FLASHPOINT

Summer 2020

The future has arrived

NZ INSTITUTE OF HAZARDOUS SUBSTANCES MANAGEMENT

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 subsances 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.

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.

If you know of other agencies which could be useful to members, please let us know at office@nzihsm.org.nz.

The ignorance of youth?

One day not too long ago, in a land far, far too close, I was doing dishes and had a background talk radio in the room behind me.

Suddenly there something rather annoying, what sounded like a screeching child yelling at us that we were doing it wrong! This was naturally grating and my instant response was to turn her off, but then even though she was annoying I thought that I would listen to see what she was all about!

"How dare you," she cried. "I shouldn't be up here. I should be back in school on the other side of the ocean, yet you all come to us young people for hope. How dare you?
"You have stolen my dreams and my childhood with your empty words. We will be watching you."
She seemed to be raining the future woes of excessive Fires, Storms, Tornados, Winds and Sea rises onto us older lot?

Wow, who was this girl and why was she so disrespectful and angry? It turned out that she was one young 15-year-old and with all the knowledge and confidence of one who hasn't lived, was upset about our world suffering from Climate change !

But what was amazing was that unlike most of her older Sapien cousins she acted and one day in August 2018, Greta Thunberg took up position outside Sweden's Parliament for the first time. She held a simple sign, black letters on a white board, that said: *School Strike for Climate.*

"It felt like I was the only one who cared about the climate and the ecological crisis," she told the *BBC*. The 15-year-old was by herself, but not for long. Within a year, her school strike, carried on through all weather, had inspired millions of young people around the world to take to the streets and demand action on climate change.

Perhaps this 'impetuousness of youth' is what is required. We older folk believe in society and fitting in, following the rules and not rocking the boat. This may be good for society and as we get older we are conditioned to believe that society always knows best, and issues will be reasonably resolved. But this society norm is not always the truth and in this case of planet Science, the school kid was correct and unknowingly in line with her ancestors discovery of the 'greenhouse effect' in 1903.

Humanity has quite possibly overcooked its use of the planets resources, but it might take a young human, unbridled with older wisdom to show us the folly of our ways!

Annoying yes, but for all of our sakes, we hope that she is successful!!

John Hickey President NZIHSM

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

Managing editor:

David Lascelles drl.sml47@gmail.com

President NZIHSM:
John Hickey john@abstel.com
0800 854 444

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

Institute national administration:

Phone: 0800 854 444
Administrator: Linda Amitrano
office@nzihsm.org.nz

The new normal flexes its muscles

Like something roaring out of the pages of *Grimm's Fairy Tales*, the latest season of Australian bushfires have been devouring all in their path as they race across the countryside.

The fires are breaking records left, right and centre, and the appalling and sobering thing is, the experts are saying "Get used to it. It's the new normal."

For all the astonishing figures that surround Australia's 2019-2020 bushfire season, there is is one very important background figure that might emerge and embarass someone in the future – how many tonnes of chemicals were released into the environment due to the destruction of their 'storage' facilities.

Some of the small Outback towns that were completely annihilated by the infernos, are exactly the places where a bit of "she'll be right" storage arrangements were likely to exist. Not to mention wide-ranging cattle and sheep stations. Some of these small town's CBDs are just a collection of blackened corrugated iron now.

It might be something people don't want to look at too hard … but there is no escaping that building standards are going to have to change, given the amount of asbestos firefighters have had no option but to deal with. Again, it in is the wop-wops; how many officials cruise through in a given year, and how many thousands of buildings are exempt modern regulations due to their age?

Whatever – it is too late now, the horse has bolted with all sorts of radicals truly free to float in the atmosphere and water.

Australia's EPA said the old Batlow hospital (pictured below) is one building known to contain asbestos. "If asbestos is suspected or identified, the site may be sprayed with a non-toxic, coloured PVA glue, to give a temporary seal to reduce the risk of airborne asbestos fibres,"said the EPA's Stephen Beanman.

Asbestos is not the only potential

The main street through the historic village of Cobargo, NSW, is beyond recognition in places.

hazard in a fire zone, according to Mr Beanman. "Houses, sheds and other buildings that have been burnt in a bushfire can leave potential health and safety hazards in the remaining rubble and ash. Hazardous household materials that may be present after a bushfire include asbestos, chemicals (including household, cleaning, garden and farm chemicals), ash and dust (including ash from burnt treated timbers) solar panels and damaged gas bottles."

Flashpoint has had a lot to say about global warming, climate change, etc. Sad to say, but it appears we are thinking along the right lines. The Australian bushfires are unprecedented, breaking records, both Australian and world-wide. Although only halfway through the season, the Australian fires dwarf the Amazonian wildfires and are more the twice the size of last year's ferocious Californian fires. As at February 1, the toll was: 27 lives lost, about 18m hectares burned (45% of NZ), about 6000 building lost, and about one billion animals killed.

By the end of Janaury, 265 New Zealand firefighters have helped battle the fires.

It is estimated that at least one billion animals have perished in the fires. No one has attempted a figure on insects.

Another statistic that everyone should paying attention to is the staggering amount of carbon being released into the atmosphere – a miniumum of 4000 megatons carbon released.

NASA says the smoke cloud will circle the Southern Hemisphere and come to rest over Australia again. The effect of this remains to be seen.

The real issue is: if the mean temperature continues to climb and promote more drought across Australia, we are going to see a lot more wildfire headlines. More big high pressure areas coming off Australia means more fine and warm weather for New Zealand. If this means a rise in our general temperature and extension of drought, we need to be prepared for our own conflagrations.

It will be a major surprise if the political fallout from the 2019-2020 bushfire season is not massive. The Government could well fall – at least a change in leadership, yet again – but at least, the public

Above: ***Prime Minister Scott Morrison inspects bushfire damage: too little, too late for him?*** Photo: *James Ross – AP.*

service will be scrambling to rewrite the methodologies and practices surrounding building codes that include mandatory garden specs surrounding housing in 'The Bush', perhaps even mandatory subterranean fire shelters equipped for a couple of days, mandatory fire-proof chemical storage and so on.

The formula for Australian bushfires is simple: the drier the fuel – trees and plants – the easier it is for fires to start and the hotter and nastier they get. The more intense the fire, the more difficult it is to put out.

The heat makes the fuel drier, so they combine for something called 'fire weather'. And that determines 'fuel moisture', which is crucial for fire spread. The lower the moisture, the more likely fires start and spread from lightning and human-caused ignition.

A fraction of the carbon being pumped into the atmosphere from the Australian bushfries as they eat up resort towns on the NSW coast. Photo: *Channel 7*.

There's been a 10% long-term drying trend in Australia's southeast and 15% long-term drying trend in the country's southwest. When added to a degree of warming and a generally southward shift of weather systems, that means a generally drier landscape. Australia's drought since late 2017 has been at least the equal of its worst drought in 1902. Scientists say this has probably been driven by ocean temperature patterns in the Indian Ocean and the long-term drying trend.

The Aboriginal used to control the incidence of bushfires by pre-emptive controlled burns that limited the amount of fuel on the ground. The fact that this has been limited recently by green activisim will be a political football for years to come.

New Zealand has so far been luckier than Australia in this area. Our summer temperatures have traditionally been lower and our trees are not naturally prone to catching fire like the eucalyptus trees of Australia. However, there is unfortunately no reason why if drying temperatures and high winds increase over here, we too may be prone to fire in our 'clean, green environment' with most of our towns surrounded by forests.

If 1° C global warming looks like 'fire time' in Australia, do we really want to see the impacts of 2 degrees or more are like on both sides of the Tasman?

Why I hate lillies–

The church goers among you will notice the propensity to load up churches with lilies at Christmas time. The apparent appeal of lilies is that their flowers are generally large hence decorative, and fragrant. But this flower (flour?) explosion is not without its risks.

Lilies are banned from many hospitals because they make sick people sicker. Why -because lilies are toxic both to humans and animals. The specific lily toxin substance is not known, but the effects are well documented.

Aldehydes have been linked with the sneezing and other allergic reactions caused by the pollen and fragrances of some lilies. Certain lilies can cause a fatal reaction or death; the star lily toxicity is so well known, it is known as the death camas. Other lilies can make the mouth, throat, tongue and lips go numb; can cause skin irritation; and can also cause nervous system paralysis, irregular heart rate, confusion, digestive upset, diarrhoea or vomiting. The calcium oxalate associated with peace lilies and calla lilies can cause renal failure.

A person with plant allergies may be highly vulnerable to lily fragrance, triggering issues that could complicate medical conditions under treatment. A potted lily plant in a hospital room could drip sap or drop plant parts into a patient's meal, also triggering the above symptoms.

Incidentally aldehydes are used as embalming fluids, which could evoke a claim for a discounted funeral?!! So it seems prudent to enjoy the beauty in lilies (if any!) from afar. – ***Dave Lascelles***

Substituting hazards

Is the cure worse than the disease?

by David Lascelles

As hazardous management professionalss we put a lot of focus on advising our clients about mitigating the potential adverse effects of the hazardous chemicals we encounter in their workplaces.

Less emphasis is placed on other arguably more effective members of the hierarchy of hazard controls.

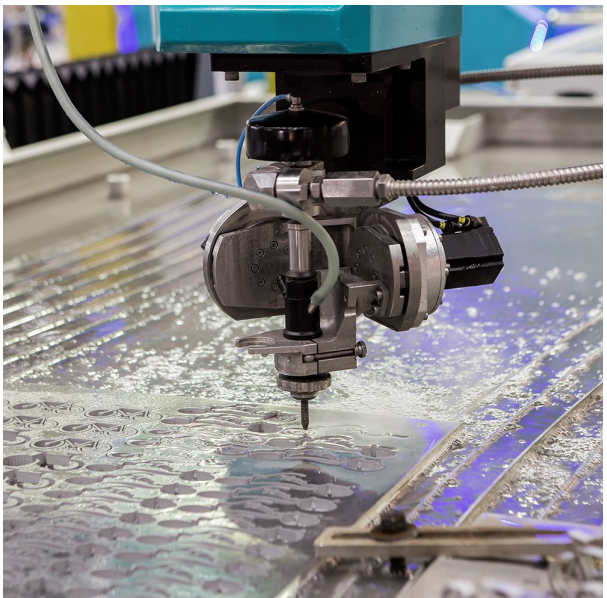
Substitution is the second most effective member of this hierarchy, after elimination. Substitution can be most effective early in the design process, when it may be inexpensive and simple to implement; while for an existing process they may require major changes in equipment and procedures. Substitution can involve changing one chemical for another, or use of the same chemical in a less hazardous form. In all cases, hazard and risk assessment of alternatives must be performed to prevent a regrettable substitution.

Common toxic chemical substitution examples include replacing carcinogenic benzene with toluene, switching from organic solvents to water-based detergents, replacing lead-based pigments in paints, and avoiding perchloroethylene in dry-cleaning processes.

Substitution of chemicals with a different form can reduce inhalation exposure to dusty powders by using a slurry or suspension of particles in a liquid solvent, instead of the dry powder.

Some chemicals, such as nanomaterials, often cannot be eliminated or substituted with conventional materials because their unique properties are necessary to the desired product or process. However, it may be possible to choose properties of the nanoparticle such as size, shape, surface charge or aggregation state to improve their toxicological properties while retaining the desired functionality.

The generally recognised decision-making framework for chemical substitutions are the health-related metrics of carcinogenicity, mutagenicity, reproductive and developmental toxicity, endocrine disruption, acute and chronic toxicity, dermal and eye irritation, and dermal and respiratory sensitisation, and eco-toxicity.



Process and equipment substitution is another management tool available to reduce workplace hazards. Hazards to workers can be reduced by limiting or replacing procedures that may 'aerosolise' toxic materials contained in the item. Examples include substituting a water-jet cutting process (pictured) instead of mechanical sawing of a solid item also creates less dust – health effects from noise can be controlled by using less noisy equipment. Other examples are limiting agitation procedures such as sonication, or by using a lower-temperature process in chemical reactors to minimise release of materials in exhausts.

Regrettable substitution

In all substitutions 'the cure must always be better than the cause'. A classic 'regrettable substitution' occurred when dichloromethane was phased out as a brake cleaner due to its environmental effects, but its replacement n-hexane was subsequently found to be neurotoxic.

This highlights the importance of reviewing all material safety data when evaluating substitute chemicals. There is also the risk of shifting the burden of a hazard to a second party. In one process it was proposed to replace the potent neurotoxin acrylamide with the safer N-vinyl formamide, but the synthesis of the latter requires use of the highly toxic hydrogen cyanide, increasing the hazards to the workers.

In summary, although substitution is a very direct method of reducing hazards, it is not always practical. A very careful evaluation must be done before any substitution plan to ensure that the new alternative chemical or process does not pose a greater hazard than that currently in use. It is also important to check to see if the substitution has produced the intended results.

Useful parameters to include may be monitoring the health of the workers, monitoring the level of contaminants in the air, and fulfilling all legal requirements. It does seem a reasonable observation that future forward thinking legislation may place more emphasis on the requirement that an organisation has evaluated the substitution option as part of the process of certifying hazardous chemical storage and handling sites.

Cometh the Moon, Cometh the corn

by Ross Miller

At what point does practicality overcome policy?

The Green Party could be left as Last Man Standing on the issue with National signalling substantial change to New Zealand regulations on GM and Labour edging toward the practicality side of the fence.

The Government has no plans for a review, although Environment Minister David Parker has asked officials to advise where lower regulatory hurdles might be considered around medical uses for gene editing, or lab tests where any risk was mitigated by containment.

Recent calls for the act to be reviewed include from a panel convened by NZ's top scientific body, the Prime Minister's chief science advisor. The latest move is an open letter to the Greens by 150 young scientists to back an overhaul of gene-editing laws, which they argue would help fight climate change.

The scientists pleaded with the party to reconsider its position, arguing that GM-based research could be decisive in efforts to reduce emissions, while also partly easing climate-driven impacts.

If we believe the climate scientists, the whole North Island could be sub-tropical sooner than later and if we don't have suitable product ready, we are in trouble. It will not be enough to simply start growing tropical fruit – our pastoral-based economy is going to need new grasses.

The resistance to gene-editing or GM in general is understandable from the point of view is that the consumer and the medical professionals need to know what effects may arise from manipulation. But … that is what research is for!

The resistance doesn't make sense from an animal husbandry perspective as breeders from time immemorial have been selective breeding, which is gene editing without any physical intervention. You breed by mixing the best examples of weight, growth rate, quality of finished product, the amount of milk.

GE-free advocates oppose any softening of the HSNO Act, arguing it should remain incumbent upon applicants to meet the regulatory requirements. Like the Greens, these groups are also concerned that relaxing our laws could threaten NZ's position in global markets – does that mean we wait and see what China's position is?

It is gene-editing and such-like that is leading toward greatly reduced animal emissions and grasses that are better at nitrogen management. But such advances are conveniently tucked away for the more strident.

Somewhere along the line we need to rid ourselves of the spectre of corn plants rising from their rows and taking over the Earth on a Halloween moon.

Greens' Gareth Hughes said the party is comfortable with keeping GE in the lab, but added it is open to a facts-based public conversation to ensure the environment was protected and consumers were kept safe and informed. Translation: we've got a bob each way on this in case our policy comes crashing down around our ears.

27 million litres of waste water

Firefighters are always conscious of run-off, even from a localised car fire, that can deposit contaminents in the waterways.

Normally this isn't too much of a hassle. But how do you deal with 27 million litres of definitely contaminated water?

For three days, firefighters attacked the fire at the Sky City convention centre construction site from various angles, and the vast basement area became a huge holding pond for about a third of it. Not such a fortunate occurrence for the 100 vehicles parked down there, which incidently could have become a secondary source of pollution once they started floating.

The first and most obvious source of contamination from the blaze was the thick black smoke that oozed over the CBD whch could have all manner of
articles from rubber-based, straw-based materials and glues, paints etc from the various work areas.

There are no reports of anyone suffering severe problems from the three days of smoky downtown, but many who lived there awoke with sore throats and sore heads after the smoke crept into their ventilation systems. Residents of the inner city, particularly, were advised to wipe down surfaces as pathogens could be present in everyday dust.

Firefighters got in a lot of breathing apparatus wearing practice and washdowns after shifts inside the fire perimeter.

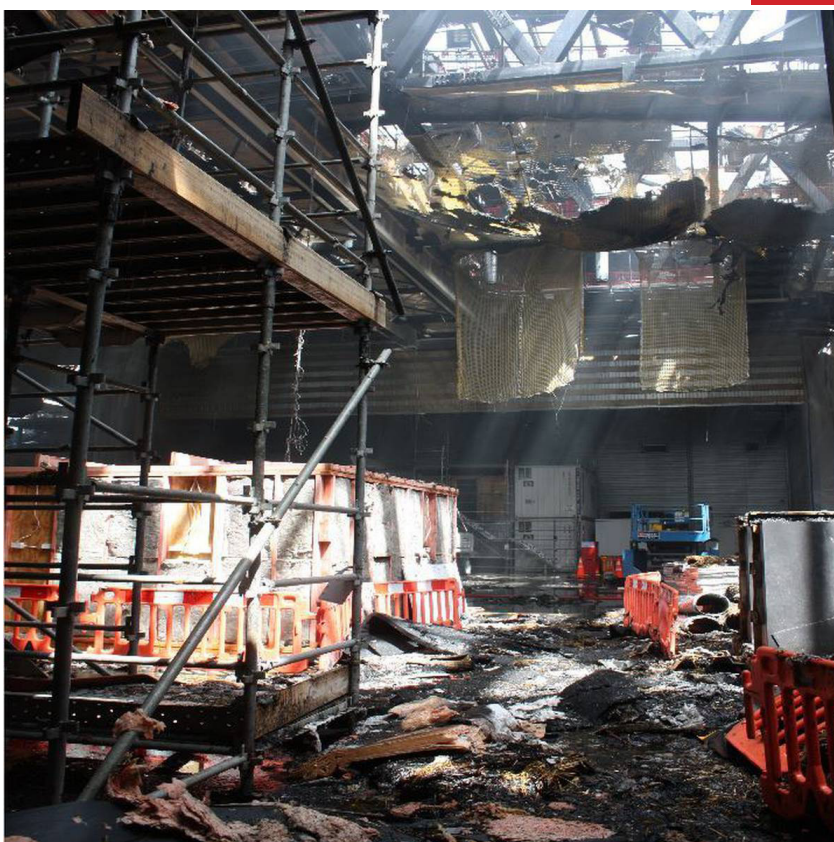
Arsenic and chromium were among the contaminants discovered by testing, but they were in such small concentrations by the time it reached the harbor, there was only danger to shellfish in the immediate area of the outfalls.

Auckland Council Safeswim's Nick Vigar said about 20 million litres of that flowed into the stormwater system and out into the harbour. The contaminants came from burning materials - including bitumen - and later oils and chemicals from mixing with cars in the basement. However, within 10 metres of the outfalls, pollution levels were almost below detection.

Most of the basement water was fed into the sewage system and was processed in the normal grey water fashion.

"Concentration of contaminents in sediments is the key concern," said Mr Vigar. "However, we are extremely fortunate in that the area is already considerably polluted from port activities, tank farms etc, and it is scheduled to be dredged for the Americas Cup development."

The dredging tailings will not be dumped in the marine environment, but neutralised in a new land area.



Below this shambolic interior, the basement car park held 8 million litres of polluted water and about 100 floating vehicles.

The gray world of the firefighter – full of toxins that inexorably build up in the body despite modern protection. Photo: *Jade Fairweather.*

Specific law change wanted for firefighter health

The universal hazard of work-related cancer isn't going away, and firefighters are the latest to make a big push for recognition.

They want a law change to allow ACC to recognise their work-related cancers, so appropriate support and compensation can be made without personal uphill battles. There has been a ground swell of protest and union action around the world lately as various countries' firefighters look to achieve similar outcomes.

The Government's response to date is that it is being looked at. However, there are some positive noises from some parts of Cabinet.

New Zealand is still looking at 50% of work-related deaths a year being caused by various cancers:

250 approx from lung cancer;

90 deaths approx from mesothellom (asbestos in the lungs);

25 deaths approx from breast cancer (stress resulting from shift work).

But work-related deaths don't start and finish with cancer. Worksafe considers 200 deaths approx to be from chronic obstructive pulmonary disease from exposure to vapours, dust, gas, fumes). About 80 deaths from ischaemic heart disease (second-hand smoke and little influence over adverse job conditions).

Of the 5000-6000 work-related cases resulting in hospital admission, about a third are cancer-related (20% non-melanoma skin cancer, 10% lung cancer). Respiratory COPD, ischaemic heart disease, asthma, depression and anxiety disorders make up the non-cancer admissions.

WorkSafe shuffles the numbers

New orientation of statistics show that agriculture is not the most dangerous of occupations, though its track record is nothing to be proud off. It has been a horror start to 2020 with seven on-the-job deaths so far – well above the 2019 rate, which was itself 40% up on 2018.

After a landmark move to combine the fatalities notified to WorkSafe, including ACC records from the police, boating and aviation industries, the combined fatality figure of 413, for the six years from 2013 to 2018, is up 40% on the 291 deaths WorkSafe was notified of, and told to the public previously. In 2018 alone, there were 64 deaths, combined, not the 42 widely reported a year ago. The combined figure is revealing key angles that were obscured before, crucially, that the most dangerous industry is the one categorised as 'transport, postal and warehousing', with 112 deaths since 2012.

This is more than any of the three industries WorkSafe has historically targeted - agriculture (109 deaths 2012-2019), construction (71), or forestry (48). A separate category of support services for those three industries also scores high, with 61 deaths. WorkSafe admits these combined revelations might change what it targets. Once the many off-road accidents are included with on-road ones, then vehicle incidents become by far the most common type of fatal accident across all sectors.

NZIHSM agrees with most 'minor' changes to regs

It is now two years since the implementation of the Hazardous Substance Regulations 2017 to replace the previous HSNO Act requirements for the treatment of hazardous substances within the workplace. Based on experiences, MIBE has now proposed 39 'minor amendments' to hopefully improve the hazsub legislation and invited NZIHSM to comment on these.

In line with this, the NZIHSM has since 2010 suggested five key issues to achieve this balance. NZIHSM is pleased to see that there has been some significant progress in most of the key areas, as follows:

1.Pre-incident 'compliance certification' and advice is critical for success as separate and in addition to post-incident enforcement (included).
2. Toxic and ecotoxic substances must be included in compliance certification in addition to flammable substances (included).
3. **Strict liability and shared responsibility should be maintained** by all involved parties including suppliers, workers, independent compliance inspectors (certifiers), users and enforcement (included although continued and greater collaboration between government, certifiers and industry would be useful).
4. Worker involvement must be supported by independent external expertise and knowledge (such as HS handler training and HS compliance certification system) to be effective (included).

5. People and communities are inextricably linked with the environment and any consideration of human protection should also consider environmental toxins such as regularly used toxins, corrosives and ecotoxics (eg: Class 6, 8, and 9) (part included although enviro-toxins still need some work).
NZIHSM is pleased to see the 2018 EPA survey which noted a 25% decrease in total hospitalisations (due to hazardous substances) from the start of the hazardous substance regulations in 2006 through to 2015, which coincides with the HS certifier regime and hope that this success continues.

39 minor changes
Comment on the proposed MBIE hazsub regulation amendments:
MBIE proposed 39 'minor changes' to the current Hazardous Substance regulations 2017 with specific comments in the attached summary.

Overall NZIHSM agrees in principle with most of the 39 proposed amendments although there are some areas where it believes there could be some improvement to some HSWA HS reg clauses as follows:
13. Clause 11.32 (3), Storage of class 3.1 substances in retail stores
"Clause 11.32(2) This regulation does not apply to a class 3.1B or 3.1C flammable liquid." should also be addressed as it is not consistent to apply this exemption only to more flammable substances.
21. Design standards for above ground stationary tanks to store hazardous liquids : Add references to standard API STD 650 to 17.6 (2) and (3).

Clarify as NZS/API 650 is listed as acceptable under 17.6.2 & 17.6.3 and AS/NZS1170 NZ Building Code 27. 5.3 (3) (b) Requirements for fire hydrants to manage risks of LPG, propane, butane and isobutene tanks. Amend 5.3 (3) (b) so the types of hydrants that will meet the requirements of 5.3 (3) are:
· hydrant systems with hoses enabling a flow of 0.33 L/sec; or · hydrant systems that incorporate hoses with a 19 mm nominal bore.
Agreed but to avoid limiting maximum hose size to "incorporate hoses with at least 19 mm nominal bore"

NZIHSM added an additional item 40 on professional judgement as It is of concern that if a 'prescriptive' rather than 'risk-assessed performance' approach is always required by the authority that:
Under the Hazardous Substance Regulations, Part 11 refers to all Class 3 & 2.1 substances to always be in Type 1 (FRR 60min), Type 2 (FRR 120min) or Type 3 (FRR 240min) buildings for all floors, walls and ceilings.

While NZIHSM agrees with walls and floors, FULL ceiling rating can be dangerous as it does not allow for venting of high temperatures or pressures to a safe place, which is usually necessary for survival of persons trapped inside in case of fire.

In the interests of trapped worker safety, NZIHSM believes that rather than always prescribing a furnace, some risk assessment and allowance for temperature and pressure relief should always be included where possible so that the risk of another Pike River is minimised.

Things that go bang in the night

Some wonder why we worry about hazardous substance controls for flammable substances!

Surely we know how to stop fires starting and it will never happen to us.

It is usually good to be a positive and optimistic, as this allows us to be brave, accept risk and to take chances to achieve positive rewards.

But on occasions those chances just don't go our way and in Australia they have been battered by bush-fires and we in New Zealand have seen White Island and the power of a natural gas explosion in Christchurch last year.

A shattering explosion at 10.14am on a July Friday morning completely destroyed a house at Marble Court, Northwood, Christchurch and caused widespread damage to houses in a large radius.

In morning drizzle on Saturday morning in Northwood, residents surveyed a scene of devastation, reminiscent of the Christchurch earthquakes in 2010/11. They were greeted in Marble Court by what looked like a bomb site. The sucking effect of the blast buckled garage doors, broke windows and pulled cladding down from eaves.

Reports suggested that the explosion may have been the result of a small gas leak from an internal natural gas fire.

It might be just a small leak but the resulting picture of a completely destroyed house and damaged neighbourhood shows the power of just a small gas leak and why some separation distances can be important.

Food, emissions and You

The above headline greeted all readers of the Christchurch newspaper *The Press* recently. Researchers at Otago University have created the first New Zealand-specific food emissions database. The research was driven by both the climate crisis and food-based health issues.

The researchers have determined that if we all ate more plant-based foods and less meat the health system could save billions of dollars and there would be sizeable reductions in climate-changing greenhouse gases. It is asserted that, if every adult in New Zealand adopted a vegan diet (how likely is that!) and minimised food waste, the emissions saved (taking into account everything from production, transport and refrigeration) would equal about 60% of all emissions from cars and vans.

The climate impact of animal products (eg beef, lamb, processed meats and butter) is apparently much higher than plant-based foods such as vegetables and legumes. Try convincing me about that after a good feed of broad beans! According to the study emissions associated with the "typical New Zealand adult's diet" is about 6.6 kg of carbon-dioxide equivalents per day. What about the methane?

The research goes on to expound the view that there needs to be system-level changes to encourage people to change their diet. Measures would include updating dietary guidelines to include messages about climate-friendly diets, pricing strategies and labelling schemes.

For all the good intentions of the researchers, I think there is an expression about doing something into the wind that applies to their endeavours. Give me meat and three veg any time. - ***DRL***

Geothermal:

How low do we go?

Our society relies on energy!

Energy is important to us all, we use it to cook our food, heat our homes, provide our transport, power our machines, run our communications and allow us to fly and talk around the planet.

A good energy source needs to be reliable in that it must be readily available, easily stored and obtainable and be able to be transported to its use site to provide ready energy with minimal side effects whenever it is required.

While according to the 2017 NZ Energy survey, oil still accounts for 33% of our overall energy usage, the search for alternative energy technologies is gaining traction such as wind, hydro, solar and hydrogen. But there is also an often overlooked steamy energy cousin, and in this article we look at geothermal.

If we consider the 2017 NZ Energy survey (below):

This summary shows that many think of hydro and wind as the big alternatives, but hydro actually only accounts for 9.7% of our overall energy and in the 2017 energy survey, its quieter geothermal cousin actually accounted for 21.9% of total energy, or over 55% of electricity production.

There are several major issues the major issues facing geothermal.

About 20% of New Zealand's electricity comes from geothermal now, with as much electricity generated from geothermal as from fossil fuel in 2018.

While it could be said that the natural heat flux of the Earth could potentially be transferred as energy in any environment, volcanic provinces such as Wairakei-Taupo have a greater geothermal gradient, which means you don't have to drill to 10km to reach temperatures above 400C. These very hot temperatures are closer to the surface than in some other countries, giving New Zealand a natural advantage.

Actual Energy Use in New Zealand 2017

Gross petajoules (PJ)				
	2017	% total	2017	2017
Primary Energy Supply			*Renewable*	*Non-Renewable*
Coal	*51.39*	5.5%		51.39
Oil	312.52	33.5%		312.52
Gas	197.61	21.2%		197.61
Hydro	90.66	9.7%	90.66	
Geothermal	204.48	21.9%	204.48	
Other Renewables	73.92	7.9%	73.92	
Electricity			*see above*	
Waste Heat	1.19	0.1%	1.19	
Totals	**931.77**	**100.0%**	**370.25**	**561.52**
Indigenous Production	712.05	76.4%		
Imports	368.47	39.5%		
Exports	108.66	11.7%		
Stock Change	-26.05	-2.8%		
International Transport	66.14	7.1%		
	931.77	**100.0%**		
Total Percentages	**100%**		**40%**	**60%**

Source: MBIE Energy in New Zealand Report 2018

A key aspect is to find permeability – rocks that hot fluids can pass through relatively easily. It is one thing to have heat, but if no fluid can circulate through the rocks we cannot harvest this heat efficiently to the surface. Water is the main carrier for heat.

So far geothermal wells in New Zealand have tended to be 1.5- 3km deep. However, geothermal could improve as according to a recent article from GNS, conventional geothermal alone cannot get New Zealand to the Government target of 100% renewable electricity by 2035, and net-zero greenhouse gas emissions by 2050.

Possible solution

GNS says a possible solution is deeper, supercritical geothermal – super-hot fluids that are found deep within the earth. Supercritical fluids exist at temperatures and pressures above the critical point where distinct liquid and gas phases don't exist.

"They exhibit higher heat content and lower density than liquid water and thus have the potential to generate many times more energy than conventional geothermal sources for the same amount of extracted fluid."

For pure water the supercritical temperature is greater than 374 degrees Celsius, and the fluids being sought are expected to be found at depths greater than 4km.

GNS aims to explore where in New Zealand could the best future targets be and to understand, using laboratory simulation, how these very hot fluids react with the rock, and how their use will affect deep reservoirs, and neighbouring shallower reservoirs, into the future.

It sees a compelling case for tapping into deeper and hotter geothermal

resources to increase the overall contribution of geothermal."

A survey of a geothermal field, by Germany's national research centre for solid earth sciences and published in 2017, noted: "A number of serious issues have been encountered while trying to handle and utilise fluids from geothermal reservoirs at temperature and pressure conditions exceeding the supercritical conditions of water."

Innovative drilling and well completion techniques were needed to deal with the extreme temperatures and aggressive fluid chemistry composition of such systems. Fluids that came from one well in Iceland had been very corrosive and abrasive, the study said.

More than 25 deep wells drilled in geothermal fields had encountered temperatures above 374C. Those wells were in the USA, Japan, Italy, Iceland, Mexico and Kenya.

New Zealand has the drilling capability but it will be costly and there are uncertainties. Industry is looking to science to provide information that will reduce uncertainties and risks of exploration and development of deep geothermal resources.

While about 21% of New Zealand's electricity comes from geothermal now, with as much electricity generated from geothermal as from fossil fuel in 2018, there is still some work to go if we are to get New Zealand to the Government target of 100% renewable electricity by 2035, and net-zero greenhouse gas emissions by 2050, but at least they are trying!

Uncle Archie

Kia ora HS practitioners!
2020 and the use of oil, chemicals, coal and plastic bags appear under the Planet's scrutiny more than ever!

The toxics are here!

The serious 'human' toxics and corrosives (Class 6.1, 8.1A) are also under scrutiny and have required certification from December 2019. Early industry reports, however, have indicated that the adoption of toxic controls may be a slower process than initially expected. However, reports from the certifiers is that even though some feel 'picked on' are that they are all 'flat-out'! But then again it took 10 years to get the (Class 1-5) Flammable controls up to speed.

Firefly?

It has been too hot in Australia over summer, the fire season started early and burned an area larger than many small countries. Not good for the koalas, kangaroos and community, causing much nervousness that this may herald a long-term change in natural processes. Any spark can cause a calamity and advice is to mow lawns in early morning while some dampness still remains as even lawn-mowing can cause fires in Aussie!

Plastic recycling?

As indicated in this magazine, we should all recognise the risks of using 'non-recyclable' plastic bags! It has been estimated, however, that the replacement bags need to be reused 36 times to have less effect than thinner plastic bags. There have also been calls to ensure that items be made from the easier recyclable plastics types 1, 3 and 5. Rather than inferior replacements for plastics, or chopping trees, recycled options should be the most sustainable solutions.

Battle of the Bugs?

Nature has done it again and a new virus affecting humans has been sourced from an open animal market in Wuhan, China. Like all new bugs introduced to humans there is limited immunity and this combined with an over two-week incubation period has meant that whole cities have needed to be quarantined to try and limit the Coronvirus spread while chemical treatments or a cure can be found.

The good virus

As with all natural processes clever humans sometimes use viruses to help. In one case a Surrey University study is showing promise using a cold virus cva21 to beat bladder cancer. Projects like this and antibiotic studies are our great scientific hope to let nature control other bugs that all are part of nature.

A sinking feeling!

Jakarta, our Indonesian neighbour of 30 million people, is sinking. Parts of the ground have subsided by four metres over recent years, meaning that only concrete barricades are preventing whole communities from being engulfed by the sea Part of this is caused by the city inhabitants obtaining 'fresh water' by pumping out the groundwater which has lowered the city's foundations, but also climate change is likely to compound this problem as sea levels are predicted to soon rise further. It is a real worry when one of the largest human settlements of the 20tth century needs to relocate in-land and some of our Pacific islands may indeed run out of land!

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!

NZ Institute of Hazardous Substances Management (Inc)

MEMBERSHIP APPLICATION FORM

1. Name: _____

2. **Employment**

Employer's Name: _____

Position and Contact Details:

Position Held: _____

Full or Part Time: _____

Other Duties: _____

Or: ☐ *Self-employed*

Business Name: _____

3. Preferred mailing address: _____

_____

_____

Telephone (Bus.) (0) _____

Contacts (Res.) (0) _____

(Mob.) (02) _____

(Facsimile) (0) _____

E-Mail: _____

Website: _____

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:** Linda Amtrano
c/o NZIHSM Secretary
PO Box 5069
Wellington
Phone: 04 802 4079
Fax: 04 384 4710
Email: office@nzihsm.org.nz

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