

Spectrum

MAGAZINE

The official journal of the Vibrations Association of New Zealand

INSIDE...

Making the classic
rookie mistake...

Connecting heat to failure

Lithium-ion battery fires

What we have learned, and what
is changing in battery safety?

Full photo gallery from Conference '26

Winter 2026 | Issue 120

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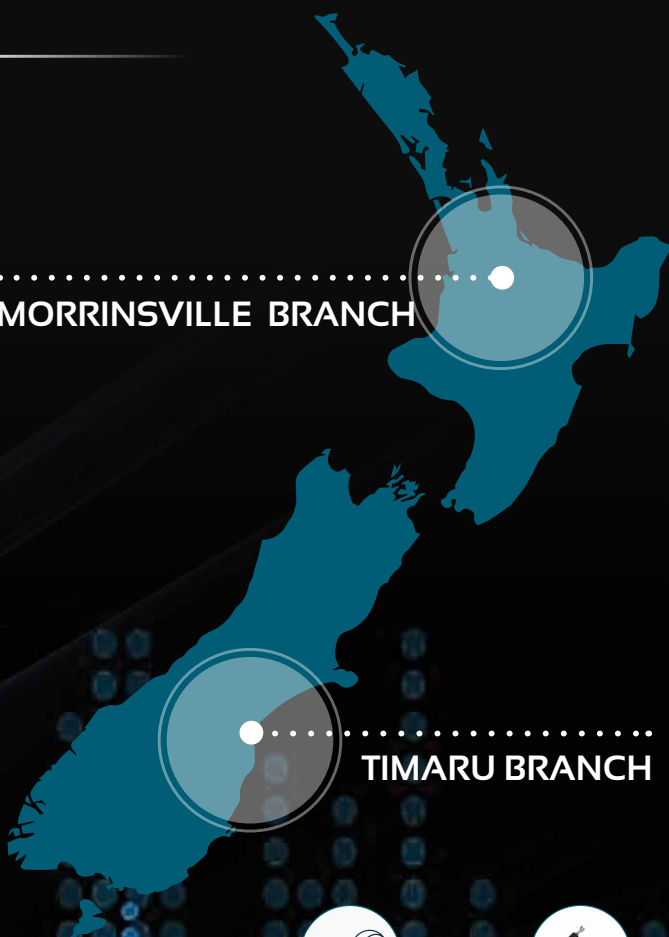
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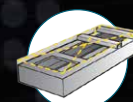
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Spectrum

Winter 2026 | Issue 120

Spectrum is published by the Vibrations Association of New Zealand (VANZ). The magazine is produced in a quarterly cycle annually in both digital and printed mediums.

The magazine is designed to cover all aspects of the Vibration, Condition Monitoring, Reliability and the wider Predictive Asset Management field and distributed to all VANZ members, including corporate members.

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ISSN 1173-793X



Reflecting on this years' conference success

Reflecting on the past 12 months, some great work was undertaken, in particular the time and effort put into the reregistration of VANZ as an incorporated society, this was no small feat involving lots of unseen work in the background as well as having to hold a special general meeting to revise the constitution, I'd like to thank all those involved.

I can now say the 2026 VANZ conference was a success with a number of new attendees and exhibitors both local and from abroad, this success was no coincidence, it was due to the hard work and dedication of the conference team, be it from managing papers to arranging marketing, well done to you all. A big thanks to our 2026 conference sponsors, a joint venture between RONDs and MBS as platinum sponsors, Allied Petroleum as the networking sponsor and MB Century as lanyard sponsors, your support was very much appreciated.

Congratulations to Mike Spence, his case study on overall equipment effectiveness took home the Peter Burgess Memorial Award for Best Paper.

I'd also like to express our thanks to all attendees and exhibitors, without your support the conference would not have been the success that it was, It would be great to see you all back again next year.

We have now locked in the venue for Conference 2027, following on from the success earlier in the year we will again return to the Rydges Rotorua 18th-20th May, please save the date.

For those that were unable to attend the AGM we have Adam Bell stepping into the role of Vice President and welcome two new general committee members Kris McCullough from First Gas and Jason Diamond from Allied Petroleum, welcome to the team.

Tim Murdoch steps back to a general committee role only due to serving the maximum allowable term as President and I'd personally like to thank Tim for the time and effort he has put in over the past three years which is often unseen, you have been a great mentor Tim and we look forward to your ongoing support.

Networking is key and 2026 was no exception with some great interaction between peers and vendors, please keep these conversations going throughout the year and support each other in these uncertain times.

I encourage you all to stay connected throughout the year via the VANZ social media platforms. Follow us on LinkedIn and Facebook to see the latest posts and announcements. Let's build and strengthen our community. ■

CONTACT US



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Conference 27



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From the editor's desk

As we recover from the hustle and bustle of the conference, we take stock of how everything has come together this year, the new ideas that worked well, the things we can improve on and the good old standard ideas that come through each year.

We'd like to thank our major sponsors MBS/RONDS for the continued support, it is much appreciated and we hope all the attendees enjoyed their time with VANZ over the conference week, it was so good to see some new faces and also catch up with our regular supporters.

Many thanks go to the organising team that helped push everything into place and to the various sponsors, many of which had a trade stand at the conference and have also placed an ad with us for this issue.



Left: Mike Spence receives his award for best presentation at Conference '26.

Our Peter Burgess Memorial Award for Best Paper this year went to Mike Spence from North Power for his presentation OEE – Case Study, congratulations and thank you for your contribution! Be sure to check out our new Presidents report from Alex Lawrence, squeeze a bit of the old grey matter with Carl's quiz and see what sort of deals our post-conference advertisers have to offer. As we continue on with the year, our newly elected committee members

are already ploughing into organising the conference for next year so we can continue to make it bigger and better for all involved.

Be sure to stay warm during these winter months and happy reading! ■

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Which silicone sealants are safe to use with electrical components?

Silicone is used widely across the site and the general assumption is it can be used for any application. Most electricians are aware that silicone cannot be used in conjunction with electrical components as it can have a corrosive effect, but what they may not be aware of is that not all silicones fall into this category. Research and tests have proven that it's not the substance that presents the problem on contact with the items, it's the vapour released while curing that causes the oxidation. Therefore when choosing a sealant it all comes down to the curing method and there are two basic types:

1. **Acetoxy cure method** - With the Acetoxy cure method acetic acid or methyl-ethyl-ketoxime (MEK) is given off as a by-product during the curing process. The acid keeps the substance sticky and pliable due to the fact that the additive reacts with the air (oxygen) before the adhesive does. Once the vapour has evaporated and the silicone reacts with the air, the outer skin can set and harden to seal out moisture.
2. **Neutral cure method** - With the neutral cure method a non-corrosive or benign by-product is released during the curing process. The by-product maybe an alkyl alcohol or a methyl alcohol and is a low odour, non-corrosive alternative and is the main ingredient in the 748 noncorrosive sealant.

Dow Corning 748 noncorrosive should be your first choice of sealant, but in cases that may need a high temp sealant Sikaflex-227 or Buytl Mastic can be used as an alternative. These are all neutral cure and have no effect on active surfaces.

The acid attacks active surfaces like, brass, copper, bronze and iron. This causes the corrosion, and is evident as a sticky, green patina. Therefore Acetoxy cure silicones should not be used to seal junction boxes, motor terminal boxes or anywhere with active surfaces close by.

Electrical accessories were placed in sealed jars with each silicone sealant, exposing them to the different curing vapours. These pictures (fig.2 and fig.3) show the results only 14 days later. ■

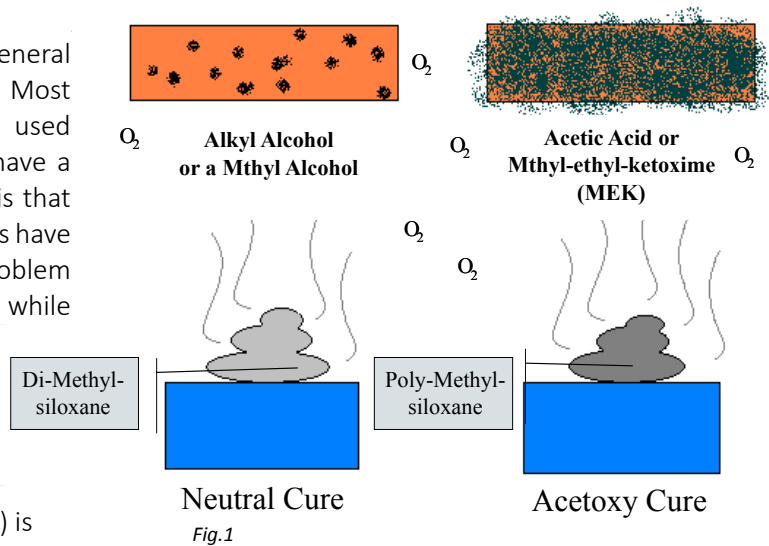


Fig.2

DOW CORNING
748 Non-Corrosive Sealant

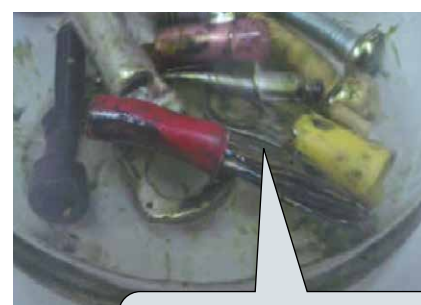


Fig.3

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CONFERENCE '26 | PHOTO MONTAGE

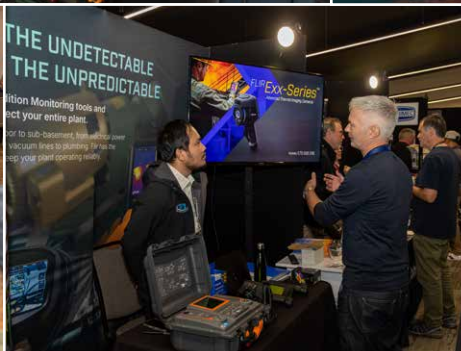
VANZ would like to take this opportunity to thank our platinum sponsor MBS/ RONDS, as well as all advertisers, exhibitors, speakers and attendees at this year's conference contributing to the overall success that it was. In no particular order, photos from the three-day conference event and are showcased over the following pages...



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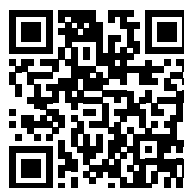
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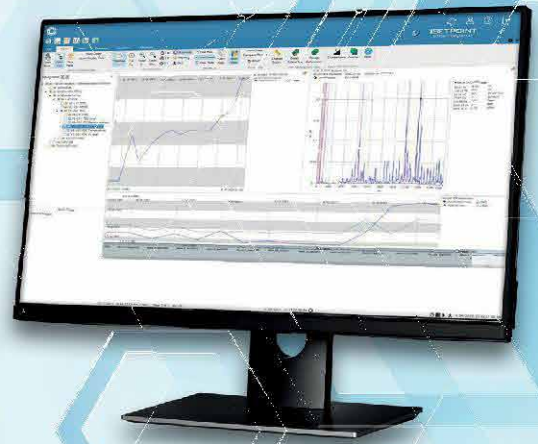
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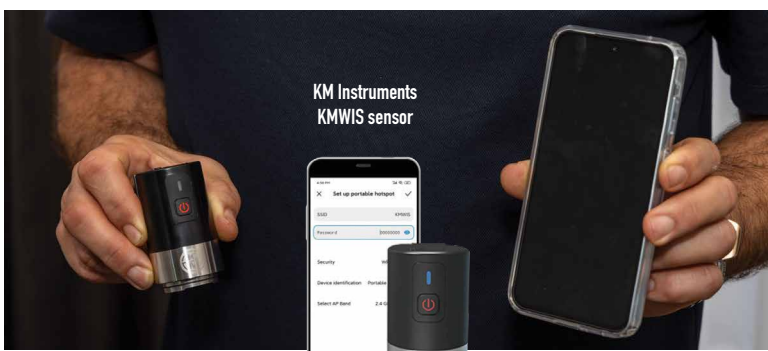
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Lithium-ion battery fires

What we have learned, and what is changing in battery safety?

Above: Lithium-ion battery fires can develop rapidly from localised failure to a fully developed fire event. Image from supplied presentation material.

A new kind of fire risk

Lithium-ion batteries are now embedded in almost every part of modern life - from mobile phones, laptops and e-bikes through to forklifts, electric buses, commercial vehicles and grid-scale battery energy storage systems. The technology has delivered major benefits in energy density, fast charging, reduced emissions and operational flexibility. However, it has also introduced a class of fire and explosion hazards that can be misunderstood if treated as conventional electrical fires.

The central issue is not simply that lithium-ion batteries can burn. The real concern is that a failing cell can generate heat internally, release flammable and toxic gases, create pressure, produce ignition conditions and then transfer heat to adjacent cells. This combination makes lithium-ion incidents fast, energetic and difficult to manage once escalation has begun. A common mistake is to describe a battery chemistry as

“

Safety is not just about preventing fire. It is about understanding thermal runaway, gas release, deflagration risk, propagation and early intervention.

”



either safe or unsafe. A more useful engineering approach is to separate the risk into fire behaviour and vent-gas or deflagration behaviour. These are related, but they are not the same hazard.

What thermal runaway means

The defining failure mechanism in lithium-ion battery fires is thermal runaway. This is a self-accelerating process in which internal electrochemical and chemical reactions generate heat faster than the cell can dissipate it.

Continued over page >

ARTICLE AUTHOR

DR JONATHAN SMITH - OPTIMECH INTERNATIONAL LTD

FURTHER READING/ STANDARDS TO REFERENCE: UL 9540A - thermal runaway propagation testing; NFPA 855 - stationary energy storage installation; ISO 3941:2026 - Class L lithium-ion battery fire classification; relevant local fire engineering guidance and emergency response protocols.

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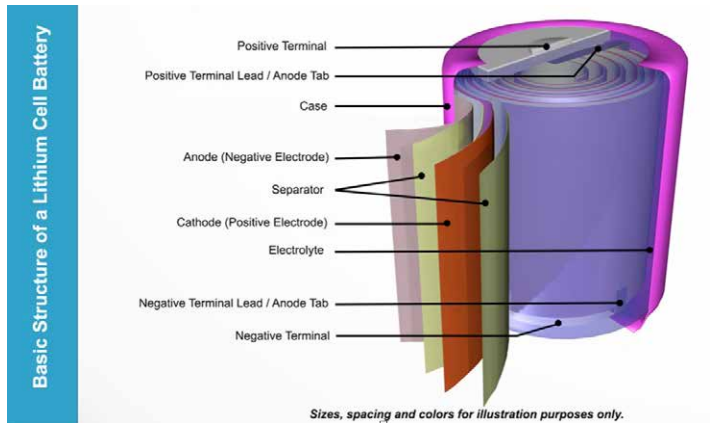
These technologies help maintenance teams identify faults early, enabling better planning, reduced downtime, lower costs, and improved performance. Condition monitoring provides the insights needed to detect issues and support smarter, more informed maintenance decisions.



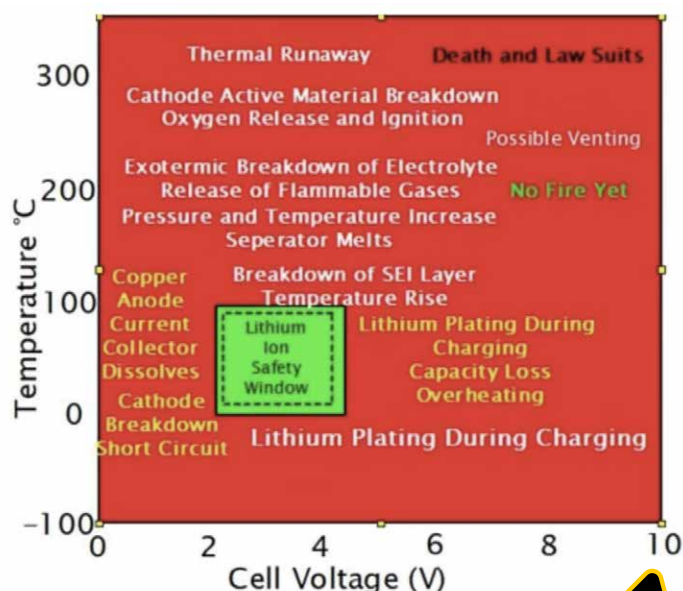
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Above: Basic lithium-ion cell construction: anode, cathode, separator, electrolyte and current collectors. Right: Thermal runaway is driven by a sequence of internal reactions that accelerate with increasing temperature.



As temperature rises, further reactions occur, producing more heat and gas. If the process is not interrupted, the cell may vent, ignite, rupture or transfer heat into adjacent cells.

Once thermal runaway starts, the battery is no longer only an external fuel package. It may become its own heat source, gas generator and ignition source. This is why conventional suppression methods can reduce visible flames without necessarily stopping cell-to-cell propagation inside the pack.

How fast can the fire grow?

Fire heat release rate data highlight why lithium-ion battery fires deserve special attention. In the supplied presentation, an e-bike design fire curve reaches a peak heat release rate of approximately 900 kW within about 45 seconds. That is an intense fire from a relatively small battery pack. It can ignite surrounding combustibles, expose occupants to severe radiant heat and shorten available evacuation time dramatically.

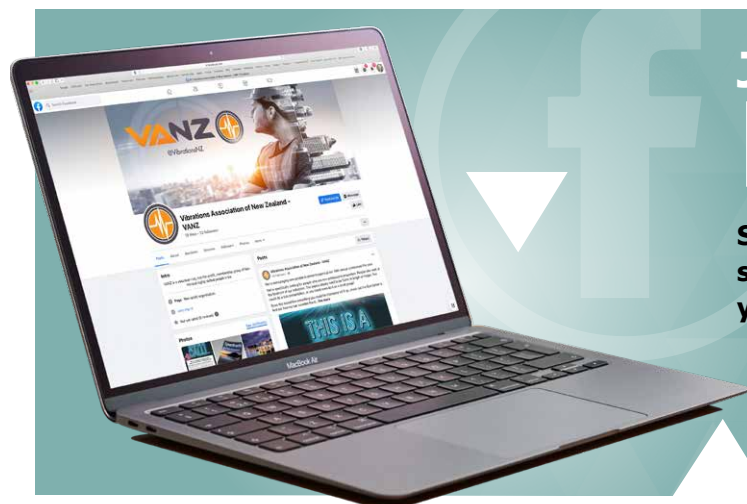
The peak event may be short, but the hazard does not end when the visible flame reduces. Damaged cells and modules may retain heat, continue venting, reignite, or ignite adjacent materials. This is particularly important during post-fire handling, vehicle recovery, waste storage and depot operations.

“ *Once visible flames appear, thermal runaway is usually already well developed. At that point, the response often shifts from prevention to consequence management.* ”

The early warning sign: white vapour

Many non-specialists underestimate the significance of white or light grey vapour from a battery. In a lithium-ion battery incident this is commonly not ordinary smoke. It is often a vented aerosol of vaporised electrolyte mixed with decomposition gases. The mixture may include carbon dioxide, carbon monoxide, hydrogen, light hydrocarbons, volatile organic compounds and, depending on chemistry and conditions, hydrogen fluoride.

Continued over page >



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Cables & Connectors



RH059M73 JMG#1312823

1 LEFT!

- 6ft cable assembly 5-Pin M12 to 5-Pin
- Conductors: 4
 - Cable Jacket Material: Polyurethane
 - Temperature Range: -50 to +121°C



059QF010BZ JMG#1486936

8 LEFT!

- Socket moulded composite connector for TO accelerometers to blunt cut cable
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 - Cable Jacket Material: Polyurethane



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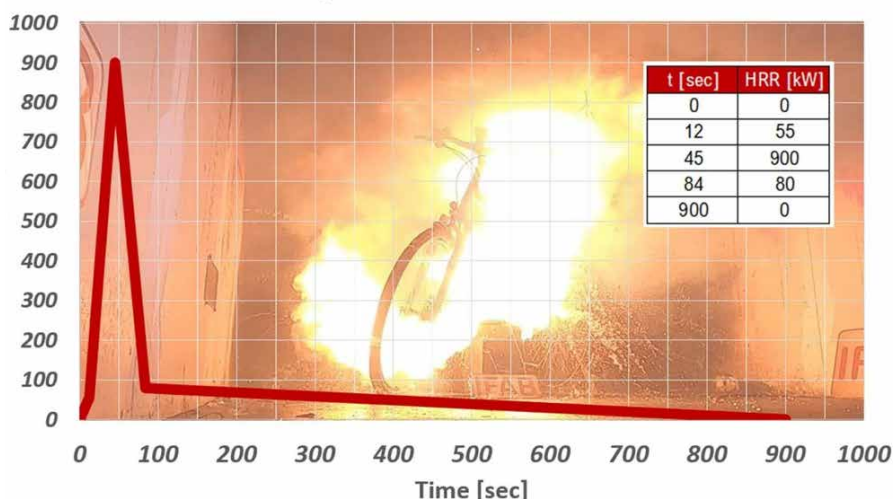
Model & Part No.	Frequency Range	
607A11 JMG#1091412	30 to 600000 cpm	3 LEFT!

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Model & Part No.	Frequency Range	
604B91 JMG#1350359	30 to 300000 cpm	3 LEFT!

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Design Fire Curve / E-bike



Left: Representative e-bike battery fire curve from the supplied presentation: rapid rise to ~900 kW peak HRR in about 45 seconds.



“

A lower-flame-severity chemistry can still produce a serious gas hazard. Fire risk and deflagration risk must be assessed separately.

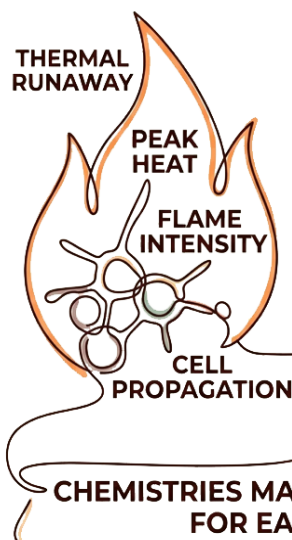
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This vapour should be treated as both hazardous and potentially flammable. It can also be one of the last practical warning signs before escalation into fire or a more severe gas ignition event. The correct response is not to observe, film or wait. It is to stop charging if safe, isolate the power source if practical, move people away, remove nearby combustibles where this can be done safely, and prepare for escalation.

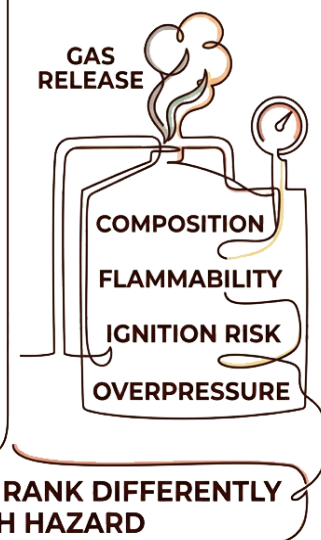
Fire behaviour versus deflagration hazard

Lithium-ion battery fire risk is often discussed as though it is one hazard. For engineering assessment, it is better to separate two hazard profiles.

FIRE BEHAVIOUR



VENTING/DEFLAGRATION



Above: Fire behaviour and deflagration hazard must be considered separately during risk assessment.

important in plant rooms, garages, shipping containers, BESS enclosures, transport compartments and depot charging areas. The most dangerous feature of this scenario is timing. A gas cloud may form before visible flames appear. It may then ignite later, or ignite at a location away from the original battery. This is why gas detection, ventilation, pressure relief and enclosure-level analysis are essential parts of lithium-ion battery safety design.

FIRE BEHAVIOUR

- Likelihood and severity of thermal runaway
- Peak heat release rate
- Flame intensity and duration
- Cell-to-cell propagation
- Radiant heat and secondary ignition

VENTING / DEFLAGRATION BEHAVIOUR

- Gas volume and release rate
- Gas composition and flammability
- Ignition probability
- Overpressure in enclosures
- Remote or delayed ignition potential

These hazards do not always rank chemistries in the same order. A chemistry that reduces flaming fire severity may still generate a gas mixture capable of ignition or deflagration, particularly in an enclosed space.

Deflagration: the hidden enclosure hazard

During thermal runaway, batteries can rapidly release flammable gases. If those gases accumulate and mix with air within flammable limits, ignition can produce a deflagration - a rapidly propagating flame front that may generate damaging overpressure. This hazard is particularly

LFP versus NMC/NCA: safer does not mean risk-free

Lithium Iron Phosphate (LFP) batteries have become increasingly common in energy storage and commercial vehicle applications. LFP generally offers better intrinsic thermal stability than nickel-rich chemistries such as NMC and NCA. It is less prone to oxygen release and



Above: Deflagration risk becomes critical when vent gases accumulate in enclosed or semi-enclosed spaces. Below: * Safety refers to how resistant the chemistry is naturally to entering an uncontrolled state or thermal runaway. Rankings are comparative and do not replace cell, module, pack, charger, installation, or duty-cycle risk assessment. Bottom right: In enclosed spaces, gas accumulation and delayed ignition can dominate the risk profile.

CHEMISTRY TYPE	SPECIFIC ENERGY	SPECIFIC POWER	SAFETY*	LIFESPAN	COST
LiCoO ₂ (LCO)	High	Moderate	Moderate	Moderate	High
LiMn ₂ O ₄ (LMO)	Moderate	Moderate	High	Moderate	Moderate
LiNiMnCoO ₂ (NMC)	High	High	Moderate	Moderate	High
LiFePO ₄ (LFP)	Moderate	Moderate	High	High	Moderate
LiNiCoAlO ₂ (NCA)	Highest	High	Moderate	Moderate	High
Li ₄ Ti ₅ O ₁₂ (LTO)	Moderate	Highest	Highest	Highest	Highest

severe exothermic decomposition, and under comparable conditions it can show lower peak fire severity.

However, LFP is not fireproof and should not be treated as a complete safety solution. When LFP cells fail, the released gas can contain a significant hydrogen fraction. Hydrogen ignites easily, diffuses rapidly and can produce high flame speeds and overpressure. This means LFP may reduce the fire-severity profile while still presenting a significant vent-gas and deflagration hazard.

NMC and NCA chemistries generally offer higher energy density, which is attractive for vehicles requiring range or high power. The trade-off is poorer thermal stability and a tendency toward more severe thermal runaway behaviour, particularly in high-nickel formulations. In simple terms, chemistry selection changes the risk profile; it does not remove the need for system-level controls.

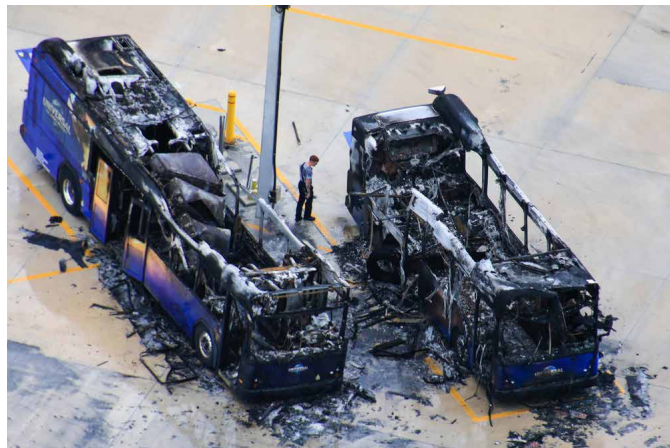
Why the distinction matters in real systems

In open environments, the dominant hazard may be flame intensity and heat release. In enclosed or semi-enclosed environments, the hazard can shift toward gas accumulation, delayed ignition and pressure effects. This is particularly relevant for battery energy storage systems, workshops, warehouses, plant rooms, garages and transport compartments. Battery safety therefore requires enclosure-level thinking. The design question is not simply, 'Will the cell



burn?' It is, 'What happens when one cell fails, where does the gas go, how fast is heat transferred, what ignites next, and can the system prevent propagation?' This is where testing approaches such as UL 9540A and installation frameworks such as NFPA 855 become important, because

[Continued over page >](#)



Above: Electric bus incidents demonstrate the scale of energy involved when large battery systems fail. Below: Roof-mounted bus battery systems may be exposed to weathering, impact, vibration, water ingress and corrosion.

they focus on propagation, gas behaviour, spacing, ventilation and emergency response planning.

Electric bus fires: large energy systems in public service

Electric bus fires have attracted international attention because the stored energy is large and the operating environment is demanding. A typical electric bus can contain the equivalent of approximately seven to eight electric car battery packs. This gives the vehicle a very large stored-energy inventory and a substantial potential for heat release and gas generation if thermal runaway propagates.

The design of bus battery systems can also increase risk. Battery packs are often roof-mounted to preserve passenger space and simplify vehicle packaging. This location can expose packs to vibration, weathering, water ingress, corrosion, impact from trees or structures, and difficult firefighter access. In addition, electric buses are relatively specialised, lower-volume vehicles compared with passenger cars, so battery enclosure design, sealing, diagnostics and integration quality can vary between manufacturers and models.

Charging is another critical issue. These vehicles require compatible, correctly configured chargers that communicate properly with the battery management system. Incorrect charging equipment, connector damage, failed charger-BMS communication, or poor maintenance can increase electrical and thermal stress. Depot charging adds a further

risk because multiple vehicles may be parked and charged close together overnight.

State of charge: a practical control

State of charge is a major influence on both fire severity and gas-release behaviour. A fully charged battery contains more stored electrochemical energy than the same battery at mid-range state of charge. Higher state of charge generally increases reaction severity, gas generation and flammability risk.

Where operationally practical, maintaining batteries in a moderate operating window - commonly around 40% to 80% state of charge - can reduce electrochemical stress, slow degradation and reduce failure severity. This is not a guarantee of safety, but it is a useful risk-reduction strategy for many applications, particularly storage, fleet operations and systems that do not require maximum range or capacity at all times.

Time is the most important safety principle

Across lithium-ion battery incidents, early recognition is critical. Warning signs include visible venting, white vapour, hissing, popping, swelling, unusual odour, abnormal heat or rapid performance change. These signs should be treated as battery distress, not as minor anomalies.

Continued over page >



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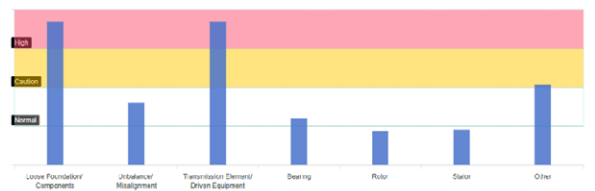
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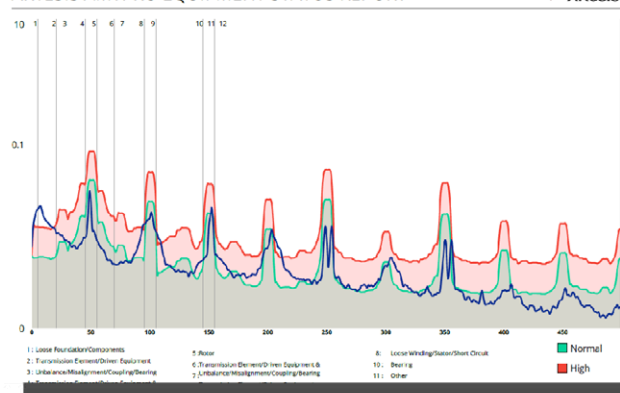
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Equipment Name:		Nominal Voltage[V]:	400.0	Nominal Current[A]:	181.0
Equipment Type:	Pump	Test Frequency:	50.0	Test Rpm:	1485.0
Report Name:	2022-811	Transmission Element:	Couplin	Starting Type:	VFD
Report Date:	Thursday, March 3, 2022	Motor DE Bearing:	N/A	Motor NDE Bearing:	6318
Site Name:		Driven Equipment Bearing 1:	6312	Driven Equipment Bearing 2:	6312



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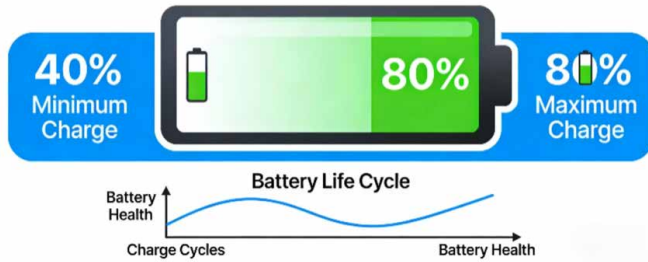
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Lithium Batteries 40–80 Rule Explained for Longer Life



Above: Operating in a moderate state-of-charge window can reduce battery stress and improve service life. Right: Early evacuation and isolation are central to lithium-ion battery incident response.

For small devices, the priority is to stop charging if safe, move people away and prevent the device from igniting nearby combustibles. For larger systems, the response should include evacuation, exclusion zones and prompt notification of fire and rescue services. Once flames are visible, intervention options are reduced and the incident may require prolonged cooling, monitoring and controlled recovery.

Standards and the shift toward Class L thinking

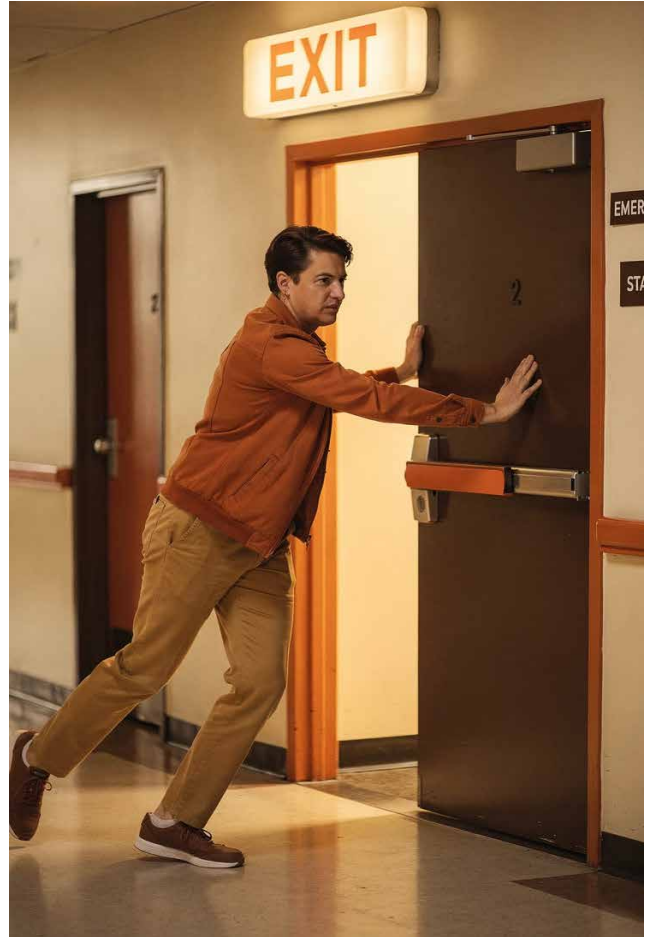
The standards landscape is evolving as the industry better understands lithium-ion hazards. UL 9540A evaluates thermal runaway propagation and gas release at cell, module and system level. NFPA 855 addresses installation, spacing, ventilation and emergency planning for energy storage systems. ISO 3941:2026 introduces a dedicated Class L designation for lithium-ion battery fires, recognising that these incidents behave differently from traditional fire classes.

Class L does not replace detailed engineering assessment, but it reinforces an important conceptual shift. Lithium-ion fires should not be treated merely as conventional electrical fires. They involve internally driven heat generation, gas release, propagation behaviour, possible deflagration and re-ignition. That distinction should influence battery selection, enclosure design, charging practice, inspection, maintenance and emergency planning.

Practical implications for industry

A robust lithium-ion battery safety strategy should combine chemistry selection with system-level engineering. LFP may reduce fire severity in many applications, but enclosure design, gas control, early detection and propagation resistance remain essential. NMC and NCA may provide high energy density, but require careful thermal management, pack design and protection against abuse. For all chemistries, the critical questions are how the system behaves when one cell fails and whether that failure can propagate.

- Select battery chemistry for the actual duty cycle and hazard environment.



- Prevent cell-to-cell and module-to-module propagation wherever practical.
- Provide controlled venting paths and avoid gas accumulation in enclosures.
- Detect abnormal heat and off-gassing early, not only visible flame.
- Control charging conditions, state of charge and operating temperature.
- Inspect for water ingress, corrosion, mechanical damage and charger compatibility.
- Treat visible venting as an emergency condition, not a watch-and-wait event.

Final perspective

Lithium-ion batteries are not inherently unsafe, but they are unforgiving of misunderstanding. The industry is moving in the right direction through improved chemistries, better testing, better standards and more sophisticated safety engineering. However, the most important shift is conceptual.

Battery safety is no longer only about preventing visible fire. It is about understanding the full hazard profile: thermal runaway, gas release, deflagration potential, propagation behaviour, re-ignition risk and the critical importance of early intervention. As electrification accelerates, the organisations that understand and engineer for these realities will set the standard for safer battery deployment. ■



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Connecting heat to failure

The first presentation of the VANZ 2026 conference ended with some folks having a few good laughs at my expense – and it was well-deserved. I made a real classic rookie mistake. Unbelievable.

I'm passionate about making people aware of some major yet little-known causes of failure in engineering steels, bolts and welds. Over 40 years in the industry has exposed me to some massive project failures caused by the smallest of metallurgical issues. Kind of like the Titanic with its steel hull plates suffering from tiny wee Manganese Sulphide inclusions that made the steel susceptible to rapid brittle cracking in the frigid North Atlantic ocean.

You would think we had learned from that tragedy, but sadly we keep making the same mistakes. The problems are shockingly widespread and much, much closer to home than you want to know. And I mean really close. It's these commonly recurring problems and failures that keep my passion alive for alerting people to these dangers.

“
Humour works well,
I've found, although
sometimes I get a bit
carried away with my
topic and say some
edgy things I really
shouldn't say.
”

But a big problem with trying to explain a dry, boring technical subject like metallurgy is keeping the audience engaged. Humour works well, I've found, although sometimes I get a bit carried away with my topic and say some edgy things I really shouldn't say. It definitely doesn't help that I spent the better part of 10 years acting as Basil Fawlty in restaurants with a Fawlty Towers theme night. Basil is constantly lurking just below the surface, and bursts forth at times like this. But hey, it's all in the good cause of education. And let's face it, if some guy is prattling on about how important it is for YOU to know how steel is heat-treated, even humour may struggle to keep you awake.

Continued over page >

ARTICLE AUTHOR

BARRY ROBINSON - METEX LTD NZ

Barry was the VANZ Conference '26 keynote speaker



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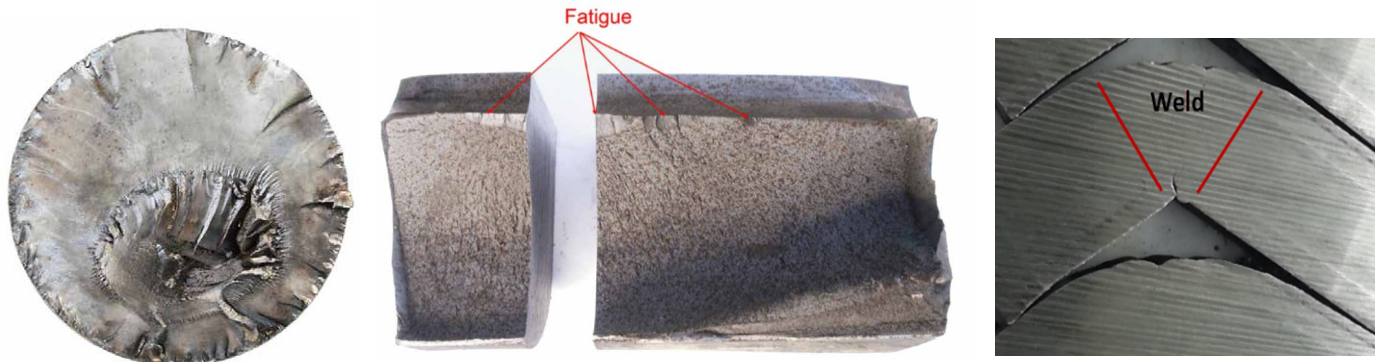


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Above: Fracture face on the 155mm diameter shaft.

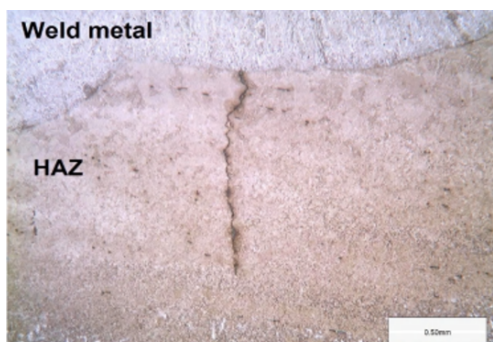
Actually I was in awe of several speakers at VANZ, and their use of humour to get their highly technical topics across to the audience.

So I've discovered that the absolute best way to get the dry point across is to demonstrate. And I mean actually crank up a gas torch, heat a bit of steel up to a good 900 degrees Celsius (orange/yellow colour), and then quench it quickly in a bucket of water. This is followed by putting the hardened steel in a vice and giving it a wee tap with a hammer. The result always amazes the people watching. The steel shatters and goes flying across the room. Sometimes it goes 20 meters, if there's no walls or people in the way (the bit about people would have been a joke if it wasn't for the demonstration).

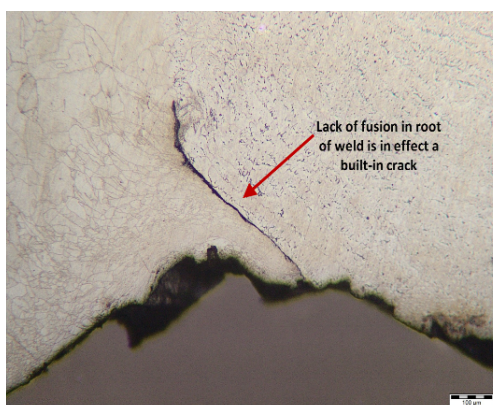
I did on a training course a couple of weeks ago...). This lovely graphic demonstration allows even the sleepest of folks to grasp the dangers of steel that has been put into a hard and brittle state. I explain that the steel is still very strong, the problem is that it simply cannot take any impact, shock or movement (like bending).

I then take the remaining brittle hardened steel, grab the gas-torch again (now turned down to a low flame) and temper the brittle steel. This second heating step tempers the hard brittle "quenched martensite" transforming it into the best structure you can get; tough "tempered martensite".

Naturally further demonstration is required at this point, so the tempered demonstration steel bar is put back in the vice and hit firmly many times, finally getting it to bend to a right angle (90 degrees). By this time I like to think that everyone in attendance who bore witness to such amazing acts of metallurgical magic now fully grasp the fundamentals



Above: Crack initiating in the HAZ under the weld. 50x, 2% Nital



“
And now we come to the classic rookie mistake. I fired up the gas torch, and then found that actually that was the last of the acetylene in the tank! Unbelievable!

of hardening and tempering steel. This learning is then easily related to the myriads of problems in steel caused by people just like us. And maybe in fact, you. Now as much as I'd love to do the gas-torch martensite demonstration in the hotel conference room, activities like that tend to excite

hotel management. So I thought I'd do it out of the back of my car, in the carpark just outside.

At least, that was the demonstration repeatedly promised to the good folks in the first presentation of the VANZ 2026 conference. I kept saying "and if you accompany me to the back of my car immediately after I finish talking, I'll show you! So a great number of people accompanied me to the back of my car. I'd like to think they were excited, but I'm a realist and think that the thought of morning tea was possibly more exciting.

And now we come to the classic rookie mistake. I fired up the gas torch, and then found that actually that was the last of the acetylene in the tank! Unbelievable!

Continued over page >



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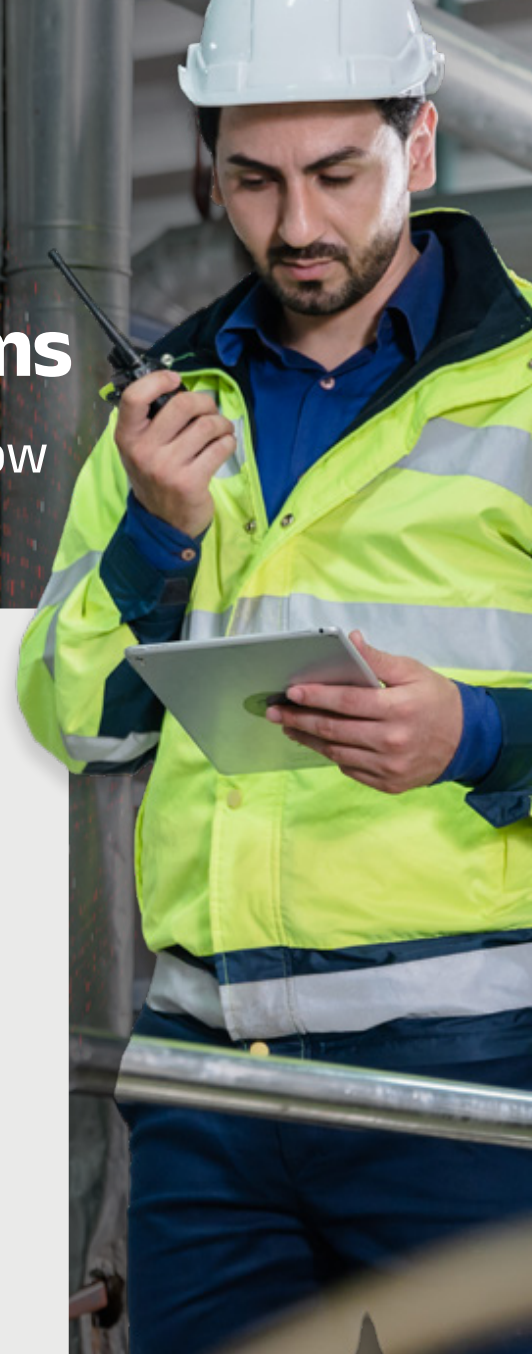


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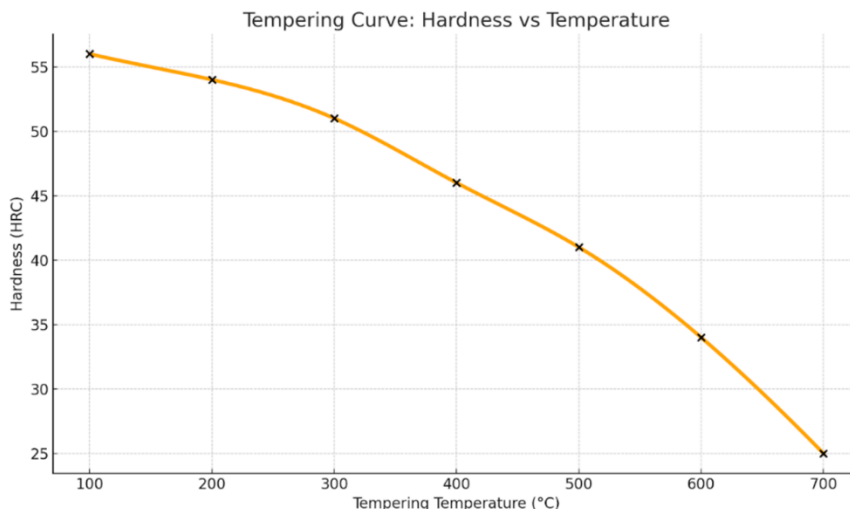
AgTech Manager, Vide Ultra Pty Ltd, Australia



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But it worked just fine last night when I did the test-run! Of course it has to run out sometime. But why now, when I have so many people expectantly waiting while smoko gets cold? And these were not just any people; these are professionals and experts in the areas of engineering and reliability. And thankfully also a few good friends who ribbed me mercilessly in front of everyone, thus saving me from the worst fear of all; polite silence and disengagement.

Remember this was only the start of the 3-day event, and I still had two more talks to be laughed at. And that indeed happened.

I had previously introduced myself in this Spectrum publication as a Useful Idiot, with the sincere hope that I could at least satisfy the Useful status. Clearly that hope was in tatters.

I think it is a wonderful thing that it's our good close friends who really send the flak our way – yet in the next breath they save your bacon. Salvation from demonstration disgrace was by the kindness of Damon from Fonterra Edgecumbe.



Above left: Oil quenching. Above right: Water quenching.



“Remember this was only the start of the 3-day event, and I still had two more talks to be laughed at. And that indeed happened.”

The next morning Damon loaned me his little butane torch, and I quietly went out to the car and tested it on the 6mm steel bar.

It was only just capable of heating the bar to the minimum hardening temperature, over a short length, but it was enough! It enabled me to promise the great comeback demonstration, to be held immediately after the conference closed the following afternoon.

About 20 or 30 stalwart VANZ attendees joined me at the back of my car after the conference. And it worked really well! In fact, almost too well. In trying to determine the flight path of the projectile while surrounded by cars and hotel glass, I figured that flax bush over there by the road would be good target. And off flew the broken brittle steel, into the grass or the flax bush – I'll never know. But upon looking directly beyond the flax I could see a little white car parked on the roadside. Thank goodness it had not struck that car!

Especially as it belonged to Fonterra Edgecumbe... ■

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WHAT IS VANZ, AND WHY DOES IT EXIST?

Engineering is constantly evolving alongside advances in technology, materials, and manufacturing. Today's engineers use multiple condition monitoring tools to support predictive asset management—a critical but demanding role. With high costs tied to downtime, equipment failure, and safety risks, skilled analysis is essential. The Vibrations Association of New Zealand (VANZ) exists to support professionals by providing:

- Training and knowledge with shared experience
- Ongoing development
- A collaborative community.

VANZ recognises that success depends on both the engineers applying the technology, and the industries and businesses they serve.

WHO CAN JOIN VANZ?

Anyone involved or interested in mechanical and electrical condition monitoring for predictive asset management, including:

- Asset managers
- Reliability engineers
- Technicians
- Consulting engineers
- Equipment suppliers and distributors
- Engineering students and apprentices.

Members gain value through collaboration, knowledge-sharing, and annual conferences. Our members also come

from a wide range of sectors, regardless of operation size or machinery used.

OUR BACKGROUND

We are a volunteer-run, not-for-profit organisation, with members across New Zealand and Australia. VANZ originated from a 1989 workshop in New Plymouth and established to create a platform for industry collaboration and learning. With unified support, VANZ has stood the test of time as a unique and respected organisation, offering:

- Training days for apprentices and trainees
- Asset management content for technicians, supervisors, and managers.
- A very strong reputation throughout Australasia.

ANNUAL CONFERENCE

The core activity of VANZ is an annual conference, where:

- Over 100 members gather in a friendly, collaborative environment
- Technical presentations and discussions are shared from community members and international guests
- Businesses have the opportunity to showcase new technologies and advancements in an exhibitor area
- Members are able to network in a relaxed environment around industry experts and fellow guests
- Global keynote speakers and local experts present insights and knowledge. ■



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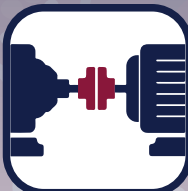
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TEST YOUR KNOWLEDGE - PART 84 OF A SERIES

1. A measurement point is set up in a vibration database. The setup parameters are a spectrum with a maximum frequency of 200 Hz, and 800 lines of resolution. What duration will the waveform associated with this spectrum be?
 - a. 1 second
 - b. 2 seconds
 - c. 3 seconds
 - d. 4 seconds.
2. Maintaining backups of your vibration data is very important. It may be necessary to recover a database backup to a certain point in time. E.g. if a corruption was introduced some time back but was not immediately detected. Which type of backup scheme might best enable you to recover your data in this scenario?
 - a. Annual full backups – only the most-recent annual backup is retained
 - b. Quarterly full backups – only the most-recent quarterly backup is retained
 - c. GFS Scheme – daily (son), weekly (father), monthly (grandfather) retention system
 - d. Daily full backups – only the most-recent daily backup is retained.
3. A DC motor being supplied by a thyristor drive developed a strong vibration at the input AC line supply frequency of 50 Hz. The vibration frequency remained at 50 Hz regardless of speed changes in the motor. Which of the following faults is most-likely to cause this vibration?
 - a. Commutator sparking on the DC motor
 - b. Loose stator windings in the DC motor
 - c. A fault in the drive, such as a mis-firing thyristor
 - d. Could be A or C.
4. A vibration analyst correctly identified that a deep-groove ball bearing in an electric motor was deteriorating due to EDM damage. The bearing was replaced and cut open for inspection. The grease was discoloured due to the EDM. What colour do you think the grease was?
 - a. Black
 - b. White
 - c. Orange
 - d. Green.
5. A strong ratio between horizontal and vertical vibration levels can sometimes be indicative of a resonant condition. A ratio greater than or equal to which of the following might be a good screening ratio to start.
 - a. 1.5:1
 - b. 2:1
 - c. 4:1
 - d. 8:1.
6. Equi-distant holes are to be drilled and tapped on a PCD on a coupling hub to facilitate the addition of correction weights for single-plane balancing. If you wish to keep the total correction mass to a minimum, which of the following numbers of holes would you choose?
 - a. 4 holes
 - b. 8 holes
 - c. 10 holes
 - d. 12 holes.
7. Two accelerometers of the same make and model are available for you to use for data-collection. The accelerometer specifications for that model list their nominal sensitivity as being 100 mV/g +/- 5%. If accelerometer A (95 mV/g actual sensitivity) is used historically, but then swapped out with accelerometer B (actual sensitivity of 105 mV/g), how might your routine measurements change if a nominal 100mV/g sensitivity is applied in the measurement instrument both before and after the accelerometer change?
 - a. The measurements will be unchanged when you swap accelerometers
 - b. The readings will decrease by approx. 10% once accelerometer B is used
 - c. The readings will increase by approx. 10% once accelerometer B is used
 - d. The readings will increase by approx. 5% once accelerometer B is used.

Continued over page >

TEST YOUR KNOWLEDGE

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8. Of the frequencies listed below, which one is the minimum that would meet the description of "ultrasonic"?
- 19 kHz
 - 23 kHz
 - 43 kHz
 - 100 kHz.
9. You wish to carry out a 2-plane in-situ balance correction of a rotor supported between bearings. Which of the following is the minimum instrumentation you would need to carry out this work?
- 2 transducers and a 2-channel vibration analyser with phase input.
 - 1 transducer and a 2-channel vibration analyser with phase input.
 - 1 transducer and a single-channel vibration analyser with phase input.
 - 2 transducers and a single-channel vibration analyser with phase input.
10. You need to fit a correction weight when balancing a rotor. The space where you can fit your weight is

minimal. Which of the following materials would you choose for your balance weight given this restricted space?

- Mild steel
- Tungsten
- Lead
- Aluminium.



HOW MANY DID YOU GET CORRECT?

Answers to VANZ Quiz and Puzzle Corner can be found on page 50.

PUZZLE CORNER

SUDOKU

To solve, each number from 1 to 9 must appear once in:

- Each of the nine vertical columns
- Each of the nine horizontal rows
- Each of the nine 3 x 3 boxes

No number can be repeated twice in a box, row or column.

Difficulty: **Extreme**

6	8			4				
		3			5	4	2	
2			7					
7		6			8			
		5		2		8	7	
	9							6
4			5	8	6			2
1	6				7		9	8
5			9					

Only 39.8% of puzzlers can solve this. Can you?

WORD LADDER

A Word Ladder has two words in the ladder, one at the top and one at the bottom. You must form a sequence of words going down. In order to solve this puzzle, on every step of the ladder (1-6), you need create a new word that only differs by one letter from the word above it until you reach the destination word on line 6. Each new step created must be a valid English dictionary word.

1	C O L D
2	
3	
4	
5	
6	W A R M

There's 50 possible three or more letter words to find.

WORD BUILDER

How many words of **three or more** letters can you make using the six letters below? You can only use each letter once. Plurals are allowed, but no foreign words or words beginning with a capital.

Word scores expected...

20 - Good | 30 - Very Good | 40+ - Excellent

O	L	C	R	E	D
---	---	---	---	---	---

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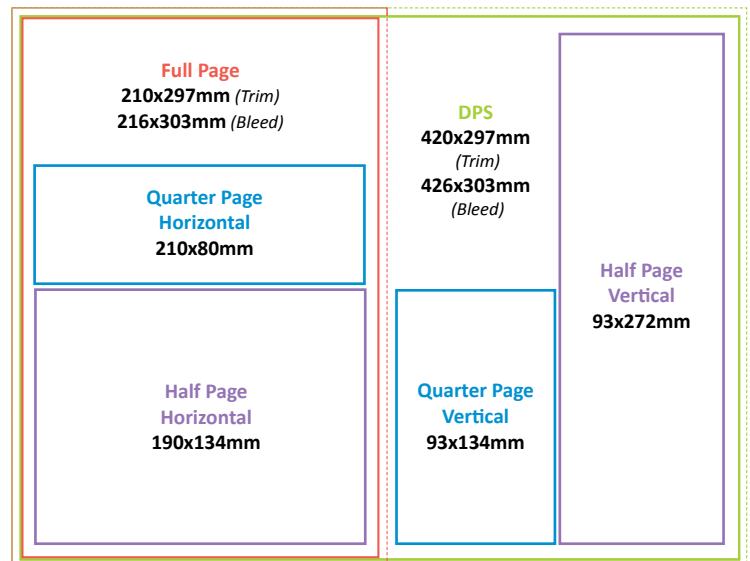
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QUIZ/ PUZZLE ANSWERS

Carlton Technology Quiz 84: 1D, 2C, 3C, 4A, 5C, 6D, 7C, 8B, 9C, 10B

Word Builder Solution: COLDER

Word Ladder: 1. COLD, 2. CORD, 3. CARD, 4. WARD, 5. WARN, 6. WARM



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