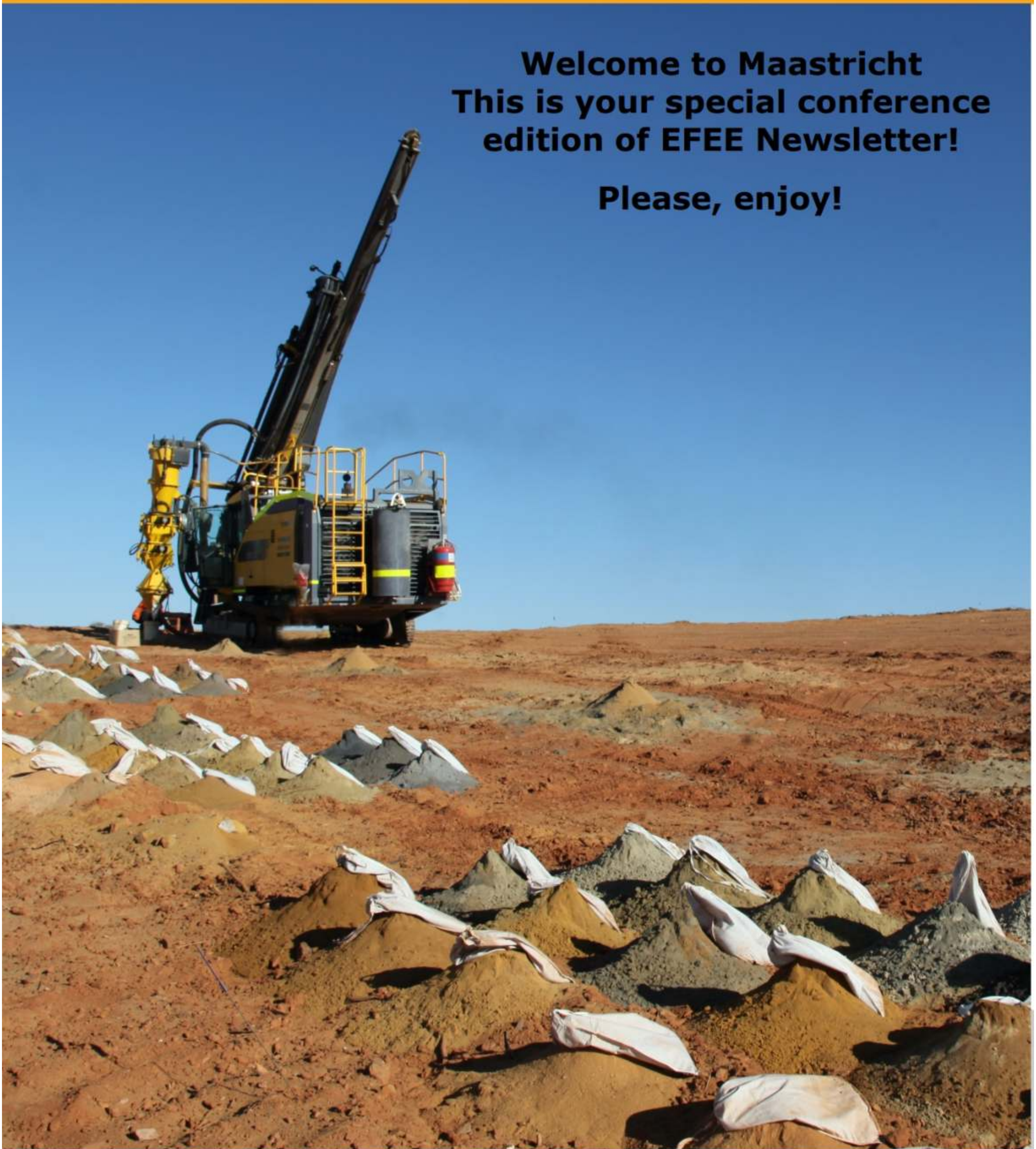
EFEE NEWSLETTER

May 2022

Welcome to Maastricht
This is your special conference edition of EFEE Newsletter!

Please, enjoy!



May 2022 edition

We in EFEE hope you will enjoy the present EFEE-Newsletter. The next edition will be published in September 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

Dear friends,
the President's voice

A new world

We, as human beings, have an intrinsic need to evolve, to undergo a metamorphosis and to change a few things every now and then. Whenever the dust settles down and nothing changes, I experience an anxious feeling of „incompleteness". Although any transformation involves some huge consumption of energy, my family and children give me discipline, energy and a purpose so I can make important changes in all areas.

Every time we go through a major crisis that brings radical changes in our everyday lives, we talk about how nothing is going to be the same "after" and we attempt to trace the contours of this new reality. Now, as we are entering the aftermath (or, at least, we hope it to be) of a pandemic, which showed us how dependent we were on some models and systems, and also how we could change things to adjust, we are faced with thinking of another "after": What will happen after the Ukraine war? Two crises, one after the other, which double the opportunity to embrace change and show us how important it is to be flexible in our approach to reality.

Whether we like it or not, there is a new world ahead of us; however, this new world cannot deny everything that went before it. This is the mistake we make all too often: we think that the rupture with the past will be an abrupt and definitive one. It rarely is, although this happens sometimes: dinosaurs got it after an asteroid had radically changed the circumstances of life on Earth.

However, generally, we have transition periods, when we have time to analyze changes, adjust and prepare for what is going to be next. These are periods when we have the opportunity to reconsider the matters in one's organization and do those things we were afraid to do before. Again, we don't have to give up on the past, but it's an ideal time to analyze more thoroughly what is worth keeping or not. What's in it to lose? Not much, considering how the world around goes by. What's in it to win? Almost everything, because we will be better equipped to deal with this new world.

So, let's keep on working and dreaming. Why working? Because this is how we move on. Why dreaming? Because this is how we will go further.

I wish a gratifying mandate to the future EFEE President, and to the members of the organization – success, inspiration and hope for a more stable and wiser world!

I hope to see as many of you as possible at the upcoming Conference in Maastricht between 15-17 May 2022.

See you soon!

Doru Anghelache,
President of EFEE

The 11th World Conference on Explosives and Blasting, Maastricht

The EFEE Board and Council members after AGM - preparing for the 11th EFEE World Conference

Spring had already arrived in Maastricht when hundreds of explosives industry professionals and interested parties started to gather in the city. They were gathering for the EFEE conference of course.

The first day brought excitement by a great diversified workshop – starting with interesting presentations by the EFEE environmental committee – presenting the Comparison of Vibration and other Standards Related to Blasting were Charles H. Dowding, Thierry Bernard, Johan Finsteen Gjødvad and Mathias Jern, then they moved on to a CO2 Calculator of Blast Compared to Other Tools by Thomas Pinel and Ricardo Chavez

and last, but not least the Incident Reporting and database by Espen Hugaas – the most important thing on those subjects were the format, everyone got to say their thoughts, discuss the matters, share experiences. The whole room was full of energy, which resulted in further discussions during breaks. The feedback was that people felt they have gained from the workshop.

Hereafter, everyone moved outside, with sunshine and warmth, to experience a team of explosive and narcotics search dogs at work. This surely widened everyone's horizon, how man's best friends, with their unique senses, made our lives safer in public places and in quarries too. However, the dogs was not the end end of this interesting day, further on, a special bus took visitors to a nearby location for an exclusive excursion to an old limestone quarry which once provided material for a cement factory and also dimensional stone, already in 13th century. Nowadays the quarry was recultivated and under natural protection with its various wildlife and it was very interesting to see.

The workshop presentations will not be included in the Proceedings of the Conference, but in case of interest, please contact Johan Finsteen Gjødvad: johan.gjodvad@sigicom.com

The evening of this fulfilling EFEE workshop ended with great joy of seeing old friends, colleagues and meet new people with drinks and snacks to make the get-together even more like a celebration, all this in between the exhibitioners.

The newly elected EFFE President, Mrs Viive Tuuna declared the long-awaited 11th World Conference to be opened and introduced the past president of ISEE Alistar Torrance, the Vice President of ISEE Janeen Smith and the Executive Director of ISEE Steven Shivak on the stage – this resulted in our Secretary General, Roger Holmberg, receiving "The Distinguished Service" award from the ISEE representatives for his lifelong contribution to the explosives industry, a great honour also to EFEE. What a blast of a way to start a conference in.

On Monday, 30 May 2022, the Maastricht MECC conference centre was bustling with busy conference visitors, - the formal introduction to this event was in the hands of ladies – the EFEE President Viive Tuuna, and the Vice President of ISEE Janeen Smith. The opening speeches were not only to greet everyone, but also to grant an award to EFEE's next Honorary Member, Heinz Berger, for his great contribution to EFEE during all those years.

Right after this special moment, the conference kept on going, with busy quests moving from one presentation room to another which in parallel provided great insights to our industry. The exhibition area gave a lot of new to things to see and touch, and a new addition to EFEE Conferences – the demo stage - promotional presentations about new techniques and industry development by professional organisations. While having tea and coffee or grabbing lunch, what better way to enjoy it, than to check out the vast and busy development of explosives industry right there at the spot.

By then, it felt to many of us like it had already been going for a few days, as in a short span of time, much information was digested, many people had been met and the feeling was good. But this was only just getting better.

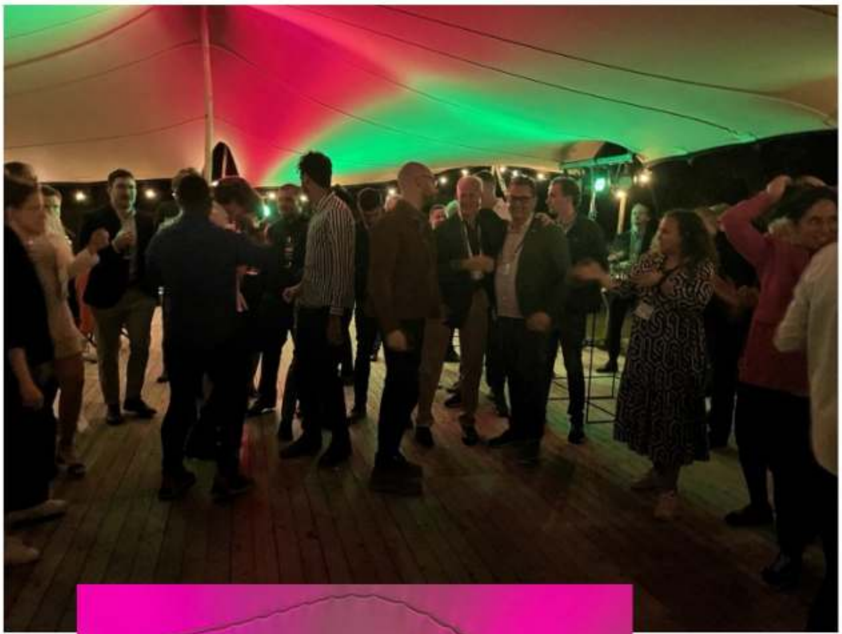

1 ART of DETONATION


"PLASTER"
DUMMY BOOSTER
"PLÂTRE"


Team Members
mecc

The same Monday brought yet another great event, which probably was highlighted not only by the almost 8 minutes of amazing fireworks, the superb food and wine, the nice live jazz but mainly by our record number of students (38), who had decided to visit the EFEE conference, and to our luck, also took part of our Gala Dinner. A truly unforgettable evening on the lawn of a beautiful mansion, we all felt so young again.

This year was also special, as a second Honorary Membership was awarded to Kar Kure from Norway, for his great work in EFEE during so many years.



It feals like one or two days is not enough - on Tuesday, the business-like atmosphere continued by full force. Many inspiring, useful, and never-seen- before presentations were performed and there was no lack of listeners.

The next EFEE World conference, 12^{th} in a row, was greatly advertised through all the Maastricht event, for it will take place already in September, next year, in Dublin, Ireland.

All of the delegates end exibitors we spoke to in Maastricht was already planning for Dublin after such an amazing feeling in Maastricht, we just can't wait to see you in Dublin the 10^{th} to the 12^{th} of September 2023.

The blast of the second "White giant" in Duisburg

By Michael Neubert, Thüringer Sprenggesellschaft mbH, Kaulsdorf www.sprenggesellschaft.de

After successfully blasting the first building 2.5 years ago, the confined space at the second giant required a much more sophisticated blasting strategy. The minimum distance to a busy road was only five meters. At the same time, the vibrations caused by the impact of the structure had to be kept as low as possible. Several blasting tests were carried out in advance to determine the optimum blasting technology. Special detonation technology and blast design software were used.

Fig. 1: Blasting first "White Giant", photo: rebuild.ing GmbH

1 The "White Giant"

To create modern living spaces for as many people as possible, large parts of the old Rheinpreußen- Siedlung were demolished in the 1970s and a total of six high-rise apartment buildings were built on the vacated area. While the buildings, which became known as the "White Giants," each with 160 and 320 apartments respectively, were considered very attractive in the early years, demand declined over time. The city of Duisburg finally decided to remove at least three of the buildings and to create a park on the resulting open spaces, thus enhancing the district. For this purpose, the properties Friedrich- Ebert-Strasse 10 - 16 and Ottostrasse 24 - 30, which had already been vacant for several years, were to be demolished first.

To accelerate the demolition and to minimize the impact on the residents, it was decided to demolish the structures by blasting. The contract for the demolition of the first high- rise building was awarded to Prangenberg & Zaum GmbH from Viersen together with Thüringer Sprenggesellschaft mbH from Kaulsdorf as the blasting company. After extensive asbestos removal, the high-rise building was finally brought down on March 24, 2019, under confined space conditions, by simultaneous demolition of all four blocks (Fig. 1).

2 The high-rise Ottostrasse 24-30

Following the successful demolition of the first building, preparatory work on the second White Giant in Ottostrasse began at the end of 2019 with the same constellation of companies. The windowpanes had already been removed here several years ago, so that the object gained notoriety as the largest pigeon loft in Europe. As a result, almost 40 tons of pigeon droppings had to be removed from the building. Like the other five White Giants, the high-rise is built roughly in a north-south orientation, with Block 24 to the north, Blocks 26 and 28 in the middle, and Block 30 to the south (Fig. 2).

BACK TO TOP

The building is around 61.3 m high, 18 m wide and 90 m long from the top of the ground and has a mass of around 40,000 tons. The four individual blocks are separated from each other by an approximately 2 cm thick polystyrene joint. (Fig. 3) They are built in monolithic wall construction. The wall thicknesses are 15 and 20 cm on the upper floors and 20, 25 and 30 cm on the lower floors. [1]

Fig. 2: White Giant and Ottostraße, Photo: Toma Babovic Sprenggesellschaft mbH

3 Surroundings

For the blasting of the second White Giant, the site conditions turned out to be even more challenging than for the first White Giant.

To the north, there was an underground garage just about three meters from the gable wall. This has been closed for several years because of the danger of collapse but was still to be preserved. On the south side, Ottostraße ran only about five meters from the gable, and the nearest residential building was 35 meters away. In addition, the blast object was surrounded by numerous other residential buildings and a daycare center (Fig. 4).

Fig. 3: Joint wall, Photo: Thüringer

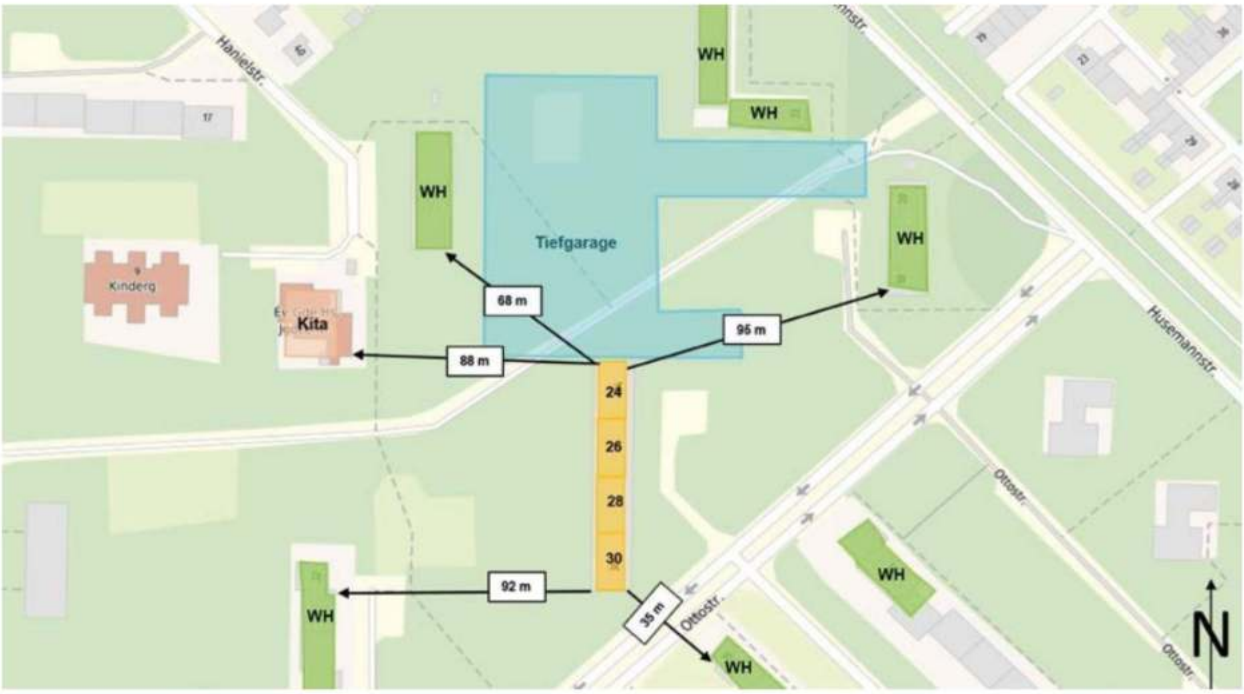


Fig. 4: Aerial photograph with distances, graphic: 3d.Ruhr

4 Blasting strategy

The confined space required a sophisticated blasting strategy. It was mandatory to limit the impact area to the property of the high-rise building. At the same time, the vibrations caused by the impact of the structure had to be kept as low as possible. Due to the very stable construction of the building, the only possible cause for the collapse was overturning due to directional blasting or blast folding. The blasting concept was designed by Dr.-Ing. Rainer Melzer, the planning office for structural demolition, provided for a combination of blast folding and directional blasting of the individual blocks. For this purpose, the two middle blocks 28 and 26 were first to be brought down at two-second intervals by blast folds transverse to the longitudinal axis of the building. Subsequently, it was planned to tilt the outer blocks 30 and 24 over the floor plan of the building at intervals of three- and six-seconds utilizing drop direction blasts (Fig. 5).

5 Demolition planning

Compared to the first White Giant, significantly more intensive use of applied explosive charges was aimed for. This time, in addition to walls with a thickness of 15 cm, walls with a thickness of 20 cm were to be destroyed in this way. Several blast tests were conducted to define the optimum loading rate.

The use of docked loads led to a significant overall reduction in noise pollution for residents, as noise- and time-intensive preliminary weakening and drilling work was required to a much lesser extent.

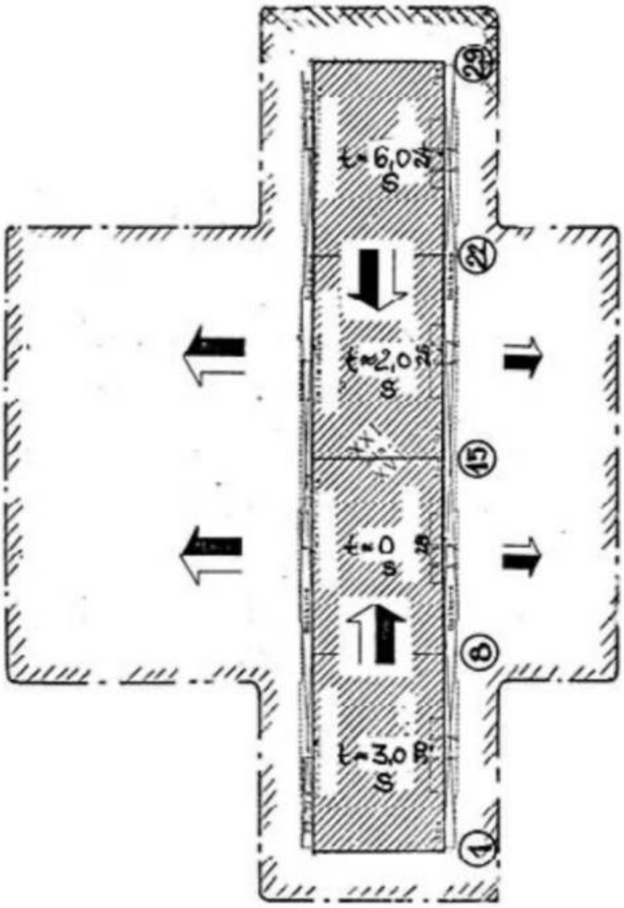


Fig. 5: Collapse principle, graphic: Rainer Melzer

One of the greatest challenges during the planning phase was the selection of a suitable blasting method for the joint walls at the block boundaries. Here it was necessary to ensure that the wall was destroyed on one side in such a way that the collapse of the associated block could take place. At the same time, the second half was separated by the polystyrene joint and the explosive charges intended for this wall still had to remain undamaged for several seconds. Blasting tests with applied explosive charges and with borehole charges were carried out on two walls for this purpose. While the applied explosive charges gave an unsatisfactory result with damage to the adjacent wall, the borehole charges showed a clean blast result. Accordingly, blasting of all joint walls in the basements by borehole charges was planned (Fig. 6).

Fig. 6: Blasting result borehole charges
Photo: Thüringer Sprenggesell schaft mbH

6 Loading work

The loading work began eight days before the blast date. In advance, a large part of the 570 borehole charges and the detonators for each component had already been prefabricated and labeled. (Fig. 7) The placed charges, on the other hand, were produced individually for each component on-site. (Fig. 8) The marking of the layout levels on the walls was already done in advance. The THW comrades supported the loading work as part of their training internship for 2.5 days under the guidance of TSG's blasting experts. A total of around 485 kg of Eurodyn 2000 gelatinous explosive material with diameters of 25 mm and 30 mm and 3,200 m of detonating cord with loading meter weights of 12 g/m to 100 g/m were used. More than 1,000 m3 of sand were brought into the building to dam and fix the applied loads (Fig. 9).

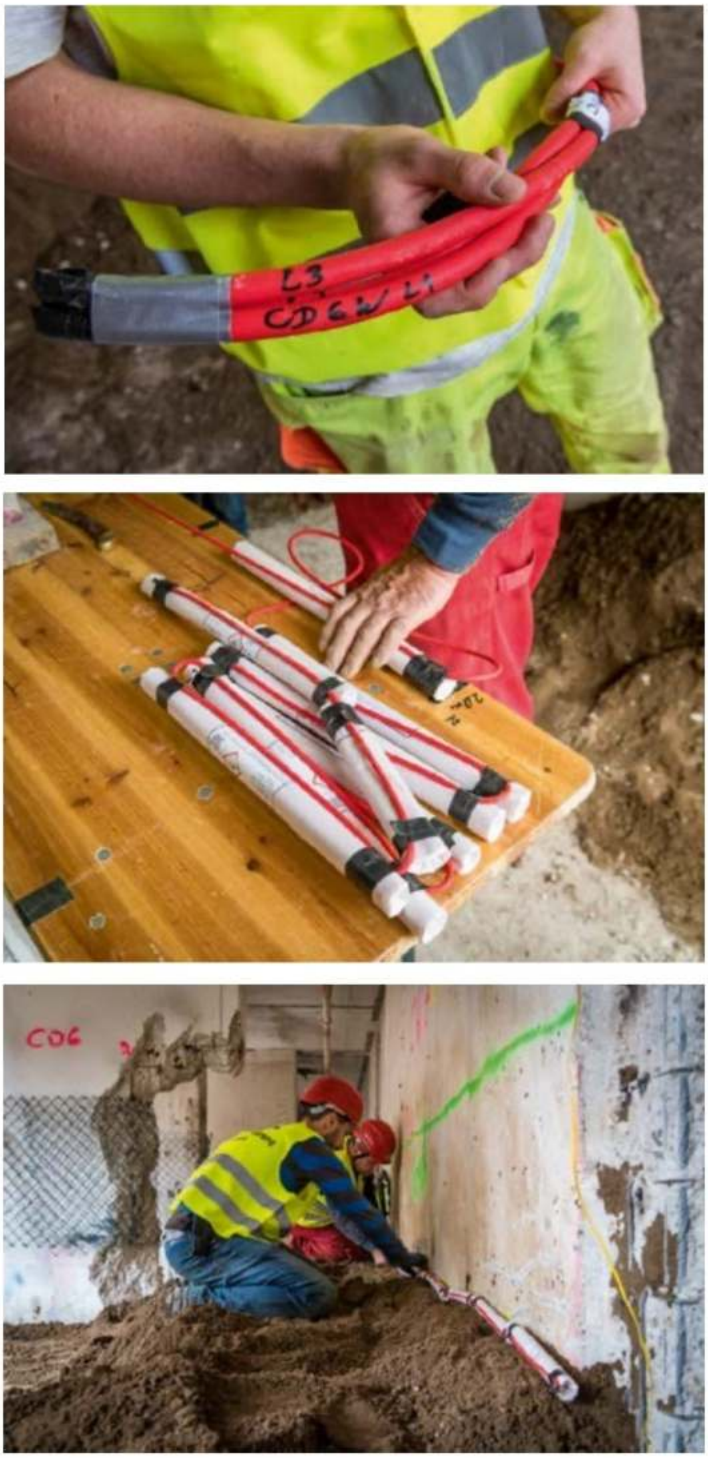


Fig. 7 - 9: prefabricated loads, preparation applied explosive charges, loading work applied charges, photos: Toma Babovic

7 Ignition technology

The high ignition time differences between the individual blocks made the use of non-electric working ignition with short-time igniters and electric frame ignition safely possible only in block 28, which was blown up first. Purely electronic ignition was provided for the other three blocks.

This simultaneously enabled the realization of a very finely graduated ignition sequence.

This allowed, on the one hand, the permitted charge quantity per ignition time stage to be maintained throughout the entire object, thus limiting the resulting pressure wave, and, on the other hand, in areas with many charges applied in a confined space, the ignition times could be designed in such a way that mutual negative influence of the individual charges could be ruled out. The use of electronic detonation also easily allowed the integration of two entrenchment blasts five and ten seconds before the actual blast. Together with the staggered blasting of the four high- rise blocks ignition times of 0 meters to 16,575 meters could be realized. Together with the ignition plan, the log path for logging in the total of 733 electronic detonators has already been defined. With the support of SSE Deutschland GmbH, the ignition plan was transferred to the ShotPlustTM Premier blasting planning software. The software was used to define the log ranges for the four loggers to be used and to pre- program the loggers. At the same time, the data backup in the program took place.

8 Safety

The tightly built environment made intensive safety measures necessary. On the day of the blasting, a cordoned area with a radius of around 200 m was set up around the blast object. Within this area, about 1,800 people had to be evacuated, and several roads had to be closed. In the high-rise building itself, components to be blown up were enclosed in several layers of textile fleece and wire mesh, and the direction of ejection of applied explosive charges was directed towards the interior of the building wherever possible. All blast levels were additionally secured by heavy fleece curtains. To reduce the shocks caused by the ground impact, a drop bed consisting of an approximately two-meter- high trench-wall sequence was constructed in the main impact area of the two central blocks to the west. A wall of earthen material several meters high was poured around the entire building to help contain the debris as it hit the site. As additional protection, against impact scatter, fleece-covered protective scaffolding was erected in front of the two nearest buildings on Ottostrasse. The underground parking garage was stabilized in the vicinity by many heavy-duty supports and custom-made steel frames. To contain the massive amount of dust that was expected, the fire departments of the city of Duisburg prepared the intensive use of water, including via jet hoses and hydro shields.

On the site of the first White Giant, a basin with a volume of around 500 m3 was specially excavated for this purpose. On blast day, about 3 km of hose lines were used to get more than 30 m3 of water per minute into the air.

Fig. 10: Preparing safety measures Photo: Thüringer Sprenggesellschaft mbH

9 Blasting

On Sunday, 09/05/2021, the residents of the cordon area had to leave their homes early in the morning. After 08.00 am, only a few authorized persons were allowed to stay in this zone. During this time, among other things, the final inspection of the ignition system was carried out by the responsible blasting authorities and the ignition line was laid to the ignition point. This was located on a balcony on the 20th floor of the third White Giant to be demolished, at the edge of the cordon area. Since the clearance of the airspace above the explosive object was still pending shortly before the planned detonation at noon, the detonation was postponed at short notice by ten minutes. Then, after the two audible entrenchment blasts, the explosive charges detonated.

The collapse of the structure began immediately and after about 13 seconds the second The White Giant went down on schedule. After a few minutes, when the dust cloud revealed the view of the debris, the success of the blasting became visible. The skyscraper was completely down in its drop bed. There were no incidents of damage in the surrounding area. Less than two hours after the blast, residents were able to return to their homes. The almost perfect demolition was highly appreciated by the participants, residents and spectators and showed once again that the demolition of such objects is a safe demolition method even in a difficult environment.

Fig. 11: Blasting, photo: Mobile Image and Measurement Service Michael Böhme

Fig. 12: Blasting result, photo: rebuild.ing GmbH

Literature:

[1] Melzer, Rainer; Project for the demolition of the high-rise residential building Ottostraße 24 - 30 in Duisburg; 2020

Peculiarities of the use of emulsion type explosives in the conditions of coal mines with methane release

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Abstract

At the undergroun d mining works performed in coal, rock and mixed coal & rocks, the process applied almost exclusively is by drilling & blasting. Given that, in Romania there are mines classified as methane mines, this involves the use of explosives and means of initiation that are safe from methane gas and coal dust. To date, permissible powdered explosives have been widely used. The drilling & blasting patterns were established according to the physical - mechanical and geological characteristi cs of the rocks in the massif, the type and section of the mining works as well as the restrictions imposed by the methane regime of the mines. In recent years, the widespread use of emulsion explosives has led to the developmen t of permissible types of emulsion explosives. In order to use the permissible emulsion in the Romanian coal mines, it was necessary to test in the INSEMEX landfill the safety and functioning parameters as well as to perform undergroun d blasts, in the specific conditions of the methane coal mines.

The paper describes the underground experimental blasting works performed, as well as technical and safety recommendations for the use of this type of explosive - permissible emulsion.

1 Introduction

The manner of performing the blasting works in the mines with methane gas regime has been regulated over time by a series of normative acts that are the basis of the security measures and requirements established by the mining units that carry out their activity in such conditions.

In the methane mines in Romania, the excavation of mining works in rock, coal and mixed coal & rocks is done almost exclusively with the help of explosives, through the drilling & blasting process. Depending on the relative flow of methane and its release, the coal mines are classified in the second category as mines with "methane regime" (over 15 m3/ ton.), which led to the establishment additional security requirements imposed on blasting technologies and explosive materials.

Regarding the explosive materials and the initiating means, one of the main safety requirements is their safety against the air-methane and air-methane-coal dust mixture, respectively the reduction of the risk of ignition of these mixtures.

Over time, various explosive materials have been used in the methane mines, either ordinary (dynamite) when digging mining works in rocks, or permissible (AGC, AGP, Metanit Special, etc.) when digging coal mining works.

Today, for safety reasons, at the digging of all types of mining works, only permissible explosives and initiation means are used (electric detonators, detonating cord). The permissible explosives used are of the powder type - Metanit Special E7H, millisecond electric detonators type MMSED - Cu, with 18 delay stages and a delay interval of 30 ms between two consecutive steps, respectively permissible detonating cord type RIOCORD PS with 6 gr./ lm. load.

Given that the Metanit Special E7H explosive will no longer be available on the market, the supplier has proposed the replacement with a permissible emulsion- type explosive - Emulinit PM.

The use of the new type of explosive involved its additional verification in laboratory conditions - in terms of safety parameters against methane and coal dust as well as underground experimentation, in order to establish the appropriate drilling & blasting parameters.

For this purpose, a program for testing the safety parameters in the explosives testing facility of INSEMEX Petrosani was carried out, as well as a number of 40 underground experimental blasts at two underground coal mines.

2 Methodology

2.1 Aspects regarding the safety requirements of permissible explosives

Only safety explosives and means of initiation are used for the blasting works in coal mines according to the provisions of Law 126/1995, with the subsequent amendments and completions brought by the existing legislation in force as well as according to GD 1049/2006 regarding the regime of explosive materials.

Permissible explosives shall be used only after the production batch has been tested and certified by a notified body for that purpose.

For this purpose, the test is performed in a mortar with a central channel, in an atmosphere of air - methane (9.0 ± 1.0 % volume), respectively air - methane (4.0 ± 0.5 % volume) - dust of coal (in suspension 330 gr./m^3 and in the mortar channel 50-150 gr./test), is 1.000 grams, and the maximum load allowed for underground use in the mine hole is limited to 800 grams.

Production batches of permissible millisecond electric detonators are used, whose possibility of igniting the air - methane atmosphere at a volumetric concentration of 8-10 % CH4, is less than 4 % of the total number of tested detonators.

2.2 Peculiarities regarding the execution of the blasting works in the coal mines

2.2.1 Requirements for blasting technologies

When determining the requirements for blasting technologies, the factorsinvolved must be taken into account, such as the regime of methane gas emissions and the flammability of coal dust.

In order to ensure the safe and efficient blasting operations, the following major requirements are highlighted.

- the distance between the holes corresponding to the type of rock and the explosive (minimum 0.5 m), in order to avoid the destruction of the tightness state of the explosive charges in the delayed firing process and the occurrence of the risk of amputation and unloading of the explosive charges;
- correlation of the hole length with the length of the explosive charge and with the observance of the minimum stemming length (minimum 1/2 of the hole length);
- proper initiation of explosive charges by ensuring a delay interval of 75 ms between two adjacent holes capable of influencing each other, respectively ensuring between the first and last charge that can be fired in the blast face of a delay interval of 200 ms in coal and 400 ms in other rocks;
- observance of the optimal ratio between the diameter of the mine hole and that of the explosive cartridges (10 - 25%);
- rear priming of the explosive cartridge inserted in the mine hole;

- when establishing the maximum quantity of explosive possible to be detonated in a mining work, the necessary air flow at the work place will be taken into account according to the criterion of diluting the gases resulting from the firing operation.

2.2.2 Drilling and blasting parameters

Achieving the desired blasting effects is conditional on setting the parameters of the blasting works so as to ensure the detachment of the rock from the massif, reducing over profiling and cracking area, obtaining an optimum granulometry and a reduced spread of the blasted rock mass.

This presupposes that the drilling and blasting parameters are determined in correlation with the physical - mechanical characteristics of the rocks and the thermodynamics of the explosives used, respectively:

- physical-mechanical and elastic properties, respectively natural fragmentation (on micro and macrocrystalline scale) of rocks;
- the section of mining works in the excavation;
- number of free surfaces of the blasting front;
- drilling and blasting parameters;
- type of explosives and initiation means;
- type of explosive load;
- size and quality of stemming area.

In the conditions of digging mining works with a single free surface - the most common situation in the case of Romanian coal mines , the action of the explosion is oriented towards this surface, on the line of least resistance, because only in this direction the massif has the possibility to deform indefinitely.

The correct formation of the blasting cut is an essential factor in increasing the degree of dislocation of the rock in the massif, in the situation of the existence of a single free surface. Considering the endowment of the mining units with means for drilling the mine holes and the physical-mechanical characteristics of the rocks in the massif, the converging blasting cuts are widely used.

They are drilled perpendicular to the stratification or cleavage of the front rocks, approaching in depth at a distance of 0.1- 0.3 m., having a length greater than the rest of the holes in the front, so that the plane passing through the base of the convergent holes to be in front of the plane passing through the base of the stopping and profiling holes by 0.1- 0.2 m.

Figure 1 shows a blasting pattern with 48 holes for a transverse gallery dug in rocks, with the size of 4.3 x 3.25 m and in Figure 2 a blasting pattern with 42 holes for a directional gallery dug in rocks, with the size of 3.8 x 2.8m.

The widening holes are placed around the cut holes so as to ensure a sufficient density on the front surface, which allows the extension of the free space created by the cut holes. When choosing the number of stopping and profiling holes as well as their location, the strength and friability of the rock in the massif are taken into account. In Figure 3 is presented a blasting pattern with 36 holes for a directional gallery dug in mixed rocks, with a size of 3.8 x 2.8 m.

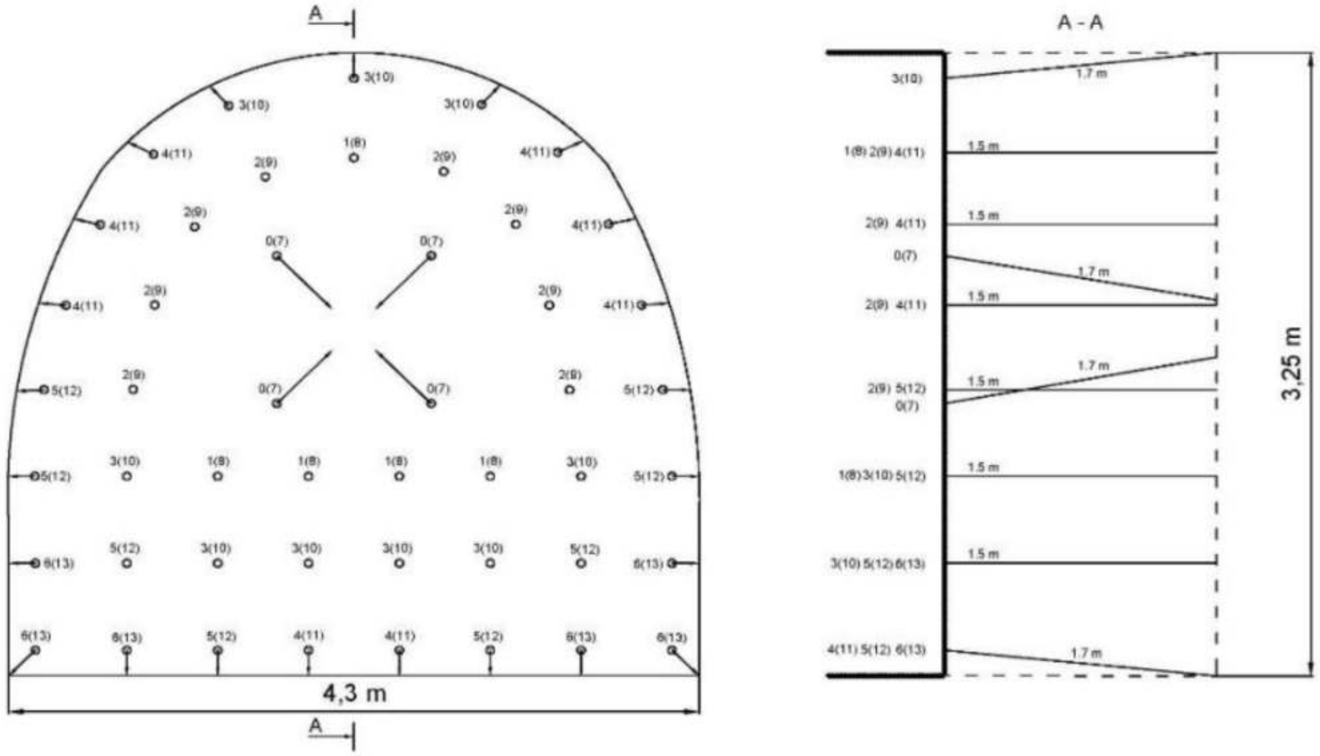

Fig. 1. Blasting pattern with 48 holes for digging gallery in rocks

Profiling holes are located as close as possible to the projected contour of the mining work (0.1 - 0.2 m) so as to avoid over profiling of the mining work.

The mining works are excavated in rock, coal and mixed rock & coal. The support of these works is made with sliding metal arches made of laminated profiles, arranged in fields of 0.5 - 1.0 m.

Regarding the blasting works at the long walls, depending on the strength of the coal in the work front, patterns with one or two rows of mine holes are applied. In the case of low-strength coal, the firing pattern with one row of holes is used, in which case the orientation of the holes is towards the bottom side of the long wall.

In the situation where the coal from the long wall front has a high friability, the cutting of the coal at the front is done exclusively by pneumatic hand hammer.

For the removal of the coal with medium to high strength, the blasting pattern with two rows of holes is applied, in which the holes in the upper row are oriented perpendicular to the transverse plane of the long wall (Fig. 4). The arrangement of the holes on each row is done in the same horizontal plane, between the rows of beams, but in different vertical (directional) planes.

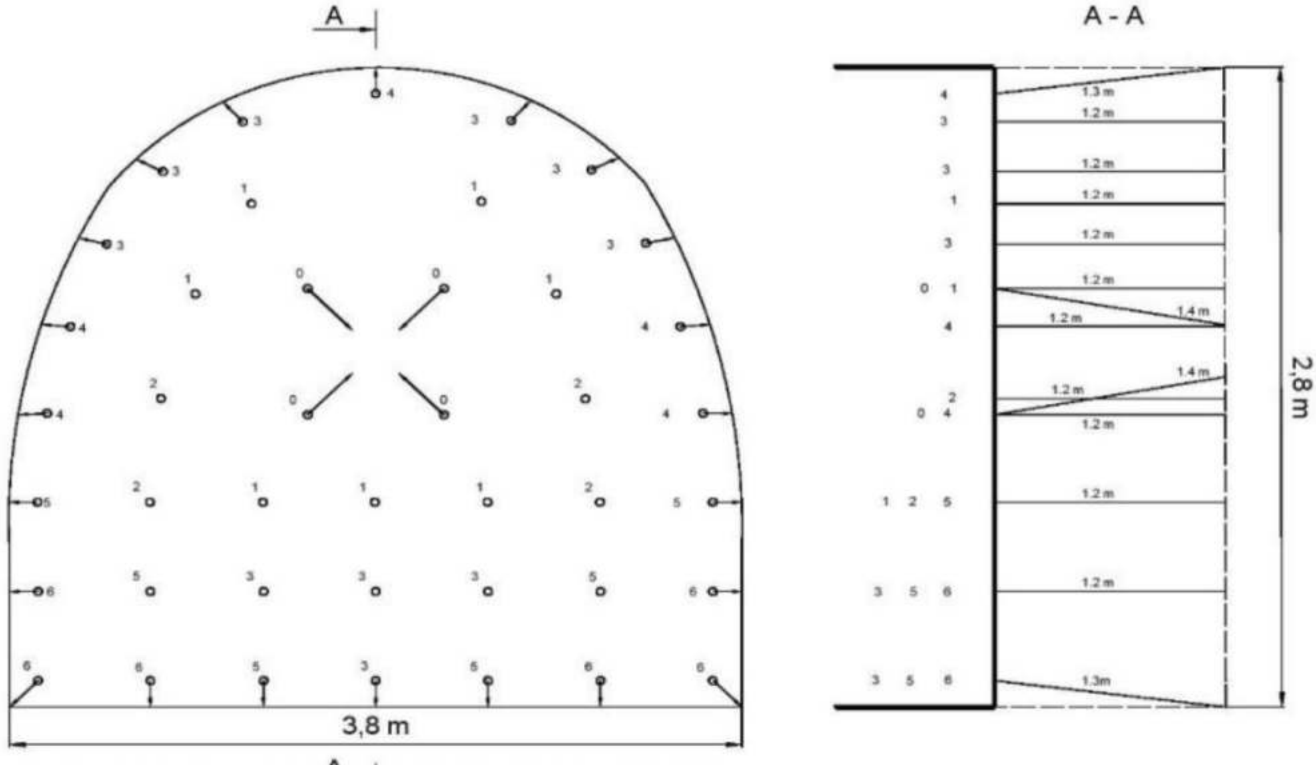

Fig. 2. Blasting pattern with 42 holes for digging gallery in rocks

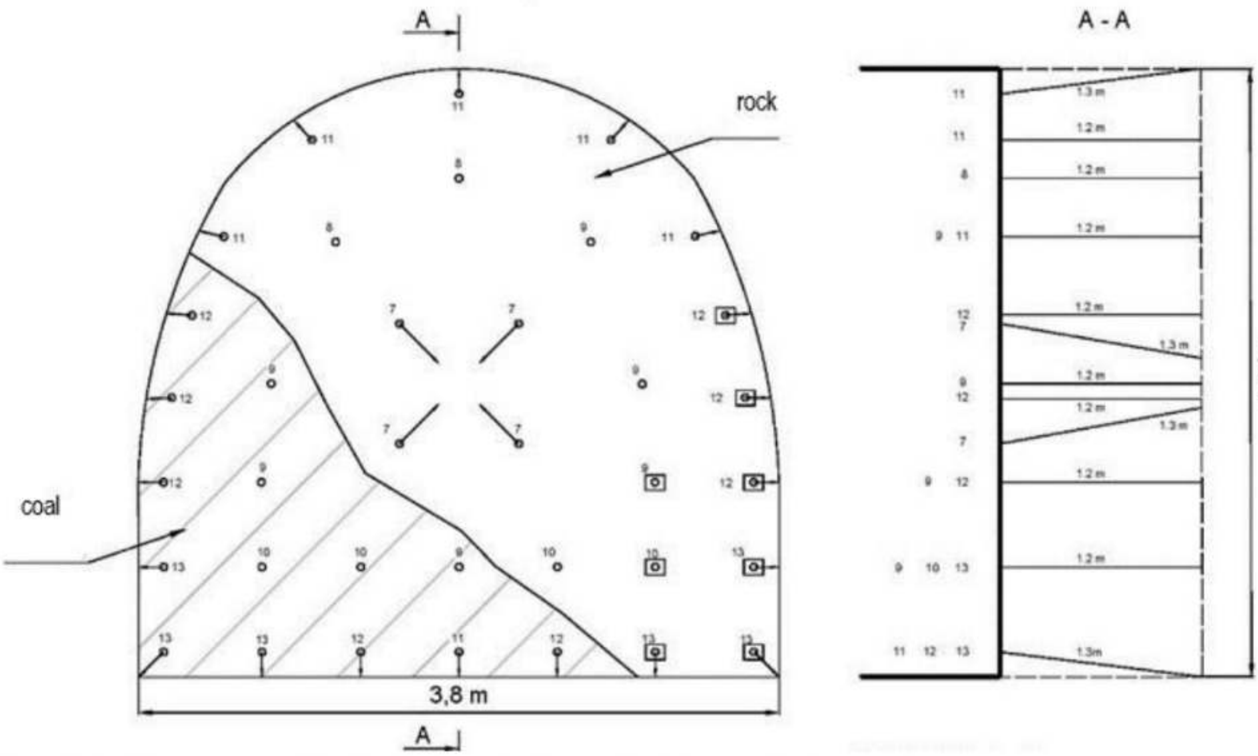

Fig. 3. Blasting pattern with 36 holes for digging gallery in mixed rock & coal

In order to achieve the desired length of advance (1.1 - 1.2 m), corresponding to a breaking efficiency of the explosive with a ratio of 0.7 - 0.8, the length of the inclined holes is 1.5 - 1.7 m, being oriented towards the bottom side of long wall, respectively 1.3 - 1.5 m for those oriented perpendicular to the front.

Regardless of the drilling pattern adopted, the holes are blasted sequentially, on short sections of 5 - 7 m length. Regarding the order of initiation of holes and rows of holes, in the first steps are initiated the holes in the second row, starting from the central area of the section, to the extremities, followed by holes from the first row and which are similarly initiated, starting from the central area to the extremities (Fig. 4).

The undisplaced coal, located at the top of the long wall face, is dug out with the pneumatic hand hammer.

Also, an underground experimentation program was prepared by using the explosive Emulinit PM for the blasting works in the galleries as well as in the coal long walls, having as reference point the parameters and the current blasting patterns practiced and presented at point 2.2.

Given the differences in size and weight of the current explosive cartridge used – Metanit Special E7H compared to the new explosive - Emulinit PM (Table 1), in the experimental blasting work was particularly aimed to establish the maximum amount of explosive in the mine hole correlated with the performance of the blasting work and the ventilation requirements in the work fronts.

3.1 Tests on the safety parameters of the Emulinit PM explosive

Explosive emulsions are a mixture of aqueous ammonium nitrate solution, various liquid fuels, various liquid fuels, emulsifiers, sensitizers and components that ensure the transmission of

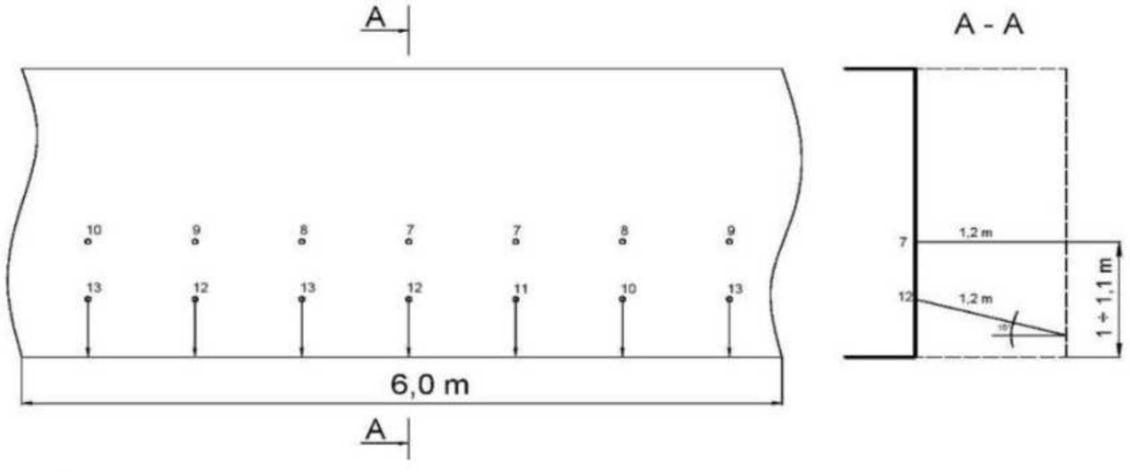

Fig. 4. Blasting pattern for coal long wall

3 Results and discussions

In order to use permissible emulsion type of explosive - Emulinit PM in the coal mines, it was necessary to check the safety parameters in the explosive testing facility of Insemex Petrosani.

various liquid fuels, emulsifiers, sensitizers and components that ensure the transmission of detonation in the mixture.

Emulsion explosives are based on the "water in oil" principle. In the composition of such an explosive, as an oxidant, ammonium nitrate (60 ÷ 85 %) is used as a solution (water proportion of 8 ÷ 16 %), and mineral oils are used as fuel, in a concentration of 5 ÷ 7 %.

In Table 1 are compared different parameters such as physical- mechanical, ballistic or safety between the Metanit Special E7H and Emulinit PM permissible explosives. Analyzing the data in Table 1, we can observe some significant differences between the two explosives, i.e., detonation speed, shock sensitivity, mass and length of the explosive cartridge.

As a peculiarity of the Emulinit PM explosive is the fact that in the situation where in the practical applications a certain quantity / length of explosive is needed in the mine hole and that does not fall in a multiple of 300 gr. or 300 mm, it can be sectioned manually in the middle of the cartridge, in the area indicated by the two arrows marked on the package (Fig. 5). In this way you get two cartridges with a mass of 150 gr. and length of 150 mm. each of them.

Explosive parameters	M.U.	Explosive type	
		Emulinit PM	Metanit Special E7H
0.	1.	2.	3.
I. Physico – chemical parameters: • appearance / color; • density, minim; • humidity, maxim; • stability at 75°C, minim;	 gr/cm^3 % hours	Emulsion/white 1.15 – 1,21 5.5 48	Powder/green 1.12 1.5 48
II. Ballistic parameters: • detonation; • transmission of detonation; • work capacity (Trauzl test); • brisance (Hess test); • equivalence coefficient in TNT;	m/s cm cm^3 mm	> 4,000 6 178 - 1,0	≥ 2,000 6 160 - 1,0
III. Safety parameters: • sensitivity to shock; • sensitivity to friction; • maximum operating temperature; • storage temperature;	J N °C °C	≥ 50 >360 -10 ÷ 50 0 ÷ 30	≥ 5 >324 -10 ÷ 50 0 ÷ 30
IV. Other parameters: • diameter; • cartridge length; • cartridge weight; • oxygen balance; • shelf life;	mm mm g % month	32 300 300 -8.53 6	32 140 125 4.4 6

Table 1

Fig. 5 Emulinit PM permissible explosive, whole and sectioned cartridge

In the testing tunnel of the explosives testing facility, a number of 20 tests were performed to verify the safety against the air-methane atmosphere of a load of 1.050 gr. of explosive Emulinit PM and as well as a number of 20 tests to verify the safety against the air - methane - coal dust atmosphere for the same explosive load. No ignition was recorded, the explosive passing the test.

Also, a number of 3 tests were performed in order to verify the initiation of a load of 1.050 gr. explosive Emulinit PM, freely suspended and initiated with a line of detonating cord Riocord PS - 6 gr. The explosive was not initiated by the detonating cord.

3.2 Experimental underground blasts with the use of Emulinit PM explosive

The experimental blasting works took place at two underground mines. At the first mine, a number of 30 blasting were performed, out of which 10 blasts in transversal galleries, 10 blasts in directional galleries and 10 blasts in long walls. At the second mine, a number of 10 blasting works were carried out in the collecting gallery.

As peculiarities of the blasting works practiced in the two mines was the limitation to 500 gr. of the explosive charge in the mine hole and the alternative use of 7 consecutive delay steps of electric millisecond detonators, respectively 1-7 and 8 – 14. For safety reasons it is limited to blast a maximum of two rows of holes in the coal long front, as well as blasting only of 2/3 of the collector gallery profile.

The performing of the experimental blasting works was made starting from the following premises:

- use as a reference the currently framework blasting patterns and taking into account the main types and dimensions of mining works in the mine;
- following the preliminary experimental blasts results, setting new blasting parameters -number of holes, length of holes, amount of explosive per hole, delay distribution;
- monitoring the gas emissions after the blasting process;
- establish the proper quantity of explosive pe hole and per blast round.

Starting from the current drilling & blasting framework patterns applied in the two mines with the use of the permissible explosive Metanit Special E7H, the first experimental blasts were made only by varying the quantities of Emulinit PM explosive in the mine hole, respectively quantities of 300 gr, 450 gr. and 600 gr. / hole.

Compared to the frame blasting patterns used for digging the galleries, blasting variants were tried with a 10 – 15 % reduction in the number of holes on the face, with the use of 300 - 450 - 600 gr. of explosive in the hole or altering the quantities of explosive loaded in the cut holes and at the bottom side of the faces compared to those loaded in the stopping and profiling holes, respectively 450 gr. with 300 gr., 600 gr. with 300 gr. and 600 gr. with 450 gr.

Quantities of 300 - 450 gr. of explosive in the hole were used for blasting in coal long walls, 450 gr. in the holes in the row from the bottom side and 300 gr. in the rest of rows.

The parameters with reference to the results of the blasting works which were monitored - breaking efficiency (jump), profiling of the mining face at walls and roof, granulometry of the blasted rock, distance of throwing of the blasted rock, disposition / geometry of the blasted rock from the face, presence and the length of the remainings at the bottom of the blasted holes, the granulometry of the blasted rock and the distribution by granulometric classes.

The results of the performed works were characterized by the following parameters (Fig. 6,7 and 8):

- breaking efficiency / jump ratio = 0.9 – 1.0;
- profiling of mining construction on walls and roof: good to verry good;
- granulometry of the blasted rock: 70 – 80% in the range of 0 - 200 mm;
- 20 – 25% in the range of 200 - 400 mm;
- 5 % in the range of 400 - 600
- throwing distance of the blasted rock: 4 – 6 - 9 m;
- height of disposal of the blasted rock from the front face: 1.5 – 1.8 m;
- low volume of blasted fumes and evacuated by the ventilations system in a time frame bellow 15 minutes.

Fig. 6 Directional gallery in mixed coal & rock face, before and after blasting

3.3 Technological and safety recommendations for the execution of blasting work

3.3.1 Technological recommendation

3.3.1.1 Hole diameter

Due to the drilling technology and the explosives used, the mine holes must have a diameter between 40 - 42 mm.

3.3.1.2 Hole length

The length of the holes must be correlated with the length of the explosive charge so as to ensure the requirements regarding the length of the stemming.

Fig. 7 Transverse gallery in rock face, before and after blasting

Fig. 8 Coal long wall face, before and after blasting

3.3.1.3 Hole spacing
The minimum distance between the holes must be 0.5 m.

3.3.1.4 In hole explosive charge construction
The construction of the load will be carried out in the continuous version with rear priming. It will be ensured that the length of the load is dimensioned so as to respect the requirements regarding the minimum stemming length.

3.3.1.5 The amount of explosive in the hole
The amount of explosive in the hole is limited to a maximum of 600 gr.

3.3.1.6 Initiation of holes and delay order
The initiation of the holes will be done with permissible millisecond electric detonators, with a delay interval of 75 ms between two adjacent holes capable of influencing each other, respectively ensuring between the first and last charge that can be fired in the blast face of a delay interval of 200 ms in coal and 400 ms in other rocks.

3.3.2 Safety recommendations

Permissible explosives and millisecond electrical detonators may only be used in methane mines after the production batch has been certified/verified by a European notified body.

Millisecond electric detonators used in methane mines must have a probability of ignition of up to 4 % of the number of detonators tested.

Emulinit PM to be used in accordance with the recommendations in the field of temperatures: -10 ÷ + 50 ° C. It is allowed to use the material at a maximum temperature of +60 ° C, at the same time, the explosive material cannot be left loaded in the holes mine more than 5 hours. The explosive material after this period still retains its explosive properties, but its parameters may worsen.

Emulinit PM cartridges can be divided as close as possible to the indicator that shows half of the load ⇒⇐ as follows:

-the surface on which the division will be carried out must be clean, free of impurities that may adhere to the exposed explosive material;

-the tool (knife) with which the division will be carried out must be made of anti-spark material and sharp, so that the cutting line is as smooth as possible, free of deformations and leakage of explosive material outside the edge of the coating;

-when loading the fronts with explosive, the explosive cartridges will be divided before inserting them in the mine hole. Care will be taken to ensure that no explosive cartridges remain divided after the holes have been loaded;

-it is forbidden to store divided loads.

For initiation use permissible detonators containing min. 0.6 gr. PETN initiation charge or permissible detonating cord with a minimum linear load of 8 gr. / lm.

5 Conclusions

The experiments presented in this article have led to the identification of solutions for carrying out the blasting work and the establishment of measures to allow the use of the permissible emulsion Emulinit PM in a safe and efficient manner. Following the analysis of the results of the experimental blasting works, it turned out that they are at higher values compare with the results at the use of Metanit Special E7H explosive type.

The most appropriate blasting patterns which can be applied have with less 10 % number holes and with a charge range per hole from 300 gr. up to 600 gr. of Emulinit PM.

Further test has to be performed in order to define the optimum power consumption and as well as to find a solution of use of a proper permissible detonating cord in order to initiate the emulsion explosive.


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Minimizing the environmental effects of blasting in a quarry on the Darica-2 HEPP structure by electronic ignition system

Case study by Ekrem Elmaci
Sales and Marketing Director / Mining Engineer

Abstract

The aim of this study is to examine the effects of possible vibration, air shock, fly rock risks on the environment and especially on the Darıca-2 HEPP project (Ordu- Turkey) area of the blasting works to be carried out in a quarry that will go to capacity increase and to determine the controlled blasting designs that will not cause any negative impact there. On-site observations, examinations and evaluations were made by us on 10.07.2021 in order to see the activity area that is the subject of the project and the Darıca- 2 HEPP location and its proximity to the site that is the subject of the project. Two blasting were carried out with two different ignition systems, and seismic measurements (vibration, wavelength, frequency) and air shock measurements were made. With the blending of all field measurements and experiences, a controlled blasting design that will not damage the Darıca-2 HEPP structure and its surroundings has been made and successfully implemented.

Introduction

The location map of the area planned for "Capacity Increase of the Blasted Stone (Basalt) Quarry" within the borders of a quarry in Ordu/Turkey province, Mesudiye County, Darıca District in Figure 1-a and the location of the quarry with respect to the HEPP, and the location of the road, valley and stream in between are given in Figure 1-b.

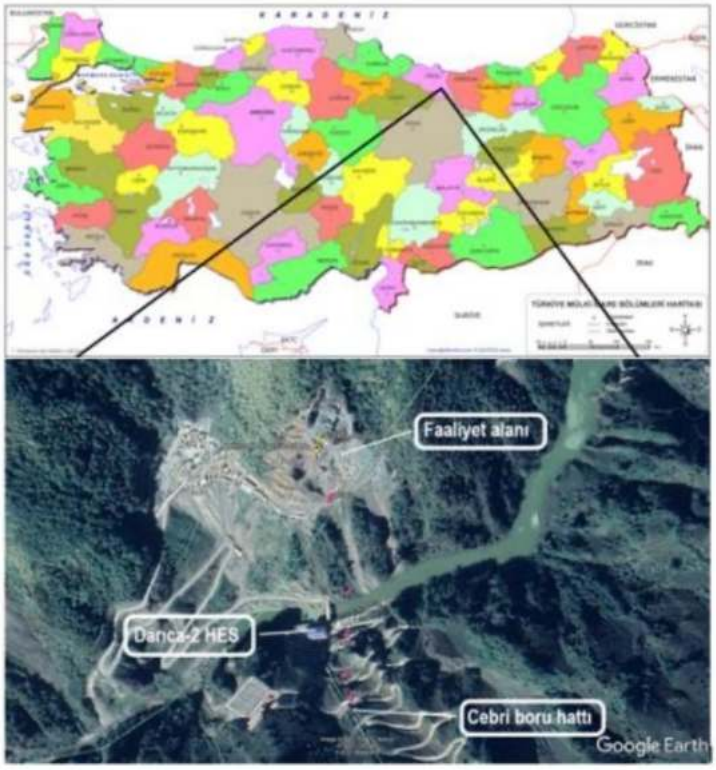


Figure 1-a) Study area within the license area of Ordu Province, Mesudiye District, locations of Darıca-2 HEPP and penstock line

Figure 1-b) Drone photo showing quarry, valley, river, Darica-2 HEPP location

On 10.07.2021, a controlled blasting design was made with using "**I- Blast" DNA Blast Software** in the Stone (Basalt) Quarry located in the Darıca district of Mesudiye county of Ordu province; Group blasting was carried out in which the design was applied. In this blasting, electronic ignition was used due to the sensitivity of the HEPP structure and its surroundings, and the superiority and safety of this system was utilized.

In this report, the successful and controlled blasting application brought by the safety and sensitivity parameters provided by the electronic ignition system in areas with critical and important structures around it, such as in this area, is mentioned.

Application with electronic ignition system

Electronic detonators provide more accurate timing than conventional pyrotechnic detonators based on the combustion rate of a pyrotechnic composition. The timing accuracy capability of the electronic detonator; It provides more efficient application of explosive energy, homogeneity of material size, increase in excavation efficiency, cost savings in excavation operations, better acceptance of blasting by the public, control of vibrations and air shock caused by explosion, contributing to slope stability. (Cardu et al. 2013, Cardu et al. 2015). Electronic detonators were preferred in this application, as they can fully ensure the timing accuracy of the delays we determined in the controlled blasting, which we designed so that the project subject blasting does not cause any negative effects such as vibration, rock flying and air shock to the Darıca-2 HEPP structure. For this reason, DETEX ELECTRONIC DETONATORS produced by KIRLIOGLU EXPLOSIVE company, which are both safer and provide delay assignment between 0 and 15.000 milliseconds in 1 ms increments, were used in this application. Thanks to the flexible delay assignment opportunity offered by the electronic detonator system, it is aimed to minimize the duplication caused by hole delays in the field blasting.

As it can be understood from the coordinates taken during this application, the distance between Darıca-2 HEPP and the electronic group blasting field is 340 meters (Figure 2-a). The distance between the penstock line and the electronic group blasting area was determined as 400 m (Figure 2-b).

(a) (b)

Figure 2 –a) Distance between electronic group blasting and Darica-2 HEPP, Figure 2 -b) Distance between electronic group blasting and penstock line.

The blast design in the electronic ignition system applications in the quarry on 10.07.2021 is given in Table 1 (Blasting Designs and Blasting Environmental Impacts Guide, 2018).

Figure.3 shows the preparation of blastholes. In this application, the first domestic brand electronic capsules and ignition system, detEX, produced by KIRLIOĞLU Explosive Company, was used (Figure.4).

Electronic Detonator Delays Intervals were determined by us with the "I-BLAST" DNA-Blast Software, which is licensed by KIRLIOĞLU Company, and loaded on the logger and defined on the capsules in the field.

Pattern Code	**Electronic Inititation Group**	
Blastin Level	**536**	**Electronic Detonator (DETEX ELECTRONIC)**
Blasting Date	**10.07.2021**	
Hole Number	**73**	
Drilling Pattern	**2,60 mt x 3,30 mt**	
Sub-Drilling	**1,00 mt**	
Hole Diameter	**89 mm**	
Hole Length	**10,5 mt**	
Explosive Amount	**ANFOEX, 2336 kg (Total) ; 32kg/hole**	
Cap Sensitive	**DYNEX-100, 73kg (Total) ; 1kg/hole**	
Blasting Time	**06:30.PM**	
Surface Delays	**See Figure 5.**	
Coordinates	**X**	**37 T 403692.41**
	Y	**4508628.64**
	Z	**522 MT**
Lithology	**BASALT**	

Table 1. 10.07.2021 Blasting design in electronic initiation system applications in the Quarry

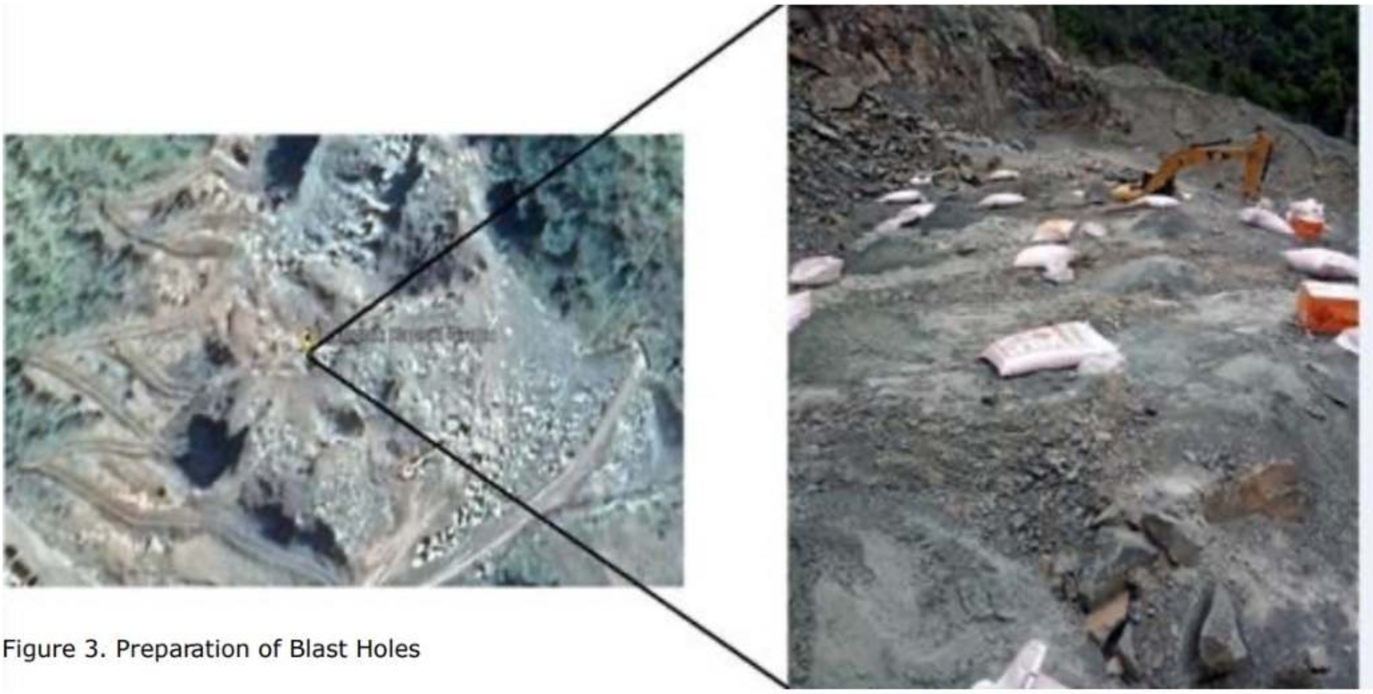


Figure 3. Preparation of Blast Holes

Figure 4. Field Application of Electronic Capsules

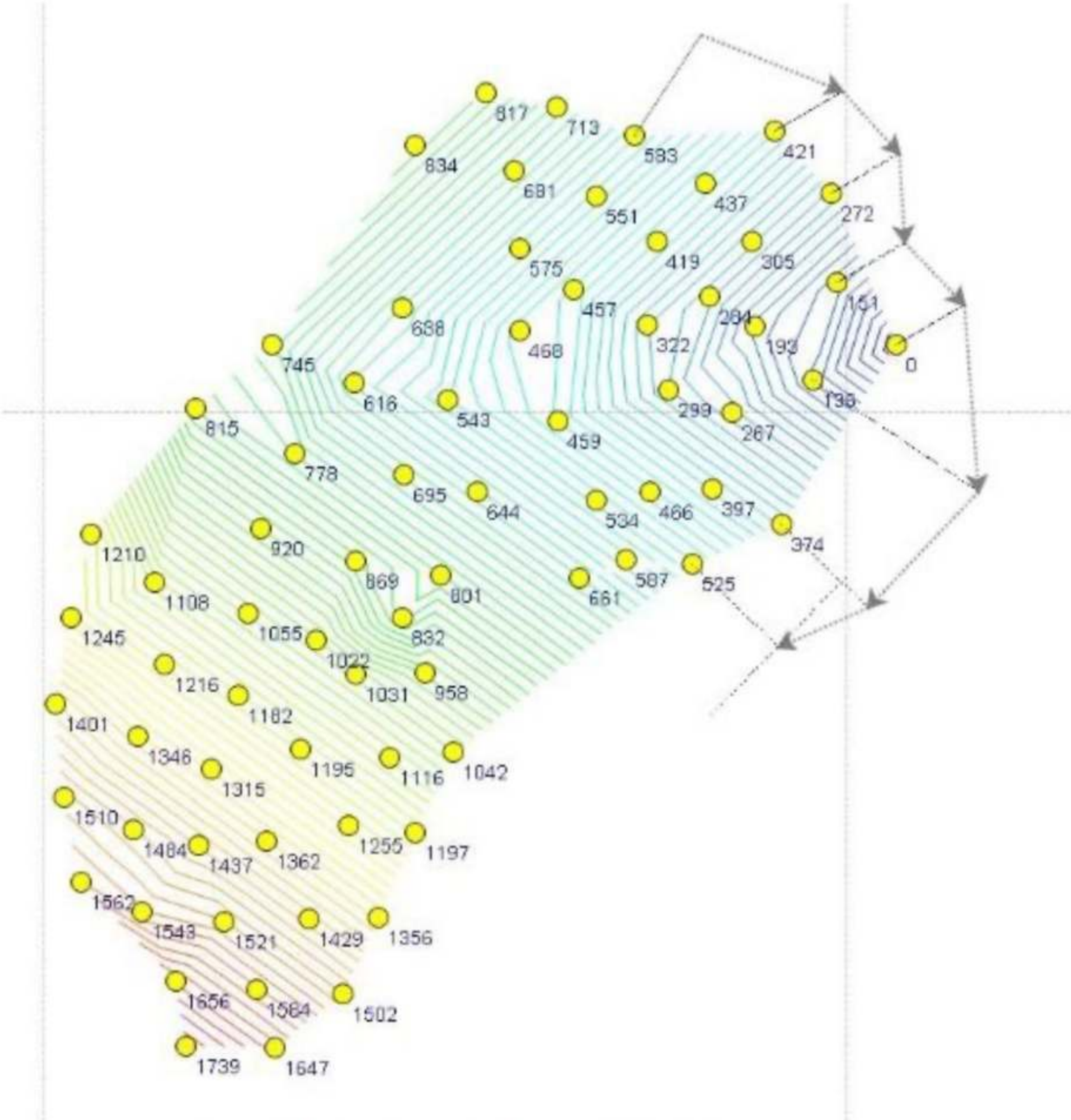


Figure 5. Electronic capsule delays applied to holes

Figure 6. Layout of seismographs

Seismograph	Blasting	Distance Measure , m	T mm/s	V mm/s	L mm/s	PVS mm/s	Dominant Frequency Hz	Air Shock, Pa	Air Shock, dB
12269	**DETEX ELECTRONIC**	86	18,16	22,48	17,65	27,76	20	25,00	121.9
14465	**DETEX ELECTRONIC**	270	1,524	1,270	1,778	1,943	32,88	4,750	107,5
13638	**DETEX ELECTRONIC**	365	-	-	-	-	-		
12270	**DETEX ELECTRONIC**	447	0,127	1,397	0,254	1,408	24,00	0,750	91,48
micro	**DETEX ELECTRONIC**	490	0,284	0,300	0,260	0,371	18,00	3,010	103,5

Table 2. Particle velocity and frequency values of seismic waves, which are formed from electronically detonated group blasting, measured in seismographs.

Table 2 shows the 3-component (T: transversal, V: Vertical, L: Longitudinal, PVS: peak vectorel sum) particle velocity and frequency values measured in seismographs of seismic waves formed from group detonation with electronic ignition.

Total amount of explosives and capsules used in this detonation: 2263 kg Anfo, 73 kg capsule sensitive explosive (1 kg each), a total of 2336 kg explosives, 73 electronic capsules. The drone image of the blasting made with electronic capsules is given in Figure 7.

As it can be understood from the drone video, there was no rock flying in the blasting carried out with the electronic ignition system, and the vibrations were measured well below the allowable limit values, befitting controlled blasting as planned (Table 2). The lateral component vibration velocity values and air shock values measured on the seismographs of the blast made with electronic capsules in Table 2 are shown in Figure 8 by writing on the seismographs in Google Earth; Thus, a better understanding of the effects on the HEPP was provided.

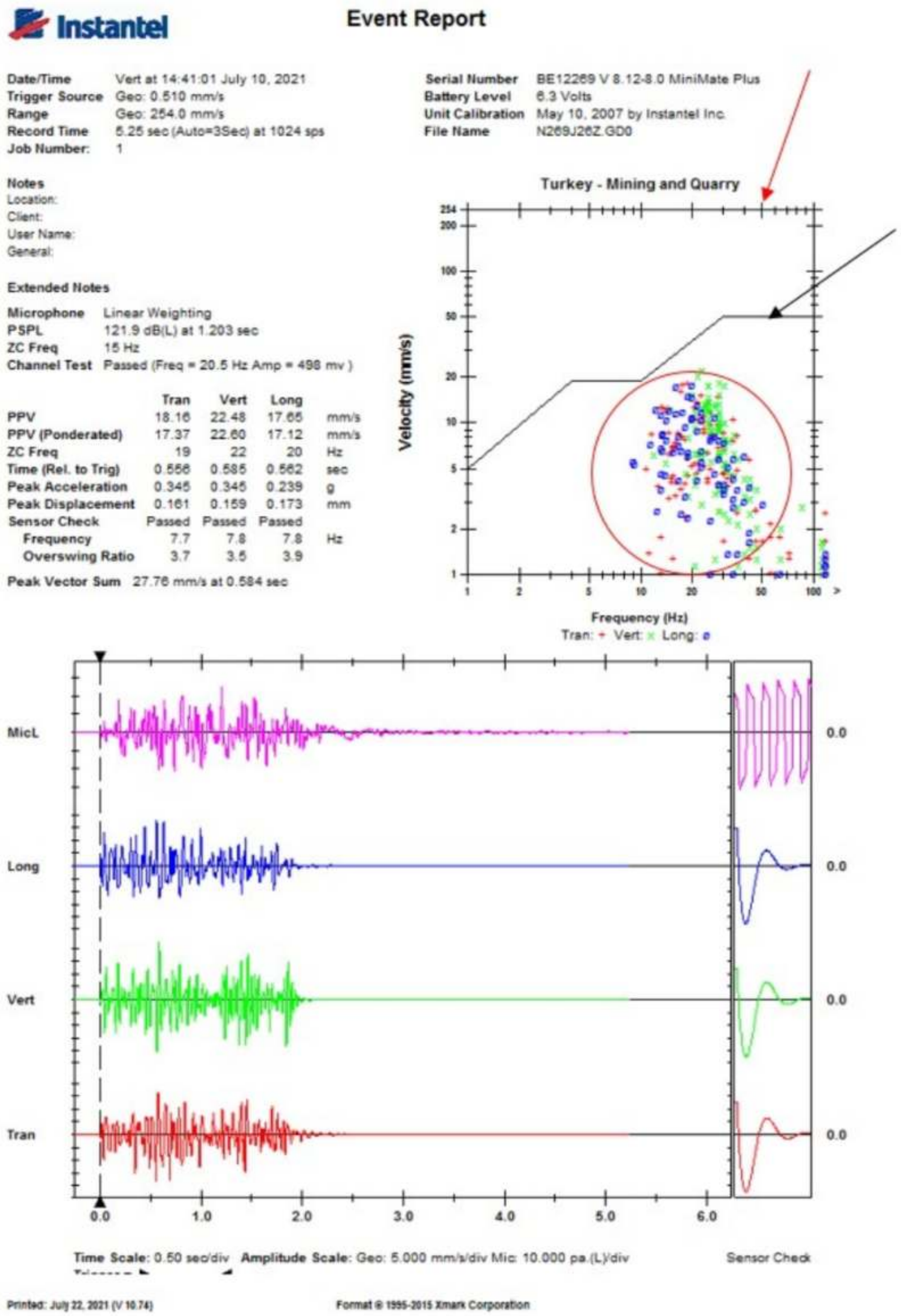
Figure 7. Blasting Image Performed With Electronic İgnition

Figure 8. Display of vibration and air shock values measured from seismographs on Google Earth

Although the vibration velocity values at the measurement point of blast-induced seismic waves are given in 3 components (lateral, vertical and longitudinal) in Table 2, only the transversal component values are shown on the map in Figure 8. Because it is the transversal components that cause the most damage to structures and slopes from blast-induced vibrations. Considering the positions and distances of the seismographs in Figure 8 with respect to the blast, a vibration velocity of 18.16 mm/s was measured in the seismograph placed on the roadside at a distance of 86 m from the blast. If we look at the Turkish vibration limits graph shown with the red arrow in Figure 9, which shows the peak particle velocity and air shock values obtained from this seismograph, it is seen that all vibration velocity values in the 3 components (indicated by the red ellipse) are below the damage line (Black Arrow), since the dominant frequencies are around 20 Hz. Figure 9 is an event report. This event report is generated from the software after each seismograph measurement. As can be seen from the report, there are vibration velocity values in the transversal (Tran), vertical (Vert), longitudinal (Long) component and peak vectorial sum (PVS), as well as the air shock value (micL) measured with the microphone attached to the seismograph and seismic waveforms in the three components. When the 3- component waveforms taken from the seismograph placed on the roadside at the closest distance to the blast were examined, waveforms were created that absorbed in 2.5 seconds as planned for the controlled blasting.

The vibration velocity measured on the seismograph 14465 at a distance of 270 m to the blast group is 1.524 mm/s in the transversal component. This value is below 5 mm/s, which is the allowable value that will not damage historical artifacts even according to the most conservative and protective German standards, as it is according to Turkish standards.

When examined in terms of frequency, higher frequency waves were formed in the ignition with the electronic capsule, as it is said in the literature (Cardu, 2013; IME 2017; Kara et al. 2014; Mishra et al. 2017). High-frequency waves lose their damaging properties by causing vibration because they have the property of being absorbed quickly. In this respect, it is desirable that slopes tend to absorb without threatening their stability. When evaluated in terms of structures, high- frequency waves are always preferred to low-frequency waves. Because if low- frequency waves are harmonized with the natural frequency of the structures, they cause greater vibration and thus damage by causing the structures to resonate. Figure 10 shows the event report for seismograph 14465. Vibration rates are plotted in this report according to the German DIN4150 standard. It is not scientifically surprising that seismic waves are attenuated 270 m from the blast, as seismic waves tend to absorbed towards the valley floor. Since it is known that S waves cannot pass through the water, we determined the delays of the electronic capsule in such a way that the seismic waves produce wavelengths that cannot exceed the width of the stream, so the seismograph 13638, which is close to the HEPP structures on the other side of the stream, could not measure any vibration velocity; The seismograph 12270 and the seismograph micromate next to the penstock recorded a vibration velocity of 0.127 mm/s and 0.284 mm/s, respectively. These last two values are actually below the vibration velocity threshold of 0.5mm/s, which is even below the seismic recording threshold of the geophone. These two seismographs, which would not normally take measurements if the microphone apparatus were not attached, were triggered by the air shock because the microphone was attached and recorded.



Instantel — **Event Report**

Date/Time	Vert at 14:41:01 July 10, 2021
Trigger Source	Geo: 0.510 mm/s
Range	Geo: 254.0 mm/s
Record Time	5.25 sec (Auto=3Sec) at 1024 sps
Job Number:	1

Serial Number	BE12269 V 8.12-8.0 MiniMate Plus
Battery Level	6.3 Volts
Unit Calibration	May 10, 2007 by Instantel Inc.
File Name	N269J26Z.GD0

Notes
Location:
Client:
User Name:
General:

Extended Notes

Microphone	Linear Weighting
PSPL	121.9 dB(L) at 1.203 sec
ZC Freq	15 Hz
Channel Test	Passed (Freq = 20.5 Hz Amp = 498 mv)

	Tran	Vert	Long	
PPV	18.16	22.48	17.65	mm/s
PPV (Ponderated)	17.37	22.60	17.12	mm/s
ZC Freq	19	22	20	Hz
Time (Rel. to Trig)	0.556	0.585	0.562	sec
Peak Acceleration	0.345	0.345	0.239	g
Peak Displacement	0.161	0.159	0.173	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.7	7.8	7.8	Hz
Overswing Ratio	3.7	3.5	3.9	

Peak Vector Sum 27.76 mm/s at 0.584 sec

Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 5.000 mm/s/div Mic: 10.000 pa.(L)/div

Sensor Check

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Figure 9. Event report of seismograph 12269

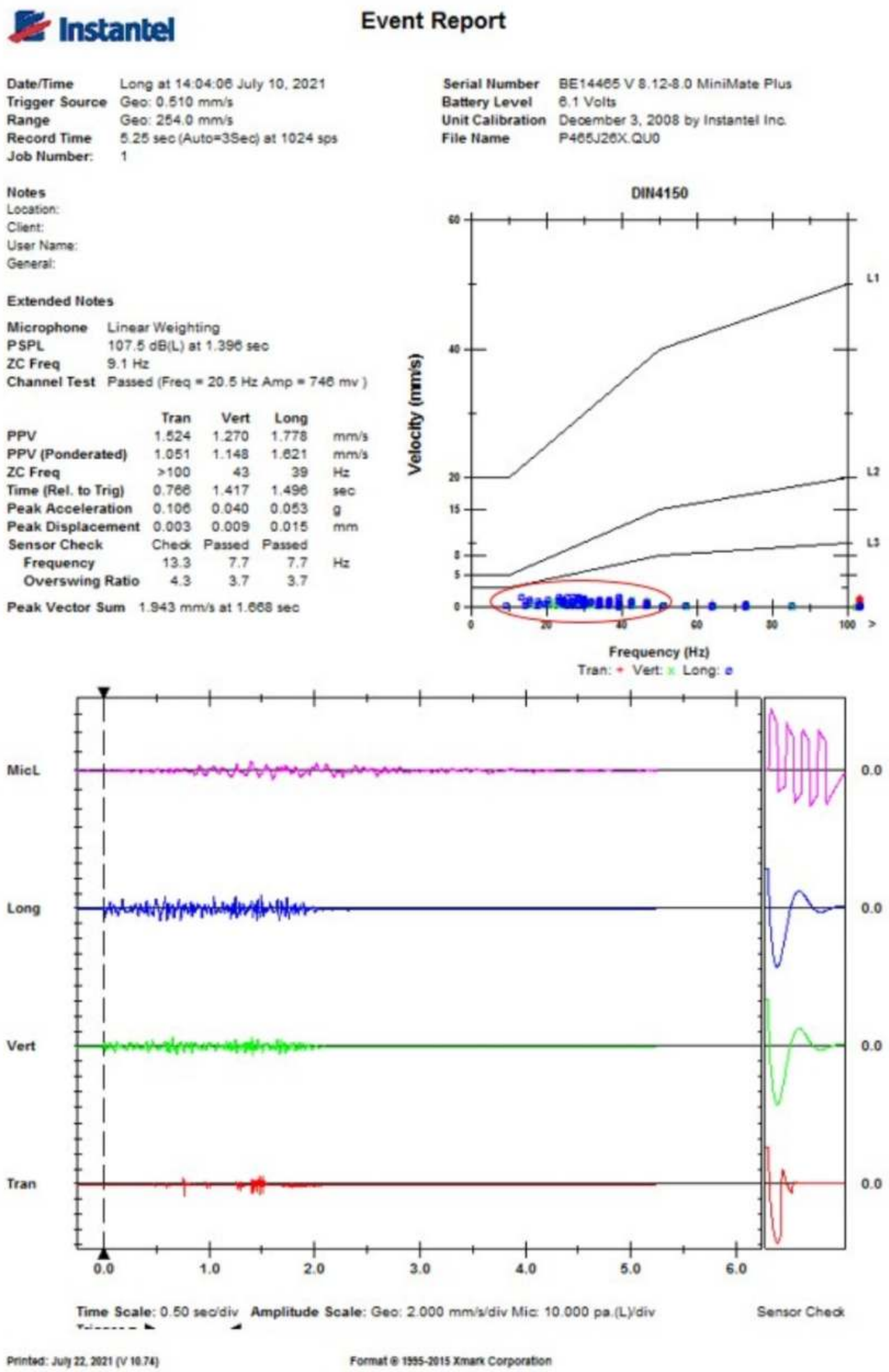


Figure 10. The event report of the seismograph 14465

Results

1- In this study, the system developed and produced as the first domestic electronic ignition system by Kırlıoğlu explosive company was used. By making use of all the advantages of electronic ignition systems that we know from the literature, the blast design that will not cause any damage to the Darıca-2 HEPP structure and its surroundings has been modeled and applied, and the results have been inspected. Explosion results were obtained that would not cause any damage to the mentioned structures.

2- No adverse effects such as vibration, fly rock or air shock were created on the road 86 m away from the blast.

3- Air shock values were measured far below the allowable 140 dB and no rock was fly.

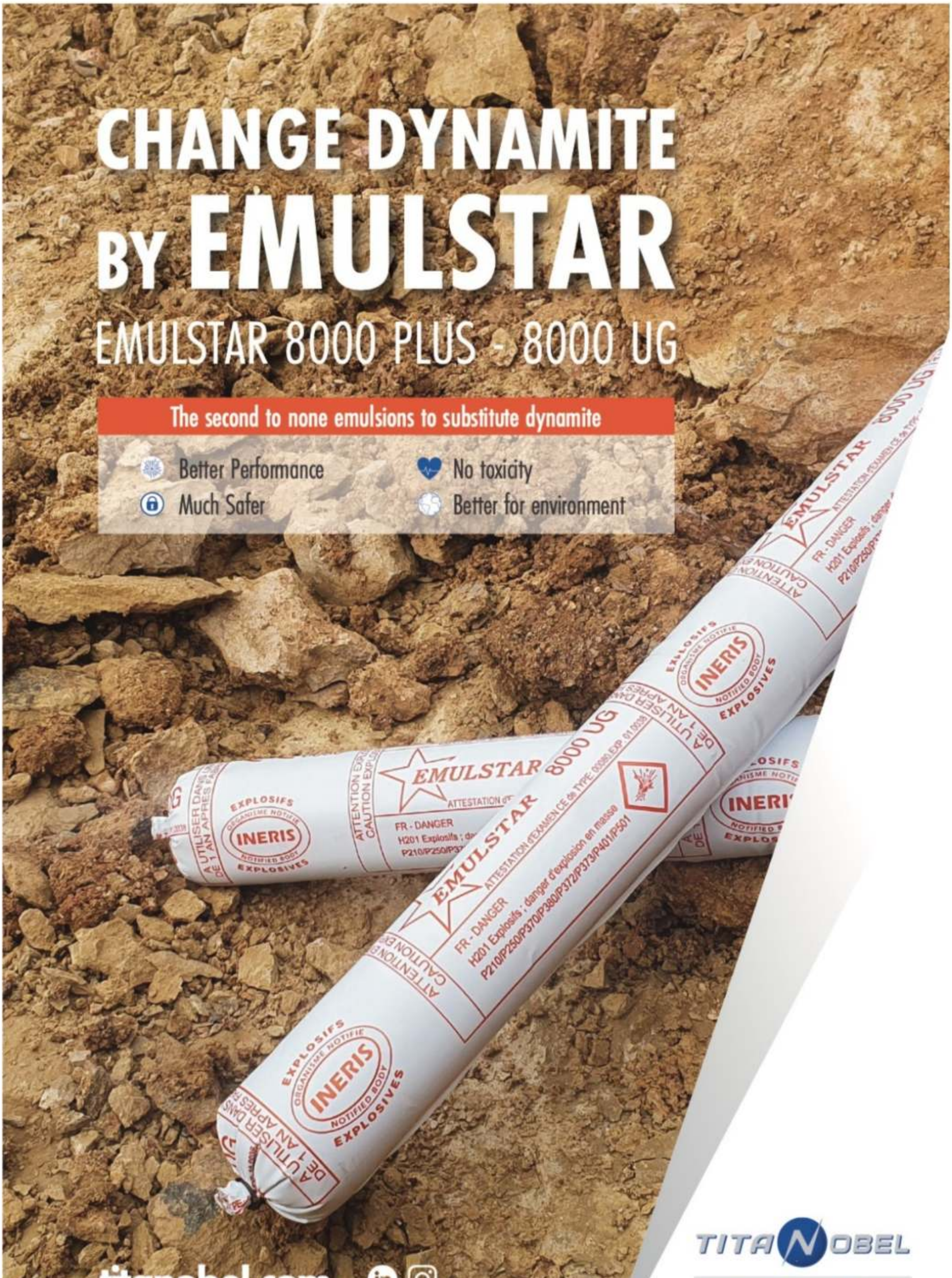
4- As in the study, when the controlled blasting design is made and this design is applied with precision, the blasting to be made in the field will not damage the surrounding structures, roads, dams, tunnels and similar structures; will not trigger environmental pollution; It is thought that it will not have a significant effect on the groundwater flow regime. Because this study contains measurable and controllable results; It is not generated from any formula or approach, it contains the parameters of the field itself.

5- There is no need to blast 85 holes to see the effects of blasting 85 holes. With single hole blasting, the seismic wave propagation mechanism is learned and controlled blasting with 85 holes, which will not harm the environment, can be designed.

Since the vibration, air shock values of the controlled blasting carried out with 73-hole electronic ignition in the field on 10.07.2021 were measured very close the road, near the HEPP, penstock, it can be scientifically said that 85- hole group detonations, if the given pattern and explosive and detonation elements are followed. It will not cause any negative environmental impact on Darica 2 HEPP structure, penstocks, tunnel entrances.

References

- Cardu M., 2013, "A review of the benefits of electronic capsüls", RemRevistaEscola de Mines.
- Cardu M, Muccı A., Uyar GG., 2015, "Investigating the effects of benchgeometry and delaytimes on the blastinducedvibrations in an open-pitquarry", GEAM, Vol. 144. 45-56.
- DIN 4150-3. Structural vibration-Effects of vibration on structures. http://webstore.ansi.org/; 1999.
- IME, 2017, "EBIS Guideline, Electronic Blast Initiation System".
- Kara S., Adamson W.R., Reis W.J., Trouse I R., 2014, "The Latestgeneration of the electronic system enhancedsafety and productivity". ProcedaEngineering, Vol. 83, 432- 440.
- Mıshra A.K., Nigem Y.K., Singh D.R. 2017, "ControlledBlasting in a Limestone Mine Using Electronic Detonators", Journal of Geological Society of India.
- Patlatma Tasarımları ve Patlatma Kaynaklı Çevresel Etkiler Klavuzu, 2018, http://ced.csb.gov.tr/kilavuz- rehber-form- i-320 (Blasting Designs and Blasting Environmental Impacts Guide, 2018)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Working with explosives detection dogs

Leo van den Blink - COO ,
European Detection Dog Service

Het Twickelerveld
European Detection Dog Service

This article is about the use of explosives to train and utilise dogs to recognise the smell of explosives so they can use their excellent ...- organs to detect even the smalles amounts hiddel from plain sight. Working with explosives in this way is purely related to the misuse of the material, for instance with terrorism. From the Dutch government, the National Police and the Royal Netherlands Marechaussee also work with explosives detection dogs. Het Twickelerveld European Detection Dog Service, the author of this article, is a company that works with detection dogs in general to detect all kinds of materials, among the detection of explosives.

Training the explosives detection dog.

We train dogs on the explosives basic substances to recognize the smell. Our dogs are used in a variety of ways in the detection of the presence of explosives.

To train our dogs on these basic substances, we work with very tiny amounts of explosive substances to teach the dogs these scents. First we look at which dogs are suitable. They must have a high aport drive and, for example, search for a ball until it is found without giving up. When the dog is completely crazy about a ball, this also becomes his "reward", the dog wants to do everything for it.

Next we watch if the dog is social and walk through large groups of people at an airport of the dog train station to test the dog. Furthermore, we also test the dog walks easily on a smooth floor, open stairs and metal rosters. When a dog meets these requirements, it detection training can start.

We then start learning the "notification". This is the signal that the dog gives to his handler when he smells the scent of explosives. When the dog has learnt how to signal, we will learn the odor recognition of the various explosive substances. We do this material by material, only when the dog has a good smell recognition of a material, we proceed to learn the next material.

We teach the recognition and notification of the material by making a link between the material and the dog's reward. The dog gets the idea that he is looking for his reward and it has the smell of, for example, pentrite. If the dog gets the smell of pentrite in his nose, the dog shows the learned notification. Later the dog gets the reward: the ball.

The dogs should not only have good scent recognition, they should also search in a calm manner. After all, when an explosive is found, the dog also needs to stay calm, so also by an explosive. As long as we work with explosives, we will continue to train them by regularly offering them different explosive substances for scent recognition, so that the scent is imprinted on the dog over and over again.

For which activities are the explosives detection dogs used?

Especially in the current time, we notice that a preventive search (bomb check) with our teams is no longer an unnecessary luxury. The threat of terrorism has not diminished in recent years, especially the larger and professional organizations are taking this more and more seriously and taking their measures in this regard.

The Twickelerveld, European Detection Dog Service uses its detection dogs explosives for various types of customers. For example,
bomb checks are regularly carried out at conferences, trade fairs, football matches or other large-scale events. The sniffer dog handler is trained as a bomb scout in order to do a qualitative and professional preventive bomb check together with the explosives sniffer dog.

In addition to preventive searches, we also offer the option of being available 24/7 for large (inter)national companies in the event of a bomb threat. For example, together with a team consisting of a bomb scout, explosives detection dog and an explosives safety team leader, we can do a first inspection before a company is completely shut down and evacuated, which can cost a lot of money.

But our explosives detection dogs are also regularly deployed within a Quick Response Team. This team remains present at large-scale events to be able to deal with any reports.

NVEE - Nederlandse Vereniging van Explosieven Experts

By Volker van Willigenburg

Chairman of NVEE

The former logo of the Society

The Netherlands has a long tradition of using explosives for civilian use. Where the application of explosives originally took place mainly in mining, after the closure of the mines, the focus has shifted to the demolition of buildings and cleaning of industrial installations. The Dutch Society of Explosive Experts (Nederlandse Vereniging van Explosieven Experts, NVEE) was founded on 10 July 1987 as the Dutch Society of Blasters (Nederlandse Vereniging van Springmeesters, NVvS).

The aim of the society has remained the same in all those years: to promote cooperation, mutual contacts and exchange of knowledge and information between the members. The society also represents the interests of its members with regard to the legal position in contacts with the government and increasing and developing the professional knowledge of its members. It provides technical and professional support, including to third parties.

Primarily, the focus was mainly on the traditional blastwork. Later the seismic blasters joined the society who were active in on land and off- shore explorations. In recent years, the field of work has broadened and the NEVEE appointed a new board in 2020 with the aim of modernizing the society and making it accessible to a wider target group. 35 years after its foundation, the society continues under the new name and with a new logo as NVEE.

The new logo of the Society

Our society now represents a great diversity of members who carry out activities in which explosives are used, such as;

- Seismic, seismic survey using explosives.
- Special Effects such as movie explosions.
- Cladding (Explosive welding).
- Cargo Security at airports and ports.
- Tracking dogs, education, training and consultancy.
- Demolition work of, among other things, buildings and bridges using explosives.
- Industrial cleaning such as cleaning waste incinerators and biomass plants.
- Artists who work with explosives.

The aim of the NVEE is therefore extended. We act as a discussion partner on legislation and regulations for governments and authorities. And we do this by holding meetings, running a website, and participating in network sessions and delegating representatives to, for example, the EFEE. The Netherlands and 4 other countries co-founded the European Federation of Explosives Engineers in Aachen on October 20, 1988 (which is close to the 2022 conference location: Maastricht!). The NVvS even provided a president for the EFEE in 1991: Henk Grünfeld.

Aachen on October 20, 1988 (which is close to the 2022 conference location: Maastricht!). The NVvS even provided a president for the EFEE in 1991: Henk Grünfeld.

First EFEE-meeting in Aachen

The NVEE is also represented with various members in the Society on Safe Dealing With Explosive Substances (stichting Veilig Omgaan met Explosieve Stoffen, VOMES). This VOMES keeps a register for people who work with explosives in the Netherlands for professional competence on behalf of the government. In addition to the above professional fields, unexploded wartime explosives trackers also fall under this regulation.

Logo of VOMES

Although the number of people working with explosives in the field in a small country like the Netherlands is relatively small, there is still a great diversity in different ways of handling explosives. The association has recently undergone a renewal in terms of management and focus and the number of members is growing. The NVEE is an association with a beautiful history and a challenging future.

Due to national but also increasingly international laws and regulations, added to the fact that our NVEE members work in several countries within the EU, but also beyond, it is important that there is a place where members can come together to share knowledge and skills. But also to have a platform that represents the interests of the industry and sits at the table to give it a voice. This place is the NVEE.

The board currently consists of:

- Volker van Willigenburg, chairman, Volker@nvee.nl
- Marc Hoogenkamp, secretary
- Bernard Vercouteren van den Berge, treasurer
- Ingrid Rijkse, general board member
- Henriëtte Rossingh-van Os, general board member

New EFEE members

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

Corporate Member

SOLAR PATLAYICI MAD. SAN. A.Ş., Turkey

Individual Members

Morne Stiglingh, AECI Mining, South Africa

Aymeric Denuelle, David Bickford Enaex, France

Nathan Rouse, Dynoconsult, Ireland

João Sorbile, Enaex Brasil, Brazil

José Silvio Corsini, Enaex Brasil, Brazil

Stefan Purcelean, DynaEnergetics Europe GmbH, Germany Thomas Moser,

SSE/Explosiv Service SA, Switzerland

Peter Shishkov, University of Mining and Geology, Sofia, Bulgaria

Student Members

Vladimir Penev, University Of Mining And Geology, Sofia, Bulgaria

Güngör Barış Özkazanç, Middle East Technical University, Turkey

Upcoming International Events

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

World Tunnel Congress 2022
September 2-8, Copenhagen
Denmark
https://wtc2022.dk/

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

49th Annual Conference on Explosives and Blasting Technique
Feb. 3–8, 2023
San Antonio, Texas, USA
https://isee.org/conferences/2023-conference

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

Safex Congress XX April 23-28, 2023
Salzburg, Austria
https://www.safex-international.org/news- safex-congress-xx-in-salzburg.html?sid=1651513642

EFEE