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SAFEX CONGRESS XX

SALZBURG 2020

25 till 29 May 2020

MESSAGE FROM SAFEX CHAIRMAN: JOHN RATHBUN

The Gift of Near Misses

As we wind down another year and head into the holiday season, many cultures start a time of reflection and pause to say thanks. In the United States we have a holiday that is called Thanksgiving and it is built around this time of harvest and reflection. A time to reflect how fortunate we are, how well we have been graced with good health, potentially a good crop due to our hard work through the year and perhaps a gain of wealth when it is all said and done. In our business, we also need to take the time to pause and think about how fortunate we have been in terms of safety and to be thankful to everyone for their contributions.

One area where we at Austin Powder have been focusing on is our near miss reporting. Specifically, our High Potential Near Misses (HPNM). Over the past years, we have been encouraging all our operations to report even the slightest near miss and to have all employees know that we want to know what nearly happened so that we can learn from it and adjust. This is particularly true when it comes to the HPNM category. Getting these reported and formalized are key to a safe operation and they are, in the true light of day, a fantastic gift.

I call them a gift since by definition they did not cause a fatality, an explosion, a toxic gas release or an injury. They happened for whatever reason that we were clearly not aware of, were fortunately observed and reported. That nothing happened is basically good luck. As every Safex member knows, the explosives industry is too unforgiving for having luck as part of a strategy for success or sustainability. Seeing these HPNMs for what they are in the cold light of day is a gift to each of us to follow up on and investigate with the same energy as an event that in fact did cause damage, death or injury and by doing so removes or reduces the probability that we will see these circumstances arise again.

At Austin Powder we have made steady progress in encouraging our various family members to report each near miss and we identify which ones are HPNMs. Like all members of Safex, we need to then take each of these gifts, unwrap them through investigation and thoughtful inspection and and learn from each one the lesson that is there to embrace. We also are thankful and grateful when we can learn from other's gifts. This is the spirit of Safex and we encourage everyone to share what lessons they have learned so that others can benefit. Groucho Marx, the famous comedian once said "Learn from the mistakes of others. You can never live long enough to make them all yourself." It is my wish that Safex is providing this service to the industry and that all members benefit from each other by sharing their gifts not just their tragedies.

I hope 2019 was a good year for you and your companies. I look forward to seeing many of you in Salzburg in May and to once again see key members of our industry sharing their stories and gifts with each other. Thank you all for your contributions to Safex. The organization is built on people sharing time and information. Gifts that we should all be thankful for.

Happy Holidays,

JDR

Some Investigation Fundamentals

by

Geoff Downs

I have been involved with many investigations and the size and type of investigation can be different. For example, an investigation may be looking into the nature and cause of an incident to determine why the incident occurred and to provide recommendations for preventing this type of incident from occurring again looking into violations that may have occurred. These types of investigations can be very small in nature to taking many years. I believe that we need to be cognizant of the emergency management principles which encompass Prevention Preparedness Recovery and Response (PPRR). In this paper I will focus on the preparedness aspect since it is essential to be prepared in order to carry out an investigation efficiently and effectively. The standard of the investigation should be appropriate to the level of investigation undertaken, whether it be a local investigation for a small event for an internal report or whether it is a major investigation for a serious event which may include fatalities, serious public exposure. The standard of the investigation and the report may be required to be suitable for court including litigation.

The Safety and Health Division of the Department I worked for had drafted an investigation manual for use by inspectors. Inspectors could be involved in nature and cause investigation or a compliance investigation. Most investigations are serious in nature and we use for our evidence in chief at Coronial inquests or for compliance actions including prosecutions. The manual is very comprehensive, and the investigation process included -

- when to investigate,
- levels of investigation,
- incident response matrix,
- initial actions examples, quick reference response chart,
- risk assessment of incident scene and other activities,
- investigation plan,
- liaison with stakeholders,
- incident scene,
- major incident kit,
- investigation log,
- note taking,
- use of notebooks,
- making notes,
- surveying the site,
- scene photographs and video recording, releasing the site,
- types of evidence,

- evidence handling procedures,
- obtaining evidence,
- evidence handling and storage, disposal of evidence,
- reports,
- independent assessments and reports,
- statements and interviews,
- when to take a statement,
- preparation for a statement,
- process for obtaining statement,
- reporting,
- preliminary reports,
- final reports,
- Independent reports,
- distribution of reports,
- legal principles, and
- training.

The investigation manual is a great support tool. However, there are many other things which happen that cannot be contained within the manual. I will recount some of the issues below that had arisen from my experiences and lessons learned.

The largest investigation I was involved in was the Bray Park fireworks fatality where a schoolgirl and many other people were seriously injured during the fireworks display at a primary school fete. I was the lead investigator, provided evidence in chief at the Coronial, provided evidence for prosecution and also provided support and evidence for the government for the claims for litigation which was set against many parties. The investigation took 16 months to complete and the investigation report was presented to the coroner and presented as evidence in chief. In addition, several compliance actions in the way of prosecutions were handled following the Coronial. Because of the seriousness of the event, litigation action was taken by many seriously injured people. Support for the litigation legal processes was undertaken until all actions were completed. The recommendations in the investigation report led to a complete overhaul and reform of the fireworks industry and practices.

You can be called up to an investigation at any time, so you need to be prepared in every respect. I was called up on a Saturday night when the fireworks tragedy occurred. You need to have all your immediate resources at hand including notebooks, cameras, and any other equipment that is required immediately. Preservation of evidence and the scene is an essential requirement and if the police are involved, they will generally undertake this activity. There is difficulty in trying to take contemporaneous notes later. In addition to getting to start the investigation, there is a demand from many areas for information, briefings, coordination with other parties and agencies and making sure that critical evidence is not compromised. For many incidents there will be more than one investigating party or agency and therefore coordination between these groups to gain a shared understanding is essential. For some investigations and especially serious events, the police will be involved as their role is to ascertain whether there was foul play or whether it was an accident. When it is established it is an accident, the police will take a low-key role. In this case it was uncertain, and the police and the Department were taking evidence. The police advised me that they would take care of the evidence and that we could collect it later. When we met the coroner, he advised that he had no idea about our legitimacy and that we had to run separate investigations from the police without consultation until our inspectors were cleared. This provided an initial obstacle at a critical time.

I was appointed the lead investigator without any initial staff. Initial period of time when critical investigation was needed to be taken was preparing briefs and internal enquiries. I was not given a formal scope and the scope of the investigation was determined informally. Setting up the scope of the investigation, the investigation plan and the resources needed are an essential and critical phase that need to be done as soon as possible. The evolving scope of the investigation meant it was difficult to get a committed budget and resources. This included getting an investigation team together and having the resources to subcontract out work for chemical testing, non-destructive testing, hydro-code modelling, performance testing, testing facilities and storage facilities or evidence. The investigating team eventually was comprised of 6 team members. Emerging technologies in other industries can also assist such as the utilisation of quantity surveyors with their equipment to map the location of debris at the Angellala Creek incident proved to be very effective. It is most important to identify these issues in the plan and to get them established as soon as possible particularly if time is critical. Not all people are suitable to work on an investigation and the selection of investigation team members is important. I also found that a multidisciplinary team worked well. There cannot be conflict of interest by any members of the investigation. An investigator cannot investigate their own actions and activities. This is the issue that the coroner was addressing as I discussed earlier for the Bray Park fireworks fatality investigation.

It is essential to have managerial support for the investigation team. Without that support the investigation may not run its true course and can be compromised. Management must understand the issues at hand, the scope and the progress of the investigation in order to provide the required level of support in all aspects. I have found over the years that when an individual is investigating a major event concurrently with their normal duties, the investigation becomes compromised to the extent that every day normal work activities take over from the investigation which becomes unacceptably delayed. It is therefore important to ensure that the appropriate amount of time is allocated by mutual agreement to the finalisation of the investigation and is reviewed and monitored.

Equipment and resources are important for carrying out in an investigation. Following the lessons learned after the Bray Park investigation, the Inspectorate set up a trailer that can be towed behind a pickup type truck. This trailer was kept at a location where it was immediately available when required and included essential items when investigations are being carried out in the field such as at the Angellala Creek investigation. The trailer included items required for the investigation but also required to support investigators in the field and at remote locations. Items included in the trailer were a generator, fridges for food, water, refreshments, tables and chairs, chargers for phones and computers, tarpaulins and tents, supporting items for different weather conditions, communication equipment, phones including satellite phones.

Systems should be in place for the ready availability of data and information generated during the investigation. Confidentiality is critical during the investigation until the report is released. This applies to the spoken word as people are always trying to find out what is happening, data systems, notebooks and any other records. The preliminary report is important upfront as it contains statements of fact only and provides some information albeit factual only, but it does address the immediate need for information. All data held in computer systems should be restricted access to essential investigation personnel only.

An investigation is a specialised and important activity to identify how and why incidents occur and to make recommendations to prevent similar types of incidents occurring in the future. To get an investigation right up front is very important as we don't get a second chance to recover lost data information and evidence when it doesn't get underway as it should. I trust that passing on some of my learnings will provide a valuable insight for those entrusted to these important activities to get the best possible outcome for their efforts in the name of safety and security.

Did you know that - - - ?

by Yen Wu

Did you know that some explosives being manufactured can cause serious effects to people's health? 2,4,6-Trinitrotoluene (TNT) is one of the most widely used molecular secondary explosives. It is valued because of its insensitivity to shock and friction, which reduces the risk of accidental detonation. It is also because of its low melting point of 80 °C, which allows it to be poured as well as safely mixed with other explosives, such as Composition B, Pentolite etc. for both military and civil applications. However, TNT is poisonous and can have significant health effects through inhalation of dust, ingestion and dermal sorption of TNT particulates. People exposed to TNT over a prolonged period tend to experience liver anaemia and abnormal liver functions. Skin contact can cause skin irritation, causing the skin to turn a bright yellow-orange colour.

The following controls are to eliminate the risk:

- Install good fume extraction system where TNT or TNT mixtures are being handled or processed to ensure that the room is well ventilated. Note: Consider the potential for TNT to recrystallise and collect in extraction ducting as the sublimated TNT is more sensitive to impact than the standard crystalline TNT.
- Regularly monitor air quality of the affected areas.
- Wear appropriate PPEs – apart from normal PPEs including work clothing, safety shoes and safety glass, wear additional PPEs such as masks, gloves, hair nets etc.
- Wash hands thoroughly and check the cleanliness of the hands using TNT solution indicator before a meal and at the end of a shift.
- Wash work clothes separately from normal clothes to prevent cross contamination.
- Set up a routine health monitoring system for production operators and all supporting staff who have exposure to TNT or related mixtures.
- Provide training to operators and supporting staff on the impact of TNT on people's health and the need to maintain good personal hygiene.

BLASTING TECHNIQUES USED FOR DECOMMISSIONING OF EXPLOSIVE PRODUCTION PLANTS

by

Gregor ENGLMAYER, Deputy Plant Manager (retired), AUSTIN POWDER GmbH, AUSTRIA

Martin HELD, Director SHES, Austin International, Inc., Cleveland, OH 44122, USA

Othmar ZECHNER, SHES Manager, AUSTIN POWDER GmbH, AUSTRIA

INTRODUCTION

In 2005 it was decided to shut down the blasting cap department situated in the St. Lambrecht Plant of AUSTIN POWDER GmbH, AUSTRIA.

In 2006/2007 activities started to plan and perform the decommissioning of the parts and buildings of the plant which would not be used any more. The following steps were considered during that process:

- Definition of the objectives for the decommissioning
- Historical review
- Site visit, investigation of actual status
- Hazard studies, action planning
- Decontamination work (including Blasting and Burning)
- Demolition and Remediation Work
- Disposal
- Status audit
- Documentation and Filing

This paper will concentrate on some detailed procedures for blasting describing special cases and blasting techniques. The sequence of the decommissioning work chosen in this paper was not exactly as shown below but was placed in an order to give a better understandable description of the techniques used.

In 2009 the decision was made to decommission the NG-plant as well. The examples for blasting of steel and iron pipes were taken from the activities to decontaminate the NG-plant.

BLASTING OF WOODEN BARRELS

Allegedly containing a mixture of lead styphnate, sulfuric acid and iron shavings.

The wooden effluent barrels under consideration were located in the lead azide and lead styphnate production building (building no. 201). Most of the equipment in that building was already decontaminated and removed as far as safely possible. The building was already prepared for burning except one partition in the lower level.

On the ground floor enclosed within a heavily reinforced concrete blast protection was a lightweight wooden and glass partition. The concrete blast protection wall was designed to withstand the 50 kg of explosive allowed to be present in the building. In the partition four wooden effluent barrels which had been used to catch any residues or overflows of final product had remained. Two of these vessels used in the lead azide production line were both empty and without any visible contamination (later on they were included in the burning of the building). The other two vessels contained residues of lead styphnate, in a mix of metallic iron and steel shavings and sulphuric acid. The barrels were approximately 1 meter in diameter and the liquid depth was about 0.3 m and 0.5 m. It was estimated that one contains approximately 200 litres and the other 300 litres of liquor and solid material.

The amount of any residual lead styphnate (if any) within the liquid was not known. However, the building was classified to have an extreme explosive risk because of the possibilty of an estimated maximum 100 kg of primary explosive being present. The mixture in the lead styphnate barrels was to perform a destroying reaction but how far this objective had been achieved has not been ascertained. While the production was running the liquid part was discharged from time to time through a drainage system into a sump pond. After the production was stopped it was decided not to touch these barrels and water was periodically added into the barrels to cover the solid residues and to keep the wooden barrels from drying out and leaking.

Figure 1 – Wooden effluent barrels containing metallic iron shavings and Sulphuric Acid

Samples of material taken in the sump pond and the manhole in the sewer pipe were dried and submitted to fire without any noticable reaction. So it seemed that the procedure for destroying the lead styphnate had worked as intended. Nevertheless due to the possible high risk we decided to blast the two barrels without touching the liquid or the solid material. The hazard considerations (using the German QD model, taking also the construction of the buildings into account as well as possible explosive material in the sewer pipes) resulted in a safety radius of about 100 m – see Figure 2.

light red: calculated for 200 kg of explosive)

As within this radius no active production building was situated this was acceptable without taking further structural measures. However, while blasts were being prepared and executed the complete plant was shut down and only people involved in the work were allowed to be inside the fenced plant area. Authorities had been informed and the fire brigade was on standby. The blast was fired from a safe shelter outside the danger zone.

The plan was to prepare the room containing the barrels for burning (we filled the room with combustible material like pallets, wood, etc. to about 1 meter high and let free only the path around the two barrels to blast) and to let two primer charges of 0.5 kg each fall into the liquid in the two barrels and then detonate the charges simultaneously by means of electronic detonators just before they reach the solid material in the barrels. The material in the barrels would either detonate and be consumed in the blast or only partially detonate and spread the liquid mixture and lead styphnate residue in particular over the absorbing sawdust and wood shavings. Either way, having pre-inserted the fuel for burning, the material could now be ignited within the building compartment and any residues of former explosives products would be consumed in an in-situ burn. The upper floors of the building were not built directly above the ground floor. They had been cleaned and decontaminated but would not be involved in the fire. We intended to pull down these floors together with the ground floor after burning.

The liquid in the barrels was allowed to evaporate before the blast therefore the solid material in the two barrels was only just covered. So the amount of liquid possibly spreading around was minimized. We estimated that less than 50 liters of liquid were left in each barrel. The primer charges were mounted on a rod by means of a cord. the cords were equipped with instant detonators for cutting the cords. These blasting assemblies were then hung into the effluent barrels. The barrels were sealed with a top plate to seperate the cord cutting detonator from the primer charge (to avoid accidental initiation) as well as keep as much liquid as possible inside the compartement – see Figure 3. The drain outlets were sealed with polyurethane foam and gypsum to avoid liquid leaving the building and to avoid propagation of the detonation into the sewer pipes (hopefully).

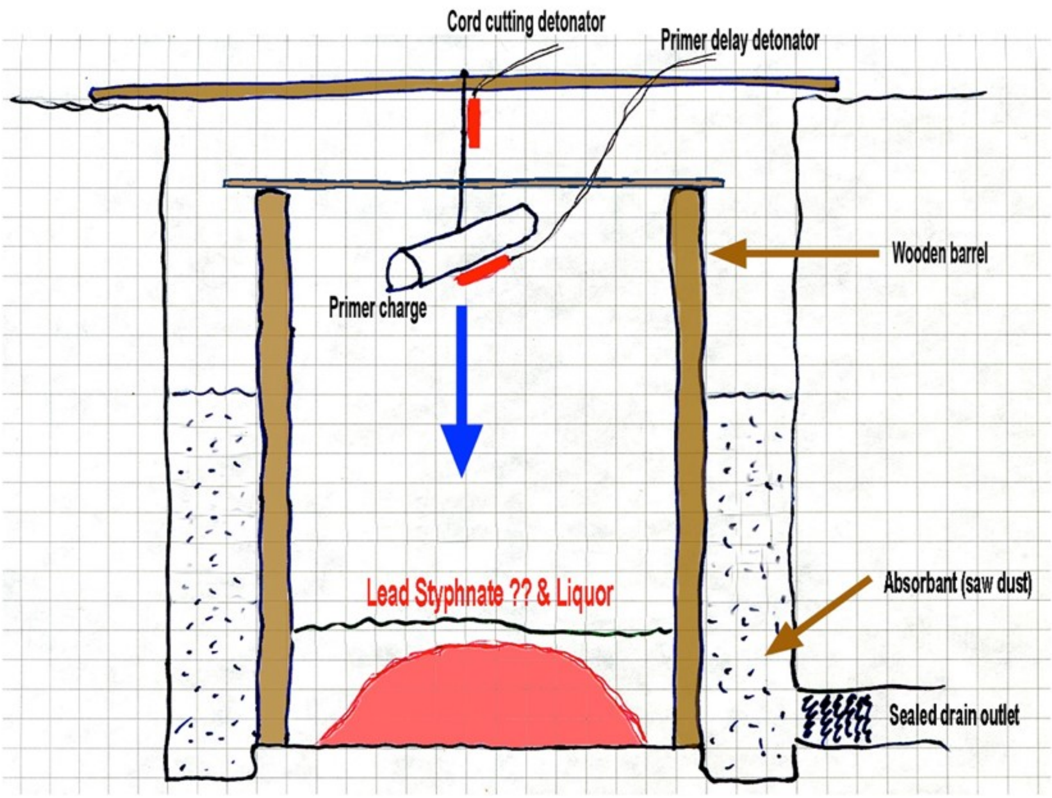


Figure 3 – Scheme for blasting the effluent barrels

Figure 4 – Blasting assembly

The blast worked as expected - see Figure 5. The upper left picture shows the effluent barrels before the blast. In the upper right picture you can see the detonators cutting the cord detonating. The lower left picture shows the charges detonating and the lower right picture the scene some milliseconds after the detonation of the charges.

Figure 5 – Blasting Sequence

However, we were lucky and it seemed that no (or very few) additional explosive inside the barrels detonated because we did not notice any significant visible or audible indication of a secondary detonation. Also the damage of the barrels was as expected from the detonation of the charges only. The barrels were broken into pieces and the liquid was absorbed by the saw dust around the barrels – see Figure 6.

Figure 6 – Blasting result

We decided to add some more combustible material especially into the part of the partition we had left open to reach the two barrels to blast. We ignited the wood by adding some liters of diesel fuel and placing a small plastic bag with some 20 g of an igniting mixture equipped with an electric squib on top of the sprinkled wood. We burned the complete lower level of the building simultaneously without noticing unusual "pops" or detonations – see Figure 7.

Figure 7 – Effluent barrels after burning

BLASTING OF THE SEWER PIPES BUILDING 201

After burning of building 201 we cleaned up the lower level of the building from the debris, metal parts, etc. Subsequently we started the decontamination of the two sewer pipes leading from the effluent barrel partition of building 201 to manholes some 40 m downhill. Looking at the plans we had from the time of the construction of the building we expected manholes in the sewer pipes somewhere else as we found them at the end – see Figure 8. No detailed actual plans of the sewer pipes of building 201 were found in the archives. The reason why the sewer pipes were not built according the plan was not known. However we were quite sure that there had not been any leakage of the drains. The sewer pipes had been built from high quality ceramic. Around the pipes there were placed concrete shells with inner plastic lining. A leakage would have been noted in the manholes because of liquid flowing out from the liner. Figure 13 shows the principle of the construction of the sewer pipes.

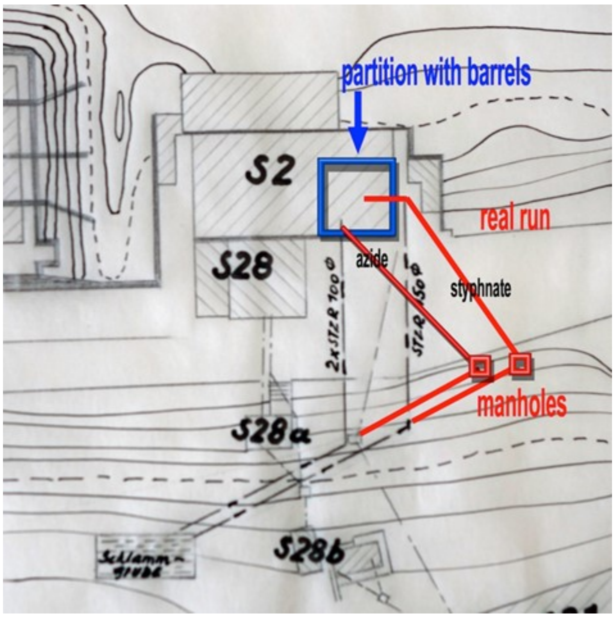


Figure 8 – Plan of the sewer pipes leading from of building 201 downhill (We assume that the plan presented here is dated from the early construction phase of the detonator plant. The buildings shown were renumbered same years after producing the drawing:
S2 ➔ 201, S28 ➔ 202, S28a ➔ 203, S28b ➔ 204)

The diameter of these sewer pipes were 10 and 15 cm. A polystyrene ball with a string attached (see Figure 9) was fed through each sewer pipe by flushing with some water until the manhole was reached. With the string we then pulled through a 80 g/m detonating cord. This was done applying some safety measures. The detonating cord was fed with help of rolls from the coil into the sewer pipe. Nobody stood nearby the coil of detonating cord while pulling. Also the operator pulling at the manhole was not standing directly in front of the drain outlet but some meters sideways.

Figure 9 – Polystyrene ball with string

We fired the detonating cord without any evidence of additional detonating material in the sewer pipes. There was no excessive damage of the surface above the sewer pipes nor was there damage observed at the drain outlets to the manholes. So if there still had been some explosive left in the sewer pipes it could have been only a small amount.

BLASTING OF THE SEWER PIPES BUILDINGS 202/203

The building 202 was in front of the building 201 and was used up to 1965 for the mercury fulminate production. This was a well ventilated, tall, single storey building containing much natural light from the many glazed windows. It had been cleared of miscellaneous rubbish which had accumulated over the years and it looked as at the time of theproduction.

The drainage from this plant was from a central floor drain and three more drains from the filter unit, the fume extraction system and the fume scrubber unit (see Figure 10). These drains lead to a vat house (building 203) and a sludge settling pond (building 204) – see Figure 11.

Building 203 was a small vat house which was used to manually intercept any effluent from the Mercury Fulminate production building and treat it in a wooden barrel before final discharge into the clearing chamber and settling pond (building 204).

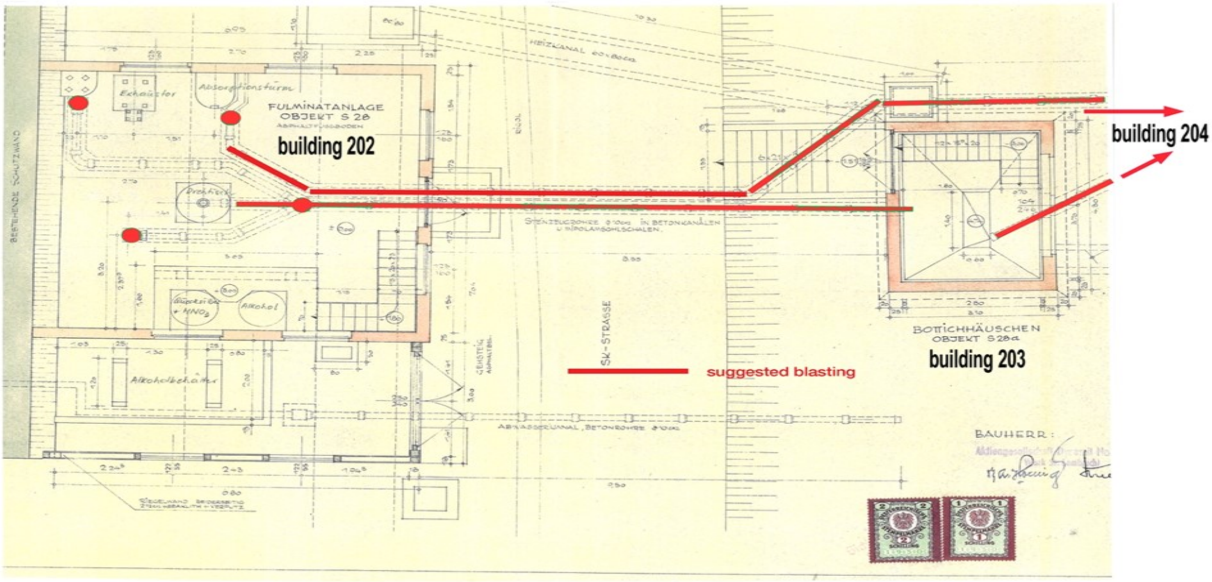
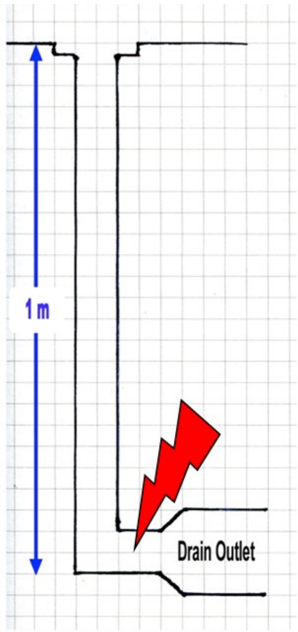


Figure 11 – Drain system buildings 202 - 203

First we tried the same procedure which we had used for the sewer pipes in building 201. However, the vertical parts of the pipes were so narrow and had a 90 ° bend 1 m below the floor level (see Figure 12), so we were not able to flush through a polystyrene ball. Maybe the line was also blocked partially (water ran through).



So we decided to blast the vertical parts of the drain pipes from the top and the horizontal pipes from the outlet in or besides building 202.

Note: We were quite sure that there had not been any leakage of the drains. The sewer pipes had been built from high quality ceramic. Around the pipes there were placed concrete shells with inner plastic lining. A leakage would have been noted because of liquid flowing out from the liner – see Figure 13

Figure 13 - Drain outlet into building 203

For the vertical drain pipes we prepared charges of plastic explosives fixed onto a stick or filled into a plastic pipe – see Figure 14 and Figure 15. We took a potential sympathetic detonation along the full length of the pipe into consideration for the risk assessment and safety distances. Ignition was done by electric detonator or detonating cord.

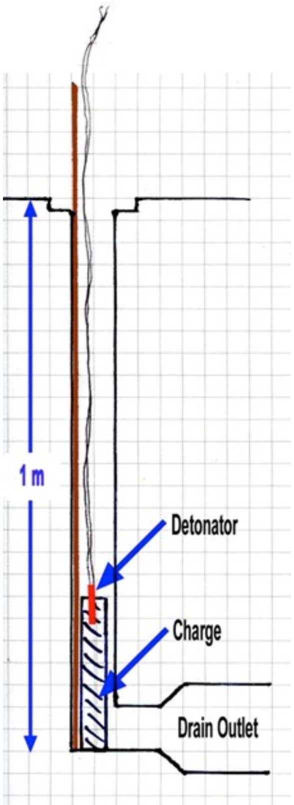
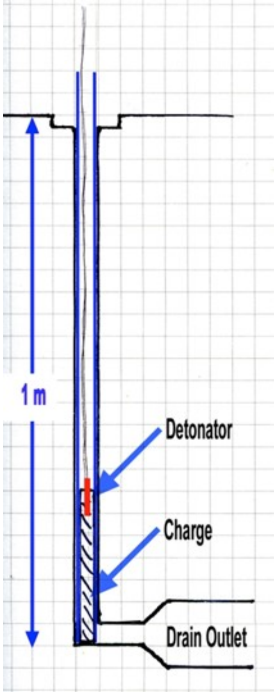


Figure 14 – Stick with explosive charge



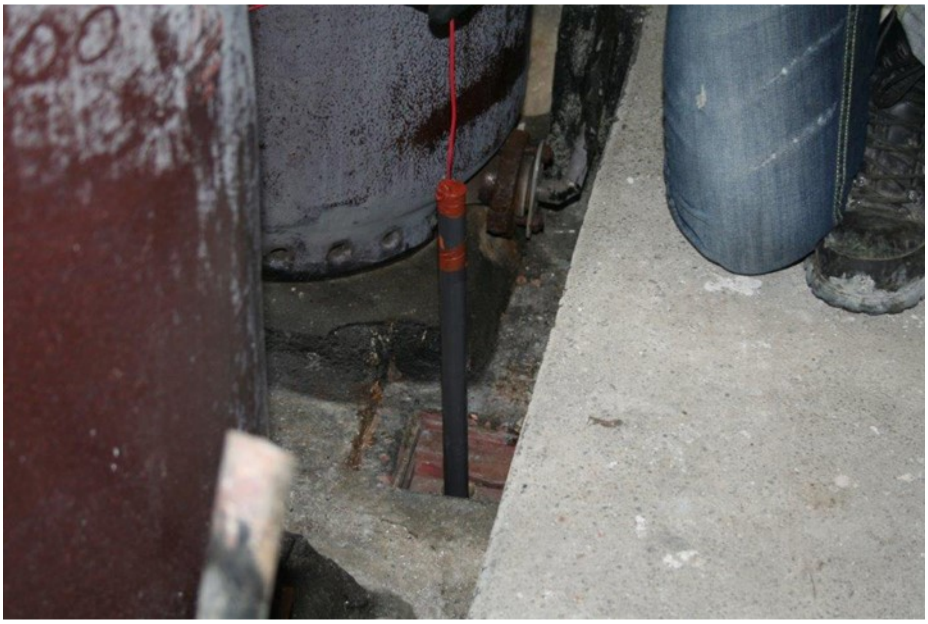


Figure 15 – Pipe with explosive charge

A plastic pipes (commonly used conduits in electric installations) was equipped with a polystyrene ball at the head of the first plastic pipe. This pipe was then inserted into the sewer pipe. Then subsequently the next plastic pipe was coupled to the first one, etc. – see Figure 16. By counting the number of the plastic pipes (2 m each) we ensured that we really reached the desired end point in the sewer pipe.

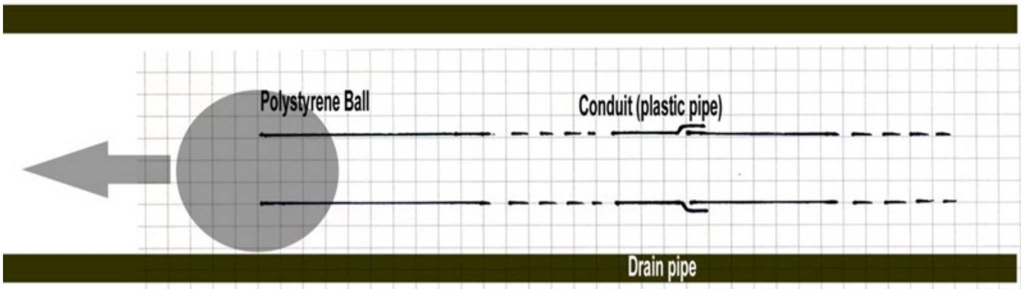


Figure 16 – Feeding of plastic pipes into the sewer pipe

When the plastic pipe was completely inserted in the sewer pipe a detonating cord 80 – 100 g/m could easily being loaded into those plastic pipes – see Figure 17.

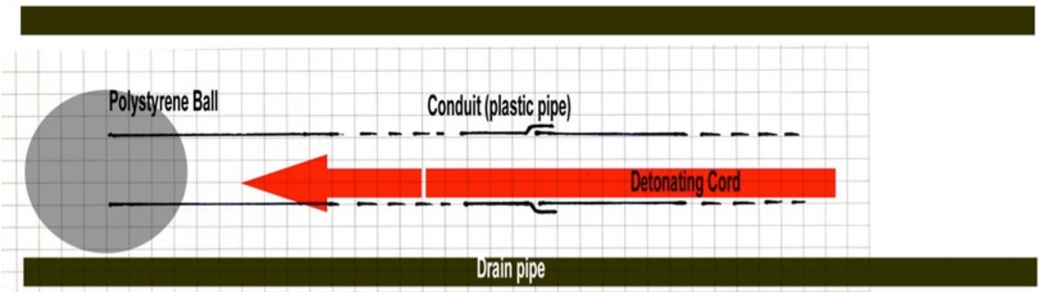


Figure 17 – Feeding of detonating cord into the plastic pipes

All this could be easily done with straight sewer pipes - no. 1 in Figure 18. Although we tried also with flexible conduits we could not achieve to reach the desired end point in the bended sewer pipe – no. 2 in Figure 18.

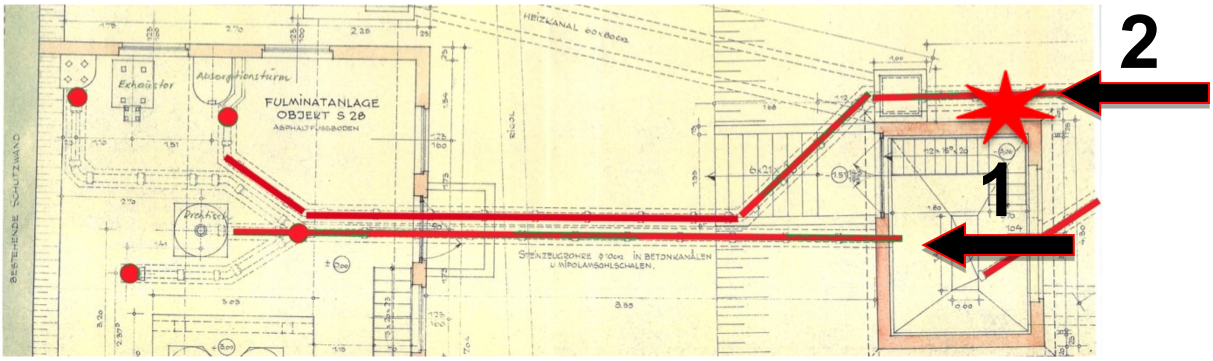


Figure 18 – Blasting points for blasting of sewer pipes with plastic pipes / detonating cord

We decided to blast the detonating cord as good as we could feed it into the sewer pipes. After the detonation of the cord there was no evidence for additional explosive on line no.1. No signs of damage by the detonation was noted at the surface above the pipe nor was there excessive damage seen at the outlet of the sewer pipe – see Figure 19.

At the downside end of line no. 2 we had more damage than we expected from the detonating cord alone. It was estimated that around 1 kg of explosive had collected in that area – see asterisk in Figure 18 and broken concrete shells and cover plates in Figure 20 .

Figure 19 – Line no. 1

Figure 20 – Line no. 2 with damage by additional explosive

Subsequently the buildings 202 and 203 were burned and demolished. The position of the not blasted part of the sewer pipe was marked and left for later treatment, because above that part of the pipe a road is crossing which is still in use.

It is planned for the future dig along the sewer pipe no. 2 and blast it part by part as possible.

BLASTING OF STEEL VESSELS

In the production line for lead azide and lead styphnate we had also vessels for preparing the raw material solutions in the upper floors of building 201. It was foreseeable that in the planned decommissioning of the NG-plant there would be some vessels possibly contaminated by NG. So we tried to learn in the lead azide and lead styphnate lines how to deal with such vessels and use this knowledge for the decommissioning of the NG line in future.

This contamination was planned to be removed by blasting a hole (or two) into each of the vessels, place wood inside and around the vessel(s) and burn the vessel(s) together with the building. The holes in the vessels guaranteed good ventilation during burning inside the vessel. The steel vessels inside the upper floors of building 201 were used as training objects for future vessel decontamination in the NG line.

We had some experience in plaster shooting with emulsion explosive. Thus the idea came up to use an emulsion explosive (Emulex 1) also for blasting of vessels. This was cheaper than using plastic explosive, also the emulsion explosive is easily available for us as an emulsion explosive producer.

We stuck around 500 g of Emulex 1 using adhesive tape onto a vessel – see Figure 21. It is very important to achieve a very good contact of the explosive to the metal. The metal must be as clean as possible. Rust, oil and other contamination of the surface of the metal must be cleaned by mechanical and/or chemical means. The blasting result was as desired – see Figure 22.

Figure 21 – Explosive charge on vessel

Figure 22– Explosive Result

Later on we realized that our Emulex C (an emulsion explosive with a special formulation using chemical gassing together with microballoons) is itself very sticky and may be used without the adhesive tape – see Figure 23 and Figure 24.

Figure 23 – Emulex C charge on vessel

Figure 24 – Blasting result

Subsequently the vessels would be filled with wood and burned.

BLASTING OF STEEL AND IRON PIPES FROM THE NG PLANT

When dismantling and decontaminating an explosive production plant you may well have metal pipes which transported liquids that contained explosives. Although we flushed these pipes properly we could not exclude absolutely the presence of some NG still inside the pipes. There are many reports describing methods of dealing with such pipes safely. Especially in our NG-plant we had (and still have) long welded pipes without flanges or valves. We used diverse methods for blasting these pipes into pieces. Our risk assessment for such blasts covered the possibility that the complete pipe would detonate and metal splinters would be projected (but this never happened up to now). At safety zone with at least 1000 m radius was established according Austrian regulations for blasting of metal constructions.

Blasting with Detonating Cord

Some layers of detonating cord 40 g/m were wound around the pipe to blast and fixed with adhesive tape or (easier) cable straps. You need some experience to estimate the number of windings you need to completely cut the pipe. Steel pipes seem to be easier to cut than iron pipes, usually they have a lower wall thickness.

Figure 25 and Figure 26 – Detonating cord applied on steel pipes

Figure 27 – Cut steel pipe after blasting with detonating cord

Blasting with an Emulsion Explosive Charge (Emulex C)

Applying of the detonating cord to a steel or iron pipe can be quite difficult in narrow spaces or if you have pipes running near together. In such cases we used at the beginning plastic explosive but later on an emulsion explosive (Emulex C, see above). Using such charges it is possible to blast one or more pipes simultaneously also under difficult conditions. You can form Emulex C into the desired charge (we define a charge as an explosive mass provided with one detonator even if it covers more than one pipe – see Figures 28, 29, 30) very easily without influencing the ignitability of the explosive. The Figures 28, 29 and 30 show some examples of blasting steel pipes with Emulex C. Figure 31 shows the result of one of the blasts.

Figure 28 and Figure 29 – Emulsion explosive charge applied on steel pipes

Figure 30 – Emulsion explosive charge

Figure 31 – Blasting result

Also using this blasting method we saw that steel pipes seemed to be easier to cut than iron pipes – see Figure 32 (charge) and Figure 33 (not satisfactory blasting result).

Figure 32

Figure 33

Therefore we improved the method for blasting of "difficult" pipes. We did not apply the explosive charge just around the pipe but put the same amount of explosive diagonally around the pipe – see Figure 34.

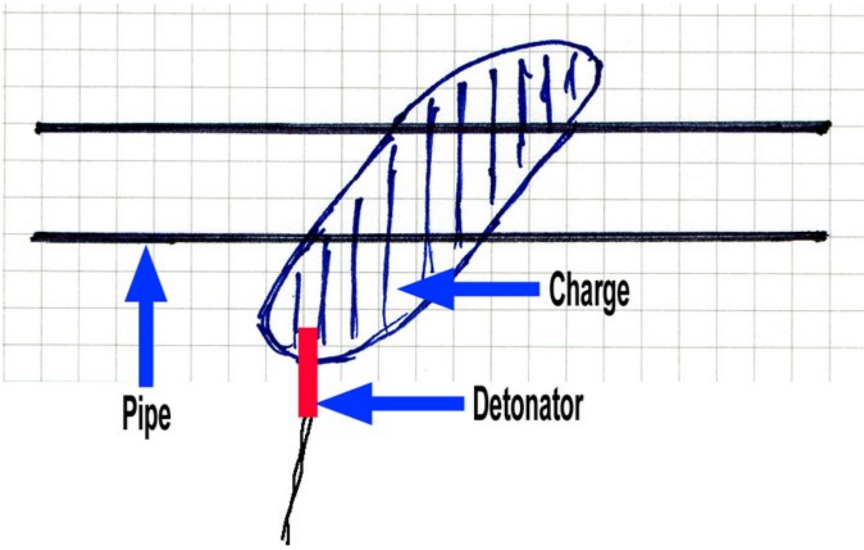


Figure 34 – Improved placement of the explosive charge

With that method we could blast also iron pipes without using an additional amount of explosive – see Figure 35 (charge) and Figure 35 (satisfactory blasting result).

Figure 34 – Emulsion explosive charge

Figure 36 – Blasting Result

We often placed more than one charge (remember: we define a charge as an explosive mass provided with one detonator even if it covers more than one pipe) along the line of pipes to reduce the number of blasts necessary. Sometimes we mentioned that we did not achieve the blasting result we expected. Sometimes a charge was gone but the pipe was not damaged at all. This only happened when the charges were placed very near together (less than 50 cm). For initiation we had used delay detonators from the laboratory stock. So we thought that this may be a reason for the misfires because delay detonators with a chemical delay element may not fire exactly at the same time.

As we had filmed videos of some of the blasts we analyzed the picture sequences around the detonation moment. There we could see sometimes that what we assumed really happens. Figure 37 shows two charges detonating at the same time but the detonator of the charge in the middle was not yet firing (red arrow). The delay detonators detonated with an estimated deviation some milliseconds.

Figure 37 – Two charges detonating, the third one is still waiting to detonate

So we recommend to prefer instant detonators or not to blast nearby charges at the same time. When you need to take delay detonators, at least use detonators with the same delay. And do not place charges below 2 m distance when using delay detonators (even when using the same delay).

CONCLUSION

Blasting is commonly used in decontaminating plant equipment from explosives. A lot of methods have been described in literature. Some special methods and their possible problems are explained in this paper. However, always take into account that no blasting situation in decommissioning is the same as the other one. Perform a hazard analyses and a risk assessment for every task. Discuss problems open and intensely with your team. Do not start blasting until you are convinced that you have found a safe and reliably working solution for your problem. Take this paper as stimulation for solving blasting problems.

RECOMMENDATIONS AND TAKE HOME MESSAGES

- Apply all the good practices which are described for decommissioning of redundant explosive plants, note that blasting techniques are only a small part of that process
- Always perform hazard studies and risk assessments for using blasting methods for decontamination
- Train the operators in the special (safety) requirements for decommissioning work
- Set up a blasting plan and a written procedure for every blasting mission (see appendix)
- Cultivate intense discussions with your team about the desired result
- Do not start blasting until you are convinced that you have found a safe and reliably working solution for your problem
- Communicate blasting activities with your site management, emergency services, authorities, public and employees
- Take pictures and remote videos (you may use a cheap camera, it is normally safe in a distance of more than 10 m for charge amounts described in this paper – up to 1.5 kg)
- Expect the unexpected

ACKNOWLEDGEMENTS

The authors acknowledges the help and input from numerous experts, managers, engineers, environmental and laboratory specialists, the blasters and all who have been and continue to be involved with the decommissioning of the former detonator plant as well as the former NG-plant at the AUSTIN POWDER GmbH site in St. Lambrecht, Austria.

APPENDIX

WORKS INSTRUCTIONS FOR BLASTING WASTE WATER VATS IN BUILDING/AREA 201

INTRODUCTION

During the course of the remediation of the closed down blasting cap department, building 201 is one of the facilities to be decommissioned. Amongst other activities the waste water barrels in one partitioned off section of that building needs to be decontaminated by blasting. The building was classified to have an extreme explosive risk because of the (albeit low) possibilty of an estimated maximum 100 kg of primary explosive being present, especially in the two waste water barrels used for the lead styphnate production.

The building 201 was used until five years ago for the producton of lead azide and lead styphnate. The mixture in the lead styphnate barrels (iron shavings and sulphuric acid) was to perform a destroying reaction, but how far this objective has been achieved could not be ascertained. While the production was running the effluent was from time to time discharged through a drainage system into a sump pond.

DESCRIPTION OF BUILDING/AREA 201

Figure 1 – Building 201

The other equipment in building 201 has already been decontaminated and the loose equipment has already been removed. On the ground floor there are two partitions which had been used for the production of primary explosives. The equipment from these two partitions has been removed. In a third partition 4 waste water barrels are located.

Two of these barrels, used for the treatment of the mother liquor from the lead azide production, are empty and no significant contamination with explosive is visible. The other two vessels – see Figure 2 - contain residues of lead styphnate, together with a mixture of metallic iron and steel shavings and sulphuric acid. The barrels are approximately 1 meter in diameter and the liquid depth is between about 0.3 m and 0.5 m. It is estimated that a maximum 100 kg of lead styphnate explosive may be present in both barrels.

Figure 2 – Lead styphnate barrels

To enable the safe preparation of the building 201 these two barrels are each to be blasted with 0.5 kg of plastic explosive. A rough planning and decription of the approach is included in Peter Cartright's visit report [Note: A Safex expert was contacted for decommissioning advice before starting the work in the detonator plant]. The only significant discrepancy is the fact that the partition will not be filled with fire fighting foam. The reasons for this decision, is that this foam will on the one hand handicap the future burning of the partition and on the other hand the possibly contaminated foam, after the blast, will be very difficult to be disposed of.

The partition, housing the effluent barrels on the ground floor of building 201, is enclosed within a heavily reinforced concrete blast protection. There is a lightweight tin roof and and a wooden glass wall which leaves room for a corridor between the partition and the reinforced concrete wall. Entrances to the ground floor are in northwest and southeast direction. The upper floors can be entered via a staircase near the northwest entrance as well as an entrance from the hillside into the second floor.

All the utilities (electric energy, phone line, steam, heating, etc.) have already been disconnected from building 201. Only the water supply is still active to enable wetting of the area around the barrels for a safe approach. This will be disconnected after the preparation of the blast has been completed.

The room containing the barrels has been prepared for burning (the room was filled with combustible material such as pallets, wood, etc. to the height of about 1 meter with only a space around the two barrels to facilitate the blast). The space round the barrels to be blasted, was filled in with absorbing sawdust and wood shavings. The drain outlets were sealed with polyurethane foam and gypsum to avoid liquid leaving the building and to possibly avoid propagation of the detonation into the sewer pipes.

It is planned to take photos of the blast preparations and also to take video recordings of the blast from outside (perspective similar than in Figure 1) as well as from inside the building 201.

THE BLAST

Details of the Blast/Charges

- Carry out steps 2 – 5 outside of building 201. Do not touch the barrels in step 6! The wearing of PPE is mandatory. This includes the following: Hard hats, anti-static work cloths, hard toe-capped antistatic safety boots.

- Preparation of 2 primer charges of plastic explosive, 0.5 kg each. Fix each charge with a cord onto a 3 meter long wooden rod. Let the charge hang down for 0.5 meter.
- Fix an electronic detonator programmed for a delay of 400 ms to each primer charge (400 ms corresponds to the falling time of around a 0.8 m falling height).
- Fix electronic instant detonators (0 ms) onto the cords near the wooden rod (to cut the cords).
- Lay the firing cable to building 206.
- Place the rods with the primer charges over the two barrels so the primer charges hang into the barrels.
- Cover the two barrels with the prepared coverage. Put on the protection plate to avoid accidental initiation of the primer charges.
- Enter the coverage (see „Safe Ignition" section below), blasting alarm signal, firing of both primer charges simultaneously.

Objective

To destroy the residues of lead styphnate that may possibly be present.

Pre-conditions

During preparation for the blast and the blast itself no personel (except blaster, assistant and helpers for the blast, maximum 4 persons) are allowed in the fenced off area of the plant. All explosives in that area must be safely stored inside the appropiate magazines. No production activities are allowed.

Safe Ignition

Ignition has to be done from a safe coverage/shelter under the access gangway to building 206 (heavy blast protection walls, earth coverage, with no direct line of sight and a distance to blast area of > 65 meters). The wearing of PPE is mandatory. This includes the following: Hard hats, anti-static work cloths, hard toe-capped antistatic safety boots, ear protection.

Hazards

The blast wave is considered as the main hazard, especially if the assumed maximum of 100 kg of explosive detonates.

Calculation of the safety radius according the German QD model:

Formula safety distance $m = k * M^{1/3}$

M = Explosive mass in kg

K = factor depending on the construction and/or use of the donator building and acceptor building(s). In this case k = 22 was used, which is the factor that is used for the distance of explosive production buildings to residential areas.

Calculation result for 100 kg = 100 meters, for 200

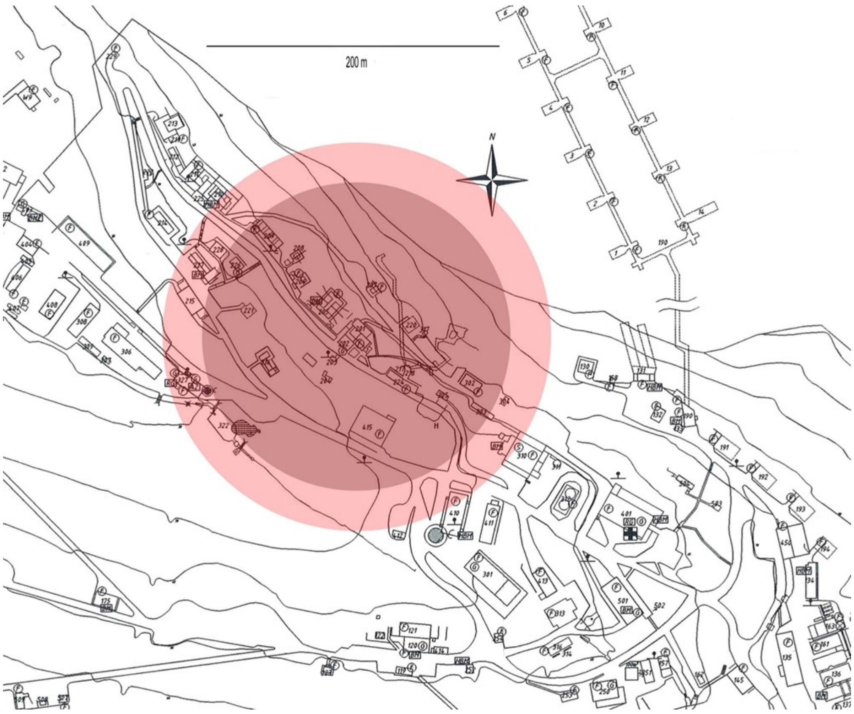


Figure 3 – Safety zone for blasting the effluent barrels (dark red: safety zone calculated for 100 kg of explosive, light red: calculated for 200 kg of explosive)

Protection of the Neighbourhood

The nearest building of the residential area is in a distance of 350 m. Impact of the blast to the residetial area can therefore be excluded.

Protection of the Immediate Neigbourhood

Some buildings inside the extended 200 kg safety zone are still in use:

Building 220 (Raw material magazine) 25 m (empty, planned to be dismantled)

Building 415 (Raw material magazine) 45 m downhill (no explosive stored)

Building 302 (Magazine) 75 m (empty, planned to be dismantled)

Building 221 (Detonator magazine) 75 m downhill (some detonatores stored, earth covered, adequate protection according QD calculation, k = 2.5)

Building 215 (Detonator magazine) 100 m (adequate protection according QD calculation, k = 5)

Building 310 (Boiler house) 125 m

Building 327 (Fire brigade station) 120 m

Building 410 (Magazine 1) 125 m (no explosive stored)

Slight damage (e.g. broken windows) was deemed to be acceptable for all these buildings. Other buildings inside the safety zone shown on the drawing have been dismantled or will be dismantled in the near future. Damage of these buildings would be acceptable.

Additional Information and Actions

Scheduled date	June 18, 2010
Scheduled time	13:30 Decision to start the works by the blaster [in Austria the blaster is fully responsible for all blasting works]
	14:00 Start of the preparation works for the blast
	Blast to be carried out after 15:00 but before 18:00
Information	Internal information by plant manager (CEO, SHES manager, departements, fire brigade, works protection force)
	Local authorities by plant manager
	Adjoining municipality by plant manager
	Police by head of APG fire brigade
	Fire brigade of the adjoining municipality by head of APG fire brigade
Blaster	Head of APG Blasting Service
Assistant blaster	Plant manager
Helper	2 more people
Exclusion zone	Fenced area of the plant. No persons are allowed to enter this area except the blaster, the assistant and helpers for the blast (maximum 4 persons). Just before the blast an inspection of the locked field path uphill from the plant has to be carried out.
Production	Starting with the date/time mentioned above no production is allowed in the plant. All explosives must be locked in the magazines.
Fire brigade	In attendance near the office building (outside the fenced area).
Inspection tour	No inspection tour by the works protection force is allowed during the time between the date/time mentioned above and the all-clear after the blast.
All-clear	After the blast activities are finished the blaster is responsible for the release of the exclusion zone.
June 06, 2010	
Signatures	Plant manager, SHES manager, deputy plant manager, blaster, assistant blaster, helper, head of fire brigade, works protection force
Distribution	Local authorities, plant manager, SHES manager, deputy plant manager, blaster (blasting team), head of fire brigade, works protection force

Dangerous Goods Truck Parking – Truck Safety and Security at REST

By

Brian Deveraj

Drivers of Dangerous Goods including Explosives, drive many hours behind the wheel and hence require to take rest stops regularly to ensure they are not fatigued at all times. It is during these situations that you can let your guard down that can lead to incidents. Here are some tips to observe, while parking trucks loaded with Dangerous Goods:

Points to observe when parking in a Truck Parking Area:

- Upon entering the vehicle park, watch out for pedestrians and fellow drivers.
- Observe safety distances between trucks and other non-compatible substances. You must maintain the required segregation distances.
- Drive slowly and observe the posted speed limit.
- Always use your turn signals, even at low speed. Ensure the vehicle is secured from rolling away – consider wheel chocks where appropriate.
- Use a spotter to aid your parking if required.

Managing cargo security while at rest:

Remember “a load at rest is a load at risk”. Good parking areas enable drivers to take rest breaks securely and then continue their journey fully refreshed. What makes as suitable rest-stop?

- Avoid hotspots for possible freight crime.
- Safe entrances and exits for trucks.
- The ability to communicate with other trucks and drivers.
- Suitable amenities and services for drivers.

How to stay safe at truck stops?

- Don’t leave items of value on display.
- Park in well- lit areas if possible
- Lock your cabin and tool boxes when the vehicle is unattended.
- Install electronic engine immobilizers where possible to prevent vehicle from starting.
- Use a steering wheel lock or similar device whenever you leave the vehicle.
- Fit a vehicle alarm where possible to deter theft.

REFLECTIONS ON SAFETY FUSE MANUFACTURE IN SOUTH AFRICA

By

Gordon Morgan

Everyone has heard of Alfred Nobel and his 1867development of dynamite.

Many people will have heard of the less celebrated William Bickford, who in 1831 patented the manufacture of SAFETY FUSE. Safety Fuse replaced unreliable methods of initiating blackpowder (gunpowder), such as hollowed goose quills and straws, with a blackpowder filled jute “rope”. The blackpowder filled “rope” (Safety Fuse) was initially waterproofed with a combination of Gutta Percha and bitumen. The Safety Fuse burned at a fairly predictable rate of approximately 1cm/sec.

It would be interesting to ponder how many miners would have been keen to use dynamite without a reliable method of initiating it from a safe distance.

Safety Fuse was the mainstay of the mining industry in South Africa until well into the 1980’s and 90’s. Gradually being replaced by “Shocktube”, delay detonators and electronic detonators. Production of Safety Fuse finally ending in South Africa in the early years of the new millennium.

A method of using Safety Fuse together with Ignitercord, as a sequential timing device, was developed for use in the underground Stopes of South African Gold and Platinum mines.

Ignitercord is a pyrotechnic coated copper wire that burns with an open flame. The pyrotechnic used is a combination of red lead, potassium perchlorate and silicon in a nitrocellulose binder. It is extruded onto a copper carrier wire and then covered by a thin extruded plastic layer. The plastic layer is more to limit damage to the pyrotechnic than as a waterproofing medium. Ignitercord is inherently waterproof and can sequentially and reliably initiate Capped Fuse. A Capped Fuse is a length of Safety Fuse with a detonator crimped to one end and an Ignitercord connector crimped to the other. The Ignitercord connector is simply an aluminium tube containing a composition that can be ignited from the Ignitercord and with a small blackpowder pill in contact with the cut end of the Safety Fuse. The Ignitercord connector is slotted for the Ignitercord to run through and a plastic collar is used to hold the Ignitercord in the slot.

Initially Safety Fuse was imported to South Africa from the UK but it soon became obvious that manufacturing facilities in South Africa were essential. A plant to manufacture Ignitercord was opened at Modderfontein near Johannesburg in approximately1956. This was followed by the construction, at the same site, of a Safety Fuse plant, utilizing secondhand Safety Fuse spinning machines obtained from Tuckingmill in Cornwall, UK. The Tuckingmill Safety Fuse plant closed in 1961.

The Safety Fuse plant commenced production, initially using imported blackpowder from Ardeer in Scotland. A blackpowder plant was then constructed also at Modderfontein and it commenced production in approximately 1964. The blackpowder plant had a capacity of 6 to 7 tonnes per day. By the mid 70's the demand for Safety Fuse was exceeding the blackpowder plants capacity. The Safety Fuse pant had a daily output of approximately 1.2 million metres, and demand outstripped supply. The South African mines were, at that time, firing over a million underground blasts per day

Faced with an increasing demand and a shortage of manufacturing capability and a reluctance to build additional blackpowder capacity, due to the inherent dangers of blackpowder manufacture, a decision to investigate alternative methods of manufacturing Safety Fuse was taken.

The culmination of this investigation was the introduction to the market of Wet Spun Safety Fuse (WSSF), and by the mid 1990's WSSF had entirely replaced traditional Safety Fuse. A new manufacturing facility opened near Rustenburg and serviced the South African Platinum mines situated in that region. Following a blackpowder plant explosion and its subsequent closure, the Safety Fuse plant at Modderfontein converted to WSSF and continued to supply the regional gold mines.

So, what is Wet Spun Safety Fuse and how does it differ from traditional Safety Fuse?

On paper the change is fairly small and, in a nutshell, dry granular blackpowder is replaced by a wet blackpowder "paste" which is dried during the manufacturing process. However, the development process was quite complex. Making **a** paste was fairly straight forward but making a paste that burned at the same rate in seconds/ metre that the customers had become accustomed too was much more challenging.

Dry Blackpowder is manufactured by combining the correct masses of sulphur, charcoal and potassium nitrate in either ball mills or edge runner mills. At Modderfontein edge runner mills were used, and "pulverise" as it was known, (a ball milled mixture of sulphur and charcoal) was added to potassium nitrate, and a small quantity of water then milled together to form the blackpowder. The product from the edge runner mills was then pressed into slabs. These slabs were then broken down into granules in a "corning machine". The granules were then dried, polished and glazed with graphite to enhance the flow properties essential for Safety Fuse manufacture. Finally, the polished grains were sieved to remove oversize particles and dust.

The burn rate of the blackpowder was determined in a lead tube filled with the blackpowder. The tube was drawn through a series of rollers to consolidate the powder until the tube was sufficiently long that it could be cut to a metre length. The burn rate of the lead tube could then be determined and used to predict the final fuse burn rate.

In order to obtain the traditional burn rate in seconds /metre a suitable particle size for the charcoal, potassium nitrate and sulphur had to be established. Remember these three chemicals had been reduced to fine particles of Blackpowder in an edge runner mill so the particle size of the individual components was unknown. As a starting point sieving the individually milled particles through a 53µm sieve to provide a fine powder of each was utilised. The 53µm sieve was about the practical limit for sieving a dry powder and obtaining a reasonable yield. (The actual particle size distributions were only established later with the aid of more modern particle size analysis).

Next came the formulation of a "paste" that was sufficiently stable to prevent separation of the individual components during manufacture and storage. There are thousands of surfactants, wetting agents and rheology modifiers available, as anyone formulating paints or cosmetics will confirm. They all play an important role in the formulation mostly, in the two industries mentioned, to prevent settling of the paints and cosmetics. It was soon apparent that the most stable paste either didn't burn at all or the burn rate had been dramatically retarded. By experimentation a formulation was established that provided adequate storage and maintained a traditional burn rate. Of necessity once a workable solution had been found the emphasis changed to introduction of the product to the market, and refining the formulation became a lower priority. There was huge pressure to increase capacity to supply the demands of the South African mines.

Traditional Safety Fuse spinning machines were modified to have a paste hopper that could auger feed the paste. The paste was wrapped in jute yarns to form a "semi-fuse". The semi-fuse was then passed through a heated closed cabinet with a forced air flow. The fuse retention time in the cabinet, was increased to around 10 minutes by the use of a series of pulleys at the top and bottom of the cabinet. The drying cabinet air was heated via a steam radiator. The jute yarns acted like blotting paper and absorbed the water from the paste and the jute yarns were dried by the air flow. Once dried the wet spun semi-fuse was processed as normal.

The history of blackpowder and its well know sensitivity and explosive properties resulted in the mixing process for the blackpowder paste being conservative. "Nautamixers™" were selected for their fairly gentle mixing action and for their ability to operate the screw in an upward or downward direction, to ensure an intimate mix. The paste was mixed for approximately 7hrs before a small quantity was discharged and spun into safety fuse to determine the burn rate. Depending on the results obtained adjustments were made by the addition of either more charcoal or potassium nitrate. Later as the properties and sensitivity of the blackpowder paste were better researched the Nautamixers™ were replaced by high shear mixers reducing the paste preparation time to around 30min.

Initially the WSSF augmented supplies of traditional Safety Fuse and the two fuses were sold to the market together.

A request from the market for a slow burning fuse was received. Both traditional and WSSF at the time burned at 99 – 121sec/ metre. There was little scope to change the burn rate of traditional fuse because, apart from the addition of some form of retardant, only the charcoal to potassium nitrate ratio could be adjusted. On the other hand, WSSF afforded other possibilities, such as altering the particle size of the raw materials. This was possible because the water content of the paste was insufficient to dissolve all the potassium nitrate. A large proportion of the coarser potassium nitrate would remain to produce the desired slow down effect. Simply sieving the milled potassium nitrate offered the opportunity to slow down the burn rate by obtaining a coarser particle size.

A coarser "cut" of potassium nitrate was selected, the paste formulation adjusted and the water content reduced to accommodate the reduced potassium nitrate surface area. These modifications enabled a slow burning Safety Fuse to be manufactured with a burn rate of 260 - 320 seconds / metre.

Similar affects are achievable by changing the particle size of the charcoal used. Although some fuse burning slower than 320 was produced reliability suffered.

Another interesting option was also explored following a request from a customer for a Safety Fuse burning at 150 s/m ± 10%, over an altitude range of sea level to over 6000 metres. (*The burn rate of safety fuse is affected by the atmospheric pressure at which it burns*). The atmospheric pressure effects were established using a pressure chamber and correlated to the burn rate at Modderfontein at 1800 metres above sea level.

Knowing the burn rates required, the question became how to make the fuse. Modderfontein had two paste formulations available one burning at a nominal 110 sec/metre and the other at 290 sec/metre. So, what happens if these pastes are blended? Well quite simply a whole new opportunity arises. By proportionally blending the pastes, a range of safety fuse burning rates can be produced.

The blending calculations are not entirely accurate however but are sufficiently predictable to meet the requirements. One of the reasons for the blending calculations not being entirely accurate is thought to be that the resulting fuse blackpowder core density differs, due to the particle size differences of the two pastes.

There are other opportunities to alter the burn rate by selecting from the wide range of surfactants and rheology modifiers available and these can have significant affects.

So, from a nostalgic point of view it is in some ways a pity that safety fuse is now largely out of favour.

LAST WORD FROM THE SECRETARY GENERAL

Following on from our Chairman's message at the start of this Newsletter, I want to commend Austin on their dedication and continuous effort to reduce and eliminate SHE related incidents throughout their organisation. I am confident that all members are doing their utmost best to achieve Zero Harm in their organisations .I also trust that you will see SAFEX as one vehicle to help you achieve this through communication of learning and helpful systems, sharing experiences as an Industry Safety Team!

During the course of 2019 only 16 Incident Notifications and one Incident Report have been filed by 57 individual members and 185 group members. This doesn't bide well for SAFEX and the industry. We all depend on the learnings from these incidents to make our systems globally more robust, thereby reducing incidents in the whole of the industry.

Just a reminder what you as a member undertook when you joined SAFEX International:

"What are a Member's obligations?

SAFEX is there to help members eliminate Health, Safety and Environmental (HS&E) incidents involving explosives as well as their impact on people, property and the environment. It does so through the exchange of the HS&E experiences members have with explosives. SAFEX can only succeed in its mission if each member is willing to:

1. **Report as soon as possible any such experiences from which members can learn and the industry can benefit. In the case of an explosive incident an initial incident notification is sent to the Secretariat.**
2. **Report to the Secretariat the findings or conclusions from any investigations it may conduct following the initial incident notification. A member is not obliged to provide confidential or commercially sensitive information but will submit as much information as possible with the view to prevent similar incidents occurring in our industry.**
3. Accept that the Secretariat will distribute this information to Members, Associate Members and members of the Expert Panel knowing that they have all undertaken to respect each other's sensitivities.
4. Not divulge any information it obtains in the course of its association with SAFEX to any third party. Nor will it use such information with the specific purpose of financial gain without prior approval from the SAFEX Secretary General.
5. Appoint a person, the SAFEX Contact, with whom the SAFEX Secretariat can liaise. The SAFEX Contact is responsible for passing information to SAFEX on behalf of the Member and for circulating information from SAFEX within the member organization as he/she sees fit.
6. Update its member profile and contact details in the manner SAFEX prescribes. This will enable networking among the SAFEX membership as well as assure uninterrupted information flow to and from the SAFEX Secretariat.
7. Pay, as specified, any fee or subscription due to SAFEX"

At the Senior Executives Meeting in Helsinki in 2017, it was agreed to widen the scope of reporting to encompass more information for learning in the wider industry:

The lack of reporting of incidents was discussed by Senior Executives at the Congress and the following proposed to increase reporting and learning from incidents and potential incidents:

Level 1. Normal incident reporting. As it is today. Company shares a detailed description of the event in question with explanations as to its cause and remedies. Company's name, location, etc. are all identified. Inclusive must be the reporting of those near misses that could have resulted in injury to people or damage to property.

Level 2. Anonymous member report: This would be where a company could report an event and the investigative outcomes but do so anonymously. Only the Secretary General would be privy to who had the event and where it happened. However, the member company would announce that it would be open to be contacted for by another member company for perhaps a verbal review or an informal discussion. This connection would be facilitated by the Secretary General.

Level 3. Anonymous No Contact report: This would be similar to level 2 type of reporting however the submitting member company specifically states that it does not want to be contacted by any member and wishes to remain anonymous to the event. Only the Secretary General would be privy as to who sent the incident report.

To date this had no effect on the number incidents reported. **Please assist the industry -we are reliant on this learning to make all our operations safer.** Let us make this the industry's "New Year Resolution" to make a commitment and report all incidents according to the above guidelines in time and in full!

In 2019 SAFEX was very active and the following was achieved:

- The new Website was launched- please check that your logon details are still valid and please positively critique the website for mistakes, out of date info and other problems.
- A programme was put in place with Cranfield University to upgrade the eLearning website and at the same time introduce the Russian and French Basis of Safety training modules.
- The GPG's on Emulsions (Parts 1 and 2) and Decontamination of Plant Equipment were published on the website.
- The users of the eLearning Module have grown by nearly 30%- if you are not using this facility, please do so, many companies use it very effectively as a training tool.
- Work Groups have started developing an Explosives Transport and a Watergel Module.
- Even with low level Company's support we still managed to issue 4 Newsletters in 2019.

Please continue and increase your support for all these initiatives.

"Effectively, change is almost impossible without industry-wide collaboration, cooperation, and consensus." – Simon Mainwaring.

I want to take this opportunity to thank the following for their support:

- All of you, the SAFEX Members, for your efforts to make the industry safe.
- Our Chairman, John Rathbun, for his support and dedication to SAFEX, even within his busy role as CEO of Austin Powder.
- The Newsletter Editing Committee, Dr Noel Hsu and Andy Begg, no matter their busy schedules, always ready to get the Newsletter out in time.
- Dr Martin Held who's input into managing the eLearning Portal and supporting it, makes it the success it is.
- The Board of Governors – each Board member plays an essential role in the success of this organisation.

Lastly, I want to wish each member and reader of the Newsletter a most wonderful Festive Season and may 2020 bring you and your families only good fortune and happiness.

TRAINING AT SAFEX 2020

Institute of Makers of Explosives IMESAFR Safety Analysis for Risk

Developed in a joint effort by the Institute of Makers of Explosives (IME) and A-P-T Research, Inc., IME Safety Analysis for Risk (IMESAFR) is a probabilistic risk assessment tool used to calculate risk to personnel from explosives facilities. IMESAFR uses the donor structure and activity, the structure of the exposed sites, and duration of exposed personnel to determine a level of safety. The program provides users with the ability to work in metric or imperial measures, and allows users to import maps or drawings of their site to assist with visualizing facility layouts and results.

IMESAFR v2.1 Training | 19-21 May 2020

In the IMESAFR v2.1 training course, students will learn how to use the software for assessing risk and assembling regulatory compliance documentation. Training is presented over 3 days with 8 hours of mixed lecture and discussion each day, for a total of 24 classroom hours. A competency test will be given at the end of the course.

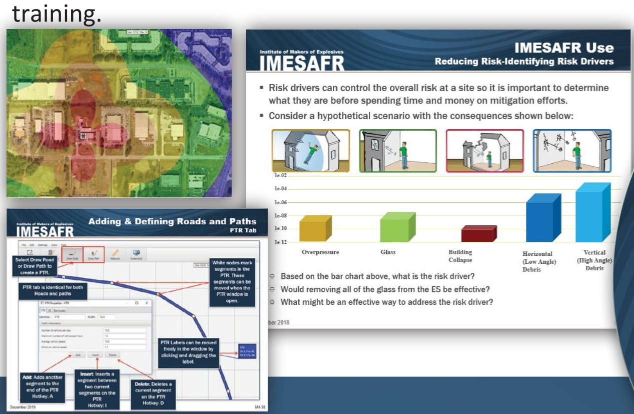
Register Online @

apt-research.com/product /safex-imesafr/

Training will be held at Hotel IMLAUER & Bräu, Salzburg,

AN Module Training | 22 May 2020

The IMESAFR v2.1 Ammonium Nitrate (AN) Module training provides an overview of AN Engine algorithms, new PES types, and exercises. IMESAFR's AN Engine is a semi-empirical physics-based model that characterizes AN events based on the AN detonation waveform, rather than simply using a TNT equivalency. The IMESAFR v2.1 AN Module is presented as a half-day course and course attendance is required to gain access to IMESAFR's AN functionality. IMESAFR v2.1 training is a prerequisite to the AN module training.



A-P-T RESEARCH, INC.
AN EMPLOYEE-OWNED COMPANY

4950 Research Drive, Huntsville, AL 35805 | 256.327.3373
www.apt-research.com | imesafrtraining@apt-research.com

ARTICLES FOR NEWSLETTER

This is a reminder that through the Newsletters we share knowledge in the areas of Safety, Health, Environment and Security pertaining to the Explosives Industry. SAFEX thus call on all members to submit articles on these subjects within their own companies and countries.

The deadline for articles for the December Newsletter is 10 March 2020 ,I look forward to your support .

SAFEX BOARD OF GOVERNORS

UPCOMING EVENTS:

ISEE 46th Annual Conference on Explosives and Blasting Technique, Denver Colorado : 26-29 January

IME institute of makers of explosives — IME Spring Meeting, Washington DC,USA March 16-19 March 2020

IGUS/CIE — IGUSWorking Group/International CIE Meetings, Madrid ,Spain 19-24 April 2020

IMESAFR — IMESAFR Training ,Salzburg, Austria 19-22 May 2020

SAFEX INTERNATIONAL EST-1954 — SAFEX International Congress 2020,Salzburg, Austria 24-31 May

Cranfield University — International Explosives Conference ,30 June – 2 July 2020 Location: Victory Services Club, London,UK

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