SAFEX INTERNATIONAL
EST•1954

*While **SAFEX International** selects the authors of articles in this Newsletter with care, the views expressed are those of the authors and do not necessarily represent the official position of **SAFEX International**. Furthermore, the authors and **SAFEX International** cannot accept any liability for consequences arising (whether directly or indirectly) from the use of any advice given or opinions expressed in this Newsletter*

CONTENTS

HELSINKI

CONGRESS XIX

NEXT CONGRESS
15-20 May 2017 at the Scandic Grand Marina Hotel

From the Secretary General's Desk

We are already a quarter way through 2017 when Newsletter 60 will see the light! Arrangements for the Congress in Helsinki are progressing well and 198 participants from 36 countries are expected for the Plenary Sessions. The Training Session is fully booked and the Explosives Transport and Emulsion Workgroups are oversubscribed- an exciting position to be in. I look forward to seeing you at the Congress.

At the recent Board of Governor's meeting it was decided to revitalise the Newsletter. To this extent, a Survey Monkey review was issued and I thank you for your inputs-this will be used to review the strategic future of the Newsletter. The Board also put together a team to review the shape and content of articles. The Convenor of the team is Noel Hsu with members Andy Begg and myself. We hope this will assist in giving the industry continued useful inputs and learning on SHE and Security issues. In the current Newsletter, you will already see the focus changing toward safety focussed articles.

Year to date five incidents have been reported by the industry:

- IN17-01 Trailer Fire
- IN17-02 Auger Incident
- IN17-03 Ignition Mixture Deflagration
- IN17-04 Nitro Ester Explosion
- IN17-05 Lead Azide Explosion

These are all available on the SAFEX Website. If you have difficulty accessing the website, please send me an email. Your inputs on any problems, even with content will be appreciated.

The Remediation and Decontamination Workgroup has issued their latest GPG guide: "Dealing with Buildings and Equipment prior to Remediation". The guide is available on the website-printed copies will not be made available as part of the SAFEX environmental protection philosophy.

In this issue the industry safety statistics for 2016 are presented by Terry Bridgewater. This is compiled by member's data which they voluntarily present to SAFEX on an annual basis. I urge all members to participate in this exercise as the information is found useful by all member companies.

Readers will see a new feature in this month's edition. It is titled "Did you know that - - -". This feature will consist of short articles submitted by our readers which will illustrate some specific issue associated with explosives safety. The piece of knowledge may appear obvious to some but to others it could be totally new and in some cases, it could be very important.

We request all our readers to think about their experiences/knowledge and submit articles for this new section of the newsletter.

SAFEX is also introducing a series of articles on Safety Management Systems to assist those companies, where required, to evaluate their own systems and make their systems more robust and effective.

The SAFEX Incident Statistics Network March 2017 By Terry Bridgewater

BACKGROUND

SAFEX is focused on high hazard operations and collects incident data and report for incidents that occur during the handling, processing or transportation of explosives.

At the Board meeting in February 2012 a proposal was discussed to look at less serious incident data relating to general occupational incidents. Often weaknesses here can be a precursor to more serious incidents and the data might also allow us to see good practice and provide a network for sharing.

It also allows the participants to benchmark against each other and with other related industries and to monitor progress over time. Additionally, if we see one company who report very low incident rates then we can ask them for information about their success.

This is occupational safety data rather than process safety data and the group has discussed extending the scope to include near misses (or near events) but to date it has not been possible to identify a robust measure for process safety near misses.

We have now collected five years of data and this paper summarises the results and findings and compares the SAFEX community performance with other industries. In accordance with the original rules of the programme, the participants receive the full data set with details of each member but others, including the Board, only see the overall summary.

Incident rates are calculated using the US OSHA formula.

RESULTS

The companies participating in the programme are:

- AEL (new this year)
- Arabian Explosives;
- Austin International;
- Chemring Group;
- Davey Bickford;
- EPC Group;
- Incitec Pivot
- Kayaku;
- Rheinmetall;
- Titanobel.

No fatalities have been reported so far and the data already received covers 16,397 employees and 82 lost time incidents. The LTI rate currently stands at 0.50 for 2016, the best performance since the statistic network has been in place.

2012	2013	2014	2015	2016
0.74	0.66	0.66	0.79	0.50

BENCHMARKING

The data has been compared against the most recent industrial injury and illness data collected and published by the US Bureau of Labor Statistics. They collect up to 80,000 submissions from companies all over the US and compile them using the standard industry codes. Comparable or complimentary industry sectors are included in the following table:

Sector	**LTI**
Chemical manufacturing	0.70
Explosives manufacturing	0.70
Small arms ammunition manufacturing	1.00
Ammunition (except small arms)	0.50
Oil and gas extraction	0.60
Petroleum refineries	0.20
Coal mining	2.30
Metal ore mining	0.90
Non-metallic mineral mining and quarrying	0.90
Support activities for mining	0.70
Electrical power generation, transmission and distribution	0.60
Guided missile and space vehicle parts	0.10
Electrical equipment manufacturing	0.70
Aircraft engine and engine parts manufacturing	0.70
Motor vehicle manufacturing	1.60
Construction	1.30

Ref: Incidence rates of nonfatal occupational injuries and illnesses by industry and case types, 2014 available from: *http://www.bls.gov/iif/#tables*

This suggests that the SAFEX participants are generally within the broad range of industrial performance and perhaps a little better than some.

INCIDENT TYPES

Lost time incident types in 2016 were similar to previous years:

Quantity of lost time injuries resulting from:	Total 2015	Total 2016
Energetic event	2	1
Slip, trip or fall	22	17
Strain or sprain	16	12
Repetitive strain	2	2
Laceration / graze / puncture wound	10	7
Crush	2	7
Struck against object	1	7
Struck by object	7	17
Chemical burn or adverse response to a substance	1	2
Stress	0	1
Burn	3	1
Other	4	8
Total number of lost time injuries	**70**	**82**

Our Accountabilities at the Blast Operation

By

Colin Wilson

Explosives manufacturers have in the past few years seen a shift in their role from just manufacturing and supplying explosives to their customers, to becoming fully integrated into the customers' operations. Operating on benches or underground, and taking full control of the customers' blasting operations with planning, execution, measurement and tracking, creates a joint responsibility to deliver safe, efficient blasting solutions. One of the most important aspects of this is instilling confidence in all blasting team members to prioritise safety. Whether on senior or junior level, each and every employee must adhere to industry safety best practices and legislation in order to carry out their work efficiently and safely.

Often we see the key safety decision making process disrupted or even over-powered by a need to meet production targets. Our role as manufacturers, suppliers and blasting support experts is to intervene in this respect, and stress the importance of safety to all staff and help them deliver on a promise of zero harm.

This puts into sharp focus the importance of allowing time for responsible and clear decision making in the mining environment. Teams must act according to their training and understand the magnitude of their responsibility. This means, all blasting/ support teams assume full responsibility and adopt a zero tolerance for non-compliance or unsafe situations. Continuous awareness and training is also an important tool to contribute to the decision making process.

Many manufacturers have programmes in place for blasting teams on their customers' sites to help them operate with confidence, and to do only what is right from a safety perspective and without any compromise. It is imperative that blasting and support teams work in conjunction with the senior management of the mine to place safety above production demands at all times.

How explosives manufacturers can address safety issues in the industry, specifically on customer sites

By creating an emphasis on training and a cadence for accountability, companies can mitigate risks to property, people and communities in close proximity to the blast site.

When explosions are managed more effectively, it is possible to ensure a good controlled blast and to secure the blast area correctly. Often, a lack of technically skilled employees has implications for this sector. Collaboration with the authorities and training institutions is vital to ensure legal compliance and to establish expert training for blasters and supervisors. Numerous existing training courses are available to the industry these include but are not limited to. The Blasting Competency programmes, Explosive Handler, Blast Assistant and Rock Breaking courses and The Explosive Engineer's courses. As manufacturers and suppliers of explosives our responsibility is to train our people in all countries across the globe to prioritise stringent safety legislation and not place safety behind production.

Incidents have been reported where blasters were instructed to set off a blast before all the mandatory safety checks were completed and this resulted in safety incidents involving fly rock, misfires and damage to property. The problem is often compounded by the blaster's lack of training and understanding of his core responsibility.

Safety Management System (SMS)

By

Andy Begg

One simple definition of an SMS comes from the UK HSE:

"A formal management system or framework to help you manage health and safety; it's your decision whether to use one or not."

Many of our members have a comprehensive Safety Management System in place and regard the SMS as a very valuable tool in helping everyone in the company understand their responsibilities for safety and how to ensure those responsibilities are met. It will also help assure compliance with the relevant legislative/ regulatory requirements.

We believe there will be members who do not have such formal systems. Therefore, the Board of SAFEX has undertaken to introduce those members who may not be as familiar with the formal SMS approach to the system and how it can be implemented. Successive future issues of the Newsletter will contain articles on one or more aspects of an SMS including a short guide on how to conduct an audit on each one. Over time this will build into a comprehensive SMS which we hope members will find useful. The first article which follows is to introduce the SMS approach.

Introduction

Over many years our members have been reporting incidents in their operations. The incident reports usually contain a description of what happened, the consequences and causes/reasons. When the incident is reported by SAFEX there will often be a short note included stating what we learn from the incident. Looking at these reports the following points can be drawn.

The majority of incidents are similar - and in some cases almost identical – to previous incidents that have been reported by other companies.

The causes of these similar incidents are generally the same and can be regarded as "an often clearly visible unsafe condition and/or behaviour existed "that will result in the incident.

Very often the report will identify or imply a failure in local management safety systems – failure in the permit to work (PTW), failure in management of change (MOC), lack of training, poor compliance with operating instructions, lack of risk assessment, poor machine guarding and so the list goes on.

We can take one view and say that we learn the importance of ensuring the PTW system, for example, is functioning correctly, and that people must be appropriately trained.

However, taking a more critical view we could say that from these incidents what we learn that in fact we do not learn anything we did not know before. We know it is important that the PTW system should be fit for purpose, that personnel must be properly trained - -. None of this is new.

What we do learn, however, is that we – as an industry – have forgotten how to consistently and sustainably manage our operations safely using the lessons we have learned from previous incidents and experiences.

We have to do better.

The full implementation of a Safety Management System (SMS) will help to ensure that:

the conditions for incidents (by their identification and avoidance) do not pose a risk to our personnel and operations.

the unsafe conditions are promptly dealt with before they result in an incident.

However, an SMS is still only a system. It has been designed by people, it is implemented by people and it is managed by people. A failure in the SMS means a failure by the people who are responsible for it – operators through to executive management.

The intention of this Series of articles is to introduce those members who do not have a formal safety management system to the typical structure and implementation of such a system and for those members who do have a system in place to perhaps motivate them to ensure the system they have is being properly and fully implemented.

This Series will specifically focus on Safety although it is common in the industry to combine safety with occupational health and environmental management systems. As we are looking at an SMS for an explosives business there will be additional elements to those found in a general industry SMS. There are several models for an SMS but I will focus on a typical one used by some SAFEX members.

The Series will include:

I. a description of an SMS and how one can be de veloped

II. a collection of typical elements that would be covered in an SMS

III. basic audit protocols for each element.

Further details of all aspects of the Series can be provided on request from SAFEX.

Part 1

Definition of a Safety Management System?

An SMS is a package of systems and procedures that help the management of an organisation ensure that all activities are carried out in such a way that they comply with agreed standards/procedures which have been designed/implemented to provide all employees with a safe place of work. The SMS will have elements relating to people, to plant (equipment) and to systems, and to their inter-relationships. There will be overlap or interaction between individual elements of the SMS – for example Risk Assessment may have implications in Operating Instructions, PPE, and Maintenance and so on.

Standards and Procedures

There can be some confusion due to the different uses of the terms “standards and procedures”. In these articles “Standard” will be taken to mean a generic mandatory requirement – for example “All employees will be appropriately trained in any task they are required to undertake”. Supporting this Standard would be a series of “Procedures” for specific training - for example one for forklift truck drivers, one for a PETN nitration room operator, one for a shot-firer, etc. There may be a Standard for “Plant and Equipment Integrity” supported by Procedures for Safety Studies on a new plant, Management of Change, Maintenance and so on.

These standards flow from 2 sources. Firstly, there will be national legislation that will specify certain requirements that must be met. Secondly there will be the company safety policy which will generally state that all employees are provided with **“a safe place of work”.**

Next step is to look at what would constitute a **“safe place of work”?** To define a safe place of work requires all the activities undertaken to be identified and then assessed for risk to employees’ safety. This includes not just conventional plant operations - making PETN, loading detonators etc. – but also to transport, magazines, testing explosives, research laboratories, and offices.

Once the activities have been identified they can be grouped into categories (Standards) of similar risk/activity or left as individual activities – whatever is found most useful for implementation. The good news is that this work has already been done by many members of SAFEX and therefore there are many examples available to adopt – often with little modification required.

Some examples of what “a safe place of work” actually means in practical terms is described below under three sections of an SMS.

The Selection and Use of PPE:

A Risk Assessment of an activity may expose an employee to risk from an exploding detonator and therefore to possible eye damage from shrapnel. This can be managed by providing suitable safety eyewear.

In another activity, the employee may be exposed to a risk from dust inhalation – this would in part be managed by providing some form of dust mask.

In another activity, flameproof clothing may be required. All of these are forms of Personal Protective Equipment – PPE.

In the SMS, these would be dealt with in a procedure for “The selection and use of PPE”. The Risk Assessment defines the hazard and appropriate PPE- but in addition the employee has to know how to use the PPE so training is also part of that requirement.

Provision of Operating Instruction:

An activity may require an employee to operate a production unit or part thereof (a detonator crimping station, an emulsion cartridging line, etc.). To do these jobs there have to be clear and comprehensive operating instructions that will give all the information the operator requires and the operator will have to be trained and shown to be competent. In the SMS, these will be covered under “Provision of Operating Instructions”.

Management of Change:

An existing plant may need to be modified by changing a reactor, installing a new detonator crimping unit, or adding another line to increase production. All of these may introduce new hazards and to ensure the modification does not expose the operators to additional or new risk the modification will need to be studied and the risks assessed. The assessment may require new PPE, a change in the operating instructions, a change in the plant P&ID, a change in maintenance schedules, and whatever else the risk assessment identifies. In the SMS these issues would be covered under the "Management of Change".

As previously mentioned some companies group similar elements together to reduce the total number of SMS headings but would then have multiple sub-sections taking each element individually while others have more individual headings. Choose whatever is best for local implementation.

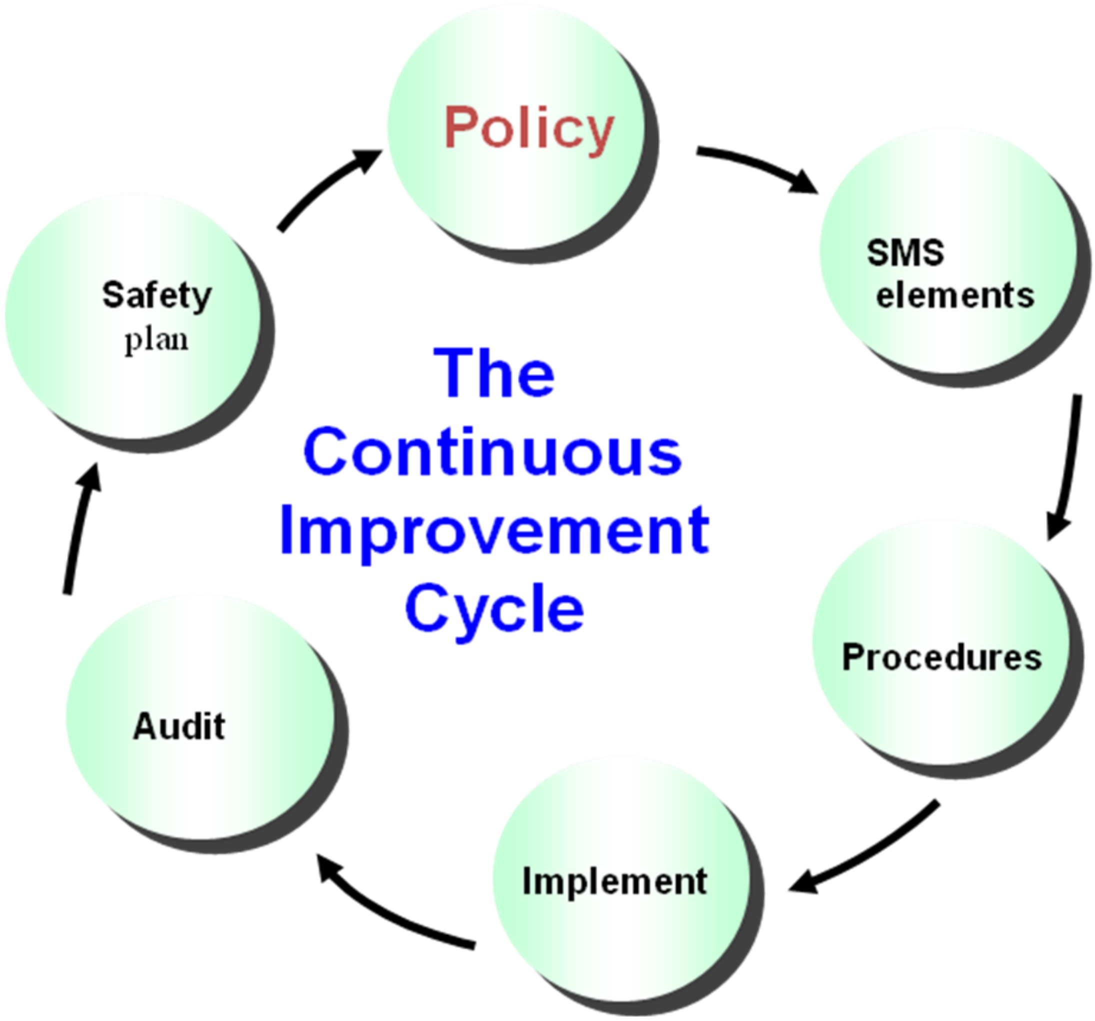
So far in the SMS we have the overall safety policy – **"We will provide a safe place of work".**

We have identified the key elements of the SMS that need to be addressed or complied with to provide the "safe place of work" from risk assessment through to operating procedures and trained personnel. Next, the job or activity is carried out according to the SMS. It should therefore be carried out safely. But is it?

Reviewing many of the incidents that are reported by SAFEX members it is clear that in most cases where there is an SMS the activity was in fact not being carried out according to the SMS - and presumably - no-one knew. This is where the next stage of the SMS comes in – **Auditing.**

Auditing is done to confirm that all activities are being done according to the SMS and therefore safely, or if they are not, to identify what action needs to be taken to avoid "an unsafe place of work" and an incident, or worse, an injury. Audits invariably identify some weaknesses in the SMS or in its implementation and identify corrective actions. Collectively the actions from audits can be consolidated into a Safety Improvement Plan and when done on an annual basis provide a framework for continuous safety improvement. Audit is yet another Standard or Procedure.

This completes the SMS circle; a basic version is shown below.



Procedures for a SMS vary from company to company and authority to authority. In the USA we have Process Safety Management (PSM) which is mandatory for certain industries. Full information on current PSM systems can be found on the internet. Responsible Care is another. Individual companies also have their own SMS which will comply with legislated requirements but will also contain specific requirements of that company. Some companies have in excess of 100 individual SMS procedures (this number would include safety, occupational health and environmental issues).

Typically the individual procedures in an SMS for an explosives company would include the following:

1. Permit to Work.
2. Management of change (MOC)
3. Working at height
4. Risk Assessment
5. Decontamination of equipment
6. Housekeeping
7. Securing (nuts, bolts etc.)
8. Permitted article list and control of small items of equipment
9. Guarding of rotating shafts, crimping heads etc
10. Control of static electricity
11. Maintenance
12. Personal protective equipment
13. Basis of safety
14. In process inventory control
15. Detonation traps
16. Destruction of explosives. (by chemical means or by burning)
17. Incident reporting
18. Incident investigation
19. Risk Assessment
20. Auditing
21. Use of contractors
22. Lifting Equipment
23. - - -
24. - - - -

In subsequent issues of the SAFEX Newsletter we will give a simplified example of these and other procedures together with a short audit protocol for that procedure.

Our hope is that members will use the information to develop new or review existing safety procedures and also undertake some (additional) auditing of their own activities.

If further information or help is required we would ask you to first contact SAFEX through the normal route.

In Newsletter 61 the Permit To Work (PTW) will be discussed.

Did you know that - - - ?

Did you know that bolt threads represent a major risk even after wash-downs; we had a major accident while a mechanic was undoing (or unscrewing) a bolt even though the equipment was thoroughly washed down. Explosives migrated into the threads after years of wash-downs. The bolt went through the mechanic's hand while he was undoing it. We instituted a procedure where all bolts susceptible of contamination were sealed with silicone caulking, penetrating oil was to be used before unbolting, and care was taken to ensure that no parts of the body of the mechanic or of any bystander were exposed to the probable trajectory of the bolt. The trajectory will be axial to the threads in cases where explosive infiltrated the threads despite all the precautions to prevent migration or explosion in the threads. The explosive involved was Comp B which is stable but not under all conditions. The nut and bolt test demonstrated that under extreme friction and confinement conditions Comp B will ignite.

Submitted by Maurice Bourgeois

Andy Begg adds

Indeed we had a similar experience on a Fall Hammer Test rig many years ago in Ardeer during a routine change of a base plate by the operator. This involved a wrench on a fixing bolt - probably half inch thread. There was an explosion and the bolt narrowly missed the operator's head but went straight through the wooden roof. Trace quantities of dry primary explosives tested had over time penetrated into the threads of the fixing and then one day - - - -!

Dismantling of explosives equipment can be done safely if the correct procedures are followed for decontamination. However, always assume there is explosive present unless you have positively confirmed there is not.

For further information on decontamination procedures you may contact the Expert Panel.

Special effects industry fatality investigation

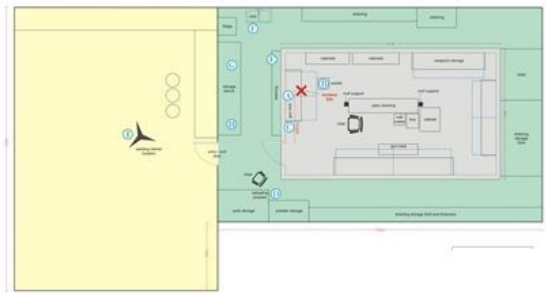
By

Geoff Downs

This incident occurred a number of years ago but there are valuable learnings when looking at the incident and what practices we put into place every day prevent such incidents. A 69-year-old special effects licence holder for the film and TV industries received burns to approximately 80% of his body and passed away approximately 14 hours after the incident. The deceased was also an armourer to the film and TV industries, collector and a shooter.

The incident occurred while he was welding nuts on the frame of the security rack for guns inside the armoury in his shed at the time of the incident. The shed was used for multiple activities including an armoury, keeping of propellants, ammunition, and explosives and keeping special effects chemicals and equipment. See Pictures 1 and 2. In picture 2, the yellow coloured area is general storage, the green coloured area is special effects, ammunition, propellant, specialised storage and related activities and the grey shaded area is the armoury. The red **X** in the armoury is the location of the fire and where the operator was standing.

Picture 1 – Shed



Picture 2 – Schematic layout of shed

The Weapons Licensing Branch of the Police had recently issued him with an improvement notice to improve the security of the firearms kept in the armoury and this led to the nuts in the gun holding rack being welded. He was working alone. The armoury is located inside the shed has one access door adjacent to the gun rack.

The area where the deceased was welding nuts on the frame for the fireworks security rack inside the armoury is seen in Pictures 3 and 4. A welder, welding mask and 3 welding rods were found in the vicinity including one in the hand piece of the welder. The shelf in the rack for supporting the guns was made from timber. There was a gap between the timber and the concrete block wall.

Picture 3 – Armoury and ignition area

Picture 4 – Ignition area

Picture 5-Welding Area-Security Bolt

Picture 6 – Armoury before incident

Explosives and pyrotechnic compositions were located underneath the timber horizontal bench of the gun rack. The explosives consisted of marine type flares, smoke devices, and pyrotechnic compositions. The pyrotechnic compositions were kept in open headed aluminium containers. The pyrotechnic compositions were compositions used in the special effects industry for fireball, flare and incendiary effects. Chemical analysis conducted by Queensland Health Forensic and Scientific Services on the evidence identified significant amounts of naphthalene, black powder, copper thermite and other chemicals. Naphthalene was found in 3 of the aluminium containers collected as evidence. The aluminium containers can be seen in the bottom left hand corner of Picture 6 taken a few weeks before the incident.

Picture 7-Propellant and ammunition reload area

Picture 8 –Melted clothing on floor

All the identified chemicals are substances commonly used in the pyrotechnics industry. For example, the naphthalene and black powder composition is known as a fireball fire fountain and is used to simulate bombs exploding in the film and TV industries.

Ammunition, propellants, detonators, plastic explosives, pyrotechnics and pyrotechnic compositions were also stored inside the explosives storage area outside the armoury. Picture 8 shows the propellant and ammunition reloading area.

The deceased was wearing synthetic clothing, short trousers, short sleeve shirt and open footwear. The synthetic clothing that melted is shown in Picture 8. The support strap of the top of the welding helmet had been burnt away and was found adjacent to the extent door of the shed. Three welding rods were found at the scene.

When the fire occurred, the deceased was thrown back against the steel pole, chair and other cabinets. The exit door seen in Picture 3 was not immediately accessible due to the flame front and intense heat.

The cause of the incident is believed to be welding particles igniting an unknown quantity of chemical compositions of pyrotechnics beneath the horizontal shelf supporting the fire. This resulted in an intense flame front engulfing the interior of the armoury estimated to be in excess of 1000°C. The heat from the burning compositions and intense flame front resulted in the aluminium containers melting and the destruction of plastic and other material in the armoury. The underside of the timber shelf supporting the firearms showed severe charring generated by the burning compositions.

Since it was believed that pyrotechnic compositions containing naphthalene, black powder and copper thermite may have been the causes of the high temperatures, it was decided that testing had to be conducted to either confirm or dismiss that theory as follows –

- welding sparks ignited the pyrotechnic compositions
- presence of naphthalene, black powder and copper ther-

mite caused the energy release

- the compositions release energy is intense heat, and
- the energy caused severe burns to the deceased

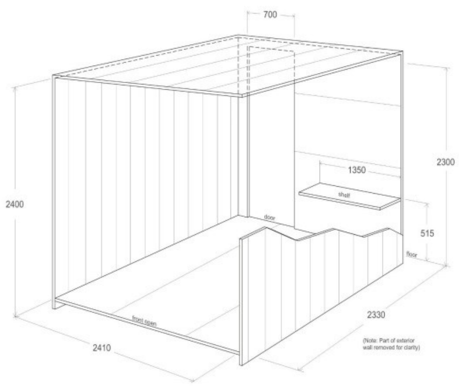
Testing was conducted through the Safety in Mines Testing and Research Station (SIMTARS) to demonstrate that the least energetic pyrotechnic composition presented for test produced at flame temperatures in excess of 1000°C and generated a large fireball that engulfed the deceased. There were 4 different tests undertaken. These were

- a small sample of about 4 g of composition they could be ignited by an electric match
- ignition tests using welding sparks
- large tests outdoor to demonstrate that a quantity of approximately 1.2 kg could be ignited and consumed and to determine whether the combustion temperature of 3.5 kg of the fire fountain composition was able to melt an aluminium container
- simulation of the incident. This included obtaining measurements of temperature, burn duration and the shape and size of the fireball.

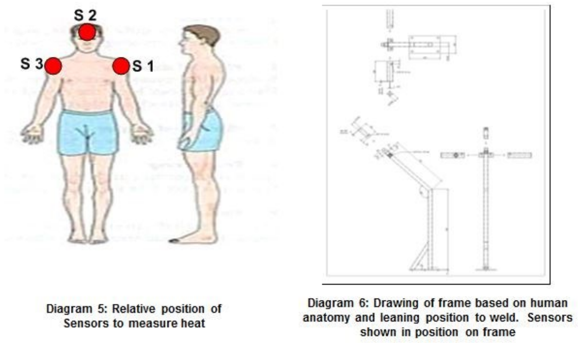
Tests were created to confirm that the compositions could be ignited by welding sparks, and the pyrotechnic composition used either in fire fountains or firebombs can be ignited by welding sparks and there was sufficient energy to melt the aluminium containers.

The simulation of the fire was done using half a 40 foot container (See Picture 9). The following items were recorded for the simulation -

- temperature produced by the fire fountain composition
- high speed footage of the combustion
- Thermo imaging of the fireball to check temperature profile inside the container



Picture 9 – Half size 40' container



Picture 10 - Sensor Location

The sensors used for temperature measurement were set up as shown in Picture 10 showing their location and these results are shown in the Temperature versus Time graph in Figure 1. The estimated flame front is shown in Figure 2.

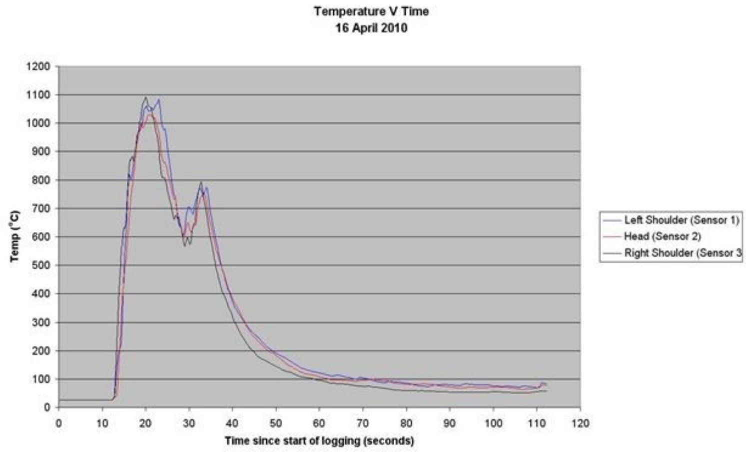


Figure 1-Temperature vs Time

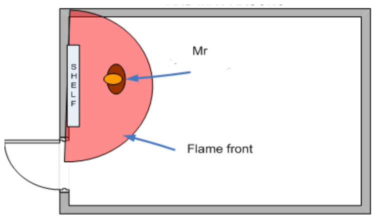


Figure 2 - Estimated flame front

The testing confirmed that

- hot particles from the welding were capable of coming into contact with the explosives underneath the shelf and the tests demonstrated that pyrotechnic compositions are capable of being ignited by the hot particles from the welding rod
- aluminium containers were melted by burning fire fountain composition
- the fireball that the composition creates in a confined space can last up to 8 seconds, reaching temperatures above 1000°C.

The test results strongly support the belief that the fatal injuries suffered by the deceased were caused by the ignition of the pyrotechnic compositions stored in the armoury.

The deceased had not identified the hazards associated with the welding activity. The housekeeping and other practices in and around the armoury was poor. The apron of the shed, explosives storage area and the armoury were untidy and cluttered the walkways obstructed by various items.

When we review this incident, we can see the absence and failed defences and the value of the risk control measures that we adopt to prevent incidents. When I go through the list of control measures, I can quickly identify those below. Can you identify any others?

- take 5 risk assessment
- hot work permits
- suitable protective clothing
- housekeeping
- emergency access and emergency exit
- isolation of activities
- working alone
- proper storage
- securing explosives
- keeping explosives containers closed (exposure)
- disposing of excess and unwanted explosives and chemicals
- keeping inventories to a working minimum.

Report on the 2016 ANNA Conference

By

Ron Peddie

The 2016 ANNA (Ammonium Nitrate Nitric Acid) conference took place at Eindhoven between September 19 – 23, 2016. As usual, although this is an industrially oriented conference, there were papers covering aspects of explosive safety when handling ammonium Nitrate.

I have shown some of the main papers with technical aspects of safety below. If anyone does not have access to these papers they can contact me and I will try to arrange copies.

The main take away from the conference is the need to continually remind the audience of the safety parameters in handling Ammonium Nitrate. There are always new participants and the things that are obvious to the old heads may not be known to them.

ANNA 2017 Eindhoven Explosives Safety related papers			
Paper Number	Description	Author	Organisation
AN-02	Granular non-ideal explosives instrumentation	Karmen Lappo	Sandia Nat. Labs.
AN-03	Safety standards for AN-pumps - application to existing plants	Christoph Neumüller	Borealis AG
AN-12	A review of testing methods and interpretation of their results for the thermal stability of Ammonium Nitrate	Martin Braithwaite	University of Cambridge
AN-14	Fire depression (suppression) in a CAN (Calcium Ammonium Nitrate) plant	Jos Classen	OCI Nitrogen
AN-16	Explosion in a prill tower head house	Miranda, Dallar, Peddie	Enaex SA and Peddie Engineering

The 2017 conference is from October 1 to 6th 2017 at the Hyatt Regency Lost Pines Resort and Spa, Austin Texas. This is an inexpensive and very open conference and is worthwhile for anyone with an interest in the safe handling of AN to attend.

Looking Back

by

Philip Kneisl

It is important in life to look back at where you came from, the fun things, the not so fun things, and especially those things you survived. At 56 I've had a bunch of the former experiences and a few of the latter ones too. Today I am thinking of a day in the mid 90's working with Lloyd, an experienced laboratory technician, who, at time, was twice my age. We were working in the prep lab making a run of explosive molding powder mixes.

It was late in the morning and we had three or four 1-pound mixes finished and in the drying oven. Another was mixing in the fume cupboard and Lloyd and I were relaxed and talking about some unimportant thing. The fume hood fan was pounding away (this was one of those old noisy fume hoods unlike today's laminar flow beauties) the air mixer was hissing and all was well. Lloyd was looking at the mix checking the granulation of the powder and I moved around to his side so I could take a peak over his shoulder. Looking up from the mix I saw a steam leak in the back of the hood. I thought, that's strange, and asked, "Lloyd do have the steam turned on?" He replied, "no". At which point I said, "then what's that steam leaking in the back of the hood?" Lloyd looked up, saw the "steam" and uttered a few choice words.

At this point I ought to explain that in the back of the fume hood we had placed several 1-liter tripour plastic beakers that we had stuffed our clean up scraps into. Each of these beakers contained a gram or two of blended HMX and TATB, some lacquer (a gooey mix of ethyl acetate and fluoropolymer), crushed up aluminum foil (used to cover the various ingredient containers prior to use), and clean-up wipes soaked in 1,1,1-trichloroethane (TCE).

One of these beakers was smoking like Mount Vesuvius, a nice white smoke that looked like steam. Lloyd quickly reached in the fume hood, snatched up the fuming beaker and removed it from the fume hood and its close proximity to a 1-pound mix. At this point I had backed off and was standing next to the emergency exit which was only 4-5 feet from the fume hood. Lloyd was now holding the smoking volcano in the room. The amount of smoke from such a small beaker was just incredible, really astounding, basically like a theatrical smoke machine. Boy, the smoke was really pouring out of there. So Lloyd realizes he has the proverbial Tiger-by-the-tail and he's shifting around from one foot to the other and says, "what do I do now?" At which point I slam the emergency door open and say, "throw it outside, throw it outside Lloyd." Lloyd's excellent Department of Defense (DoD) environmental training kicks in and he says, "but what about the environment?" My reply was, "**** the environment, throw it outside!" At which point the beaker sailed in front of me, out the door, and on to the grass. Lloyd and I were watching the beaker starting to burn a moment later when, WOOF, there was a bright flash! Wow aluminum burns hot. Now Lloyd says, "I can't see," and I tell him that neither can I. But of course, this passed in a few seconds and we opened the door to look out at what's left. Horror of horrors we see this immense Indian smoke signal rising several hundred feet in the air announcing our recent faux pas to management. At which point Lloyd took a hose from the lab and wet everything down. As we're cleaning up Lloyd informs me that, "I'm invoking the 15-minute rule." "What's the 15-minute rule," I ask. Lloyd informs me that if no one asks about this incident within 15 minutes, it never happened. No one ever asked.

It never happened, officially, but Lloyd was a good lead technician. We discussed this event several times as neither of us wanted to repeat the experience. After a little research, I learned that TCE is incompatible with aluminum. I had thought this would really only be a problem of corrosion of aluminum containers and may be a more serious issue with aluminum powder. But under the right conditions, especially with solubilized fluoropolymer and explosive powders mixed in, the result can be mighty interesting. Not long afterward TCE use was banned because it damages the ozone layer in the atmosphere. Before that Lloyd and I banned it from our work and we quietly updated the molding powder SOP to reflect this. But looking back the right thing to do was to bring it to management's attention. I was young. . .

Another time in the lab I was standing next to the scrap explosive receptacle. It was one of those heavy metal oily waste containers with a spring-loaded lid. So, I'm just standing there talking to someone and there is a small bang and the lid pops open a few inches and slams shut. No one ever investigated that one either, in fact the container must have been empty because no one ever admitted to putting anything in it.

Chemical compatibility is important. Do you know the compatibility of materials in your work space? We tend to get complacent because most of us make a living mixing incompatible things like AN and fuel oil. It certainly can be done safely, but there is a line somewhere where it becomes unsafe. The older I get the more curious I am about where that line is.

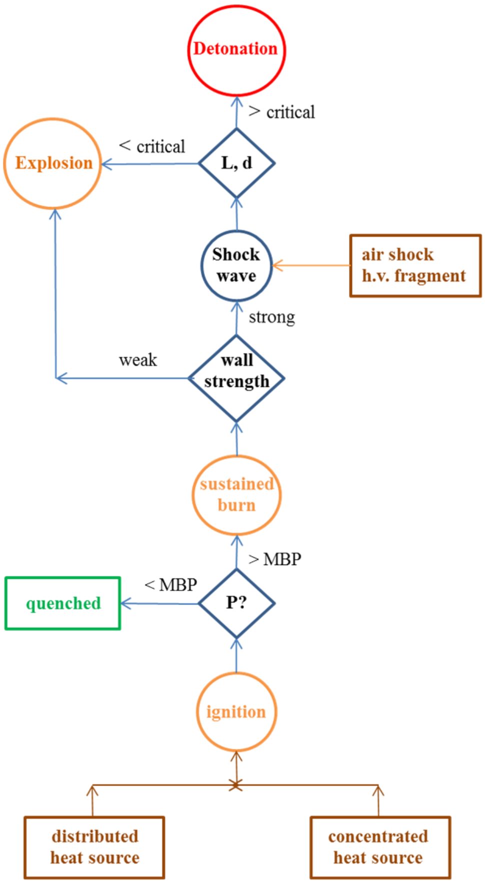
I guess the big take away is for management. Don't make the safety system so tight that people dread bringing near misses to light. Keep the resulting investigation small and as short as possible. Be sure that everyone who needs to know, knows what happened. Experience can be a very hard teacher and we should embrace it when it is gentle with us.

Be Safe & Be Well.

Correction in article placed in Newsletter 59

Reaction sequences leading to Explosion/Detonation By S.K. (Jim) Chan

Jim inserted a few missing path indicators in the figure of the article :



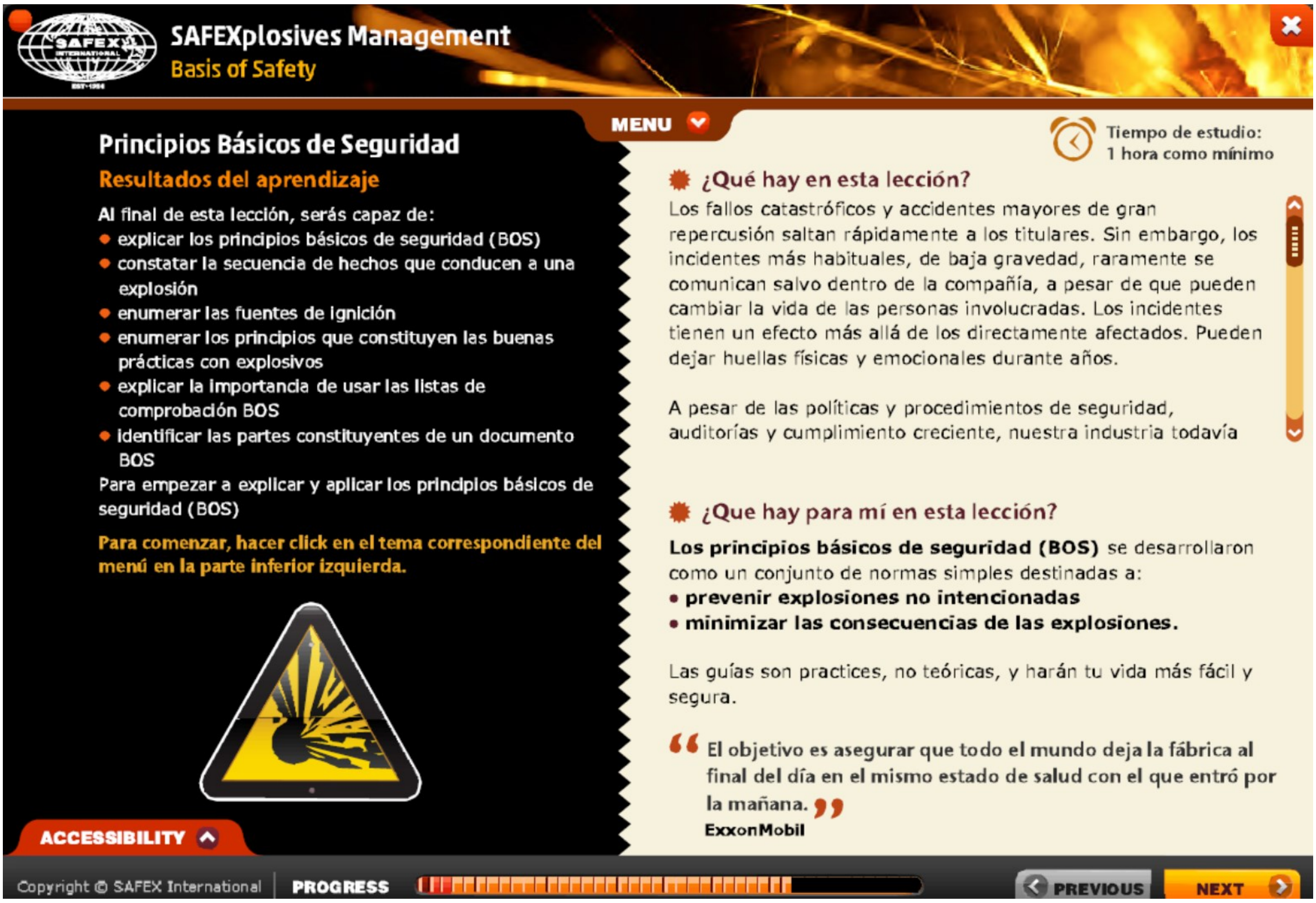
SAFEX eLearning modules by Martin Held

The SAFEX eLearning module on BOS (Basis of Safety) is NOW available in English and Spanish, Russian to follow soon

at

http://www.safex-training.org/


SAFEXplosives Management
Basis of Safety
MENU
Basis of Safety
Learning Outcomes
By the end of this lesson you will be able to:
• explain the Basis of Safety (BOS)
• state the BOS hierarchy of events
• list the sources of ignition
• list ways of minimizing the consequences of an explosion
• list the principles of good explosives practice
• explain the importance of using BOS checklists
• identify the parts of a BOS document
in order to explain and apply the Basis of Safety approach.
Click NEXT to start or choose a topic from the menu.
Study Time: About 1 hour minimum
What's in this Lesson?
High profile catastrophic failures and major incidents make the headlines. However the more commonplace low profile incidents are often not reported, despite being life changing for those involved. Incidents have a ripple effect on many people, beyond those immediately involved. They can leave physical and emotional scars for years.
Despite safety policies and procedures, safety audits, and increasing compliance, most incidents could have been anticipated. They are often caused by lack of attention to basic safety.
What's in it for me?
Basis of Safety (BOS) was developed as a set of simple, established principles designed to:
• avoid unintentional explosions
• minimize the consequences of explosions.
The guidelines are practical not theoretical, and will make your life easier and safer.
"The goal is to ensure that everyone leaves the plant at the end of each day as healthy as they entered it in the morning."
ExxonMobil
ACCESSIBILITY
Copyright © SAFEX International
PROGRESS
PREVIOUS
NEXT


SAFEXplosives Management
Basis of Safety
MENU
Principios Básicos de Seguridad
Resultados del aprendizaje
Al final de esta lección, serás capaz de:
• explicar los principios básicos de seguridad (BOS)
• constatar la secuencia de hechos que conducen a una explosión
• enumerar las fuentes de ignición
• enumerar los principios que constituyen las buenas prácticas con explosivos
• explicar la importancia de usar las listas de comprobación BOS
• identificar las partes constituyentes de un documento BOS
Para empezar a explicar y aplicar los principios básicos de seguridad (BOS)
Para comenzar, hacer click en el tema correspondiente del menú en la parte inferior izquierda.
Tiempo de estudio: 1 hora como mínimo
¿Qué hay en esta lección?
Los fallos catastróficos y accidentes mayores de gran repercusión saltan rápidamente a los titulares. Sin embargo, los incidentes más habituales, de baja gravedad, raramente se comunican salvo dentro de la compañía, a pesar de que pueden cambiar la vida de las personas involucradas. Los incidentes tienen un efecto más allá de los directamente afectados. Pueden dejar huellas físicas y emocionales durante años.
A pesar de las políticas y procedimientos de seguridad, auditorías y cumplimiento creciente, nuestra industria todavía
¿Que hay para mí en esta lección?
Los principios básicos de seguridad (BOS) se desarrollaron como un conjunto de normas simples destinadas a:
• prevenir explosiones no intencionadas
• minimizar las consecuencias de las explosiones.
Las guías son practices, no teóricas, y harán tu vida más fácil y segura.
"El objetivo es asegurar que todo el mundo deja la fábrica al final del día en el mismo estado de salud con el que entró por la mañana."
ExxonMobil
ACCESSIBILITY
Copyright © SAFEX International
PROGRESS
PREVIOUS
NEXT

Who should take it:
Anyone involved in the manufacture, storage and handling of explosives, energetic materials, and their precursors

Why should one take it:
To gain a better understanding of the hazards associated and the requirement for critical controls so that one can operate safely

How do I register for it:
Contact your administrator who will set you up as a registrant, or contact Piet Halliday at secretariat@safex-international.org

What does it cost:
EUR 100 (~USD110/GBP70)
nonmembers EUR 250

Coming in May !!!

- Explosives Incident Investigation
- The new module will consist of 2 parts with a total of 4 lessons.
- See the sneak preview
- Good news for you: there will be no additional cost to access this module once you are registered for SAFEX eLearning modules starting with BOS!
- DON'T miss this opportunity!

SAFEX BOARD OF GOVERNORS

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 March Newsletter is 3031 May 2017 and I look forward to your support** .

SAFEX thanks the following authors for their invaluable support:

- **Terry Bridgewater, Chemring**
- **Colin Wilson, AELMS**
- **Andy Begg, Convener-Expert Panel**
- **Geoff Downs, Expert Panel**
- **Ron Peddie, Expert Panel**
- **Philip Kneisl, Expert Panel**
- **Martin Held, Convener -E eLearning**