

The pair coil problem

Are fridges paying the price for substandard products?

Skills workshop

Handling refrigerants during maintenance

HVAC & R NEWS

AIRAH | INDUSTRY JOURNAL

JUNE-JULY 2025 | ISSUE 164

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rinnai.com.au

Rinnai

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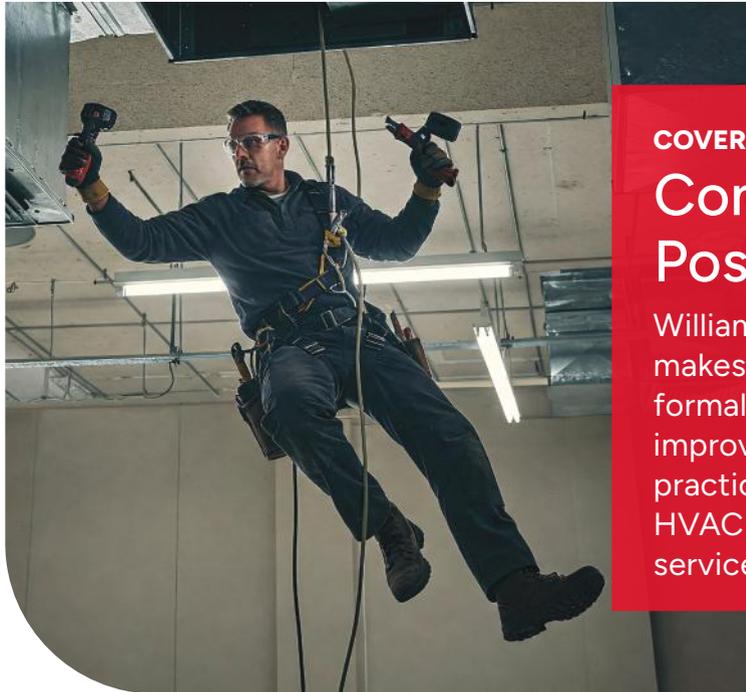
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ISSUE 164



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A Shakespearean plot twist

If I learnt one thing at high school, it's that being a fan of Shakespeare wins you absolutely no street cred.

While I was swept away in the grim downfall of *Macbeth*, my classmates were presumably off doing more important things like playing footy or making friends.

In the 21st century, we've come to think of Shakespeare as a high-brow poet who wrote fancy plays for fancy people in a language we barely recognise. This couldn't be further from the truth. Shakespeare was an amazing storyteller, but his target audience wasn't the British nobility – it was the common person.

His plays are full of innuendo, filth, and the kind of interpersonal drama that you just can't look away from. He was, at heart, a magnificent trashbag.

Romeo and Juliet wasn't the *Downton Abbey* of the 17th century. If anything, it was more akin to *Married at First Sight*.

This century, probably the closest thing we've witnessed to a Shakespearean tragedy

in Australia (other than *MAFS*) is federal politics. Parliament has been full of conniving, backstabbing and drama of the highest order. The only thing missing has been the likeable characters.

Think of Gillard betraying Rudd, Rudd returning the favour, Abbott claiming the throne only to be struck down a few years later by Turnbull, who was in turn knifed by ScoMo. Not even Shakespeare could have conceived of such a ridiculous plotline.

But if the past 15 years have felt like a fog of instability and betrayal, the election result this time around feels different. After looking in trouble just six months before the election, Anthony Albanese and his Labor party have pulled off the kind of come-from-behind victory Shakespeare would have shocked his audiences with. They now have the strongest majority in decades, with the Coalition and the Greens left decimated and searching for answers.

I'll let you decide whether one party having so much power is a good thing. But whatever your thoughts, it's clear that over the next three years, the government has an opportunity unlike any in recent history to shape the country's future.

If you go to page 10 of this magazine, you can read about the changes AIRAH would like to see. We've submitted a document of policy priorities to the government and will advocate passionately on the HVAC&R industry's behalf.

In our cover feature, AIRAH legend William Lane, F.AIRAH, makes the case for a more structured career pathway for HVAC&R commissioning technicians. We also look at the pair coil controversy that has rocked the industry over recent years, recap the main points from the recent ATMOsphere conference focusing on natural refrigerants, revisit the refrigeration set point debate, and announce AIRAH's expanded state apprentice awards. Our skills workshop is taken from part 2 of the *Australia and New Zealand Refrigerant Handling Codes of Practice*.

So, next time you watch an episode of *MAFS*, consider that a few hundred years from now, kids in class might be analysing it as if it were the Shakespeare of our time.

Nick Johns-Wickberg

EDITOR

✉ nick.johnsw@airah.org.au



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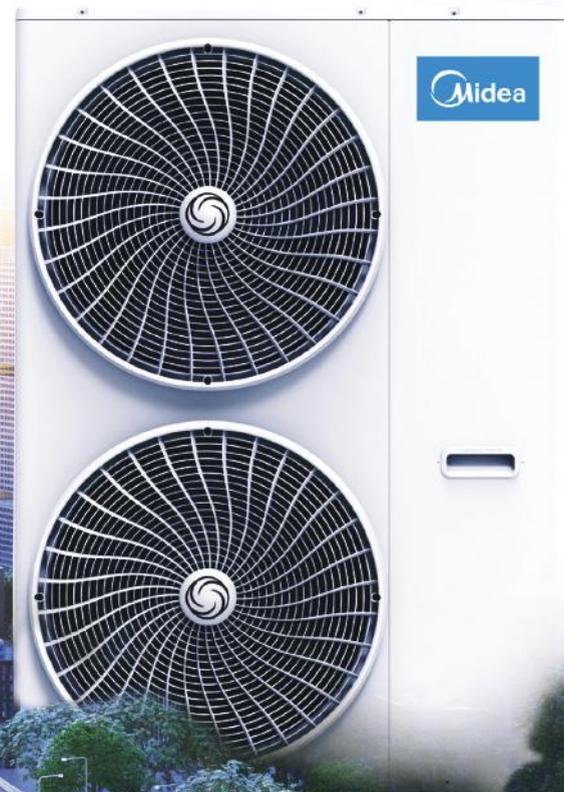
Installation of max. 6 IDUs in one system



Mdhome.com.au



1300 726 002



Midea Air Conditioner Australia



daikin.com.au

Classy touch

Daikin Australia has launched its new Simple Touch controller, a light commercial centralised controller featuring a touchscreen interface.

The wall-mounted controller features an 8-inch touchscreen interface, a wake/sleep button, and what Daikin describes as a minimalist, user-friendly GUI.

A single controller can connect to up to 128 indoor units or 64 groups. Three additional sub-controllers can be integrated into the network for operation and monitoring of systems from multiple locations.

Daikin says the controller caters to the needs of light commercial applications, with several features:

- On/off
- Operation mode
- Temperature setpoint
- Airflow rate
- Airflow direction
- Weekly scheduling function
- Force-off input contacts, allowing the controller to receive a signal from external devices to promptly shutdown all air conditioning systems.



More from airCore

Temperzone has announced updates to the airCore 700 range of Hitachi air conditioners.

The units are now available in cooling capacities ranging from 7.2kW to 16kW. Temperzone says the units have an ambient operating range of -20°C to +52°C, meaning they can perform in the full spectrum of temperatures consumers are likely to encounter in Australia.

Temperzone adds that the airCore 700 is equipped with electrical box protection, a design enhancement that helps protect from dust, moisture, pests, and physical damage.

The range also comes with cloud and WiFi connectivity, self-cleaning technology, and a six-year parts and labour warranty.



temperzone.com.au



mitsubishielectric.com.au

High five for WiFi

Mitsubishi Electric has announced that its MSZ-AP Series, MSZ-EF Series, and MFZ-KW Series will now have built-in WiFi connectivity, allowing users to control their systems remotely.

Mitsubishi Electric says the addition enables users to remotely adjust settings, including temperature, mode, and fan speed through the app, which is compatible with both iOS and Android devices.

WiFi will roll out across three of the company's most popular air conditioner series: MSZ-AP Series, MSZ-EF Series, and MFZ-KW Series.

"With this latest development, our customers can experience greater flexibility, energy savings, and most importantly, comfort," says Atesh Mani, National Product Manager at Mitsubishi Electric Australia. "Whether they're coming home to a cool environment or adjusting the settings while they're away, our air conditioners are now more connected than ever before."



What's next?

Next Cycle has launched in Australia, delivering what it says are energy-efficient solutions for sustainable heating, cooling, hot water and chilled water across residential, commercial and industrial applications.

Partnering at launch with Italian brand Maxa, Next Cycle stocks the Maxa i-290 series, which comes with a seven-year warranty.

The series is available in nine certified sizes in Australia: 2.1kW–11.27kW for domestic purposes and 17.4–22kW for commercial applications.

The Maxa i-290 and HWA2 series use R290 refrigerant, which has a global warming potential (GWP) of 3 and zero ozone depletion potential (ODP).

Next Cycle says Maxa R290 systems operate at a wide range of temperatures, depending on refrigerants and accessories.

Next Cycle is also offering Maxa Green Training, which it says will provide installers with the expertise to install and service Maxa products.

nextcycle.com.au



Selection perfection

Allvent Ventilation Products has announced the launch of its new Fan Selector Program, a digital tool designed to simplify and speed up the fan selection process for engineers, contractors, and consultants.

Allvent says the Fan Selector Program enables professionals to choose the

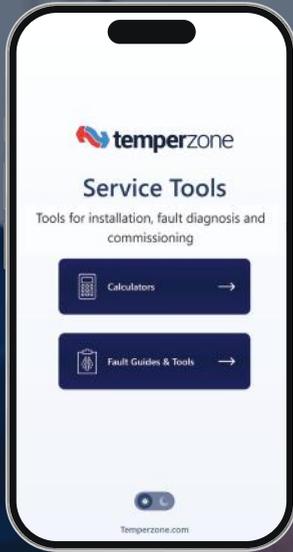
ideal fan based on key project parameters such as airflow, pressure, and system requirements. The program allows users to filter through an extensive range of fans – including axial, centrifugal, roof- and wall-mounted models – to find the best-fit solution for their needs.

According to Allvent, the key features of the program include:

- Quick and easy interface – select fans in seconds
- Wide product range – tailored for a variety of applications
- Instant downloads – access detailed specs and data sheets on demand
- Engineer-friendly design – built specifically for industry professionals.

allvent.com.au

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Capacity Calculator:
Calculate equipment duty to ascertain performance.



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AIRAH engineer register expands

The AIRAH Professional Engineer Register (APER) has expanded to Western Australia and gained renewed approval for five years in Queensland.

The APER is a professional accreditation scheme for engineers operating in the HVAC&R building services industry. It demonstrates to the public that an engineer is qualified, competent, and ethical.

The program's expansion means AIRAH is now approved as an assessment entity in four jurisdictions: Queensland, Victoria, the ACT and WA.

"AIRAH has strongly advocated for the introduction of professional registration regimes, and we are supporting them through the APER program – the only accreditation program solely focused on representing mechanical engineers working in HVAC&R building services," says AIRAH CEO Sami Zheng, Affil.AIRAH.

"We are delighted to confirm that the APER program is now available for engineers seeking professional registration in Western Australia, and renewed in Queensland."

airah.org.au



Rake steps down

Gary Rake has stepped down as CEO of the Australian Building Codes Board (ABCB).

Rake was appointed as ABCB CEO in March 2022 and oversaw the publication of the 2022 version of the National Construction Code (NCC), as well as the development of NCC 2025.

"I would like to openly and loudly say how grateful I am for the effort, commitment, and support of the people I've worked with over the past three-plus years at the Australian Building Codes Board," Rake wrote on LinkedIn.

The Department of Industry, Science and Resources has appointed Judith Blake as interim CEO of the ABCB while an open recruitment process is undertaken.

abcb.gov.au



Setting the foundation

The ARBS Foundation has announced the appointment of Dr Simon Bradwell, M.AIRAH, as its new chairman, replacing former chairman Ian Hopkins.

ARBS says that, with his industry experience, Bradwell is poised to contribute to the foundation's continued success.

ARBS says one of Bradwell's key priorities is to increase the foundation's visibility within the industry. He aims to strengthen relationships with key industry groups and believes that the foundation has much to learn about effectively communicating with its stakeholders, a common challenge faced by engineering-based organisations.

arbsfoundation.com.au



ncc.abc.gov.au

NCC amendment

The Australian Building Codes Board (ABCB) has published an amendment for the 2022 edition of the National Construction Code (NCC). The amendment, to be known as NCC 2022 Amendment 1, was adopted on May 1, 2025.

The amendment contains variations and additions for Western Australia (WA), a variation for Tasmania regarding Volume Two Part H8, and a few minor corrections. The impact on HVAC&R appears to be minimal.

According to the ABCB, the amendment makes necessary corrections to the NCC at a national level, while also providing additional compliance options for users of the NCC 2022 in WA.



RectorSealing the deal

RectorSeal Australia has announced a partnership with HVAC tool manufacturer NAVTEK Global.

NAVTEK has nearly 30 years of industry presence, with a portfolio including vacuum pumps, recovery units, tubing tools, and precision testing instruments. RectorSeal has begun stocking NAVTEK products in Australia.

"In today's landscape, where handling flammable refrigerants like A2, A2L, and A3 classes is becoming the norm, NAVTEK stands at the forefront with purpose-built solutions," RectorSeal says in a statement. "Their tools are designed and rigorously tested for compatibility with these refrigerants, supporting safe, efficient, and regulation-compliant service practices."

rectorseal.com.au



Hussmann and Refra team up

Hussmann has partnered with Refra to provide exclusive supply of natural refrigeration systems in Australia.

The companies say the collaboration will focus on transcritical CO₂ racks, chillers and R290 heat pump technologies. As part of the partnership, Hussmann says it aims to enhance its offerings in the realm of sustainable refrigeration by incorporating technologies that promote energy efficiency and environmental responsibility.

"We are excited to partner with Refra, a leader in refrigeration technology, to bring these advanced systems to Australia," says Vinney Kumar, Deputy MD, GM Australia & Business Development Director Hussmann Oceania.

hussmann.com.au



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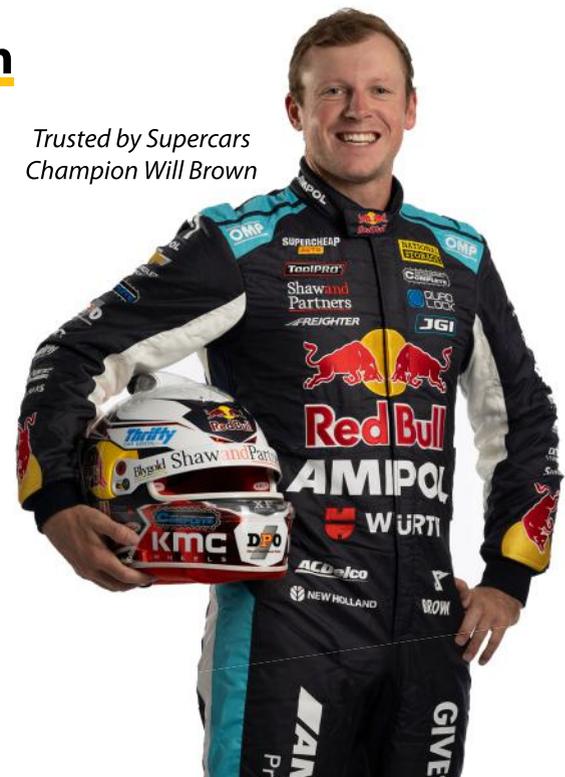


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A green light from voters

AIRAH has prepared a document outlining the Institute’s policy priorities for the freshly re-elected federal government.

As the Albanese government celebrates a strong election win and prepares for a second term with a clear majority, AIRAH says industry is eager to harness the momentum and make our country healthier, more sustainable, and more productive.

AIRAH CEO Sami Zheng, Affil.AIRAH, says her first response to the election result was relief.



But Zheng also warns that the Labor government cannot afford to rest on the strong election result.

“Australians have given government a mandate to keep working,” she says. “We expect to see great progress over the coming term.”

Healthier people, healthier planet

The first area Zheng points to is improving the wellbeing of building occupants, in particular by safeguarding indoor air quality.

“Improving indoor air quality is perhaps the greatest opportunity of our generation to lift the quality of life of all Australians,” she says. “We can improve people’s health and productivity, while also protecting the most vulnerable people in our society. We look forward to continuing the positive conversations we have had with the Albanese government and turning these into concrete actions.”

When it comes to addressing climate change, Zheng says the built environment is ready to play a leading role, with proven technologies and

strategies – unlike many hard to abate sectors. Through instruments such as the Sectoral Net Zero plan, Trajectory for Low Energy Buildings, expanded NABERS and CBD schemes, stronger policy on refrigerant gases, and ongoing funding for three-yearly revisions to the National Construction Code, she says Australians can have the buildings they deserve, without overburdening the environment.

“It is right that the housing crisis has been a focus throughout the election,” says Zheng. “But there is little value in building hundreds of thousands of new houses if they will not provide adequate living conditions in 10–20 years’ time. Australians need quantity *and* quality.”

Workforce priorities

To deliver these goals, Australia needs a strong and plentiful workforce. In the building and construction sector, that means more engineers and more trades.

“It all starts with expanding the pipeline of talent,” says Zheng. “In schools, we need to keep engaging all students with STEM subjects. We also need to recognise the value of vocational education and training, rather than treating it like the poor cousin to university. This requires a holistic, nuanced approach – free TAFE places is a good start, but this must be supported by investment in the facilities and in the educators.”

Overall, Zheng says Labor’s second term presents an opportunity.

“We are excited about working with the Albanese government to tackle the big issues facing Australians, and making a better world with HVAC&R.”

“Improving indoor air quality is perhaps the greatest opportunity of our generation to lift the quality of life of all Australians.”

Sami Zheng



“Our members were alarmed at some of the policies put forward by the opposition,” she says, “in particular the pursuit of nuclear power that would extend the use fossil fuels, and also the plan to freeze the National Construction Code for 10 years. The election results clearly show that Australians did not support these ideas.”



FEDERAL ELECTION 2025

Policy pointers for a healthy, sustainable, and productive Australia



AIRAH’s policy priorities

You can access and download AIRAH’s policy priorities document for free via the QR code.





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For more information on our products please visit mitsubishielectric.com.au or call 1300 280 625





AIRAH golf days

AIRAH holds annual golf days for members and industry professionals across Australia. These are more than just a day on the green – they’re one of the most enjoyable and relaxed ways to connect with fellow professionals in the HVAC&R industry.

“With such a great mix of competition and connection, golf days are a standout on our calendar,” AIRAH Events Officer Lukas Skaife says. “They’re a chance to take a break from the daily grind and enjoy the company of colleagues across the industry.”

For upcoming dates, sponsorship opportunities, and registration details, please contact the AIRAH events team at events@airah.org.au.

Have a swing!

Dates and locations for the remaining 2025 golf days are below:

NSW: Moore Park Golf Course – Friday, July 25

ACT: Gungahlin Lakes Golf Course – Friday, September 12

Victoria: Heidelberg Golf Course – Thursday, October 16

You can register for your local golf day by scanning the QR code.



For full details on award categories, eligibility criteria, submission requirements, visit awards.airah.org.au.

For any further enquiries, contact the AIRAH events team at awards@airah.org.au.

Nominations open for AIRAH apprentice awards in 6 states and territories

AIRAH’s state apprentice awards have expanded to cover: SA, Victoria, Queensland, WA, NSW and the NT.

In previous years, only AIRAH’s WA and SA divisions held dedicated apprentice awards. This year, the Institute has made it a priority to expand the program to cover the majority of Australian states and territories.

“The success of the apprentice awards in WA and SA over recent years has shown us just how important it is to highlight and applaud emerging young talent in our industry,” says AIRAH Events Officer Lukas Skaife, who runs the Institute’s state-based events. “We’re excited to expand the awards to recognise outstanding young HVAC&R professionals across Australia.”

The apprentice awards in each state will be held in conjunction with AIRAH member awards events. They celebrate the achievements of outstanding apprentices across the country and highlight the bright future of the industry.

“These events are a fantastic opportunity to recognise the next generation of HVAC&R talent,” Skaife says.

More than just an award

In an interview late last year, 2024 SA Apprentice of the Year Janamdeep Singh, Stud.AIRAH, told *HVAC&R News* he was thankful that the industry is always looking out for and supporting emerging young technicians, no matter what their background.

“It is a dream come true to reach this milestone in front of renowned HVAC&R industry professionals and experts,” Singh said. “With big achievements come big responsibilities; I have to always keep up this level of tidy and high-quality workmanship.”

“The major thing that comes with these awards for me is the thought and trust that, no matter what race, religion or culture you are from, the Australian HVAC&R industry will always recognise you for your good work and provide you equal opportunities. This has boosted my motivation.”

Save the date

- › **WA Member and Apprentice awards** – Wednesday, September 10, 12–3pm
- › **NSW Member and Apprentice awards** – Thursday, September 18, 7–10pm
- › **QLD Member and Apprentice awards** – Thursday, October 2, 7–10pm
- › **NT Member and Apprentice awards** – Thursday, October 9, 7–10pm
- › **VIC Member and Apprentice awards** – Thursday, October 30, 7–10pm
- › **SA Member and Apprentice awards** – Wednesday, November 5, 7–10pm

“It is a dream come true to reach this milestone in front of renowned HVAC&R industry professionals and experts.”

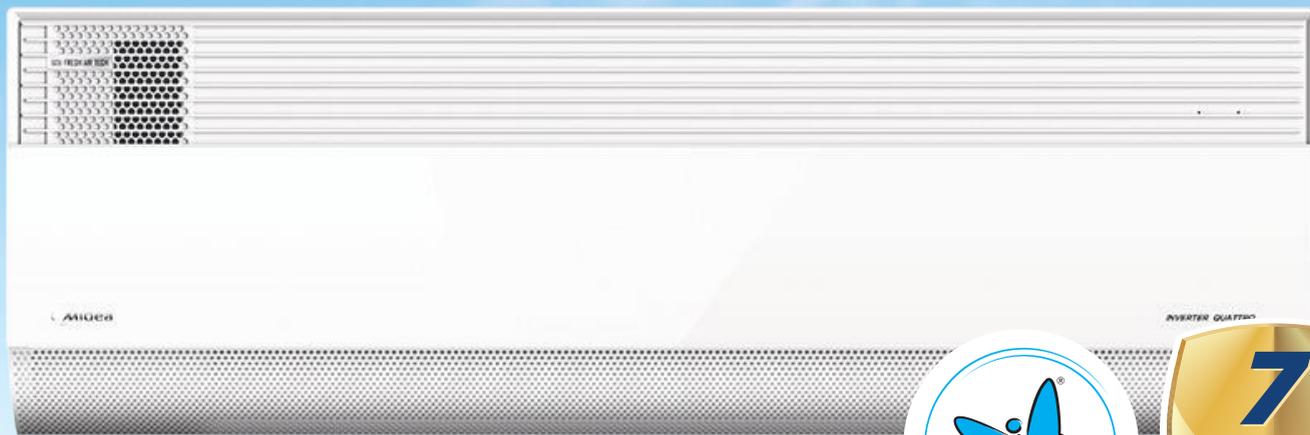


2024 SA
Apprentice of the Year
Janamdeep Singh, Stud.AIRAH

Submit a nomination

Nominations for all state apprentice awards – and AIRAH’s national awards – are open until Friday, July 18. To submit a nomination, scan the QR code.



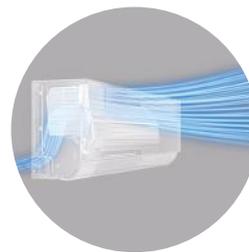



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In Silence mode, the A/C can operate as low as 19.3dB (Example: Breathing).

*The test conducted at Intertek Testing Services Shenzhen Ltd., in 30.0m³/h air flow with DEHS Aerosol, report No. 230504050GZU-001. **The data is tested by Midea Laboratory, and based on the maximal fresh air volume 60m³/h with the room size of 20 square metres and 3 metres high. The product is equipped with 30m³/h fresh air as standard, while the maximum air flow can reach to 60m³/h if the hole is enlarged and the chamber is expanded in A/C installation. ***Self-cleaning mode reduces coil-trapped bacteria by 99.9% after 2 cleaning cycles, tested by UL Solutions (No. A802784). Visit <http://verify.ul.com> for further details.

ARC reports licensing growth

The Australian Refrigeration Council (ARC) reports that its licensing scheme is attracting record numbers, while also engaging consumers.

The ARC says the boost in its ARCTick licensing program reflects the sector's expanding workforce and increasing industry profile.

In the 2023–24 financial year, the ARC recorded a net increase of over 12,618 permits, comprising 10,692 individual refrigerant handling licences (RHLs) and 1,926 business-related refrigerant trading authorisations (RTAs).

Good times ahead?

The ARC says recent data suggests the industry is on track for a strong year in 2024–25, with projections exceeding 12,000 new licences and business registrations. The ARC estimates over 65% of new refrigerant handling licence holders this year are under the age of 35, which it says highlights a declining average age across the licensed workforce and suggests a promising industry future.

ARC CEO Glenn Evans describes the growth as a strong indicator of the industry's promising future. He says it's encouraging to see more professionals entering a field that plays such a vital role in sustainability, safety, and innovation.

"It's great to see industry numbers growing every day, with the new generation joining the climate change sector," Evans says. "The profile of our industry is growing at an accelerated rate."

The ARC says this consistent increase in qualified professionals and businesses not only reflects a healthy and expanding RAC industry, but also underscores the importance of preventing emissions of refrigerants while working on RAC equipment as part of Australia's transition to a net-zero future.

Consumer checks surging

The ARC says its 2024–25 summer campaign has shown a significant increase in consumer engagement with the ARCTick scheme.

According to the ARC, website visits surpassed 136,000 – an increase of 62.66% from the previous year. Licence checks also jumped by 58.75%, with nearly 13,000 checks completed so far in 2025.

"Licensed technicians ensure quality service and help prevent risks like substandard workmanship and refrigerant leakage, both of which pose risks to consumers and the environment."



ARC CEO Glenn Evans

Additional campaign highlights include:

- › Business directory searches: over 18,500
- › Free AC guide downloads: over 13,000

The ARC says these results underscore the growing public recognition of ARCTick licensed professionals and the importance of turning to trusted, certified businesses.

"The increase in website visits and license checks shows growing consumer awareness of the importance of choosing licensed professionals," Evans says.

"Licensed technicians ensure quality service and help prevent risks like substandard workmanship and refrigerant leakage, both of which pose risks to consumers and the environment."

"We're proud of the success of the 'Look for The Tick' campaign in empowering consumers to make informed choices and connect with trusted, certified businesses and professionals."

New research into RE170

A new study from Jaume I University in Spain has looked into the potential effectiveness of dimethyl ether (RE170) as a refrigerant.

The study evaluated the effectiveness of RE170 as a refrigerant both in its pure form and in 11 various blends with R600 (isobutane) and R744 (CO₂). RE170 is considered a natural refrigerant and has a global warming potential (GWP) of 1 and an ozone depletion potential (ODP) of 0.

The researchers were investigating whether RE170 or any of its blends could be used as an alternative to propane (R290). To do this, the researchers performed a theoretical evaluation of refrigerant options before conducting

practical experiments over three phases: a drop-in test with a compressor running at a fixed speed of 2,100rpm and an inlet temperature of 30.0°C, a fixed cooling capacity test, and a fixed heating capacity test.

Overall, the researchers found that RE170 offered a better coefficient of performance (COP) than R290, but had a reduced heating and cooling capacity in both refrigeration and heat pump applications. For refrigeration, RE170 showed a COP improvement of 29.8% against R290, with a 17.3% reduction in capacity. For heat pumps there was a 17.99% improvement in COP but a 24.7% reduction in capacity.

Based on the results of the experiments, the researchers determined that pure RE170 would be the best alternative to R290, with some blends being more appropriate in situations where compressor size or speed is a limiting factor.



Read the study

To read the full research paper from the *International Journal of Refrigeration* website, scan the QR code.





Handling refrigerants during maintenance

MODULE 164

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WHAT'S IT ABOUT?

This skills workshop outlines procedures for safely handling refrigerant while maintaining HVAC&R systems other than self-contained low-charge systems.

WHO'S IT FOR?

Relevant for technicians involved in the maintenance and repair of larger HVAC&R systems.

This skills workshop, taken from the 2025 edition of the *Australia and New Zealand Refrigerant Handling Codes of Practice*, provides technicians with guidelines for safely maintaining HVAC&R systems other than low-charge self-contained systems.

Technicians have the opportunity to reduce leakage when servicing or maintaining systems. Conversely, poor service and maintenance will increase the risk of leakage occurring.

General

Technicians handling equipment containing a scheduled refrigerant **must** be competent (i.e. suitably qualified and holding a relevant national licence where required).

Scheduled refrigerant **must not** be discharged to atmosphere. All scheduled refrigerants **must** be recovered and either recycled, reclaimed, or held for destruction in an approved manner.

If the technician doubts the integrity of the system due to leakage rate and charging history, it **must not** be recharged until appropriate repairs and leak testing have been undertaken.

Having identified and located a leak, that part of the system **must** be isolated to minimise the loss of refrigerant. All remaining refrigerant **must** be pumped back into the system receiver or recovered to a separate cylinder if isolation is impractical, after which the repair can be undertaken.

The cylinders designated for the recovery of scheduled refrigerants **should not** be used for recovery of any other refrigerants.

Technicians **should** always read and understand the instructions and advice of the manufacturers and suppliers of all equipment, and apply as relevant and appropriate.

Refrigerant type

A technician **should** be aware of the possibility that the system may have been incorrectly charged or incorrectly labelled.

Before working on an unfamiliar system the technician **should** first establish the type of refrigerant contained in the system, by checking the pressure/temperature relationship or by using a refrigerant analyser or other methods, and verify that the labelling is correct.

Any refrigerant that cannot be identified **must not** be vented from the system.

If identification of the refrigerant is not possible it **should** be treated as a flammable refrigerant.

Flammable scheduled refrigerant

When working on appliances containing flammable scheduled refrigerant, instructions conforming to the requirements of AS/NZS 60335.2.40: Annex DD **must** be adhered to.

Manufacturers and suppliers include additional safety information in the operation and maintenance manuals for RAC equipment using a flammable refrigerant. Technicians **should** always read and understand the instructions and advice of the manufacturers and suppliers of all equipment, and apply as relevant and appropriate. Tools and equipment **must** be rated for use with the appropriate flammability grade (2 or 2L).

For flammable refrigerants, if a leak is suspected, all sources of ignition and naked flames **must** be removed/extinguished.

Before beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised. Ensure that the area is in the open air or that it is adequately ventilated before breaking into the system or conducting any hot work. Any mechanical ventilation utilised **should** be suitable for use in a potentially hazardous environment. Electrical devices, leads or ignition sources in the vicinity **should not** be energised, unless rated for hazardous environments.

For more information, refer to the flammable refrigerant resources mentioned in the preface of this code.

Maintenance

Preventative maintenance

Regular leak tests, inspections and checking of the safety equipment **should** be carried out.

The system instruction manual (see AS/NZS 5149.2) **must** include the maintenance instructions for the entire system with a time schedule for preventive maintenance with respect to leakage.

AS/NZS 5149.4 requires that preventive maintenance be carried out in accordance with the system instruction manual.





Inspection

All systems **should** be regularly inspected in accordance with AS/NZS 5149.4, *Section 5.2 Maintenance* and AIRAH I DA19 – *HVAC&R maintenance – Compliance level maintenance*.

The general operating conditions **should** be checked once a week, including system pressures where readings are displayed, refrigerant sight glass, etc. The condition of condensing equipment **should** be checked once a week. For air-cooled equipment, the condition of the condenser coil **should** be observed.

A regular inspection program **should** ensure that the protection offered by the sacrificial anode or other protection where fitted is maintained and that the heat exchangers stay clean and scale-free.

In-service leakage inspection

Including in-service leak inspections as part of a preventative maintenance program allows the technician to find and fix small leaks before they lead to complete loss of refrigerant charge.

The in-service leak inspection is carried out with the refrigerant in place and the system operating as normal.

“Inspected for leakage” means that the equipment or system is examined primarily for leakage using direct or indirect measuring methods, focusing on those parts of the equipment or system most likely to leak.

For an in-service leakage inspection, the technician **should** complete:

1. a visual inspection of the system
2. a diagnostic analysis of the system operating parameters
3. a leak inspection of the system, including common leakage points.

Visual inspection

The technician **should** review the maintenance records to check where leaks have been found previously. The technician **should** complete

a visual inspection of the operating system including, but not limited to, identifying any:

- › visible oil or dust stains on joints, components or insulation
- › movement or stresses due to vibration or thermal expansion
- › signs of corrosion, thermal stress, wear or metal to metal contact points
- › unusual level of noise or vibration from the system.

Diagnostic analysis

The technician **should** assess the system/ refrigerant operating temperatures and pressures and compare against the manufacturer’s data and operation instructions to determine whether the refrigerant charge is low.

For systems with fixed-speed compressors, measuring pressure readings coupled with air and refrigerant temperatures allows technicians to assess charge levels against manufacturer data.

For systems with variable speed compressors, diagnostic analysis can involve running the system at maximum output and measuring temperature difference (ΔT) across the heat exchanger at steady state or measuring delivered capacity, which requires measuring ΔT (heating), ΔH (cooling) and airflow.

Some systems have on-board diagnostics for automatic leak detection.

Where diagnostic analysis indicates a low refrigerant charge, a leak tightness test **must** be performed.

Leak inspection

Various methods may be used for leak inspection, e.g. electronic leak detectors, ultrasonic leak detectors, proprietary leak detection spray, or ultraviolet fluorescent additives. Electronic leak detectors **must** be specific to the refrigerant type; see Clause 4.9.3.

- › Using a leak detector, assess all joints and components on the system for leakage, with a focus on common leakage points and any areas identified in the visual survey
- › Follow the leak detector manufacturer’s instruction for leak detection
- › The results of the in-service inspection **should** be recorded.

Where a leak is detected, all refrigerant **must** be removed from the system or affected section, and the leak repaired.

Where a leak is suspected but not detected, all refrigerant **must** be removed, and the system (or affected section) **must** be leak tightness tested.

Common leakage points

The following areas **should** be individually assessed with a leak detector:

- › joints – flare joints, mechanical joints and flanges, brazed joints, catalyst cured joints
- › valves – Schrader valves, service valves, manual valves, pressure relief valves/ devices, expansion valves, line tap valves
- › evaporators and condensers – corroded areas, return bends, valves and joints
- › seals – shaft seals (open compressor), compressor gaskets, seals on replaceable driers and filters, seals on gauge points, seals on caps
- › other – capillary tubes, control bellows, O rings and pressure switches.

Access valves **should** have their caps refitted.

Testing the low-pressure side

The low-pressure side of a system **must** be placed under positive pressure before leak testing the evaporator, heat exchanger, expansion valve, solenoid valve, and other components.

Pressure build up in the low-pressure side of the system **must not** exceed the maximum design conditions during testing.

Testing negative pressure systems

Negative pressure systems can, if not controlled correctly during testing, burst the rupture disc.

The test pressure **must** comply with AS/NZS 5149.1 when leak testing.

Tube-piercing valves or equivalent devices **must** only be used to gain temporary access to the system where there is no other means of access in order to remove refrigerant. They **must** be removed prior to the completion of service.

The technician **should** ensure that the condenser is clean and serviceable.

If the system has electric defrost, the compressor **should** be switched off and the defrost cycle initiated without pumping down the system to increase the system pressure.

PULL OUT

SYSTEM TYPE/REFRIGERANT CHARGE	LEAK INSPECTION FREQUENCY
Self-contained systems, unit systems	After repair or when leakage is suspected
Hermetic systems ≤ 6kg refrigerant charge	Every 12 months
All other systems ≤ 3kg refrigerant charge	After repair or when leakage is suspected
All other systems > 3kg ≤ 30kg refrigerant charge	Every 12 months
All other systems > 30kg ≤ 300kg refrigerant charge	Every 6 months
All other systems > 300kg refrigerant charge	Every 3 months
Stored refrigerant in cylinders	Every 3 months

AS/NZS 5149.4 Recommended in-service leak inspection frequency

REFRIGERANT TYPE	REFRIGERANT CHARGE (TONNES CO ₂ e OR KG REFRIGERANT)	LEAK INSPECTION FREQUENCY (MONTHS)	
		No fixed leak deflection	With fixed leak detection
HFC and HFC/HFO blends	5t CO ₂ e ≤ refrigerant charge < 50t CO ₂ e	12	24
	50t CO ₂ e ≤ refrigerant charge < 500t CO ₂ e	6	12
	refrigerant charge ≥ 500t CO ₂ e	3	6
HFO	1kg ≤ refrigerant charge < 10kg	12	24
	10kg ≤ refrigerant charge < 100kg	6	12
	refrigerant charge ≥ 100kg	3	6

European Union (EU) F-Gas regulation – Leak inspection frequency

The charging and/or temporary gauge lines and connecting lines and/or flexible hose **should** be evacuated using a vacuum pump to less than 5,000 microns to eliminate air intake.

Leakage inspection frequency

Mandatory leak inspection frequency

AS/NZS 5149.4 requires that each refrigerating system be subjected to preventive maintenance with respect to leakage in accordance with the system instruction manual, including the frequency of in-service leakage inspections.

Recommended leak inspection frequency

In the absence of instructions in the operating manual, the recommended frequency of in-service leakage inspections of AS/NZS 5149.4 **should** be followed.

Best practice leakage inspection frequency

The best practice approach to in-service leakage inspections is currently reflected in the European Union (EU) F-Gas regulations, where the frequency is based on tonnes of CO₂ equivalent of the refrigerant charge, and whether a fixed refrigerant leak detection system is fitted.

The tonnes of CO₂ equivalent (tCO₂e) of a refrigerant charge is calculated by multiplying the mass of refrigerant charge in tonnes by the global warming potential (GWP) of that refrigerant.

The EU regulations also mandate inspection frequencies for HFO refrigerants, based on refrigerant charge mass.



Shutdown systems

In preparation for seasonal shutdown, it is recommended that the system be pumped down and the bulk of the refrigerant charge be valved off in the condenser.

Systems equipped with an open-type compressor that have been shut down for periods longer than a month **should** be treated as follows.

Positive pressure systems

For systems with separate oil pumps, these pumps **should** be run at least once a month.

On systems where a separate oil pump is not fitted, the shaft **should** be rotated at least once a week to ensure the seal is kept lubricated.

If a system is to be shut down for more than one month the system **should** be:

1. pumped down
2. all necessary valves closed to prevent the escape of refrigerant
3. suitably labelled.

If this is not possible, the system **should** be run once a week for at least half an hour in order to ensure that mechanical seal faces, bearings, etc. have a continuous oil film on their surfaces. This procedure could prevent seal failure occurring over a long period of shutdown.

If, after any shut down period of more than one month:

- › the oil pump has not been run, or
- › on compressors with no oil pump, if the shaft has not been rotated periodically, the shaft seal **must** be thoroughly inspected, lubricated and leak tested before starting any maintenance.

Negative pressure systems

Negative pressure systems can be under a vacuum and could draw in air and moisture both while operating and when they are off.

A method of pressurising the system and controlling the pressure to between 0.3kPa and 2.0kPa gauge **should** be implemented when the system would otherwise equilibrate at a vacuum when not operating.

Once a week the compressor **should** be stopped and the shaft seal checked for excessive oil leakage.

The seal **must** be checked with a refrigerant leak detector if oil leakage is found, opening the compressor only.

This minimises the quantity of refrigerant that might be lost due to any minor leak on the low-pressure side of the system and refrigerant that might leak through the shaft seal.

The compressor **should not** be allowed to pump the suction pressure into a vacuum.

A slight positive pressure is necessary to prevent air and moisture from being drawn into the system through minor leaks and through the now unmoving shaft seal.

Seasonal start-up

The compressor oil line sight glass, oil pressure and liquid line sight glass **should** be checked upon seasonal startup, after the system has been operating for 15 to 20 minutes.

The condenser and liquid receiver (if used) **must** be checked for refrigerant leaks using a refrigerant leak detector.

The system temperature controller **should** be readjusted to the proper temperature setting if no leakage is confirmed.

This month's skills workshop is taken from the 2025 edition of the *Australia and New Zealand Refrigerant Handling Code of Practice, part 2: Systems other than self-contained low charge systems.*



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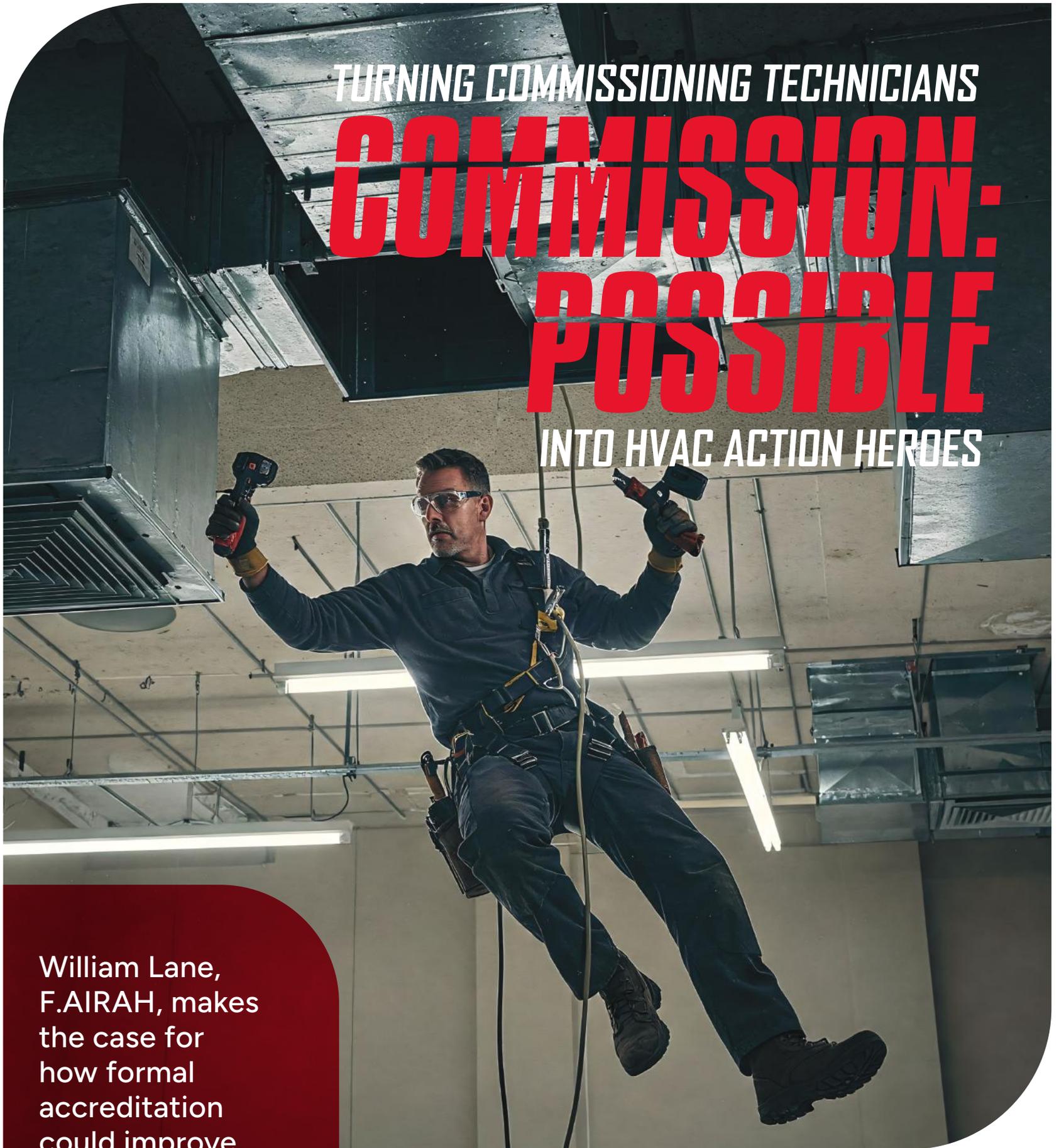


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TURNING COMMISSIONING TECHNICIANS

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INTO HVAC ACTION HEROES



William Lane, F.AIRAH, makes the case for how formal accreditation could improve commissioning practices across Australia's HVAC and building services sectors.

In the HVAC sector, it's important that we don't just think about air conditioning and ventilation systems in isolation, but instead take a holistic approach towards building wellness. This means considering factors like indoor air quality (IAQ), energy savings, and any other adjustments that can affect the working environment of the occupant in relation to overall building wellness.

With this in mind, I'm glad that AIRAH now has Special Technical Groups in fields such

as IAQ, electrification, building physics, and of course commissioning. I'm also glad to see organisations such as the Testing and Commissioning Association (TACA) doing good work in this area. But I feel that the next step for improving HVAC commissioning in Australia is the establishment of formal – and mandatory – accreditation for multi-skilled commissioning technicians who oversee projects from start to finish.

What is commissioning?

Let's start by defining a term that I believe to be widely misunderstood within the industry: commissioning.

The U.S. Department of Energy defines HVAC commissioning as "the process of thoroughly verifying and proving that building systems are installed and operating according to the criteria in the original design and engineering documentation."

The practical aim of HVAC commissioning is maintaining a suitable indoor comfort zone while minimising operating costs. Many people consider comfort to be largely subjective and influenced by bodily sensations, temperature, thermal radiation, sound, lighting, and smells. However, there are established industry guidelines for temperature, humidity and air velocities, which are generally applied during the commissioning process. For HVAC systems, the golden zone is 21–24°C at 40–60% relative humidity.

In practice, even the most sophisticated control system cannot always achieve an ideal comfort zone. But while "ideal" and "always" are impossible goals, there are certain things within our control.

Designing a system well will improve outcomes. Commissioning it well will improve outcomes further. And tuning it will make even greater improvements. But miss one step or use unqualified people and it can all fall apart.

The role of the commissioning expert is to help optimise the system in accordance with the design intent of the overall building. As such, the end result is largely dependent on the commissioning technician's level of expertise.

Commissioning should only be performed by a competent technician. However, at present there is no legal requirement for any specialist training in commissioning, and no mandatory accreditation process.

We'll take a look at how formal accreditation might work later on in the article. But first let's look at some of the problems that need to be addressed.



Problems galore

Over the years, I have been trying to raise awareness of the importance of the commissioning process associated with the installation of HVAC systems. In doing so, I have encountered a great deal of resistance.

I believe a major source of this resistance comes from a general lack of understanding of the commissioning process, or at least the failure to acknowledge its importance and the value it offers. Another major factor is that contractors often don't budget or free up finances for HVAC systems until the end of construction projects, instead prioritising what they consider to be more important or pressing needs. This means HVAC is often "tacked on" at the end of the build, an approach that inevitably creates problems and leads to systems that are not properly designed or adjusted for how they will be used.

Think of it like this: you've just bought an expensive new sports car with an engine that contains only top-of-the-line, high-performance parts. However, once you take the car home, you realise that none of those parts have been properly tuned to achieve their performance capabilities. You then discover that tuning them would cost you a lot of time and money on top of the huge sum you've already paid for the car. You'd be furious, wouldn't you?

A building is much the same. It's imperative that the correct timeframe and funding are made available at the beginning of the project – and that this is professionally managed – to ensure that the end product is what the client actually ordered. This can be challenging when the contractor is running short on funds towards the end of a project, especially if they're trying to cut costs for the sake of profitability.

As it stands

At present, there are several independent commissioning companies that fill a significant void within the industry. Instead of training their own technicians in commissioning, many companies outsource this responsibility to one of those independent companies.

At best, they do this to access expert services as and when needed. At worst, it's simply an exercise in cutting costs.

The problem is that you don't always get the level of skill, knowledge and accountability you're looking for when you outsource. Let's look at an example of the impact a commissioning technician can have on a facility.

When measuring airflow, we develop factors to correct the reading of the instrumentation used. There are processes to calculate this value, and if they're not applied correctly, it can significantly impact the effectiveness and efficiency of the system.

An untrained commissioning consultant might apply a factor of 1.1 to a toilet exhaust grille when they should have used a factor of 0.8. In this example, the factors look similar enough, but the result is a 37.5% difference in airflow rate, which can mean a huge difference in performance. This mistake can cause

discomfort, increase energy consumption, and can even create other issues as it compounds, including rushing noises from the additional airflow.

In some cases, consultants insist that an independent balancing company with no affiliation to the manufacturer or mechanical contractor must be used to remove any doubt about the accuracy of their readings. Situations like this can quickly add to the complexity and cost of a project.

As technology changes, so must we review our methodologies and working practices. We need expert commissioning personnel to accept responsibility for the works performed and sign off on those that have been performed correctly. It's time to take responsibility and show that we are serious about our credibility by signing our work off directly.



The answer: accredited commissioning technicians

I believe the industry needs to formally train and accredit commissioning technicians to understand the original design intent of HVAC systems as laid out by the design engineer. Training, licensing and registering commissioning technicians is the best way to avoid the problems we've discussed above.

These commissioning technicians would be multi-skilled and accredited in a diverse range of relevant fields. Below is a summary of their objectives and responsibilities:

Objectives:

- › Confirm that the design intent has been achieved
- › Achieve a predictable return on investment (ROI) for the owner
- › Ensure that each individual item of equipment – whether automated or not – operates as required
- › Confirm that each individual item of equipment is correctly integrated into the building management system.

Responsibilities:

- › Test and verify the performance of equipment against the design criteria
- › Adjust and calibrate equipment to achieve the design intent
- › Ensure that the system is working in the manner for which it was designed
- › Record all readings for future reference.



Components of accreditation

The commissioning technician should be suitably skilled, with a level of accreditation that matches their skillset and experience. I propose that accreditation in commissioning should involve the 13 areas of expertise outlined below:

1) Refrigeration: Components, lubricants, refrigerant types, refrigerant transfer, leak testing, recovery and recycling, evacuation, charging, welding, electrical and controls, defrost timers.	2) Controls: Electrical – wiring diagrams and schematics, electronic, pneumatic, measuring devices used, electromagnetism and inductance.	3) Electrical: Ohm's law, inductance and capacitors in HVAC systems, overload protection devices, transformers, motor start and variable speed controllers, wiring diagrams and schematics.
4) Plumbing: The installation of HVAC components, welding, gas, water, steam.	5) Air balancing: Methodology used (ratio, proportional), variable speed controllers, understanding HVAC components.	6) Water balancing: Methodology used (ratio, proportional), variable speed controllers, understanding HVAC components.
7) Psychrometrics: Understanding psychrometrics – properties of air, effects of humidity.	8) System components: Understanding all system components that are used in HVAC systems, where and why they should be used.	9) Steam: Properties of steam, safety when using steam.
10) Worksite and personal safety: Understanding the components that you are working with and the risks to personal safety.	11) Customer communication: Liaison with the customer, communicating clearly and respectfully, managing budgeting and customer expectations.	12) Documentation of results: Ensuring that results are true and accurate.
13) Test instrumentation: Understanding the accuracy of the test instrumentation, when and where to use.		

The levels of accreditation would consist of various combinations of these units of competency. I propose four levels of accreditation for commissioning technicians. This would provide easily recognised and uniform standards for the industry, thus improving the overall quality of HVAC commissioning in Australia:

Level 1: Basic entry (items 5, 6, 10 & 13)	Level 2: Service technician (items 1, 3, 5, 6, 8, 10 & 13)
Level 3: Senior technician level 1 (1–10, 12 & 13)	Level 4: Senior technician level 2 (1–13)

Table 1: Author's proposed classification of technicians based on required technical experience.

Proposed classification	Technical category (refer to above list)												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Level 1: Basic entry					✓	✓				✓			✓
Level 2: Service technician	✓		✓					✓		✓			✓
Level 3: Senior technician level 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Level 4: Senior technician level 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Continuing improvement

To achieve these goals, all those working in the industry should undertake additional training and certification. I believe we need mandatory ongoing education for each level of accreditation to ensure that technicians keep up to date with the latest industry innovations. For example, this might involve 12 hours of continuing professional development (CPD) activities over a two-year period.

Implementing a CPD requirement would ensure that technicians' knowledge continually develops. This would also create a clearer and more stable career path for commissioning professionals.

I have long argued that establishing this career path for commissioning technicians is necessary. These professionals are often forgotten about in between projects, but having someone with the skills and experience to see a project to completion and ensure that HVAC systems are performing as designed should be a top priority for all employers in the industry.

AIRAH has shown that it is serious about the importance of HVAC commissioning. Now I'd like to see the Institute go one step further and push for formalised accreditation in this sector.



About the author

William Lane, F.AIRAH, began his career as a plumber before moving into HVAC&R, eventually running his own company as a commissioning technician. He has been an active member of AIRAH since 1987, achieved fellow membership status, and was honoured in AIRAH's 100 Faces project in 2020, having also received a Master Plumbers award in 2010. One of William's greatest honours is coordinating the AIRAH Legends group, where long-serving members gather to socialise and share knowledge.

The pair coil problem



Unexplained corrosion in pair coil has caused pinhole leaks, affecting system performance and releasing refrigerant gases.

Note: This is an AI-generated image intended to illustrate the problem. It is not a literal representation of corroded pair coil.



Louise Belfield
CONTRIBUTING AUTHOR

Around 2020, fridgies across Australia began reporting unusual leaks in the pair coil within air conditioning systems they had installed. Fixing these problems has proven costly, but should the technicians be the ones to pay the piper?

Pair coil is a type of copper piping with insulation on the outside that is commonly used in air conditioning. In recent years, installers of this type of piping have been called back to jobs by unhappy customers and finding small pinhole leaks in stretches of pipe where you wouldn't normally expect them. Pipes have been corroding, systems have stopped working properly, and refrigerant has escaped to the atmosphere in what appears to be classic cases of corrosion known as "ant nesting".

Installers have been called out to make repairs and have literally had to pay the price. But opinion is divided as to where the blame lies.

Fridgies passed on their concerns to their suppliers, then the Australian Refrigeration Council (ARC). Ultimately, the Department of Climate Change, Energy, the Environment and Water (DCCEEW) investigated the complaints and determined through a steering committee that the key issue was how the pipework had been installed.

According to the DCCEEW investigation, if the ends of the pair coil were not sealed properly and the bends were not done carefully, this could lead to moisture gathering between the insulation and the pipework, leading to corrosion. Wholesalers claimed they had tested the pair coil and found that it was okay. Contractors did not all agree.

Leaking at the coal face

It's all been a bit of a nightmare for Daniel Nigro, a fridgie of some 12 years and director of All Round Heating & Cooling in metropolitan Melbourne.

According to Nigro, the issue first reared its ugly head in 2022, with the ant nesting occurring between bends. Since then he's had another 24 cases, but says they have been less frequent of late. Like many others in his field, he associates the problem with the COVID-19 pandemic.

"I have been working with pair coils from day one and never had any issues pre-COVID," Nigro says. "Something changed around then. Pipes started corroding, with small pinholes that you can't see, and this generally happens when moisture pools in low points or where there is a bend in the pipe.

"The pipe turns a green purple, generally within two years of the install date. I've had a job where it happened within three months."

Nigro found using cable ties to seal ends has helped, but like other fridgies, the cost of rectifying the leaks has fallen to him.

"I'm bearing the cost labour wise, but luckily I have a branch manager who has been very supportive in helping me out where he can."

In addition to cable-tying the ends of all installations, Nigro also siliconed the

insulation on all ducted jobs where moisture can pool on the U-bend, and he hasn't noticed any issue since.

"It's been very time consuming," he says. "There's also a lot of paperwork to do to fix these issues. I write everything down just in case any class actions do occur. And it's been very frustrating trying to explain this to customers."

Common concerns

Many other installers echo Nigro's comments, voicing their opinions loudly on the "Crappy Refrigeration" Facebook page.

One says he has also been dealing with the problem since 2020, having had to rectify "well over 50 cases now and still going".

Another fridgie reported 16 cases over the past two years, generally about a year after installation. He no longer uses white insulated pair coil because of this. "It has cost thousands to rectify and no one has any answers or accepts liability for this," he says.

In his opinion, it is the insulation that is causing the issue. Even after joining new pipe, "pinholes on the liquid line and green corrosion" occurred just 12 months later, with the insulation then resembling jelly, he says. "There was possibly something they couldn't get through COVID so they substituted it with something else."



Degradation of the insulation surrounding pair coil is another common problem.

Another installer observes: "It always [occurs] in the same spot [in a bend at rear of outdoor unit]. It's a massive issue."

"All leaks are on the liquid line and not related at all to poor installation practices. I suspect poor quality copper imported through COVID. [I am told] there are only a handful of cases throughout Australia, but my fear is that many companies are yet to find their failed copper runs."

Another company reports having its first issue with this on an install done almost five years ago. "The copper split. A tech [from a major company] claims this is happening very frequently and says it's not due to poor installation but the quality of pair coil."



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Causes of corrosion

Martin Lynch, Affil.AIRAH, is a former mining professional who has managed a renewable energy business for the past 15 years. He is currently undertaking a PhD at the University of Queensland focusing on substitutes for copper.

Lynch notes that pinpointing the chemical reactions behind the ant nesting issue is key to working out who or what is at fault.

“The first thing to do is determine what type of corrosion is happening,” Lynch says.

“There have been some suggestions that formicary corrosion is the problem, but this is a type of corrosion that occurs when a copper pipe is exposed to the air, and airborne chemicals – such as wood smoke or fumes from cleaning fluids – collect on the pipe surface. In the presence of water and oxygen these chemicals break down to formic or acetic acid, and they eat into the pipe. But as these cases of corroded sections of pipe are not exposed to the air, it is very unlikely to be formicary corrosion.”

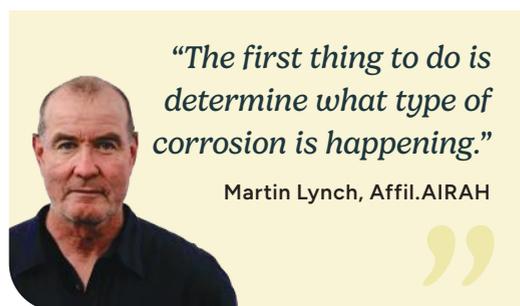
Lynch suggests that the problem is also probably not due to internal corrosion – which can be caused by refrigerant breaking down in the presence of moisture to form hydrofluoric acid – because the first-hand observations all say that the corrosion is forming on the outside of the pipe. This, then, suggests that it is general pitting, he says.

“This (pitting) occurs when the surface of the metal comes into contact with a mixture of water and (most often) chlorine compounds. Together these can form hydrochloric acid, and that will eat through copper pipe. The speed at which this occurs varies with the concentration of the acid. It can sometimes occur in a matter of months.

“And since the cause of the corrosion seems not to be clearly established at the moment, one place to look is at the composition of the inner surface of the insulation,” Lynch says.

“The question then needs to be asked: has there been a change such that, in the presence of water, there are chlorine compounds, or other potentially corrosive chemicals being released from the insulation when that wasn’t the case before?”

“In the meantime, preventing any water ingress between the pipe and the insulation seems like a good preventive measure. This is really good.”



Costly corrosion

Corrosion is a leading cause of refrigerant leaks, leading to costly call-backs and threatening the environment as refrigerant is exposed to the atmosphere.

The two most common forms of external corrosion in the HVAC&R industry are pitting and formicary corrosion. These can occur anytime from a few weeks to one to four years after installation. Identifying the type of corrosion is the first step to determining the cause of a problem such as the one reported in pair coil.

General pitting

General pitting is caused by aggressive anion (negative ion) attack on copper tube, which is an abundant source of cations (positive ions).

Large pits resembling bite marks characterise general pitting. These will eventually break through to the inside of the tubing and create leaks. Chlorides are the most common cause.

Formicary corrosion (“ant nesting”)

The word “formicary” stems from the French word for ants, which would build nests on warm copper pipes that were out in the open and exposed to rain.

Martin Lynch, Affil.AIRAH, says ants produce formic acid, which, when it comes into contact with copper, can eat



into the pipe if it’s in the presence of water and oxygen.

Formicary corrosion occurs on the outside surface of copper pipes, not on the inside. These days, it is more likely to be caused by man-made chemicals rather than ants. Fumes from cleaning agents or cosmetics – as well as smoke-borne chemicals – can generate formic acid when they come into contact with copper pipe.

“These chemicals can degrade and form acids. If they form formic acid or acetic acid, then there could be a problem,” Lynch says.

“If the pipe is dry, nothing will happen. But if its wet – such as when airborne moisture condenses on the copper pipes of an air conditioner – then the ground is laid for formicary corrosion.

“So, the essential ingredients for formicary corrosion are chemicals floating around in the air, copper pipe exposed to that air, and moisture condensing on the pipes.”

DCCEEW findings

In 2023, the DCCEEW convened two advisory group workshops with industry peak bodies including suppliers, installers, and other experts on the concerns of leaking pair coil. The ACCC attended the advisory group to highlight the rights of technicians as consumers.

The DCCEEW also conducted an industry survey on pair coil issues, including questions on pair coil brand and specific issues observed. The survey results showed technicians had concerns with a range of different types of pair coil on the market, with no one brand or style of pair coil identified as more at fault.

Following the workshops, the advisory group recommended that pair coil issues were deemed to be a contractual issue best raised with the manufacturer of the pair coil.

In 2024–25, the DCCEEW worked with AIRAH to review, update and publish parts 1 and 2 of the *Australia and New Zealand Refrigerant Handling Codes of Practice*. This included providing more detail on best practice for pipework installation and maintenance.

Ongoing frustration

While the issue continues to cause problem, no action has been taken to independently test products or recall them if they were found to be faulty. Many HVAC&R contractors are still encountering problems – and bearing the financial burden of the issue.

Lynch says he would be cautious about laying the blame for corrosion on poor installation practices given how many experienced installers have reported that they had not seen this type of corrosion prior to 2020. The fact that these issues have emerged post-2020 suggests that something else may have changed, he says.

Nigro disagrees strongly with the findings of the industry investigation.

“Pair coil has been around for a very long time with no issues ever occurring,” he says.

“It’s the quality of the product that is the weak link here. The copper deteriorates and this should not happen. There were never any issues pre-COVID.

“I’m not sure whether it’s the copper itself or the insulation causing it, but it’s not an installation fault.”

Read all about it

The skills workshop from issue 97 of *HVAC&R News* covers the basic types of corrosion in copper piping. You can access this three-page document on the AIRAH website by scanning the QR code.



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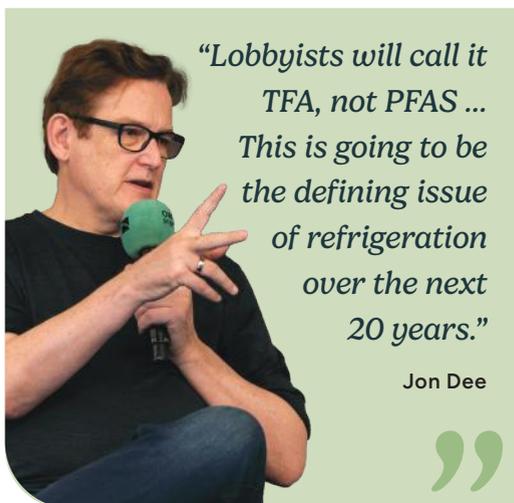


Natural progression

The ATMOsphere conference returned to Australia in May to continue its work promoting the uptake of natural refrigerants.

A familiar name, new momentum. Although the ATMOsphere series of conferences has clocked up more than 80 events globally, it has been five years since the event was held in Australia. A growing interest in natural refrigerants was reflected in a strong line-up of 42 speakers, attendees representing over 90 organisations, and 27 sponsors and partners.

Highlights of the conference included market and technology trends, the environmental impacts of HFOs, the latest policy developments around natural refrigerants, and case studies from a wide range of applications.



“Lobbyists will call it TFA, not PFAS ... This is going to be the defining issue of refrigeration over the next 20 years.”

Jon Dee

Downstream impacts of HFOs

One of the major topics of conversation in the HVAC&R industry today is the concern over HFO refrigerants breaking down into per- and polyfluoroalkyl substances (PFAS), also known as forever chemicals for their persistence in the environment. ATMOsphere put a spotlight on the issue in a session on “the real impact of HFOs”, presented to a packed conference room.

ATMOsphere Founder and CEO Marc Chasserot set the scene by explaining that HFOs break down into trifluoroacetic acid (TFA), a type of PFAS, and that refrigerants are the main source of TFA. Chasserot also highlighted the move away from fluorinated refrigerants around the world – he estimates that by early 2028 there will be a ban on PFAS in Europe, while parts of the US, including Minnesota, Maine and California, are taking similar action. These bans are likely to come to different sectors of HVAC&R at different times, starting with refrigeration.

Chasserot then handed the microphone to social entrepreneur and environmental advocate Jon Dee, who told attendees about the serious health issues his family and community are facing due to PFAS contamination of drinking water in

the Blue Mountains. Although the problems Dee spoke about relate to a different kind of PFAS linked to fire-fighting foam, the session offered a sobering view of the environmental impacts of forever chemicals in general.

“Lobbyists will call it TFA, not PFAS,” said Dee. “This is going to be the defining issue of refrigeration over the next 20 years.”

He recommended to attendees that they get on the front foot rather than get caught by surprise, pointing to the class action he has initiated to sue the NSW government over PFAS contamination of drinking water. So far, Dee said, \$365 million has been paid out in similar cases to communities in Australia, and he says the Blue Mountains is far more affected.

The session finished with a presentation from Dr Chris Hansen from the University of New South Wales. He spoke about degradation pathways for HFOs and how certain species of HFOs break down into ultra-high GWP chemicals, such as R23 (fluoroform), with a GWP of 14,800.

Hansen explained the research he is leading, and how the results may require industry to reconsider the use of some HFO refrigerants that have previously been selected for their ultra-low GWP.

Refrigerants and regulation

Another stand-out session explored the policy and standards developments impacting the uptake of natural refrigerants in Australia and New Zealand.

Ron Pulido from NABERS spoke about how the NABERS rating system has driven energy efficiency improvements in a range of sectors, including refrigerated warehouses. He called for case studies of refrigerated warehouse upgrades and said that NABERS is looking at incorporating refrigerants in its rating systems.

Matthew Darby from Cool-Safe spoke about the refrigerant product stewardship systems in place in New Zealand. He also spoke about the New Zealand HVAC&R industry more broadly, talking about the impending skills shortage as older practitioners hang up their gauges – of the 14,500 people working in the sector, only 735 are currently in training, indicating an alarming gap between retiring workers and new starters.

Peter McQueen from PL & D McQueen spoke about the need for training in natural refrigerants for trades, including a thorough review of existing courses. As McQueen noted, many registered training organisations delivering the training package for refrigeration and air conditioning apprentices are still not offering the required units of competency for working with flammable refrigerants due to a lack of equipment or teachers.

“Education is the key to change,” McQueen said.

Mike Nasser from AAPT Group and Redynamics director Ben Adamson, F.AIRAH, spoke about hydrocarbon safety and compliance requirements in Australia. They revealed a patchwork approach, with Queensland’s tighter system acting as a de facto control for other parts of Australia. They noted the dangers inherent in retrofitting systems to run on hydrocarbons without suitable testing and safety assessments. And they also underlined some of the issues Australia faces dealing with local and international standards.

Top takeaways

Adrian Bukmanis, Affil.AIRAH, representing the Natural Refrigerants Company, presented a case study on a cold storage facility in Melbourne using CO₂ transcritical refrigeration with heat reclaim and hot gas defrost.

Bukmanis notes that big players in the industry were present at ATMOSphere with a broad range of natural solutions, including an R290 chiller deployment in Queensland and many innovative local applications for CO₂. He says that more involvement from people on the tools would be beneficial.

“There are opportunities still to get more trade level and contractors in the room – for some it appeared to be new content,” he says.

“There is a wider audience that would benefit from these messages. The sessions on hydrocarbon certification and licensing

were helpful, but also suggest there is still plenty of confusion.”

Samantha Bothma, M.AIRAH, presented on the work Woolworths is doing to decarbonise its supermarkets by moving to transcritical CO₂ refrigeration systems and other natural solutions. For her, the big takeaways from the event were the availability of propane chillers and heat pumps, but the lack of supporting training or policy.

“We are very keen to use R290 chillers and heat pumps, but there is a lot of uncertainty and fear around this,” she says. “Having the certifiers there to talk was really good – and it made me realise what a gap there is across the various states. Maybe something needs to be done on a federal level, or maybe the other states can adopt Queensland’s methodology.

Bothma says the need for training was also clear.

“Skills shortages came up – as it does at every conference, in every country,” she says. “Naturals are the refrigerants of the future.”

Ben Adamson, F.AIRAH, who presented on certification of imported hydrocarbon packages, said his biggest takeaway was the scale of the PFAS/TFA issue.

“The fact that refrigerants are the main contributor to PFAS emissions was a huge talking point,” he says. “As was stated more than once, this is likely to be the defining issue for our industry in the next decade.”

Adamson also noted that natural refrigerants are being embraced more quickly in some sectors than in others.

“There is high take-up of natural refrigerants in the industrial and commercial refrigeration sectors, but low take-up in HVAC,” he says. “Expanding natural refrigerants into HVAC will be critical over the next decade, and needs to avoid a fall-off-a-cliff situation when the inevitable HFO ban comes in.”

Stefan Jensen, L.AIRAH, occupied the front row throughout ATMOSphere, and took the stage to present on low-charge ammonia systems. Although he emphasises that it is vital not to take our eyes off energy efficiency, he agrees the session on PFAS/TFA made a huge impact.

“The PFAS issues have put the global refrigeration industry on notice that refrigerant change is imminent.”



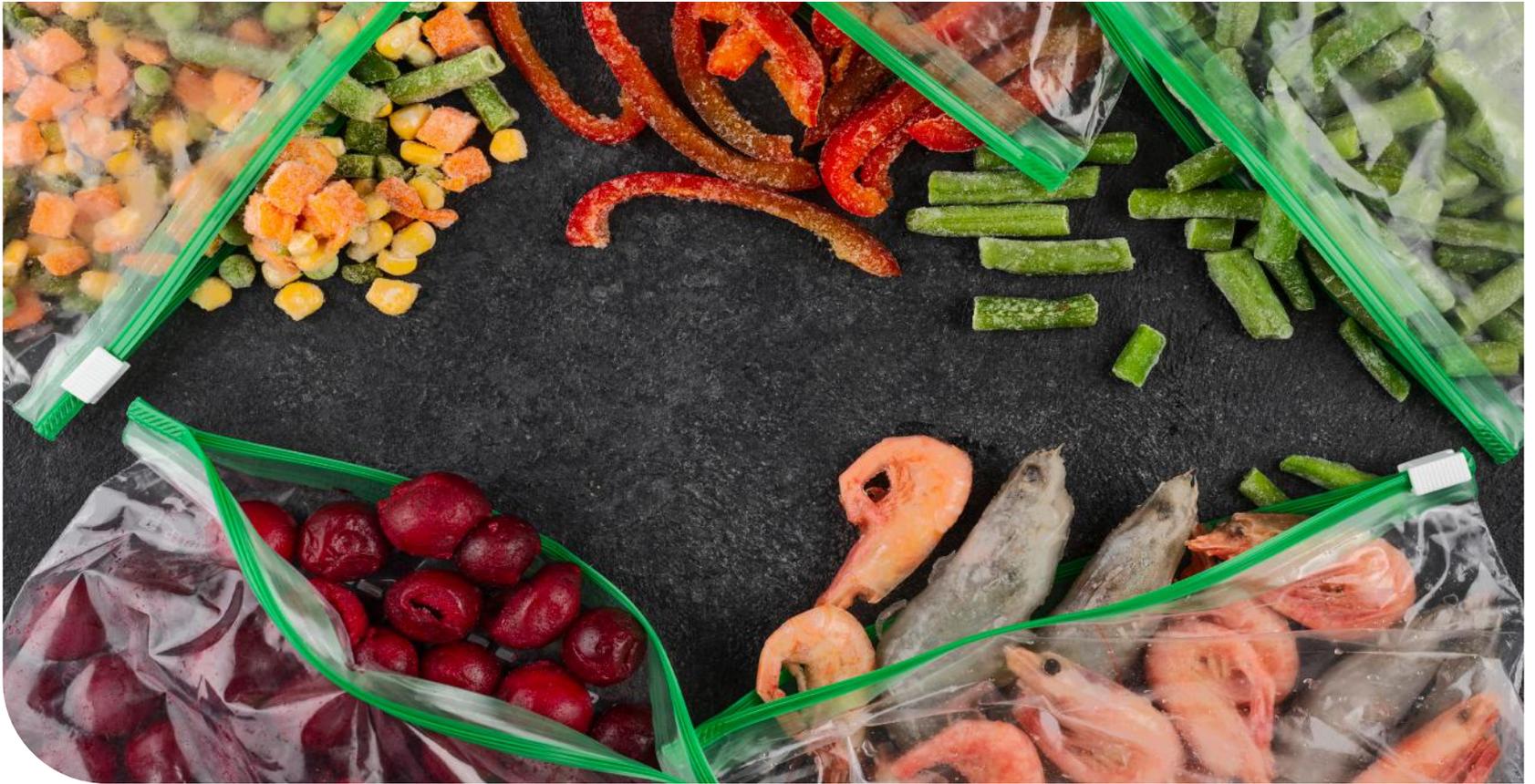
AIRAH President Mikaila Ganado, M.AIRAH



Ron Pulido



Samantha Bothma, M.AIRAH



IIR weighs in on set point debate

The International Institute of Refrigeration (IIR) has released a position paper on frozen food set points.

The issue of set point temperatures for frozen food has been hotly debated since the IIR's Centre for Sustainable Cooling released a report titled *Three Degrees of Change* in November 2023.

The report examined the current industry standard set point of -18°C , looked at cases where a shift to -15°C could be appropriate, and discussed the potential flow-on effects in terms of both energy savings and food waste. It also offered advice to help policymakers decide whether to make the shift or not based on their circumstances.

While that initial report offered nuanced findings about the viability of the 3°C increase, some subsequent public campaigns – including the Move to -15°C Coalition – have pushed for universally changing set points in cold storage facilities to -15°C . These campaigns have sparked criticism from industry leaders, who say they lack understanding of the fundamentals of refrigeration.

The IIR's position

The newly released position paper makes several findings based on research by IIR members. The shift from -18°C to -15°C for frozen food storage is expected to:

- › Reduce energy consumption by approximately 10%

- › Reduce the shelf life of frozen foods with respect to noticeable quality changes by around 30%, with one study of the -15°C set point showing the vitamin C content of spinach decreases below critical threshold values after three months of storage
- › Result in restricted acceptance in terms of temperature fluctuation during frozen storage, requiring thicker packaging solutions that result in a lower occupation ratio of food products in frozen storage and a rise in packaging weight
- › Result in food waste if the food industry reduces the shelf life presented on the packaging.
- › Maintaining the existing set point of -18°C for high-sensitivity products
- › Considering a 3°C increase in storage temperature with upward temperature fluctuation of 1°C for medium-sensitivity products
- › Considering a 3°C increase in storage temperature with upward temperature fluctuation of 3°C for low-sensitivity products.

Taking these findings into account, the position paper recommends:

The realities of a 3°C shift

Dr Michael Riese, M.AIRAH, from Cold Logic sits on the AIRAH national board and is also a member of the Institute's Special Technical Groups focusing on refrigeration and



Energy saving alternatives

Dr Michael Riese, M.AIRAH, offers some alternative measures for saving energy in cold storage facilities:

- › Updates to control systems to be able to deal with part loads

- › Better understanding of system behaviour by owners and operators
- › Better control of incoming product temperatures to avoid temperature pull-down loads
- › Tight controls of heat ingress through building fabric and openings.

"These all have the potential to make significant impacts on energy consumption already, without the need to change storage set points," Riese says.

"These options are already a real possibility, but require owners/operators to listen to subject matter experts, rather than jumping onto slogans that sound great but do not address underlying problems."

commissioning. In the summer 2024–25 issue of *HVAC&R News*, Riese penned a column critical of public campaigns to raise set point temperatures, arguing that the shift wouldn't save much energy and would cause potentially serious problems down the line.

Riese believes the IIR's recent position paper supports his argument.

"The findings of the IIR review clearly reiterate that a general increase of cold storage temperature is not suitable across the board," Riese says. "While it can be demonstrated that there is room for some products to be stored at increased temperatures, this varies from product to product and between physical location and ambient temperature conditions."

In his earlier column, Riese pointed out that adjusting temperatures in cold storage facilities isn't as simple as changing the thermostat. He argued that the design of a typical facility means that, even if most rooms were adjusted to -15°C, having just one room operating at -18°C would require a lower suction temperature across the board, negating most theoretical energy savings.

In response to the IIR's paper, Riese points out further sustainability issues that could arise from a set point increase.

"There are clear possibilities to achieve energy savings for the cold storage facility and owner," Riese says. "But if we take the circular economy into consideration, the increase in thicker packaging and tighter control of transport refrigeration will negate some – if not all – of the savings made in the first place."

"There is no doubt that millions of centralised NH₃ plants with liquid overfeed consume several times more energy than they need to."



Stefan Jensen, L.AIRAH

The bigger picture

Stefan Jensen, L.AIRAH, is the Managing Director of Scantec Refrigeration Technologies and the 2023 winner of AIRAH's James Harrison Medal for lifetime achievements in the industry.

Jensen agrees that a blanket shift to -15°C is not the answer, pointing out that improved plant design and retrofitting outdated facilities would produce much higher energy savings than adjusting set points.

"Very little attention, if any, is being paid ... to what competent refrigerating plant designers can do to make practical refrigeration cycles much more efficient," Jensen says. "The IIR/IIF study is academic in nature and appears to assume that energy savings originate from changing cycle conditions only."

Jensen points to a conversion of a refrigeration facility that uses ammonia (NH₃) as its refrigerant. The refrigeration system was upgraded from an older NH₃ liquid overfeed design to a modern dry expansion NH₃ design, with no change to any other systems within the facility.

He says the annualised energy savings for the 43,000m³ cold store – which performs blast freezing – amount to 2,600MWh, translating to a 65% reduction in energy consumption, although he notes that this might decrease to around 50% during summer.

"These and other similar upgrade projects are generally being overlooked by the IIR, IAR, and many other similar organisations worldwide," Jensen says. "There is no doubt that millions of centralised NH₃ plants with liquid overfeed consume several times more energy than they need to."

Read the paper

To read the IIR's position paper on refrigeration set points, scan the QR code.



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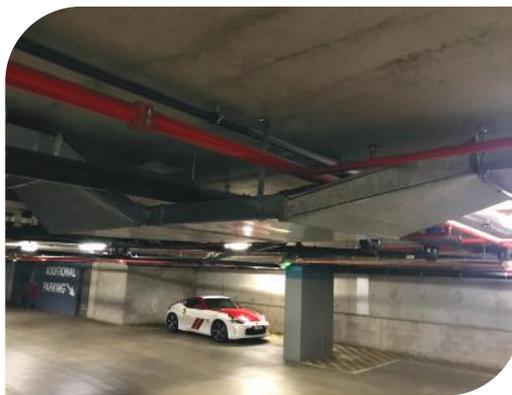
What were they thinking?

Matthew was full of questions when he encountered this ... interesting approach to drainage while servicing a unit. "Is this a new type of sub cooling?" he asks – "and what happens when you need to replace the gutter?". We'll leave those questions to Steve.



A penetration in the side of the gutter will increase the amount of water being handled by the gutter on the new extension. This will be a problem if the gutter and downpipe on the new extension was not designed to cope with the additional rainwater created by the house. Also of concern: are the pipes and conduit angled down sufficiently to ensure rainwater travelling along them cannot drip past the gutter and into the roof cavity?

And to state the obvious – the person given the job of replacing the gutter will have a perplexing problem!



Check those ratings again

"This is in a technology building at a university, which claims to be highly energy efficient," says Ken of this ductwork disaster. At least the car in the background looks well designed!



The duct installer has had to reduce the height of the duct to ensure the minimum ceiling height is maintained in the carpark ... but doing so has had a serious impact on resistance. Consider two examples: one duct measuring 1m high by 1m wide, the other 0.25m high by 4m wide. Both have the same area – 1m² – but the amount of sheet metal in contact with the air is 4m compared to 8.5m respectively, resulting in additional friction.



Against the flow

"The client said their air conditioner would stop working on really hot days – I don't know why," says Jacob, tongue firmly planted in cheek. Is it time to get Marie Kondo out to suburban Australia for some much-needed decluttering?



We seem to get one of these every couple of months! It only goes to reinforce my long-held belief that our industry is totally hidden from society, with the simple "hows" and "whys" of our machines equally misunderstood. I see our systems as living, breathing entities – cut off the airflow and they suffocate! Unlike doctors, however, a good fridgie can usually revive the patient with a little effort.



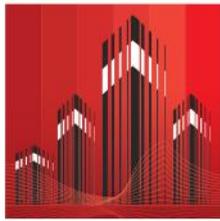
At one with nature

Craig came across this cooling tower, which he says "was still running and blended in well with the environment". We consider this to be a particularly bold new take on the term "natural ventilation" ...



First thought: how long has it been since this tower was last maintained? Quickly giving way to the second thought: what's growing in the sump ... and where did I put my respirator? This vegetation clearly thrives in the warm, humid environment, as do bacteria like *legionella pneumophila*!

Additional comments and observations provided by Steve Smith, Affil. AIRAH, Education Relationship Manager at Superior Training Centre. Please note that the comments are provided on the basis of the photos only and should be read with this in mind – not all issues or solutions are apparent from a 2D image.



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