# SAFEX NEWSLETTER
# No.36 1st Qtr. 2011

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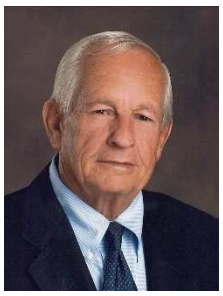
## *This is your Captain Speaking*

### David Gleason - Austin Powder Holdings



As a veteran of World War II, David Gleason graduated from Dartmouth College after the War and joined Austin Powder Company in 1955 as an apprentice blaster. He has held positions in manufacturing, transportation, storage and marketing and in 1965 was named President and Chief Executive Officer.

David Gleason has served as a President of the Institute of Makers of Explosives from 1979-1982. He moved the organization (IME) from New York to Washington, DC where it could more effectively respond to government issues and legislation. Gleason has testified for the IME before various US House Committees as well as the US Senate Judiciary Committee regarding explosives used by terrorist groups in the USA. He is active in various mining associations in the USA and the International Society of Explosives Engineers. He also served for many years on the SAFEX Board of Governors and was instrumental in moving the SAFEX head office from Paris to Geneva where it could function in a more neutral environment.

He lives in Cleveland, Ohio with his wife Kathryn. They have four adult children, all also residing in Cleveland. Today David Gleason is the CEO of the Austin Powder Holdings Company and his son Michael is the President.

Safety has been an integral part of Austin Powder for 178 years. At Austin, safety is our first priority. We are passionate about safety. We want to live it, and we want it to be who we are. We have a clear duty to protect our customers, our people, our partners, and the public. We have a long tenure, and mostly we have been successful with our safety programs. However, mostly is not good enough.

Many of these virtues can become platitudes without adequate support from the top. Top down and bottom up responsibility needs to be compelling. Hiring the right people, providing the right training, and having the right systems are all important. Our company has done many good things to further safety, and we have made some mistakes. Mistakes in our business are unlike those in other industries. That is why the leaders in our industry have to commit themselves and their entire organizations to safety. In our companies, safety and sustainability are joined at the hip. That also is why our industry has formed industry wide organizations dedicated to safety, and why our industry so actively shares and participates in these fine organizations.

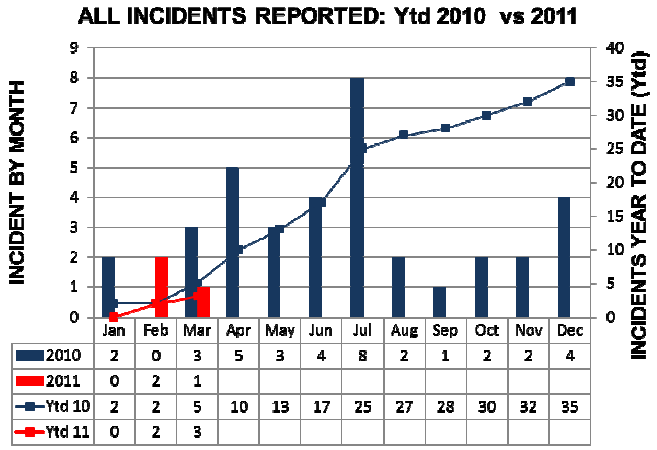
We make sure that we are fully engaged in all of the industry safety organizations. SAFEX is one of the very best. It plays a critical role in our success, and in the safety of our industry. The collective data and knowledge of these groups, properly presented and used, can make the difference. Austin will do all that we can to help SAFEX, our company, and our industry. It is not easy to stay ahead in safety. Collectively, however, it can be done.

# Incident Reporting

## Our Incident Reporting Performance

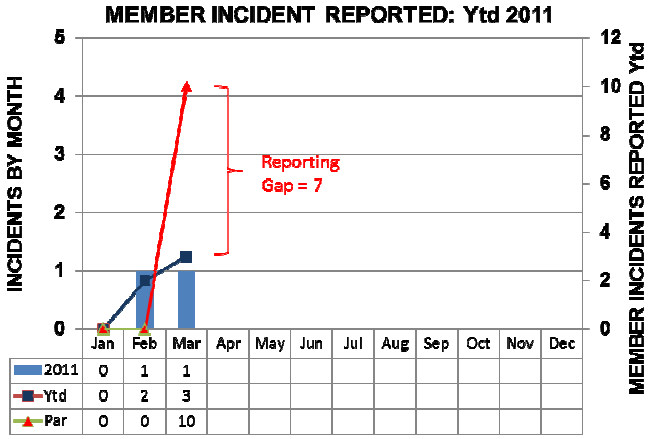
*"Every incident that is reported may prevent another from occurring. You can save a life by reporting an incident - including a near-event."*

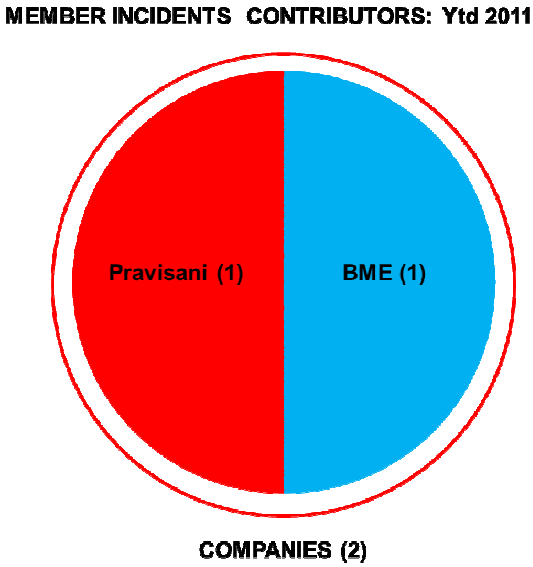
SAFEX learns from its members' experiences through the incident reports we receive. By applying these lessons we can prevent similar incidents recurring. That is why we track our incident reporting performance as follows:




**All the incidents reported**. This chart compares the sum of non-member and member incidents reported to SAFEX every month this year to the previous year. We have reported fewer incidents this year than in 2009. Are we having fewer incidents or are we not reporting the incidents we are having? Every incident not reported is a lost learning opportunity. Remember, it's never too late to report an incident.

**Member incidents reported**. Because they give us the best learning opportunities, we track member incidents (MI's) separately in the chart on the right. PAR is an estimate of how many MI's are occurring based on the severity of the MI's that occurred in a particular month. The gap between the number of MI's reported and PAR is our Reporting Gap. The Reporting Gap suggests that only ⅓ of our MI's are being reported.




**Contributors of member incidents (MI's)**. This chart identifies those members who reported their incidents. It shows the number of incidents each of these members have reported relative to the total number of MI's received. The chart distinguishes between Groups and Companies merely to indicate the performance of the two membership categories each of which has about the same number of operating units. In this chart Group members do not appear as they have not reported any incidents year-to-date (Ytd).

# URGENT

**We need your help, please!**

We have tried to send out the hotel reservations and Congress registration information earlier this time than previous Congresses. Please don't wait until the last minute before registering or making reservations. This makes it more difficult for everyone.

**Prospective delegates can help us by making hotel reservations and registering for the Congress sooner rather than later.**

## *Know the Expert Panel*

The **Expert Panel** comprises individuals who were nominated by members and approved by the Board. Such an individual must be associated with the explosives industry and have acquired expertise in specific fields. He must also be willing to make the same available to SAFEX members on a commercial basis which is agreed between the expert and the member. SAFEX merely "connects" the Expert and the Member who has a need and does not get involved in the detail arrangements.

To access the services of a SAFEX Expert, a client Member accurately defines the need it wishes the Expert to address. This requirement is captured in a Brief which is e-mailed or faxed to the Secretary General. The Member will be notified of the details of Experts that could meet this need. It is then up to the Member to select an Expert and enter into an agreement directly with him.

### SERGE EGLOFF

#### PERSONAL

**Position:** Deputy Director

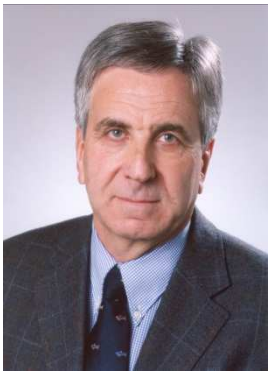
**Company:** BIAZZI SA www.biazzi.com

**Location :** Chailly / Montreux, Switzerland

**Education:** Mech. Eng .*HES* Eng., Safety & Mngt Post-Graduate *EPFL (Swiss Federal Institute of Technology, Lausanne)*

**Affiliations:** SSST Switzerland

**Languages :** French, German, English



#### CAREER OUTLINE

**BIAZZI SA:** Project
Research
Development
Commisioning
Technical Director

#### EXPERTISE

- Safety review of explosives operations and risk management
- Auditing
- Assessment
- Incident / Accident investigation
- Training

#### ASSIGNMENTS

- Project / Research / Development (more than 35 years of experience)
- Control system implementation and integration
- Explosives and Chemical plants commissioning

# Feedback from the Boardroom

The SAFEX Board of Governors meets routinely at the beginning of every year to discuss the health of the Association and the way forward. An important item on its Agenda at every meeting is a discussion of the **SAFEX Strategy**. How the Strategy should be adapted and what the Board should do to implement it better are typical questions the Board tries to answer. Other standing items include **Governance**; **SAFEX Events** such as Congresses, Seminars, etc; **Member Services**; and the **Secretariat**. The most recent Board meeting took place in San Diego, CA on 6 February this year. Besides the review of the SAFEX Strategy carried over from the previous meeting, the focus of the Meeting was the forthcoming Congress. The proposed course for developing explosives operations managers also received considerable attention.

## Explosives operations management development

### Is e-learning the way to go?

The Course the Board wants to produce to develop all levels of managers in explosives operations was assigned to a Task Group. As reported in the last Newsletter the Task Group held an inaugural Workshop in London during October last year. The London Workshop agreed a preliminary outline for the course comprising 8 modules to be presented over 4 or 5 days. A further Workshop was scheduled for San Diego prior to the Board meeting at the beginning of February this year.

During this follow-up Workshop the Task Group realised that smaller companies have limited depth in their leader group. As a result they may not be able to release potential candidates for more than 2 days. This constraint impacts on how the Course is delivered. Therefore, it was decided to move the emphasis from Classroom to Virtual (e-Learning) training. While the Task Group will examine the implications of such a change, it wants to be guided by Members. To this end it was agreed that there should be provision for a Paper on the Course to be presented during the Open Day of the Congress. The Paper will focus on explaining what such an e-Learning approach will entail and its implications for course participants. The Paper will be supported by a Brochure to obtain feedback from delegates on the preferred instructional format (Classroom vs. Virtual) and potential market (number of participants). In the meantime the Module Leaders will continue to do whatever is necessary to refine modules for either Classroom or Virtual delivery options. The Task Group recognised that it will be necessary to fast track the development of modules in time for May 2012 once delegates at the Congress have indicated the way forward.

## What to call the Course?

### Does SAFEXplosives Management work for you?

In the last Newsletter we invited readers to let us have a name for the proposed SAFEX explosives operations managers Course we are developing. We wanted something that is simple, informative and distinctly SAFEX. It is clear that the concepts of "safe", "explosives" and "management" should feature in such a name. Can the name "**SAFEXplosives Management**" work?

It is a play on words to drive home the Course is a SAFEX initiative. It is uniquely explosives in that it focuses on what is key to making *our* industry, as distinct from other industries, safer. And it is intended for managers as we want to help managers in our industry lead from the front. What do you think?

## Subcommittee refines SAFEX Strategy

There was a feeling at the Board that the proposed Strategy should be simplified and abbreviated. The Board tasked a Subcommittee to review the draft Strategy known as SAFEX 2020 and make its recommendations to the Board that will be appointed by the next General Meeting at Congress. John Rathbun (Austin International) was asked to convene the Subcommittee that comprises Steve Dawson (Dyno Nobel), Andy Begg (Individual Associate) and Noel Hsu (Orica USA).

## Nominations invited for SAFEX Board of Governors

According to the SAFEX Articles of Association, the term of office of the current Board expires at the next General Meeting of Members which will be held at Congress on Friday, 27 May 2011. The Board has appointed a Nomination Committee to assist it with the nominations process. The Committee comprises the Chairman, Claude Modoux (Poudrerie d'Aubone), Piet Halliday (AEL Mining Services) and John Rathbun (Austin International).

The role of the Nomination Committee is to establish a formal process for appointment of Governors, and its duties include:

- Approving the formal invitation for nominations of candidates from members;
- Assessing the required skills set of the Board and the necessity for Governors to be as representative of our membership as possible. Governors are expected to be active contributors to the work of the Board at meetings and throughout the year;
- Identification of suitable candidates based on references and curricula vitae (CV's)
- Preparation of a recommended short-list of candidates for consideration for nomination by the Board at the General Meeting.

Members are invited to submit nominations for Governors to serve on the SAFEX Board of Governors. All nominations, as well as the consent from the person being nominated, should reach the Secretary General via e-mail on secretariat@safex-international.org before

30 April 2011. Nominations should include the name of the proposer and be seconded by another member company. A detailed CV of the candidate must be attached. The nomination should also include a motivation as to the Nominee's ability to contribute to the Board of Governors .

### Board recognises Newsletter contributors

At its meeting the Board acknowledged the time and effort required to produce contributions for the regular Newsletter features such as *Research Notes from CERL*; *Our Explosives Regulatory World*; *Explosives Eco-talk*; and *Tony's Tale-piece*. The contributors all stand in full-time employment and write these articles because they love their subject and are committed to SAFEX and the explosives industry. The Governors recognised Phil Lightfoot (CERL), Ben Barrett (DG Advisor), Hans Wallin (KCEM) and Tony Rowe (AEL Mining Services) for unselfishly contributing to SAFEX in this special way.

## *Congress Chat*

The XVII SAFEX Congress in 2011 will take place during the week **Monday, 23 May to Saturday, 28 May 2011** in **Istanbul, Turkey.** The planning framework for the Congress was communicated to members in Congress Bulletin No.1 which we distributed in March. At the end of April we issued Bulletin No.2 in which we called for Congress Papers and requested prospective authors to submit Abstracts by the end of June. Bulletin No.3 outlined at the end of August the Congress Programme in order to give members an indication of what to expect if they attend this Congress. This was followed by Bulletins No.4 and No.5 in which prospective delegates were informed of accommodation arrangements and how to register. This Newsletter elaborates on those arrangements.

### Overview of Congress Sessions

The main Congress activities comprise the following Sessions:

**Training Session**

**Workgroup Sessions**

**Plenary Sessions**

**CEO's Programme**

**Social Programme**

The Plenary Sessions are divided into an Open and Closed Day. Participation in the Closed Day is restricted to members of the SAFEX Community. The following topics will be covered in the Plenary Sessions:

**Open Day:**

* Risk management: Hazards and Regulatory impact
* Risk management: Tools and best practices
* "Green" explosives manufacture
* Behavioural Safety

**Closed Day:**

* Incident investigation and reporting
* Incidents with initiating systems and primary explosives
* Incidents with other explosives
* Ordinary General Meeting of Members.

### Have you made your hotel reservation?

Congress Bulletin No.4 outlines the two accommodation options for which SAFEX was able to negotiate preferential rates for delegates. They are:

**Hotel Elite World Istanbul** (5-star) is the Congress venue. The rate we have been given per night per room including breakfast is Euro 195.00 (single) and Euro 215.00 (double). More information about the hotel is available at http://www.eliteworldhotel.com.tr/en/index.asp

**Hotel Elite World Prestige** (4-Star) is situated right next door to the Congress venue. Its rates per night per room including breakfast are Euro 155.00 (single) and Euro 185.00 (double). For more information visit http://www.eliteworldprestige.com/Elite_World_Prestige_Hotel_Home.html

Reservations must be made directly with Elite World Hotels using the Reservation Form that was attached to Bulletin No.4. If you need a copy of the Bulletin or the Form please contact the Secretariat at secretariat@safex-international.org

**We have only reserved a limited number of rooms in these hotels especially the Elite World Prestige (4 star)**. Please make your Reservation as soon as possible.

## Pre-Congress Activities Oversubscribed

There has been an overwhelming response to the Congress Training Session and some of the Workgroup Meetings. As indicated in our previous Newsletter no further registrations can be entertained for these activities.

The training Session focuses on the application of Basis of Safety (BOS) and Good Explosives Practice (GEP) principles in explosives operations. It is scheduled to take place on 23 and 24 May 2011 and be given by four experienced facilitators from companies who have active BOS and GEP programmes. While we have budgeted for only 30 participants, Andy Begg has accepted 39 trainees given the demand for places.

Workgroup meetings on Wednesday, 25 May 2011 will take place in two Sessions: one in the morning for three of the Workgroups and another in the afternoon for the remaining three. Workgroup leaders whose names are in brackets have now arranged their Meetings as follows:

| ROOM | SESSION | |
|---|---|---|
| | MORNING<br>09:00 to 13:00 | AFTERNOON<br>14:00 to 18:00 |
| Rumeli | Emulsion Manufacture<br>(Leigh Hart) | Good Explosives Practice<br>(Martin Held) |
| Pier Loti | Explosives Transportation<br>(Henry Merrick) | Remediation / Decontamination<br>(Paul Harrison) |
| Ayasofya | Track and Trace<br>(Noel Hsu) | TGAN Storage<br>(Noel Hsu) |

While we tried hard to accommodate everyone's preferences it was impossible to do so. Regrettably we had to ask some delegates to switch Workgroups because of unavoidable clashes. We thank them for their understanding and willingness to help us.

Workgroup Leaders will soon be contacting delegates who have registered for their Workgroups with some preliminary information about each Workgroup meeting.

## It's not too late to register for Congress

SAFEX Congresses take place once every three years. One of the reasons for doing so is to have an infrequent event at which as many SAFEX member companies as possible are present. The personal exchange of experiences and the networking that takes place among member companies from all over the world is something money can't buy. As an association SAFEX will go to great lengths to accommodate as many member companies' delegates as possible.

The fact that the Pre-Congress activities are oversubscribed does **NOT** mean the Congress is full. We can still accommodate delegates at the Plenary Sessions on the Open and Closed Days as well as partners / spouses in the Partners' Programme. The same applies to the Gala Dinner and Congress Excursion.

If your Company is not represented at the SAFEX Congress, the Congress is going to be the poorer for it. May we humbly suggest that you, too, will also lose out on a valuable opportunity to learn and grow in making your explosives workplace healthier, safer and environmentally friendlier. Some may even go so far as to say participation at the Congress can be a matter of life or death.

***Below**: A Workgroup meeting in progress during the XVI Congress in Madrid*

***Below**: Delegates arriving at the Welcome Reception during the XVI Congress in Madrid*

**IF YOU ARE NOT YET REPRESENTED AT XVII CONGRESS IN ISTANBUL PLEASE HAVE YOUR DELEGATES REGISTER NOW. WE WILL ACCOMMODATE THEM.**

## Chief Executives at the Congress

### We have a special Programme for you

Given the value of having the CEO's together at a SAFEX meeting, the Board of Governors approved a special programme for the chief executives of member companies that are at the Congress. The SAFEX Chairman, Claude Modoux, will extend a personal invitation to all chief executives that have registered for the Open Day on Thursday, 26 May 2011. The objective of this special session, which will run in parallel with some of the Open Day sessions, will be to have CEO's identify the future focus for SAFEX and its development. The CEO's Programme will commence after the Open Day coffee break and include the Chairman's Lunch hosted by Claude. CEO's should be free to join the final session of the Open Day Programme after the afternoon coffee break.

During the CEO's Programme, CEO's will be divided into two discussion groups each of which will be facilitated by a SAFEX Governor. CEO's inputs will be captured for the incoming Board of Governors to incorporate into the SAFEX strategy. It is therefore a vital opportunity for CEO's to influence SAFEX's direction and SAFEX to find out what its members want and need. **This is a key Congress activity; will your CEO be there?**

***Above*: Chief Executives at the Chairman's Lunch during the XVI Congress**

Over lunch we will have one of the chief executives give an informal talk about his experiences. The talk should serve as a discussion starter for the other executives present to share their own experiences. We will appreciate it if as many member companies' CEO's register for the Open Day as possible so that we can invite them to be part of the CEO's Programme.

# *Research Notes from CERL*

## Hazardous Contaminants of Ammonium Nitrate

**Dr Phil Lightfoot**



### Introduction

It is well known that ammonium nitrate (AN) is incompatible with a number of materials. Although AN is essentially stable and safe for handling purposes up to its melting point at 169°C, and only decomposes slowly below 200°C, it can be rendered much less stable if mixed with incompatible materials. Thermodynamically speaking, AN is metastable: it would prefer to decompose to lower-energy products with the release of heat, but there is an activation barrier preventing it from doing so (**Figure 1** on the next page). Unfortunately, a number of accidents over the years provide ample evidence that contaminants help AN overcome the barrier and accelerate its thermal decomposition.

Generally speaking, the main mechanism by which contaminants create problems with AN is to reduce its thermal stability, resulting in unplanned thermal runaway and sometimes transition to detonation. This is not always the case however. **Figure 2** on the next page shows crystals of tetramine copper (II) nitrate that had formed via the interaction of AN with copper in an electrical junction box on an explosives plant. This copper compound is explosive and rather sensitive to initiation.[1]

We have a long-standing interest in AN compatibility at CERL, going back several decades. For example, following the explosion in Walden, Ontario, in 1998, which involved the detonation of a truckload of blasting explosives follow-

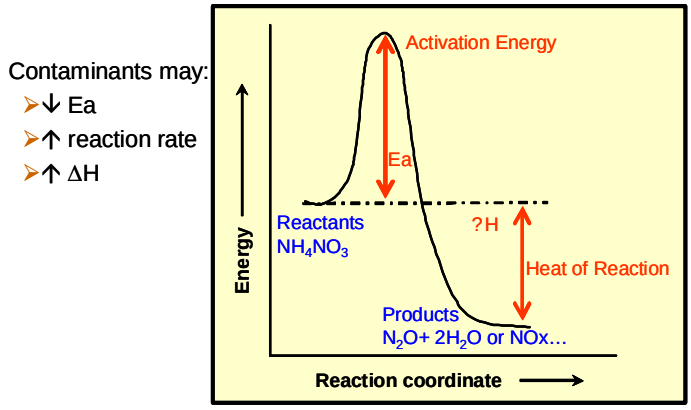



**Figure 1** ***(Above): Contaminants can render AN less stable by reducing the barrier to reaction, providing alternative reaction mechanisms, or increasing the amount of heat generated.***

**Figure 2** ***(Above): Crystals of tetramine copper (II) nitrate formed by the interaction of AN with copper in an electrical box on an explosives plant.***

1. $NH_4NO_3 \leftrightarrow NH_{3(g,\ell)} + HNO_{3(g,\ell)}$ endotherm (dissociation/vaporisation)
2. $NH_4NO_3 \rightarrow N_2O + 2H_2O$ exotherm (major reaction)
3. $NH_4NO_3 \rightarrow \frac{3}{4}N_2 + \frac{1}{2}NO_2 + 2H_2O$ exotherm
4. $NH_4NO_3 \rightarrow N_2 + 2H_2O + \frac{1}{2}O_2$ exotherm
5. $8NH_4NO_3 \rightarrow 5N_2 + 4NO + 2NO_2 + 16H_2O$ exotherm
6. $NH_4NO_3 \rightarrow \frac{1}{2}N_2 + NO + 2H_2O$ exotherm

**Figure 3** ***(Above): Multiple decomposition pathways for AN. The endothermic dissociation is favoured at low temperatures. The exothermic pathways are more favoured at higher temperatures***

ing a fire, we produced an internal review of the relevant literature in 2000.[2] In 2009, as part of our joint hazards program with Orica Mining Services, we updated the 2000 review, this time with an emphasis on AN contaminants.

The purpose of this short article is to provide a summary of our recent review. While much of the information may be familiar to the industry, we hope that it will serve as a useful reminder as to why compatibility of AN with other materials is an important safety consideration for the explosives industry.

**Scope of Review**

The review focused on open-source literature from 2000 – 2009, using common search engines (primarily Scopus, Science Direct and WorldWideScience). References prior to 2000 were taken from our internal database at CERL and include both open and unpublished sources. A total of 98 relevant items was found, with 36 after 2000. Brief notes were produced for each of the 98 items. We would be happy to provide the notes and detailed literature references to SAFEX members, on request.

**Comparing Like with Like**

There are many ways to measure thermal stability and we use several techniques to do so at CERL. However, it is important to understand when a particular techniue is appropriate and when it is not, especially when attempting to compare results obtained using different techniques. Ammonium nitrate presents a particular challenge for thermal analysis, as there are competing endothermic (heat absorbing) and exothermic (heat liberating) reaction channels for AN decomposition **(Figure 3).** The relative importance of the different reaction channels depends on the temperature and the conditions of the test. The endothermic vaporization step (Path 1 in **Figure 3**) is generally favoured at lower temperatures and so is very important for scenarios where the materials is being heated up, as in many potential accident scenarios. **Figure 4** on the next page shows differential scanning calorimetry traces for AN in an open vessel and in a sealed glass ampoule. In both cases, three endothermic phase transitions are seen as the temperature increases, the third being the melting point at 169°C. Above the melting point, however, the two traces are completely different. In the open vessel (red line), the endothermic vaporization step dominates: the sample absorbs heat and vaporizes; no exothermic reaction is seen. Based on this trace alone, one might deduce that AN presents no hazard for thermal runaway. However, in the sealed ampoule (green line), the endothermic vaporization is largely suppressed as pressure builds up and the exothermic pathways in **Figure 3** dominate as the temperature rises, resulting in an obvious heat output. For this reason, at CERL we almost always study the effects of contaminants on AN using well-sealed sample containers.

Typically speaking, when looking at thermal stability, the key parameter from a safety perspective is the temperature at which the first signs of thermal runaway are observed. It

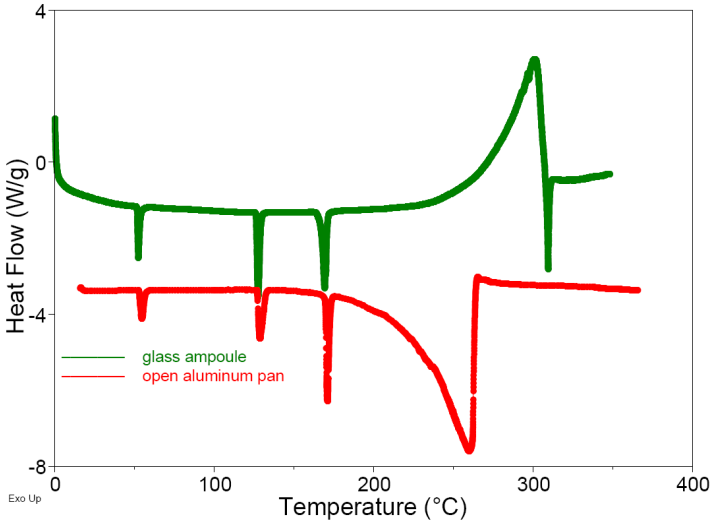



**Figure 4 (Above)*: Differential Scanning Calorimetry traces for 0.5 mg of AN in open (red line) and sealed (green line) sample containers.***

should be understood that the measured onset temperature depends also on the sensitivity of the technique and the amount of material used. In general, large-scale techniques with very low heat losses will produce the lowest onset temperatures that are also the closest to the behaviour expected at full industrial scales. For example, the Adiabatic Dewar Calorimetry technique that we have used at CERL is very sensitive and gives results that are directly applicable to large scales.[3] However, with sample sizes of 100 g and above, the work cannot be done without blast protection of some kind and runaway reactions can require a complete re-build of the instrument!

At CERL we generally prefer to use Accelerating Rate Calorimetry (ARC) for AN compatibility work **(Figure 5).** ARC is not quite as sensitive as the Adiabatic Dewar Calorimetry but, as it uses samples of around 1 g, the work can be done in a standard laboratory environment. In an earlier SAFEX newsletter, we described how ARC is both very practical and provides results that can be readily applied to large scales.[4]

**Well-established Hazardous Contaminants**

What follows is a compilation of fairly well-established hazardous contaminants from the literature, as confirmed by our survey. The compilation is by no means exhaustive, but should provide a reminder of the wide range of materials that are incompatible with AN.

*Fuels, Carbonaceous Materials*

Given that AN is an oxidizer and in light of the very wide range of fuels that can be used to produce ANFO-like explosives, it is not surprising that AN is known to be incompatible with a wide range of fuels, e.g., acetone, aniline, carbon disulfide, ethanol, ethylene glycol, waxes, oils and stearates.[5] Reactions with 'Bag paper' have been observed as low as 140°C and with cellulose starch at 100°C.[6] Mixing AN with fuels is generally not a good idea, particularly under confinement at high temperatures.

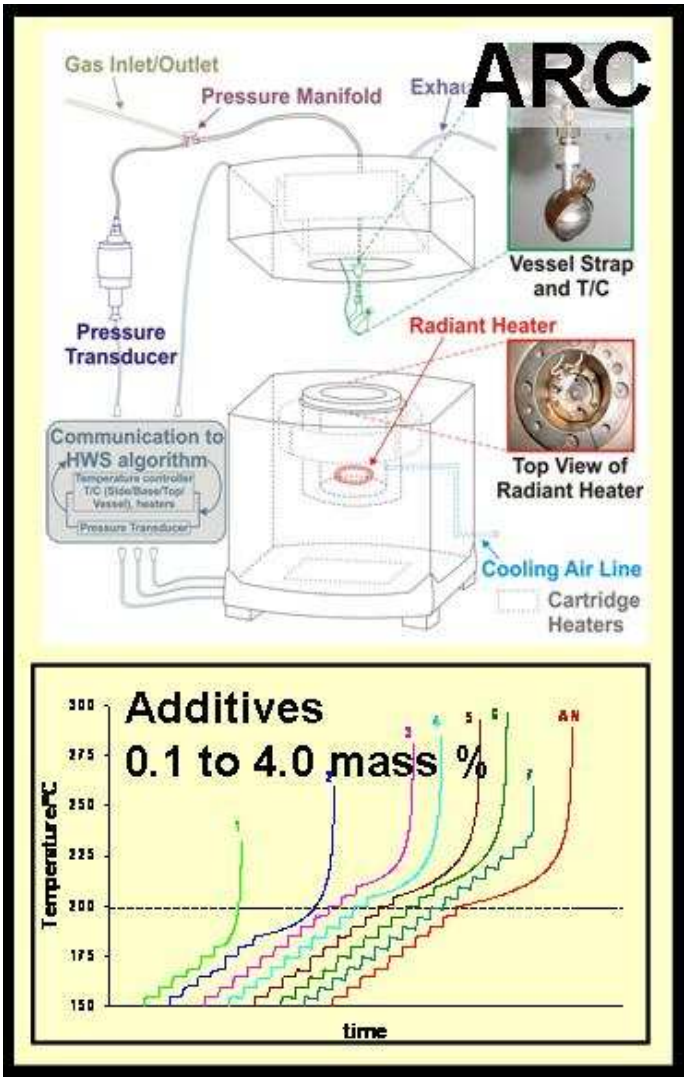



**Figure 5 (Above):** ***Use of Accelerating Rate Calorimetry to evaluate the compatibility of AN with various contaminants. Top – a schematic of the ARC technique. Bottom – examples of ARC experiments with different AN additives. With additives #1 and #2 runaway reaction begins at lower temperatures than for pure AN, whereas other additives actually delay the onset of thermal runaway.***

*Metals and Metallic Compounds*

AN is highly incompatible with some metals, metal ions and compounds containing metals. These may react directly with AN, catalyze its decomposition, or simply increase the rate of reaction due to heat accumulation. Examples include:

- Lead, copper, nickel, zinc react violently with AN below its melting point [7]
- Violent reactions have been observed with molten aluminum [8]
- The catalytic effect of metallic chromium and chromium ions on AN decomposition has been highlighted on several occasions in the literature[7, 9, 10]

*Acids*

AN melts are acidic due to the high volatility of $NH_3$ relative to $HNO_3$ (open systems containing molten AN or concentrat-

ed AN solutions tend to acidify with time). Acid catalyses AN decomposition, the rate increasing with increasing free acid content. For example, 5% nitric acid at 200°C accelerates decomposition by orders of magnitude. The same effect is seen to a varying degree with other acids.[11, 12, 13]

The incompatibility of AN with certain sulphide-containing ores, such as pyrite and pyrrhotite provides a good example of its acid-catalysed decomposition. There have been a number of unexpected deflagrations and detonations around the world, when AN-based blasting explosives have been left in contact with acidic sulphide ores. The time to runaway reaction depends on many factors and the chemistry is complex, although the situation is particularly problematic with partially weathered ores, as these tend to be most acidic.[14]

*Chlorides*

Potassium, sodium, ammonium, calcium (and other) chlorides present a very serious incompatibility with hot AN or AN solution. Chlorides significantly decrease the stability of AN through a catalytic effect. The effect has been known since at least the 1920s.[15, 16] The catalysing effect increases proportionally with the concentration of (nitric) acid and is synergistic: the total effect of chloride and acid is greater than the individual catalytic effects.[17, 18]

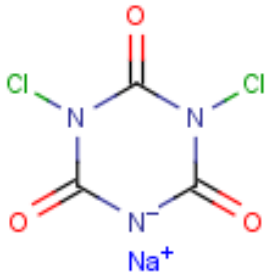



**Figure 6 (Above):** ***Sodium dichloroisocyanuric acid or 1,3-dichloro-1,3,5-triazine-2,4-dione-6-oxide. More conveniently known as SDIC.***

**Examples from the Recent Literature**

Literature emerging after the accident in Grande Paroisse (Toulouse) plant in September 2001, identified sodium dichloroisocyanuric acid (SDIC or 1,3-dichloro-1,3,5-triazine-2,4-dione-6-oxide, see **(Figure 6)** as being extraordinarily incompatible with AN.[19, 20, 21, 22, 23] Adding as little as 0.5% of SDIC to AN lowers its onset temperature for thermal decomposition by ~100°C.[24] By 2006, SDIC and its trichloro analogue were being cited as being incompatible with ammonium salts (i.e., AN) and combustible materials.[5] The di/tribromo analogues are suggested to behave similarly. In retrospect, the interaction between SDIC an AN is not surprising as SDIC, a swimming pool disinfectant, is a chlorine donor and AN is known to be incompatible with chlorides.

Apart from SDIC and its analogues, no new materials have been identified as being significantly incompatible with AN since 2000. AN compatibility is still an important issue, however, and research work has continued in the area to refine our understanding of the matter. For example, there have been two studies that addressed the effects of chlorides on AN stability.[25, 26] Even at levels of 0.1%, chloride salts have a significant effect. Two studies used DSC to investigate the effect of a fairly wide range of contaminants.[26, 27]

**Conclusions**

We hope that this short article has provided a useful reminder of the broad range of materials that are incompatible with AN. In an industrial setting, it can be difficult to ensure that incompatible materials are not brought into contact with each other. For example, as part of this work, an inventory of chemical products at an Orica AN manufacturing facility identified over 300 chemical products on site. In some cases, it might not be known whether two materials are incompatible ahead of time, particularly if commercial products such as cleaners or lubricants are used, where the actual chemical composition is not declared. Material Safety Data Sheets are useful, but not always complete, so precautionary testing is sometimes advisable. Similarly, newly developed potential additives for AN require testing for compatibility before being put into production. At CERL, we are asked to test several materials a year for compatibility with AN. The work has been going on for over a decade and there is no sign that the supply of new materials for testing will dry up soon. We plan to do some additional work on the well-known incompatibility of AN with sodium nitrite in the near future, for example.

We would be most interested in hearing from any of the SAFEX readership about cases that they might have come across during the course of their operations, where incompatibilities of materials with AN have arisen. We are very aware that not all compatibility work is done as part of an academic study that is destined for publication and would like to hear of any unusual interactions, however they were observed.

**Acknowledgements**

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# Our Explosives Regulatory World

## Test Series 8
## We've created a Monster

**Ken Price**

Ken Price has submitted this interesting and relevant contribution to our Newsletter. He was an explosives regulator for 30 years and retired as the CIE of Western Australia in 2001. Since then he is consulting as Riskom International. Its activities include working with and for the United Nations Secretariat in Geneva; consulting to governments and industry on explosives safety in transport, storage and manufacture; and testing and use of explosives and related materials. He is also the Honorary Secretary of the International Chief Inspectors of Explosives (CIE) Forum. Because of his experience and commitment to SAFEX, Ken has been nominated as an Associate Member of SAFEX.

**Background**

About 10 years ago, France proposed to the United Nations Subcommittee of Experts on Transport of Dangerous Goods that a new UN number be allocated for emulsions, suspensions and gels. The number was to apply to water based mixtures primarily containing ammonium nitrate and other oxidizers, fuel and water, which needed sensitization to become explosives of Class 1. The proposal was presented with the best of intentions: the existing tests did not recognize emulsions, suspensions or gels as dangerous goods of any class. Because they clearly had the potential to explode, some sort of regulation was needed. And the French proposal was to allocate them to Class 5, as was already being done in most thinking jurisdictions around the world.

The result of that proposal, after some five years of working groups and millions of dollars on tests could most politely be described as a mess.

The key regulatory requirements that are now causing grief around the world are:

- Excessive test requirements for Class 1.5 explosives
- Impracticable test requirements
- Serious inconsistencies in application of the requirements
- No packing instructions for UN 3375 apart from the Tank Instructions.

**Excessive test requirements for Class 1.5 explosives.**

All national and modal regulations that follow the United Nations Model Regulations, including the IMDG Code, Australian transport regulations (for explosives and dangerous goods), RID/ADR include the following special Tank Provision, TP32:

a. *For UN 0331, UN 0332 and UN 3375, portable tanks may be used subject to the following conditions:…*

b. *Suitability for transport in tanks shall be demonstrated. One method to evaluate this suitability is test 8 (d) in Test Series 8 (see United Nations "Manual of Tests and Criteria", Part 1, Subsection 18.7)…*

One has to ask, if one can legally and safely transport 1.1D explosives on public roads, and the entire load of 1.1D explosives, by definition, will mass explode if initiated, then why must 1.5D explosives (UN 0331), which by definition will also mass explode, be subjected to additional testing if transported in tanks? What will the additional testing demonstrate?

This leads neatly to the next cause of grief.

**Impractical test requirements**

In his extremely professional article in SAFEX Newsletter 34, Dr Phil Lightfoot from CERL put forward some principles for selecting tests for the UN test manual:

- Reasonably easy to perform;
- Similar to existing tests;
- Address the hazard being evaluated.

The 8 (d) (Vented Pipe) test fails to meet most of these criteria.

It could be said that it is relatively easy to perform. But only if you have a test range with two kilometres of surrounding land in which red hot projectiles may land. And a fire suppression team to extinguish the resultant fires. And no environmental restrictions to be concerned about the high volume of corrosive mists produced.

As to addressing the hazard being evaluated, it is hard to see this. The 8 (d) test requires a steel pipe many times stronger than any steel tank in use for transport. The venting is completely disproportionate to the venting of any tank in use. The fire is much more rigorous than any conceivable vehicle fire, though perhaps some marine fires may be comparable.

It is also easy to criticize the 8 (b) (ANE Gap) Test:

- The steel to perform the test is very difficult to obtain;
- The test requires cast PMMA as a spacer, which is also difficult to obtain. Competent Authorities often will not accept an equivalent attenuation calculation for using extruded PMMA;
- The prescribed boosters are not readily commercially available and some Competent Authorities are insisting on pressed boosters even though the Manual allows alternatives if calculations can show comparable pressures. (This despite the wide variation in pressure properties between the two permitted boosters).

And so to the third source of grief caused by the test requirements.

**Serious inconsistencies in application of the requirements.**

Canada is fortunate, as Dr Lightfoot acknowledges, in having a scientifically competent laboratory to support its inspectorate. This allows them, and their neighbours to the south, to classify emulsions as 1.5D (UN 0331) and still ignore the tests.

Many jurisdictions don't have this level of support and are floundering with the requirements in the IMDG Code, where the 8 (d) test is now mandatory for transport of emulsions, suspensions or gels in tanks. One regulator for example has refused to accept an 8 (d) test result because the temperature of the wood fire dropped below 800° C for a few minutes.

About 90% of the world's emulsions, suspensions and gels are produced in USA, Canada, China, Russia, Australia, South America and southern Africa. Of all those regions, only Australia appears to have adopted the United Nations Model Regulations including the requirement for Test Series 8, and the 8 (d) test for transport in tanks. Europe, as I understand it has adopted the requirements for Test Series 8, but appears to be ignoring the 8 (d) test.

To add to the confusion, the Scandinavian countries are insisting on "soft" tanks (plastics or aluminium) for transport or storage of emulsions suspensions or gels, thereby avoiding the need for testing. Their competence, and some large scale tests have convinced them that use of low melting point tanks will meet the criterion in the United Nations Model Regulations: *Suitability for transport in tanks shall be demonstrated.*

Meanwhile, if you are a producer of emulsion and wish to export it, you will be facing serious problems as IMDG requires the test and you may not have a test laboratory on your continent. And you probably can't ship as UN 0331, because that requires the 8 (d) test for tanks also. And how will you convince your Competent Authority to approve the packaging in which you consign the samples, because the designated Packing Instructions are P099 and IBC099. These require Competent Authority certification for the packaging.

**Lack of Packing Instructions**

The designated Packing Instructions for UN 3375 are P099 and IBC099:

*Only packagings / IBCs which are approved by the competent authority for these goods may be used (see **4.1.3.7**). A copy of the competent authority approval shall accompany each consignment or the transport document shall include an indication that the packaging was approved by the competent authority.*

There seems to be no justifiable reason why plastics or steel drums or steel/ plastics composite IBCs could not safely be used for Ammonium Nitrate Emulsions, Suspensions or Gels (UN 3375).

**Conclusion - So What?**

Something needs to be done! Canada and Japan are both producing alternative tests, which in Canada's case has reached the stage where new explosives must pass the Minimum Burning Pressure test before being accepted for use in Canada. This test has taken Canada some 15 years to develop to the stage where it can be applied within their own jurisdiction. While this slow and steady approach may be frustrating to those of us who are keen to see a change, it is entirely appropriate and would have been a good model to follow before the 8 (d) test came in to effect.

Perhaps something useful will come from the forthcoming IGUS/CIE meeting in Salt Lake City in early May. Perhaps policy could be given a push along at the SAFEX meeting later the same month in Istanbul.

What I would like to see is:

- Removal of the requirement for Test 8 (d) for 1.5D explosives (UN 0331)
- Clear packing Instructions for UN 3375.
- More flexible arrangements for applying Test Series 8;
- An amnesty on the application of the 8 (d) test for all Ammonium Nitrate Emulsion, Suspensions or Gels (UN 3375) for six years while the United Nations Working Group reconsiders its options and the consequences of the current requirements.

I would be happy to discuss this with any of you who are interested in the subject and who will be in Istanbul in May.

# *Explosives Eco-talk*

The impact explosives and explosives manufacture has on the Environment fall squarely in the SAFEX domain. We are as interested in the experiences members of the SAFEX community (Members, Associates and Expert Panel) have in minimising explosives' environmental impact as we are in safety and health. While most of our explosives incidents concern the safety and health impact, we are eager to learn about the environmental side of our activities. By way of this Feature we want to encourage readers to let us have contributions which create awareness of this facet of our operations as well as assist our industry to behave with environmental sensitivity and responsibility.

It is with regret that SAFEX is unable to provide an article for this Feature. We urge any readers who are able and willing to contribute appropriate material for this Feature to contact the Secretariat.

# Inbox @ SAFEX-International.org

From time to time we receive e-mails from members of the SAFEX community on a variety of issues. It is important we share such experiences and insights and if necessary debate them. Our quarterly Newsletter may just be the forum for doing so. We therefore invite ALL readers to drop us a line at secretariat@safex-international.org if they want to raise an explosives health, safety or environmental issue or comment on any of the opinions received from our correspondents.

### Mystery waste electric detonator fire

*In a recent incident reported to SAFEX a security guard noticed smoke coming from a waste preparation building in the early hours of the morning. It was followed by a sequence of 5 to 6 small explosions. The building contained about 500 waste electric detonators awaiting destruction. They were packed in their original boxes and located on top of a pallet. No other explosive or non-explosive material was present in the building. There was no electrical or thermal ignition source inside the building and no one was present. Despite a careful examination of the scene, the cause of the fire could not be determined*

**Maurice Bourgeois (GD-OTS Canada) thought about it and sent us the following observation**: There is no mention whether the detonator lead wires were shunted. If they were, is it possible that one of the detonators may not have been shunted properly? Low frequency radio emitters or a high power radio transmitting antenna near the plant may have caused a problem with an un-shunted detonator especially if the lead wires were fairly long.

# Pondering the Profession

The so-called 'Safety Professional' is an important component of the explosive industry's health, safety and environment efforts. In that case, should we not be devoting a column to them and create a forum in which we can talk about the Profession. We have referred to it as "so-called" because as we well know the work of the Safety Professional goes further than safety and often includes health, the environment and sometimes security as well. The Board of Certified Safety Professionals (BCSP) puts it this way: "*Today's safety professionals are well-educated, highly-motivated and aim to recognize, evaluate, and control risks to people, property and the environment. They must be able to apply technology and work with top management to minimize risk and ensure that safety, health and environmental performance are fundamental measures of business success.*" Our aim is that this column will be read by all but that the Safety Professionals in our industry will make it their own.

### What is a Safety Professional?

On December 13, 2008 at 9:02am "Pam S" attempted to define a Safety Professional by posting the following blog on the internet (http://www.manufacturingcenter.org/profiles/blogs/the-definition-of-a-safety )

"Sandwiched tightly between Top Brass and the teaming masses sits a wild-eyed individual madly singing a safety tune. He's the most misunderstood, maligned and unsung person in all the world of business. He's the proverbial **"SAFETY PROFESSIONAL"**

"This fellow's a little bit of all strata's....a member of none. To the employee or worker he's a tool of management; to management, he's just another employee. He finds his job interesting. He speaks for management from the "Ivory Tower" and then runs out to the Production Area, Warehouse or Work Site to hear how it sounds. He must keep his head in the "brass' board room", his feet in the muck.... a difficult position to keep from falling on his butt. He has the curiosity of a cat....the tenacity of a mother in law...the determination of a taxi driver...the nervous system of a race car driver...the digestive capacity of a goat...the simplicity of a jackass...the diplomacy of a wayward husband...the hide of a rhinoceros...the speed of a rocket and the good humour of an idiot. He has the busiest, shrewdest, plottingest, worryingest, most thoroughly washed brain of any human.

"His mail basket is always full, his desk is a constant mess and his calendar looks like cave drawings. Nobody has been given the run-around as often, has been passed so many bucks, is left holding so many bags, and has cut his way through so much red tape. The Safety Professional keeps the coffee plantations, aspirin plants, liquor distilleries and the midnight oil companies in business. He must tread lightly over mountains of eggs, knowing where to tread and, more importantly, when and where NOT to tread. You'll find him everywhere...shouting loudly over the din of a bunch of roaring engines, whispering softly in the hallowed precincts of thick-carpeted offices.

"Whenever there is an accident, the SAFETY PROFESSIONAL is often called in to explain why and how it happened. He's expected to pull rabbits out of non-existent hats; when the job is thankless, he gets it. He must engender interest in good housekeeping to people who live

in garage sale clutter ...promote wider responsibility to people who have a narrow focus ... preach safety to people who think they don't need it. He must listen to the phrase, "that's always the way we've done it," until he vomits.

"Despite all the careful planning he is usually found dangling on a deadline...he's the original cat on the hot tin roof...in the middle of a muddle and of course LATE.

"The master of understatement, he must make fire protection sound as essential as religion and an accident cost sound like the national debt. He's supposed to be a "specialist" who can breathe new life into committees and meetings... leadership into management... cooperation into supervisory personnel... responsibility into employees/workers. He must inspire without propaganda... propagandize without being obvious.

"He parks his 1980's jalopy between the boss' new Mercedes and the janitor's SUV. When he's clever, it goes unnoticed...when he stubs his toe, the world is there to see and mock it. To him a headache is normal; he'd have ulcers if he could afford them. He has more critics than Harry Truman. He meets more people who think they know more about safety than the company has conveyor hooks. He can never be right. When he simplifies, he's pandering. When he gets a little technical, he's over their head. Half the people wonder what he does... the other half know what he does but think he's doing it wrong! When an idea turns out lousy and after the blame has been thoroughly kicked between the employee/worker, foreman and supervisor, it winds up in his lap.

"More people bend his ear than anybody else's. Everybody thinks he always has time to stop and listen to a joke...hear a gripe...attend a meeting... serve on a committee. He does, and winds up taking most of his work home. He has no peer in the realm of praise, propaganda and procrastination. He knows he's right; only the world thinks he's wrong. If he has an idea, it was stolen. However, a stolen idea is research! Where else do you think the background material for this sad tale of woe about a Safety Professional originated."

Is this how Explosives Safety Professionals see themselves? Of equal importance, how do others in the explosives environment view the Safety Professional? We look forward to hearing from you. **Make this column your own!**

# *Safety Snippets*

## Dyno Nobel 2011 HSE Conference

### Back to Basics Boot Camp


From time to time SAFEX Members hold in-house HSE Conferences. The 2011 Dyno Nobel HSE Conference coincided with the SAFEX Board Meeting and SAFEX was privileged to be invited to participate in it. It is with pleasure we publish this article which Diana L. Roising, Corporate Communications Manager of Dyno Nobel Inc. wrote following Dyno's "Back to Basics Boot Camp". SAFEX not only enjoyed this event immensely but found it most informative. Being able to connect with people from our Member companies in this way is something special.

May we invite other Members to let us have similar articles on their in-house Conferences. We are aware that Orica also had an HSE Conference earlier this year which regrettably SAFEX could not attend. However, we hope to bring you an article on that Conference soon.

Those attending this year's HSE conference were handed a folder that contained a sealed manila envelope with Special Orders, dog tags, and Platoon assignment. The mission – concentrate on the basics and identify safety initiatives that will get us to Zero.

Over the two day conference, the safety leaders in attendance were armed with a new HSE Management System, new tools, and special behavior training all supported by the newly formed Zero Harm Council. Introduced at the conference was a fresh approach to focusing on safety.

In a call to action and confronted with the brutal facts from Managing Director, CEO and Chief Safety Officer, James Fazzino, all attendees were requested to draft their own personal contract on how they will achieve Zero Harm. James stated, "I want you to enter into a contract with me to achieve Zero Harm because it is important to you, your family, and your colleagues." He then outlined the elements of IPL's HSE strategy that involves four key areas, or the 4 Ps:

- **Passionate Leadership** (most important in determining the safety behavior of employees);
- **People** (must recognize and respond to their role in maintaining the safety of themselves and colleagues);
- **Procedures** (system which provides for safe work and ensures controls are applied); and
- **Plant** (designed for the function it fulfils and maintained in proper condition for safe operations).

James did not mince words and adamantly reiterated that zero means zero.

As a follow up to James's presentation, Brian Wallace, President Dyno Nobel Americas, presented the hard statistics that showed how our journey to Zero Harm has stalled and the grim reminders of the consequences. He called for a

**Left**: ***Helen Muller (SAFEX Contact for the Dyno Nobel Group) and Brian Wallace (President, Dyno Nobel Americas) take a break during the Conference***

**Right**: ***James Fazzino (CEO of IPL) discusses ZIP with Melanie Kinser from SENTIS***

partnership between management and employees and set forth a new Play Book – a three year strategic plan focused on three areas: Equipment Operation, Driving, and Process Safety Management;

Fitness for Work (ergonomics, biomechanics, and fatigue); and

Safe Thinking (everyone making safe choices).

Brian stressed the importance of identifying potential hazards through near miss reports and resolving them before they escalate into an injury. He reminded everyone that safety is an individual choice and challenged delegates with the question, "What will you do differently when this conference is over?"

Getting back to the basics, Helen Muller, Senior Director Health and Safety Dyno Nobel Americas, introduced the new HSE Management System which will provide the structure to identify hazards and minimize or eliminate the associated risks. The System is made up of ten elements and within each are various standards. All fit neatly into a big blue binder which everyone in attendance is expected to read. To make the task less daunting, each participant was given a mug with the completion deadlines listed on the side and the instructions – Read To Lead.

Lance Tinney, VP Dyno Nobel Canada, introduced the discipline of *Safe Thinking Leads to Safe Choices*. He stated, "There is no way a company can write a procedure or put a guard in place to control every possible risk in the business. What will keep our people safe are their skills, knowledge, abilities & choices and their brain. This is the focus of our *Safe Thinking* initiative." Lance continued, "It isn't about *getting* our people to make better choices, it is about *helping* our people improve the quality of their thinking and helping them make safe choices. As a result, all operations personnel will go through a new training initiative called ZIP." ZIP is a psychologically-based safety program designed to empower employees, give insight into how an individual's brain works, their thinking, attitudes and values, and will allow employees to gain control over their thinking to control the outcome, in particular a safe outcome. Lance emphasized that, "Safety is not about protecting us **FROM** something…It is about protecting us **FOR** something".

**Above**: ***Dyno Nobel's Environmental Group was recognized for their active support of their goal of Zero Harm. Left to right: Barbara Cabot, Neil Olsen, Brenda Olivares, Benoit Choquette, Fred Jardinico, and Scott Kolb.***

Steve Hessel, VP HSE Global Manufacturing & Shared Services, brought to the discussion the personal side of leadership. As a manager, Steve shared his first employee injury, his biggest personal near miss, and his first fatality. He said, "I can't imagine not sharing life's milestones with family. We have an obligation to share our safety lessons with family and friends." It was evident that Steve is passionate about safety and takes it personally. Steve's bottom line: you need to be more than compliant, you need to be committed. Steve then explained how management has set up operations Health & Safety Networks to provide leadership for the development, implementation, and execution of the Health & Safety program. He also listed the newly drafted *Rules to Live By* which are principles that are clear and simple, address high risk issues common across all IPL, identify potential consequences and are enforceable.

Turning the focus on achieving Zero Harm through implementation of Process Safety Management and through improvements in the operation of mobile equipment process, Mason Harvey, VP Dyno Nobel Americas, summed it up by saying, "If it moves, it's dangerous." He outlined the areas of focus for the operation of mobile equipment and stated, "Given the fact that 95 % of collisions and fatalities are caused by human error, how do *we* manage inside this reality?" To give our drivers the skills to deal with any situation and to better focus their attention, Dyno Nobel has chosen a vendor called the Smith

System. Their approach can be boiled down to one word, PRECAUTION. The Smith System teaches precautionary measures that help drivers to see, think, and act their way through the multitude of driving environments and challenges.

Several rotating workshops were held on the topics of job safety analysis, process safety leadership, fall protection, Health & Wellness, and an MSHA update. An interesting presentation was given on "The Myths & Realities of Fatigue in 24-Hour Operations," by William Sirois, Senior VP COO of Circadian Technologies Inc. He presented the well-established scientific research on the human biological clock which shows that as fatigue increases productivity drops. He stressed that fatigue is not being captured as the causal factor in many on-the-job accidents. Dyno Nobel will be implementing a Fatigue Management program throughout the company.

The evening Awards Banquet featured a surprise special recognition for Mike Kelly who has given 38 years to Dyno Nobel HSE. His family was present to share in the recognition. In addition, a number of sites were recognized for their practical approach to Safety. Dyno Nobel's Environmental group was also recognized for their active support of our goal of Zero Harm.

This year's conference drove home the message that Dyno Nobel is doing more than just talking about safety, it's implementing programs, processes, training, tools and a focus on us. After all, safety is about us, all of us.

## Hot work protocols save lives

Noel Hsu (Orica USA Inc) kindly brought to our attention an investigation report that MSHA of the United States Department of Labor published on their website http://www.msha.gov/fatals/2010/ftl10m06.pdf. While the incident occurred in a mining environment it does drive home some important lessons for the explosives manufacturer, especially concerning hot work decontamination. As the report is too long to publish in its entirety, we have prepared the following extract in the interests of the lessons it contains. It can so easily happen to us. Let's learn from it.

The victim worked as a mechanic for a company that mined and crushed limestone for cement manufacture. On the 14 May 2010 he was scheduled to weld plates in the workshop. A contract driller came to the shop with 12 ft. sections of 1¾ in. diameter drill steels with drill bits attached to them. He asked the victim to cut 4 ft. off each drill steel to salvage the drill bits. The driller left and heard a very loud explosion from the shop. He ran back to the shop to find a cloud of dust and the victim laying on the shop floor. The hollow drill steel exploded when the initial cut was made. The flying shrapnel from the drill steel struck the victim and killed him.

Investigators determined that the most likely cause of the explosion was the presence of an explosive type material within the inner diameter of the drill steel that was ignited by an oxyacetylene torch during the cutting process. The steel shattered along a length of approximately 8 ft. and appeared to have multiple areas where failures initiated. Additionally, the victim was not trained to perform the task assigned. A root cause analysis identified the following root causes:

- Management policies, procedures, and controls for cutting drill steels were inadequate and failed to protect persons performing the task.
- Management failed to properly task train the welder in performing his task

As a result the following corrective actions were instituted:

- Management policies, procedures, and controls were established to ensure that persons can safely perform the task of cutting drill steels by assuring the steels are not blocked. Drill steels must be drained, ventilated, and thoroughly cleaned of any residue prior to cutting.
- Management established safe operating procedures and task trained all miners regarding the procedures to safely cut drill steels.

## *Tony's Tale-piece*

A tailpiece is something that appears at the end of a publication. I guess it is derived from the tail of an animal which is (normally) fixed to "the end" of it. However, we refer to this feature as a "Tale-piece". It is not a spelling mistake but a different tale. This "tale" is about telling stories. While it appears at the end of our Newsletter, it is also meant to tell a story hence the play on words. Let me tell you what "Tony's Tale-piece" is about.

Tony Rowe from AEL Mining Services has kindly agreed to provide a regular feature based on truths he has discovered over many years in his work with explosives. He has a unique style of writing (perhaps "telling stories" may be a better way to describe it) which we hope gets a well-known message across in a new way. This Feature is there to remind readers of some explosive(s) truths in a different way!

# This fuse goes with a bang!

**by**

**Tony Rowe**

I like to visit the abandoned factories hidden in the forest. There is a kind of fellowship to be found there. As I negotiate the narrowed and overgrown tracks, old blast walls suddenly loom out of the bush like some long lost Mayan city. It is empty now, desolate. Human life has moved on. What remains has been left to the rats, the snakes, the ants, the odd buck and whatever else chooses to inhabit the abandoned walls. It is old, but not so old. It is a lot like me. We have both endured against all odds. As relics, it's true that we don't look so good any more and little still works like it once did. There are cracks and we both need some work. Our drainpipes are clogged and it will take more than a roto-rooter to sort them out. In my particular case, any sudden stiffness is probably only rheumatism. Worse still, every now and then, something falls off.

I returned to the ruins again just the other day. I remembered the old black powder plant – now gone for ever – and I thought about gunpowder. It was probably the first explosive used for blasting rock.

Killed plenty over the centuries, blackpowder has. It has killed them underground, it has killed them on surface. It has killed them in accidents, wars and terrorism. Blackpowder has even killed people on happy occasions. Think about fireworks, aren't they used for celebrations and parties? How many have died in incidents involving fireworks? They're still dying today.

The invention of safety fuse by Mr. W Bickford did a lot for the guys working underground though. Mr. Bickford was horrified by what he saw in the mines and he vowed to alter the lot of miners everywhere. He did and Bickford was granted his first patent for safety fuse during 1831. His intention was to create a safer means of firing the main charges. It worked and what he invented is still – in one form or another - in use today.

But what about its sister product, Detonating Fuse? Where did it come from and who thought of stuff like that. I thought I'd find out and then share the information with anyone who was interested.

Detonating fuse had to wait until somewhere around 1877. It was – I suppose – a natural development of safety fuse. Some early inventors even soaked Bickford fuses in nitro-glycerine. Match igniteable too. Exciting! You'd have thought that some fairly enterprising person would have developed especially long matches. Lucifers de Diablo, they would have been around 4 - 5 feet long. They might have been provided with a Hessian wrapped tip perhaps soaked in a mixture of turpentine, quicklime, black lead and pitch. Burning time would have exceeded 30 minutes; time to (a) allow the intended user to psych himself up or (b) to consume sufficient gin or its local equivalent (Dutch Courage) so as not to care.

By 1879 though, "Cordeau detonant" had emerged. This was nitrocellulose based and could be initiated using a detonator. "Hess" fuse came along in 1887. This used mercury fulminate. Wow! The great advantage of the "Hess" fuse was that it was impervious to damp. Mercury fulminate is not affected by water. It was reported to have some safety issues though. At about the same time an Italian company was producing a detonating fuse based on a mixture of nitroglycerine and nitrocellulose. In 1905 the French replaced the nitrocellulose component in their Cordeau detonant with picric acid. For some reason this variant became known as "The Yellow Peril." (It didn't really, but picric acid is yellow in colour so I made that up). After 1913 the world had turned to TNT as a filling and this version was still in use as late as 1944, but in the same year (1913) PETN began to be the explosive of choice. Around this time there were even fuses manufactured that used a mixture of PETN together with nitroglycerine. The nitroglycerine apparently "phlegmatised" the PETN. It didn't last though. By the end of World War II the use of PETN was well established and now 65 years on, it still is.

Detonating fuse detonates at around 6000 metres per second. It is extremely powerful and should a length be caused to detonate in someone's hand, that unfortunate person will be counting to 5 for the rest of their lives. The reason, the affected hand will have been effectively amputated by the force of the blast. Fortunately though detonating fuse has proved to be safe to work with and accidents are rare. Safety is best so always cut detonating fuse with an approved cutter and only connect the initiating detonator to the trunkline immediately before blasting.

Both detonators and detonating fuse contain very powerful explosives. Handle with care and initiate only from a place of safety. Remember, detonating fuse can throw stones and debris a long, long way.

# NOTICE

## IMESAFR Course: There is still space available

For delegates or prospective delegates to our Congress who are interested in the IMESAFR training we have good news: there is still space available for the IMESAFR Course. It is an ideal opportunity to kill two birds with one stone. You can experience the training without incurring extra travel costs. The Course takes place in the **Hotel Elite World Prestige (the 4-star hotel) on 23, 24 and 25 May 2011** before the Congress starts. Furthermore, the Elite World Prestige is right next door to the Congress Hotel (the 5-star hotel) and therefore very convenient for delegates regardless of where they elect to stay.

By now you know IMESAFR is a software model and tool the Institute of Makers of Explosives (IME) developed for analysing risk especially related to Quantity/Distance (Q/D) issues. The course is being arranged and presented by APT Research on behalf of the IME and Ashley Bedwell is the point of contact. **It is not too late to enroll for this Course. If you are interested please contact Ashley Bedwell at abedwell@apt-research.com**

If you want to know what IMESAFR can do for you, don't miss this opportunity.

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Boet Coetzee
**Secretary General, SAFEX International**

**SAFEX International** thanks the following for their contributions to this Newsletter:

- **David Gleason,** CEO of Austin Powder Holdings
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