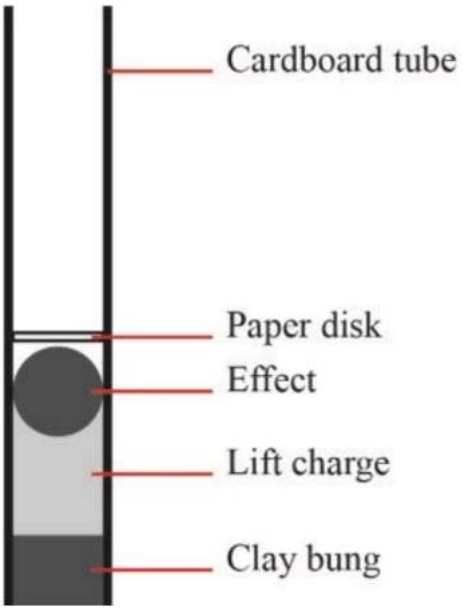


Figure 4. a single shot tube.

The large size of many professional display cakes make them the heaviest fireworks in general use. The simple cake shown (figure 3) has a small piece of visco delay fuse at the end of the quickmatch for the operator to light with a flame, although this is not always the case and varies from cake to cake. some have no fuse and just the quickmatch protruding, while others have a plastic electric igniter connector or some a combination of the above. for a professional operator conducting electrical firings, their preferred option would be to use the installed electric igniter connector. however, if no such connector has been installed, as is often the case, whatever fuse the manufacturer has added is removed and an electric igniter added to the quickmatch.

Why pre-fuse?

As well as fusing their fireworks, a display company will also be waterproofing their products. This may involve encasing individual cakes in a plastic bag or cover them in a layer of pallet wrap (industrial 'clingfilm'), either way this is done after fusing, so that the whole firework and fusing arrangement is protected from any inclement weather on the day of the display. it is safer to fuse in a sheltered, comfortable and controlled environment than it is to carry out these activities in a muddy field with cold hands where dirt, grit and rain could compromise fusing work, leading to accidental ignition or partially functioned or completely unfired firework having to be made safe and de-fused after the display. This is one of the riskier jobs for a display operator and is to be avoided if at all possible.
a large show consisting of 200 cakes may take a few days to properly fuse and waterproof which is usually just not viable on a display site as overnight security, storage, etc. would all need to be taken into consideration.

Method of adding an electric igniter

As mentioned previously, the preferred method is to use an existing electric igniter connector if the fireworks manufacturer has fitted one. These are usually a hard injection moulded piece of plastic inserted into the centre of the quickmatch paper tube, where the fuse composition is, then the paper tube is fastened around the plastic connector with a piece of cotton. a plastic bung is added at the factory in place of the electric igniter to prevent moisture ingress into the quickmatch (figure 5).

Figure 5. a standard pre- installed Electric igniter connector.

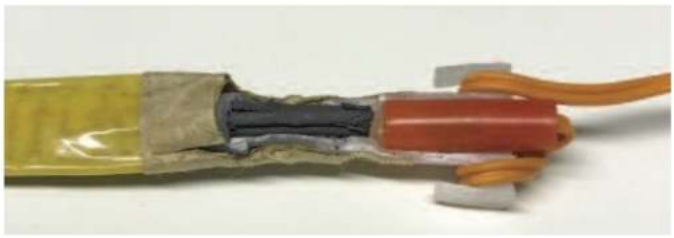


Figure 6. cut through showing position of Electric igniter in relation to fuse composition.

To fuse, the operator simply pulls out the bung, inserts an electric igniter and wraps the lead wires around the wings of the connector to secure it and prevent the electric igniter from being pulled out of the connector (figure 6). in this way, the electric igniter is protected from physical damage by the hard plastic connector and the head of the igniter does not make contact with the fuse composition. When ignited the connector guides the flame from the electric igniter into the fuse tube and onto the fuse composition.

If the manufacturer has not installed an electric igniter connector then there are two options. The first, is to add an aftermarket connector (figure 7). These are usually made of a hard but flexible injection moulded plastic, designed to slide over the outer case of a length of quickmatch and can easily be secured with a small piece of tape.

Figure 7. a typical aftermarket Electric igniter connector.

The electric igniter is inserted and secured in exactly the same way as a pre-installed connector, such that the electric igniter head and fuse composition do not make contact (figure 8).

Figure 8. cut through showing position of Electric igniter in relation to fuse composition.

The second option, if the manufacturer has not installed an electric igniter connector is to slide an electric igniter directly into the paper casing of the quickmatch so it sits on the composition. ideally the shroud of the electric igniter should be left in place as it gives some protection to the head of the electric igniter and keeps the head from coming into direct contact with the fuse composition. The shroud also directs the flame down the tube onto the fuse composition (figure 9).

In reality and more often than not, the electric igniter will not fit down the outer casing of the quickmatch with the shroud in place. in this case the shroud is removed or slid back and the bare electric igniter head is carefully slid inside the quickmatch casing so it sits directly on the fuse composition (figure 10). This means there is nothing protecting the electric igniter head from physical damage and there is the added risk of friction between the match and fuse composition, which can lead to accidental ignition when an electric igniter is inserted into or removed from a firework.

Figure 9. Electric Igniter sitting inside the fuse with the shroud in place.

Figure 10. Electric igniter sitting inside the fuse with the shroud removed.

Method

We addressed the worst case scenario, where the hardest material of a vehicle used to transport a fused firework would be a steel floor. The hardest material that is likely to sandwich a fuse assembly against a steel floor would be the clay bung from a cake. (figure 11) .

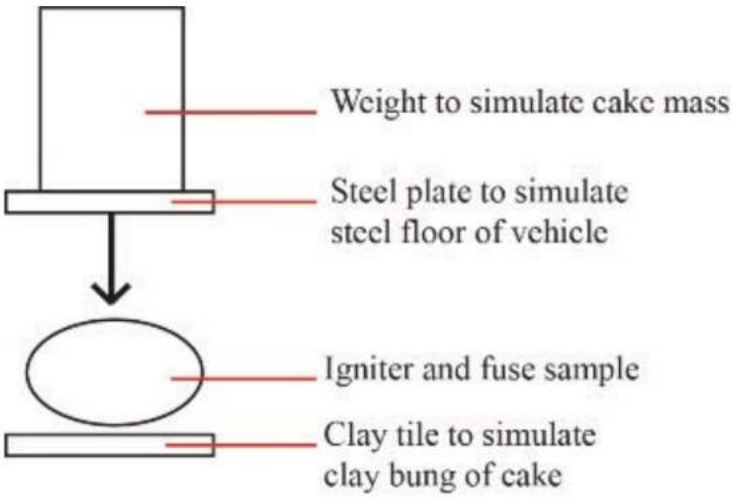


Figure 11. layout of test rig.

A clay roof tile was used to simulate the clay bung of the firework tube and a steel 'hammer' for the steel floor of the vehicle. The mass of the hammer was 3kg, which is a lot lighter than most firework cakes3. The hammer was dropped from 300mm, a fall distance that could easily be achieved in the real world, when a vehicle hits a pothole at speed (figure 12).

Figure 12. Testing apparatus set up ready.

100mm strips of four types of quickmatch were fused with three different electric igniters (figure 13) in the four configurations described (with/without connectors and/or shrouds). These were taped to the roof tile with the Electric igniter in the centre of the area impacted by the hammer blow (figure 14). The test was repeated three (3) times for each configuration.

Figure 13. Three different Electric igniters. from the left, czech, chinese a & chinese B.

Figure 14. 100mm strip of fuse with electric igniter inserted ready for testing.

The arm was then secured 300mm above the tile and held in place with a pin attached to a chain. When the chain was pulled it removed the pin, allowing the hammer to drop the required distance onto the fused assembly, impacting the location of the electric igniter.

Results

The results (Table 1) show that electric igniters are more easily initiated by the impact and friction associated with the simulated accidental drop conditions, when their heads are in direct contact with the fuse composition inside any of the tested varieties of quickmatch. There were no ignitions from hammer drops when the shroud acted as a barrier/protector between the head of an electric igniter and the fuse composition, when electric igniters were fitted into plastic connectors, were not fitted into quickmatch or from quickmatch without an electric igniter fitted.

It is important to highlight that just because some of our tests show 'no ignition', this cannot be taken as evidence that a similar arrangement will never result in an ignition.

Conclusion

pre-fusing with bare electric igniter heads in direct contact with quickmatch fuse compositions is likely to lead to accidental ignition of one or more fireworks during handling or transportation - potentially resulting in flame transmitting through the whole load, with catastrophic results.

	Chinese Electric Igniter A	Chinese Electric Igniter B	Czech Electric Igniter
All quickmatch types with no electric igniter (12 tests hammer drops)			
No quickmatch with electric igniter on its own with and without shroud (18 test hammer drops)			
All quickmatch types with electric igniter inserted into a pre-installed and aftermarket connectors (72 test hammer drops)		No Ignition	
All quickmatch types with electric igniter directly inserted with shroud in place (36 test hammer drops)			
Black powder quickmatch with electric igniter directly inserted without shroud (9 test hammer drops)	Ignition Ignition Ignition	Ignition No Ignition Ignition	Ignition Ignition Ignition
Perchlorate quickmatch with electric igniter directly inserted without shroud (9 test hammer drops)	Ignition Ignition Ignition	Ignition Ignition Ignition	Ignition Ignition Ignition
Single strand quickmatch with electric igniter directly inserted without shroud (9 test hammer drops)	Ignition No Ignition No Ignition	No Ignition Ignition Ignition	No Ignition Ignition Ignition
Double strand quickmatch with electric igniter directly inserted without shroud (9 test hammer drops)	Ignition Ignition Ignition	Ignition Ignition Ignition	Ignition Ignition Ignition

Recommendations

Fireworks should not be pre-fused and transported when an electric igniter is inserted directly into quickmatch without a shroud.
It is also recommended that the insertion of shrouded electric igniters into quickmatch should be avoided as it is very easy to push the electric igniter out of the end of the shroud as it is being inserted, which then brings the electric igniter head into direct contact with the fuse composition.

If fireworks are to be fused and then transported, the use of pre- fitted or aftermarket electric igniter connectors are recommended to minimise the possibility of accidental ignition.

As these connectors keep the fuse composition dry and free from mud/grit, while making the insertion of electric igniters a quick and easy process, there may no longer be a need to fit electric igniters away from the display site.

This could allow the firework display providers to bring themselves in-line with long established best practice from across the rest of the explosives industry. i.e. Only introducing an electrical means of initiation to the explosive train, after the electro-explosive device (electric igniter or detonator) has been attached to the firing system and circuit tested. This prevents any accidental ignitions being transmitted to the main explosives being used, should ignitions be generated by stray currents, static electricity or faulty equipment.

References

1. health and safety Executive - Explosives regulations 2014.
2. u.s. Department of Justice - The federal explosives law 2012.
3. celtic fireworks - celtic fireworks full stock list 28.11.18.

BACK TO TOP

The use of vibration monitoring to record the blasting works impact on buildings surrounding open-pit mines

Anna Sołtys1,*
Jan Winzer2
1AGH University of Science and Technology, Faculty of Mining and Geoengineering, Krakow, Poland
2Exploconsult Sp. z o.o., Krakow, Poland

Abstract.

Environmental protection law and geological and mining law require the mineral mining plant to protect its surroundings from the effects of mining operations. This also applies to the negative impact of vibrations induced by blasting works on people and construction facilities. Effective protection is only possible if the level of this impact is known, therefore it is necessary to record it. The thesis formulated in this way has been and continues to be the guiding principle of the research works carried out in the AGH Laboratory of Blasting Work and Environmental Protection. As a result of these works are procedures for conducting preventive activities by open- pit mines in order to minimize the impact of blasting on facilities in the surrounding area. An important element of this activity is the monitoring of vibrations in constructions, which is a source of knowledge for excavation supervisors and engineers performing blasting works, thus contributing to raising the awareness of the responsible operation of the mining plant. Developed in the Laboratory of the Mine's Vibration Monitoring Station (KSMD), after several modernizations, it became a fully automated system for monitoring and recording the impact of blasting works on the surrounding environment. Currently, there are 30 measuring devices in 10 open-pit mines, and additional 8 devices are used to provide periodic measurement and recording services for the mines concerned.

1. Introduction

Initiating the explosives in long holes is a commonly used method of rock mining, and that is why the related problems are so important for open-pit mining. Only 20 to 30 percent of the detonation energy of explosives is used for mining. The remaining part is lost and it causes scattering of flyrocks, airblast, and seismic waves. Especially the latter ones cause a lot of problems because the vibrations of the substrate can affect various building structures in the vicinity of mines. Both mining efficiency and economic aspects lead to the use of as many explosive charges as possible in a single batch, which may, however, cause the increasing problem of harmful impacts.

Long-term research work (also financed by mines) carried out at AGH's Department of Open-pit Mining and activities aimed at disseminating the idea of preventive action in this field in mining plants [1, 2, 3], allowed on the one hand to develop specific research procedures, and on the other hand to achieve a certain level of awareness among mining supervisors, which results in ongoing consultations, conducting control measurements or even full monitoring of the blasting impact on the environment. This decisively increases the mental comfort of both supervisors and investigators and analysts. Such actions are in most cases socially acceptable.

Generally, the preventive activity of open-pit mines covers two groups of the issue [4]: basic research and recording the level of vibrations in the environment.

The aim of basic research is to determine the conditions for safe execution of blasting works taking into account local geological and mining conditions, as well as the type, quality and technical condition of the surrounding buildings. The final effect of the basic research is to determine the dependencies allowing for the calculation of the allowable mass of explosives for the expected range of excavation within a defined time interval, together with the description of the technique and technology for performing blasting works.

Recording of the blasting work's impact is aimed at checking the validity of the relations specified in the basic research, i.e. the compliance of the intensity level of vibrations induced in the environment with the predicted values together with the assessment of the impact of the recorded vibrations on the buildings. These activities may be performed, as cyclical control measurements or in a wider scope, as vibration monitoring in designated buildings in the vicinity of mining operations.

It results that prevention activities in this respect should include:
- an inventory of the technical condition of the facilities in the surroundings,
- recognition of the directions of vibration propagation and their intensity in the vicinity of the mine excavation, on the basis of which the range of harmful vibration impact and allowable mass of explosives are determined,
- conducting cyclical control measurements,
- vibration monitoring in protected objects in special cases.

The last two points mentioned above are repeatedly cited by experts as recommended for implementation and, in the last period of time, also required by the concession granting authorities as a condition for obtaining it. These are activities resulting from the Environmental Protection Law and the Geological and Mining Law, applicable to enterprises that may have a significant impact on the environment. These include the majority of mines extracting minerals using explosives.

2 Monitoring of the effects of vibrations on the environment

Monitoring of vibrations induced by blasting works was the subject of research and projects carried out since 1996 in the Department of Open-pit Mining at AGH [2] and carried out in cooperation with industry. The result of works was the implementation of the measurement, analytical and archiving apparatus into the mining practice. When designing the first measurement system, it was assumed that the measurement of vibrations must be supplemented by an assessment of impact using the Polish standard. This is why the system was equipped with a software, which made it possible to use correction filters complying with the PN-85/B-02170 [5] standard, which made it possible to assess the impact immediately after the measurement. Practically this procedure of system operation is still being used, obviously taking into account new analytical and graphical abilities. The cooperation of the AGH's Department with Exploconsult Sp. z o. o. and later also with A- STER s. c. allowed for rapid development of the system to its full automation and adjustment of the impact assessment to the requirements of PN-B-02170:2016- 12 [6] standard.

In open-pit mining, the following measuring systems have been used to monitor vibrations induced by blasting works [2]:
- Small Vibration Monitoring Station - Explo 504,
- Vibration Monitoring Mine in 3 versions:
- KSMD with radio communication,
- KSMD GSM with cellular communication,
- KSMD APN with the Internet connection (fig. 1).

The main idea of the changes was to make the system more flexible by:
- direct contact between the measuring station and the central server,
- limitation of the service by the operator,
- the use of the wireless Internet connectivity,
- data is collected on the server and can be accessed at any time without the need to establish a connection to the measuring station.
- remote service maintenance and changes in the software of the measurement device.

The basic link of the new system is the KSPD Mine Vibration Measurement Station (fig. 1), equipped with a 3- axis vibration velocity meter and a number of processing and measurement data collection systems. An integral part of the station is a GSM/GPRS modem that automatically sends the collected measurements to a KSMD server located at AGH, in Krakow.

The web service is used to manage the stations and measurements made by them. It can be used to view measurements, generate reports, manage devices, buildings, and system users. An access to the service is protected by a username and password.

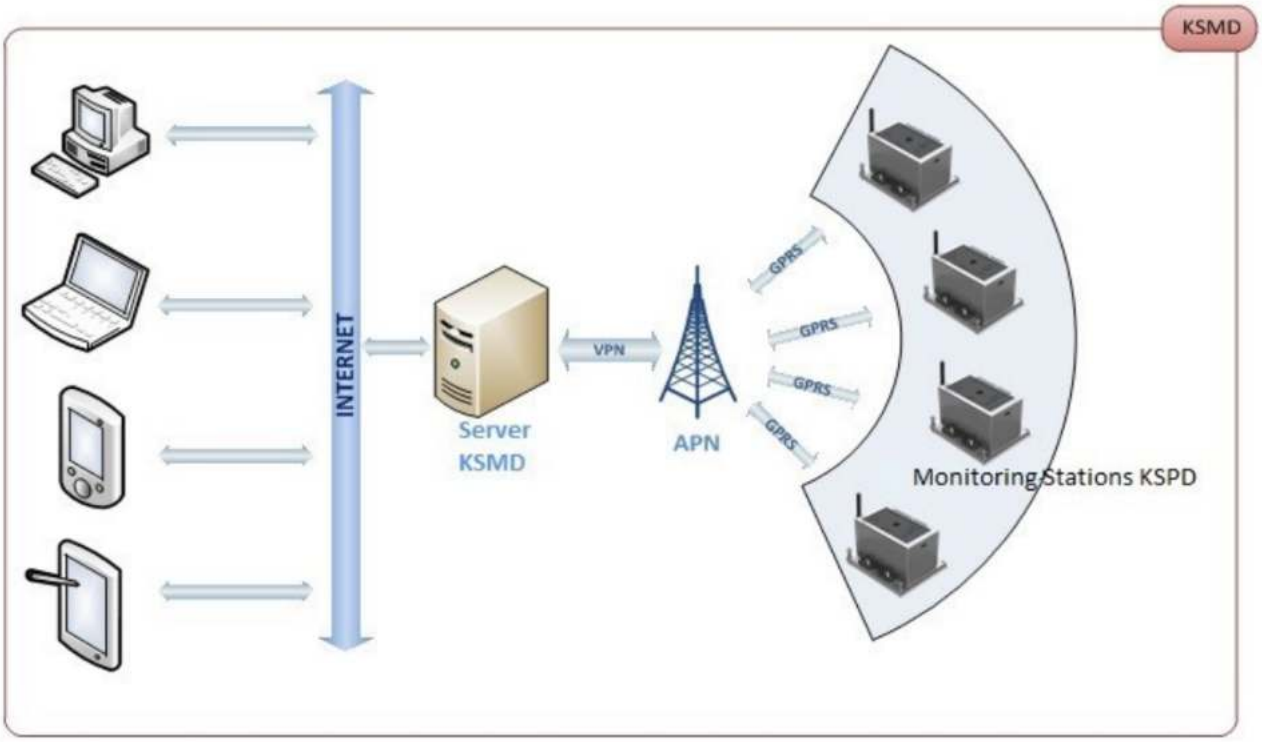


Fig. 1. Mine Station of Vibrations Monitoring - 2012 model.

The most important advantage of the modernised system is collecting measurement data on the server - KSPD measuring station, after saving the event in memory, automatically establishes contact and sends the data to the server. In case of communication problems, data transmission shall be repeated until the successful transmission. This is very important because KSPD does not store the data but the KSMD server does. As a result, the system operator cooperates only with the server in terms of analysing or using the database.

Advantages of the new KSMD system:

- continuous vibration measurement in the constructions,
- unlimited memory,
- automatic data transmission to the server,
- constant connection with the server,
- automation of the station starting process,
- the possibility of contact from any point on the Earth,
- archiving of complete vibration waveforms,
- archiving of reports and impact assessments,
- visualisation of vibration waveforms in time and results on the SWD scale,
- reporting after each event.

Currently, there are 42 measuring points in 13 open-pit mines:

- KSMD APN model - 10 mines and 31 Mining Vibration Measurement Stations (KSPD),
- KSMD GSM model - 2 mines and 11 measurement points.

In addition, AGH Laboratory of Blasting Works and Environment Protection has 2 KSPD stations and Exploconsult company - 7 stations. These stations are periodically rented to perform monitoring in open-pit mines as well as to control the impact of engineering works using explosives (e.g. macro-levelling during the construction of roads, tunneling and demolition works).

3 Analysis of recording from blasting works

The operation of the modernised KSMD system started in 2012, therefore the five-year period of operation of the system can be summarised.
In total, all KSMD ANP measurement stations performed 11407 measurements of vibrations induced by blasting works carried out in open-pit mines during last 5 years (2013 to 2017).
Tables 1 and 2 show the number of measurements made by the measurement stations in individual mines until the 31st of December 2017.

In all cases KSPD measuring stations are fixed to building foundations at ground level, i.e. the vibration measurement concerns a building and not the ground in its surroundings. This is important information, as the standards of other countries set specific but different requirements in this respect. For example, in Poland, the Mining Rocks of Intensity require the measurement of ground vibrations.

For example, the results of measurements obtained by the station - limestone mine 2 / station 1 were analysed in details. Table 3 presents the part of recording results for the 1 quarter of 2013. This part was selected for recording, on January the 17th, the events with the highest intensity during 5 years of station operation.

Mine / raw material	Starting date	Number of measuring points	Number of measuring points (facilities)	Number of measurements
Gypsum mine 1	05.07.2012 r.	4	8	1491
Limestone mine 1	04.07.2012 r.	3	3	1791
Limestone mine 2	29.10.2012 r.	4	5	1387
Limestone mine 3	25.05.2013 r.	4	5	452
Gypsum mine 2	09.04.2013 r.	4	5	1357
dolomite mine 1	15.04.2013 r.	2	5	1521
Limestone mine 4	14.03.2014 r.	2	3	695
Limestone mine 5	19.07.2016 r.	1	1	136
dolomite mine 2	23.11.2016 r.	2	2	833
shale mine	24.05.2015 r.	2	2	101
In total				9764

Table 1. Vibration measurements made at individual mines - stations owned by mines

Mine / raw material	Operation period	Number of measuring points	Number of measuring points (facilities)	Number of measurements
dolomite mine 3	since 04.08.2015 -	1	7	160
Limestone mine 6	since 23.08.2016	4	4	1233
granite mine	15.05.2015 to 31.07.2015	1	1	24
dolomite mine 4	02.09.15 to 10.02.16	1	1	52
basalt mine	25.05.16 to 26.06.17	1	1	44
ampibolite mine	16.08.16 to 23.03.17	2	2	30
Limestone mine 7	03.11.16 to 22.02.17	1	1	86
dolomite mine 5	09.06.17 to 30.06.17	1	1	14
In total				1643

Table 2. Vibration measurements made at individual mines - measurements carried out as a part of the service

Date	Time	Vibration velocity, mm/s			Frequency, Hz		
		u_z	u_x	u_y	f_z	f_x	f_y
2013-01-09	13:25:22	0,71	1,15	0,98	11,0	9,6	11,6
2013-01-17	**13:20:37**	**1,52**	**2,64**	**5,20**	**12,6**	**11,4**	**11,0**
2013-01-17	13:23:05	1,24	2,64	2,20	13,0	12,0	11,6
2013-02-14	13:21:44	2,08	3,43	2,44	17,0	16,7	11,3

Table 3. Results of vibration recording in the first quarter of 2013 - limestone mine - station No. 1

The figure 2 presents the visualization of recordings on the SWD-I scale (horizontal components x and y), and the percentage distribution of maximal velocities within the assumed value ranges.

The visualization of the measurement results is shown on two graphs, as the maximum value of the vibration velocity (without frequency) does not give full information about the impact, due to the shape of the SWD limit lines. At the same time, it is important to be aware that the measurement results, in the form of maximum values of frequency correlated with vibration velocities, applied on the SWD scale do not constitute an impact assessment, but only illustrate the scale of the problem and allow for the preliminary conclusions to be drawn as to the level of recorded vibrations over a longer period of time.

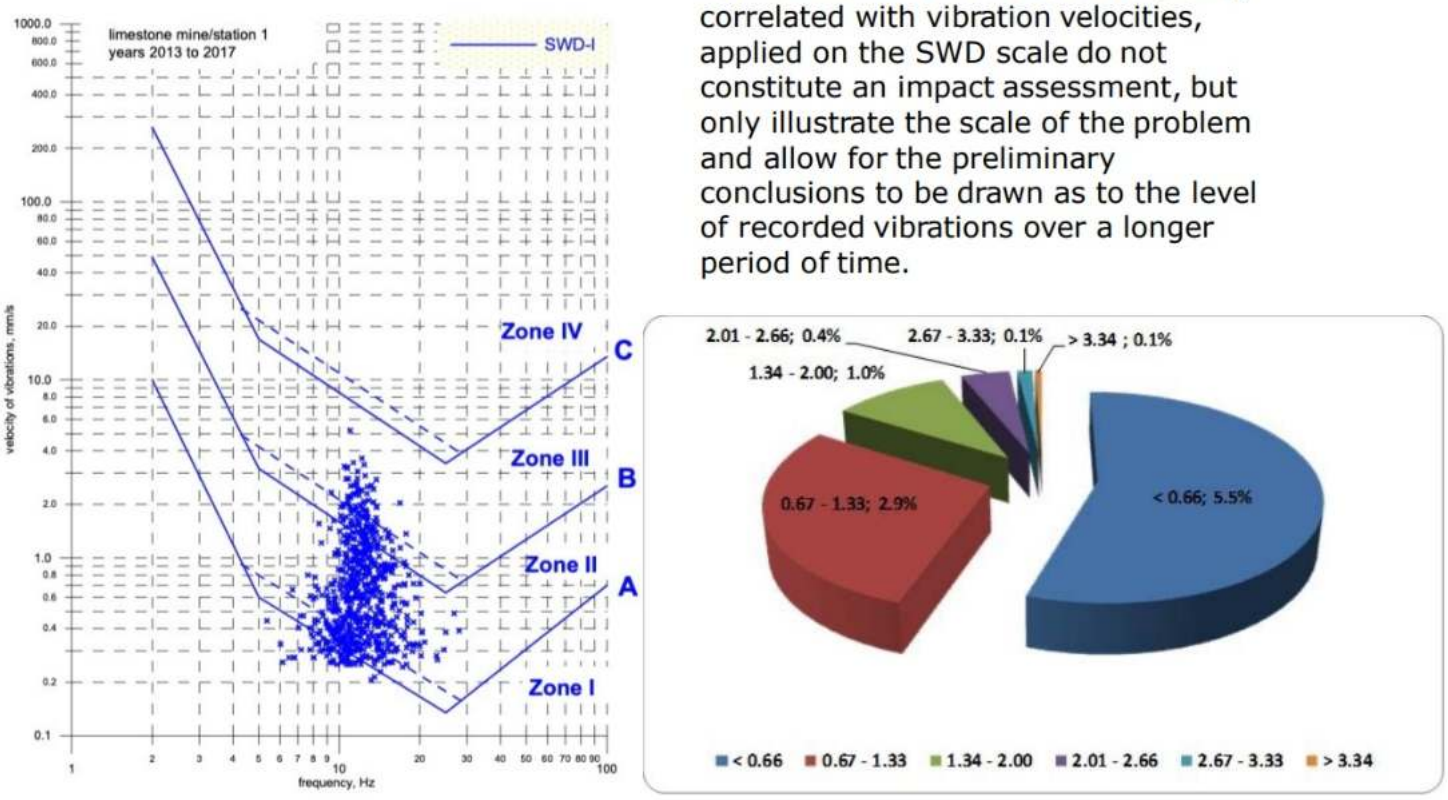


Fig. 2. Visualization of vibration recording results for the years 2013 to 2017.

When analysing the data presented in Figure 2, it should be noted that almost 85% of the vibrations induced by the blasting works did not exceed a maximum value of 1.33 mm/s, which means that they can be classified as negligible in the process of impact assessment for a protected object [6].

As already mentioned, on 17 January 2013, the event with the highest intensity during the five-year period was recorded. For example, the structure of these vibrations are shown in Figures 3. As shown in Figure 3, the 12.59 Hz frequency is predominant in the structure of vibration and the horizontal component y is predominant in the impact assessment, as shown in Figure 4.

The assessment of induced vibrations impact, in accordance with the procedure in the standard [5] (fig. 4), has shown that these vibrations should be classified as zone III of the SWD-I scale. It should be noted here that it is a single event recorded over a period of 5 years, and only 0.6 % of the recording (4 events out of 692) exceeded the value of 3.33 mm/s.

The number of performed measurements and the scope of measured values are the information of the essential significance during every compensation proceeding. The fact that most events are recorded by vibration measurements, each of which can be used as a basis for assessing the impact on the building, and most importantly, only a few (of the highest intensity) of the hundreds of documented events were perceived vibrations, is very important for the opinion formers, and consequently also for the courts.

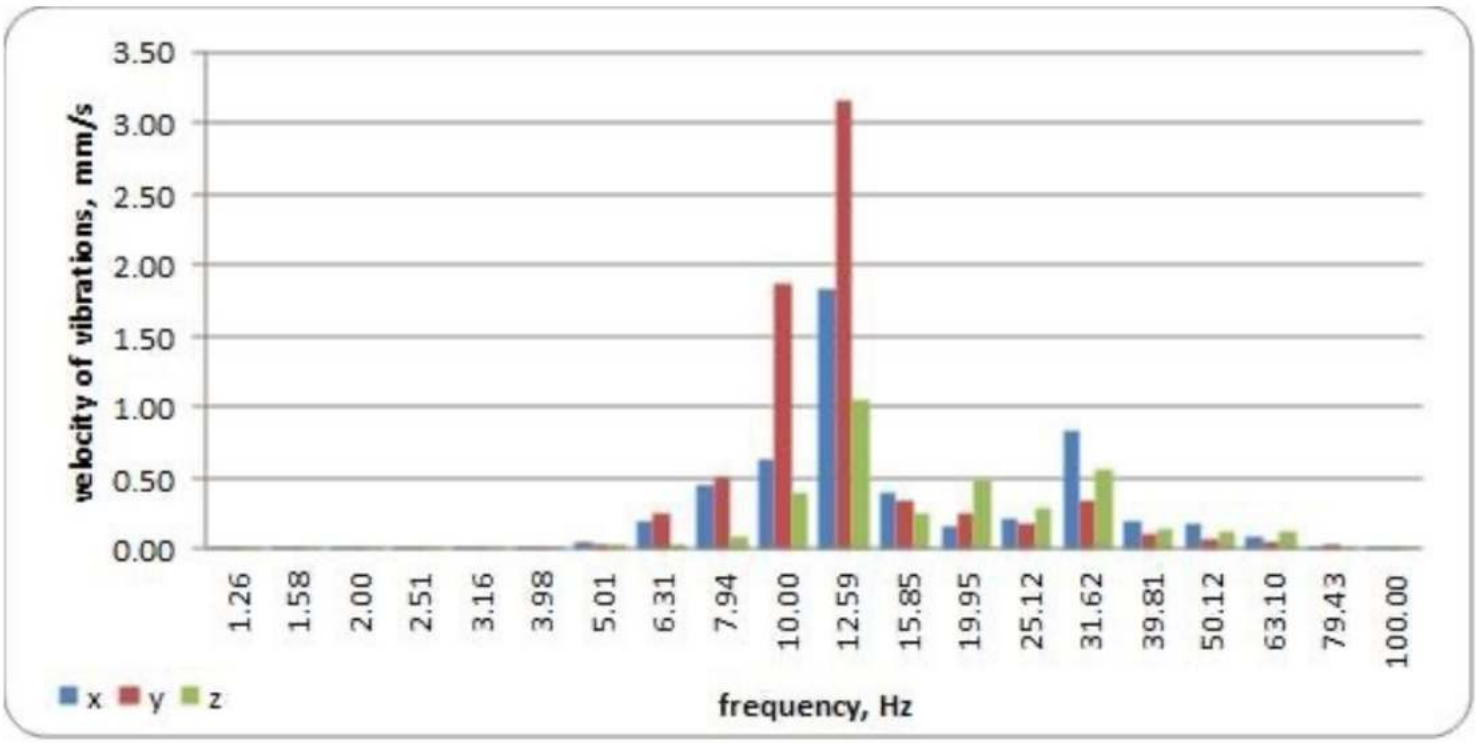


Fig. 3. The structure of vibrations registered on 17.01.2013 - limestone mine / station 1.

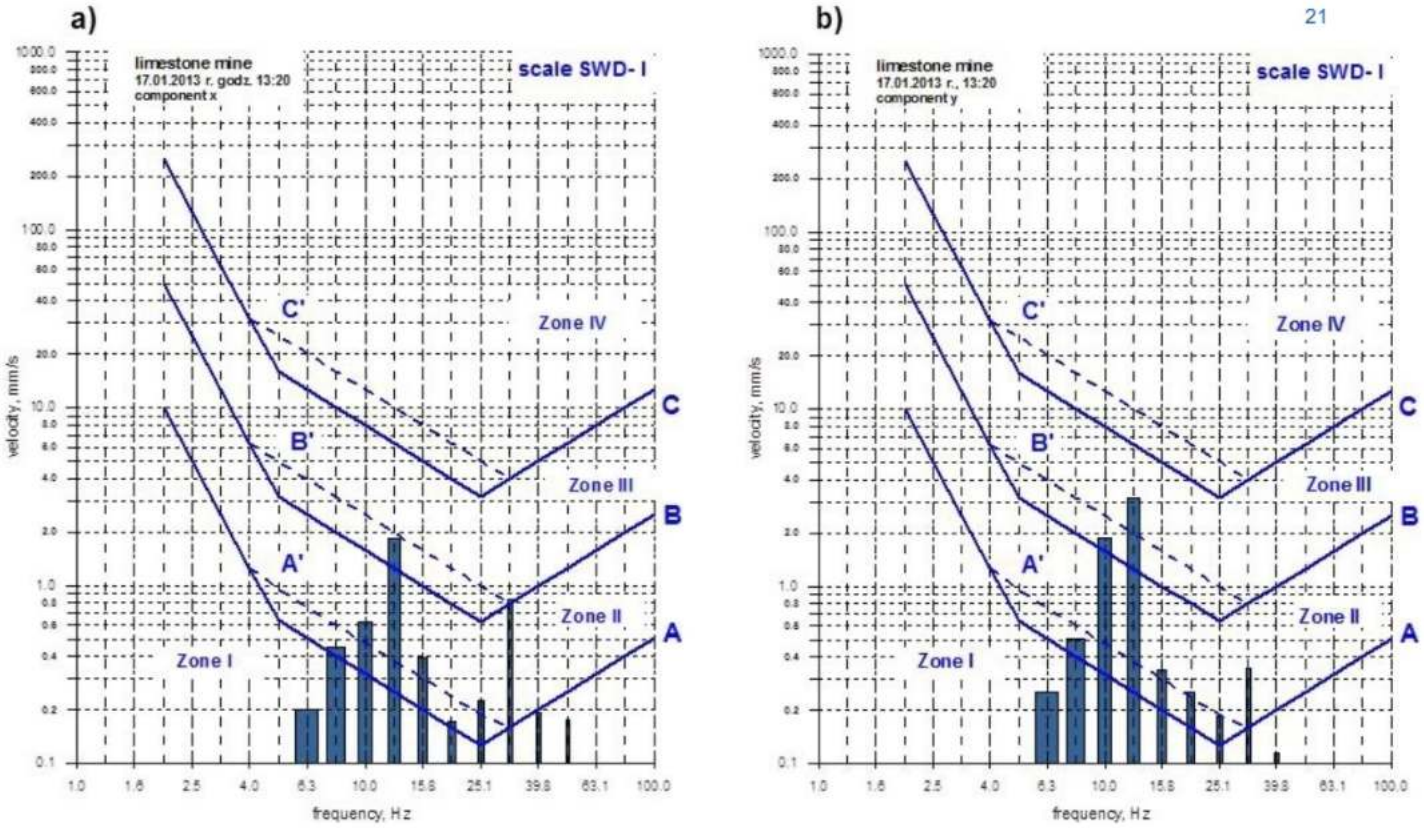


Fig. 4. Vibration impact assessment - limestone mine/station 1 - event dated of the 17th of January 2013: a) component x, b) component y

On the basis of observations made during the monitoring, despite the occurrence of recorded vibrations which were qualified to the third zone of the SWD scale, no new damages or deepening of already existing cracks in the building structure has been observed. It has to be emphasized that this was the only event qualified to the third zone, out of 692 recorded within 5 years window. It can, therefore, be concluded that the occurrence of individual events qualifying to the third zone of the SWD scale does not contribute to the occurrence of new damages in the protected site.

4 Summary

Monitoring of vibrations induced by blasting works on constructions, in the vicinity of the excavation, is an important element of the prophylactic activity of open-pit mines in the scope of minimizing the impact of exploitation works on the environment.

Documenting the impact of blasting works on the environment is a solution that allows to:
- collect up-to-date information for surveillance, concerning the intensity of vibrations induced by blasting works,
- monitor the impact of vibrations on building structures,
- create a database, which can always be used to provide evidence of damages,
- make current corrections under conditions limiting the performance of blasting works.

The KSMD system used in mining plants, which was built with the financial participation of open-pit mines, has been gradually modernized, thanks to which it is now a modern, automated system which uses new technologies in the field of measurement, analysis and wireless communication. The system has been created as a tool for supervising personnel, enabling the current control of the blasting works impact on buildings in the surrounding area.

After the modernization, KSMD enables access to measuring devices from any point on the ground, control of measuring equipment, an immediate preview of the recorded event and rapid impact assessment.

In vibration monitoring nothing is accidental. The permanent presence of measuring equipment in the protected object allows for recording also events not related to blasting works. Sometimes shocks caused by underground mines are recorded, as well as vibrations induced by blasting works in neighbouring open- pit mines.

The operation of vibration monitoring systems provides thousands of evidence that controlled blasting works in open-pit mines can be harmless to buildings in the surrounding environment.

References

1. E. Maciąg, J. Winzer, R. Biessikirski, Metodyka postępowania w ochronie otoczenia w przypadku robót strzałowych. Bezpieczeństwo Pracy i Ochrona Środowiska w Górnictwie 9(157)/I/2007, pp. 56 – 60 (2007)
2. J. Winzer, Dokumentowanie oddziaływania robót strzałowych na otoczenie kopalń odkrywkowych. Górnictwo Odkrywkowe, R. 48, nr 3-4/2006, pp. 159-167 (2006)
3. J. Winzer, A. Sołtys, J. Pyra, Oddziaływanie na otoczenie robót z użyciem materiałów wybuchowych. (Wydawnictwa AGH, Kraków, 2016)
4. J. Pyra, A. Sołtys, J. Winzer, Skomputeryzowane systemy do dokumentowania oddziaływania robót strzałowych na otoczenie kopalń odkrywkowych. Bezpieczeństwo Robót Strzałowych, GIG, pp. 79 – 88 (2012)
5. PN-B-02170:1985 - Ocena szkodliwości drgań przekazywanych przez podłoże na budynki.
6. PN-B-02170:2016-12 – Ocena szkodliwości drgań przekazywanych przez podłoże na budynki.

Use of black powder in re-enactment

by Ian MacDonald Watson miExpE

The English Civil War Society (ECWS) is a re-enactment group that portrays military and civil life during the seventeenth century – from the Union of the Crowns in 1603 to the Glorious Revolution and beyond. The ECWS along with other re- enactment societies and groups strive to recreate the life and times of their chosen periods for the education and enjoyment of spectators and the amusement of their own members.

All these societies, from the fifteenth century period onwards, use black powder blank firing weapons in their displays and skirmishes. They do of course have to abide by civil legislation for the control of explosives and weapons.

The display was undertaken in a field at crewe hall in the hotel grounds. ->

Re-enactment group from the EcWs with authentic costumes and weapons.
<-

March 2022

BACK TO TOP

Preparing the 17th century cannons for firing.

The EcWs was founded in 1980 and is the umbrella organisation for the King's army and the roundhead association. its purpose is to raise awareness of the conflict between King charles 1 of England and his supporters and their opponents in parliament and scotland. it aims to stimulate interest in the authentic re-enactment of the seventeenth century military and civil life and in doing so they endeavour to entertain and instruct their own members and visitors to their events. They do this by continually striving for historical authenticity in clothing, artifacts, methods, weapons and tactics.

The author joined the King's army, which is the royalist army of the EcWs in 1972. He has been a Director of the EcWs ltd since 1980 and is currently serving as the lord general in command of the King's army.

Guests at the iExpE members' Weekend examine the muskets

Loading the 17th century weapons.

He is the founder and colonel of the modern version of the Marquess of Winchester's regiment; the original regiment formed the garrison of basing house in hampshire where the royalists held out in a series of sieges until 1645.

On saturday 1 June at the iExpE members' Weekend, a group from the EcWs demonstrated the blank firing of matchlock muskets and robinet (1½ inch bore) and minion (3½ inch bore) artillery pieces.

This demonstration aimed to show the use of black powder in muskets and artillery pieces of the 1640s period. The weapons were all accurate reproductions meeting modern safety requirements and the drill was of the period.

Further information:
ian.macdonaldwatson@sde-uk.com;
www.ecws.org.uk

The 48th annual conference on Explosives and Blasting Techniques, Las Vegas Nevada

Back in business.

The 48th ISEE conference in Las Vegas with its attendance, papers and exhibitors were back at pre covid levels.

The 48th conference subsided all expectations and was a great success. We are looking forward to attending the 49th conference in San Antonio, Texas in 2023. And not the least the 50 years anniversary in Savannah, Georgia in 2024. It will be a blast.

The attendees were very eager and the conference was a great success. This was after a year (2021) when ISEE was kept running by Alistair Torrance without being able to have a conference. Alistair has done a fantastic job with keeping things running during these unusual times.

The presentations where of high quality and the exhibition hall was bustling with new initiative, the demo stage, giving the exhibitor a chance to show their products and latest innovations.

Steven Shivak the new Secretary General for ISEE and his team did a fantastic job re-opening a conference he had never previously attended. *Kudos* to Steven and the team.

EFEEs 11th world conference on explosives and blasting in Maastricht, Netherlands from the 15th to the 17th of May 2022 was presented to the international reception by James Tyler from Tyler events and Johan Finsteen Gjødvad from Sigicom. Johan is also a member of both the EFEE and ISEE board.

EFEEs general secretary Roger Holmberg, a living legend in the explosives business, received the finest reward that ISEE has, namely "The Distinguished Service Award". This was given for his lifelong contribution to the explosives business. Unfortunately, Roger was not able to receive the price himself as his plane was grounded due to bad weather in Scandinavia. ISEE is planning to physically hand Roger the award at the EFEE conference in Maastricht in May 2022 - www.efee2022.com

Johan Finsteen Gjødvad also presented a paper on the progress of the EFEE vibration monitoring project comparing international standards for vibrations related to blasting.

Presenting one of the founding members of EFEE

INFRA – Infra Contractors Association in Finland

68 Years of developing and defending the construction business in Finland

INFRA was founded in 1954 and it is part of the Confederation of Finnish Construction industries RT (CFCI), which on the other hand is the joint interest organization of building contractors, special contractors and the construction product industry. CFCI represents the entire construction sector including building construction, construction product industry, infrastructure, HPAC contractors and surface contractors. Its aim is to firm up the cooperation of industrial players, promote good construction and to strengthen the supervision of the interests and importance of the construction industry.

The parent CFCI is a central federation, through which about 3 000 companies are organized. The member companies employ over 60 000 people. The joint turnover of the companies is over 20 billion euros.

Paavo Syrjö, CEO of INFRA Contractors Association in Finland

Kati Kaskiala, General Secretary of Rock Excavation and Blasting section

INFRA has approximately 1 600 member companies, which consist of large, medium and small construction companies. Member companies of INFRA produce a combined revenue of over 5 billion euros and have personnel of over 16 000 employees.

These member companies produce a quarter of total construction volumes in Finland while working in aggregate production, building of tunnels, roads, streets, railways, waterways, harbors and airports, parks and sports grounds, pipelines and sewers, and constantly increasing networks for power-distribution and telecommunication.

The aim of INFRA is to improve operating possibilities and environment of its members and to improve understanding the importance of infra construction as a foundation of our wellbeing. INFRA is a strong influencer in rules of our industry like laws and directives. INFRA is also often an initiator and a major player in different kinds of development projects for this industry. It negotiates general employment terms for our industry together with the employee unions.

The most important task and role of INFRA is to guide the whole industry, not only members, concerning common rules and to represent the whole industry towards authorities, media and other stakeholders.

Organization and operation

All operational bodies within INFRA are run by representatives from multiple construction companies and all parts of Finland.

The highest decision-making body in INFRA is its Council. Execution of Council decision belongs to the Board which is assisted by Branch Sections which concentrate in the development of various construction areas within infra construction segment. INFRA has also Committees which handle all labor and industrial policy matters concerning our members.

Branch Sections in INFRA are:

- Asphalt
- Aggregate
- Maintenance
- Rock excavation and blasting
- Cranes and special deliveries
- Demolition and recycling

The Use of explosives is part of work for member companies within rock excavation and blasting, aggregate and demolition branches. Most explosives and rock excavation related matters are handled in Rock excavation and blasting branch meetings. This branch has approximately 30 active members. The EFEE membership is also handled through Rock excavation and blasting section. Although member companies in the Rock excavation and blasting section include all major branch companies in Finland, only half of civil explosives consumed annually are handled through these companies.

The other half is used by mining companies, which are not represented by INFRA. However, INFRA co-operates with FinnMin (Finnish Mining Association) which represents mining companies in Finland. Many INFRA members also work in mines as contractors for example for development of tunnel network or even for production excavation.

The Rock Excavation and blasting section of INFRA participates in variety of development and decision-making work and bodies for the explosives using industry. INFRA has for example two representatives in the Shotfirer training council, which is an official Council set by the Ministry of Social affairs for controlling, advising and development of training and licenses of shotfirers.

As part of CFCI, INFRA is also allowed to have representation in working groups developing safety legislation and norms for the excavation and explosives industry, like norms for handling of blasting vibrations and training of shotfirers, legislation for storing of explosives and safety rules for blasting work sites.

In order to develop the working prerequisites and safety of blasting and rock excavation work, INFRA organizes two joined meetings annually where all authorities meet and discuss daily topics with INFRA members. These authorities include the Police, Regional State Administrative Agency (Safety and Health authority), Chemical Safety agency, Finnish Transportation and Communication Agency, Ministry of Transport and Communications and Ministry of Economic Affairs and Employment.

These meetings offer a forum for users of explosives to have dialogue with different authorities and this have turned out to be essential in development of legislation and other prerequisites for safe use of explosives.

Another important role of INFRA is to participate frequently in various environmental development projects concerning construction work. Recent projects have handled for example minimization of plastic waste from blasting work in seas and lakes, minimization of nitrates in tunnel and runoff waters, official guidelines for blasting and other construction induced vibrations. Dust related projects are also frequently on agenda. INFRA co-operates with NEPSI – European Network for Silica, in pursuit to control exposure to quarts dust.

The only major event in Finland for rock excavation and technology called "Rock technology days", are also arranged by INFRA semi-annually in co-operation with the Finnish National Group of ISRM.

INFRA is very proud and thankful that it was allowed to arrange the 10th World Conference on Explosives and Blasting together with EFEE in Finland in 2019. It was a success and the largest EFEE conference so far and praised for all arrangements. We sincerely hope that all delegates and quests enjoyed the conference and their stay in Helsinki, Finland! It was truly an honor and a pleasure to have many of you here.

Magician and mentalist Noora Karma facilitated the fabulous Gala dinner during the 10th EFEE conference in Helsinki together with Jari Honkanen from INFRA, the Finnish national Council member and Past President of EFEE ->

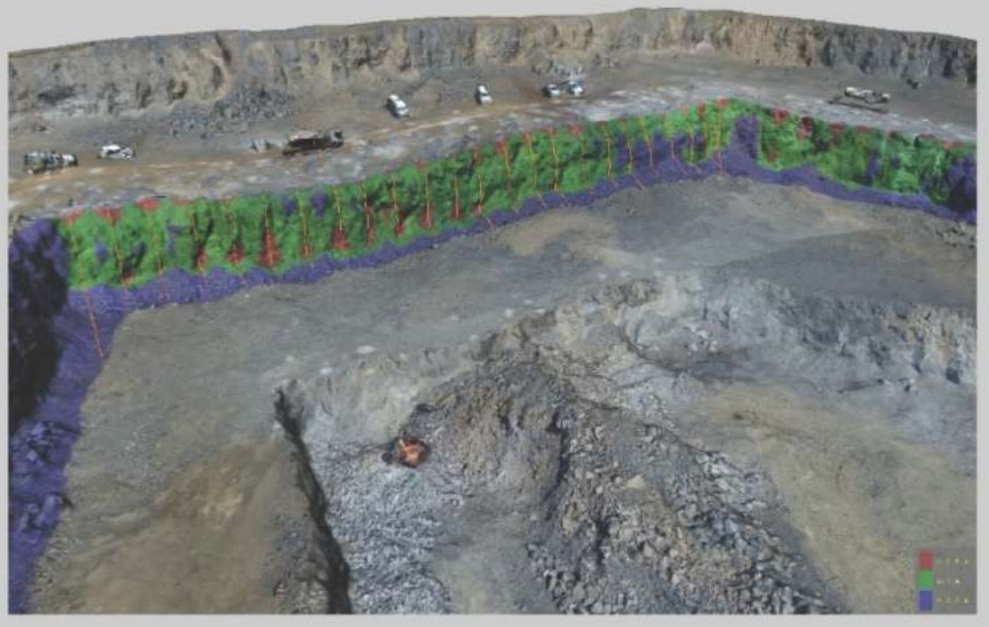
INFRA arranged the 10th World Conference on Blasting and Explosives in Helsinki, Finland in 2019 in co-operation with EFEE. Several Finnish companies used the opportunity to present themselves to the international audience in the exhibition and lecture rooms.

During the 10th EFEE World Conference on Blasting and Explosives in Finland, INFRA arranged the pre-conference work shop on blasting works in urban environment and took participants to visit the underground Helsinki and showed how everything was done ->

BlastMetriX UAV

Blast Optimization

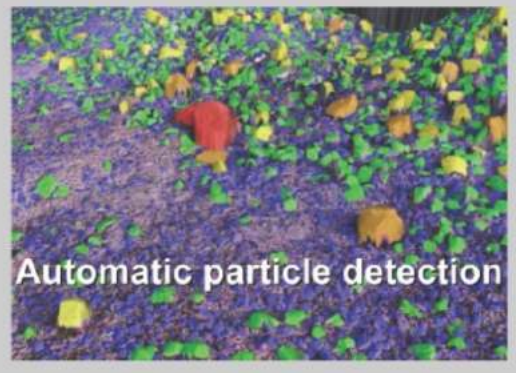
Blast Design and Blast Analysis with 3D images



3D images from drones are a perfect survey of large blast sites. 3GSM's unique blast optimization procedure bases on proactive blast design and automatic fragmentation analysis in 3D.

Features

- Face profiles (burden diagrams and maps)
- Pre-post blast comparison
- Quantification of muckpile (movement, volume, swell)
- Seamless data flow
- NEW! First 3D fragmentation analysis from drone imagery



3GSM Software & Measurement 3GSM.at

3GSM GmbH
8010 Graz - Austria
office@3gsm.at - www.3GSM.at

Obituary
Mr. Aslak Ravlo

Mr. Aslak Ravlo passed away on 22. February in an age of more than 92 years. After graduating as a civil engineer in the mid-1950s, he started his career for Ing. Arne Reinhertsen in Trondheim, Norway before moving on to work for Ing. F. Selmer AS. Here, he worked in a variety of roles and positions within the civil construction industry. Projects included among other things, building and construction of roads, bridges, dams and hydro power plants. Through his work, he got involved in projects around the world both as an engineer and as a project manager. His long and vast experience also led to engagements as professional co-jugde in legal trials where both Norwegian and international contractual provisions applied.

In the Norwegian Tunnelling Society (NFF) he had his years as president and later as secretary for more than a decade. He remained active in the society almost to his last days as a member of the cultural committee. In 2021 he, together with a colleague, edited and partly wrote a book titled *Bergets beseirere* (Translates to; *Those who are winning over the rock*), a summary of many rock blasting and building projects carried through after the second world war. For his long-time service and commitment, he was awarded an honorary member in 2003. Aslak could always be spotted in the front rows during a presentation or in engaging discussions in the breaks during the annual Norwegian blasting conferences.

For a period, Aslak was also a board member of The International Tunnelling Association (ITA) and he was a key player in arranging the 1999 ITA general assembly in conjunction with the World Tunnel Congress .

In EFFE we know him as former president, active debater in many committees and in the Shotfiring Committee special as the project manager of the ESSEEM project.

Many of us will miss Aslak and we will keep him in good memory.

Rest in Peace.

By Karl Kure and Espen Hugaas on behalf of NFF (Norwegian Tunnelling Society) and EFEE

Aslak Ravlo

AvaTrace M8o

Simple, remotely controlled vibration monitor. 8 month battery life!

- Online monitoring and remote control of field instruments – all from your web browser!
- Field instruments made for harsh outdoor conditions – perfect for your construction and mining projects!
- Fully automatic system with no manual attendance required – simple and easy to handle.

Are you ready for a demo? Please email info@avamonitoring.com or visit avamonitoring.com

AVA MONITORING
simpler measurement, automatically

New EFEE members

We would like to welcome the following members who have recently joined EFEE.

Congratulations and a warm welcome for joining EFEE as a member.

Individual Members

Brett Macaulay, Dyno Nobel, Australia

Jesús Angel Pascual De Blas, MAXAM, Spain

George Piperides, K.kythreotis Holdings Public Ltd, Cyprus

Govindarajan Karthigeyan, AMBALS EXPLOSIVES PVT LTD, India

Stefanos Baliktsis, EXORIXI SA, Greece

Juha Kreivi, Orica, Finland

Rikki Isgar, Brown and Mason Group, UK

Philip Van Greunen, BME, South Africa

Yong Pan, Serbian Zijin Copper Mine, Serbia

Robrecht Schmitz, Sibelco, Netherlands

Fabiola Gonzalez Dominguez, Newmont, Mexico

Christian Asbjørn Andersen, NIRAS, Denmark

Upcoming International Events

SAFEX International Congress
April 3-8, 2022
Salzburg, Austria
https://www.safex-international.org/safex/news-safex-congress-xx-in-salzburg.html?sid=1580472102

WORLD TUNNEL CONGRESS 2022
UNDERGROUND SOLUTIONS FOR A WORLD IN CHANGE
April 22-28, 2022
Bella Congress Center Copenhagen, Denmark
https://www.wtc2022.dk/

EFEE 11th World Conference on Explosives and Blasting
May 15-17, 2022
Maastricht, Netherlands
www.efee2022.com

HILLHEAD 2022
June, 21-23, 2022
Hillhead Quarry
Buxton. UK
https://www.hillhead.com

International Explosives Conference 2022
June 22nd-24th, 2022
Victory Service Club
London, UK
http://www.iec-2022.com/?action=main

EUROCK 2022
September 12th-15th, 2022
Helsinki, Finland
www.eurock2022.com

FRAGBLAST 13 October
15-21, 2022 Hangzou,
China
www.fragblast13.org.cn

World Mining Congress
June 26-29, 2023
Brisbane, Australia
www.wmc2022.org

EFEE

JOIN TODAY

Join the European Federation of Explosives Engineers today and connect with industry experts from 56 countries

Join fellow industry specialists from across 56 countries and take advantage of the many benefits on offer, including:

Specialist Knowledge

Immediate access to the latest SAFEX information and incident reports, most interesting technical articles, list of European standards on vibrations and air blast, industry news and opportunities.

Online access to a library of previous conference proceedings with papers covering:

- -Blast Design Management
- Blast Vibration and Seismology
- Blasting Work Experiences
- Construction, Mining & Quarrying (Blasting)
- Demolition Blasting
- EU Directives & Harmonisation Work
- Explosive Detection for Security
- Health, Safety & Environment
- New Applications and Training
- Technical Development

Membership Discounts

EFEE members enjoy discounted prices on conference and workshop attendance, proceeding sales and newsletter advertising.

Networking

Exclusive access to the EFEE conference, meetings and web page with information and possibilities to interact with likeminded members.

Newsletter

All EFEE members receive 4 electronic newsletters per year including the latest industry news, blasting experiences and commercial adverts. As a member you also have the opportunity to influence content and advertise your business.

Committee Membership (Open to all Members)

Providing specialist information and the opportunity to influence EU explosives society, shot fire procedures and attending standing committees such as EU-directives, Environmental, Newsletter and Shotfirer.

Individual membership costs just €75 per year.
Join today, visit www.efee.eu

March 2022

BACK TO TOP


EFEE