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SAFEX International *Safety in explosives*



About this Newsletter

The design of the next SAFEX Congress in 2008 and how members can assist in its preparation, is the focus of this Newsletter. The Congress framework that has evolved over the years is used to identify key Congress activities. Each activity is summarised followed by an appeal to members for specific suggestions and input. The SAFEX Congress is our premier event and it can only be successful if it meets the needs of delegates. This edition

outlines the areas in which members can help ensure that the 2008 Congress is another resounding success by giving us their suggestions.

The standing features of our Newsletters are: Meeting the Governors; Reviewing our Incident Reporting Performance; and our Expert Panel at Work. The latter is in response to the positive feedback we received to the Expert Panel feature in our previous Newsletter and takes the

form of a case study. With the help of the Expert Panel we hope to publish such a case study in each edition of the Newsletter.

We conclude by introducing the focus of our next Newsletter. The CERL (Canadian Explosives Research Laboratory) has agreed to feature a report that may be relevant to our members in each future Newsletter. Read more about this exciting development.

Feature: Meet the Governors - Andy Begg



Andy graduated with a degree in pure chemistry in 1970 and joined the Research & Development Department of ICI Nobel's Explosives Company in Scotland.

His first assignment was on PETN and this was followed by work on watergels, emulsions and nitro-glycerine. During his research term he occupied various positions before being appointed Explosives Research Manager in 1978. In 1985 he was transferred to Works Manager of the ICI explosives factory in England. He was seconded in 1987 to the newly acquired ICI explosives company in

Brazil where he spent 2 years as Operations Director. At that time ICI was setting up its explosives businesses as a global Group with the head office in Canada. Andy was transferred to the group as International Operations Manager in 1989 and continued in that role until 1999. This position involved considerable travel to review and support the Group's explosives and detonator operations worldwide. As many of

the common issues were safety related, much of his time was focused on safety. This included managing an international audit programme, establishing global training programmes and chairing various technical groups and serious incident investigations. In 1999 he transferred to the Acquisitions and Mergers Group of ICI where he worked until his retirement in 2003. Since 2003 he continued to support the explosives industry as a consultant.

He joined the Governing Committee of SAFEX as the ICI Explosives representative and has maintained his involvement with SAFEX as an Individual Associate after his retirement from ICI. Andy has made his mark in SAFEX through his efforts on incident reporting and organising training events at Congress.

Andy lives in Scotland and when not consulting he spends his time pursuing a number of interests. This includes

fishing (“if it has fins I will try to catch it”), scuba diving (“in case I can’t catch it with a hook”), boating (“to get to the fish”) and cars (“nothing to do with fishing other than occasionally going off-road to fish for trout”). Let’s give Andy the last word: “Besides gardening I spend any time that is left in my workshop. Fortunately my wife, Carolyn, also likes to fish and play with boats and cars!”

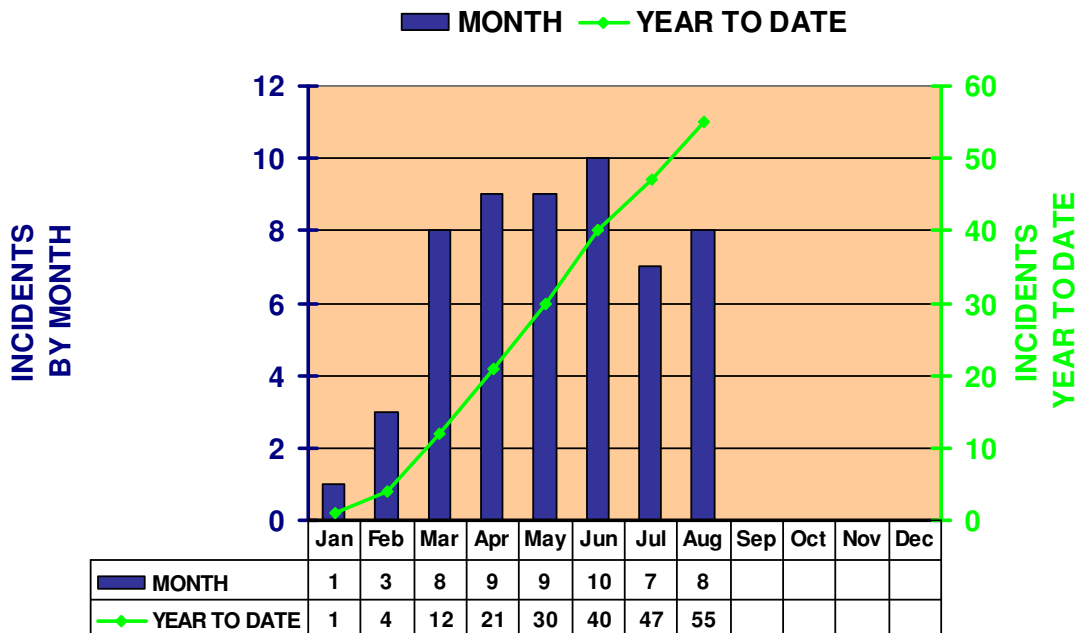
Feature: Scoring our Incident Reporting Performance

As promised in our previous Newsletter, we will regularly feature our incident reporting performance. The graph below indicates the total number of member and non-member

incidents that were reported. After recording a record number of incidents in June, the number of reported incidents dropped off during July and August. We do not want

incidents to happen; we merely want those incidents that are taking place to be reported. Remember: **Every unreported incident is a wasted learning opportunity**

TOTAL INCIDENTS REPORTED: 2006

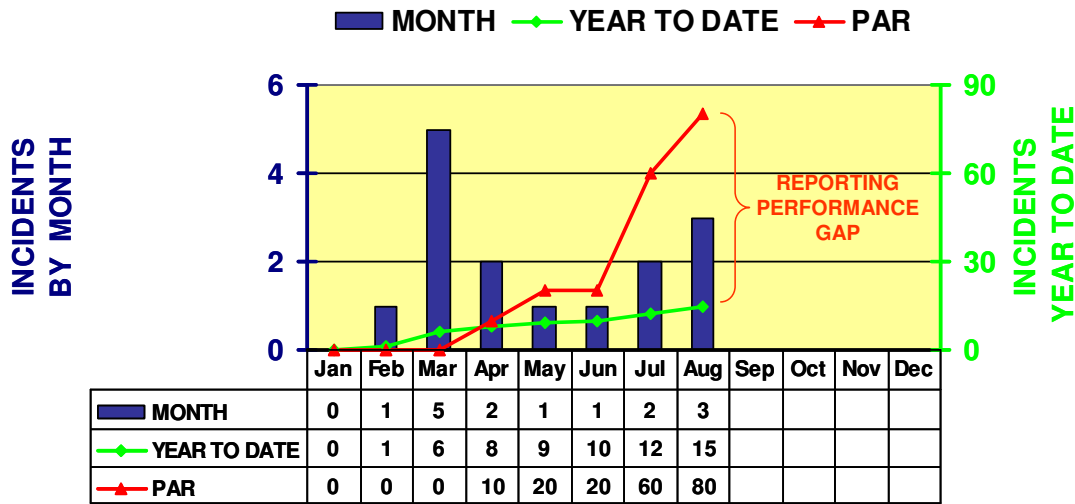


The second graph concerns member incidents. We measure them separately because our ability to learn from them is greater. The Bird Triangle gives us a way of calculating how many incidents (including near-misses) are taking place based on the

number of serious injuries that are reported. We call this “par”. The gap between “par” and the number of incident reports SAFEX receives reflects our incident reporting performance. As you can see this gap is increasing all the time. We want to

urge our members to be generous in reporting any explosive incident from which others can learn. You never know, **your report may be the one that saves a life.** Surely it is worth the effort?

MEMBER INCIDENTS REPORTED: 2006



Feature: Our Expert Panel at Work

Characterisation and remediation of a mercury fulminate plant

The client had closed a large explosives factory which employed about 3000 people and manufactured products such as NG, NC, PETN, mercury fulminate, boosters (TNT/DNT/RDX), shock-tube assemblies, detonating cord and a wide range of military products. The client wanted to remediate the mercury fulminate plant area for commercial, office and residential development and retained the expert as Project Manager to clean up the plant site.

This plant had operated from about 1920 until 1945, and for a short while during the 1960's. It stretched over an area of about 10ha with the actual manufacturing area covering about 5ha. The expert adopted a risk-based corrective action approach to evaluate human health and ecological risk and to determine the final soil clean up target levels. His plan consisted of the following 5 stages:

- Stage 1: Review historical information
- Stage 2: Characterise the Site
- Stage 3: Evaluate Data and Risk
- Stage 4: Assess and select a method
- Stage 5: Clean-up

Stage 1 (Historical Review)

Information on the plant was gleaned from the archives on site. This included a manufacturing method book dated 1937, aerial photographs dating back to 1938, information from a “grandfather” (one who had actually worked on the plant) and various reports. The plant manufactured mercury fulminate, hexanitromannitol, N° 6D and 8D detonators and N° 6D electric detonators. According to the reports the mercury fulminate plant was “decontaminated by flooding parts of the area with a calcium poly sulphide solution” during 1974. The ground was ripped and ploughed to a depth of 0.75m - 1.0m and “all mercury fulminate within reach had been destroyed but a significant amount remained”. Another report noted that “mercury droplets had been noticed in the fume duct outlet area.” Key information obtained in this way was put onto a series of plant layout drawings and overlaid on digitally corrected aerial photographs

Stage 2 (Site Characterisation)

A number of trenches were dug across areas of the plant. The trench positions were chosen to intersect strategic

areas of the plant. During excavation each trench was monitored for evidence of foreign/waste materials or residual foundations of plant buildings. Evidence was logged and samples taken for analyses. In one trench a cache of detonators was found. It was evident from inspection that some of the detonators were intact. Those that had corroded were green, showing oxidation of the copper detonator tubes. Attached to the green deposits were globules of elemental mercury. The detonators were tested for impact sensitivity and gave negative results in the “fall hammer” test. Preliminary soil samples indicated mercury levels of the order of 75mg/kg. This prompted a full characterisation exercise of the area which entailed sampling the area in a grid pattern based on the historical data and plant layout. The grid pattern was reduced in size in hot spot areas. The final state of decomposition of mercury fulminate will be metallic mercury unless sulphide-type compounds are present in which case mercury sulphide will be obtained. It was with this and the historical review in mind that it was

decided to test for total mercury. The levels of up to 785mg/kg of mercury were detected at 3m. A number of monitoring wells were also installed to assess the impact, if any, on ground water. After allowing the monitoring wells to stabilise, water samples indicated very low levels of mercury of the order of $40\mu\text{g/l}$ in the water.

Stage 3 (Data and Risk Evaluation)

The materials that could pose a risk were detonators (explosion) and mercury in the soil. The risk would vary depending on the type of mercury: Based on the human health risk calculations, elemental mercury poses an ingestion problem at levels >2000mg/kg. From an inhalation point of view mercury is dangerous at exposure levels >0.15mg/m³/h. Organic mercury at levels >200mg/kg poses a potential risk. The aquifer had been classified as a “minor aquifer” due to high natural salinity and poor yields and mercury at $40\mu\text{g/l}$ was deemed acceptable. The water is non-potable and would/could not be used for irrigation purposes and is held in a clayey geological horizon with low transmissivity. If it were to be released, it would in any event be diluted >1000 times, with storm water



Detonator cache with remnants of packaging showing green colouration on detonators

Stage 4 (Selection of Method)

The first possible remediation strategy that was considered entailed fixing the mercury by converting the elemental mercury to cinnabar (HgS) using a solution of calcium polysulphide sulphur (CaS_x). Cinnabar is a stable mineral with a very low solubility. Bench and field trials were conducted to determine the optimal concentration of calcium polysulphide sulphur to be used and an effective method/means of mixing the soil and the reagent. The bench trials worked extremely well. The field trials were, by contrast, extremely unsuccessful and no simple and effective means could be found to obtain or come close to the results

obtained in the laboratory. The main reason for this was the extremely variable nature of the soil. Where mercury occurred in globules, a degree of “armouring” was encountered. It was concluded that this technique was impractical. The alternatives comprised “leave as is”, *in situ* capping, retorting, and dig and dispose options. The latter was selected after agreeing a protocol with a company handling hazardous materials. It entailed disposing the material in an HDPE-lined monocell at their hazardous waste facility.

Stage 5 (Clean Up)

The challenge was to find an effective means of only disposing material that posed a human health risk. A cost effective approach required a reliable method to identify obvious areas requiring disposal. This can be followed by more extensive testing to refine the boundaries of contamination. A flux chamber was developed to measure real time vapour measurements on site. This provided a rapid means for finding vapour “hot spots” that exceeded human health risk levels. Vapour levels were measured using a geo-referenced grid. Where these levels exceeded



Flux chamber in operation



Mercury fulminate plant area after excavation

predetermined values the material was sent off site for disposal. Further determinations were then carried out until negative results were achieved. A final round of soil samples were taken to confirm the remaining mercury levels. As a precautionary measure all material in which organic mercury levels exceeded 200mg/kg was also sent for disposal. A total of 40 000t of contaminated soil was disposed of in this way.

During the digging of test holes and trenches a number of caches of

detonators were found. The distribution of these was totally random and it was decided to remove the adjacent eucalyptus forest of about 5ha and to excavate the entire area down to 1.5m at a large additional cost. The detonators were destroyed by immersion in a paraffin /oil solution and destroyed by burning. In addition to the detonators a small amount of “very active” mercury fulminate was found in one area. This was detonated using a shaped charge.

Once the contaminated soil was removed, the area was back filled with clean soil and compacted to the standards required by the developers. All the work that was carried out was peer reviewed by an international peer reviewer. Finally, the land was released for residential and commercial development using a rigorous land release protocol (also peer reviewed). The records of decision were made available to the developers.

Focus Article: XVI SAFEX Congress in 2008 – We need your help

The SAFEX Governing Committee will be meeting during the annual ISEE Conference at the end of January 2007 in Nashville, Tennessee. One of the important items on its agenda will be the arrangements for XVI SAFEX Congress in 2008. While the Congress only takes place in two years time the Governing Committee want to start early to make sure the Congress lives

up to your expectations The success of a Congress depends on how well it meets the needs of the participants. You can help the Governing Committee arrange a successful Congress by sharing your ideas with it at an early stage. For that reason the Governing Committee would like to receive any suggestions you may have about any of the Congress activities by

the end of the year. To help you with your input, this Newsletter will address the following questions:

- When and where will the XVI Congress be held?
- What is the framework of a typical SAFEX Congress?
- What activities are planned within the Framework and how can you help us?

The “when” and “where” of the Congress

SAFEX holds its Congresses every three years. The next Congress will take place from **Wednesday, 28 May to Saturday, 31 May 2008**; a little less than two years from now. The Governing Committee has accepted the invitation of Maxam (formerly

Union Espanola de Explosivos - UEE) to hold the next Congress in **Madrid, Spain**. At the time of writing the Congress sub-committee is identifying possible venues which the Governing Committee will consider at its meeting in Nashville. The requirements for such a venue include: the ease in getting to and from the airport and the city; affordability for delegates from

different countries; appropriate accommodation and meals; the necessary conference infrastructure and support; and **ease** of making reservations. As our Social Programme is an important part of Congress, the venue’s ability to support such a programme is also an important consideration.

Who may attend and what does it cost?

Delegates are not charged for the Congress itself as the costs are covered by the annual membership fee. However, delegates are

responsible for their own air fares/transport and will pay their own hotel bills. Single company members may nominate 2 delegates per company for the Congress. A Group member is entitled to 10 delegates for

the whole Group. Arrangements for more delegates can be made under special circumstances. Presenters of papers are not included in this number.

Typical Congress framework

Based on the feedback we receive from delegates after every Congress,

SAFEX has over the years developed a basic Congress framework. This framework is outlined in the following

table and illustrates the principal activities on each of the Congress days:

CONGRESS ACTIVITY	DAY OF XVI CONGRESS IN 2008									
	← PRE-CONGRESS →				← CONGRESS →				← SOCIAL →	
	Tues 27 May		Wed 28 May		Thurs 29 May		Fri 30 May		Sat 31 May	
	am	pm	am	pm	am	pm	am	pm	am	pm
Training session										
Pre-Congress workshops										
Congress registration										
Plenary sessions										
Discussion forums										
CEO's lunch										
Social programme					Spouses			All		

What each Key Congress Activity Entails

Training session

At the last two Congresses, SAFEX was fortunate to access world-class trainers to conduct a training course for about 30 delegates on the *Tuesday* and *Wednesday* prior to the Congress. Previous training topics included:

- XIV Congress, Amsterdam (2002) – Incident Investigation Techniques

- XV Congress, Geneva (2005) – Technical Investigation of Explosives Incidents

What can you do to help?

We are inviting members to suggest possible training topics for the XVI Congress in Madrid. You can do so by considering questions like: What

general training needs do you believe exist in the area of explosives safety/health/environment (SHE)? What training can SAFEX offer to improve the SHE performance of its members worldwide?



Pre-Congress Workshops

At the previous Congress in Geneva, SAFEX convened two technical work groups in specialist areas of safety/health/environment (SHE) concern to members. The work groups consist of about 10 specialists in each area and they meet on the *Wednesday* morning. Their purpose is to establish a knowledge base for that specialist area by pooling their resources. The outcome should ensure that critical knowledge of the specified area: (a) is not lost over time; (b) is available in a

user friendly and practical format; and (c) promotes safe operation in that area now and in future. The other feature of the technical work groups is that their work continues between Congresses under the leadership of a convener. The two work groups that were established at the last Congress addressed the following specialist areas:

- Pumping waterbased explosives (Convener: Dr. Piet Halliday)
- Remediation of NG facilities (Convener: John French)

During the Congress members requested a third work group on “Good Explosives Practice” to be established with Andy Begg as its convener.

What can you do to help?

Please indicate your interest in joining any of these specialist groups if you have a contribution to make. Members are also welcome to nominate other specialist areas in which SHE is a concern and for which work groups should be established

In a new initiative, the Governing Committee is considering running a pre-Congress workshop specifically for SAFEX Contact Persons. This workshop will take place with the other workshops on the *Wednesday* morning. It will address issues to help SAFEX serve its members better.

Participants will be given in-depth briefings on current services like incident reporting, the database and the intranet. They will be encouraged to discuss how SAFEX can improve those and other services. It will be an opportunity to meet other Contact Persons and discuss common issues.

[What can you do to help?](#)

We would value an indication of whether you would be interested in joining this workshop as well as your ideas on how to make it more meaningful for Contact Persons.



Plenary sessions

There are three **Plenary sessions**: a morning session on *Thursday* and a morning and afternoon session on the *Friday*. This is the heart of the Congress. The *Thursday* morning session introduces two SHE themes for the **Discussion forums** to develop in the afternoon. The two *Friday* sessions focus on the traditional

objective of the Congress which is to discuss and analyse incident case studies presented by members. These are closed sessions which allow members to present their incident findings in confidence to fellow members.

[What can you do to help?](#)

We would like members to suggest themes for the *Thursday* **Plenary**

session and subsequent **Discussion forums**. SHE management systems seem to come up regularly. Previous themes have included aspects such as handling explosives waste; good explosives practice; and risk management to mention but a few. The question to you is what SHE aspect of our operations, would you like to see us discuss in-depth at the next Congress?



Discussion forum

On the *Thursday* afternoon, Congress delegates can elect the Forum they wish to attend after the **Plenary session** in the morning. These Forums (two or three depending on the number of themes) will enable delegates to discuss the themes presented in the **Plenary sessions**. The

objective of these Forums is to encourage more delegate participation and interaction. Members will be invited to present short papers for discussion in the less formal environment of these Forums. In these forums delegates raise the explosives related SHE issues with which they grapple in the workplace. Forum participants then share their

experiences in dealing with those issues.

[What can you do to help?](#)

You can see how important it is for the Governing Committee to receive the issues you want to see discussed in good time so that we can structure these forums properly. Please let us have your suggestions.



CEO's lunch

Chief executive officers (CEO's) have a vital role to play in the SHE performance of their organisations. Congress gives them an opportunity of meeting together for lunch on the *Thursday* afternoon. This session is exclusively for CEO's and enables them to get to know each other, hear informally about SAFEX's future plans and comment on how SAFEX

can add value for them. During the session two CEO's informally and very briefly (5-10 min) present SHE-related experiences from which they believe other CEO's can benefit. This can be, for example, a SHE initiative that worked well in his/her organisation or a CEO perspective of a significant incident that occurred and what he/she learnt from it. The 'programme' is informal and does not

extend beyond an hour after lunch. CEO's can, if they wish, join the Forums that will be running at the time. The *Thursday* evening is free which means CEO's can spend time socially with their delegates.

[What can you do to help?](#)

CEO's are invited to let us have any suggestions that would make this activity more meaningful for them.



Social programme

In recognition of the support spouses and partners give our members and their delegates, we arrange a Social Programme for those spouses and partners that accompany delegates. There is no extra charge for this

programme. The Spouses programme entails tours and visits on the *Thursday* and *Friday* morning, leaving the *Friday* afternoon free. They then join the delegates on the *Friday* evening for what is the climax of the Congress, the Gala Dinner. The Social

programme finishes on the *Saturday* with further tours for delegates and spouses together. Arrangements are made for those delegates that have to catch flights to leave the tour for the airport at lunch time

To come: Next Newsletter

SAFEX collaborates with the CERL

The Canadian Explosives Research Laboratory (CERL) within the Explosives Branch of Natural Resources Canada is the only Canadian government laboratory dealing with commercial explosives, and one of the few such laboratories in the world.

Much of the work at CERL is aimed at improving the safety and security of explosives during manufacture, transportation and use, and by reducing the harmful effects of explosions. CERL scientists (several of whom have previous experience in the commercial explosives industry) conduct wide ranging studies on the properties of explosives and explosion effects, from small-scale laboratory testing to large-scale field tests. CERL carry out safety-related research to underpin new regulations and policies, and to help industry translate their ideas safely into commercial products and processes. Over the last few years, CERL have increasingly worked in the area of explosives security. As a result, they have very active programs in blast mitigation, and in the identification and detection of explosives.

CERL publish much of their work openly and are prepared to make it available to SAFEX whenever there are no confidentiality issues. The SAFEX Newsletter will be the vehicle for this sharing of valuable explosives safety-related information.

Many of the papers issued by CERL are lengthy and in such cases it is proposed to submit a summary report in the Newsletter. Any Members wishing further information are encouraged to contact CERL directly, who will be happy to provide it.

Some of the work reported by CERL may be in the form of interim reports with further work ongoing. As such, it may contain views from the authors that could subsequently be modified as more information becomes available and it is important, therefore, that our members read the reports on that basis.

The reports will be issued in good faith by CERL and CERL will welcome individual comments and feedback from the SAFEX membership on the technical content and interpretation of findings. This way, we will all benefit from the combined knowledge of CERL and SAFEX members

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

- **Andy Begg**, member of the SAFEX Governing Committee
- **Mervyn Traut**, member of the SAFEX Expert Panel
- **Dr Phil Lightfoot**, Manager, Canadian Explosives Research Laboratory

Boet Coetzee

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Secretary General: SAFEX International