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Review on Innovative Methods and Tools to Control Hazard Triabulations

B.K. Sugave*[1], O.G. Bhusnure[1], S.S. Thonte[2], S. B Gholve, D.R. Kaudewar[2], Kardile G.B[2]

[1]Channabasweshwar Pharmacy College (Degree), Department of Quality Assurance, Latur.
[2]Channabasweshwar (Poly) College, Basweshwar Chowk, Kawa Road, Latur

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Corresponding Author Email: baswaraj137sugave@gmail.com

Abstract

Tribulations means a cause of great trouble or suffering and cause is hazard which is having harm potential which is very risky for the peoples working in the industry, laboratories, public places and for the product and peoples the general types of hazards air based , chemical based , electrical based and thermal based these hazards to be identified evaluative, classified and on this safety majors to be taken but till the date the industry fighting for the sources of hazards which are occurring accidently hence the management is difficult to control hazards this article will show how to identified the hazards and which safety majors to be taken.

Keywords

Hazards, Hazards Sources, Tribulations, Regulations.

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INTRODUCTION

Hazard creates tribulations which is a great challenge. The terms "hazard" and "risk" are often used interchangeably. However, in terms of risk assessment, they are two very distinct terms. A hazard is any agent that can cause harm or damage to humans, property, or the environment. Risk is defined as the probability that exposure to a hazard will lead to a negative consequence, or more simply, a hazard poses no risk if there is no exposure to that hazard.

Hazards can be dormant or potential, with only a theoretical probability of harm. An event that is caus ed by interaction with a hazard is called an incident. The likely severity of the undesirable consequences of an incident associated with a hazard, combined with the probability of this occurring, constitute the associated risk. If there is no possibility of a hazard contributing towards an incident, there is no risk.

Hazards can be classified as different types in several ways. One of these ways is by specifying the origin of the hazard. One key concept in identifying a hazard is the presence of stored energy that, when released, can cause damage. Stored energy can occur in many forms: chemical, mechanical, thermal, radioactive, electrical, etc. Another class of hazard does not involve release of stored energy; rather it involves the presence of hazardous situations. Examples include confined or limited egress spaces, oxygen-depleted atmospheres, awkward positions, repetitive motions, low-hanging or protruding objects, etc. Hazards may also be classified as natural, anthropogenic, or technological. They may also be classified as health or safety hazards, by the populations that may be affected, and the severity of the associated risk. In most cases a hazard may affect a range of targets and have little or no effect on others.

First, the key technical elements of the process to assess and manage industrial risks are described together with the related key legislative principles. Various techniques exist for the assessment of risk of industrial operations, and for the assessment of hazards to the environment and mankind. These techniques share common areas, e.g., with regard to data collection and interpretation, that offer the possibility of synergetic approaches via international agreements and institutions. In addition to technical risk assessment, cultural factors will need to be taken into account when addressing the topic of acceptable risk in any given social context. Next, various examples of current risk management frameworks in a multi- and bilateral context are given. Eventually, as a concrete example of an industrial risk management framework, the European Union's legislation to control major accident hazards, the Seveso II Directive, is discussed.

HAZARD AND RISK

What is a hazard?

The meaning of the word hazard can be confusing. Often dictionaries do not give specific definitions or combine it with the term "risk". For example, one dictionary defines hazard as "a danger or risk" which helps explain why many people use the terms interchangeably.

There are many definitions for hazard but the most common definition when talking about workplace health and safety is:

A **hazard** is any source of **potential** damage, harm or adverse health effects on something or someone.

The CSA Z1002 Standard "Occupational health and safety - Hazard identification and elimination and risk assessment and control" uses the following terms:

Harm - physical injury or damage to health.

Hazard - a potential source of harm to a worker.

Basically, a hazard is the potential for harm or an adverse effect (for example, to people as health effects, to organizations as property or equipment losses, or to the environment).

Sometimes the resulting harm is referred to as the hazard instead of the actual source of the hazard. For example, the disease tuberculosis (TB) might be called a "hazard" by some but, in general, the TB-causing bacteria (Mycobacterium tuberculosis) would be considered the "hazard" or "hazardous biological agent".

What are examples of a hazard?

Workplace hazards can come from a wide range of sources. General examples include any substance, material, process, practice, etc. that has the ability to cause harm or adverse health effect to a person or property. See Table 1.

Table:1 Examples of Hazards and Their Effects

Workplace Hazard	Example of Hazard	Example of Harm Caused
Thing	Knife	Cut
Substance	Benzene	Leukemia
Material	Mycobacterium tuberculosis	Tuberculosis
Source of Energy	Electricity	Shock, electrocution
Condition	Wet floor	Slips, falls
Process	Welding	Metal fume fever
Practice	Hard rock mining	Silicosis
Behaviour	Bullying	Anxiety, fear, depression

Workplace hazards also include practices or conditions that release uncontrolled energy like:

- an object that could fall from a height (potential or gravitational energy),
- a run-away chemical reaction (chemical energy),
- the release of compressed gas or steam (pressure; high temperature),
- entanglement of hair or clothing in rotating equipment (kinetic energy)

What is risk?

Risk is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard. It may also apply to situations with property or equipment loss, or harmful effects on the environment.

The CSA Z1002 Standard "Occupational health and safety - Hazard identification and elimination and risk assessment and control" uses the following terms:

Risk – the combination of the likelihood of the occurrence of a harm and the severity of that harm.

Likelihood – the chance of something happening. **Note:** In risk assessment terminology, the word "likelihood" is used to refer to the chance of something happening, whether defined, measured, or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically (e.g., a probability or a frequency over a given time period).

For example: the risk of developing cancer from smoking cigarettes could be expressed as:

- "cigarette smokers are 12 times (for example) more likely to die of lung cancer than non-smokers", or
- "the number per 100,000 smokers who will develop lung cancer" (actual number depends on factors such as their age and how many years they have been smoking). These risks are expressed as a probability or likelihood of developing a disease or getting injured, whereas hazard refers to the agent responsible (i.e. smoking).

Factors that influence the degree or likelihood of risk are:

- the nature of the exposure: how much a person is exposed to a hazardous thing or condition (e.g., several times a day or once a year),
- how the person is exposed (e.g., breathing in a vapour, skin contact), and
- the severity of the effect. For example, one substance may cause skin cancer, while another may cause skin irritation. Cancer is a much more serious effect than irritation.

What is a risk assessment?

Risk assessment is the process where you:

- Identify hazards and risk factors that have the potential to cause harm (hazard identification).
- Analyze and evaluate the risk associated with that hazard (risk analysis, and risk evaluation).
- Determine appropriate ways to eliminate the hazard or control the risk when the hazard cannot be eliminated (risk control).

  The OSH Answers document on Risk Assessment has details on how to conduct an assessment and establish priorities.

What is an adverse health effect?

A general definition of adverse health effect is "any change in body function or the structures of cells that can lead to disease or health problems".

Adverse health effects include:

- bodily injury,
- disease,
- change in the way the body functions, grows, or develops,
- effects on a developing fetus (teratogenic effects, fetotoxic effects),
- effects on children, grandchildren, etc. (inheritable genetic effects)
- decrease in life span,
- change in mental condition resulting from stress, traumatic experiences, exposure to solvents, and so on, and
  - effects on the ability to accommodate additional stress.
  - ntact with electrodes of a battery or capacitor (electrical energy).

Will exposure to hazards in the workplace always cause injury, illness or other adverse health effects?

Not necessarily. To answer this question, you need to know:

- what hazards are present,
- how a person is exposed (route of exposure, as well as how often and how much exposure occurred),
- what kind of effect could result from the specific exposure a person experienced,
- the risk (or likelihood) that exposure to a hazardous thing or condition would cause an injury, or disease or some incidence causing damage, and
- how severe would the damage, injury or harm (adverse health effect) be from the exposure.

The effects can be acute, meaning that the injury or harm can occur or be felt as soon as a person comes in contact with the hazardous agent (e.g., a splash of acid in a person's eyes). Some responses may be chronic (delayed). For example, exposure to poison ivy may cause red swelling on the skin two to six hours after contact with the plant. On the other hand, longer delays are possible: mesothelioma, a kind of cancer in the lining of the lung cavity, can develop 20 years or more after exposure to asbestos. Once the hazard is removed or eliminated, the effects may be reversible or irreversible (permanent). For example, a hazard may cause an injury that can heal completely (reversible) or result in an untreatable disease (irreversible).

What types of hazards are there?

A common way to classify hazards is by category:

- **biological** - bacteria, viruses, insects, plants, birds, animals, and humans, etc.,
- **chemical** - depends on the physical, chemical and toxic properties of the chemical,
- **ergonomic** - repetitive movements, improper set up of workstation, etc.,
- **physical** - radiation, magnetic fields, pressure extremes (high pressure or vacuum), noise, etc.,
- **psychosocial** - stress, violence, etc.,
- **safety** - slipping/tripping hazards, inappropriate machine guarding, equipment malfunctions or breakdowns.[1]

TYPES OF HAZARDS:

Different types of hazard are classified depend upon their origin. One key concept in identifying a hazard is the presence of stored energy that, when released, can cause damage. Stored energy can occur in many forms: chemical, mechanical, thermal, radioactive, electrical, etc. Another class of hazard does not involve release of stored energy, rather it involves the presence of hazardous situations. Examples include confined or limited egress spaces, oxygen-depleted atmospheres, awkward positions, repetitive motions, low-hanging or protruding objects, etc.

Hazards may also be classified as natural, anthropogenic, or technological. They may also be classified as health or safety hazards and by the populations that may be affected, and the severity of the associated risk.

In most cases a hazard may affect a range of targets and have little or no effect on others. Identification of hazards assumes that the potential targets are defined.

Biological hazard

It is also known as Biohazard and refer to agents that pose a threat to the health of living organisms, the security of property, or the health of the environment.

The term and its associated symbol may be used as a warning, so that those potentially exposed to the substances will know to take precautions. The biohazard symbol was developed in 1966 by Charles Baldwin, an environmental-health engineer working for the Dow Chemical Company on the containment products. and is used in the labeling of biological materials that carry a significant health risk, such as viral samples and used hypodermic needles. Biological hazards include viruses, parasites, bacteria, food, fungi, and foreign toxins.

Many biological hazards have been identified. For example, the hazards of naturally occurring bacteria such as Escherichia coli and Salmonella are well known as disease-causing pathogens and a variety of measures have been taken to limit human exposure to these microorganisms through food safety, good personal hygiene and education. However, the potential for new biological hazards exists through the discovery of new microorganisms and through the development of new genetically modified (GM) organisms. Use of new GM organisms is regulated by various governmental agencies. The US Environmental Protection Agency (EPA) controls GM plants that produce or resist pesticides (i.e. Bt corn and Roundup ready crops). The US Food and Drug Administration (FDA) regulates GM plants that will be used as food or for medicinal purposes.

Biological hazards may include medical waste or samples of a microorganism, virus or toxin (from a biological source) that can affect health.

Biological hazards may be food origin, Pathogens, toxins, parasites, foodborne toxins. Pathogenic Campylobacter and Salmonella are common foodborne biological hazards. The hazards from these bacteria can be avoided through risk mitigation steps such as proper handling, storing, and cooking of food. Disease in humans can come from biological hazards in the form of infection by bacteria, antigens, viruses, or parasites.

Chemical hazard

Chemical Hazards are generally due to overdoses.

Health hazards associated with chemicals are dependent on the dose or amount of the chemical. For example, iodine in the form of potassium iodate is used to produce iodised salt. When applied at a rate of 20 mg of potassium iodate per 1000 mg of table salt, the chemical is beneficial in preventing goiter, while iodine intakes of 1200–9500 mg in one dose have been known to cause death.[9] Some chemicals have a cumulative biological effect, while others are metabolically eliminated over time. Other chemical hazards may depend on concentration or total quantity for their effects.

Chemical hazards are various types for example benzene, methane etc. However, every year companies produce more new chemicals to fill new needs or to take the place of older, less effective chemicals. Laws, such as the Federal Food, Drug, and Cosmetic Act and the Toxic Substances Control Act in the US, require protection of human health and the environment for any new chemical introduced. In the US, the EPA regulates new chemicals that may have environmental impacts (i.e. pesticides or chemicals released during a manufacturing process), while the FDA regulates new chemicals used in foods or as drugs. The potential hazards of these chemicals can be identified by performing a variety of tests prior to the authorization of usage. The number of tests required and the extent to which the chemicals are tested varies, depending on the desired usage of the chemical. Chemicals designed as new drugs must undergo more rigorous tests that those used as pesticides.

Some harmful chemicals occur naturally in certain geological formations, such as radon gas or arsenic. Other chemicals include products with commercial uses, such as agricultural and industrial chemicals, as well as products developed for home use. Pesticides, which are normally used to control unwanted insects and plants, may cause a variety of negative effects on non-target organisms. DDT can build up, or bioaccumulate, in birds, resulting in thinner-than-normal egg shells which can break in the nest.[7] The organochlorine pesticide dieldrin has been linked to Parkinson's disease.[10] Corrosive chemicals like sulfuric acid, which is found in car batteries and research laboratories, can cause severe skin burns. Many other chemicals used in industrial and laboratory settings can cause respiratory, digestive, or nervous systemproblems if they are inhaled, ingested, or absorbed through the skin. The negative effects of other chemicals, such as alcohol and nicotine, have been well documented.

Ergonomic Type of hazard

Such type of hazard show effect mostly on physical system i.e on muscular system which is playing very important role in movement. That may pose risk of injury to the musculoskeletal system, such as the muscles or ligaments of the lower back, tendons or nerves of the hands/wrists, or bones surrounding the knees. Ergonomic hazards include things such as awkward or extreme postures, whole-body or hand/arm vibration, poorly designed tools, equipment, or workstations, repetitive motion, and poor lighting. Ergonomic hazards occur in both occupational and non-occupational settings such as in workshops, building sites, offices, home, school, and facilities.

Mechanical hazard

Machines which are used in production process, utilities etc. May produce mechanical hazards. Motor vehicles, aircraft, and air bags pose mechanical hazards. Compressed gases or liquids can also be considered a mechanical hazard.

Hazard identification of new machines and/or industrial processes occurs at various stages in the design of the new machine or process. These hazard identification studies focus mainly on deviations from the intended use or design and the harm that may occur as a result of these deviations. These studies are regulated by various agencies such as the Occupational Safety and Health Administration and the National Highway Traffic Safety Administration.

Physical hazard

It is a natural hazard cause due to by nature or accidently by human error Physical hazard is a naturally occurring process that has the potential to create loss or damage. Physical hazards include earthquakes, floods, fires, and tornadoes. Physical hazards often have both human and natural elements. Flood problems can be affected by the natural elements of climate fluctuations and storm frequency, and by land drainage and building in a flood plain, human elements. Another physical hazard, X-rays, naturally occur from solar radiation, but have also been utilized by humans for medical purposes; however, overexposure can lead to cancer, skin burns, and tissue damage.

Psychosocial hazard

Psyche means mind and such hazard may show the effect on mind i.e psychogenic effect which may affect body behavior. Psychosocial hazards are related to the way work is designed, organized and managed, as well as the economic and social contexts of work and are associated with psychiatric, psychological and/or physical injury or illness. Linked to psychosocial risks are issues such as occupational stress and workplace violence which are recognized internationally as major challenges to occupational health and safety.

Natural hazards

Natural hazards such as earthquakes, floods, volcanoes and tsunami have threatened people, society, the natural environment, and the built environment, particularly more vulnerable people, throughout history, and in some cases, on a day-to-day basis. According to the Red Cross, each year 130,000 people are killed, 90,000 are injured and 140 million are affected by unique events known as natural disasters.

Recent policy-oriented work into hazard management began with the work of Gilbert White, the first person to study engineering schemes as a means of mitigating flooding in the US. From 1935 to 1967 White and his colleagues led the research into flood defenses, and further collaboration on investigation was undertaken at the University of Chicago.

In December 1989, after several years of preparation, the United Nations General Assembly adopted

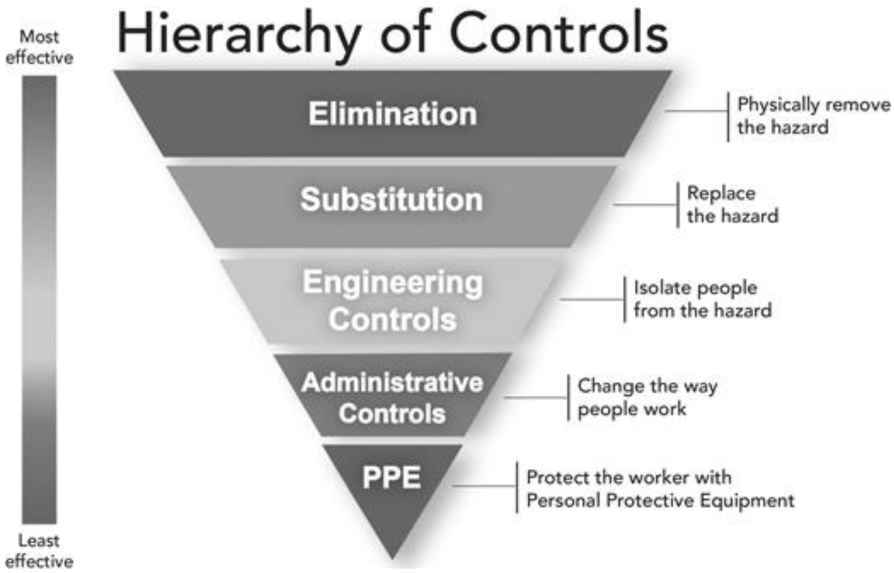

Figure No 1: Hierarchy of control. Source: National Institute for Occupational Safety and Health (NIOSH), Division of Applied Research and Technology.

PROBLEMS IN IMPLEMENTING RISK MANAGEMENT

As we have seen in our study of financial and non-financial firms across the globe, risk management practices are not without problems. To summarise the work of Stulz (2008) there are five types of risk management failures:

1. Failure to use appropriate risk metrics

VaR is a popular risk metric, but it can only tell us the largest loss the firm expects to incur at a given confidence level. VaR tells us nothing about the distribution of the losses that exceed VaR. This would suggest the application of VaR doesn't guarantee the success of risk management. In addition, the effectiveness of implementing VaR also depends on the liquidity of the financial market. If the market is illiquid, then daily VaR measures lose their meaning. This is because if a firm sits on a portfolio that cannot be traded, a daily VaR measure is not a measure of the risk of the portfolio because the firm is stuck with the portfolio for a much longer period of time.

2. Mismeasurement of known risks

Risk managers sometimes make mistakes in assessing the probability or the size of losses. Similarly they could use the wrong distribution. For a financial institution with many positions, although they may properly estimate the distribution associated with each position, the correlation between the different positions may be mismeasured. Mismeasurement of known risk is a common problem in risk management practice.

3. Failure to take known risks into account

According to Stulz, it is very difficult to consider all the risks in a risk measurement system, or it is costly to do so. This is because nobody can forecast future events perfectly.

4. Failure in communicating risks to top management

Risk managers communicate information about the risk position of the firm to top management and the board. The management and board use this information to determine the firm's risk strategy. If a risk manager is unable to communicate this information effectively, top management may make decisions that are badly informed, or they may develop an overoptimistic perception of the risk position of the firm.

5. Failure in monitoring and managing risks

Finally, it is challenging for risk managers to capture all the changes in the risk characteristics of securities and to adjust their hedges accordingly. As a result, risk managers may fail to adequately monitor or hedge risks simply because the risk characteristics of securities may change too quickly to allow them to assess them and put on effective hedges.

These problems in risk management practice confirm that risk management is a complex system. Done well, it can be a very effective tool, but risk managers and management should be aware of the potential for failure. In addition to using quantitative measures like VaR, companies should also conduct stress testing and scenario analysis to provide a more rounded and comprehensive risk assessment. Stress testing involves subjecting the company's financial positions to extreme movements in critical variables. Scenario analysis involves modelling a combination of events (eg, changes in exchange rates, interest rates, and commodity and asset prices) to capture the interactions within and between markets.[2]

MAJOR HAZARD TRIBULATION MANAGEMENT STRATEGY

AIR POLLUTION

Health always should be the first priority and their maintenance and safety must be manage, peer-reviewed, interdisciplinary journal published quarterly in English beginning in 2010. The journal is aimed at providing grounds for the exchange of ideas and data developed through research experience in the broad field of occupational health and safety. Articles may deal with scientific research to improve workers' health and safety by eliminating occupational accidents and diseases, pursuing a better working life, and creating a safe and comfortable working environment. The journal focuses primarily on original articles across the whole scope of occupational health and safety, but also welcomes up-to-date review papers and short communications and commentaries on urgent issues and case studies on unique epidemiological survey, methods of accident investigation, and analysis. High priority will be given to articles on occupational epidemiology, medicine, hygiene, toxicology, nursing and health services, work safety, ergonomics, work organization, engineering of safety (mechanical, electrical, chemical, and construction), safety management and policy, and studies related to economic evaluation and its social policy and organizational aspects. Its abbreviated title is Safe Health Work.

The sources of hazards are NATURAL as well as from Man, Material and Machines. Natural Hazards are generally from environment that may be managed by industry forcefully by the implementation of regulatory requirement like FDA, UFC, OSHA but it is very difficult to manage Hazards frequently generating from MAN, MATERIAL AND MACHINE which is very dangerous because it affects people's health and product quality. Here the real training, awareness, education is required to each and every employee regarding system, procedures, machine, materials and their possible hazards and its management. Hazards generally produced from 4M are contamination and electrical as well as fire.

***Management of contamination of air hazard*.**

During product process contamination is main problem that should be analysed, identified, evaluated. A contamination problem can create a highly sensitive situation during which many resources are focused on inspecting the sample and /or site, identifying the contaminants, searching for their sources and achieving resolution, as the issue could potentially threaten the safety of your product, affect your product's performance and can also damage your reputation as a manufacturer, a leading brand or distributor.

Contamination is unpredictable and can originate from unexpected sources in many forms. It can manifest as particulates, fibers, impurities, gels, discoloration, cloudy or opaque matter, stains, metal fragments/metals & trace chemicals, degradation products, surface residues, reaction by-products and catalyst residues and can occur in samples from many industries including chemicals, flexible electronics, cosmetics, food packaging, pharmaceuticals and petroleum.

Our contamination testing experts provide a strategic response to resolving a contamination incident, which incorporates both a stringent risk assessment methodology and investigational insight, with focus on accurate identification of the nature of the contaminant, determination of its source and on swift resolution via key techniques including spectroscopy and microscopy.

We detect, isolate and identify suspected contaminants down to trace and ultra-trace levels, to quickly understand the contamination problem and are typically experienced in dealing with various sample types such as liquids, solids, gases, surfaces, powders & particles, metals, polymers, formulated chemical products, silicones, greases, lubricants, cleaning agents, organic and inorganic materials.

We understand that time is critical in any contamination situation that you face, and as such, we specialize in rapid response problem solving, lasting solutions and client support via contamination control and decontamination across many manufacturing sectors, products and markets.

Our laboratories are staffed by industry-experienced personnel who provide an independent, specialist resource using a wide range of proven and advanced analytical techniques, guiding you through the issues which you may be facing.

On recounting such progress, it is especially disappointing that in recent years, improvements in air quality, not solely within the UK but in many urban areas around the world, have miserably stalled. We occasionally experience smog hanging over our cities when poor airflow and dispersal allows pollution to build up—and it is during such episodes that susceptible individuals (e.g. those with asthma, COPD or heart disease) may undergo an acute exacerbation requiring increased medication or admission to hospital. Of greater concern, however, is the inherent. modern type of pollution in today's urban environments, which unlike the Victorian pea-souper smog, is indiscernible at ground level but manifests in chronic health effects. This 'invisible killer' contains nitrogen oxides, ozone (O_3) and exceptionally small particulate matter (PM). PM_{10} and the more abundant $PM_{2.5}$ constitute particles with diameters less than 10 and 2.5 µm, respectively—the latter being approximately 30 times less than the width of human hair. Of the modern-day air pollutants, PM has been held responsible for the majority of health effects. In urban areas, the major source is fossil fuel combustion, primarily from road transport, as well as power stations and factories. In rural and semi-urban areas of developing countries, the burning of biomass fuels on open fires or traditional stoves creates indoor concentrations of PM that far exceed those considered safe in outdoor air. Over the last 10 years, there has been a substantial increase in findings from many research disciplines (e.g. population exposure, observational epidemiology, controlled exposure studies, animal toxicology and in vitro mechanistic work) that these modern-day ambient pollutants are not only exerting a greater impact on established health endpoints, but are also associated with a broader number of disease outcomes. The aim of this brief review article is to summaries the increased health hazards to emerge from PM air pollution research in recent years, drawing upon findings published in international projects , Health Effects Institute (HEI) research reports authoritative reviews and important individual publications. We will also discuss how the increased evidence base of risk relates to current public awareness and understanding of the problem. Indeed, focused education and continued evolution of sophisticated information systems have the potential to achieve a durable change in public attitude and behaviour, in a way that improves people's health as well as the quality of the air they breathe. Health effects of PM air pollution

Mortality due to air pollution

Mortality is a major issue due to air pollution. Air pollution directly affecting the human life. Epidemiological evidence first emerged from American research, which arguably began as a consequence of the 1952 air pollution episode in London. The reported associations between increased respiratory and cardiovascular mortality and acute and chronic exposures to particulate air pollution (Schwartz and Dockery ; Dockery et alwere subsequently confirmed outside of the USA, in many cities around the world. Of particular note, recent long-term studies show associations between PM and mortality at levels well below the current annual World health Organisation (WHO) air quality guideline level for PM. Several updates to the Havard Six Cities Study and the study of the American Cancer Society cohort continue to cite consistent and significant associations between long-term exposure to PM and mortality In addition, new prospective cohorts provide additional evidence of this association, including effects observed at lower concentrations , whilst the emerging multicity cities have confirmed previously reported increases in daily mortality

We now understand that air pollution has overtaken poor sanitation and a lack of drinking water to become the main environmental cause of premature death). The latest estimate from the WHO reported that in 2012, approximately 3.7 million people died from outdoor urban and rural sources.

The cause of deaths was broken down as follows: ischaemic heart disease (40 %), stroke (40 %); chronic obstructive pulmonary disease (COPD) (11 %), lung cancer (6 %) and acute lower respiratory infections in children (3 %). These figures are based not only on a greater understanding of the diseases caused by poor air quality, but also more accurate exposure assessment that utilises sophisticated measurement and modelling technology. Of note, the overall mortality estimate more than doubles previous ones and reveals that the vast majority of deaths stem from cardiovascular disease.

By region, the largest outdoor air pollution burden is found in the low- and middle-income countries of the Western Pacific and South-East Asia, with 2.6 million linked deaths in, reflecting the heavy industry and air pollution hotspots within the developing nations of these areas. However, the problem is very much a global one. Focusing on Europe, air pollution is again the biggest environment risk factor behind premature death. In 2012, mortality numbers related to outdoor air pollution in the low- to middle-income, and high-income countries were estimated at 203,000 and 280,000, respectively In recent years the proportion of the urban population in the 28 European Union (EU) Member States who live in areas where the EU daily limit value for PM_{10} and $PM_{2.5}$concentrations exceeded that was 21 and 10 %, respectively. The percentage of the EU urban population exposure to PM concentrations above the WHO is significantly higher, reaching 64 and 92 % for PM_{10} and $PM_{2.5}$, respectively (EEA 2014). Life expectancy of Europeans is reduced, on average, by about 8.6 months owing to $PM_{2.5}$ pollution (WHO 2013b), whilst traditional health impact assessment methods used in the project Improving

Knowledge and Communication for Decision-making on Air Pollution and Health in Europe, estimates that potential exists to increase average life expectancy in the most polluted cities by approximately 22 months if PM .That poor air quality can have such a significant impact on human health is undisputed, and the previous sections have drawn upon research conducted over recent years that supports the notion that risks are increasing as new hazards emerge. How then does this translate to public awareness of the problem? The general consensus is that society would benefit from being better engaged and educated about the complex relationship between air quality and ill health If people are aware of variations in the quality of the air they breathe, the effect of pollutants on health as well as concentrations likely to cause adverse effects and actions to curtail pollution, there follows a greater likelihood of motivating changes in both individual behaviour and public policy. In turn, such awareness has the potential to create a cleaner environment and a healthier population.

Studies and initiatives examining public awareness and understanding in this area have yielded mixed results, with some acknowledging a significant amount of concern within the public over poor air quality, an awareness of air quality warnings, and a positive relationship between alerts and a change in outdoor activities; In fact, following findings that air quality warnings associated with ground level O_3 do have a significant impact on attendance at outdoor facilities in Southern California, suggested that ambient air quality measurements from monitors may not reflect personal exposure if individuals intentionally limit their exposure in response poor air quality. Bell et al. have also hypothesised that deliberate avoidance in time spent outdoors could contribute to the considerable heterogeneity in O_3-induced mortality observed across US communities. Other research has concluded that both awareness of the links between air pollution and ill health and an understanding of air quality information are lacking amongst the public; the European Commission (EC) conducted a flash Eurobarometer to gain a greater insight into the views of the European public on matters of air quality and air pollution (EC 2013). Six out of ten Europeans responded that they did not feel informed about air quality issues in their country. When asked how serious they considered a range of air quality related problems to be in their country, responses for respiratory disorders, cardiovascular diseases and asthma/allergy were 87, 92 and 87 % respectively.[3]

FACTORS DETERMINING AWARENESS

Other than the availability of sufficient information that will be covered in the following section, factors governing how aware individuals are about the quality of their air and potential repercussions for their health are likely to include understanding, perception and a vested interest. Individuals may choose not to concern themselves about air quality owing to a poor understanding of what is undoubtedly a complex science. Unlike other environmental risks that are routinely communicated such as UV and heat, overall air quality encompasses several primary pollutants as well as secondary products owing to atmospheric transformation. Rural areas for example are very often considered safe places to escape from pollution. However, at times, O_3 concentrations can be as high or greater than urban locations owing to the presence of lower concentrations of nitrogen oxides to sequester rural O_3. A lack of vested interest in the topic is also possible amongst 'healthy' people, less likely to have any personal experience of the benefits that lessoning pollution and/or increasing medication may bring. Indeed, where research has indicated that individuals are aware of air quality warnings and take responsive actions, larger responses were observed for more susceptible groups or carers thereof (McDermott et al). Within a cross-sectional study of 33,888 adults participating in the 2005 Behavioral Risk Factor Surveillance System, 31 % with asthma versus 16 % without changed outdoor activity in response to media alerts Perception is another factor influencing the public understanding of the importance of healthy air, as attitudes and behaviour can be driven by a person's immediate locality and own understanding rather than accurate data generated by monitoring sites and communicated via an advisory service. Several studies have investigated the relationship between perceived and measured outdoor air quality provided by monitoring stations and whilst some studies found a significant association between the perception of air quality and specific air pollutants others have found little or no association Of relevance, Semenza et al. (2008) not only reported a low (10–15 %) level of behavioural change during an air pollution episode, but that the personal perception of poor air quality rather than the advisory service, drove the response. Some epidemiological researchers have also indicated that self-reported health status is associated with perceived air pollution rather than measured air pollution.

Chemical Hazard Management

Every country is largely producers of chemicals for need as well as countries economic growth.whether they are industrialized or developing. In one way or another, chemicals affect directly or indirectly to all humans and are essentials to our feeding (fertilizers, pesticides, food additives, packing), our health care (pharmaceuticals, cleaning materials), or our well-being (appliances, fuels). Some of the chemicals could be hazardous. Chemical hazards are toxic, corrosive, irritant, carcinogenic, flammable, and mutagenic. Workplace hazardous materials information classification of chemical hazards is represented in Table 2. THE HAZARDS OF ORGANIC SYNTHESIS Organic chemical synthesis presents industrial hazards of three main types: • First, the active agents used to attack and modify the structure of organic compounds are, by their very nature, exceptionally able to attack and modify the organic compounds of the human body, thus producing highly poisonous effects. • Second, the intermediate compounds in most organic synthesis are often characterized by the readiness with which they enter into chemical combination with other organic matter; they are active. This often confers toxic properties of great variety on them. • Third, the final products, though they are medicines designed to be introduced into the human body, may nevertheless produce severe poisoning under conditions of industrial exposure [10]. Some common hazards of organic synthesis with their examples, the hazards they cause, and their management are summarized in .

ORGANIC SOLVENT HAZARD

Organic solvents which are mostly used during manufacturing may e hazardous. And halogenated hydrocarbons; and many others are widely used as solvents in both laboratories and chemical industries. Organic solvents are used in chemical laboratories for synthesis, extraction, separation, purification and drying, analytical methods, spectrometric and physicochemical measurements. In chemical industries, they are widely used to dissolve and disperse fats, oils, waxes, pigments, paints, rubber, and so on. They are also used as antifreeze, degreasing, and cleaning agents; as volatile organic liquids that easily evaporate at normal temperature and pressure, produce volatile organic compound emissions. For example, trichloroethylene is most commonly used as a degreasing agent for metal parts in the industry and its use at work is linked to an increased risk of developing Parkinson's disease six times. Characteristics of organic solvents that determine the type of danger: • Spills and solvent leakage cause significant air, soil, and water pollution. • Inhalational exposure of volatile organic solvents and an easy absorption through the skin are the two most important ways of exposure to the workplace. For example, solvents such as dimethylsulfoxide and glycol ethers, which have water and lipid solubility, are well absorbed through the skin. • Many organic solvents have low flammability points and burn when they light up. The flammability and explosiveness of a solvent are decisive determinants of the risk associated with its use, for example, nitrocellulose. Classification is used to qualify the flammability hazard associated with a solvent:

Hazardous Gases

Various volatile and flammable liquids used in the chemical industry, vaporize when exposed to room temperature or above, causing atmospheric pollution. The steam turns on causing fire accidents and explosions which tend to spread rapidly in the surrounding environment, causing loss of lives and property. Therefore, the storage and handling of these hazardous gases require special attention to avoid risks. These can be classified as follows: Combustible gas Includes gases such as methane (CH_4), pentane (C_5H_{12}), propane (C_3H_8), butane (C_4H_{10}), and hydrogen (H_2) when released in an installation naturally as a by-product or leaked, gets ignited when comes in contact with oxygen. This represents the danger of combustion within a facility if the concentration reaches a certain optimum level. Fuel gas detectors are needed when there is a risk of life or property due to the accumulation of combustible gases. Each type of fuel gas has three important ranges, and each of these ranges differs for specific gases but uses the same definitions. • Fuel gas concentration is too low for combustion below the lower explosion limit (LEL) or lower flammable limit. This is the range in which more fuel gas detectors work. • The upper explosive limit (UEL) or upper flammability limit is th

Toxic gases Toxic gases produce an immediate and persistent hazard to human resources and include gases such as carbon monoxide, chlorine, nitrogen oxide, sulfur dioxide, hydrogen chloride, hydrogen cyanide, ammonia, hydrogen fluoride and many others. They are usually hazardous even at low concentrations and are often characterized in terms of threshold limit value (TLV). Oxygen deficiency In many common working environments, there is the potential for low oxygen atmospheres due to the gas cylinder and cryogenic exposure. Cryogenic freezing uses CO_2 or liquid N_2 . Argon is used in inert welding processes. Environmental chambers and test cells inject liquid nitrogen or use heat exchangers for rapid cooling. Hydrogen is widely used in research for alternative fuel vehicles. Liquid helium cools superconducting magnets for research and medical imagings such as magnetic resonance imaging machines. Oxygen depletion can be caused by any of the following processes such as displacement, combustion, oxidation, chemical reaction, or bacterial action. Cryogenic liquids have huge expansion ratios (460–840 to 1 for those listed), so a big gas cloud is likely to occur for a little amount of cryogenic liquid. Continuous monitoring with risk mitigation measures must be used to ensure the safety of personnel working in the field of gas use or storage. When stationary gas detection is positioned, it is useful to include hazardous gases dynamics such as ventilation, stratification or the possible diffusion and gas features. Simple smoke tests can reveal the essential characteristics of the airflow of the area and greatly simplify the positioning of the gas and siren and ventilation for gas concentration dilution) and a high alarm (emergency and siren light and process action). The action of the process involves stopping or isolating the gas source and stopping the process equipment. Recording It is an important element of the alarm response. The sensor status reports provide a valuable reference to assess the severity and magnitude of the gas hazard. It can generate real-time and post-event analysis. It is the transfer of information provided by the system to the staff of the plant, which enables effective gas risk management.

MANAGEMENT OF OVEREXPOSURE TO CHEMICALS

Although thousands of chemicals are commonly used in industry, the medical management of acute overexposure is not specific and includes four basic steps (with some exceptions). 1. Removal from exposure • Immediate removal ofthe person from the display site is the first step. • If a disabled victim is to be rescued;the rescue workers must protect themselves from contaminated atmosphere first. • Respirators and rescue lines are compulsory first aid. • Sometimes chemically impervious suits are also worn. 2. Resuscitation • Resuscitation means restoring the life of someone apparently dead (collapsed or shocked). • If the victim is apneic, resuscitation should start as soon as it is removed from the area.

SMS in confirmation to requirements. The results are used to make necessary improvements for meaningful implementation of the work. • The SMS requires periodic critical inspection of both workplace and workers to control and prevent the possible occurrences of injuries, accidents, and related problems for the necessary corrective action. • Periodical workplace inspection by a qualified inspection team to know the real problems, if any, of the workers and workplace managers/supervisors. This help to identify jobs and tasks of the workers, the potential hazards that the workers are exposed to, and the possible reasons for occurrences of hazards.

REGULATIONS

CHEMICAL HAZARDS

Chemical hazards regulation can be prepared by considering environmental conditions of national, international, universal and worldwide areas, as well as voluntary initiatives including a globally harmonized system of classification and labeling of chemicals, the strategic approach to international chemicals management and responsible care. In many countries, legislative and administrative measures have been introduced to deal with chemical hazards. In 1992, the United Nations Conference on Environment and Development gave rise to the Agenda 21 Report 2. This report outlined the responsibilities of States toward the achievement of sustainable development and was adopted by heads of Government in over 150 countries. Chapter 19 of Agenda 21 addresses the environmentally sound management of toxic chemicals for all countries, including basic programs for: 1. Adequate legislation. 2. Information gathering and dissemination. 3. Capacity for risk assessment and interpretation. 4. Establishment of risk management policy. 5. Capacity for implementation and enforcement. 6. Capacity for rehabilitation of contaminated sites and poisoned persons. 7. Effective education programs. 8. Capacity to respond to emergencies. Some international treaties related to chemical management and India's participation in them is represented in Table 6 . The Indian Chemical Industry is poised for growth, and a clearly. defined vision has been developed to enable it. The vision for Indian chemical industry is "To facilitate the growth and development of the chemical industry in an environmental friendly manner; with focus on innovation to meet local needs, sustainability, and green technologies and processes; so as to enable it to become a globally competitivemajor-player." The non-regulatory mechanisms adopted by industries in India, in addition to legislative control, play a very important role in themanagement of chemicals. Indian industries take several initiatives for environmental protection and chemical management, such as responsible care, corporate responsibility in environmental planning, ISO 14001, OHSAS 18001, ISI Marking (Indian Standards Institution), and eco-mark. Several awards related to chemical and environmental management are initiated on voluntary basis by industrial associations, who play an important role in encouraging industries to go for non-regulatory mechanisms for chemical management. Important industrial associations include Indian Chemical Council (formerly, the – Indian Chemical Manufacturer's Association), Confederation of Indian Industry, and Federation of Indian Chambers of Commerce and Industry .

GLOBAL REGULATORY AGENCIES

These are specially related to chemicals, drugs, and petrochemicals are many and in brief include the following (besides many more):

• US Food and Drug Administration.

• US EPA.

• Insecticides Act, 1968. Ministry of Agriculture and Cooperation, Government of India, and the Environment Protection Act, 1986, India.

• Pest Management Regulatory Agency (PMRA), Health Canada. • PMRA, U.S. EPA. • Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), United States. • National Toxicology Program, United States. • National Administration of Drugs, Food, and Medical Technology, Argentina. • The European Agency for the Evaluation of Medicinal Products. • Federal Institute for Drugs and Medical Devices, Germany. • Medicines and Healthcare Products Regulatory Agency, United Kingdom. • World Health Organization (WHO), Geneva, Switzerland. • International Conference on Harmonization, Geneva, Switzerland. INDIAN REGULATORY AGENCIES The Republic of India enacted several legislations, rules, and regulations to exercise all the powers vested under the Act and Rules pertaining to the protection of environment and control of pollution. These are implemented and enforced in all environment legislation agency activities. The selected acts and Regulations include, but are not limited to, the following: • Drugs and cosmetics act, 1940. • The prevention of food adulteration act, 1954. • Insecticides act, 1968. • The water (prevention and control of pollution) act, 1974. • Air (prevention and control of pollution) act, 1981. • Narcotic drugs and psychotropic substances act 1985. • The environment (protection) act, 1986. • Manufacture, storage, and import of hazardous chemicals rules, 1989. • Hazardous wastes (management and handling) rules, 1989. • Water prevention and control of pollution act, 1974. • Hazardous waste (management and handling) rules, 1989. • Manufacture, storage and import of hazardous chemical rules, 1989. • Rules for manufacture, use, import and storage of hazardous microorganisms, genetically engineered micro-organism or cells, 1989. • Biomedical waste (management and handling) rules, 1998. • The recycled plastic manufacture and usage rules, 1999. • The ozone-depleting substances (regulation and control) rules, 2000. • The noise pollution (regulation and control) rules, 2000. • The batteries (management and handling) rules, 2001. Our quality of life has significantly improved through chemistry since it has provided us with various useful products, but this has also provoked global environmental deprivation and the decline of non-renewable natural resources. Many pollutants end their path to the food chain and deteriorate the ecosystem. Green chemistry and its principles canchange all of these negative aspects and impacts and through design, innovation, and green practices to restore the sustainable development. The ultimate goal is to develop and design non-conventional synthetic methodologies for important industrial chemicals to prevent/reduce environmental pollution .[3]

Innovation Risk and Limitations

Innovations inherently have a wide array of risks that depend on attempting to predict the unknown. Even though companies have long been dedicating extensive resources to manage these risks, uncertainty surrounding innovation continues to plague many unprepared innovators who jump too quickly into the market. When managers engage in the process of brainstorming how to minimize innovation risk, they generally do so under a flawed decision model or imperfect context. As a result, a number of innovation failures do not necessarily stem from the innovation itself but from the process used to determine how the innovation is introduced. In order to successfully manage innovation risk, managers must take adequate time and thought to developing and improving their decision model under which they are evaluating their respective innovations. The more reliable and relevant information companies use in making choices about when and how to introduce innovation into the marketplace, the less risk those companies are assuming that they have missed an important variable to consider in their calculations, and thus reducing unintended consequences.

A recent Harvard Business Review article addresses critical elements of innovation risk by offering five basic rules for managing them. Five Rules to Manage Innovation Risk

1. **Recognize that a model exists and needs to be developed for judging risk and return.**

Even those innovations that involve only minor alterations to existing products or require minimal investment are built on a foundation of knowledge (i.e., a model). Cognitive scientist refer to the use of this knowledge about risk and return as a "mental model" whereby the decision maker assesses the trade-offs of taking risks and generating return. These mental models attempt to take into account a number of factors that might affect the profiles of risk and performance. Historically, most people have applied these models in semi-consciously. Whether formalized or intuitive, these models exist and need to be discussed among the members of the project team in order to fully assess the outcomes of alternative actions. The more discussion the innovation receives, the more variables that will be considered, and will result in less unintended consequences. This is a pre-step in that the team is setting up the context in which the innovation should be considered.

2. Every innovation model has its own set of limitations.

There are two broad and pervasive types of limitations to an innovation's model. The first is having an incorrect model – one where the underlying assumptions about the innovation's potential and the way it is fundamentally evaluated is simply wrong. This requires a complete turn around and redevelopment of a new model. The second is having an incomplete decision model. Incompleteness is a limitation that all models have in common as an innovation model will never be perfect.

3.Expect the unknowns.

Even with unconstrained time and resources, an innovation model will never incorporate all the factors that could potentially affect the innovation's success and completely minimize its related risk. This is largely due to the fact that many unrelated risks, when occurring simultaneously, can inadvertently become an adverse event that ultimately results in an inept innovation. Basically, the author is encouraging risk managers to recognize that the process of identifying risk factors may incorporate going outside the scope of an innovations-related risk by considering how different conditions can affect a project's success.

1. **Obtain intimate knowledge and understanding of the user.**

   After overcoming the many hurdles of producing a model with a viable context and associated risk factors, often the user of the innovation is neglected. For example, managers should consider questions such as:

• What are the qualifications of the intended user?
• How would an unintended user find a use for the innovation?
• Does the user fully understand the innovations application and limitations?
• How might they misapply the product or service?

2. **Consider the infrastructure the innovation will be placed in.**

   The pace of innovation and technological advances constantly question the infrastructure of certain products. For example, the infrastructure that the cloud has produced has altered many companies' business models. However, many of these changes were executed after the fact. Businesses must look ahead to consider if the innovation they are pursuing to market will have an adequate infrastructure that will enhance the user's application of the product. Also, if the company identifies the need to change the current infrastructure, managers must dedicate a substantial amount of time to considering how long the change will remain viable.[5]

Fire and Explosion

Conditions which can give rise to unexpected of hazardous explosions during operational firefighting are identified through a survey of reported fire incidents covering the seventy years to 1976 (of UK, USA and Canadian origin). A range of phenomena regarded as explosions, and the conditions under which they have occurred, is described.

The survey discusses occupancies, materials involved, and fire fighter casualties. Several significant incidents are described in detail. Relevant research has also been discussed.

The type of fire now commonly described as the 'Chatham mattress' fire is seen not to be an entirely new phenomenon, the first formal description of what have been called 'smoke explosions' having been given in 1914.

The most hazardous (because they have been unexpected) explosible conditions have resulted from shouldering fires with low rates of heat release. Low temperature and apparent fire inactivity can no longer be regarded as indicating safe conditions for the entry of fire-fighting personnel.[6]

Innovative solutions to prevent and reduce water pollution

The most important industrial pollutants are represented by the textile effluents discharges, containing dyestuffs, metals, electrolytes, surfactants, grease matters, etc., which can get into the main Danube River that crosses the Romanian-Bulgarian border area; An important negative influence on water quality from urban wastewater treatment plants from Ro-Bg border area and consequently the Danube's water quality is determined by the discharge of waste water untreated or insufficiently treated, by textile trading companies in the area; The exigencies expressed at present, at water quality parameters level, impose: a reassessment of the vision on the technological processes activity, the use of best available techniques in the textile-chemical processing industry, research and implementation of advanced wastewater treatment.

Solutions for minimizing the wastewater pollution generated by textile finishing Modern technology solutions for textile chemical processing; Modern wastewater treatment technologie

The wastewater treatment plant in Giurgiu North Technological and Industrial Park Modern wastewater treatment technologies

The wastewater treatment process is conducted in five circuits each with its own specificity.

Introduction of a pneumatic aeration systems in the second phase of wastewater treatment Oxygenation in the aeration basin Advantages Improvement of the removal efficiency of wastewater pollutants by 10-26% (reduced values of COD, BOD, NH4+, P total , SO42-, detergents, discoloration degree, sludge) Reducing the consumption of chemicals used in the wastewater treatment process (coagulation, flocculation, pH adjustment, discoloration) Reducing the wastewater treatment time. Wastewater treatment by physical-chemical methods (aeration and coagulation-flocculation) Advantages obtained by the introduction of aeration system in the wastewater technology flow can be seen in the graphs regarding the evolution of the main quality indicators of wastewater and from the treatment degree of the modernized installation In the NGTIP upgraded aeration basin, wastewater, mixed with activated recirculated sludge, is oxygenated by a pneumatic aeration process. Treated water, in a percentage of 94-97%, is separated from the flocs of activated sludge in the secondary settler

Success factors of GP

By applying the suggested solutions, the textile companies from RomanianBulgarian cross-border area manage to comply with the national rules relating to treated water discharge into sewer systems or natural receptors; By applying the modern technology solutions for textile chemical processing, less water & energy is needed per kg of fabrics and less water pollutants & less sludge can be found at the end of the process; By introducing the aeration system in the wastewater treatment plant, the treatment time and the chemicals consumption used for wastewater depollution are both reduced, obtaining at the end of the process, wastewater indicators with diminished values. Porto, 14th February 2017 Difficulties encountered, and lessons learnt from the practice Missing of wastewater testing devices within cross-border textile companies' leads to some difficulties for on spot monitoring and controlling of wastewater quality indicators, thus delaying the decision making. Success factors of GP By applying the suggested solutions, the textile companies from RomanianBulgarian cross-border area manage to comply with the national rules relating to treated water discharge into sewer systems or natural receptors; By applying the modern technology solutions for textile chemical processing, less water & energy is needed per kg of fabrics and less water pollutants & less sludge can be found at the end of the process; By introducing the aeration system in the wastewater treatment plant, the treatment time and the chemicals consumption used for wastewater depollution are both reduced, obtaining at the end of the process, wastewater indicators with diminished values. Porto, 14th February 2017 Difficulties encountered and lessons learnt from the practice Missing of wastewater testing devices within cross-border textile companies' leads to some difficulties for on spot monitoring and controlling of wastewater quality indicators, thus delaying the decision making.

Remarks on the durability of the GP results and impacts The durability of the GP can be seen in the following aspects Water reuse and sustainability will continue to be important goals for environmental pollution prevention/reduction practices in the textile industry The textile industry will continue to choose and utilize water treatment solutions not only to reduce its operating costs, but also to reduce its water footprint and decrease the ecological impact from its wastewater discharge and solids sludge generation on the surrounding ecosystem. Good Practice value added at regional and transregional (EU) levels Cooperation between the existing institutional frameworks (environmental protection agencies, administrations of the protected areas and project partners) for the maintenance of the sustainability of ecosystems and protection of the shared natural environment, a cross-border integrated approach and networking; Improve the public cross-border awareness on environmental management and protection; Increased competence of textile companies from cross-border area in the field of advanced wastewater treatments.[7]

INNOVATIVE METHODS IN SAFETY MANAGEMENT FOR WORKPLACE HAZARDS.

The newest technical methods must be applied to prevent the workplace hazards. The activity of people and processes is enhanced only by the tools available to them, and technology itself is rarely a complete solution to workplace safety. Having said that, technological innovations are essential in creating a significant impact in securing facilities, reducing the severity of emergencies and even shortening response times for first responders. One area in which we've seen substantial improvements is the communication systems that organizations are implementing.

The technology powering these changes provides essential communication throughout the workforce, no matter the situation or location. Maintaining communication with employees can be essential not only in an emergency, but also for simple organizational issues such as staffing. The key to implementing an effective communication technology is to provide continuity throughout the workplace. Today, employees are bombarded by many different modes of communication, making effective emergency communication that much more important.

Communication systems are playing a key role in today's workplace, as the modern office no longer is confined to one specific space. Mobile technologies have allowed employees to access work wherever they are, whether collaborating across campus or the country, as well as traveling remotely. With that, a major trend in workplace safety is protecting the lone employee. In the office or in a remote location, corporations still are responsible for protecting each employee. Business leaders now must be sure that communication platforms will reach all employees during an emergency, no matter the location and preferred method of communication.

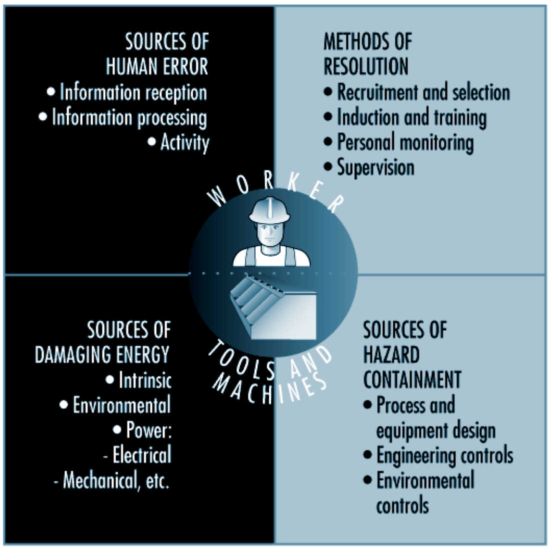

Figure No. 2. Representation of workstation elements relevant to injury causation and control

With all these forms of communication come questions that businesses need to address. Are employees safe? Do they need additional resources and assistance? Are they not in their normal location? These questions can be answered with technologies such as poll-based alerting. These tools can work alongside mass notification systems to solicit information and even location data from employees in the event of an emergency. This allows groups – whether they're located in a specific area or are members of a certain shift – to receive targeted communications with essential information in an accurate and timely manner. Using these tools alongside email, SMS text and voice options maintains continuity across all forms of communication.

The majority of employees expect to receive immediate communications from their organizations regarding emergencies. In addition to employees receiving notifications about potential life-threatening events, timely updates regarding office closures because of severe weather or system outages also must be communicated to ensure business continuity. Integrating essential communication that isn't just associated with safety situations ensures employees are enrolled in the appropriate communication channels.

Communication training is now a day is strongest tool in prevention of workplace hazards. [8].

Innovative Ideas to Prevent Workplace Hazards

Every work or job should have a work instructions or job steps activity. Every written SOP should include pictures at job steps where significant hazards exist. Pictures that show appropriate PPE should be included with SOP. PPE Hazard Assessment required by OSHA may be built into JSA. Complex JSAs should be videoed with voice narrative for significant hazards. Employees should sign off that they understand the JSA and will obey precautions. Review and revise JSA as necessary following each accident investigation.

Control band chemical exposures. Establish hierarchy of controls for chemical exposure based on control banding concept

When time and budget are tight just spend a day at the exhibits and skip the educational sessions. Tracings visit to the exhibition in such free time gives new innovative ideas. Trained mind always does the right things. Mind training is the best tool method to prevent any hazard and solve the complex Tribulations.[9]

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