

CYP1A and C expression pattern is identical. The difference is that over expression of CYP1A has been stronger and more consistent.

Comparing the field analysis of the study with experimental ones indicates that CYP1 family genes (CYP1A and CYP1C in gill and liver) can be considered suitable biomarkers in ecological risk assessment.

Resiliency of Smart Infrastructure Under Cyberattack in Internet of Things

*Ghorbani R, Branigan J
University of Hawaii at Manoa*

Internet of things such as smart meters, smart camera, smart appliances are an inevitable of future civil infrastructure. Thus, different attacks needs to be investigated to prevent catastrophic failures and to increase the resiliency of such systems. This work studies the resiliency of smart infrastructure with a focus on smart electric grid under cyber attack to millions of interconnected devices. It also provides a risk analysis on different failure modes of such system.

Biosorption of Bismarck Brown Y from Wastewater Using Port Jackson-Based Adsorbents

*Giwa AA, Wewers F, Umunyuzo H
Ladoke Akintola University of Technology, Ogbomosho; Nigeria; Cape Peninsula University of Technology, Bellville, South Africa*

In this study, the potential of two adsorbents prepared from Port Jackson plant for the removal of Bismarck Brown Y dye from wastewater was investigated. Four different adsorbents were prepared from Port Jackson leaves that were collected from Belhar, Western Cape, South Africa and were characterized using Infrared spectroscopy and Scanning Electron Microscopy. The adsorbents were raw and chemically treated (using nitric acid, phosphoric acid and sodium hydroxide respectively) leaves. Batch adsorption experiments were conducted to evaluate the effects of various parameters (contact time, temperature and adsorbent dose) on the efficiency of the processes. The experimental data were fitted to different kinetics and isotherm models. Thermodynamic parameters {Gibb's free energy (ΔG), enthalpy (ΔH) and entropy (ΔS)} of the processes were also determined. The percentage removal of the dye by the adsorbents increased with increasing contact time and adsorbent dosage but decreased with increasing temperature.

The adsorption processes followed Pseudo-second order kinetics ($R^2 > 0.99$) and were spontaneous ($G_0 -1.04$ to -8.38 kJ/mol) and exothermic ($H_0 -15.64$ to -25.68). The processes were accompanied with decreased randomness as shown in the negative change in entropy (S_0). The four adsorbents exhibit good potentials for remediating dye-contaminated wastewater.

A Sociotechnical Perspective on Safety Incidents in High-Risk Industries

*Goede JF, Hofstede GJ
North-West University and Wageningen University & Research*

The interaction between people and technology, also described as sociotechnical systems, is growing in complexity. Despite advanced technologies and management tools available to high risk industries, major incidents occurred in the past decade, such as the nuclear incident in Fukushima, Japan and the oil spill in the Gulf of Mexico, USA. In this presentation, the findings of a literature study of academic papers from the past 70 years are presented. The literature shows progress from tools to assess safety risk, to the design of safer technologies, and increased automation and regulations, which resulted in fewer occupational incidents and fatalities over this period. However the increasing scale of interconnected systems leads to greater probability of high-impact incidents, even though lower in frequency. Despite engineering efforts to eliminate the human factor, behaviour and culture remain as contributors to such incidents. Traditionally, technology and people are seen as separate and inherently different disciplines, resulting in a blame culture which do not prevent these unfortunate incidents from occurring. Instead, technology and people could be viewed not as opposing forces, but as one interconnected sociotechnical system for safety management. While technology analyses are mature, an assessment of the safety culture in the workforce is more difficult. A sociotechnical model is proposed to assess both the inherent safety culture-as-is, as well as the ongoing learning from experience that influences future behaviour. This presentation concludes that the intuitively commendable goal of zero incidents could result in limited learning opportunities for operators to gain safety experience, leading to unintended and surprising increases in risk for major safety incidents to occur. Further research is recommended on development of realistic sociotechnical system simulations to

train employees to ensure sustainable safety performance and reduce safety incidents.

An Analytical Framework to Review Judicial Decisions Based on the Precautionary Principle with a Case-study Application

*Gonçalves V
Dinâmia-Cet/Iscte-Iul*

The precautionary principle has been applied in environmental policy and law internationally in the assessment and management of uncertain risks. Different legal roles in different jurisdictions have depended on legal cultures and also on political, economic and environmental contexts. At the level of individual jurisdictions the application of the principle has shown some ambiguity in the interpretation of the concept of precaution, insufficient knowledge of the potential impacts and lack of operational frameworks to support decisions. This has hindered the functioning of administrative justice and generated discretion and unpredictability in the decision process. This article intends to develop a systematic analysis of legal proceedings in a national jurisdiction in order to clarify how the precautionary principle has been interpreted and applied by the courts in the analysis of conflicts associated with serious risks to the environment and to public health. It is also intended to contribute to the debate on when and how to apply precautionary measures. In order to evaluate the degree of consistency of the courts' decisions in relation to comparable risks and their proportionality with respect to the severity of hazards, a theoretical framework was developed based on three attributes: level of seriousness of hazards, level of evidence required, level of severity of precautionary measures. A case-study application of this framework was developed for Portuguese courts. The judicial cases where the precautionary principle was invoked between 2007 and 2014 were considered, in the areas of waste incineration, high voltage power lines, dam and wind farm construction. Different positions among courts were observed, with contradictory arguments in the same case or in similar cases. In order to counteract this, more explicit legal requirements and criteria for the analysis of uncertain risks and the weighting of interests by area of activity are proposed.