FLASHPOINT

NZ INSTITUTE OF HAZARDOUS SUBSTANCES MANAGEMENT

Summer 2018

What Lies ahead?

USEFUL ORGANISATIONAL CONTACTS

NZ Institute of Hazardous Substances Management
(formerly the Dangerous Goods Inspectors Institute)
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 whose goal is to protect people, communities, and the environment against the adverse effect of hazardous substances, while maintaining the benefit of these.

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 povide compliance advice 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
The Ministry provides policy, publications, technical reports and consultation documents on HSNO legislation.

Department of Building and Housing
www.dbh.govt.nz
The Government agency that maintains the Building Act and the Building Code.

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 hazardous substances legislation. Often a first response point with valuable local knowledge.

Government legislation
www.legislation.govt.nz

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

President's column

What is happening to the environment??

I consider myself lucky to be have been born in New Zealand, a land of greenery and spectacular landscape! I was also very lucky to be educated in the New Zealand education system where we were trained in the scientific method! Observe the Problem, suggest Solutions, Test our assumptions, SOLVE the problem! (and repeat the process as often as necessary to solve any problems).

In fact, some of my more notable New Zealand teachers actually stated that we had a DUTY to question and ensure that our capitalist democratic society was for the benefit of ALL!

Yes it is hard to question, or indeed, sometimes hard to listen to questions, and for some it would perhaps be easier to live in a more totalitarian society where only a chosen few can decide what is the benefit of all and we should NOT question their 'superior intellect'. "Yeah right!"

However, I do note the Churchillian comment: "Democracy is the worst form of government, except for all the others."

And possibly we should be at least slightly grateful for those media, politicians, scientists, certifiers, engineering industrialists and others who are brave enough to question and push ahead to try and develop solutions that allow our relatively young human race a fighting chance to live in harmony with our aged but beautiful blue planet.

This summer was hot! Recent reports are saying our Blue Planet is warming up and we are learning that our neighbour Mars may have at one time run blue like ourselves!

At the same time we are learning that nature is rebelling,

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John Hickey
Institute

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Flashpoint

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History never repeats : yeah right!

by Dave Lascelles

As engineers and safety specialists, we constantly strive to drive a balance between the helpful properties of the chemicals we promote to the market place, and the harmful (eg flammable, corrosive, explosive or toxic) effects of these chemicals.

Sadly, despite our best efforts the literature and popular press abounds with reports of accidents, near-misses, or low-level failures in the chemical process industry. Despite all the wisdom that emanates in all the 'lessons-learned', follow-up enquiries and reports, we continually repeat our errors as past lessons are forgotten.

Difficulties may include that within any one incident there can be a failure to differentiate between contributory causes and root cause; and that without comparisons between incidents, patterns of recurrent causes can be missed.

The late Trevor Kletz (formerly Safety Advisor ICI UK), widely regarded as the father of modern process industry safety, discusses these difficulties in his book *What Went Wrong – Case Histories of Process Plant Disasters,* and encapsulates the lessons gathered from many such disasters in such a way that the lessons can be applied throughout all process industries.

Although all incidents have apparently unique sets of circumstances and causes, comparisons between incidents reveal common themes including insufficient hazards analysis, poor design and choice of equipment, and inadequate process measurement and control.

Inevitable question

The inevitable question when an incident occurs is why? This question, asked often enough in a systematic way may identify the root cause of an event. Used too often, however, and the outcome may be a lose set of generalisations that do not deliver any specifically useful results.

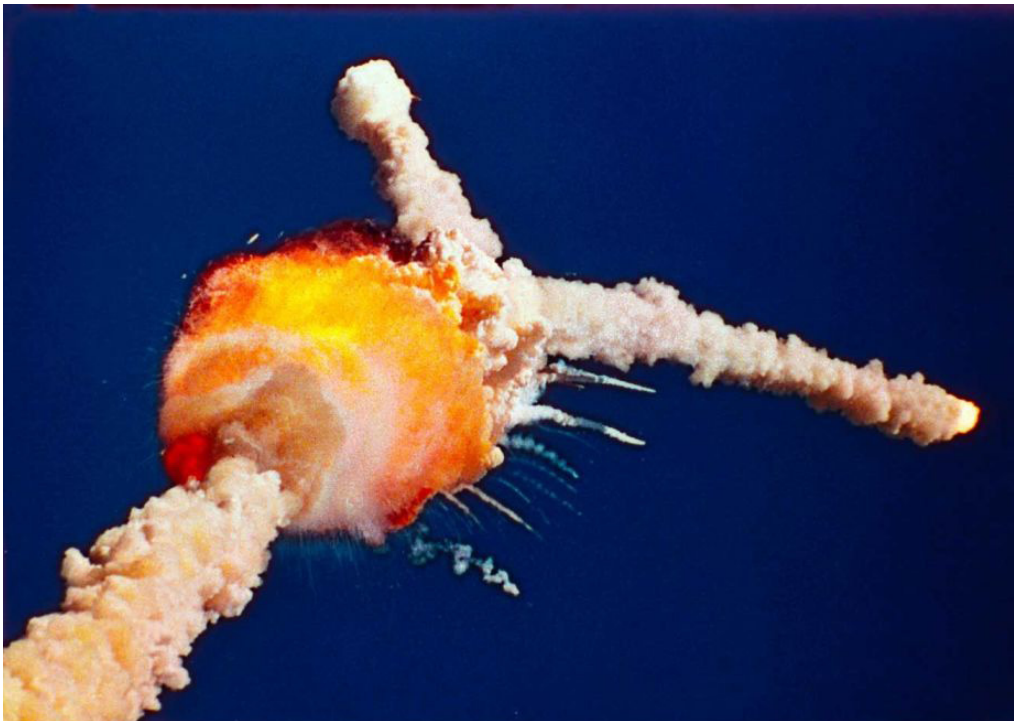
The difficulty for senior management (particularly in a climate of strict liability legislation) is that the underlying root cause for many incidents is invariably failure of a management system that allows faulty design, inadequate training, or deficiencies in maintenance to exist. These, in turn, lead to unsafe acts or conditions that can result in an accident.

An appeal to a contributing cause as the reason for an incident is invariably flawed, as such a factor only facilitates the occurrence of the event or increases its severity.

Management's counter-argument will be to debate which factors are root causes, which are contributing causes, and which are neither, as many accidents generally involve more than one cause. There may also be non-causal factors (i.e. systematic deficiencies that may be identified during the course of an accident investigation that are not directly related to the cause of the accident).

An accident investigation may uncover several plausible scenarios that might have led to the accident; of which only one of the scenarios actually transpired, but the others might have occurred, if circumstances had been

Challenger's O rings were suspect.



different. Each of these scenarios may identify different deficiencies which need to be addressed.

Near misses first

Ultimately, however, it is important to understand which critical factors ultimately led to the accident and which did not.

A closing note on warnings that go unheeded. History shows repeatedly that major disasters are often preceded by a series of smaller accidents or near-misses.

- In the Challenger space-shuttle accident, engineers were aware of previous malfunctions in solid rocket booster O-ring joints on several previous shuttle launches.
- At Bhopal, India, small MIC leaks had been noted on numerous previous occasions prior to the disastrous methyl isocyanate (MIC) release in 1984. Workers stated that experiencing MIC eye irritation was not an unusual phenomenon, but these warnings went unheeded.

Time and again process upsets are either ignored, or are investigated, but the remedial actions are not put in place.

As engineers and safety specialists we can only analyse the facts with perfect 20/20 hindsight; and leave the litigation to the lawyers!

Dave Lascelles, BSc, BE Chem), MIChemE, C.Eng (UK); former Corporate Engineering Manager, ICI (NZ) Ltd, is the editor of ***Flashpoint.***

Beer flood a killer

The streets of London have never been paved with gold, but they were covered in beer one day. Over one million litres of free beer in a five metre-high tidal wave, burst down Tottenham Court Road on 17 October 1814.

The great beer flood originated from a broken vat at the Horse Shoe Brewery and flooded the local area with porter, a dark beer native to the capital, killing eight people and demolishing a pair of homes. George Crick, the clerk on duty, told a newspaper what happened: "I was on a platform about 30 feet from the vat when it burst. I heard the crash as it went off, and ran immediately to the storehouse, where the vat was situated. It caused dreadful devastation on the premises – it knocked four butts over, and staved several, as the pressure was so excessive. Between 8000 and 9000 barrels of porter were lost."

The beer inundated the nearby slum of St Giles Rookery – an area of poverty and vice which inspired Hogarth's Gin Lane – flooding the cellars where whole families lived. Some of the inhabitants survived by clambering onto pieces of furniture. Others were not so lucky. Hannah Banfield, a little girl, was taking tea with her mother, Mary, at their house in New Street when the deluge hit. Both were swept away in the current, and perished.

It is not recorded how the fire service handled pumping out the cellars, but it seems later rumours that people collected the beer in pots and pans were untrue. None of the London newspapers report anyone trying to drink the beer after the flood, indeed, they say the crowds that gathered were mainly well behaved.

The Horse Shoe Brewery soon went back into production, only closing in 1921, when it was replaced by the Dominion Theatre. The terrible scene that unfolded there two hundred years ago has been largely forgotten, although a local pub - The Holborn Whippet – brews a special anniversary ale each year.

Engraving of a typical brewery of the time. duncan1890/iStockphotos.

First, read the label!

by Jacqueline Rowarth, Chief Scientist EPA
A recent survey commissioned by the EPA indicates that its efforts to protect people are having a positive effect. The data included a 25% decrease in the total number hospitalised over 10 years (433 in 2015, compared with 578 in 2006, despite an 11% increase in New Zealand's population). This means, however, that three people among every 10,000 hospital admissions are suffering from exposure to a hazardous substance.

Hospital admission of children under five years old related to hazardous substances has decreased by 34% over 10 years: 21 per 100,000 in 2015, compared with 32 in 2006. For young people (5 to 24 years old) related to hazardous substances, admissions have decreased by 49% over 10 years: 18 per 100,000 in 2015, compared with 35 in 2006. Men still suffer the most harm from hazardous substances (since 2006, the ratio of male to female hospital admissions has remained steady at 7:3), and approximately 40% attributed to hazardous substances result from incidents in the home.

Although a 2017 consumer awareness survey of 500 respondents found 74% of respondents read the labelling on products to identify if they are hazardous, only approximately two thirds of respondents in the 2017 EPA survey said they keep themselves and others safe by following the label instructions, using protective equipment, and/or keeping hazardous substances out of reach. This means education must continue.

The EPA has launched a significant 'safer homes' initiative, with website information (e.g. http://www.epa.govt.nz/hazardous-substances/at-home/Pages/Staying-safe-with-hazardous-substances.aspx) and attendance at Home and Garden shows.

The future

These changes are being made to make it easier to keep New Zealanders, and New Zealand, safe. Nobody wants a repeat of the Pike River disaster which precipitated the reforms. Everybody would like the hospital figures to decrease further. The regulations are designed to reduce the risk around using the chemicals that we know have beneficial uses – in cleaning, reducing crop competition from weeds and pests, and in keeping the country moving. The EPA's role is in keeping the balance between environment and economy, with human safety at the forefront. Our role is also in education. There would be fewer hospital admissions if people read the labels….

More information on the EPA website: www.epa.govt.nz.hazardous-substances/hsno-reform/Pages/Default.aspx

Jacqueline Rowarth

Changes ahead

by Jacqueline Rowarth
On December 1st last year, the regulations around managing risks to workers when using hazardous substances were transferred to the Health and Safety at Work Act under the aegis of Worksafe New Zealand. These changes were stimulated by the Pike River Mine tragedy and are part of the Government's efforts to improve workplace health and safety.

The Independent Taskforce on Workplace Health and Safety made the recommendation to combine the workplace health and safety aspects of the hazardous substances rules in to the Health and Safety at Work Act. The intent was to reduce the complexity of the rules and uncertainty for those businesses that use hazardous substances in their workplace by putting the management under one organisation, Worksafe.

The overall goal of the recommendation was to make it easier for businesses to comply,

with the aim of reducing workplace injuries and illnesses.

What isn't changing is the role of the EPA in assessing the risks associated with the new applications for hazardous substances, and then deciding whether or not they should be approved for use in New Zealand. The EPA will also continue to be responsible for setting the rules for classification, labelling, safety data sheets and packaging… as well as for protecting the environment and for public health.

EPA Notices

Notices are a result of the reforms and most of the hazardous substances rules that sit under the HSNO Act, will be set in EPA notices in the future, rather than by regulation. This means that the EPA Board will be making approvals rather than Cabinet, and also means that the EPA can be more agile in its response to changes in technology or international best practice.

Note that the change from Cabinet-approved regulations to Board-approved notices does not change the requirement to consult with the people and industry affected by the proposed change, and to take their feedback into account in the process. International best practice, and any costs and benefits associated with a proposed change will also be included.

Enforcing the rules

From 1 December 2017, the EPA has an enforcement role which ensures that the rules are obeyed. When the rules are followed, labels and SDS have the right safety information on them, which means that people at work and in the home – as long as they read the information – know what they are dealing with and how to keep themselves safe. Worksafe will continue to enforce requirements around the use of hazardous substances in the workplace, and can also enforce workplace environmental and disposal controls.

Class 9 controls retained

'The controls on class 9 (ecotoxic) substances will be retained in Part 4 of the EPA Hazardous Substances (Hazardous Property Controls) Notice 2017 (HPC Notice), which comes into force on 1 December 2017, according to EPA's Principal Scientist Dr Peter Dawson.

In particular, the controls on stationary containers (tanks) are contained in clause 39, which incorporates the requirements in Part 17 of the HSW Hazardous Substances Regulations 2017. This applies to the requirements for the design, construction, installation, and operation of tanks, filling requirements, requirements for pipework and fittings, tank markings, record keeping, repairs and maintenance, and secondary containment requirements for tanks.

In addition, clause 40 of the HPC Notice applies separation distance requirements for stationary tanks of class 9 substances, clause 41 applies secondary containment requirements, clause 42 emergency response plans, and clause 43 signage requirements.

Compliance certification is not required, however ,for Class 9 certified, he emphasised. The reason for this is that it is expected compliance certification of any tanks will already be addressed under the HSW HS regulations for such tanks, and certification under the HSNO HPC Notice would be regulatory duplication. Also, there are controls identified above, such as secondary containment and emergency response plans, which would mitigate the effects of any environmental damage resulting from the failure of a tank.'
http://www.epa.govt.nz/Publications/Hazardous%20Substances%20(Hazardous%20Property%20Controls)%20Notice%202017.pdf
Pehaps certifers should continue to check these ? **(Ed)**

Chemicals: Good, bad, helpful, hazardous, terrific?

Late last millennium chemicals were considered good. They allowed us all to live longer – they had beaten the bugs, and our mastery of science allowed us all to live in big cities with all our wants catered for and even food falling off shelves. How wonderful!

Since the millennium, the force of the internet is with us, and chemicals are now all hazardous substances, natural is good and man-made is bad? Some even say that this is science!

In 2018 the new 'hazardous substance regulations' are bringing in some of the acute toxics and corrosives along with flammables into the checking procedures!

After all, ALL chemicals must be bad, otherwise why would so many advertisers proudly proclaim their products to be 'chemical-free' and why would phrases such as "it's full of chemicals" be so commonly used to imply something is unnatural and therefore inherently dangerous?

Meaningless

On one level these phrases are meaningless – as chemicals are everywhere, in everything. From the air that we breathe to the vitamin pills, it's all chemicals.

Then again, some could argue that we should all know that 'chemical-free' means and those who rail against the absurdity of the phrase are just being silly. Even the Oxford Dictionary defines a chemical as "a distinct compound or substance, especially one which has been artificially prepared or purified.

So chemical-free' products are adhering to a recognised usage. However, when all is considered, the real point is that every time anti-chemical slogans are used, people are being misinformed.

The implication is always that the terms "chemical" and "poison" are interchangeable. This is a perception that infects our subconscious and is actually quite wrong.

As a result of this common usage of 'chemicals', the whole subject has been tainted with unpleasant connotations. And while physics and biology have their celebrity scientists extolling the wonders of bosons, bugs and big bangs, chemists, certifiers and engineers are left floundering in their wake, or left completely unrepresented in the mainstream media. And when we talk chemicals we call them 'hazardous substances'.

This is all despite the modern world having been built on the innovations of chemists. For example, Fritz Haber invented a means to turn the nitrogen in the air into useful agricultural fertiliser (40% of the nitrogen in us comes from Haber's reaction) and this chemical innovation has fed the majority of the world's population.

Meanwhile, the chemists who artificially prepared or purified antibiotics are responsible for a treatment that saves more lives than any other medical intervention.

Common misconception

A common misconception is that all man-made chemicals are harmful, and all natural chemicals are good for us.

However, many natural chemicals are just as harmful to human health, if not more so. In fact, almost everything is poisonous or toxic in too large a quantity, it is the dose that counts. In some ways it could be said that almost all substances are in fact chemicals, not just the poison ones. Some are just a bit more reactive than others!

We would like to clarify the disconnect between the lifestyle view (and popular definition) of chemicals and the realities of how chemistry is used to sustain the modern world.

A key misconception is that natural chemicals are somehow safer than man-made ones. Let us be clear that whether a chemical is naturally occurring or man-made tells us precisely nothing about its toxicity. Not only that, but where harmful chemicals do occur (be that in potatoes, apples or lethal injections) the dose is the really important thing to consider.

When considering chemicals and toxicity we should remember that:

- RISK = TOXICITY * EXPOSURE
- So to the best way of protecting against poison or toxics is to remove the exposure where possible.

But for most of us, hazardous substances or chemicals cure diseases, build our houses, fuel our transport, light our fires and even feed us!

So spread the word: CHEMICALS ARE ACTUALY GOOD FOR YOU!

Formal investigation into firefighting foam

A formal investigation is underway on fire-fighting foams manufactured using PFOS or PFOA are held or being used at airports and other locations.

Given there is significant public interest in this issue, and information is already in the public domain, the EPA considers it appropriate to let people know we are investigating.

All hazardous substances, including fire-fighting foams, that are imported, manufactured or used in New Zealand require approval by the EPA under the Hazardous Substances and New Organisms Act 1996. Foams manufactured using PFOS or PFOA have not been legal for use in New Zealand since 2006.

The EPA's initial priority has been to identify the types of foams held, whether they have been used or not, and how and where they are stored. If any do not have an appropriate approval the EPA will check that they are safely stored.Provided these foams are appropriately stored, they pose no immediate risk to people or the environment.

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temperatures are rising, storms and tornados have more passion, with the annual tornado carnage through the USA's mid-west, Beijing smogged out, Australia and New Zealand temperatures and floods are more intense, and Pacific islands of Papua and Tuvalu are becoming swamped by the salt of high tides and trees are growing no more.

Much of the above natural phenomena is being blamed on global warming! This is where our consumption of carbon fuels has lead to an increased carbon layer in our atmosphere, which acts like a glasshouse allowing shorter light and UV waves through, but trapping the longer heatwaves given off when shortwaves are absorbed by the earth.

Can we solve it? Yes we can! We hope!

But it might help if the environmental recognition (Class 9) characteristics are still considered as we strive to understand, influence and adapt to our planet's process.

Confined spaces warning

An incident on a farm in Australia is a reminder of the dangers of entering storage vessels within which there may be an irrespirable environment.

A farmer was inside a storage tank on a farm property when he was overcome with gas. His two sons entered the tank to rescue him, and were also overcome. The wife of one of the sons was first to come across the scene, saying it was a shocking experience. "It was just total chaos, there was just a horrible scene to see," she said.

The three men ended up in induced comas at the local hospital. Seven others, including two police officers and two paramedics, were also affected by the fumes.

An inquiry found that the gas came from fermented cattle feed product. The incident highlights the need to use a confined space entry clearance system whenever entering a vessel which may be oxygen deficient.

Uncle Archie

Kia ora HS practitioners!

HSAW (Hazardous Substances) regulations
The Health & Safety at Work Hazardous Substance Regulations are now being implemented with some consistency with previous regulations but 'training for all' and some changes to Class 9 environmental appear to have led to early confusion.

Why ignore the environment?
In 1996 the New Zealand Government, in what is possible a world first, introduced the concept of environmental toxin (Class 9) into our care for hazardous substances, but in December 2017 this was removed! The latest HSAW HS regulationss include for Flammables (Class 1-5) and Toxics (6,8) but why are the Class 9's (Environmental toxins) only in for information only?

People's responsibility!
As a result of immigration concerns there are now children born in Australia who are stateless (ie: do not belong to any country on the planet). We can understand why these poor people may feel that the planet is the least of their concerns, but perhaps the rest of us should at least think about it?

Robots and artificial intelligence!
A report by McKinsey estimates that as many as 800 million people may be displaced by automation by 2030. Driverless vehicles and AI customer-interfaces could require as much as a third of country's workforces to need new occupations. Many of our current $/hr working practices may need to be reviewed if we are going to look after all our people.

Water treatment?
The latest government report into the 2017 Havelock North water crisis, where much of the town was poisoned by contaminated bore water, has been issued. The report found that 80% of Kiwis live in areas where the water standards are met, but the inquiry did find a large number of drinking water supplies in the country were not being treated and the inquiry has made 51 recommendations on how to keep drinking water safe for New Zealanders.

A one-line summary appears to be that if the natural or bore water cannot be guaranteed as safe, then the water should be treated to be safe for humans.

A fool tank?
It was of interest to see the attached tank level labels on a New Zealand site tank. Does this mean that gravity works upwards?

This is the Southern Hemisphere, Archie!
Siah !!!!!!!! **(Ed)**

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!

Is our weather weird or just wacky?

We are hearing much about how like no dominant species before us, we humans are actually affecting the planet and the weather and the carbon-based fuels that we are burning are actually creating weather extremes through a process called Global warming.

A MFtE and StatsNZ report titled "Our atmosphere and climate October 2017" (www.mfe.govt.nz) provides some enlightenment on this. But is this theory truly happening or just another beatup?

In the beginning of January 2018 after a period of calm, dry weather for much of New Zealand, where centuries old records for 'no-rain' were toppled, a furious storm from the north seemed to come out of the blue.

What may at first seem like atmospheric whiplash was actually a case of cause and effect – and may be a taste of things to come.

The sub-tropical low roaming down the country, which formed earlier in the week near Queensland in Australia, was the most significant storm to hit New Zealand in many months. Within 24 hours of hitting land on Thursday 4 January 2018, it had rained more in Auckland than it had through November and December combined; Rotorua had surpassed its usual total January rainfall; and coastal and riverside areas were about to be inundated by an unfortunately timed king tide.

Part of the storm's intensity, however, can be traced back much further, to the settled days of late November when much of the country was cloaked in sunshine and worrying about drought.

A weather pattern consistent with La Niña caused warm temperatures and widespread dryness, particularly in the south. It didn't rain at all in Christchurch for more than 40 days, an effect which spread like a halo to much of Canterbury where rainfall totals for the month were in single digits. In Milford Sound, the wettest part of the country, it didn't rain for 23 straight days.

Those warm, dry, and settled conditions contributed to an unusual phenomena: a marine heat wave, in which sea temperatures around New Zealand were about 2 degrees Celsius warmer than average. Off the west coast, in the Tasman Sea, temperatures were as much as 6C above normal – at the time, it was the largest sea temperature anomaly in the world.

That effect is a major reason why climate scientists say rising temperatures will increase the intensity of extreme weather events: warmer oceans can empower storms, potentially increasing rainfall amounts and wind speeds. This is all just basic physics!

The unusual warmth of the sea around New Zealand has ebbed and flowed since November last year. The water is not only warmer on the ocean's surface, but much deeper down, to depths of about 100 metres.

The storm reached its peak on Friday 5 January 2018, roughly aligned with a king tide which would have happened with or without the storm

Record 30º temperatures brought thousands of Southlanders to the beach.
Photo: *Stuff*

The consequential effect is called a storm surge – a tsunami in miniature: the storm increases the height of the water beyond what would typically be expected in normal conditions, which is already high in a king tide.

Storm surges are typically the most damaging component of a major storm, particularly in a coastal country like New Zealand. In Thames, for example, the 5 January rainfall was far from the heaviest in New Zealand, but storm surges caused significant flooding and damage to infrastructure.

With rising sea-levels, as expected under a warming climate, storm surges will get higher and reach further inland – issues already evident in pockets around the country, where homes and infrastructure have been damaged.

Some have blamed an increase in carbon in our atmosphere for this apparent global warming, so how is NZ getting on with our share of this issue?

With increased NZ commitments for the environment arising from the 2°C Paris climate change target it is interesting that the environment CO_2 is now reported at 403.3ppm up from 400ppm the year before. This is a 50% rise on the average over the past decade in WMO reports.

Environmental controls for Paris agreement?

To reach the 2° Paris Climate change target the EWMPO says that society must store 4bn t/yr of CO_2 to meet climate goals. Existing Carbon Capture & Storage facilities (CCS) are capturing 38m t/yr (8m cars equiv) of CO_2 (ie: <1% of total). While 200m t of CO_2 has been injected underground to date it is estimated that the world will need 2500 large scale CCS facilities by 2040 up from the 21 CCS facilities onstream in 2018 (<1%).

What could this mean?

We have a way to go and may need trees and carbon reductions to accompany these! These changes may not only effect the infrastructure but also cause issues with insurance. As it was reported after the Christchurch earthquake some insurers were nervous about significant payouts and wishin to limit their exposure. In recent July 2017 storms, high winds caused various house parts and windows to be blown out that had been stable over the past twenty years.

It is also possible with rising sea-levels and high storm events not being covered that our favoured trend of building houses close to the sea may become too risky.

While it may be nice that our temperatures may become warmer for longer, our current building standards may need to be adjusted for higher winds and rain loadings more commensurate with a tropical climate.

This would indicate that we must be careful that where our environment interactions do effect the climate that we try and understand the process and control the interactions so that our preferred methods of living do not become unsustainable.

Old habits costing big money

Some old habits and procedures are still catching out companies and employees, despite the efforts of the industry and regulators to change atittudes.

One recent facility to fall victim to past procedures is Tasman Tanning which was fined $380,000 and ordered to pay reparations of $18,000 to the victim.

Although being fined five years ago for a similar offence, Tasman found itself before the Court after a forklift driver was exposed to hydrogen sulphide gas, a well-known hazard in the industry. The employee was shifting containers when overcome by the gas, losing consciousness twice, suffering a concussion, facial gashes and a nose injury.

WorkSafe found multiple breaches – failings included lack of training and warnings, not providing personal gas moitors, ineffective communication between workers at shift changes and not having policies in place to adhere to safe operating procedures.

Tasman Tanning was charged under sections 36,48(1) and (2)(c) of the Health and Safety at Work Act, 2015.

$137,000 fine

Failing to learn from past mistakes has cost Budget Plastics Ltd $137, 000.
This has prompted WorkSafe to warn companies they must immediately take action to manage their known risks - identifying and listing them is not enough.

The Budget Plastics case was the first sentencing under the Health and Safety at Work Act 2015 for health and safety breaches after a worker's hand was dragged into a machine while he was pouring recycled plastic into it on 6 April 2016.

WorkSafe's Brett Murray, said: "If you can't fix it, then take it out of service until it is safe to use. The company identified issues with the guarding on this machine six weeks before the incident, and yet at the time of the incident, nothing had been done to guard, or isolate the machine." Failure to take action to this known risk left their employee with a life-long injury. "Sadly, it could have been avoided by acting quickly and guarding the machine properly," he said.

The WorkSafe investigation found that the company had inadequate systems for identifying and managing risks; that their safe operating procedures were outdated; their policies and processes for training staff were lacking; and key safety features such as emergency stop buttons within reach of the operators were absent.

The victim was left with only his thumb and half a forefinger as a result of the incident. The judge reduced the final fine to $100,000 and reparations based on the company's ability to pay .

Off-grid eco hut comes alive!

In this world of city infrastructure, most of us are dependence on our power, water, waste and heat and the ability of our communities to deliver all of the utilities that we require.

In this conclusion to our series on constructing an 'OFF grid"eco-hut, we have looked at the provision from scratch of a dwelling's utilities, where no public utilities are available in a steep hill site some miles from the nearest town.

Over the past 200 years our societies have progressed at a wonderful pace – we have provided roads, transport, power, waste, water and heat to our people and provided great cities for us all to live in !!!

But what would happen if this changed and utilities failed to deliver, water was no more, the electrics failed and transport was disrupted?

Hopefully this is rare, but as has happened in Capetown, recently, when the rain fails to fall in our water reservoirs or hydro-dams fail to fill, or as with our Pacific cousins recently, the stormy seas or winds rise too quickly causing some of the infrastructure for our necessities to fail.

As there is some evidence that the world's weather is changing with longer hot dry spells, followed by intense storms, this may force us to adapt and require individual dwellings to have some self-sufficiency.

The basic hut arrives…

So in the case where utilities are not available, what options can we have at our dwellings to provide the necessities from our direct surroundings?

That is how do we do it?

1. Site: To build we would need some space and preferably some flat area, even in a hilly country. A good digger driver was useful here to flatten a hilly site as in our previous article.

2. Shelter: Second you need a dwelling, and we have covered a 'relocated and recycled' wooden hut in previous articles. We did add roof insulation and a clear roof veranda along with a new corrugated iron roof to allow for the clean collection of pure rainwater.

3. Water: All life requires water, most human systems need about 100 litres per day, but when you are far away from a 'town supply', how do you find your own?

In article 2 we discussed the installation of a gravity fed 750l header tank along with a 30,000 litre 'roof water' tank system with 12V water pump.

4. Waste: How do handle your waste, sewerage and outputs? Can we recycle and reuse our own waste streams?'

We have discussed the installation of an underground septic tank system for liquid waste, which collects sewerage waste for 'bug' treatment, following which the nutrient rich waste then spread through three pipes to a planted area beyond.

5. Food: Ok we are still relying on our modern 'supermarket' to date although have planted significant

quantities of edibles although have an ongoing battle with the wild goats as to who actually 'owns' these!

The above have worked well to date but for a modern facility we still need to handle our heating, cooking and power requirements. So in this final article we discuss how we did this this when we are miles from the public electrical or natural gas reticulation systems?

6. Heat: Typically we need to maintain our body heat around 37°C even when our surroundings may be down to zero. But how can we do this when the world is cold around?

Many would argue that one of humankind's greatest inventions was the ability to harness fire, as not only did the heat from fire allow us to warm our surroundings but also to cook our foods. Possibly the simplest way to harness fire is in a fireplace, and with plenty of forest surrounding our hut, there was a ready supply of dead wood and of live trees to soak up any CO_2 from the combustion processes.

Solar panels power much of the hut.

An additional bonus of a modern stand-alone 'wood-burner' is that once a significant fire-place temperature is reached, then most solid waste and packaging items will burn and form a useful fuel source while reducing the need to take solid wastes from the site.

Hot water was an issue but it was decided to use an LPG power water heater/califont to heat up the cold tank water to allow for hot showers and dish washing water where required.

Combining this with ceiling insulation allowed for a relatively warm premises over those cold winter nights as long as the fire was able to be maintained. But then, maintaining a fire overnight can be a problem, so insulation, hot water heat and saving methods were also utilised.

7. Power: We are an electric lot, and we use this for light, heat, hot water and over the past 100 years refrigeration to mention a few. But what if we are miles off grid, how do we cope?

For most of us in city areas we have an electrical grid harnessing energy from hydro, geothermic, fuel, gas or coal fired electrical power stations with the energy being converted into electric power which can be transported around our cities at up to 33kV to allow for power losses around the national grid network.

Of course, 33,000V would be rather explosive into most domestic appliances, so power transformers convert the 33kV or 11kV grid power down to a less dramatic 400V three phase or 240V single phase power supply. But how much power do you need in an average house and how can you create this power in cases where the national grid may not be present?

Often when one is working out domestic power calculations, it is inefficient to use electrical power for heating or direct power cooking unless there is a ready supply of electrical power or fuel present.

It is also useful to have an indication of the power requirements under a 12V system which is a common unit for a solar panel system unless a power inverter is present.

So in this case, an estimate of solar power calculations for the typical items that would be

Solar Power Calculations

Item	*Volts* *	*Amps* =	*Watts* *	*Hrs/day* =	*Watts/day*		
Examples							
Fridge compressor	*12*	*4.0*	*48*	*8*	*384*		
Pump 100 lt/day @ (10 lt/min)	*12*	*5.0*	*60*	*0.25*	*15*		
Lights 1 off 12W	*12*	*1.0*	*12*	*2*	*24*		
LED Lights 1 off 2W	*12*	*0.2*	*2.4*	*2*	*4.8*		
Radio	*12*	*2.0*	*24*	*6*	*144*		
Television	*12*	*4.0*	*48*	*2*	*96*		
Total Watts Used/day					*667.8*		
SOLAR Panels	*Watts/panel*	*# of panels*	*Tot Watts*	*Solar hours*	*Watts/day*		
	80	*2*	*160*	*3*	*480*		
Difference between Watts Used and Solar Watts/day					*187.8*		
	Volts *	*Amps* =	*Watts/Battery*	*No Batteries*	*Total Watts*	*Max discharge*	*Watts Available*
Battery (s)	*12*	*100*	*1200*	*2*	*2400*	*50%*	*1200*
No of days using Solar & Battery					*6.4*		

included in the hut is, as above.

These calculations would indicate that we would be expecting a usage of around 0.67 kW per day for a typical system.

Now the choice becomes of what power source in an 'off-grid' system is most appropriate with the main choices as follows:

Diesel generator. These are useful but do require the transport of diesel fuel to site and are often rather noisy with a 100db diesel generator somewhat destroying the silence of a remote outdoor site. Also without batteries, a generator is required to be on at times whenever electrical power is being used.

LPG. LPG is a relatively useful method of providing rapid heating of water or cooking but is not fully efficient for the provision of electricity as it is a once through non-rechargeable system.

Wind power. Wind power is a useful method of creating energy from the power of the wind, however it is limited by requiring wind to be effective and really needs a battery system to provide a constant source of power.

Solar power. On consideration that almost all of our earth energy systems originate from the sun it does make sense to harness the sun's power directly where possible.

Over the past few years photovoltaic (PV) or solar power panel systems have greatly reduced in cost as Asian economies have begun to manufacture relatively cheaper supplies of photovoltaic panels.

The issue that does effect the usefulness of this power source is that in some way this system does require the sun to be present, although with the efficiency of modern PV panels to gain electricity even on cloudy days and the fact that the sun is typically for at least half of every day, then this manner of power should be considered.

Power choice for the hut

In this case it was decided that as the wind was sometimes intermittent and there was suitable sun on a north-facing roof, that a solar panel system with batteries and an intermittent diesel generator backup would be employed.

Our estimate of approx 0.7KW system requirements was that a 2kW panel system with a 1kW battery support would be used. As the existing roof on the relocated hut was showing its age and may not stand up to the additional load having 8 panels screwed onto it, we installed new Colorsteel corrugated roofing iron and ceiling insulation prior to installing the PV panels.

The power from the roof mounted PV panels was then conveyed down through an outside battery shed along with solar power supply electricals and a 3kW 12V to 240V inverter to allow for the use of NZ standard electrical appliances.

While it is slightly less efficient, powerwise, to operate a 240V system rather than the direct 12V supply usually obtained from a PV panel, given that the sun electricity is plentiful and free, a house standard 240V system was decided upon to be

connected via the inverter to the original distribution board and existing power circuits.

This system has run the 8 LED lights, electric kettle, toaster, vacuum cleaner, microwave, and two <500W panel heaters to boost the temperature when the fireplace is not fully utilised. The interesting issue with the 240V system was how to operate the 12V pump from a 240V system. On reflection we used an old fan-cooled PC inverter to convert the power to the 12V for the pump and also allow for a switch so the noisy pump could be turned off and the quiet header tank run directly when required.

To date, the above electrical system has performed well and even with most of the systems running simultaneously the battery percentage has remained above 50% to date.

Summary

So that is that, contrary to some initial expectations, it has been shown that an energy efficient 'off-grid' drive-on tramping hut can be achieved using:
a header and 30,000 litre roof based water supply;
a solar panel electric system;
an LPG cylinder hot-water and cooking system;
a woodburner fireplace for heating and combustion of most waste materials.

Overall a self sustainable place with birds, bees and goats for company surrounded by native-bush and the bird-song of the original New Zealand bush to wake us up in the morning.

The plastic's not for burning

More than 800 tonnes of on-farm plastic container waste result from argiculutral activities More than 800 tonnes of on-farm plastic container waste result from argiculutral activities in New Zealand every year, and almost half of it is now recycled responsibly by Agrecovery.

Seventy manufacturers have agreed to pay Agrecovery a levy that covers the collection and recycling of containers and chemicals. More than 300 tonnes of high-density polyethylene plastic was recycled through the programme last year, which was then made into products such as electrical insulation.

Federated Farmers' Guy Wigley said farmers are acutely aware of the importance of not contaminating their own properties and will re-use and recycle where possible.

"Farms are a working environment and they need to be kept clean and tidy. Some things cannot easily be reused or recycled."

Another waste stream that creates an enormous amount of unwanted plastic is used feed bale wrap. Plaswrap recycles about 2000 tonnes of plastic every year, most of which is bale wrap. It also recycles other plastic items such as polypropylene bags and twine as well as some high density plastic drums. The recycled material is made into plastic bags and building products.

The most powerful category of tropical cyclone ripped through the South Pacific mid-Janaury, causing massive damage. Not one house on Tonga's main island escaped damage. The possible HSNO hazards that could arise were not available at publication.

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:

……

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3. Preferred mailing address:

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Telephone Contacts (Bus.) (0) ……

(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**: P O Box 10-385, The Terrace, Wellington
Email: office@nzihsm.org.nz

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