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FROM THE SECRETARY GENERAL'S DESK

We are half way through 2016! What have we achieved or not achieved in these six months? The global economy remains under pressure, and the explosives industry is straining under the impact of low commodity prices. Big mining companies are restructuring and rebalancing their asset base-it is a period of instability for the work force as redundancies affect the whole of the industry. Losing key employees will eventually impact on safety. Training and retraining to build up experience bases takes a long time and impacts on productivity, safety and quality. A judicious approach to the rebalancing of the employee structure is thus required.

This quote from the early 1900's is very pertinent:

Every accident is a notice that something is wrong with men, methods, or material — investigate — then act.

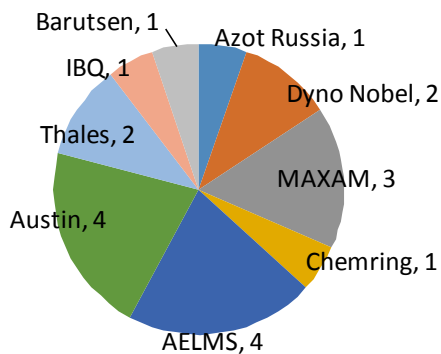


CONGRESS XIX

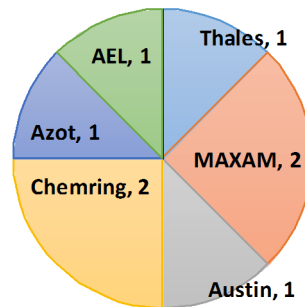
NEXT CONGRESS
15-20 May 2017 at the
Scandic Marina Hotel

Below are the graphs comparing 2015 (whole year) to 2016 (half year).

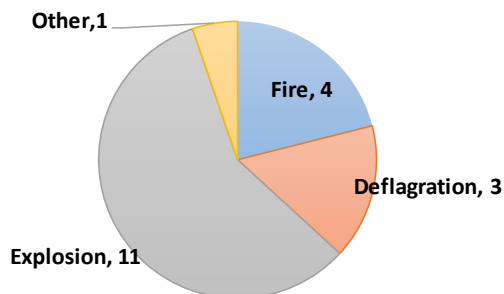
Incidents Reported by Member Companies 2015



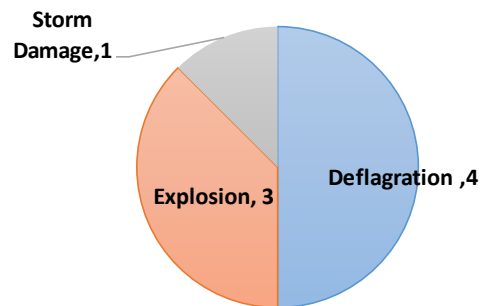
Incidents Reported per Member Company June 2016



Type of incident 2015



Type of incident June 2016



It is clear from these graphs that the industry is tracking very close to last year's incidents ,should the trend for the rest of the year continue .**It is up to all of us ,however,to share incidents small and big to spread the learning and ensure the above numbers get smaller over the following years !**

SAFEX attended 2 meetings over the last 3 months , IGUS/CIE in Switzerland and the IME in the USA. Ken Price describes in his article the success of the IGUS/CIE Conference later in this Newsletter.

The preliminary programme for the upcoming SAFEX Congress in Helsinki has been developed and as in past years it consist of the following:

Days 1 and 2: Incident Investigation Training Event

Day 3: Work Group Meetings

Day 4: Open day plenary sessions

Day 5:Closed day plenary sessions.

The editing teams are currently evaluating all the abstracts received and final papers are expected no later than the end of August 2016. As is the tradition an event will be organised on day 4 in which the CEO's and Senior Executives can share common issues around safety , health environment and security.

Noel Hsu also comments on the Work Groups under his leadership's progress in an article .An update on the rest of the Workgroups will be published in the next Newsletter

Further information on the Congress will be communicated as it becomes available over the forthcoming months.

SAFEX WORKGROUPS UPDATE

BY

NOEL HSU

Technical Grade Ammonium Nitrate Storage

This Workgroup (WG) was created to craft a document on Best Practices within the SAFEX members who are manufacturers of technical grade ammonium nitrate (TGAN). The WG consists of global manufacturers of TGAN who have contributed their individual companies' practices that relate to safe storage of TGAN. The outcome of the sessions was the Good Practice Guide for TGAN Storage which was released in 2010. It was accepted that this GPG would be a live document, and the WG meets once a year to update the information. The most recent release of the TGAN GPG is Revision 2, which was published March 2014. After the completion of the GPG on TGAN storage, the WG determined that the next area that would be of value to the SAFEX members is a GPG on the transportation of TGAN.

Since its release the GPG for TGAN storage has been referred to by regulators in Canada. Following the accident at the West, Texas facility which involved the mass explosion of fertilizer grade AN, a Chemical Advisory was issued jointly by the US Agencies EPA, OSHA and ATF, which also made reference to the SAFEX GPG.

Technical Grade Ammonium Nitrate Transportation

The same Workgroup that crafted the GPG for AN Storage has now begun work on a Good Practice Guide for TGAN Transportation. In this Guide, the WG is considering all common modes of transportation of TGAN, namely road, rail and marine. Within each transportation mode the Guide will outline the necessary precautions to be taken to ensure that the TGAN is transported safely from source to destination. The WG is planning to have this GPG published by the 2017 Congress.

The Explosive Transport Workgroup will be incorporated into the AN Workgroup after the Congress in 2017 to continue developing GPG's for all explosives transport.

Traceability of Explosives and Explosives Articles

The European Union is the largest bloc to mandate the labelling and recording of explosives articles. This Directive was fully implemented in April 2015. Outside the EU, Brasil and China, among other countries, had labelling requirements. The labelling format that the EU required is different from what other countries had in place, which in turn were different from each other.

The Workgroup to address this area met at the 2014 Congress and the view expressed by the members was that a single global format would benefit both the regulators and industry. The Institute of Makers of Explosives (IME) based in the USA, has proposed a global format based on the EU Directive. Given that this initiative was underway, the WG decided that SAFEX would monitor the progress of IME's proposal since their objective is completely aligned with that of SAFEX.

International Group of Experts on the Explosion Risks of Unstable Substances (IGUS) – - Explosives, Propellants and Pyrotechnics (EPP) Working Group.

16th International Conference of Chief Inspectors of Explosives.

By

Ken Price

The above two groups held their annual meetings together in Bern in April 2016, the former chaired by Ed de Jong from TNO, and the latter jointly chaired by Konrad Schlatter and Claude Muller of the Swiss Police. This paper will give you a brief outline of the highlights of the meetings.

By way of background, the participants are senior regulatory officers and technical testing laboratory experts and their industry counterparts.



The EPP Working Group of IGUS was originally formed as a consultative group for OECD to advise the United Nations Committee of Experts on Transport of Dangerous Goods, a role it still performs though it is no longer associated with OECD. The aim of IGUS is to exchange information on the behaviour of unstable substances, with respect to production, handling, storage and transport. The CIE Conference aims to provide safety and security benefits to the public and industry by promoting best practice in the field of explosives regulation. The two groups complement each other very well, blending practical research with regulatory practice.

Some of the topics discussed are reported below.

REVIEW OF CHAPTER 2.1 FOR GHS

Chapter 2.1 of GHS was drafted in the mid 90's and is only now starting to come into effect. And as it does so all its inconsistencies and imperfections are becoming apparent to the explosives industry. For example, why do we not have to placard Hazard Division 1.5 explosives with a Class 1 dangerous goods diamond? The intrinsic hazard is explosive, but for some reason GHS does not require the exploding bomb symbol.

These matters and more were discussed as a lead-up to the meeting of the United Nations Explosives Working Group (EWG) scheduled for June 2016. Sweden and the Australian Explosives Industry Safety Group (AEISG) are leading the charge to remove some impractical requirements from GHS and thereby make the regulatory requirements that will flow from adoption of GHS more in line with industry safe practice. More on the outcomes of the EWG meeting in the next newsletter.

DESENSITISED EXPLOSIVES

We all know what desensitised explosives are, right? They are things like TNT or RDX, that are explosives in their own right, that have been desensitised, usually by the addition of water or some other phlegmatizer. But apparently some interpreters of the law believe that because the mixture of water wet TNT, for example, was made to ultimately create a practical effect by explosion (albeit only after drying off the water) then the mixture meets the definition of explosive in the United Nations Model Regulations (and the GHS) so therefore the water wet mixture should be in class 1 and not class 4. Trying to make this crystal clear was another issue discussed in the EPP meeting and which will also be discussed in Geneva in June.

BONFIRE TEST FOR EXPLOSIVES

Jon Toreheim from Bofors in Sweden informed the groups of a gas burner Bofors developed that would comply with the Manual of Tests and Criteria and the NATO criteria and which could be made from readily available materials. The cost of making a burner is approximately 1500 Euro and it allows the operator to do about 2-4 tests per day. If you want further details, contact Jon at jon.toreheim@testcenter.se

PARTICIPATION FROM CHINA

There was extensive participation from Chinese government and industry in the meetings.

Mr Xiao Chunquan gave a very informative talk on the directions the regulators will be guiding industry to improve safety over the coming years. Like the rest of the world, resources consumption has dropped and so the explosives industry is under great pressure to deal with this diminishing market. Regulators need to be aware of this when applying safety laws to ensure that industry standards don't slip.

Complementary to Mr Xiao's talk, speakers from Nanjing University, Shanghai and the Safety Technology Research Institute Of Ordnance Industry spoke on several accident investigations that took place over the past year.

KOENEN TEST

Canada and others have been doing extensive work on the Minimum Burning Pressure (MBP) Test for explosives and some have seen this as a potential replacement for the Koenen test. There was support for the use of the test, but significant opposition to the proposal for it to replace the Vented Pipe Test (VPT) and Koenen because the tests measure different things. This has a way to run, but with Canada already applying the MBP test and with general agreement that Canada's criteria for applying the results of the test are appropriate, it looks like it will only be a matter of time before the MBP test is introduced into the UN Manual of Tests and Criteria.

EXPLOSIVES TRANSPORT LIMITS IN EUROPE

Once again Europe is contemplating the quantities of explosives that may be carried on public roads. The current limit is 16 tonnes and the proposal is to allow up to 20 tonnes. Comments in the meeting were that regardless of emotional objections to increasing the limits, various studies have shown reducing the quantity per load results in more vehicle movements and thus increases the probability of an accident whereas the change in quantity carried does not produce a commensurate increase in the effects of an accident. There was general support for the proposed change.

FIELD TRIP

As customary for IGUS/CIE meetings there was a field trip. In Switzerland, where better to visit than Claude Modoux' black powder mill at Aubonne where several of us caught up with the Treasurer of SAFEX and enjoyed a pleasant lunch at a local vineyard.



The Black Powder Factory



Claude explaining how the Charcoal Furnace Works

NEXT MEETING:

Plans are being developed to hold the next meeting in Xi'an, China in April 2017. Contact the author if you want more details at : ken@riskom.com.au

THE IMPORTANCE OF NEAR MISSES REPORTING

by

Enrique Barraincúa

The cornerstone of any Safety Management System is the ability to foresee dangerous situations and to adopt measures in anticipation. If this statement is true as a general assumption for any kind of industry, it becomes a golden rule for those who devote our careers to prevent risks in the difficult field of manufacturing and handling of explosives.

The sequence of events that leads from the mere presence of explosives at a given place to a final non intentional explosion comprises the existence of sources of ignition and a reaction that is able to propagate. Our processes are designed and supervised in such a way that tries to ensure that the existing conditions do not allow the sequence of events to happen.

However, the environment of the process does not always lend itself to make this task easy. From the quality of raw materials, passing through maintenance conditions and undesired changes of design, to the final complacency of operators and supervisors, there is a slippery path that we must negotiate daily.

The purpose of this article is to highlight the importance of a thorough reporting of near misses to achieve this goal. The traditional safety theories have been warning us for decades against the unnoticed events that, had they been exposed, could have told us where the real risks were.

The anticipation we seek will not come from the ability to foresee the future, but from the disciplined and quiet work of detecting, recording and assessing situations that have already taken place in the past.

Examples of them can be notorious: spills of sensitive explosives, signs of decomposition such as fumes, small initiations. But others, more subtle, can be much more frequent and they can conceal equally high risks: unearthed equipment, incorrectly stored explosives, poorly designed barriers and defenses.

Sometimes, the boundary between near misses and unsafe acts and dangerous situations may not be clear. However, this distinction is not important. What is vital is the fact that we can count on an early detection.

And, once again, the detection force that will enable us to learn from all those situations is made of committed people that have been adequately trained and motivated.

Need for an International Code on Explosives and IExpE Role in developing it

by

Roberto Folchi , Hans Wallin, NITREX, Italy and Ken Cross, PICRITE Ltd, UK

Abstract

Having so many norms and technical content of legislation to deal with is a problem that an explosives engineer has to face, especially when working internationally. Each country has its own norms and legislation, sometimes even each region or state, as if the physics of explosions, rock, concrete, and masonry characteristics could change across the borders. Norms and laws

may be out of date, being mainly developed at the beginning of the previous century and adjusted, piecemeal, in a constantly changing technical and political context. Adjustments are often adopted in a hurry, due to a problem arising such as international terrorism. Sometimes also, norms are not harmonized with those they amend, so require explanations and further adjustments in a vicious circle increasing confusion, complexity and depressing the explosive industry.

A similar situation occurred years ago for explosives transportation. Since then, an international code for the "transportation of dangerous goods - explosives" was summarized in the United Nations "Orange Book." This was published to harmonize legislation all over the world, making possible the safe transfer of explosives in an international market. The adoption of this common code for dangerous goods/explosives transportation became easier as the list of the joining nations increased because emulation, more than comprehension, played an influential role at the political level where the code was to be adopted and incorporated into the national legislation.

The time is now ready for another similar international code for the storage, internal movement and handling, processing and disposal of explosives in the mining and construction industries, as the "Orange Book" is for the "transportation of explosives." (from this point on, we will refer to explosives as Explosive Substances and articles [ESA]) To this could be added a harmonized code of basic principles which easily can be adopted as a starting point for any local legislation relating to "Quantity and Separation Distances FOR EXPLOSIVES DETONATION / ROCK OR CONCRETE BLASTING: "computation of iso-damage area due to explosives accidental explosion". Those changes from each nation, illogically because physics cannot change just crossing the borders. In Italy we scale distance with the square root ($\sqrt{0,5}$), in America with the cube root ($\sqrt[3]{0,3333}$) ... Harmonization will produce a benefit for the industry and for all members of the IExpE, ISEE, EUExcert and SAFEX organizations. Instead of wasting time in facing problems which are more "bureaucratic" than technical, explosives engineers could have more time left to deal with real technical problems, increasing quality and quantity of the job being delivered and also profitability, increasing a competitive margin against other mechanical excavation/demolition techniques and technologies.

As well-known international associations of explosives engineers, IExpE, ISEE, EUExcert and SAFEX should promote and be directly involved in the production of such a harmonization of norms on the storage, handling and disposal of ESA, by publishing an international code of practice, to be adopted worldwide as a code or even as technical content of national legislations, exactly as it is for the "Orange Book" as A.D.R. (transportation of dan-

gerous goods on road), I.M.D.G. (transportation of dangerous goods on waterways), R.I.G. (transportation of dangerous goods on railroad).

The aim of this article is to review briefly the international situation regarding norms and legislation on the civil use of ESA and to promote, among the international associations' members, a discussion on the matter. It is also to propose a program for the compilation of a database of international norms, as a source for the development of such an international code on the use of explosives in mining and the construction sector as a worldwide replacement of the national norms and legislation.

The Italian and European experience...big deceiving efforts

A collection of the Italian legislation, norms and related explanatory on explosives

Taking advantage of the free time of an old mining engineer colleague and good friend, due to his retirement, we managed to convince him to put together, in a single book, all the legislation, norms and related explanatory notes from the police department and fire departments of the Italian Ministries of Internal Affairs, Industry, Labor, and Public Works, court sentences, etc. related to the explosives sector. Our colleague, having served for 25 years as chief of the mining safety department of the Ministry of Industry, and also as a component of the central advising committee for explosives of the police department of the Ministry of Internal Affairs, was well qualified for the task.

We felt the need for the Italian explosives industry, to have a single source of reference in which to find all norms and laws. This complexity is due to their constant modification over the years, starting in 1890, and their integration with the European directives in a huge, confused, "mass" of mandatory, sometimes contradictory specifications. In this situation, the common explosives user and also the local police officer issuing licenses for the use of explosives got "confused." This leads to explosives licensing and control procedures differing from one city to the next. Italian explosives engineers working in the explosives sector, when confronting authorities for licensing, are frequently working with licensing decisions that are contrary to national legislation mainly from lack of knowledge from their side and also from the police officers. Suffice to say, that for a stranger, this bureaucracy, overcome by the "usual practice," is overwhelming.

This book on explosives legislation, extracting, collecting, actualizing, harmonizing and pointing out discrepancies in the European directives, technical content of national laws and explanatory notes (but not including the industry norms which are commonly used in Italy, such as the Italian UNI, the European ISO, the German DIN and the Swiss SN, took one year to be completed and totals more than 700 pages. Reference to the industry norms would have added another 200 pages.

First checks with the key people of the sector proved that even if there was appreciation for the effort to put together and harmonize the matter in a single source of information, the main feeling from this book was discouragement because of the “excess” of information. Apart from rare cases, the previous situation remained unchanged, again with confusion and discrepancy against the law in conduct of the authorization procedures and job execution.

If we accept that regulation of a high-hazard industry, i.e. with a low-probability of incident but high-impact / consequence, will necessarily require many pages, it is essential that the regulations are easy to navigate.

The “EUExcert” project experience

We took part in the “EUExcert” project, financed by the European Community, to set a European shared program for education, training and certification of personnel engaged in the explosives industry in its whole. This project started in 2003, continued in 2006 (EUExcert II) and again in 2009 (EUExNet) with partners from ten European countries and also the European Federation of Explosives Engineers (EFEE). The fourth project in the programme is called EUExImp and is intended to implement the occupational standards agreed at the end of the EUExNet project in one industry partner organisation in each of 5 of the project nations from the previous projects.

The idea for the EUExcert programme arose from a perception and also evidence after some fatal accidents, that competence in the explosives sector is being eroded (we would say that this could probably be confirmed also for the rest of the world) and many experienced and knowledgeable personnel are retiring or nearing retirement. For the explosives specialists left, activity is increasing at the international level, to maintain explosives capability, national security, and to sustain a competitive industry.

What we found when we met with the colleagues in the programme was that in each of the member nations, there was a situation similar to the one above described for Italy, with many old norms partially readjusted and not harmonized, in a mass of specifications not always so clear as needed.

“Dividi et impera”: division makes the explosives industry weak

We would like to stigmatize on the evil of division by quoting the ancient Roman locution: *Dividi et Impera*. Ancient Romans encouraged division and also competition among their neighbors to reduce the risks of their

alliance against the Romans. For themselves, they encouraged the opposite attitude of unity, in search of simplicity, cooperation, coherence, uniformity and effectiveness.

We believe that the civil explosives industry should adopt this attitude of the ancient Romans.

Our suggestion is that the international associations, as a worldwide expression of the civil explosives industry and members of the organizations, promote an “International Explosives Code” aiming to simplify and reduce the number of technical codes and norms, and also to promote cooperation and coherence, to find a way to achieve this goal together, which will drive uniformity and effectiveness in operations for the sake of the explosives industry on a global scale.

The UN International Ammunition Technical Guidelines: An Example to Follow

For an excellent example of how an international code for the civil use of explosives could be developed, reference could be made to the IATG (International Ammunition Technical Guidelines), published by the United Nations Office for Disarmament Affairs (UNODA) together with the United Nations Mine Action Service (UNMAS). They took less than four years to complete, from 2008 to 2011. They were written by qualified expert consultants with the support of international, governmental, and non-governmental organizations. The documents were reviewed and approved by a Panel of eight UN Member States.

In some 900 pages, the matter (very close to that of the civil use of explosives) is exposed in an exhaustive, simple and clear text, with formulas, pictures and forms, to constitute a practical and effective international reference for technicians, easily accepted by rulers. The purpose of this guideline was to provide an internationally shared method for the safety and secure management of ammunition. They are structured in 12 volumes addressing the whole life management of ammunition, from nomenclature to risk assessment, from transport to storage and destruction. This constitutes a comprehensive code summarizing, at the highest technical level, the hundreds of thousands of pages of each single national code and legislation put together.

The International Ammunition Technical Guidelines provide a frame of reference which encourages national authorities responsible for conventional ammunition stockpile management to achieve and demonstrate effective levels of safety and security. They provide a common language, are based on sound and accepted explosive science, recommend an integrated risk and quality management system, and allow for a progressive, integrated improvement in safety and security in line with

available resources.

A Proposal for International associations of explosives engineers

How could international associations help to achieve this goal? The proposal is to form an “International Committee” in conjunction with other strategic partners, e.g. UNODA/UNMAS, and a small but representative group of stakeholders from each continent. Individual nations would have a “National sub-committee” working together in listing, collecting, digitizing with a common format, all the legislation and norms in force in that country.

Data could be shared in a special SAFEX-ISEE-IExpE web-based database. The international committee should define, in sequence, titles and draft content of an “ISEE-IExpE-SAFEX Explosives Code,” starting from a “nomenclature” chapter. ISEE already have a code for “good practice for ground vibration monitoring,” but we are missing a unique code for “safe ground vibration thresholds for civil constructions above ground” and “underground.” This is needed because each different norm also provides macroscopically different values, with no reason why.

The structure of the IATG code may serve as a reference, since its structure and some of its titles could be followed. A proposed index could be the following:

Introduction and Principles of Management of Explosive Substances and Articles

- Introduction to International Code for Management of Explosive Substances and Articles
- Index of Risk Process Levels
- Policy Development and Advice
- Terms, Definitions and Abbreviations
- ———UN Explosive Hazard Classification System and Codes
- Explosive Substances and Articles Faults and Performance Failures
- Bans and Constraints
- Formulae for Explosive Substances and Articles Management
- “Air overpressure safety limits for humans and animals” and the same “in water”;
- Principles of ground vibration safety limits

Risk Management

- Introduction to Risk Management Principles and Processes
- Quantity and Separation Distances for storage and processing of explosive substances and articles.
- ———Quantity and Separation Distances FOR EXPLOSIVES DETONATION / ROCK OR CONCRETE BLASTING: “computation of iso-damage area due to explosives accidental explosion” with threshold limits for overpressure in air, primary and secondary fragmentation, ground vibration, gas release and overpressure in water. How many discussions with local authorities and project supervisors, could be saved if safety distances could be set in a code?
- Explosives facilities and worksites (with minimum requirements in terms of competencies, insurance, equipment, etc.)
- Safeguarding of explosives facilities and worksites
- Fire Safety at explosives facilities and worksites

Accounting for explosive substances and articles

- Inventory Management
- Lotting and Batching
- Import and Export of ESA
- National Controls over the End-Use and End-User of Internationally Transferred ESA
- Tracing of ESA etc in the same vein as UN IATG

“Good practice in the use of explosives for tunneling,” the same

for “bench blasting,” “shaft sinking” and also for “underwater blasting”; “reporting activities with explosives” etc.

Each National committee could propose a draft code for each of the above topics, based on the data sampled at the national level. The International committee would review and consolidate them in a single document choosing the best solution/practice.

Conclusion

A barrier to international development of the explosives sector is determined by the huge and frequently confused mass of technical content of legislation dealing with the use of explosives for the mining and construction industries in each single nation which inhibits trans-national work.

A study of thousands of pages of laws and norms may be needed to execute one job, in each single nation.

As the largest international associations of Explosives Engineers and Producers, the IExpE, ISEE and SAFEX should play an important role in reorganizing this situation by the supporting and participation in the completion of an international code on the

storage, processing handling and disposal of explosives in the civil explosives industries. This code should summarize and actualize all norms and technical content of the national legislations into a unique document to be adopted at the international level and to make reference to in national legislation. This approach was followed many years ago with success for the transportation of dangerous goods, with the publication of the "Orange book" by the UN. Again, recently, a clear example which could be followed by IExpE, ISEE and SAFEX is given by the International Ammunition Technical Guidelines whose structure and content seems to be close to that of a code that could be developed for the use of explosives in the mining and construction industry.

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CE Registration Grows Legs

By

Jackson Shaver

Introduction:

In 2010, a job assignment introduced me to the CE registration process for the introduction of pyrotechnic articles in Europe. I was fortunate to have a highly qualified and capable team in Europe to lead the effort. Discussions with the Federal Institute for Materials Research and Testing, BAM (DE), the Health and Safety Laboratory (UK), other regulatory bodies and qualified consultants regarding the CE registration requirements and implementation schedule proved very helpful. I remember thinking that the Directive 2007/23/EC (placing on the market of pyrotechnic articles) would grow legs and that CE registration requirements would not be limited to the EU market. In 2012 requests for pyrotechnic article CE registrations from non-EU companies and countries began to come in through the sales team and I realized quickly my expectation was validated. The requests for guidance were not limited to the automotive industry as peers from other pyrotechnic and explosive manufacturing industries began to experience the impact of the CE registration process.

The 2013/29/EU recast directive for pyrotechnic articles clarified a few items that were cloudy in the 2007/23/EC directive. However, the 2007/23/EC pyrotechnic directive primary requirements for notified body examination/site visit, quality assurance emphasis, designations for consumer and professional users, and, essential safety requirements remained unchanged. The pyrotechnic directives provide certain product exemptions and applies pyrotechnic categories to fireworks, theatrical pyrotechnic articles and pyrotechnic articles for vehicles. The pyrotechnic categories are segregated by the type of use, intended purpose and hazard potential to limit distribution and control access. The pyrotechnic directive outlines obligations for manufacturers, importers and distributors and prohibits making pyrotechnic articles available on the EU market unless the product satisfies the pyrotechnic directive requirements.

CE Registration Label

Pyrotechnic Directive (2014/58/EU) outlines a traceability system for pyrotechnic articles and comes into full effect 17 October, 2016. This directive is connected to the recast and original Pyrotechnic Directives, 2013/29/EU and 2007/23/EC, for placing pyrotechnic articles on the EU market. Manufacturers, importers and distributors must ensure the pyrotechnic article is labelled with a registration number linked to the notified body which carried out the conformity assessment. The label containing the CE registration number is intended to facilitate tracking and tracing of pyrotechnic articles by authorized regulatory

ry specialists. It is expected that the manufacturers will provide the CE registration labels. However, the importer or distributor may need to assume this responsibility to ensure the product labeling is correct. When there is insufficient room on the pyrotechnic article for the CE registration label the required information can be provided on the smallest piece of the product packaging. The CE registration labeling format for pyrotechnic articles includes a four digit number of the notified body, the product category (e.g., T1, T2, P1, P2) and the processing number assigned by the notified body: ____ - __ - ____ .

CE Registration Process Summary

The process to obtain the CE registration approval for pyrotechnic products is not complicated. The process includes:

- Contacting a Notified Body qualified to accept pyrotechnic articles
- Determine how many articles will be needed to complete the examination and which examination modules apply
- Complete the submission process, provide product technical documentation, ship the articles needed for examination
- The Notified Body will complete the relevant examination process
- The Notified Body will perform the examination
- Upon successful completion of the examination, the Notified Body will issue a CE registration certificate
- The manufacturer can place the CE conformity marking (see illustration) on certified pyrotechnic articles or packaging
- The Notified Body will perform an examination (on-site) to examine the process and quality assurance system for conformity



The Path Forward

The CE registration process for pyrotechnic articles is not an overnight activity or rapidly completed exercise. Manufacturers will need to demonstrate the pyrotechnic article conforms to the pyrotechnic directive essential safety requirements with technical documentation and test results. Additionally, the manufacturer will need to demonstrate the pyrotechnic article can be produced reliably and that a robust quality assurance system is in place. Manufacturers should anticipate the process will require thirty (30) days or more to complete and plan accordingly.

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In-Process Hazards Classification of Explosives

By Bob Ford

President

Safety Management Services, Inc.

The United Nations Manual of Tests and Criteria (UN MTC) provides the protocol, testing, and criteria for proper classification of explosives packaged for transport and for explosives stored in their transport configuration/packaging. The potential initiation sources and key parameters associated with transport and storage are reflected in the UN MTC. However, the manual does not address explosives classification for the varied and unique conditions found in the other life cycle stages. This fact creates the need for “In-Process” classification of explosives. Figure #1 illustrates the life cycle stages for explosives and indicates which explosives classification scheme applies to each stage: in-process (blue), transport (white), and storage (yellow).

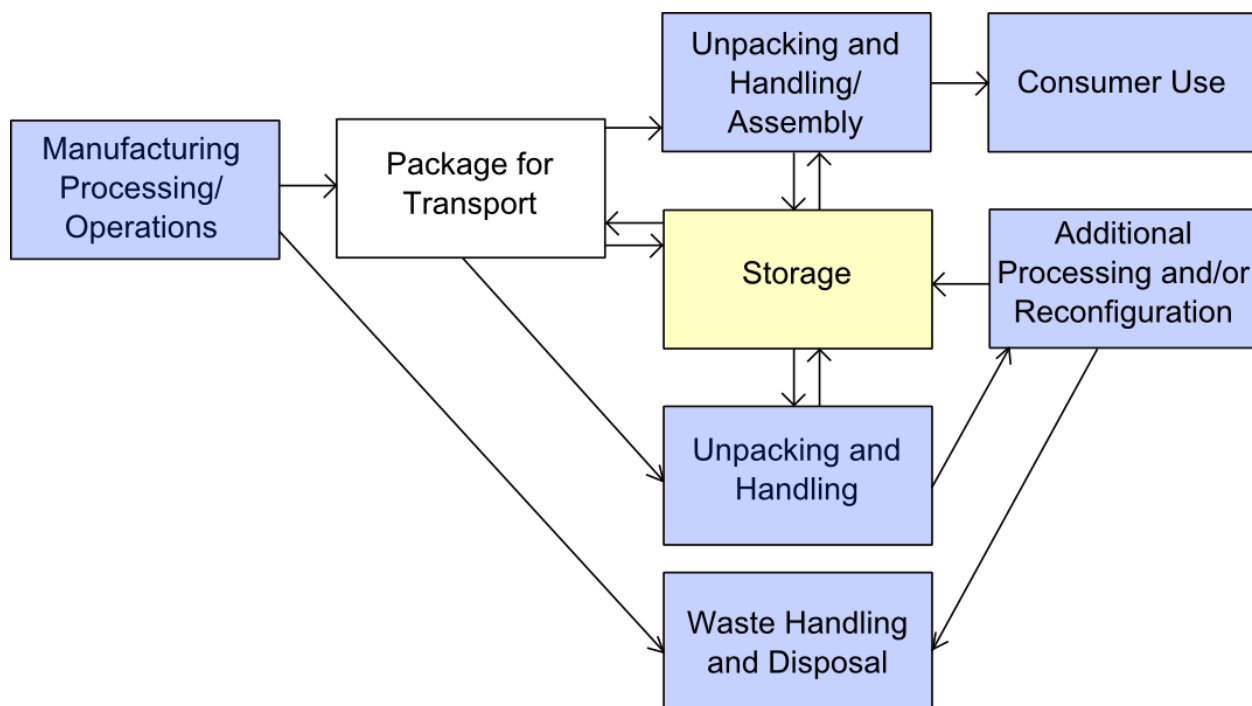


Figure 1: Explosive Life-Cycle Stages

In response to a request from the explosives industry, Safety Management Services, Inc.® (SMS) prepared a technical paper entitled “In-Process Hazards Classification of Explosives” in 2003. This paper utilizes standard or modified UN MTC, US Department of Defense (DoD), Bureau of Alcohol Tobacco and Firearms (ATF), and other industry-accepted test methods/protocols to more closely simulate key in-process parameters for in-process classification testing of explosives. Key in-process parameters include composition, physical state, configuration (confinement or packaging), conditions (e.g., temperature, pressure, humidity, etc.), and normal and abnormal ignition sources. Tests that incorporate these key parameters are essential to determine proper in-process classification of explosives.

The In-Process Hazards Classification of Explosives paper is referenced by the International Fire Code (IFC) Section 5605.1 via the National Fire Protection Association (NFPA) 495, Chapter 5 Section 5.3.1 titled “In-Process Hazards Classification.” This paper also provides the technical basis for “Alternative Materials, Design and Methods” as defined by the International Building Code (IBC) to address the wide variety of unique process equipment and construction associated with explosives manufacturing.

Accurate classification of explosive substances and articles is essential for all life cycle stages of explosives. Life cycle stages include manufacturing/remanufacturing, storage (including intermediate product storage), transport, and use. Proper classification requires an understanding of how the explosive will respond to the conditions found in each stage. The in-process classification may be different for each operation within each stage. How explosives respond depends on 1) the initiation

source and 2) the key parameters that govern the type of explosive effect that will occur. Initiation sources include impact, friction, electrostatic discharge (ESD), thermal heating, shock, etc. which may result from normal or abnormal events that could occur during the various life cycle stages. Key explosive parameters that may be present in the given life cycle stage include the composition, physical state, configuration/confinement, and environmental conditions (e.g., temperature, pressure, humidity, etc.). These initiation sources and parameters are identified and defined **by performing a proper risk assessment**. Explosive classification will only be accurate if it is based on testing and risk assessment that incorporates the unique aspects associated with each life cycle stage. For transport, the UN MTC includes testing protocol, configurations, and criteria based on acceptable transport risk and hazard communication. Risk assessment has a significant role in the classification of explosives in the other life cycle stages where the configurations and conditions of the explosive change.

There are two main categories of explosives addressed by the In-Process Classification scheme: substances and articles. Substances refer to the actual energetic material (powders, grains, pellets, etc.) Articles refer to items, which contain explosive substances (detonators, igniters, inflators, etc.) Both substances and articles can mass react (1.1), exhibit a mass fire hazard (1.3), exhibit a minor explosion hazard (1.4), or no explosive hazard (Not Class 1). Additionally, articles can be classed as a fragment hazard (1.2). The classification depends on the explosive materials they contain and the design configuration used. Different tests are needed to evaluate the propagation potential of substances and articles.

The energetic substances classification decision tree for in-process operations is outlined in Figure #2 below. A similar decision tree exists for articles and is available in the in-process paper.

Energetic Substances Classification Decision Tree for In-Process (IP) Operations

IP Test Series 1

(Required Fundamental Handling and Processing Tests)

Impact Sensitivity Test
Friction Sensitivity Test
ESD Sensitivity Test
Thermal Sensitivity Test

IP Test Series 2

(Equivalent to the UN Manual of Test and Criteria Test Series 1)

UN Gap Test
Koenen Test
Time/Pressure
Internal Ignition Test

IP Test Series 3

Small-Scale Burning Test
#8 Cap Sensitivity Test
Shock Sensitivity Test

IP Test Series 4

Process Simulation Test
Critical Diameter Test
Critical Height Test
Koenen Test
Internal Ignition Test

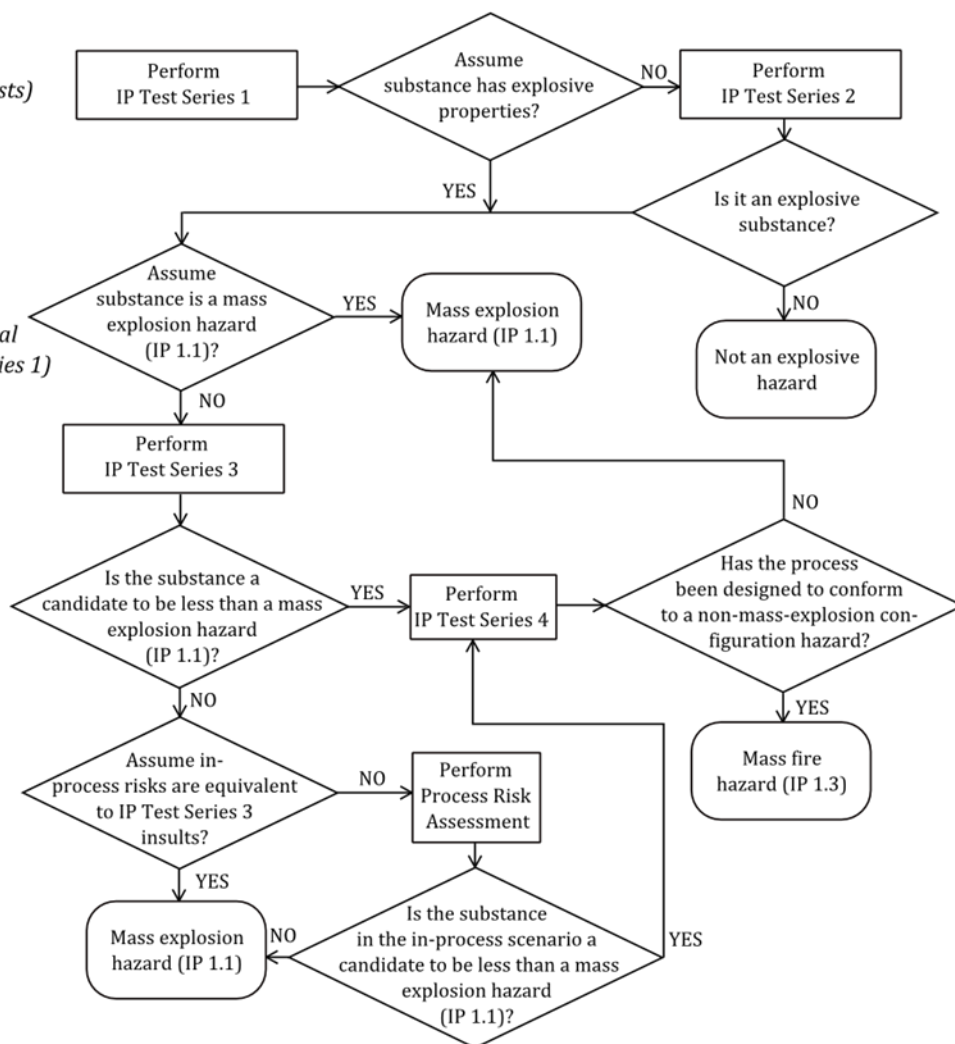


Figure 2: Energetic Substances classification decision tree for in-process operations.

Standardization and improvement to the protocols and test methods outlined in the In-Process Hazard Classification of Explosives paper are facilitated by the Explosives Testing Users Group (ETUG). ETUG participants include major international, US Department of Defense (DoD), Department of Energy (DOE), and industry explosives testing laboratories and test sites. Participating laboratories collaborate to systematically minimize the variability associated with explosives testing to ensure consistent/repeatable test data and interpretation of test results. This is accomplished by 1) developing procedures and methods, 2) applying technology, 3) reaching consensus, and 4) performing periodic "Round Robin" testing. One of the valuable tools that has resulted from this effort is the ETUG Test Methods Matrix™.

The ETUG Test Methods Matrix™ (TMM) is a public accessible database that outlines the purpose, key test parameters, and indicators (including pictures and videos) for each sensitivity and reactivity test for both In-Process and UN test methods. The database also serves as a repository for the specifications for the parameters and indicators along with the documentation of their origins. The information contained in this informal database augments the technical discussions associated with proposed improvements or changes to the classification testing protocols and methods. The ETUG has stewardship for maintaining the In-Process Classification portion of the database whereas the International Group of Experts on the Explosion Risks of Unstable Substances (IGUS) has stewardship for the UN MTC portion. The ETUG TMM is an excellent tool to ensure generational continuity for explosives classification testing. The ETUG TMM database and the In-Process Hazards Classification of Explosives paper are accessible at www.etusersgroup.org.

Application of the prescribed In-Process Classification protocol will provide accurate classification of explosives for the unique and varied configurations and conditions that may exist during manufacturing, remanufacturing, demilitarization operations, intermediate storage, and use. Such explosives classification will facilitate proper design and specification of process equipment and facilities and will therefore reduce the risk to personnel.

For more information on In-Process Classification of Explosives or Process Risk Assessment, please contact Bob Ford at rford@smsenergetics.com or visit our website at www.smsenergetics.com.

ACCIDENTS, ARE YOU A WINNER?

by

Anthony Rowe

Safe to handle and eminently safe to use, it is a given that commercial blasting explosives do not detonate spontaneously or without cause. Before being offered for sale they have been subjected to just about every safety test that authorities and manufacturers can imagine or prescribe. Few other products in this world are required to meet such stringent regulatory requirements, yet still the accidents continue. For sure, the venue and the persons involved change, but the root causes rarely do. Innocent people die or have life changing injuries inflicted upon them. What gives the industry much cause for concern is that the same accident scenarios occur over and over again, they're like a belt fed bazooka, endlessly repeating. In the overwhelmingly vast number of cases, it was demonstrably the actions of the end user that led to the incident.

What is it then that causes people in different countries, of different nationalities and different religious beliefs to repeat the same deadly steps? It's not a tendency confined to any particular race, colour or creed, but one that appears almost universal.

I don't believe in the theory of a terrible darkness that lurks in all of us, a need to court death or perhaps some deep masochistic need that secretly revels in pain, permanent blindness and/or the loss of limbs? If such a thing exists, I confess to never having come across it.

Still, people continue to hit, hack, dissect, crush, heat and bend detonators. They store and carry detonators in their pockets, throw explosives onto fires, drill into primed explosives and carry out a host of other potentially and arguably hazardous acts. Blasting explosives, both with and without the necessary initiators continue to be taken home, not with any criminal or terrorist intent, but purely to satisfy some primitive masculine need. Such items may later become surplus to requirements and

will, almost inevitably, be disposed of inappropriately. Detonators in particular are often cut open by end-users just to see what is inside or peculiarly in South Africa, to scrape out the primary explosive(s) pressed within. Operators take shortcuts with processes and license limits are exceeded.

I have seen the outcomes from a number of accidents and incidents over the years. I've seen the shock posters too. These were an attempt by the industry to jolt people into reality by showing the human cost of accidents. Shattered bodies, hands, feet and faces blown apart, but it didn't last. Such images have limited value as their effects are extremely short lived. After a day or two, people have adjusted, compensated and the message is irrevocably lost.

What are we doing wrong?

Is it the products or is it the people?

This is my view.

Mostly it's the people. Explosives are generally as safe as they need to be. Explosives for instance don't usually generate any fear in their end-users, but some end-users certainly generate fear in me. Explosives have in fact become so safe that many workers, operators and end-users have thrown caution to the winds. People want to be 'winners.'

What exactly is a winner? Winners are those people who get the job done at any cost. They're the ones who forge on ahead, first away at the robots, fastest on the highways, but who can also leave a trail of devastation in their wake.

Modern society encourages 'Winners' to take chances. Fear is not a factor. 'Winners' don't give up and are flexible in their approach. 'Winners' are also positive thinkers. They're there for the long haul and are both tenacious and patient. For instance, watch one of the many TV programmes showing clips of people engaged in what seems to be incomprehensibly foolish behavior. The participants nearly all see themselves as 'Winners,' but most of them seem to lack any sort of forward vision. For them, consequences simply don't exist. The comprehension that things can go wrong or that actions have consequences may be so heavily repressed that the ability appears to be entirely missing from the perpetrators psychology. The knowledge that some of those consequences may be really, really bad has clearly never even been considered. Hindsight though is 20/20. So is regret.

In the world of the big bang, the potential first outcome for the victims from an explosives related incident will

be pain, perhaps even life changing pain. Losing a pound or two of flesh, some fingers, a limb or any part thereof is a terrible prospect. Some recipients may even die, a few immediately, some much later. It is no longer simply light entertainment and for those who have suffered amputation type injuries, it may be devastating.

I believe that most of the puzzlingly risky things that people do is based on a simple assumption, that what once was - always will be. There can be no consequences, because nothing can go wrong. Why? Because when we do something foolish, stupid or illegal with an explosive or a product containing explosives and nothing happens it establishes a benchmark around which our future actions are based. How to understand and deal with this all too human tendency represents a serious training issue because whether we realise it or not, we learn.

We learn that if we do such and such a thing and nothing happens, then it's a favourable outcome. It is a powerful message and as a consequence, we will almost certainly repeat the exercise. Once the act is repeated and the outcome is again neutral, (nothing happened) the original learning is reinforced, underscored if you will. From that moment on we are almost destined - or is it condemned - to continue. We may even push the envelope a little more. Eventually of course our sins catch up with us. There is a loud bang and the claret begins to flow. If you are really lucky then perhaps you can hear a sort of high-pitched wailing sound. It is the sound of regret. If you are really, really lucky then it's not you making it.

It was for this reason that in the world of big bangs there once existed the HAZOP, now downgraded and renamed as Risk Assessments or RA's. The HAZOP was time consuming and expensive. A proper HAZOP required the dedicated input of a whole range of knowledgeable people skilled in the art. Did they save lives? Oh undoubtedly Yes!

In their day HAZOPs really were an amazing tool. Amongst a host of other variables they looked at the tendencies of human beings to push boundaries. They identified where and then put in the safety measures necessary to reduce or eliminate the risk. Sadly, time and a loss of expertise have eroded their credibility. Today they're viewed in a negative light, an obstacle to be overcome, rather than the crystal ball or Tarot deck that they once were.

I believe that HAZOPs are truly able to predict the future.

I was once verbally abused at a HAZOP. To tell the truth, I've often suffered abuse at HAZOP's. In the case of one serial abuser, the sight of his ankles jiggling about under the table would herald the storm soon to be unleashed. The faster the jig, the more terrible the storm to come.

Anyway in this one particular case, my claim that a certain set

of circumstances could result in the creation of a major end-user hazard had come under attack. The owner of the project just couldn't see any sense in what I was proposing and had now reached the shouting phase. I was mocked and belittled. It was pointed out that I was short and fat, walked with a bit of a trot and had funny teeth to boot. My dress sense, the type of car I drove, even my choice of undergarments were subjected to scrutiny and criticism. Laughter is an effective weapon and I was the butt of the joke.

How relieved do you think I was when one of the assembly staff stood up and stated that what I had just proposed had in fact already happened - twice, but had been picked up and dealt with by the assembly line personnel themselves. Management had not been informed. Why, because it was high scrutiny, trial product intended purely for the firing range.

There was silence. There was a re-design too.

I mention this not to bask in minor glory, but to highlight the emotions that HAZOP's can create. People get actively "locked in" to the process and once this happens, of necessity, give all of themselves. The friction created in a well-run HAZOP ultimately though creates light without any lasting heat.

It is probably time to focus a little around the industry issue of accidents and incidents, but where to start? What about the road transport of dangerous goods?

The history of the road transport of explosives is in itself littered with incidents. For instance, trucks carrying explosives have caught fire only to detonate violently some time later, trucks are even reported to have exploded spontaneously whilst simply driving along the road. Vehicles have overturned or crashed, their drivers perhaps asleep at the wheel. Stinging insects (such as bees) in the cab have also caused some strange occurrences. Personnel have even suffered explosives related injuries from minor detonations occurring within load compartments. Materials deemed to be more or less non-explosive (ammonium nitrate solution for instance) have surprised everyone by suddenly detonating - admittedly after prolonged exposure to (flame related) high temperatures.

There is a lot of history in all of that and the book is still being written, but for now have you ever considered the ubiquitous "explosives bakkie," the industry workhorse? Not the custom-built variants, but the various conversions and adaptations servicing the mining regions of Southern Africa. The vehicles display the

brands from a range of manufacturers. Apart from the necessary signage they are immediately recognisable by the lockable aluminium box carried externally on the loadbed. The illustration below shows the sort of thing I am talking about. This particular design looks to have been well thought through, but there are some others out there which could bear some serious re-assessment.



What do these trucks actually carry? What is permitted on board is subject to the terms and provisions of an explosives license issued by the responsible authority. It may be blasting explosives only. It might be detonators or a range of ignitercords, capped fuse or other initiators all lumped together under the general and archaic term of "Accessories." They're certainly not ladies handbags or belts; bangles or scarves, but detonators, detonating fuse, pentolite boosters, connectors and ignitercord, in fact everything used to initiate a blast, but excluding the blasting explosives themselves. An odd fact around 'accessories' is that they may have widely different explosives classifications and in the absence of a special permit, may not be legally transportable together.

If both blasting explosives and detonators are part of the load being hauled, the truck must possess a special license permitting the carriage of such "a mixed load." It is an operation otherwise called "simultaneous conveyance." Cards on the table I don't approve of "mixed loads," but then who am I anyway? I'm not the decision maker I'm simply a fat little man with a big mouth. I'm not even a good arguer or influencer, my brain simply doesn't work fast enough and I get shot down by the quicker thinkers. Probably just as well.

One design for a truck-compatible explosives box comprises of a unit fabricated from bent aluminium sheeting, the bare metal held together using pop-rivets. Like the photograph shown previously, this design is rectangular in shape and

also features a central divider creating two similar sized, separate, but unlined compartments. Another significant difference from the illustration, however, is that the two lockable lids are located on the top of the box, not the end. The box is meant to be easily removable from the vehicle and is thus fitted with a handle at each end allowing it to be lifted and carried. Larger versions of this design can be quite heavy even when empty. A figure of 70 kg or so seems likely *(by the way, I don't approve of pop rivets in certain applications either. The reason is that the centrally fitted steel or stainless steel mandrel which suffers tensile fracture during rivet expansion can - if subject to regular movement, or vibration - loosen and fall out. This phenomenon can occur years after the original installation)*. In the wrong place such a foreign body can create significant issues.

The box, however, is not normally placed on the vehicle's loadbed unsupported. A steel support frame is required. Large boxes thus take up a substantial amount of the available floor space and not unreasonably make access to the box and/or its contents less than easy.

Vehicles that are higher off the ground further compound the problems and fixed side panels in lieu of drop-sides may further complicate access. In such cases the provision of a footstep would be entirely reasonable, but not one positioned below the tailgate as this would be rendered useless once the tailgate itself was opened. Clearances between the aluminium box and the sides of the loadbed must also be sufficient to permit comfortable access. The requirement for personnel to "tightrope" along the raised sides of the vehicle should be avoided. Box depth should also be a consideration.

Some box designs feature a pair of hinged and individually lockable access lids positioned at the top. On a higher ground clearance vehicle anyone standing at the side of the wagon would therefore be unable to access the contents of the box. Despite careful nurturing, feeding and frequent exposure to sunlight I'm not very tall. Despite a lifetime of growth I have achieved only some 5 feet and 7 and a quarter inches or 1,71 meters,

In hindsight though I seem to recollect that the lids of just such a box when fitted to a bakkie with just the sort of high load-bed under discussion were almost level with the top of my head.

Because of the various constraints discussed above, loading the box, especially with the standard ca 25 kg cases of blasting explosives would, given the inadequate deck space available, be somewhat difficult. A worker engaged in the loading process might instead choose to

stand within (inside) the box. Would he give consideration to the sand and gravel on the soles of his boots now being introduced to the box's interior? Would he think about the additional and highly localized stresses being applied to the unsupported box floor - the workers own weight - plus the 25 kg mass of the case of blasting explosives - plus whatever else is in the box?

To gain subsequent access to such a box's contents would inevitably require a crewman to clamber unassisted up onto the vehicle's load deck or sidewalls, itself not an easy task - especially if his legs are short like mine.

Once in position, (and probably controversially by today's practices) he might perhaps now be standing (of necessity) on the vehicle's narrow sidewall. Our crewman would then have to unlock and open the box before leaning inside to retrieve whatever was required. Of course, you then have to close and relock the lid(s) before climbing down. Not particularly difficult I hear you say, but what if you have to repeat this procedure many times a day? How long will it be before an easier method begins to form in your mind, one which you can readily justify both to yourself and to your partner and one which entirely eliminates the need for all the clambering up and down? Life would become a doddle. Even better, what if there seemed to be no (recognisably at least) additional risks involved and as a bonus, nobody in authority could readily identify the minor procedural changes involved? It might be unwise to publically disclose precisely what those changes might be so just for once, I'll hold my tongue.

I have to ask myself, if this were all apparently so, would I as a crewmember, go ahead and implement the modified procedure?

More so. Would you?

I would not. I'd want a HAZOP first.

Is this then one of the keys? Do people dislike working unnecessarily hard and, retrospectively at least, with poorly designed equipment or processes, or do they rather want to work smart, perhaps actively seeking easier and quicker ways of doing things? I cannot say. What I can say is that most of the time people just want to get the job done and to achieve their aim they can be incredibly creative.

As an example I offer a lovely story - warranted true – which involves the manager of a large production facility.

It goes like this:

Long, long ago in a land far, far away there once lived a big boss. He ruled over the lives of all his workers, but he was kind and his people prospered. One day the King of the land decreed that the amount of waste his tenants produced would henceforth be actively monitored. The numbers obtained would then be used

as a kind of yardstick in the determination of later production efficiencies. Good things would happen to those who reduced waste whilst the wicked would go to the wall. Ongoing improvements in production techniques would be implemented and reductions in waste levels would demonstrate the ongoing improvement – if any. The unit of measure was to be the case.

(NB: A case is a cardboard box having fixed dimensions).

At first, our big boss, who was very wise, arranged that the number of cases of packaged waste that his production unit produced substantially increased. To achieve this, less waste was packed by the workforce into each case. The quantity of waste thus appeared to be much higher than normal. This increased level of waste accordingly made up the opening balance on the audit's initial checklist. As time went by the big, wise boss called on his workforce for a steady reduction in the number of cases of waste that his plant produced. This was apparently achieved.

The big, wise boss was accordingly paraded, celebrated and rewarded. He had become a hero, our very own Hercules or Theseus, but in truth his feet were of clay. All he had done was to pack ever higher masses of waste into an ever reducing number of cases. The true amount of waste had not changed, only the perceived volume had.

Extremely cunning, but far less easy to pull off today! He later moved on to pastures new. Onwards and upwards.

Was he also a winner?

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ARTICLES FOR NEWSLETTERS

This is a reminder that through the Newsletters we share knowledge in the areas of Safety, Health, Environment and Security pertaining to the Explosives Industry. SAFEX thus call on all members to submit articles on these subjects within their own companies and countries. **The deadline for articles for the September Newsletter is 10 September 2016 and I look forward to your support .**

SAFEX thanks the following authors for their invaluable support:

- * Dr Noel Hsu – ORICA
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- * Dr Jackson Shaver-SPECIAL DEVICES INC.
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