FLASHPOINT

NZ INSTITUTE OF HAZARDOUS SUBSTANCES MANAGEMENT

Winter 2024

Winter 2024

Chemical advance too much of a good thing?

USEFUL ORGANISATIONAL CONTACTS

NZ Institute of Hazardous Substances Management

www.nzihsm.org.nz

The official home of professionals committed to the safe management of hazardous substances and dangerous goods. The NZIHSM is a 'not for profit' industry association specialising in improving safety, health and (site) environmental performance, particularly the safe management of hazardous substances in the community.

Responsible Care NZ

Box 5557 Wellington 6145

Responsible Care NZ works with industry partners to implement the hazardous substances legislation.

WorkSafe (MBIE)

www.worksafe.govt.nz

Government agency formed to provide compliance and enforcement of hazardous substances. Responsible for hazardous substances certificates.

EPA

www.epa.govt.nz

The EPA administers the HSNO Act and supplies extensive information on working with hazardous substances.

Ministry for the Environment

www.mfe.govt.nz

The Ministry administers the HSNO Act, and provides policy, publications, technical reports and consultation documents.

HAZANZ

www.hazanz.org.nz

An association of the safety organisations in New Zealand.

Institution of Chemical Engineers

Since 1922 the multi-national IChemE has advanced chemical engineering's contribution for the benefit of society. Its offices include UK, Australia and New Zealand.

Local Government NZ

www.lgnz.co.nz/lg-sector/maps/

Local Authorities have responsibility for policing building controls. Some local authorities are contracted to Department of Labour to provide enforcement of the Hazardous Substances legislation.

President's message

Working towards reality!

Life seems to have abandoned boring again with items like energy crisis, eastern wars, large continent cyclones and general chaos causing much excitement for many.
It often seems lucky to be far away from a lot of the action as we try and relax in our little space on our own little planet.

But life is trying to head back towards normal and a gentle working world, recommencing planetary travel and overseas immigration is reaching new highs, as many offshore folk flock towards the perception of peace that is New Zealand, (or was that Australia)

In this winter edition of *Flashpoint*, our NZIHSM team too continue in our goal of "protecting, people, communities and the environment" commenting on our society and planet in articles as follows:

(i) We are BETTER than Oz !!
(ii) MBIE consultation on the 'Health & Safety' at Work Act
(iii) Ignorance burns down petrol station
(iv) Process Safety Management – trends and technologies
(v) How did we get an Energy crisis in New Zealand ?
(vi) Humans & Chemicals – Too much of a good thing !
(vii) Archies ramblings
(viii) Gate to Hell – Nature too has a great source of carbon warming!!

All of the articles are interesting reads as we look forward to all living with each other and mother nature so we can all enjoy the wonders of our Earth for many generations to come. Enjoy!

John Hickey
Institute President

It is with great sadness that we have recently learnt of Dr Bryan Watts' passing.

His government HS team was a great help to the hazardous substance protection development and with his knowledge of chemistry and engineering, he has left an admirable legacy to all of us in New Zealand by 'Helping us with the benefits of chemicals while at the same time protecting us against the adverse effects of the hazardous side of these'.

Our thoughts and prayers are with his family and all who knew him !

CONTENTS

Cover photo by Adelina Chavez Sotomayor via Pinterest

Flashpoint

Flashpoint is the official journal of the NZ Institute of Hazardous Substances Management.

Editorial material does not necessarily reflect the views and opinions of the Institute.

Managing editor:
Dave Lascelles
drl.sm47@gmail.com
027 6918091
President NZIHSM:
John Hickey
john@abstel.com

Editorial managers:
Ross and Sue Miller
kotuku.media@xtra.co.nz
Phone: 04 233 1842

Copyright: Nothing in this publication may be reproduced by any means without the express permission of the editor.

Institute national administration:

President: john@abstel.com
0800 854 444
Secretary: linda@accreditation.co.nz

office@nzihsm.org.nz

Psst!

We're better than Oz…

There has been some criticism in the media of late of how the New Zealand safety systems are not working as well as those of Australia, and some other western countries, due to our reactive rather than proactive approach to safety.

The Business Leaders' Health and Safety Forum's 2024 *State of a Thriving Nation* August 2024 report found Kiwis were twice as likely to die from a workplace incident than workers in Australia. The report, written by an New Zealand economist on behalf of the NZ Business H&S forum, said the cost of lost lives, lost earnings, serious injury costs to ACC and health issues rose to $4.9b last year, up from $4.4b in 2022.

While our performance is slowly improving, New Zealand's fatality rate is 60% higher than Australia and more than 500% higher than the United Kingdom. Australia and the UK have similar legislative settings as ours, but something is not working in New Zealand. The report believed that New Zealand's regulatory interventions are more reactive than in Australia and that its regulatory system lacks a mechanism for oversight and co-ordination or 'system stewardship', which is at the heart of the successful regulatory approach by the UK's Health and Safety Executive.

Missed the point!

This study, however, may have missed the 'Proactive nature of the NZ Hazardous substance regulations' which indicate that Aotearoa is really not that bad ! It appeared that most of the reports findings seemed to be based on accidents in the forestry, manufacturing and outdoor industries, but it was not clear if the study carefully considered the actual proactive nature of the New Zealand safety procedures under the hazardous substances regime, which should also be considered.

Results from New Zealand's proactive hazardous substances regulations have quietly demonstrated that a proactive system can work for the betterment of all. It has been 28 years since the first Hazardous Substance and New Organisms Act development combined most of New Zealand's chemical regulations into one piece of legislation – the HSNO Act 1996 – as a direct result of number of incidents, in particular, the ICI Fire of 1984.

18 years on …

As part of this it has been 18 years since the 'proactive site visits' by HS compliance certifiers were introduced in 2006 to try and "protect people, communities and the environment against the adverse effects of hazardous substances".

Fortunately, up until 2017, there has been some monitoring of the overall safety effects of the hazardous substance legislation by the EPA which summarised the first 10 year effects in its report from 2017 with key findings as follows:

There is less harm to people attributed to hazardous substances than in past years.

There has been a 25% decrease in the total number of hospitalisations attributed to hazardous substances over 10 years: 433 in 2015, compared with 578 in 2006. During this time, the population of New Zealand increased by 11%. The current rate equates to three people among every 10,000 hospital admissions.

Seventy-six percent of all hospitalisations attributed to hazardous substances were less than 24 hours duration. For children under five years old, 92% of hospitalisations attributed to hazardous substances were less than 24 hours duration.

Hospitalisation of children under five-years-old related to hazardous substances had decreased by 34% over 10 years: 21 per 100,000 in 2015, compared with 32 in 2006.

Hospitalisation of young people (5 to 24-years-old) related to hazardous substances had decreased by 49% over 10 years: 18 per 100,000 in 2015, compared with 35 in 2006.

Male hospitalisations attributed to hazardous substances remain considerably higher than female hospitalisations. Since 2006, the ratio of male to female hospitalisations is steady at 7:3.

Over the last 10 years, about 40% of all hospitalisations attributed to hazardous substances result from incidents in the home.

Hospitalisations related to the discharge of fireworks have decreased by 32% over 10 years: 17 in 2015, compared with 25 in 2006.

Legacy chemicals (for example, DDT), also known as persistent organic pollutants, are banned in New Zealand. These are bioaccumulative chemicals, meaning that they persist in the environment for a long time. In order to monitor that their impact on people is decreasing, the Ministry of Health, undertakes blood sample monitoring studies.

This monitoring shows that adult New Zealander detection rates are generally low compared to Australia, US, and Canada and New Zealand detection levels continue

to decrease over time.

Lead detection in blood is at the lowest level since 2008, when the minimum notification rate was significantly reduced. Also, since 2008, there has been enhanced occupational screening. People's awareness about the safe use of hazardous substances in the home

A 2017 consumer awareness survey of 500 respondents found 74% of respondents read the labelling on products to identify if they are hazardous. A similar survey in 2015 found over half of the 496 respondents read labelling on hazardous substances before use.

More than two-thirds of respondents in the 2017 survey said they keep themselves and others safe by following the label instructions, using protective equipment, and/or keeping hazardous substances out of reach.

In 2015 (latest data), there was a 23% decrease in the number of calls to the National Poison Centre related to hazardous substances, compared with 2014.

Feedback wanted:

Rare chance to make a difference

As industry compliance experts it would be useful if you could provide some feedback into the current government's HSWA Act with particular emphasis on the hazardous substance regulations and benefits of the HS certifier regime.

Have Your Say on Work, Health and Safety – submission form: https://www.mbie.govt.nz/have-your-say/work-health-and-safety. Closing date 31st October 2024. With little fanfare, MBIE has opened consultation on the Health and Safety at Work Act, with a view to guiding the Minister in identifying appropriate improvements, which will reduce harmful incidents in the nation's workplaces.

There are three prime areas you are invited to address in your response: **Focus Area 1** – *Businesses are best placed to understand and manage their risks.* The survey seeks information about your decision-making regarding health and safety risks and the measures to eliminate or minimise them. You are also invited to comment on your costs of compliance.

Focus Area 2 – *The law is designed to balance flexibility and certainty.* Does the law present the right balance between too much detail or not clear enough? What do you believe is working well and your view of the value of your sources of advice?

Focus Area 3 – *Worker engagement and participation.* The extent of your engagement with your workforce and particular practices you find effective.

This MBIE consultation is a rare opportunity to ensure your views on facilitating safer workplaces are brought to the attention of the regulators. As always, we would appreciate a copy of your submission and also send a copy through to Resp. Care NZ & HSPNZ to help us ALL with our industry submissions.

Thank you for your efforts and
Best regards

NZ Inst. Hazardous Substance Mgt Inc (NZIHSM)

Environmental pollution – air, water and soil – attributed to hazardous substances

Water quality

Seventeen percent of groundwater wells contained detectable pesticides in the national survey undertaken in 2014. All but one of the detections, were at levels below 17% of the maximum acceptable value for drinking water. (Note: (i) 101 wells in the survey had been sampled for 12 years or more. They show no evidence of an increased level of pesticides. Fifty-five percent have not had any pesticides detected.

The next national survey is due to be undertaken in 2018. (ii) Monitoring data from 2015/16 shows aquatic herbicides, used by territorial authorities to control particularly invasive stream plant pests, were effective in reducing target pest weeds, with limited damage to other plants within treatment areas. EPA controls were followed appropriately, including adhering to environmental exposure limits, resulting in minimal impact to the environment.

Soil quality

The New Zealand fertiliser industry has a voluntary standard that phosphate fertilisers do not contain more than 280mg of cadmium per kg of phosphorus. It is best practice for farmers to be aware of their cadmium soil levels with five-yearly soil tests.

Non-agricultural land has very low cadmium concentrations. Waikato and Taranaki regions have the highest cadmium concentrations. Several samples from Waikato, and one each from Taranaki, Bay of Plenty, and Tasman exceeded acceptable cadmium concentrations.

Air quality

Air quality monitoring has found that atmospheric concentrations of lead and arsenic peak during winter

in New Zealand urban centres, due to the burning in domestic fires of old timber painted with lead-based product.

Meeting obligations

New Zealand is meeting its obligations under the Montreal Protocol designed to reduce the use of ozone-depleting substances. Although it is an ozone-depleting substance, the Montreal Protocol allows approved use of methyl bromide for quarantined imports and treatment of some products prior to export. A challenge for New Zealand is that methyl bromide use has risen from 74.8 ODP tonnes to 355 ODP tonnes in the last 16 years.

Bee health

Winter hive loss in New Zealand in 2016 was 9.8%, compared with 17% in the northern hemisphere. Normal winter hive loss in New Zealand ranges from 10 to 13%. A main cause of winter hive loss internationally is toxic exposure. In New Zealand, there is a range of causes, with only 14% total winter hive losses due to toxic exposure.

Hazardous substances and new organisms contributing to the reduction of pests and weeds EPA-approved pesticides, particularly flumethrin and amitraz, have been crucial to the growth of our apiculture industry following the deadly infestation of varroa mite in the early 2000s. The Department of Conservation estimates that 85% of endangered rock wren nests have been successfully protected from pest control work, including the aerial application of 1080. Since 2008 over four million hectares of conservation land have been treated by aerial application of 1080.

The EPA has approved biological control agents to reduce New Zealand most harmful weeds including tutsan, Japanese honeysuckle, and Darwin's barberry. Overall the above would indicate that the implementation of the hazardous site regulations and proactive certifier site visits have had a very beneficial effect on the safe use of hazardous substances in New Zealand from 2006 to 2017.

As a result of the miners' deaths caused by the Pike River explosion on 19 Nov 2010, the chemical regulations were again revised under the Health Safety and Employment Regulations 2015 and the Hazardous Substance Regulations 2017 (HS Regs). with 'non-environmental' and the compliance certifiers reporting shifting from the EPA through to Worksafe for workplace environments.

These findings from the EPA study of proactive hazardous substance regulations up to 2017 indicated that rather than New Zealand falling behind Australia, we were actually performing somewhat better than our Australian cousins! But we better not tell them that !

Ignorance burns down petrol station

Three inspirational' people destroyed a BP service station in Napier with one thoughtless (brainless) act.

A 'bucket' of fuel in a car parked at the bowsers caught fire and took the entire forecourt with it. One of the occupants had checked the level of fuel in the container with a naked flame. Luckily, firefighters were able to contain the blaze within half an hour.

It would appear little thought or understanding was present in the trio who started the fire – and miraculously lived to tell the tale.

Hopefully all learnt that flammable liquids should NOT be opened in vehicles and in NO cases should a naked fire source be introduced to fuel or a fiery explosion will result... and they might not be so lucky the next time.

Photo: *Warren Buckland/NZ Herald.*

Process Safety Management: trends and technologies

In the industrial environment, process safety management is not just a regulatory requirement, but a vital asset for the smooth operation of any facility. Effective PSM is also a key driver of improved performance in safety through greater operational discipline, reduced downtime, and increased reliability.

Initial PSM practices were largely reactive, focusing on accident investigation and fault rectification post-incident. However, various catastrophic events in the mid-20th century such as the Bhopal catastrophe in India in 1984 highlighted the need for better management of processing industries' operations, shifting the emphasis from reactive to proactive safety management.

The first step-outs into proactive safety management included using various tools such as risk assessments, safety audits, and training programmes. More recently, technological advancements in industrial automation, process digitalization, data collection, and analysis have significantly influenced the move towards more sophisticated, data-driven PSM strategies.

Emerging technologies such as artificial intelligence machine learning, digital twin technology, and Big Data analytics are set to further revolutionise PSM. Their use in PSM provides real-time actionable insights and forecasts potential hazards, thus enabling preventive actions. AI and ML can facilitate predictive analysis and maintenance, which can foresee potential equipment failures and process disruptions, aiding in proactive intervention. Big Data analytics can handle and analyse massive amounts of process data for valuable insights and decision-making. The concept of digital twins, virtual replicas of physical systems, is making waves in industrial practice. These digital counterparts can be used to simulate and predict system behaviour under various scenarios, leading to enhanced problem-solving and planning efforts.

The chemical facility at Bhopal became a rusting wreck after a gas leak killed at least 2259 people (official figure), but could have been many times higher. Compensation was paid to 574,366. Photo: Getty images.

Future PSM systems will promote deeper human-machine collaboration. Technological tools will aid human decision-making, while operators' expertise will provide the necessary checks and balances for automated systems. Such synergy will result in a system that minimises human error without fully eliminating the human touch.

Minimising impact

PSM will also play a crucial role in minimising the environmental impact of industrial processes, reducing waste generation, promoting energy efficiency, and ensuring the overall sustainability of facilities. However, the transition towards future PSM practices will not be without its challenges, which can affect its effective implementation – such as cost and resource constraints, resistance to change, and the ensuring of the quality of the data used in the PSM process (garbage in equals garbage out).

Some practical steps and strategies to transition to new technological PSM practices will be required including:

1. Identifying the right technology for any given application and integrating it into existing systems.
2. Developing a change management plan to gain the confidence of employees; and training staff on the new PSM practices.
3. Regularly reviewing the process to confirm that it is delivering improved work efficiency and safety measures;
4. Ensuring adequate security measures are in place to protect sensitive data.

The following case studies show how several dominant companies have led the way in implementing the latest PSM technologies.

Shell

The multi-national energy company has successfully implemented advanced PSM practices using AI-enabled predictive maintenance to prevent unexpected equipment failure at its petrochemical plants. Shell leverages machine learning and AI solutions that analyse vast amounts of operational data, improving efficiency and reducing maintenance costs.

Dow Chemical Company

Dow is a pioneer in implementing innovative PSM practices. Dow leverages big data analytics and AI-based systems to build risk profiles for each asset class in its global factories. By identifying possible threats in real-time, the PSM system provides Dow with a preventative and proactive approach to ensure safety in its operations.

BASF

BASF, a German chemical company, has successfully adopted digital twins technology for better process safety and plant efficiency. By creating simulated models of their production facilities, BASF can analyse system behaviour under various conditions. These digital replicas enable the company to optimize processes, improve facility maintenance, and minimise risks.

These case studies emphasise the importance of strategic planning, robust implementation, and continuous improvement when transitioning to future PSM practices. Successful integration of advanced technologies will require organisations to be adaptable and open to change, while still upholding the core tenets of process safety management. It will also require investments in money and time, but the long-term benefits in terms of improved safety and productivity will be the payback.

– Dave Lascelles

Uncle Archie

Kia ora HS professionals!

Artificial intelligence

Some technology commentators have raised concern about the rapid rise of Artificial Intelligence in recent times as machine information processing speed and capacity starts to exceed that of the human brain. While the reduction in cost of major data analysis can be good, such as in manufacturing plants where by constantly analysing all plant variables, problems can be identified and solved before they occur, it would help if we humans understood it !

Energy crisis

Towards the end of our winter we had what our PM called an "energy security crisis", as has happened with a dry winter at the end of August 2024 most of our hydro lake levels were at extreme low-levels. In addition, our natural gas levels were not readily available, and electrical prices hit all time highs. The bottom line is that less gas means more coal. More coal means higher carbon emissions per kW of energy, which more rapidly increases the carbon-cloud and energy volatility in our atmosphere and 'weather weirding' causing less then more intense rain storms when the rain storm does come down ! Perhaps more investment in solar, wind and geothermal energies are needed to back-up our hydro availability!!

Think Big, think flexible !

In the 1980's Rob's National government, decided to Think Big! They wanted to get NZ producing large-scale manufacturing facilities, especially in Taranaki where the new exciting fuel – oil and gas, had been found! But then in 2024, after a dry winter, a power and gas crisis highlighted the role of NZ's largest gas user Methanex in Taranaki, which uses 40% of the country's gas supply! Since the 'Think Big' 1980's, the Methanex plant firstly used the natural gas to produce synthetic gasoline.

But then in the 1990's the world need changed, so Methanex then produced global methanol in its two feed plants which it has successfully for the past 30 years.
In 2024 the world changed again, and the carbon output from oil-based fuel transport had altered the weather patterns and NZ had a late winter energy crisis, no rain to fuel our hydro-electrical supplies. Again Methanex showed flexibility, and agreed to shut till October to help the late winter energy crisis! In addition, to avert future crisis it may even shut one of its two methanol plants to save 20% of NZ's gas usage! This 'Think Big' flexibility is great and we have somehow used Methanex as NZ's largest gas battery, even if it still relies on free carbon credits for financial viability. It may seem a shame when a once wonder industry becomes suddenly again becomes cost unviable, but if it can prove flexible to save a bigger country problem, then perhaps this is an unexpected 'Think-big-Design' bonus indeed!

Politics as simple as ABC !

Perhaps this latest fuel crisis demonstrates a constant rule of government which many commentators have expressed as being as simple as ABC – Another Bludy Crisis!

If you want to send your comment, you can send it to archie@NZIHSM.org.nz.
The ideas expressed in this column are not necessarily the views of the NZIHSM or Flashpoint and in some cases the NZIHSM frankly does not approve!

How did we get an energy crisis in NZ?

New Zealand has always been the land of plenty with our two large green and bountiful islands providing so much for so few. Green fields, food and nature's gifts prevail.

Some commentatoers are saying the country sleep-walked into this siutation. Be that as it may, until very recently we had whatever power we needed, but in mid-August this year authorities told us that we are likely to be heading to an energy crisis and like other less fortunate places, we too may need to have blackouts if we don't conserve our energy.

To investigate this we should look at how we use energy in New Zealand and where our energy actually comes from.

In 2023, New Zealand generated just over 43,000 gigawatt hours of electricity and consumed almost 40,000 GWh. This means that we had almost an 8% buffer over demand exceeding supply.

Households were the largest consumers, accounting for almost 35% of our total electricity consumption. The industrial sectors consumed nearly 33%, the commercial sector used 24%, while agriculture, forestry and fishing used 6% and transport, less than1%. Our biggest industrial users were the wood, pulp, paper and printing sectors and the basic metals sectors. The single largest user of electricity in the country was the New Zealand Aluminium Smelter, at Tiwai Point, which accounts for around 12.5% of our total electricity consumption.

A recent comment from the NZ Electricity Authority indicates that in 2024, the monthly total electricity demand has been higher than the 2018-23 average.

In 2024 a warm summer and colder autumn has resulted in higher demand for heating and cooling, there has been additional demand for irrigation as dry conditions persisted through the summer and into autumn (particularly in Canterbury) and further demand from the electrification of transport, industrial processes and homes. The electricity generation mix also is subject to environmental changes. In mid August, hydro generation fell to 42%, while wind doubled to 12%.

In New Zealand, electricity is generated through hydro, geothermal and wind energy power – with generation from the combustion of coal, oil, and gas providing the balance or backup electricity supply. MBIE data indicated that in 2023, 60% of New Zealand's electricity was generated through hydropower, 18% through geothermal, 9% through gas, 7% through wind and just over 2% from coal.

Earth's major source of energy, namely our local Sun, does still not rate highly in the production of our machine required electricity. With the issues surrounding carbon-based global warming perhaps Solar energy should be used to create non-carbon and locally available electricity.

Hydroelectric power is generated using a dam or structure to store water which when released can flow by gravity through electricity generators in the opened dam to create instant electricity.
Hydro provides the majority of our electricity needs in New Zealand through more than 100 hydro-electric generating plants, especially

The latest twist in renewable energy is grazing between the sola array rows – the best of both worlds.

One poblem: most generation in the South Island-- most power required in the North Island.

around our southern lakes around Mānapouri, Benmore and Clyde.

Geothermal power plants use steam to produce electricity. The steam comes from reservoirs of hot water found below the earth's surface and most of New Zealand's geothermal generation comes from Taupō, with a small amount from Northland.

Wind energy is generated across 21 onshore farms, where large turbines connected to generators that convert the wind's energy into electricity. Our largest wind farms are in Turitea, Tararua and the Hawke's Bay with construction underway on several more.

Natural gas is sourced from six main gas fields in the Taranaki region, three onshore and three offshore. The electricity sector typically uses the most gas in winter when demand is highest.
Several of our gas fields are naturally declining as their fuel depletes and the Labour government has had a recent transition plan to move away from using LPG and natural gas, to reduce emissions.

Coal is used to generate electricity at the Huntly power station, the only coal and gas fired power plant in New Zealand. In 2023, 270,000 tonnes of coal was used to generate electricity, while a further 322,000 tonnes were used in co-generation (when waste heat produced in an industrial process is turned into electricity). Electricity generation accounts for the largest amount of domestic coal use.

What does this mean for us?
If hydro lake levels remain low and high wholesale prices continue, the pressure will fall on retailers to increase their residential power prices in the coming months. This transition away from carbon-based fuels is a worthy long term goal, but as with any transition process, care must always be taken. In the move away from carbon-based fossil fuels there has to be a suitable replacement to ensure that society's energy needs can be sustained by alternate sources of power

Meanwhile, businesses and households were being urged to go easy on electricity to avoid a supply crisis. The Major Electricity Users Group, whose members include Fonterra, New Zealand Steel, Oceana Gold, Visy and Woolworths NZ, said the current situation was concerning.

So, what is being done?
The Government's supply operator, Transpower – which operates the national grid – recently stated that in the worst case scenario, generators would be using that extra low storage contingency from the already low hydro lakes from around mid- September. This extra low storage has about two months of additional electricity generation to buy us all time for it hopefully to have decent rain around the storage lakes.

If the Spring rains do not still arrive, then Transpower must organise an conservation campaign, if hydro lake levels fall below what is known as the emergency risk curve and there is a 10% chance of running out of energy in the next 12 months. It would then call on the community to make voluntary electricity savings, in order to slow the draw down on hydro lake levels.

Who would of thought that we should be anxiously awaiting for rain!

So it is now apparent that New Zealand's electricity supply has come under immense strain in recent months as hydro lake levels drop after a dry summer and below normal rainfall, while falling gas reserves also contribute to driving up the cost of electricity. In mid August the hydro lake levels were about 55% of the average of what they would normally be at this time of year, which is among the lowest levels in around 90 years of historic records.

In addition, our natural gas production continues to decline,

with data from MBIE showing the country is not going to produce enough gas to meet expected demand in at least the next three years. Methanex in Taranaki, who uses almost 40% of New Zealand's gas consumption to make methanol, had fortunately agreed to stop production to allow it gas use to be diverted ito make electricity instead.

Electricity prices reflect the cost of the fuel used in their generation, so with a lack of hydro, the country is reliant using on more expensive fuel like gas, coal, and sometimes even diesel, to generate electricity.

There is also another issue – most of the NZ hydro generation is in the South Island while the biggest city is at the top of the North Island requiring hundreds of miles of electrical transmission cables and the corresponding voltage losses thereof.

The likely best solution to an ongoing electricity problem?

Electricity usage is likely to increase over the years ahead, especially when transport needs move to electric vehicles over the petrol-based cars of our recent century. In addition, as the weather changes it may be riskier to assume that rain will fall in the right places where our current hydro-dams are located although at least hydro is a renewable energy source.

So it is likely that fossil fuels will still be required for some time as we build our transition to renewable energies. We should be constructing our renewable energy generators as soon as possible while we have the chance and before we really cook our little planet !

Which of the renewable energy forms should we favour :

Nuclear power in each mass particle is an option, but is a difficult option to control.

We really need is a renewable energy form that is consistent for the foreseeable future, can be produced at a local level to avoid transmission voltage losses, and is relatively cheap to collect on a local basis. If this is our criteria, then perhaps we should favour the major energy source for all the Earth, our Sun, rays from which we can collect through solar photovoltaic panels mounted on each house.

So if we want to limit 'global-warming' but at the same time maintain our availability of energy, then why not invest some assets asap and use our old friend, the SUN !!!

Mega-slump endangering planet

A mega-subsidence in Siberia is threatening the planet. The Batagaika or Batagay crater, nicknamed the "Gateway to Hell," is the largest in the world, and due to a degradation of the permafrost cause by a rise in temperatures and precipitation in the Arctic.

According to scientists closely monitoring the situation, its evolution does not bode well. The crater is widening at a worrying speed, releasing various greenhouse gases, including carbon dioxide and methane, contributing, at the same time, to global warming. It was 790 meters wide 10 years ago – it is now 200 meters wider. It is comparable in area to Meteor Crater in Arizona.

As it collapses, the Batagay crater exposes layers of permafrost that had been frozen for thousands of years. This represents a volume of one million cubic meters per year, since 2014, figures that could even be underestimated.

On the one hand, global warming causes and leads to an accelerated melting of the permafrost and on the other, the greenhouse gases released contribute to the rise in temperatures. A vicious circle. However, researchers note that if the crater continues to widen, the permafrost that would remain inside would only be a few meters thick, limiting its development - how consoling!

– Dave Lascelles

Humans and chemicals:

Too much of a good thing?

by John Hickey

What use are chemicals to humans? Over the recent past in the history, an upright ape called human learned to use chemicals which has helped humans, when they work together, become the dominant species on this little planet on this little corner of a galaxy.

The human race learnt to use nature's chemicals to solve most of their life challenges in the areas of food, housing, health, medicine, energy and transportation to generally to arrange Planet Earth in the way it wants it. The good and benefits of chemicals have been enormous, but as always there is always a balance between too much of a good thing that can lead to bad effects, which we refer to as the hazardous nature of substances.

Where humans have done well to date is developing a process to "accentuate the positive aspects of substances while reducing the negative or hazardous effects of these same substances" through the process design and control methods for their chemical usage.

How have we done over our recent history?

If we consider the human population on Earth over the past 200 years, we can see that in 1800AD there were roughly one billion people on this planet, but only 200 years later through the high rate of chemical and human development that now by 2020 there are more than eight billion humans on this planet. A growth factor of 800%, which is truly remarkable!

This asymtopic growth would suggest that we humans have certainly made this planet work for us over the past 200 years! This growth has been through humans forming societies to enhance the development of food, chemicals, housing, transport, use of planet-stored energy, a global communication and labour force based on a general, if sometimes limited, understanding of the nature of our planet.

In this way we have effectively accentuated the positives of our planet, but in line with our spectacular growth we are just starting to learn that our "Accentuation of the positive has not entirely eliminated the negative" and that we must balance our planet process system before the negative and hazardous side of nature such as global warming, overuse of resources, bug explosions, land devastation and other such items could put a dramatic halt to our 200-year party.

To consider if we progressed, perhaps we could look at the recent progress we have made in the discovery and use of chemicals over the most recent 100 years:
Food: we have developed fertilisers, farming equipment and food markets so that one farmer can produce enough food for greater than 1000 neighbours and we are almost feeding the entire eight billion.

Chemicals:

We have learnt how organic and inorganic chemicals can be used to enhance our environment through food additives, housing products, hydrocarbons to be used in the design of many tools like building, clothing, communication, food additives, plastics and protective coatings

Housing

Building products including enhancing the growth of trees in

Getty Images

nature to create weather protective houses and the mixing of bricks and then cement-based chemicals to create high-rise concrete structures to accommodate many humans in one place. Even glass chemicals allow us to let sight and heat throughout our building edifices and create super housing complexes called cities!

Energy

Through our early reliance on our local Sun star to produce energy waves and daylight, heat and power for our little planet, we have now moved on to reuse some of the ancient energy storage areas on our planet through the use of firewood and fossil fuels, geothermal, wind, electricity and sunlit solar energy to power our grand developments. cWe have even moved into the quantum building blocks of nature to split the atoms and release the dramatic nuclear energies that are inherent in the building blocks of mass that form our understanding of nature (e=mc2)

Transport

We have learnt to enhance our personal leg-energy with cars and mechanical equipment to drive, surf, train and even fly around the land and seas of our planet and out into the almost empty space beyond.

Weather:

Like all of our planet's life forms we have evolved to use and protect ourselves against the vagaries of our Earth's weather. This is where our solid land masses and liquid seas and early life forms have evolved a gaseous atmosphere around us with the life giving gases of oxygen, nitrogen, carbon-dioxide, hydrogen, helium, oxygen di-hydride(water), sulphur dioxide and many other gaseous forms have developed to

Antoine and Marie-Anne Lavoisier, who helped develop the metric system and a system for naming chemical compounds.

create and protect the life within its atmospheric planetary cover.

But what holds this atmospheric cloud to our planet is partly gravity, partly the attraction of mass particles for each other and partly magnetic. This is a huge, but almost fragile, surrounding as has been evident in our close planetary neighbour Mars, which somehow recently lost its atmosphere and with it any life forms within.

Overall, the speed of development of these scientific advances and growth of the human race over the past 200 years would indicate that we have made amazing progress indeed.

This chemical and knowledge growth has been great for the human race, but possibly we are now approaching a saturation point where the rate of unchecked growth is 'un-balancing' the Earth's processes and causing a number of unsafe or hazardous items for humans to occur.

Hazardous effects being caused by human actions ?

Weather worries from global warming, rising seas, super cyclones and dramatic storms are being caused by an increase in stored carbon being released to our atmosphere causing the 'Greenhouse effect' where an additional carbon layer becoming present on the atmosphere allows shorter wavelength uv sunlight rays to pass through the atmosphere to be absorbed on the Earth's surface, but heat rays trapped within.

These UV (ultraviolet) sun rays get absorbed by the planet and under a lengthening effect called 'Black body radiation' are turned into longer length infra-red 'heat' rays, which are re-emitted – but like in a greenhouse, bounce back to the inner atmosphere causing an increase in heat, 'wilder weather', increased water held in air and the wind, flood, polar ice-melts and rising sea-level events thereof.

To change this wilder weather, we either adapt to the changes or can try and reduce the carbon in the air though use of replace carbon-burning technologies with non-carbon technologies (eg: solar electric), carbon-absorbing technologies (eg: plant more trees) or other carbon-reducing items.

With our rapid growth over only 200 years, and chemical use, we may have unwittingly enhanced the bad as well as the good side of chemicals, and changed our surroundings to affect not only ourselves, but life around us. So perhaps we humans could use our wits and develop a full understanding of nature and chemicals to balance the system for the on-going benefit of all.

Tug-of-war in energy transition

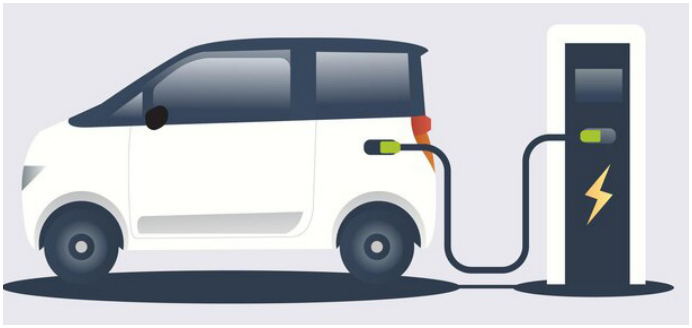
The pressing need to combat climate change to develop a more sustainable future, is seeing an unprecedented investment in energy transition technologies. But there is a tug of war between this transition and present term demands. Even as the world moves towards a decarbonised future, global oil consumption still rises, challenging global fossil fuel reduction targets.

Electricity is at the forefront of the transition away from fossil fuels; in, particular its production from renewable resources. The demand for, and hence the resources required to produce the metals such as copper, aluminium, steel, and iron ore, essential for batteries, electric vehicles, and renewable energy infrastructure, must rise. However, these metals are all very energy intensive to manufacture.

Clean hydrogen, produced by alkaline water electrolysis, is attracting a lot of interest in the metals sector as a green production enabler. However hydrogen is a rapidly diffusing gas with a wide range of flammability. One can only begin to imagine the extent of risk reduction measures required to ensure the safe functionality of an electrolysis facility producing hydrogen on an industrial scale. These measures would have to include:

- Primary safety measures built in at the design stage (eg acknowledging the potential for explosive atmospheres, and over-pressure or over-temperature conditions).
- Complementary protective measures to limit the consequences of hazardous conditions (e.g. the ignition of hazardous explosive atmospheres or bursting of pipes).
- Measures to limit the consequences of hazard incidents (e.g .detective devices or sensors such as a fire detection system).

The electric vehicle domain has witnessed significant growth, with the global shift towards sustainable transportation. This growth has been enhanced by the advent of hybrid vehicles, which has eased the pressure to build public charging infrastructure for electric vehicles. Despite this transition, global oil demand continues in an upward direction, driven by heavy road vehicle fuel demand, and the post Covid recovery in the aviation sector. However, there is currently a supply deficit, due to output curbs and production cuts from major producers.



This, coupled with limited investments in new oil exploration due to environmental considerations, could potentially lead to spiralling prices and a supply crunch at some point in the near future. While oil will face a decline in demand in the long term, it must remain available as an essential commodity in the short term.

The renewable energy sector is an essential component of the energy transition. While there is continued investment in solar energy and wind farms, these are both only intermittent electricity generators. As utility companies search for consistent base-load energy sources to balance this intermittency, nuclear energy is re-emerging as a viable solution. The advent of advanced modular reactors promise a more efficient, safer, and scalable approach to nuclear energy. Carbon capture and storage technology is also commanding attention in the global decarbonisation journey.

The world is undeniably shifting towards a greener template, with the renewable energy sector at its forefront. While decarbonisation investments have reached exceptional heights, it will require an intense on-going commitment to, and a recognition of the safety implications of proposed technologies; if we are to resolve the inherent resource conflicts and achieve our global objectives in a safe and sustainable manner.

Some may seek answers to these conflicts through the application of AI. AI may have its place, but as a commentator in a recent Scientific American observed, humans tend to attribute authority and trustworthiness to machines, and this blind faith could cause some serious problems.

If AI replaces human thinkers, research results no longer benefit from human scrutiny, with the potential for adverse safety and environmental outcomes. There are an infinite number of questions we could ask about science and about the world, but the worry is that with the expansion of AI, the questions that AI is well suited to answer will be mistaken for the entire field of questions one could ask.

– Dave Lascelles

NZ Institute of Hazardous Substances Management (Inc)

MEMBERSHIP APPLICATION FORM

1. **Name**: ……..
   First Name Surname

2. **Employment:**
   Business/Employer's Name: …….

   Position and Contact Details:

   Position Held: ……..

   Qualifications: ……..

   Experience in HS:
   ……

   ……

   ……

3. **Preferred mailing address: ……**

   Telephone Contacts: (Bus)…….

   Residential: …….

   Mobile: …….

   Email: ……. Web: …….

4. I have previously been a member of the Institute: Yes…… No ……..
   If No, I am applying to be a

   Member: ☐ Associate member: ☐

5. Return to: PO Box 10-385, The Terrace, Wellington
   Email: office@nzihsm.org.nz

How did you find out about us? ……

……

www.nzihsm.org.nz
office@nzihsm.org.nz