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ENVIRONMENTAL

Storing CO2 underneath the Siberian Permafrost: a win-win solution for long-term trapping of CO2 and heavy oil upgrading
2001-08-17

A two-year project entitled “Assessment of the Feasibility of CO2 Storage in the Russian Permafrost” delivers new conclusions about the safety role of the permafrost and specific conditions of storage in an area of abnormal geothermal gradient in Western Siberia. One of the specific issues of the project was the potential formation of carbon dioxide hydrates from the injected CO2 and the possible reaction between the existing methane hydrates and the injected CO2. Maps have been constructed showing the areas of CO2 hydrate stability. A second specific issue was the compatibility of CO2 storage in the permafrost with oil production. Pilot tests of EOR technologies, involving either the injection of CO2 or the generation of CO2 in situ, proved very efficient for high-viscosity oil pools. Therefore, propose to inject CO2 in West Siberia into high-viscosity oil fields. High-viscosity oil fields are mainly located in the centre of the Western Siberian Basin in Khanty-Mansijsk autonomous okrug (KMAO). An alternative or complementary solution is storage in aquifers. Deep aquifers, such as the Pokur formation overain could also be storage targets, but their potential is unknown because they have not been explored in detail. The inventory of major CO2 sources in Western Siberia has shown that the major CO2 emission in the power sector comes from the KMAO, where power stations in Surgut and Nizhnevartovsk are large CO2 sources. GIS mapping of the permafrost depth and thickness, and the associated stability domain of the CO2 hydrates, has shown that a good overlap could exist between these industrial areas and the stability domain of the gas hydrates, underneath the permafrost. Storage beneath the permafrost as CO2 hydrate is not suitable due to the probable rapid plugging of the porosity by solid gas hydrates. But, the CO2 should be stored at supercritical state in the hydrocarbon fields, with added value of heavy oil upgrading, and trapped underneath a classical cap rock. In addition, the permafrost would act as a secondary cap-rock by trapping the CO2 as hydrates if the primary caprock should fail.

Authors: Le Nindre, Yves-Michel; Allier, Delphine; Duchkov, Albert; Altunina, Liubov K.; Shvartsev, Stepan; Zhelezniak, Mikhail; Klerkx, Jean

Full Source: Energy Procedia 2011,4, 5414-5421 (English)
This study aims to investigate the mutagenic potential of surface water samples from Cadeia and Feitoria rivers (RS, Brazil) in areas influenced by tanneries and leather footwear industry. Micronucleus assays using V79 cells and human lymphocytes were used. Cells were exposed to surface water collected bimonthly from three sites for a year, totalling six samples. Significant MN induction in human lymphocytes was shown by 83% of samples from sites FEI001 and CAD001 located downstream from the industrial area, followed by FEI004 (33%), upstream. Only a single sample from site FEI004 showed a positive response for MN in V79 cells. Thirteen discordant and five concordant responses were found between the two in vitro tests. Mutagenic agents were found at the sites where chemical quality was worst, corroborating studies on chronic toxicity, oxidative stress and mutagenicity performed in this area. The assay using human lymphocytes was more sensitive than V79 cells to detect the contaminants from this area, showing that it is an excellent biomarker of environmental genotoxicity.

Authors: Lemos, A. O.; Oliveira, N. C. D.; Lemos, C. T.
Full Source: Toxicology in Vitro 2011, 25(4), 761-766 (English)

Chromatographic determination of tetraethyl thiuram disulphide in human blood

Sodium fluoride is added to the analysed sample in amount of 10% of the mass of the sample and the sample is extended twice for 45 minutes with portions of Et acetate, the mass of each of which is twice higher than the mass of the sample. Separate extensions are combined and filtered through anhydride sodium sulphate. The solvent from the filtrate is evaporated at 50-60°. The residue is dissolved in a mixture of hexane-dioxane-propanol-2 solvents. Liquid chromatography is performed on a column with silica gel L 40/100 i using a hexane-dioxane-propanol-2 mobile phase. The eluate fractions which contain the analysed substance are merged. The eluate is evaporated. The residue is dissolved in a mixture of hexane-dioxane-propanol-2 solvents and the analysed substance is
Environmental pollutants have a significant impact on the ecosystem and disrupt balance between environment, human and non-human components that result in deleterious effects to all forms of life. Identifying environmental factors for potential imbalance are extremely crucial for devising strategies for combating such toxic dysregulation. Automobile exhaust (in air), heavy metals (in food and water) and pesticides (in air, food, soil and water) are the most common environmental pollutants and their short and long term exposures can cause hazardous effects in humans leading to systemic disorders involving lungs, kidney and immune systems. Mechanisms involved in genesis of such toxic effects have revealed complex, interactive pathways. Strategies for the protection of homoeostasis and health, viz., general preventive measures, nutritional supplements and herbal agents have been described, to counter these pollutants induced damaging effects on various body systems.

Authors: Gulati, Kavita; Banerjee, Basudeb; Lall, Shyam Bala; Ray, Arunabha
Full Source: Indian Journal of Experimental Biology 2010, 48(7), 710-721 (Eng)

Biomarker expression in lung of rabbit with pulmonary fibrosis induced by ammonium perchlorate
2001-08-17
Ammonium perchlorate (AP), an oxidiser, has been used in solid propellants. Although AP exposure has been suspected as a risk factor for the development of pulmonary fibrosis, data are still inconclusive. To evaluate the pulmonary toxicity and the potential pulmonary fibrosis caused by occupational exposure to this compound, 25 male rabbits were randomly allocated into five groups to receive AP or bleomycin or saline by intratracheal injection. All rabbits were sacrificed and total RNA from the lungs was extended. Expressions of types I and III collagens, transforming growth factor-α1 (TGF-α1) and tumour necrosis factor-R (TNF-R) mRNA detected via HPLC on a 64x2 mm column filled with Silasorb 600 sorbent using a hexane-dioxane-propanol-2 mobile phase and a UV detector.

Authors: Shormanov, V. K.; Gorbacheva, N.A.; Duritsyn, E.P.; Prosvetova, A. P.; Ilyushina, T. N.; Korolev, V. A.; Ivanov, V. P.; Kim, A. V.
Heavy metals are omnipresent in the environment, and industrial use has greatly increased their presence in soil, water and air.

Technical

(mRNA) were measured by reverse transcription-polymerase chain reaction (RT-PCR). The expressions of type I and III collagen mRNA in low, moderate and high dose AP groups were significantly higher (p < 0.01 or p < 0.05) than that in the saline group. There was also a significant increased level of TGF-α1 and TNF-R mRNA in the three AP groups compared with saline control group (p < 0.01 or p < 0.05). These results reveal that AP can increase gene expressions of types I, III collagens, TGF-α1 and TNF-R in lung of rabbits exposed to AP. The overexpression of these biomarkers were considered as effective indicator linking to the development of pulmonary fibrosis and finally demonstrated that AP has potential to induce pulmonary fibrosis.

Authors: Wu, Feng-hong; Guo, Hui-xia; Lin, Ming-fang; Chen, Zhi-ze; Zhou, Xuan; Peng, Kai-liang
Full Source: Toxicology and Industrial Health 2011, 27(3), 235-241 (English)

Embryotoxicity and fetotoxicity following intraperitoneal administrations of hexavalent chromium to pregnant rats

2001-08-17

Heavy metals are omnipresent in the environment, and industrial use has greatly increased their presence in soil, water and air. Their inevitable transfer to the human food chain remains an important environmental issue as many heavy metals cause a range of toxic effects, including developmental toxicity. Administration of chromium VI (1 and 2 mg/kg as potassium dichromate) through i.p. injection during organogenesis (days 6 to 15 of gestation) in rats revealed embryo- and fetotoxic effects. Reduced foetal weight, retarded foetal development, number of foetuses per mother and high incidences of dead foetuses and resorption in treated mothers were also observed. Gross morphological abnormalities, such as displayed form of oedema, facial defect, lack of tail, hypotrophy, severe subdermal haemorrhage patches and hypotrophy of placenta were obsessed in foetuses after chromium VI-treated mothers. A skeletal development of foetuses presented an incomplete ossification in nasal, cranium, abdominal or caudal bones in rats treated with 1 mg/kg of chromium, whereas rats treated with 2 mg/kg showed ossification and absence of the sacral vertebrae compared with the control. At a higher dose of chromium, histological changes were found in foetuses with atrophy of their vital organs. Placental histology observations revealed a pronounced morphology alteration, with atrophy of decidual cells, a degenerated of chorionic villi and hypotrophy of blood lacuna. The present study suggests a risk to the developing embryo when the mother is exposed to a high
Multicentre open-label phase II/III study of intravenous levofloxacin in subjects with respiratory tract infection
2001-08-17
This open-label study evaluated the efficacy and safety of an injectable preparation of levofloxacin (LVFX), a quinolone antibacterial, in the treatment of respiratory tract infection (RTI). Subjects with community-acquired pneumonia or secondary infection of chronic respiratory disease were enrolled and treated with LVFX administered at 500 mg once daily by i.v. infusion for 7-14 days. Clinical efficacy: Of 181 evaluable subjects with RTI, 173 (95.6%) showed a clinical response at the end of treatment. Clinical response rate by diagnosis was 95.9% (140/146) for community acquired pneumonia and 94.3% (33/35) for secondary infection of chronic respiratory disease. A clinical response was achieved in 35/35 subjects (100%) with isolates of Streptococcus pneumoniae the predominant RTI causative organism. Bacteriological efficacy: Bacteriological response rate per subject was 97.6% (80/82) and overall pathogen eradication rate was 97.8% (91/93), at the end of treatment. Safety: The adverse drug reaction incidence was 44.2% (91/206) in the overall population and 25.0% (4/16) in the elderly (≥80 years of age). Adverse drug reactions reported in at least 5% of those treated and evaluable for safety included injection site erythema (13.6% [28/206]), ALT increased (9.7% [20/206]), and AST increased (8.7% [18/206]). Injection site reactions-erythema, pruritus, pain, swelling, and induration- were especially frequent, occurring in 34 of 206 subjects (16.5%). All injection site reactions were mild and resolved within the day of onset without treatment. None required treatment discontinuation. In conclusion, LVFX administered by i.v. infusion at 500 mg once daily for 7-14 days is effective and safe in RTI treatment.
Authors: Kohno, Shigeru; Watanabe, Akira; Aoki, Nobuki; Niki, Yoshihito; Kadota, Junichi; Fujita, Jiro; Yanagihara, Katsunori; Kaku, Mitsuo; Hori, Seiji
Full Source: Nippon Kagaku Ryoho Gakkai Zasshi 2011, 59(S-1), 18-31 (Japan)
In this study, the authors investigated the effects of chronic exposure by welders to Mn through an analysis of the degree of brain activity in different activities such as cognition and motor activities using the neuroimaging technique of functional magnetic resonance imaging (fMRI). The neurotoxic effect that Mn has on the brain was examined as well as changes in the neuro-network in motor areas, and the usefulness of fMRI was evaluated as a tool to determine changes in brain function from occupational exposure to Mn. A survey was carried out from July 2010 to October 2010 targeting by means of a questionnaire 160 workers from the shipbuilding and other manufacturing industries. Among them, 14 welders with >10 years of job-related exposure to Mn were recruited on a voluntary basis as an exposure group, and 13 workers from other manufacturing industries with corresponding gender and age were recruited as a control group. A questionnaire survey, a blood test, and an fMRI test were carried out with the study group as target. Out of 27 fMRI targets, blood Mn concentration of the exposure group was significantly higher than that of the control group (p < 0.001), and Pallidal Index (PI) of the welder group was also significantly higher than that of the control group (p < 0.001). As a result of the survey, the score of the exposure group in self-awareness of abnormal nerve symptoms and abnormal musculoskeletal symptoms was higher than those of the control group, and there was a significant difference between the 2 groups (p < 0.05, respectively). In the correlation between PI and the results of blood tests, the correlation coefficient with blood Mn concentration was 0.893, revealing a significant amount of correlation (p < 0.001). As for brain activity area within the control group, the right and the left areas of the superior frontal cortex showed significant activity, and the right area of superior parietal cortex, the left area of occipital cortex, and cerebellum showed significant activity. Unlike the control group, the exposure group showed significant activity selectively on the right area of the premotor cortex, at the centre of supplementary motor area, and on the left side of superior temporal cortex. In the comparison of brain activity areas between the 2 groups, the exposure group showed a significantly higher activation state than did the control group in such areas as the right and the left superior parietal cortex, superior temporal cortex, and cerebellum including superior frontal cortex and the right area of the premotor cortex.
This study considers whether the diagnostic value of laboratory tests can be defined, by studying the relationship of endogenous exposure (effect) and the proportion of subjects with the changed level of a biomarker (response) to the dose of a substance, stage of disease, and length of service.

Methodological approaches to selection of informative laboratory biomarkers and their complexes for early detection of the effect of hazardous factors on humans and for the diagnosis of occupational diseases

2011-08-08

Approaches and strategy have been developed to choose informative laboratory biomarkers for the early and preclinical diagnosis and to detect the negative influence of harmful industrial and environmental factors. This study considers whether the diagnostic value of laboratory tests can be defined, by studying the relationship of endogenous exposure (effect) and the proportion of subjects with the changed level of a biomarker (response) to the dose of a substance, stage of disease, and length of service. Due to the polysyndromic pattern of many occupational diseases, it is shown to be most expedient to carry out a few tests characterising different aspects of the pathogenesis of disease. Methodological approaches to developing a set of informative biomarkers have been proposed.

Author: Pavlovskaya, Nadezhda A.
Full Source: Klinicheskaya Laboratornaya Diagnostika 2011, (4), 22-25 (Russian)

Occupational exposure to potential endocrine disruptors: further development of a job exposure matrix

2011-08-08

In the present study, the authors developed a new up-to-date and comprehensive job exposure matrix (JEM) for estimating exposure to potential endocrine disruptors in epidemiological research. Chemicals
with endocrine disrupting properties were identified from the literature and classified into 10 chemical groups: polycyclic aromatic hydrocarbons (PAHs), polychlorinated organic compounds, pesticides, phthalates, organic solvents, bisphenol A, alkylphenolic compounds, brominated flame retardants, metals and a miscellaneous group. Most chemical groups were divided into three to six subgroups. Focusing on the years 1996-2006, three experts scored the probability of exposure to each chemical group and subgroup for 353 job titles as unlikely (0), possible (1) or probable (2). Job titles with positive exposure probability scores were provided with exposure scenarios that described the reasoning behind the scores. Exposure to any chemical group was unlikely for 238 job titles (67%), whereas 102 (29%) job titles were classified as possibly (17%) or probably (12%) exposed to one or several endocrine disruptors. The remaining 13 job titles provided too little information to classify exposure. PAHs, pesticides, phthalates, organic solvents, alkylphenolic compounds and metals were often linked to a job title in the JEM. The remaining chemical groups were found to involve very few occupations. The authors concluded that despite some important limitations, this JEM could be a valuable tool for exposure assessment in studies on the health risks of endocrine disruptors, especially when task specific information is incorporated. The documented exposure scenarios are meant to facilitate further adjustments to the JEM to allow more widespread use.

Authors: Brouwers, M. M.; van Tongeren, M.; Hirst, A. A.; Bretveld, R. W.; Roeleveld, N.

Full Source: Occupational and Environmental Medicine 2009, 66(9), 607-614 (Eng)

**Relationships between alumina and bauxite dust exposure and cancer, respiratory and circulatory disease**

The associations between alumina and bauxite dust exposure and cancer incidence and circulatory and respiratory disease mortality among bauxite miners and alumina refinery workers was investigated in this study. This cohort of 5770 males has previously been linked to national mortality and national and state cancer incidence registries (1983-2002). Poisson regression was used to undertake internal comparisons within the cohort based on subgroups of cumulative exposure to inhalable bauxite and alumina dust. Exposure was estimated using job histories and historical air monitoring data. There was no association between ever bauxite exposure and any of the outcomes. There was a borderline significant association between ever alumina exposure and cerebrovascular disease mortality.
In this study, the authors evaluated the pulmonary function status of the workers engaged in manufacturing of brass made utensils and polishing.

Cross sectional study for the assessment of respiratory function status among the workers in brass utensil factory
2011-08-08

The brass metal workers are affected by the flakes of brass during making of brass made utensils that causes the decrement as well as impairments of pulmonary functions. In this study, the authors evaluated the pulmonary function status of the workers engaged in manufacturing of brass made utensils and polishing. A standard questionnaire was followed to note the symptoms, like cough, breathlessness and chest tightness, etc. The male workers were only involved in the work of brass made utensils factory a total of 50 male workers and 20 control male subjects not engaged in this profession and belonged to same socio-economic class were also investigated for pulmonary function tests (PFT). The study was carried out at Kunghaghata in the district of Murshidabad, West Bengal. The pulmonary function status assessment was done by spirometric method using Spirovit-Sp-10 and Wright’s peak flow meter. Student two tail ‘t’ tests are used to compare between the control and utensil workers to find out whether there are any significant changes are found due to work exposure. Pearson’s ‘r’ product moment co-relation is also performed to find out relation between duration of exposure and pulmonary function. The respiratory symptoms are found higher among the exposed utensil workers.
workers. A trend of decrement of lung volumes and flow rates were found with the increase of age and duration of work exposure. Product moment correlation showed negative correlation between work exposure and pulmonary function. The pulmonary function abnormalities found among the exposed workers are restrictive, obstructive and combined restrictive and obstructive type. As a whole 8% utensil workers showed respiratory function impairments in which obstructive type of impairments found more (utensil makers-3.12%, and utensil polishers-11.11%). The authors concluded that the findings suggest that the respiratory function impairments among the brass made utensil workers might be due to their exposure in to the work environment.
Authors: Chattopadhyay, B. P.; Alam, J.; Hossain, M.
Full Source: Indian Journal of Environmental Protection 2009, 29(7), 634-642 (Eng)

PUBLIC HEALTH

Acute childhood leukaemia and residence next to petrol stations and automotive repair garages: the ESCALE study (SFCE)
2011-08-08

The association between acute childhood leukaemia and residing next to petrol stations and automotive repair garages was analysed in a national registry-based case-control study carried out in France in 2003-2004. Population controls were frequency matched with cases on age and gender. Data were collected by standardised telephone interview with the mothers. The latter were asked to report the proximity of their homes to petrol stations, automotive repair garages and other businesses from the conception of the index child to the diagnosis (for cases) or interview (for controls). Odds ratios were estimated using unconditional regression models adjusted for age, gender, number of children under 15 years of age in the household, degree of urbanisation and type of housing. 765 Cases of acute leukaemia and 1681 controls were included. Acute leukaemia was significantly associated with residence next to petrol stations or automotive repair garages (OR 1.6, 95% CI 1.2 to 2.2) and next to a petrol station (OR 1.9, 95% CI 1.2 to 3.0). The OR showed no tendency to increase with duration of exposure. The results were not modified by adjustment for potential confounding factors including urban/rural status and type of housing. The results support the findings of our previous study and suggest that living next to a petrol station may be...
associated with acute childhood leukaemia. In addition, the results suggest that the role of low-level exposure to benzene in acute childhood leukaemia deserves further evaluation.


Full Source: Occupational and Environmental Medicine 2009, 66(9), 598-606 (Eng)

Critical evaluation of approaches in setting indoor air quality guidelines and reference values

2011-08-08

The importance of good indoor air quality for the health of the individual was recognised as long as 150 years ago and that period also saw recommendations, which essentially related to questions of ventilation and carbon dioxide. The first evaluation standards for organic and inorganic substances were laid down in the 1970s, often on an empirical basis. It was in the mid-1980s of the 20th century that a shift occurred towards systematically evaluating the results of indoor air measurements, carrying out representative environmental surveys and deriving guideline values and reference values on the basis of toxicological, epidemiological and statistical criteria. Generally speaking the indoor environment is an area which can only be assessed with difficulty since its occupants are in most cases exposed to mixtures of substances and there can be great local and temporal variations in the substance spectrum. Data are available today for a large number of substances and this makes it possible, with the aid of statistically derived reference values and toxicological based guideline values, to make useful recommendations regarding good indoor air quality. Nevertheless, it is still difficult to evaluate reactive compounds and reaction products. What is disadvantageous, however, is the fact that different guideline values may be published for one and the same substance, whose justification and area of application are often not transparent. The author concludes that a guideline or reference value can only be regarded as rational when necessary and when a strategy for its verification is available.

Author: Salthammer, Tunga

Full Source: Chemosphere 2011, 82[11], 1507-1517 (Eng)

Heavy metal pollution and potential ecological risk of paddyfield soil in littoral area, Fujian Province

2011-08-08

During the present study, the concentrations of Hg, Cd, As, Cr, Ni, Cu,
Zn and Pb were measured in 185 paddy soil samples collected from 10 valleys in Fujian Littoral area, Fujian Province, in order to assess the pollution and distribution of these heavy metals. According to the Tessier sequential chemical extractions, the speciation of heavy metals in the soils were assessed. The results demonstrated that the mean contents of Hg, Cd, As, Cr, Ni, Cu, Zn and Pb in Paddy soil samples were 0.41, 0.20, 6.62, 35.65, 12.7, 128.39, 109.65 and 63.56 mg kg, respectively. Compared to the background values for soils in Fujian Province, Hg and Cd were the strongest enriched elements. These were 46% samples, which had Hg content and 13% samples, which had Cd content higher than the standard II of soil quality. The samples with higher Hg content were distributed around city or town such as Fuzhou, Zhangzhou and Hg was mainly in organic phase. These characters showed that higher content of Hg was due to the pollution of economic activity. Whereas the samples with higher Cd content did not limit the area of economic activity, and Cd in the soils mainly existed in residual phase and Fe-Mn oxides. The higher contents of Cd should be laid on the geochemical background of the rocks. Cd and Hg in paddy soil possessed higher potential ecological risk and rice had a characteristic of strongly absorbing Cd. Moreover acidification could increase this absorbency. The authors concluded that the soils in this area were acidic, so the food safety resulting from Cd pollution needs to be observed.

Authors: Chen, Diyun; Xie, Wenbiao; Song, Gang; Luo, Dinggui; Zhang, Hongguo; Yang, Junhua
Full Source: Turang Tongbao 2010, 41(1), 194-199 (Ch)

How safe are antioxidant food supplements containing selenium?
2011-08-08
Three antioxidant food supplements were analysed for selenium [Se] and its species. Sample A main constituents were coenzyme Q10, selenium (as medical yeast), vitamin C and natural vitamin E. The product is used for maintaining health and strengthening physical and mental abilities, stimulating the immune system, inhibiting the development of atherosclerosis, strengthening a weakened heart. Sample B main constituents were coenzyme Q10, selenium, vitamin E and betacarotene. The product is advertised as high dosage natural coenzyme Q10, which provides supply of energy to all cells of human body. Sample C main ingredients were coenzyme Q10, selenium (as sodium selenite), beta-carotene and vitamin E with the same positive effects described as for the samples A and B. The samples were digested and analysed for Se content.
The investigation on quality status of soil environment for cultivation of Radix et Rhizoma herbs in Chongqing City were analysed to provide the science evidence for GAP base construction and production of medical medicines.

Quality analysis and evaluation on soil environment for cultivation of Radix et Rhizoma herbs in Chongqing City
The investigation on quality status of soil environment for cultivation of Radix et Rhizoma herbs in Chongqing City were analysed to provide the science evidence for GAP base construction and production of medical medicines. The samples of Paeonia suffruticosa, Atractylodes macrocephala, Angelica dahurica and Scrophularia ningpoensis cultured in Chongqing City were used to evaluate the pollution of Pb, Cd, Cr, Hg and As in soil environment. The pollution indexes of all pollutants in soils for cultivation of P. suffruticosa, A. macrocephala, A. dahurica and S. ningpoensis were less than 0.7. It indicated that the levels of heavy metal pollution of soil environment for cultivation of Radix et Rhizoma herbs in Chongqing City were less than the standards in Safety Qualification for Agricultural Product-Environmental Requirements for Origin of Non-Environmental Pollution Vegetable (GB/T18407.1).

Authors: Deng, Caifu; Zhang, Wenwei; Tan, Qiusheng; Luo, Chuan; Luo, Shun
Full Source: Shizhen Guoyi Guoyao 2010, 21(8), 2048-2050 (Ch)
Using the ISA 84/HAZOP/LOPA procedure to design a safety instrumented system (SIS) for a fumed silica burner
2011-08-17

A Cabot Team used the ISA 84-2004 (IEC61511-1) standard to evaluate the Safety Instrumented System (SIS) for an existing fumed silica burner and made design changes to reduce the risk. Years prior to this initiative, the layers of protection review used was subjective and resulted in assigning unreasonably high Safety Integrity Levels (SIL) on safety critical interlocks. The Team turned to the ISA 84 approved LOPA procedure and found it to be a more realistic and a less subjective risk evaluation that resulted in a practical, defensible process safety system design. The procedure steps followed were to: 1) Perform a HAZOP, 2) Use Process Hazard Analysis (PHA) software to generate LOPA spreadsheets, 3) Populate LOPA spreadsheets for each risk scenario and compare to the Cabot Risk Matrix, 4) Design an SIS/SIL to bridge the LOPA-identified risk gaps, and 5) Implement and document the changes. After completing the PHA/LOPA analysis, two scenarios were identified where the process safety risk was marginal and required design improvements. The Team struggled on how to design proper SILs and, with the help of a certified consultant, completed Step 4. Both SIS design improvements were implemented in 2009, reducing the inherent control related risks with a practical solution.

Authors: Vaughen, Bruce K.; Mudd, Jeffry O.; Pierce, Bryan E

Overview of inherently safer technology
2011-08-17

Inherently safer Design (ISD) is a holistic approach to making the development, manufacture, and use of chemicals safer. Over time, there have been many developments on the concept of inherent safety, however, currently there is a growing fixation on only one element of ISD: substitution. This paper will present an overview of ISD and its elements of minimise, substitute, moderate, and simplify. In addition, the life cycle
of a process will be explained in context of ISD to further explain the most effective use of ISD as well as other risk mitigation methods and strategies.

Author: Hendershot, Dennis C.


Regulating inherent safety Contra Costa County’s industrial safety ordinance
2011-08-17

There were numerous accidents that occurred in Contra Costa County during the late 1980’s and throughout the 1990’s. The public and the County’s Board of Supervisors were very concerned about the impact these accidents had on the community. The Board of Supervisors decided to expand on any other process accident prevention regulations that existed in the United States to prevent these accidents from occurring in the future. The Industrial Safety Ordinance, which requires facilities to consider Inherently Safer Systems, was approved by the Board of Supervisors and became effective in Jan. 1999. The paper discusses the implementation of applying inherent safety and how Contra Costa Health Services ensures that the requirements are being met.

Author: Sawyer, Randall L.