

A SYSTEM FOR REPORTING, CLASSIFYING AND MEASURING EVENTS, NEAR MISSES

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INTRODUCTION

The recordable injury rate (RIR, based on the number of Lost Time Incidents) has been the only key performance indicator (KPI) to measure safety performance and to benchmark vs the industry for many years in AD.

All lost time incidents have been investigated and measures have been taken to prevent recurrence.

Though the total injury rate at AD was perceived to match with industry standards and competitors in the explosives manufacturing industry, there was no significant trend towards a permanent decrease, i.e. the rate hovered around a constant level.

Taking recordable injury rates as the only Key Performance Indicator to 'measure' safety performance is rather a reactive approach that triggers action after an incident happened, i.e. a person has become injured.

Near-misses had been reported on occasion, but there was no systematic approach to collect, count and investigate near-misses ranging from 'simple' unsafe action to those with no injuries or damage, but a high potential for severe consequences.

AD was also struggling on how to deal with rare events of flare/flare and smaller explosions (e.g. friction event in detonator shell pressing) in remotely controlled operations that have been designed to protect employees and minimize consequences (e.g. blast walls, blowout areas). As the production operation was designed/built on the basis that explosion could occur but that the operator would always be protected and therefore never injured these incidents were not always

considered as important for reporting. We now believe this to have been an oversight in our reporting requirements.

A system has now been developed to classify/categorize all non-injury incidents/near-misses to generate a set of KPI's for each category with then being able to monitor and steer those separately.

For further improvement of communication and to have higher level management involved in these activities, a so-called Management Safety Activity (MSA) has been introduced that requires managers from all departments to conduct plant walks/inspections and plant audits after a preassigned schedule.

INJURY INCIDENTS

Austin Detonator (AD) has been measuring the lost time injury rate (recordable injury rate (RIR)) for many years.

Injury incidents and relevant hours of exposure are counted as to the following scheme (Figure 1):

Fatal	An injury that results in death
Lost time incident	A lost time incident is one which results in death or permanent impairment or which renders the injured person unable to work on any day after the day of the injury
Medical treatment	An incident requiring medical attention (doctor's office visit).
First aid	An incident that only requires first aid attention. Person can continue with his/her normal work
Occupational illness	Any disorder not resulting from an injury, caused by environmental factors associated with the job performed.
Hours of exposure	This represents the actual hours worked during the month by personnel or contractors. (but rates are measured separately for each)
Recordable Injury rate (RIR)	The number of recordable injuries (fatalities + lost time injuries) per 1,000,000 hours worked.
Medical treatment rate	The number of medical treatments per 1,000,000 working hours.

Figure 1: Classification of injury incidents

Figure 2 below shows the reported lost time incidents from 2001 to 2012. As it can be seen, there had been a fatal incident in 2001 that was related to a manual handling of explosives operation (lead styphnate, explosion). Beside safety measures being taken to prevent this incident from reoccurrence, the fatality had a strong psychological effect on the entire workforce (behavior). It should be mentioned that the site has a low turnover in personnel.

Lost time incidents were decreasing as a temporary effect, but peaked in 2006.

Improvements were made during 2006 as a result of the deterioration.

Employees were also trained and encouraged to (better) report all medical treatments and first aid incidents.

Figure 3 shows the training effect, but these numbers were rather taken as a renewed initiative to build on this success of improved reporting to now be able to capture non-lost time injuries than to use those as a performance indicator and seek for preventive measures.

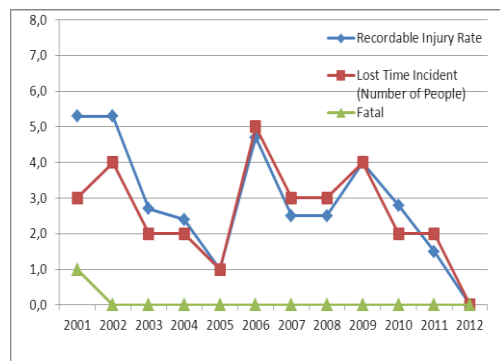


Figure 2:
Recordable injury rate, Number of lost time incidents and fatalities
per million hours worked

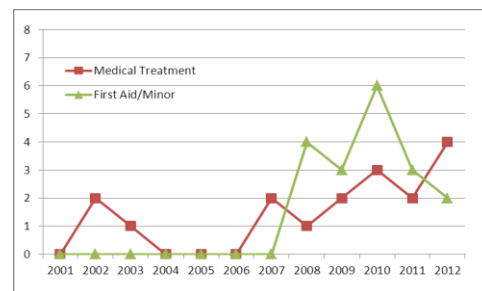


Figure 3:
Medical treatment and first aid/minor

Figure 4 shows 14 (45%) lost time incidents related to handling with explosive in 31 lost time incidents, i.e. there was no significant trend towards an increase of LTI not related to explosives handling operation or vice versa.



Figure 4:
Numbers of lost time incidents and lost time incidents related to handling with explosive

NON-INJURY INCIDENTS

API significantly updated its safety reporting policy in 2010. All involved employees were familiarized with the new policy by two internal training sessions.

The first training session – “Licence to Supervise (LTS)” - focused on, defined and raised awareness of supervisor responsibilities and the management of safety . Every line manager starting from the foreman up to the general manager is understood to be a supervisor. One of the supervisor’s roles is to report all unsafe events and generate and maintain records of these as well as to encourage subordinates to report near misses.

The second one – „Incident Investigation Training“- focused on organization of incident investigation, investigation report, root cause analysis and to put a focus on near miss reporting and investigation.

Shortly afterwards the trained AD’s SHES coordinator, Safety manager and Safety engineer have trained another 40 supervisors at the AD plant. Plant training was based on API requirements and also focused on specific detonator production issues including suitable and understandable examples.

Classification of non-injury incidents

AD decided to classify non-injury incidents according to the following scheme:

- Explosion or flare/flame event
- TRE – Technology Related Event (“minor” explosion or flare/flame)
- Near Miss (Low, Medium, High Potential)

In detonator manufacturing, it is not unusual to routinely observe small flares/flames/explosions during (remote) operations (e.g. a detonator shell explosion during pressing operation) where no-one is injured. Ignition of a single fuse head (screen protection, no transmission due to inventory/safety measures) caused by a friction event on a workbench would be another example. They are not nearly as serious or potentially as serious, so it was felt these should be reported as a separate type of incident. These incidents are classified as TRE (see above).

However, a significant increase for a specific TRE (shift from ‘normal’) would also be investigated to identify the underlying causes.

Examples:

Explosion – initiation and detonation of

- > 0,5 grams of primary or secondary explosives
- a sequence >2x TRE /1 shift

Flare/flame – initiation and flare/flame of

- > 250 grams of charges (= e.g. delay charges)
- > 6 fuseheads
- a sequence >2x flare/flame TRE /1 shift

TRE – initiation and detonation or flare/flame of

- max 0.5 gram of primary or secondary explosives
- max 250 grams of charges (= e.g. delay charges)
- max 5 fuseheads

Near miss

- a unplanned event that could have resulted in an incident,
- unsafe condition or act that could have resulted in an incident

Near miss high potential

- near-miss which did not result in incident, flare/flame, explosion and did not lead to injury, but has the potential for a severe injury and/or damage

Low potential near misses are investigated and action is taken by the setup man/operator and the foreman/supervisor, medium by the foreman and the technologist, high potential incidents by the Explosives Committee (= internal team of explosive specialists).

The difference is just in severity and/or amount of explosives involved (see above). There are not necessarily explosives involved.

Incidents and near misses are reported as soon as possible in the Near Miss Book (an accident book; an electronic record of an event on the intranet) of each subsidiary company and captured centrally afterwards.

MEASURING OF PROGRESS – KEY PERFORMANCE INDICATORS

As soon as the new reporting system for non-injury incidents/near-misses had been introduced and staff had been given appropriate training, a leap in reporting could be observed (summer of 2011, Figure 5).

Reporting of near-misses in an open communication was then perceived as a proactive measure to prevent (lost time incidents) injuries and as a Key Performance Indicator.

It was made clear from the beginning that an increase in number of near-misses was expected and a desirable outcome to be able to improve the safety system and – as a consequence – to prevent LTI's from happen.

Based on the results for 2010 and 2011, the target numbers for 2012 and 2013 were set:

242 (275) reported events in 2012 (2013)

Figure 5 below shows that our goals have been realistic and employees have perceived reporting of “their failure” positively and their approach has been proactive. A number of reported events has fluctuated within an expected range, explainable drops have been noticeable only during the regular plant shutdowns (vacation and maintenance) in July and December.

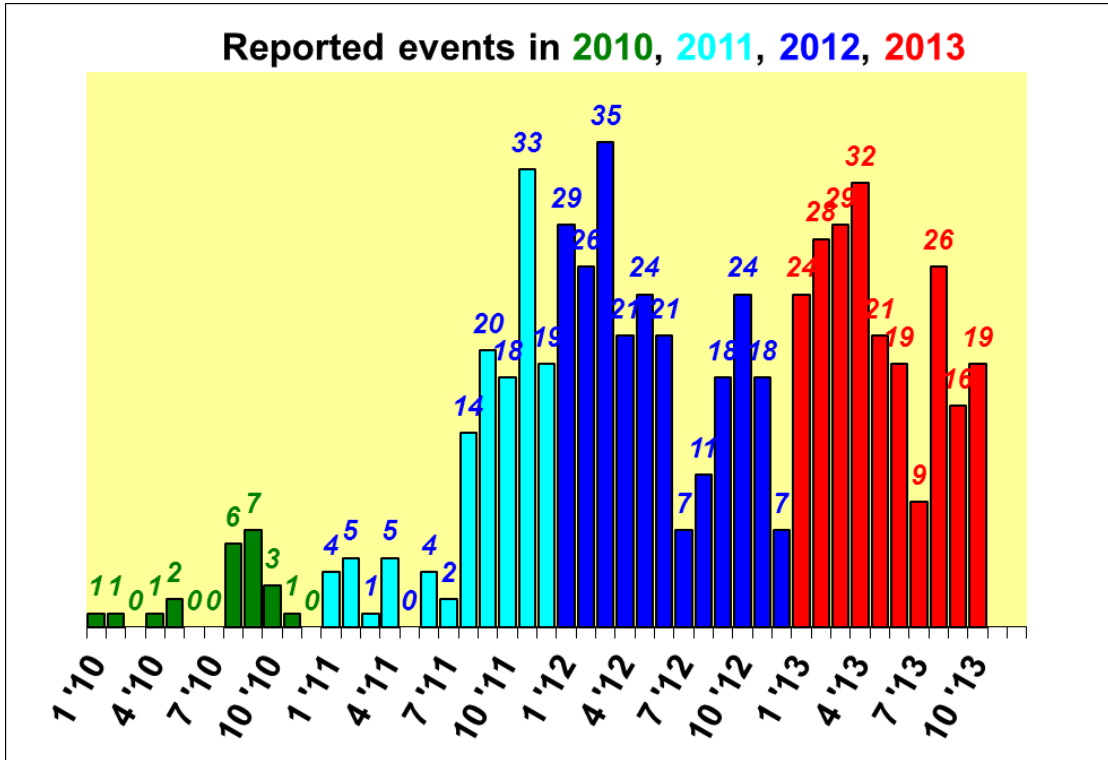


Figure 5: Number of reported events from 2010 to 2012
(month by month)

Figure 6 below shows differences between 2012 and 2013. We can observe

- a significant decline in a number of explosions, flames/flares and technology related events in 2013
- a rise in a number of reported near misses in 2013

The progress demonstrates an proactive approach of most employees.

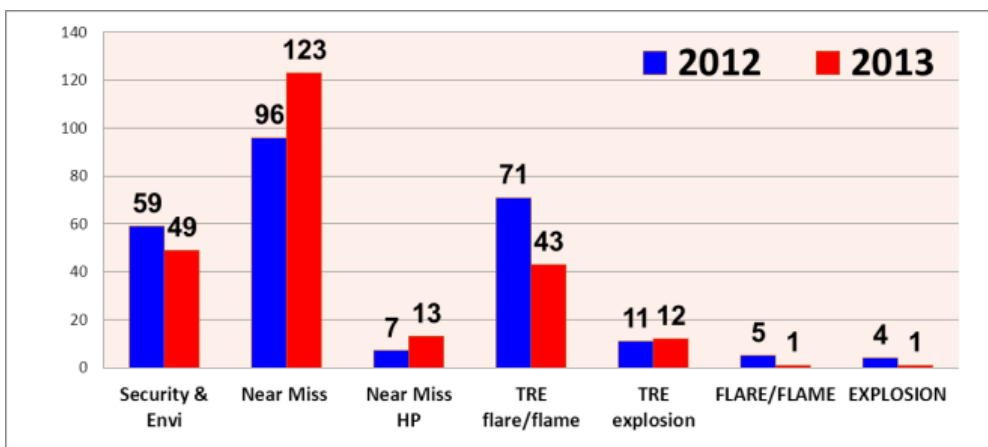


Figure 6: Types of Events, a comparison between 2012 and 2013

Security & Envi (security or environmental event); Near Miss; Near Miss HP (high potential); TRE (technology related event) – flare/flame; TRE (technology related event) – explosion; FLARE/FLAME; EXPLOSION)

The targets for 2014 (2015) are:

- a decline in explosions or flares/flames – maximum of 7(6) per year (or better – as a minimum to keep the achieved level in 2013)
- a decline in technology related events (TRE) – maximum of 70 (65) per year
- a rise in reporting near misses (other than above) – minimum of 285 (300) per year

The decision that had been made to classify non-injury incidents/near-misses into different categories has delivered a set of independent Key (safety) Performance Indicators.

As it can be seen from the targets set, the numbers are used to drive down TRE and other flare/flame/explosion, but also to encourage staff to report unsafe acts/conditions that are not (directly) related to explosives and its precursors and that increasing numbers in this area in the following years are not seen as a negative, but help to improve the overall level for safe work/operations (eventually also this number would decrease towards an ideal situation).

Implementation of this system also helped to have TRE being reported at all (!). In the past, operators may have taken a small explosion/flare/flame with no further consequences as a personal failure and said/reported nothing with the consequence of relevant information becoming lost.

Sharing of Information

All reported events are daily reviewed, addressed and investigated by the local Safety Engineer Department.

Key (safety) Performance Indicators are presented to the senior management once per week.

All Safety Performance Indicators are presented to the senior and junior management in detail at management safety meetings three times per year.

The Key (safety) Performance Indicators and production information have been shared by the senior management with all employees once per three month at regular briefings.

Safety information (including learning from related incidents) have been shared by the junior management with all employees at safety trainings once per three month.

MANAGEMENT SAFETY ACTIVITY (MSA)

The Management Safety Activity (MSA) has been introduced in 2012. It requires managers from all departments to conduct plant walks/inspections and plant audits according to a pre-assigned schedule.

Participation in MSA is incorporated as an objective to the individual Personal Performance Reviews.

The frequency of required plant visits/inspections is depending on the role in the company, i.e. minimum of 10/y for safety, technology and production department staff (category 1), 8/y for plant management (cat 2), 6/y for business department staff (cat 3) , 4/y for financial, IT department staff (cat 4).

All supervisors are responsible for safety in their departments and they are required to carry out activities to positively influence of occupational safety.

A performance review is presented at the management safety meeting (three times/year) and published on the intranet. Recommendations/actions from inspections/audits are also transferred into an electronic database and followed up by the department's Safety Engineer. This gives a positive feedback to all staff members (required actions from incident/near-miss report are followed up in the same way).

Figure 7 shows the status of performed MSA (Jan – Sep 2013) as an example. Category 4 (financial/IT staff) is lagging behind schedule and is one of the target areas for improvement in 2014.

However, with open communication, regular management reviews and publishing performance data, significant improvement by peer pressure is expected in the future.

Name	Category	Number of checks	Month in 2013												In total	% In total			
			1	2	3	1Q	4	5	6	2Q	7	8	9	3Q			10	11	12
KP	1	10	3	4	7	2	2	4	1	3	1	5	1			1	17	170%	
MR	1	10		1	2	3		1	1	2		1	2	3		0	8	80%	
HH	1	10	1	1	2	4	1		1	2		1	1	2		0	8	80%	
SV	1	10		2	1	3	1		2	3	1	1	1	2	1		1	9	90%
LP	1	10	1		1	2	1		1	2		1	1	2	1		1	7	70%
VP	1	10		1	2	3		1	1	2		1		1	1		1	7	70%
GO	2	8	1		1	2	1	1	2	4	4		1	5	1		1	12	150%
VK	2	8	1		2	3		1	1	2		2	2				0	7	88%
DZ	2	8			2	2			0	2	1	1	4				0	6	75%
KA	2	8	2	1		3	1	1	1	3		1	1	2			0	8	100%
TM	2	8		2	1	3	1		1	1	1	2					0	6	75%
KJ	2	8		1	1	2	1	1	2	2	3	3					0	7	88%
HP	3	6	1		1	2	1	1		2	1	2		3	1		1	8	133%
KV	3	6		1	1	1	1		1	1	1	1					0	3	50%
BL	3	6		1	1	2			1	1	1	1					0	4	67%
JL	3	6			2	2			1	1			0				0	3	50%
KR	3	6	1			1	1	1	1	2			1	1	1		1	5	83%
HP	3	6			1	1	1		1	2		1	1				0	4	67%
KP	3	6		1	1	2			0	1	1	2					0	4	67%
VJ	3	6	2			2			2	2			0				0	4	67%
KJ	3	6			1	1	1		1	1		1	1				1	4	67%
JJ	3	6		1	1	2	1	1	1	2		1	1	2			0	6	100%
SK	3	6		1		1			0		2		2				0	3	50%
KP	3	6	3			3			0				0				0	3	50%
HJ	4	4				0			0								0	0	0%
VB	4	4				0			0								0	0	0%
GI	4	4				0			0								0	0	0%
ML	4	4				0	1		1	2							0	2	50%
SJ	4	4				0			0					0	1		1	1	25%
RP	4	4		1	3	4	1		1	2		1	1	2			0	8	200%

Figure 7: List of employees carrying out Management safety activity - statement of checks.

In the course of the year 2013 (from January to September)

TAKE HOME MESSAGE

The introduction of a more differentiated incident reporting system and staff training (including incident investigation techniques) and the MSA significantly contributed to a new AD plant record - 686 days without LTI.

- The classification of non-injury and near-miss events improved reporting in general and delivered a set of independent KPI.
- The independent KPI's can be used to 'measure' reporting and to follow-up on targets to reduce the total number of high potential incidents and to identify trends in TRE and take suitable preventive measures
- Near miss reports are good news, and the quality and frequency of reporting are incorporated in company goals.
- Near miss reporting is a measure of real commitment to safety because it demonstrates employee involvement and we can learn and without or before someone is injured.
- Communication is very important both to start the data gathering and also to sharing the results