

Other entries received, showing the diversity of Responsible Care**Contents**

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COMMUNICATIONS CATEGORY

A helping hand

AkzoNobel Industrial Chemicals

Through its 'Community Programme', AkzoNobel encourages all employees worldwide to actively contribute to their local communities. Employees donate their time, ideas and expertise, and are supported by the company through funding, products and facilities. The key in all projects is to help beneficiaries help themselves – ensuring sustainability. So the company funds projects for a maximum of three years, after which they must be self-supporting.

Bitterfield site staff have embraced the programme whole-heartedly. In a facility of 78 employees, almost 70 have been involved in the programme, which takes place outside working hours. A total of 15 projects have been carried out since 2005, with three currently ongoing. Their scopes are broad: from renovation and refurbishment of community centres, clubs, historical sites, kindergartens and a fire brigade, to cycling with physically disabled people after providing them with specially adapted bikes. Employees have also helped socially deprived children integrate into a sports club and maintained green areas in the community.

Sometimes the projects are personal. After losing her new-born child, one employee joined a self-help group, where she initiated renovation of their meeting rooms. The renovations were cathartic and helped her to move on. The scheme also fosters team building among employees who work together on projects.

An exhibit in transparency

Boehringer Ingelheim Pharma

The public often challenges drug companies of a lack of transparency. Boehringer Ingelheim aimed to change this through a six month exhibition held in the towns of Biberach and Mainz. In order to guarantee objectivity, the company partnered with the municipal Museum Biberach. The result was an exhibition entitled 'Boehringer Ingelheim – The Making of a Drug', described in the press as a 'warts and all' display.

Diverse aspects of pharmaceutical research were presented, such as development issues, social responsibility, financial risks and market access. The exhibition also took on the thorny issues of animal testing and environmental protection, and roped in employees for direct discussions of their work. A range of themed communication materials included poster campaigns, postcards, tour guides and catalogues covering in-depth background information. The campaign's reach was increased through a dedicated website which is still active.

Never before had an exhibition of this sort been held in Germany and it was visited by over 17,000 people in Biberach alone. Success continued in Mainz and the exhibition won the coveted 'Red Dot Design Award'.

Cultivating connections

Celanese Deutschland

'Celanese Connects' is a global initiative on social responsibility. Its framework is adaptable according to different sites' needs and the focus in Germany is on neighbourly relations. Here there's a double aim – to weave a culture of corporate social responsibility (CSR) into employees' lives, and to solidly root the company's name into the neighbourhood.

Falling under the banner 'We Create Connections', CSR projects target local social institutions with the aim of helping out where needed. Science is brought close to the people through presentations at 'Night of Science', fun kindergarten demonstrations and partnerships with young researchers. Hands-on support is also offered and employees have been involved in painting a school and baking cakes in an old people's home. All projects are based on creating long-standing connections and improving residents' quality of life.

Employees can contribute via two routes. They can use one working day to support a social project of their choice or they can take part in volunteer events organised by Celanese. Events usually involve at least one company leader in order to maximise CSR culture amongst staff. So far, German employees have contributed over 700 work days to the initiative.

A neighbourhood newsletter

Evonik Germany

In 2011, Evonik's Worms site launched a newsletter in order to strengthen links with the local community and establish the Evonik brand. The newsletter, published at regular intervals, is distributed to all employees, neighbourhood societies, stakeholders and visitors.

Each issue presents company innovations and products as well as current topics and events. It also focuses on environmental responsibility and social commitment, highlighting the site's own efforts. It serves as a strong platform from which to reach out to future employees, countering labour shortages in the region by targeting students and graduates, offering information on apprenticeships and cooperative study options. Professional training topics also present Evonik as an attractive local employer.

Distributed by mail and electronically, the newsletter has proved successful in firmly integrating the Evonik name into the neighbourhood and helping the site attract high-quality job applicants.

Ensuring industry's sustainability

Svaz chemického průmyslu České republiky (SCHP CR)

The chemical industry association of the Czech Republic, SCHP CR, organises a host of activities under the Responsible Care umbrella. These include national and international conferences, technology platforms, preparation of reference documents on best practices, and related research. SCHP also grants an annual Sustainable Development Award and has set up a journal specifically focusing on the transport of hazardous cargo.

In 2013, the association launched an annual national competition for young students entitled 'The Best Young Chemist'. Over 6,000 primary school students take part. Its aim is to combat the general lack of interest in the study of chemistry and technical disciplines, which was further exacerbated by the global economic crises and is widely experienced in so many parts of the world. The contest shows chemistry in a positive light and highlights the country's need for chemistry professionals.

As the Czech Republic has no direct access to the sea, logistics is another SCHP CR priority. With this in mind, it is an active member of the Chemlog project, a European initiative that aims to improve chemical logistics and transnational transport of hazardous substances. The association also tackles important basic issues such as machinery maintenance, providing courses and seminars to industry stakeholders.

A good neighbour

Michelin Reifenwerke AG

One of Michelin's five core values is respect for people, which includes being a good neighbour to surrounding communities. This is of utmost importance at their plant in Karlsruhe, as it is sited in a historic area in the middle of the city.

To help answer residents' queries on production processes and their potential effects on the surrounding environment, the company partnered with Civic Association Grunwinkel. Over the years this has grown into a close cooperation involving joint projects and mutual assistance. Examples include an annual district clean-up initiative, as well as training residents in subjects such as computer skills and job applications. The partners have organised joint blood drives and celebratory activities for the district's centenary, and continue to keep residents informed on plant developments through invitations to visit the factory grounds and mailed brochures on specific topics. The cooperative teamwork also serves as a stable base from which to tackle potential crisis situations.

Thanks to this partnership, Michelin has become a trusted name in the neighbourhood. Queries from residents have continually decreased, and open dialogue is the order of the day.

Spreading Responsible Care

PharmaVision San. Ve Tic.

In order to share their expertise on Responsible Care with business partners and Turkey's youth PharmaVision has developed collaborations with schools and universities, and partnerships with social associations. The company has an extensive intern education programme and organises multi-company meetings on Responsible Care topics. These activities help guide youngsters to adopt safe and environmentally friendly behaviours, at the same time as highlighting key issues for the chemical industry.

Collaborations with educational institutions involve site visits, seminars and presentations. These are supplemented by financial and social support. The company also had a hand in designing a master degree in pharmaceutical engineering at Istanbul University. Students who intern at PharmaVision follow a thorough seminar programme on both personal and professional development topics, besides being given work experience.

The company's outreach activities are further extended through its role in the Turkish Chemical Manufacturers Association, and it's a co-founder of the Turkey affiliate of the International Society for Pharmaceutical Engineering.

Easily identifiable green products

Total Refining and Chemicals

Customers' expectations are changing. Environmental performance is now increasingly considered part of a product's value for money. So in 2009, Total launched 'Total Ecosolutions' – a labelling programme that allows customers to identify products and services which environmentally outperform market standards.

To qualify for the label, products have to outperform in the reduction of greenhouse gas emissions, energy consumption, non-renewable raw material consumption or use of water. Also considered are reduced ecosystem or health impacts. An internal governance system chooses and assesses products. The analysis also includes an assessment of potential pollution transfer to ensure that the environmental benefit isn't outweighed by other impacts. The process is based on international ISO standards and has been externally verified. Labels are valid for three years, after which market study data has to be updated. Central to the Ecosolutions programme is two-way dialogue with customers and stakeholders, in order to understand and anticipate their needs.

Currently the programme includes 45 certified products and services, and the aim is to incorporate a total of 50 by 2015. Total calculates that sales of Ecosolutions products have so far reduced carbon dioxide emissions by 1.4 million tonnes. Other key environmental indicators will soon be used to quantify further benefits.

Managing change

Total Research & Technology, Feluy

In industrial plants, management of change (MOC) is a systemically applied process in order to prevent serious incidents and maintain operational integrity. But in research centres and laboratories the process tends not to be so rigorous. Analysis of incident records at Total's Research and Technology site in Feluy showed that many incidents were due to uncontrolled changes that were either immediate or gradual shifts.

To cut down on these, there are regular weekly meetings between MOC managers and specialists from engineering, health and safety, and maintenance. These ensure information is shared and acted upon, and are proving an effective way of identifying and spreading good practices. Critical tasks are identified, and roles and responsibilities are clearly defined with respect to any changes. The meetings have also helped the site's researchers to view MOC as added value rather than something that hinders creativity. In the future, the MOC process will be applied to product changes and product screening – a real challenge in a place where new products are made almost daily.

ENERGY EFFICIENCY CATEGORY

Value chain energy efficiencies

Ak-Kim Kimya Sanayive Ticaret A.S.

In 2007 Ak-Kim Kimya built Turkey's first sodium percarbonate (SPC) production plant. The aim was to reduce the widespread use of sodium perborate in laundry detergents by replacing it with the more eco-friendly SPC. Energy efficiencies not only came from modifications to the SPC production plant, but were also passed on to end users: detergents containing SPC mean washing machines can be operated at lower temperatures. This is estimated to achieve nationwide energy savings of almost 400 million Kilowatt hours/year.

Ak-Kim focused on making the SPC production plant more energy efficient through implementation of two different projects. The first optimized the plant's pressurized air system which enabled energy savings of around 3 million Kilowatt hours/ year. The second project involved recycling steam and natural gas through a scrubber system for reuse in SPC production resulting in annual savings of almost 3,000 tons of steam and over 5 million m³ of natural gas. Emissions into the surrounding environment were also reduced.

System optimisation

Chemische Fabrik Budenheim KG

As part of efforts to improve the energy efficiency of its compressed air system, Chemische Fabrik Budenheim KG carried out a potential analysis and air demand assessment to identify savings that could be achieved. Technical specifications were then drawn up with the help of a specialist.

These plans led to the purchase of new compressors, with highly efficient, integrated absorption dryers which recycle heat energy. The compressors are also speed-controlled, oil-free and water-

cooled. Different compressed air systems throughout the site were combined in order to eliminate redundancies and a demand-based control system was set up. A leakage monitoring and recording system was also introduced, as well as performance tracking in order to achieve sustainable savings.

This €1.4 million investment saves the company over €280,000/year with major reductions in electricity and natural gas usage, as well as lowering CO₂ emissions.

More competitive soda ash production

Solvay Chimica Italia

Solvay Chimica Italia has made production of soda ash at the Rosignano site more efficient. This was achieved through a series of actions leading to reductions of up to 17% for fuel, limestone and steam. Improvements were targeted in both the lime kiln sector and quarry. Limestone sizes were reassessed, and loading and queuing of the kilns was improved to avoid wasting fuel. In addition, the limestone/fuel mixture used in the kilns was made more homogenous. Monitoring of the process was also improved by the introduction of Radar Layers in the cooking cylinders, a screening plant on the 'Malcotti' recovery circuit and an online analyser to continuously monitor lime milk quality.

Substantial gains have been achieved from both economic and environmental standpoints. The €2 million investment was part of a 'World Class Factory' project aimed at improving the plant's competitiveness, as well as that of the overall Solvay soda market.

ENVIRONMENT CATEGORY

Reducing the ecological footprint

Chimex

Inspired by Lord Kelvin's words "If you cannot measure it, you cannot improve it," Chimex set out to measure the ecological impact of its products. As there wasn't any relevant international frame of reference, it developed the EcoFootprint which factors in ten criteria to measure a product's ecological footprint. Criteria include water consumption, geographical origin of raw materials, reaction efficiency, rate of renewable carbon and overall carbon footprint, potential environmental impact of both raw materials and finished product, and the rate of reuse of waste and effluents. Also taken into account is the E-factor, which gives the ratio of waste generated to finished product. All data is certified by an independent third party in order to guarantee authenticity, and then communicated to customers and stakeholders.

The system facilitates continuous improvement and development of sustainable chemical processes. It has already led to substantial improvements in the environmental impact of Pro-Xylane, an anti-ageing L'Oreal molecule. The indicators used in 'EcoFootprint' continue to evolve and next to be included are concepts such as water footprint, naturalness and biodiversity.

Addressing legacy issues

Merck

In the 1960s, hexachlorocyclohexane (HCH) was thought to be harmless to the environment and was approved for use in building foundations. But over time, the chemical was discovered to be an organic pollutant and is now known for its persistence, bioaccumulation and long-range transport. Acquisition of Merck's Gernsheim site included an agreement to remove all existing contaminated soil and deposits by 2022.

The HCH removal project, started in 2008, involves excavation, transport and incineration of the pollutant. Merck constructed a small, mobile demolition hall which allows complete housing off of each area being excavated. The remaining pit is then filled with crushed stone and the hall moves on to the next area. Excavated material is transported to a filling plant, sealed into containers and incinerated at suitable sites without being re-opened.

Occupational health and safety is a main concern during the project due to the presence of volatile compounds. Partial vacuum and airlocks are maintained in both the demolition hall and filling plant, to stop pollutants entering the environment. Any exhaust is filtered and monitored, whilst employees are provided with protective equipment and biomonitoring.

So far, Merck has eliminated 26,000 tonnes of HCH from the area, and estimates that 38,000 tonnes will be eliminated by 2017.

Saving water through symbiosis

Solvay S.A.

Solvay is part of an ambitious European project, 'E4-water', which aims to save large volumes of potable water and come close to zero discharges of salt and liquid waste. Solvay's contribution is based on three modules carried out at their Antwerp site. The first two have already been fully industrialised and are currently saving the company 33 cubic metres/hour of water.

The first module involves recycling of wastewater through ultrafiltration and reverse osmosis membranes to produce demineralised water that can be used in Solvay's chemical processes. The second module can produce this demineralised water from brackish surface water pumped up from the river and nearby harbour. Both modules are possible thanks to support from E4-water partners, Evides Industriewater and Vito.

The third module capitalises on the previous two. The aim is to treat an external company's salted waste water and use the resulting purified water and salt concentrate in Solvay's manufacturing processes. In this way, the external partner avoids effluent production and Solvay gains additional water savings of 20 cubic metres/hour.

Besides saving water, the project serves as an industrial 'experimental garden'. Companies are motivated to work symbiotically, and experiments and demonstrations are carried out for external users.

Shifting to renewable raw materials

Solvay S.A.

Epichlorohydrin, the key chemical in making epoxy resins, is usually manufactured from the propylene. Solvay has developed an innovative way of forming epichlorohydrin from glycerine – a renewable by-product of biodiesel and oleo-chemical manufacturing – whilst retaining the same product characteristics.

Compared to the original propylene-based manufacture, the Epicerol® process results in a 61% reduction in global warming potential (GWP) which is due both to botanical carbon capture and to the efficiency of the manufacturing process. Consumption of non-renewable energy is 57% lower. The process also significantly reduces chlorine consumption, as well as the amount of chlorinated by-products and liquid effluents produced.

Solvay makes sure to source biomaterial from suppliers that share the same values, such as protection of biodiversity, responsible use of pesticides and good working conditions. The sustainability of the whole process and comparative life cycle assessment was externally validated.

Mobile recycling

Solvay Chimica Italia

Solvay Chimica Italia has turned a pollution problem into an opportunity by developing a mobile recycling kit which can be moved between different sites. The kit is a process simulator which focuses on wastes produced in electrochemical processes. It can be adapted to different plant characteristics and effluents, and indicates how various wastes should be treated for reuse in electrolysis. Parameters can be tested without interfering with any ongoing production processes and facilitating pilot-scale simulation of treatments which may not yet be available locally. The kit also produces chlorine at volumes which are replicable in an industrial context.

The mobile kit is modular and designed to be easily transportable by land and sea. It's compact, self-controlled, easy to start, and allows recycling analyses to be carried out onsite and on demand. Safety controls have also been included in its design, which allow it to operate without continuous supervision. The kit is enabling the company to design more sustainable processes, helping it protect natural resources and save money.

OCCUPATIONAL HEALTH AND SAFETY CATEGORY

Safety at the core

BASF Italia

BASF Italia wanted to improve safety at the Pontecchio site after noting that most lost time incidents (LTIs) were due to wrong behaviours. The company consulted with psychologists and educational experts from the University of Bologna, and the result was 'Safety Lab', which launched in 2010 and

is still ongoing. The project's main aim is to promote safety as a core foundation, and encourage proactive behaviour by all employees.

The first step was a questionnaire, measuring the safety culture and behaviour at the site. The results highlighted that workers had low awareness of the risks involved in chemical production. They also didn't believe they had much influence or personal responsibility for safety. The programme then focused on filling these skill gaps and misconceptions. Workers were taught non-technical skills like teamwork, situation awareness, decision-making, communication, leadership and how to cope with fatigue. Training was directly based on case studies from the Pontecchio plant.

The programme is bearing fruit: 36 months have gone by without any LTIs – an achievement never reached before. Employees can be heard discussing safety even whilst chatting at the coffee machine, and are being more resourceful in their work. Key performance indicators (KPIs) have improved and there is positive feedback from both management and operators. Similar projects have now been launched at other BASF sites.

Safety motivators

Celanese (Frankfurt)

To improve safety culture, 100 operators at Celanese's Frankfurt site were invited to become 'Safety Change Agents' (SCAs). These people were natural leaders and trained in behaviour-based safety, conflict management, observational feedback and dynamic risk assessment.

In German their role title is 'Sicherheitsmotivator', literally meaning 'safety motivator'. And this is exactly what these employees do: help to improve behaviours and safety ownership, and make sure that any incidents are learnt from and do not reoccur.

Frankfurt SCAs have been involved in a yearly 'Keep Safe' video contest as well as organising the first ever 'Frankfurt Safety Week' in which best practices were shared across the site. They carry out safety culture surveys and then plan improvements with management. They also helped develop unit-specific safety commitments and action plans in order to maximise employee engagement. This included identifying critical tasks and behaviours, and building an observation system which facilitates monthly safety discussions with all operators and contractors.

Currently, SCAs continue to work towards improving safety culture. Thanks to them, Celanese employees have enjoyed more than 1.5 million safe work hours.

Zero injuries

Celanese Emulsions Norden AB

On October 7th 2013, the unthinkable appeared to have happened at Celanese's Perstorp site – a huge chemical release and six people missing. But this was actually a large-scale emergency drill organised by Perstorp's safety change agents (SCAs), for which the fire brigade, ambulance and police services were all roped in.

The event was part of the SCAs' commitment to a sustainable zero-injury culture, together with increased safety ownership and engagement. The SCA programme was initiated in 2012 and includes 15% of all employees onsite. After an initial training phase, they actively started working on improving safety culture.

Perstorp's first 'Safety Day' also took place in 2013. Production was shut down for the entire day and employees were divided into competing teams to hunt for health and safety risks around the site, answer questions and carry out practical exercises related to work behaviours. Booths were also set up with information on rescue services, emergencies, first aid, hand and behavioural safety, personal protective equipment (PPE) and the role of SCAs.

The Perstorp site has had no serious injuries in three years, and suffered no loss of primary containment or environmental releases in 2013.

Internalising safety

Clariant International

Work behaviour is very dependent on cultural norms. With sites all over the world, Clariant had to factor this in when updating the safety programme 'AvoidingAccidents@Clariant'. The company decided to do away with external safety trainers and replace them with internal ones, thus removing communication barriers due to linguistic and cultural differences. This way, know-how also remains within the company, maintaining the safety programme's sustainability.

International workshops were organised to coach the chosen trainers, most of whom were already responsible for safety at their sites. Both conscious and unconscious behavioural patterns were tackled, either of which can cause serious accidents. The grasp reflex, which can happen automatically when something is dropped into a machine, is just one such example of a dangerous unconscious behaviour.

After the workshops, the internal trainers returned to their home countries equipped with new tools and action plans to educate their colleagues. The system works via a top-down approach, with the internal trainers supported in turn by a core safety team. So far, this new programme has managed to reduce Clariant's Lost Time Accident Rate (LTAR) by over 70% since 2007.

Tackling safety at national level

Federchimica, Italy

Italian chemicals association Federchimica is helping to improve worker safety. Near misses from all companies and public institutions working in the chemical sector are being fed into a common database, 'Programma Observer'. The key lies in the analysis and proper management of these near misses which can help prevent serious accidents. Information input includes how each event was

analysed and tackled. All those signed up to the programme can thus learn from others' near misses and implement technical and management measures that will prevent their repetition. Cross analyses for type, products involved, hazards, geographical area and the like, can be carried out. All searchable data remains anonymous, ensuring company confidentiality.

Federchimica is currently increasing awareness about the programme through workshops and meetings, and distributing brochures to encourage more companies to sign up to the initiative.

Doing more to protect employees

Hedinger GmbH

Fatal accidents from falls off tank trucks are a recurring motif even though trucks are equipped with mandatory handrails. As Hedinger's operators walk on tank trunks and Iso-containers on a daily basis, the company wanted to do more to improve employee safety.

They built a designated hall for tank truck sampling, loading and unloading processes, and designed innovative, protective equipment. This takes the form of an extendable passageway with handrails reaching a height of 1.1 metres on either side. The passageway can be manoeuvred directly over the truck, and adjusted to different truck sizes via a hydraulically operated system. The result is that the equipment covers the whole length and width of the vehicle, essentially forming one unit and fully secures the operators. In addition, access to the unit is only possible once the protective equipment has been properly positioned.

Safety first

INEOS

"Our work is never so urgent or important that we can't take the time to do it safely and with respect for the environment." This is Ineos' internal safety, health and environment (SHE) statement, and a message that they wanted foremost in the minds of all employees and contractors involved in their largest ever cracker turnaround (TAR) carried out in Cologne in 2013.

As well as 2,000 employees, the two-month project involved 4,000 contractors; most weren't fluent in German or familiar with the company philosophy. The challenge was to get them all aboard a 'zero incidents, zero accidents and zero environmental issues' safety culture. The company appealed to both hearts and minds through a non-verbal video, underlining that they should watch out for each other's safety in a 'brother's keeper' fashion. Multilingual safety inductions were carried out and brochures on the company's SHE principles were translated into 15 different languages. Near miss note pads and a '60 seconds check' card were also handed out to help workers assess the safety of their surrounding environment. Daily safety audits were carried out and safety officers and engineers were constantly present.

At less than €35,000, the communications materials were just a fraction of the overall €100 million turnaround cost, but had a real impact: only six minor (first aid) cases were recorded for contractors

during the entire TAR, and none at all for employees. These materials are now standard at the Cologne and other Ineos sites.

Turning safety into child's play

SABIC Polyolefine GmbH

Sabic's annual plant turnaround at its Gelsenkirchen, Germany site involves many contractors. To raise awareness about environmental health, safety and security (EHSS) during these events, the company carried out campaigns with a twist – appealing to workers' emotions, rather than just the need for compliance. So the company runs an annual competition involving local schoolchildren.

Each year, schools are invited to design and paint tarps around a given safety motto. These are then hung up around the plant during the turnaround and ranked via workers' intranet voting. Daily safety walkthroughs are organised and if there's any deviation from EHSS standards, the contractor has to pay a pre-agreed fine which goes into the competition jackpot; however, if there are no such findings, the jackpot money comes from Sabic. The money is given to participating schools based on their pictures' rankings.

Everybody involved benefits: communities gain a deeper understanding of the company, schools get an influx of funds, and of course safety awareness is raised on and off the job. And the idea is spreading – another chemical company nearby has already implemented the project successfully, and others are interested in following suit.

No chemical exposure or emissions

Total Petrochemicals

In 2013, Total's Carling platform was shut down for planned maintenance. This turnaround involved 480,000 work hours. The event's main challenges were to ensure no injuries, no environmental damage and no exposure to dangerous chemicals. Of most concern were the carcinogenic materials benzene and 1,3-butadiene.

Preparation for the turnaround was the most critical phase. All lines and vessels had to be emptied, washed, opened and ventilated. Critical phases were identified in advance. Inerting was improved and purge collection was maximised to limit waste. All waste water was preventatively pumped to limit any fugitive emissions, and waste sorting was improved to maximise treatment efficiency.

Atmospheric sampling was carried out throughout the turnaround, both through fixed samplers and passive badges carried by maintenance technicians. Workers' urine samples were analysed before and after each shift. Emissions were tracked inside and outside the site, and monitoring was adapted according to variations in the turnaround plan. Staff received specific training and respiratory protection. Task forces and regular coordination meetings were also set up.

The project was a success. Occupational exposure to dangerous chemicals was five times below authorized limits, and no atmospheric emissions occurred off site.

Improving with CaRE

Alkermes Pharma Ireland Limited

In 2013, Alkermes' Athlone site launched a new programme called 'CaRE', which stands for 'Collaborative Risk-focused Engagement'. CaRE involves all employees in reducing risk and was developed in-house by an interdisciplinary team. It includes easy-to-use tools and follows a 'plan-do-check-act' process. The whole system is based on continuous improvement.

CaRE begins with identifying risks within the workplace which may affect people, the environment or the business. Besides traditional risk assessment methods, innovative tools have been developed. The 'one minute risk assessment' prompts workers to check for any risks before starting work, and 'STAR' – an acronym for 'stop-think-act-review' – provides a structured approach to assessing non-routine tasks. Any corrective and preventive actions are then implemented and used as opportunities for improvement.

Employees are further empowered to improve their workplace through monthly walk-through checks. These focus on behaviours, practices and work conditions and provide opportunities for discussion, feedback and encouragement. One such example is 'golden nugget' – recorded instances of good practice that can be shared across the site. A specially-developed metric tracks all related progress.

The system encourages all employees to look out for each other. And although based on EHSS, the model can evolve to integrate other business risk mitigations such as Quality Risk Management. CaRE will be rolled out in Alkermes sites across the world.

PROCESS SAFETY CATEGORY

Eradicating leaks

Dow Chemical

Dow Chemical's Lauterbourg site wanted to completely eradicate chemical leaks and launched an ambitious campaign in order to do so. First, they established a monitoring system, in which all unforeseen chemical leaks were recorded. Based on this data, three main areas were targeted for improvement.

The first area was organisational and managerial support, where concrete guidelines were established. These specify that root-cause analysis and follow-ups have to be carried out on any leaks above 50 kilograms. Publication of any leaks is also encouraged, whereas best improvements are celebrated. Plant management and employees formed local leakage reduction groups. And leaks are now even taken into consideration when determining employee compensation.

Secondly, improvements were initiated in operations and behavioural control. Equipment was rearranged and colour-coded caps were introduced to distinguish between hazardous and non-hazardous chemicals, and indicate valves which should only be opened on exceptional occasions.

Checklists and double-checking by a second operator were also implemented to ensure proper valve resealing.

The third area was equipment. A list of repeat offenders was drawn up and preventive maintenance initiated. Any equipment misalignments were also corrected as these can cause premature ruptures. Investments were made into new technologies, such as replacing circle pumps with screw flasks, introducing valves that can only be opened by key, and installing high-level and leak detectors that can automatically shutdown equipment.

The site's efforts are paying off. Leaks have decreased by almost 90% since 2009 and employees have thoroughly embraced the 'zero leak' culture.

Walking the line

Celanese

'Walk the Line' is a Celanese initiative focused on strengthening a mature process safety management programme. It identified a need to improve energy control by reducing the amount of loss of primary containment (LOPC) incidents. An analysis carried out in 2012 showed that half these incidents were due to operators lining up energy transfers incorrectly; transferring material to unintended points or open ends.

These incidents are totally preventable so 'Walk the Line' was initiated to make sure that operators always transfer energy to where it's supposed to go. The scheme focuses on setting and reinforcing expectations at corporate level as well as site-specific plans for customized improvement. The Johnny Cash motif was purposely chosen to catch operators' attention.

A two day workshop was given globally by region, in order to strengthen management, engineering and operational discipline, as well as reinforce best practices. Weak areas and related improvements were identified in site-by-site assessments. Corporate communication tools were then set up to constantly reinforce the message. Site specific communications include training programmes, audits and commissioning forms. Walk the Line has worked, resulting in a 37% drop in LOPC incidents.

Degree-level safety

Pfizer Little Island

In 2012 Pfizer Little Island realised that onsite process safety knowledge was about to dip as experienced workers were leaving the organization. To combat this, the company partnered with the Cork Institute of Technology (CIT) to develop a bespoke 'Process Safety Course' for employees. The course was offered across the board, from senior management to operators, in order to make process safety part of everyone's agenda.

The course was equivalent to a final-year honours degree module and internationally accredited. It tackled hazard identification, risk analysis, associated workplace controls and safety management systems, with a sharp focus on local operations. Chemicals were covered in detail, including properties, segregation and storage, reaction safety, and pressure relief. The aim was to

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demonstrate the importance of process safety and empower staff to recognize and challenge lapses, and continually strive to improve operational practices.

More than 40 staff members from various departments successfully completed the course. They now participate in monthly process safety meetings and have had a noticeable impact on safety culture and conversations onsite. The course is currently being expanded into the wider Pfizer network.

Programming safety into sites

Total Refining and Chemicals

Many major accidents in the oil and gas industry could be avoided with the help of barriers that ensured prevention, mitigation and protection. Total has therefore developed a system to facilitate their design. Named Total R², an acronym for 'Tool to Analyse Residual Risks', the programme aggregates process safety information and uses this data to develop risk management strategies, as well as properly designed site layouts.

The programme's basis is an exhaustive list of possible Loss of Containment (LOC) events and related information. It can simulate all related physical impacts in a site-specific context, using contour mapping, probability data and consequence models. So far, it's been used in various Total sites for a wide spectrum of applications. Some of these include optimisation of a gas detector network, placement of onsite buildings, design of site layouts that minimise escalation effects, turnaround management, optimisation of evacuation routes, and development of risk reduction strategies for cross-country pipelines.

The system shows the most efficient and cost-effective solutions for predefined levels of safety. It also enables transparent communication on design of industrial sites. This innovative tool has been recognized by the European Process Safety Centre as a reference for the industry.

PRODUCT STEWARDSHIP CATEGORY

Downstream sustainability

CCP Composites

CCP Composites developed a new cost-effective and sustainable resin with reduced specific gravity known as TAP resin. The resin is used by bath manufacturers to reinforce acrylic bath shapes. It was trialled in conjunction with Carron Bathrooms to very positive feedback. Use of the resin led to lower styrene emissions, faster curing and less acrylic distortions. Carron could also produce more baths per tonne of resin. The product was launched on standard bath lines in 2010.

Its environmental performance was measured in comparison to the standard resin used in bath manufacturing. Cradle to grave analysis highlighted a number of benefits. Reactions between the raw materials are exothermic, so less heating is needed in production. The raw materials emit fewer greenhouse gases and require less energy for storage. Benefits continue at the compounder phase because the new resin contains half the solvent and emits fewer volatile organic compounds. This is

a big plus for occupational health as the resin is spread manually. Thanks to better workability, there's also less wastage.

TAP resin has also been awarded the 'Total EcoSolutions' environmental label.

Detoxifying the electrical equipment market

Solvay S.A.

Electrical equipment manufacturers are substituting halogenated flame retardants in their products with less toxic alternatives. However, these replacements are usually not as resistant to high temperatures. To combat this, Solvay has created a new formulation which is toxin-free and meets the combined performance requirements of fire resistance, mechanical strength and overall improved processability.

The product is a synergy between a non-halogen flame retardant and a specifically designed high-temperature polyamide. As this polymer is fluid and can be used to build thinner parts, it meets the requirements of the rapidly developing 'miniaturisation' market. The new formulation can also be used to develop higher amperage circuits, such as circuit breakers. These characteristics, coupled with the product's safety and increased productivity, allow it to contribute towards smart cities in which multiple connected devices help businesses and homes optimise their use of electrical energy. Due to its novel attributes, the formulation is expected to substitute 40% of high-temperature, halogenated products currently on the market.

Novel membranes for water purification

Solvay Speciality Polymers, Italy

Water scarcity is an important global issue, and recovery of saline and polluted waters is a prime priority. But desalting the highly saline waters produced by the oil industry is costly and there are few distillation processes that can carry out effective purification. A new development in membrane distillation from Solvay Speciality Polymers means this could be about to change.

In typical membrane distillation, a temperature gradient is applied to two opposing sides of a porous membrane, forming a hot and cold side. Impure water on the hot side cannot pass through the membrane, but its vapour can. In this manner, impurities are left behind and purified water is collected on the cold side. One of the technical issues preventing large scale application of this process was the lack of suitable membranes for the oil industry. Solvay's innovative double-layer membrane can be used to design composite membranes with tuneable properties.

A big advantage of this process is that it can be coupled with solar and geothermal energy, or even waste heat sources. Customers in remote, arid areas can now benefit from an efficient way of extracting and purifying water.

Minimising the fallout from transport accidents

Total Petrochemicals

Despite best efforts, accidents still occasionally happen during the transport of dangerous goods. The priority after these events is to minimise societal and environmental impacts, but recovery operations are usually long, costly and impact heavily on road and rail traffic. Total Petrochemicals has developed mobile equipment that facilitates transfer operations after such accidents.

The equipment can handle a variety of chemicals and includes a trailer with a compressor, flexible hoses and a mobile stack. Pumps designed specifically for liquefied petroleum gas (LPG) and flammable hydrocarbons are also available, together with a set of connections suitable for most trucks and rail cars.

Use of this equipment increases the speed of intervention as it can be easily mobilised to accident locations within France. Environmental impacts are further reduced through less burning of chemicals and minimised product losses. The system has been tested successfully in several locations and two units are currently ready for use in Lyon and Le Havre. The equipment can be used by any Total site, as well as by external companies in the spirit of Responsible Care via the Cefic programme ICE (Intervention in Chemical Transport Emergencies).

SECURITY CATEGORY

Biomonitoring on the move

Solvay Speciality Polymers, Italy

Biomonitoring is increasingly important for security purposes such as detection of contaminants in food and early diagnosis of infectious diseases. Thanks to Solvay Speciality Polymers, biomonitoring can now be carried out on the move using a new diagnostic tool, 'Reflective Phantom Interface', connected to a smartphone.

Biomarkers are usually proteins in aqueous samples. Solvay has exploited the fact that these compounds are easily detectable using light when placed between two materials with similar refractive indexes. They developed a polymer that has the same refraction index as water and embedded receptor probes into its surface. This was then combined with a smartphone and sample holder. When the system is used to analyse an aqueous sample, biomolecules end up between the polymer and water, and can be detected using the smartphone's camera and flash.

Analysis is simple and low cost, and the system enables laboratory-quality tests in remote or developing areas of the world. Developed in 2014 in conjunction with the University of Milan and PRoXentia, it has great relevance to human diagnostics, biodefense and food safety. It limits the need to travel to centralised healthcare settings and should improve crisis management in potential terrorist attacks.

