



Hot Air

NEWSLETTER

The Mobile AC, Electrical and Cooling Technicians of Australasia

AUGUST 2008

Corporate Affairs and CEO: PO Box 1160 Paradise Point Qld 4216 Ph 07 5591 6274 Fax 07 5591 8172
Administration: Level 3, 1 Elizabeth Street Melbourne Vic 3000 Ph 03 8623 3019 Fax 03 9614 8949

secretary@vasa.org.au www.vasa.org.au

The Australian automotive
code of practice 2008



Control of refrigerant
gases during manufacture,
installation, servicing
or de-commissioning of motor
vehicle air conditioners



Australian Government
Department of the Environment,
Water, Heritage and the Arts



Motor Trades Association of Australia



The Code of Practice is now LAW

The long awaited automotive Code of Practice has been signed into law.

The Code provides the detail to the regulations which apply to the handling of refrigerants such as R134a.

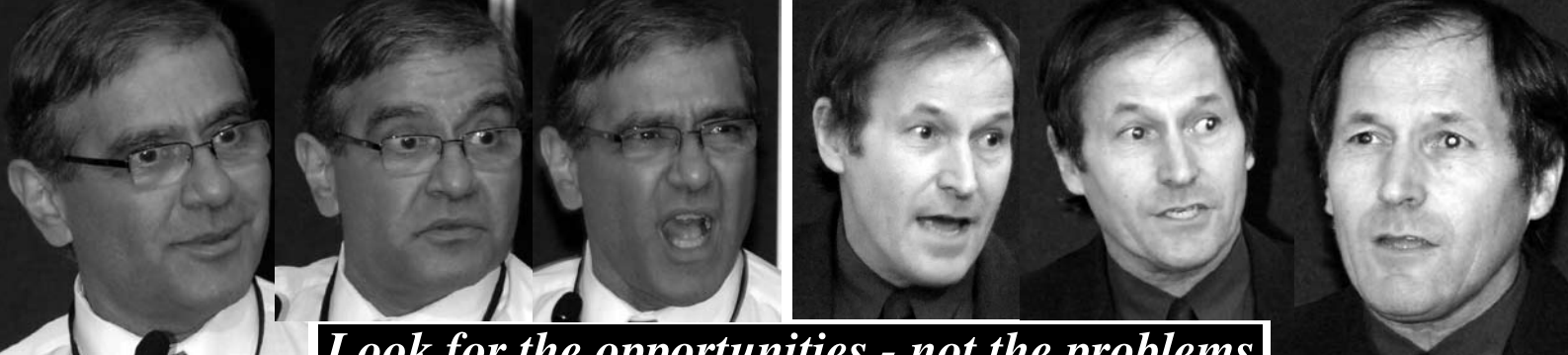
The Code does not apply to hydrocarbon refrigerant, not because it is already subject to occupational health and safety regulations in most states, but because hydrocarbon gas is not a greenhouse gas, nor an ozone depleter.

The Code of Practice will become the bible of vehicle air conditioning repair and maintenance and VASA, along with the Australian Refrigeration Council and the Australian Government, will go out of its way to ensure that all workshops have a copy, and that the detail of the Code is explained.

Beginning with this issue of Hot Air, the Code of Practice will be serialised, with expert comment where it is considered necessary, to ensure that the intentions of the Code are abundantly clear.

Wire & Gas Convention best yet - make a date for 2010





Look for the opportunities - not the problems

The double act on the main stage of Wire & Gas, Jack Stepanian and Grant Hand, was voted the most popular keynote address. This was no doubt because their messages were uppermost in many minds at the convention - how will technicians face the next critical five years in an industry which is undergoing technical upheaval and, for the AC repairers, a future nationwide change in refrigerant gas.

Tim Grimes, representing Gold Sponsor, CoolDrive Distribution, introduced the duo as the Wizard of Wire and the Guru of Gas.

Grant pinpointed the main issues as competitive pressure, the reliability of systems with failure rates lower than ever, less disposable income for fixing cars and shortage of skilled tradespeople.

He had a lot to say about business image, or lack of it. He pointed to the Ford mantra - fix it right the first time. A technician's ability to deal with customers had become paramount in attracting and holding customers.

"Too many workshops still have the greatest customer turn-off of all time - filthy toilets. "How hard can it be to keep



such a little room clean?"

Grant said tools and equipment would become more of a manufacturer-driven requirement as vehicle repair became more sophisticated.

But he threw cold water on the notion that systems had become too difficult for repairers to cope with. "There are no new systems, just application of old systems," said Grant. "Sure, there will be new refrigerants, new pressures and temperatures but no confrontational stuff.

"We are facing evolutionary pressures,

not revolutionary change."

He implored technicians not to undersell themselves.

"Too many technicians have low self esteem. You have more stored knowledge in your heads than you give yourselves credit for. In fact, you people who attend conventions such as this, represent the top 5% to 10% of the industry in Australasia.

"Take advantage of the opportunities at this convention. Next door is a trade show full of information and knowledge. Go and talk to as many people as you possibly can.

"There's a lot of pressure to use modern tools, such as scan tools. They may be necessary, but they don't do everything. They only identify the area of fault. You still need to understand what's going on, and that's where the accumulated knowledge that's sitting in the back of your heads will be critical," added Grant.

Jack Stepanian reminded the technicians that their job was to help customers maintain a safe car on the road.

He advised technicians to use their multimeters, invest in circuit diagrams, and learn how to use scan tools.

"Most importantly, keep your customer regularly in touch with the diagnostic skills and tools you are using. This is because, often, a huge percentage of the job is diagnostic time.

This has to be considered part of the repair, not separate to the repair.

"Strength comes from unity and sharing information," added Jack.

When asked about which scan tool to buy, Jack's advice was simple. "Go and get the cheapest one you can find and spend one weekend with a vehicle in your closed workshops learning how to use it. Get to know that car inside out.



"Once you understand what a scan tool does, then you should ask around your mates in the industry. Find out which scan tool will suit your workshop best.

"And when in doubt, Google it. You will be amazed at what you can find out about fault codes on the internet," Jack said.

The advice from both speakers was that motorists will go to an independent service centre if they have confidence in the technicians there.





Rick Goodwin of CoolDrive uses the VASA simulator provided by funding from Refrigerants Australia to assess candidates for refrigerant licences.



Hybrid trainer Gil Sher used wall projection to demonstrate the mysteries of the hybrid.



The finer points of electrical component rebuilding in an environmentally aware manner was demonstrated by Scott Pattison and Alan Hill of ERG - Cargo Pty Ltd



Grant Hand of Automotive Training Solutions (centre) had packed audiences for every one of his five workshops dealing with advanced AC diagnostics.

Honeywell's and Arkema's Brett Fraser, now based in Hong Kong, were among the VIP guests at Wire & Gas 2008.



VASA PIONEER AWARD 2008

The late Ken Rudder, of Sydney was regarded as a pioneer of the purest form because he started in auto air in 1967, when the industry was barely five years old.

His award was accepted at Wire & Gas convention by Ken's brother, Elton Rudder, who also runs an AC workshop north of Sydney.

Ken began in the industry in 1967 and up to 1972 was in his first auto air job at Air Pty Ltd, Parramatta Road, Camperdown. In 1973 Ken and his partner Peter Austin started All Car Air conditioning in St Peters and moved to Marrickville in 1978. In 1979, Ken sold his interests to Peter, and started Prestige Auto Air Pty Ltd with his partner David Cannell.

In 1982, he bought out Dave's interests and continued the business until it went into liquidation in 1999.



Elton Rudder accepts his late brother's award from VASA President Mark Padwick and Vice-President Mark Mitchell

He started Avken Products, at Prestons, where he traded until 2002. Ken then started Vancool, which is still operating today.

His first business had grown rapidly with the popularity of Mazda and the rotary engine models which most others at the time found too risky or too difficult to air condition.

Ken Rudder developed a determination to fabricate everything in house. His desire to be independent was paramount.

Ken was always looking for that little extra to add value to



his products. Ralph Cadman, another great pioneer who imported and distributed Unicla compressors, recalls Ken's obsession with shiny bolts. Unicla mount and drive kits were full of shiny bolts, but there was a shortage of them in Australia.

In an effort to make his brackets look better, Ken would appear at Unicla's back door, pleading with Ralph to lend him some shiny bolts.

Always ambitious, sometimes beyond reality, Ken's expansion into the larger premises of Prestige Air was

a stepping stone towards something bigger.

Prestige became the titan of the industry for all the AC applications that were 'too hard'. It was remarkable what Ken Rudder could build, and he did build the whole system except for the compressors and cores.

And from doing all this complicated, hard stuff, he just carried on air conditioning anything that moved and that included backhoes, trucks, tractors, sweepers and fridge vans.

Which gas? Latest news from Europe at Wire & Gas



The world waits for the final word on which refrigerant will be the most favoured to replace R134a as a result of the European Union's ban on refrigerants with a high global warming potential.

As the Wire & Gas Convention discovered, there could be at least two refrigerants in totally different systems facing the technicians of Australasia in years to come.

The keynote address on refrigerants, which was to be given by Conrad Norris of Sanden, Europe, was instead given by Mark Padwick, General Manager of operations for Sanden Australia (above). Conrad was called to the Phoenix, Arizona USA new refrigerant symposium on the eve of the Gold Coast convention.

The three contenders

CO₂ (R-744)

- Very high operating pressures – 30-40 bars suction and 100-120 bars discharge
- Small compressor displacement – typically 22cc to 28cc

- Condenser is replaced by a gas cooler as no condensation takes place
- Requires a variable, externally controlled compressor for maximum efficiency
- The system requires an internal heat exchanger for maximum performance and efficiency
- CO₂ has a global warming potential of 1 (GWP R134a = 1300 and for R12 = 8700)
- However, it is potentially toxic at concentration of 5%
- Even in refrigerant grade CO₂ is cheap!

The synthetic replacement

- Chemical industry proposed a known refrigerant, R-1234yf that gave very similar performance to R134a
- R-1234yf has similar pressure properties to R134a
- Has the possibility of being a near drop-in and compatible with the elastomers that are currently used

R-152a

- Known for over 40 years
- It is flammable and has only been used in conjunction with other refrigerants so that the resulting mixtures are

non-flammable

- These mixtures have a global warming potential of greater than 150
- The GWP of R-152a itself is 140

The impacts

The introduction of CO₂ would require the whole service industry to re-equip. Training standards would have to rise to cope with the requirements of higher operating pressures.

The introduction of R-1234yf would be that operating pressures and work practices would be similar to those of today. Current leak detectors could be used but new recycling and storage cylinders would be required to avoid cross contamination with existing R134a systems.

At present only Europe has legislation requiring a change of refrigerant. However, the whole world is watching and if the introduction of the new synthetic refrigerant is successful in Europe, most of the rest of the developed world will probably quickly follow. At least in Europe, it is possible that there will be two new refrigerants.

All toxicity tests necessary for regulatory approval have been completed for R-1234yf. However, further tests will be

done and the results were to be available in August.

A large group of car manufacturers from Europe, Japan, USA and Korea, representing 69% of global car production, are strongly supporting the use of R-1234yf as a global solution,

The German OEMs continue their support for CO₂.

As happened with R-12, there will be life after R134a.



Keynote speaker Steve Pohlner from Ford Australia took the delegates on a virtual tour of the issues which face car designers with every new model.

Steve said that contrary to what the service industry might think, the access to components is taken seriously in the design phases.

He said Ford wanted feedback from the aftermarket industry, but it wasn't enough to just report that the AC system was not working.

As much information as possible would help the Ford engineers, who use the information to improve car design.

He said Ford was grateful that there are people like VASA members who are committed to doing things right when they service the product.

Pic above shows Steve (left) receiving his token of appreciation from Gold Sponsor Shayne Quale of Ashdown-Ingram.



World champion motorcycle racer Wayne Gardner enthralled his audience with tales of his rise to fame. His message was inspirational - never give up, despite the apparent hardships. He was presented with his token of appreciation by Don Cormack, CEO of the ADRAD Group of Companies, representing Gold Sponsor ADAIR.



The Code spells out the things you **MUST** do and the things you **SHOULD** do

By now, all financial members of VASA will have received the Code of Practice booklet. This is the booklet that all technicians who hold a Refrigerant Handling Licence should have in their back pocket for immediate reference at all times.

VASA is proud to have its logo on the front of the new code alongside the Motor Trades Association of Australia. VASA and its many associates and advisers, put in a lot of work on the Code, with VASA's first version penned by Grant Hand of Automotive Training Solutions.

The 20 page code is incredibly easy to read, with background colour behind the text to differentiate between those sections which are mandatory and those which are advisory.

In fact, the Code is so easy to read and user-friendly, that VASA can see copies on the customer waiting room coffee tables in workshops across the land.

It will become a valuable educational aid for motorists who, until recently, have not been fully exposed to the requirements of the AC industry to fix or decommission air-conditioning systems rather than just top them up with gas.

Beginning with this Hot Air, the Code will be printed in episodes, with explanations added where we think it will help.

Members need to understand that this Code does not constitute a technical design document and must be used with other standards and Codes of Practice already in existence - in particular, AS 4211.1 - 1996 gas recovery or combined recovery and recycling equipment.

The Code in detail

This Code provides for minimum standards for operation, servicing and repair procedures of motor vehicle air-conditioners and includes procedures for recovery and recycling of refrigerants to control emissions of refrigerant gases.

Users of this Code should refer to the relevant motor vehicle or air-conditioning service manual for details of specific systems.

Technicians must comply with the requirements of the Regulations, this Code, the instructions and the service manuals provided by

equipment manufacturers. Where there are contradictory instructions, the requirements of the Regulations will take precedence over this Code and this Code takes precedence over any other instructions or manuals.

A.3 Preliminary inspection

A.3.1
The owner and/or driver of the vehicle should be made aware of the service organisation's responsibility to conduct the service as required under government legislation.

VASA NOTE:

At the Wire & Gas Convention, during a debate at the VASA annual general meeting, it became very obvious that the standard of dialogue between the technician or service manager and the customer would invariably determine whether the repair job ran smoothly or turned into an awkward argument over the necessity for, or the cost of, repairs.

Quite a few members said they had no problems explaining the refrigerant handling regulations to customers. This meant that if leaks were found in the AC system and expensive repairs needed to be carried out, the customer readily accepted the inevitable and supported the technician's recommendations.

On the other hand some workshops complained of losing customers because they just wouldn't accept the workshop's advice or wouldn't accept that the technician had a responsibility under the new legislation to fix a leaking AC system and not just top it up with gas.

There are two issues to consider here. Either the workshop is not explaining the new licensing requirements adequately or it should accept that there are some customers who may never be convinced and therefore these are the customers you might well do without.

So we read into Code A.3.1 that there is an obligation on the workshop to explain the workshop's responsibilities under the legislation. If a customer refuses to accept that these obligations are now law, then the workshop needs to make up its own mind whether or not to accept that customer.

This is not turning business away. Look at it more as turning trouble away. That

customer may well find another workshop which is prepared to close its eyes to the leaks and just squirt it full of replacement gas.

Sooner or later, as ARC auditors step up their campaigns and close the gaps between amateur and professional, the disbelieving motorist will get the message, and who knows, may very well end up back in your workshop.

So the message is, stand firm on your professional obligations under the legislation, and don't be afraid to walk away from jobs which will only end up in angst. The fact that you have tried to educate the customer means that you have done your best for the environment.

A.3.2

The system **must** be inspected and leaked tested for any signs of leakage.

A.3.3

Signs of ageing or wear of pipework or hoses should be noted.

A.3.4

Debris, which may inhibit airflow to the condenser should be noted.

A.3.5

If, in the opinion of the licensed technician there are doubts about the integrity of the system, the system **must** not be re-gassed prior to the necessary rectification work having been completed.

VASA NOTE:

This is where the effectiveness of your dialogue with your customer comes into sharp focus for the first time. If you have explained your obligations under the legislation clearly at the beginning, the customer will understand why you are liable if you re-gas the vehicle while any doubt exists about the integrity of the system.

A.4 Topping up of air conditioning systems

A.4.1

The addition of refrigerant to an existing system charge to top up **must** not be carried out.

(More in the next issue of Hot Air)

Refrigerant levy increase and rebate decrease

Sustainability is an investment in our future

by Michael Bennett
General Manager
Refrigerant Reclaim Australia

On 1 October 2008 the levy applied to new ozone depleting and synthetic greenhouse gas refrigerants will rise to \$2 per kilogram + GST, and the rebate paid to contractors for recovered refrigerant will fall to \$3 per kilogram + GST.

These decisions have been made by the Board of Directors of RRA, comprising representatives of the major industry associations, only after detailed consideration, analysis and consultation.

You need to know why.

Sustainability

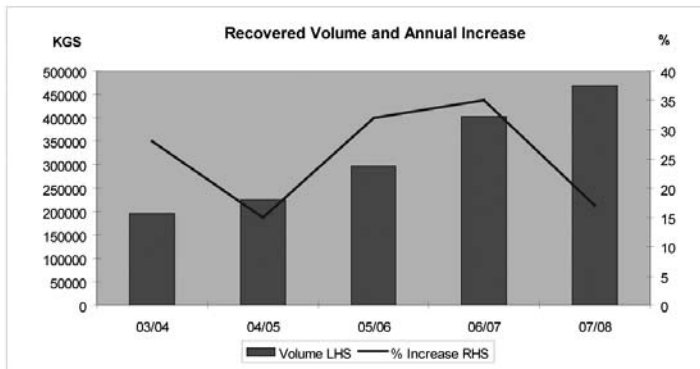
At the heart of RRA's decision is the need to ensure the long term success and sustainability of a low cost industry-wide product stewardship scheme: a scheme that meets Australian regulatory and environmental requirements, that will be sustainable in the very challenging environment of increasing volume and cost pressures, where the future is remarkably uncertain.

Growth in recovered refrigerant returns

The amount of unwanted and contaminated refrigerant recovered by the industry and collected and destroyed by RRA has been growing strongly (see recovered volume graph).

The amount collected is doubling about every three years and this financial year totalled 470 tonnes.

The implementation of the Ozone Protection and Synthetic Greenhouse Gas Management Act that includes licences for technicians and



authorisations for purchasers of refrigerants has much improved industry practises.

Unusable refrigerants must not be emitted but recovered and returned for safe disposal. This change has impacted strongly on the rate of recovery.

Current volume projections indicate that 1,000 tonnes will be recovered annually in just five years time, which will see a doubling of program costs from today's level.

Increasing costs

Almost all costs increase over time, but the cost of destroying recovered refrigerant is increasing rapidly. RRA uses the argon plasma-arc process to destroy recovered refrigerant.

This process transforms the fluorocarbons into salts and water. The costs of the main inputs to the process – electricity, sodium hydroxide, expert labour – are all rapidly increasing.

In 2007/2008 RRA paid out \$2.1 million in rebates to contractors, up from \$0.6 million five years ago. The fast growing rate of recovery, 1,000 tonnes in five years, means that maintaining the rebate at its current level and maintaining a low cost program are incompatible outcomes.

Increasing liability

The quantity of refrigerant installed in the Australian market place for which RRA is responsible, has been growing strongly. Recent research estimates the total

is now about 31,100 tonnes. This liability means the RRA product stewardship program will need to be operating a long way into the future to ensure the industry is able to meet its obligations.

As industry practices improve further and end-of-life management and recycling of equipment such as split air conditioners and motor vehicles becomes more prevalent, the amount of refrigerant being recovered and returned will increase. There are approximately seven million split air conditioners installed in Australia that will need to come out of service in 10-15 years, with many retaining most of their refrigerant charge.

Much of RRA's anticipated growth in recovered refrigerant will be provided by programs established to properly recycle these systems and other types of equipment.

Uncertain future

The growing uncertainty of the future operating environment complicates planning and managing for a sustainable product stewardship program. Two initiatives in particular will impact strongly on the industry broadly, and RRA

quite specifically: the Carbon Pollution Reduction Scheme (CPRS), and low global warming potential (gwp) refrigerants.

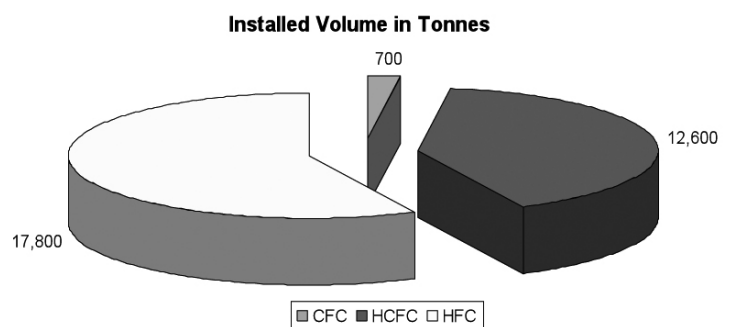
The CPRS will impact significantly on the industry and RRA but it is not possible to determine what that impact will be right now. Fluorocarbon refrigerants are scheduled to be included in the CPRS from the start but this may not be the final position.

At this stage we cannot know whether the safe disposal of recovered refrigerant will generate carbon credits, who they may belong to, or how much they might be worth. The lack of certainty creates risk for the long term viability of a low cost product stewardship scheme and the RRA Board must be appropriately cautious.

The development and introduction of fluorocarbon refrigerants with global warming potential less than 10 is a reality, although the range and availability is still speculation at the moment.

Already, a replacement for HFC134a in automotive air conditioning has been announced and is in the latter stages of testing. Low gwp refrigerants have the potential to dramatically reduce the industry's environmental impact, but the legacy of the installed bank will remain to be cleaned up over many years. And RRA will need to continue operating to take back and safely dispose of these legacy products.

The RRA Board has acted prudently and responsibly by increasing the levy and reducing the rebates, and



seeking to ensure the long term sustainability of the RRA product stewardship program.

No one else is going to take responsibility for taking back and destroying the thousands of tonnes of refrigerant that will be recovered in the future.

Tomorrow is up to us

As an industry, we install it today. Taking it back tomorrow is also up to us.

If you need further information or would like to make any comments regarding these changes please contact RRA at:
www.refrigerantreclaim.com.au
info@refrigerantreclaim.com.au
au
Tel: 02 6230 5244

Welcome to new members

Ross McKenna
Rosscos Auto Electrics
Gawler Tasmania

Bryan Felton
B.F. Industries Pty Ltd
Grafton NSW

Russell Chapman
Midwest Mobile Mechanics
Dongara WA

Antonia Sanchez
A.L.S. Auto Electrical Service
South Melbourne Vic

VASA members receive free subscription to The Automotive Technician and their problem solving service.



A total of 26 apprentices attended Wire & Gas Convention, free of charge, thanks to a radical move by the committee to encourage newcomers to the industry to take an interest in continuous training. Each of the apprentices received a gift pack, thanks to some generous sponsors who supplied tools and vouchers. They also received free subscription to VASA and TaT for one year.

Those who attended the gala dinner were presented with their packs by new VASA board member Tim Grimes and President Mark Padwick.

Pictures shows (l to r) Peter Hull, Tim Marsh, Grant Raven, Mark Padwick, Steven Petchell, Simon Swalwell and Colin Wilson.

Want to help plan a convention?

The Wire & Gas Convention committee has issued an invitation to any member of VASA to join in the planning of the 2010 event.

Hot on the heels of the success of the 2008 convention, the committee has started early to plan the next event on the Gold Coast for the long weekend in June 2010.

While the majority of the committee which organised the last two conventions have volunteered to stay involved, it was felt that an open invitation to all VASA members might bring forward an enthusiast or two who are prepared to devote some time and energy to the 2010 show.

The committee declared that those who put their hands up to serve must be prepared to commit to attending at least 80% of all meetings. It is planned to hold the committee meetings every two months but closer to the convention, perhaps six months out, it is likely that the meetings will be held each month. In between time, email and phone contact is maintained.

It would not be necessary for all committee meetings to be held on the Gold Coast or in Brisbane, and it's likely that many of the meetings will be held in Sydney and perhaps some in Melbourne.

The committee has responded quickly to suggestions made by delegates and exhibitors in the surveys which were conducted during the Wire & Gas 2008.

Among the major decisions are:

- The convention will revert to its traditional time slot of the Queen's Birthday long weekend in June 2010, making the dates Friday 11 – Monday 14 June 2010.
- The target number of delegates is approximately 600 – double the attendance at the recent convention.
- An action-packed partner program will be developed and marketed heavily to partners to encourage greater partner and family participation.
- The traditional golf day will be reintroduced.
- The on-car training, which has become the major driver of the convention's success will be extended to at least a day and a half.
- The 2010 convention will be held on the Gold Coast by popular demand and the committee is looking at venues which offer an environment more conducive to socialising and networking, even to the extent of opening a bar in the trade show on the Saturday afternoon around four o'clock.
- There will be fewer keynote speakers and in view of the popularity of the session conducted by Grant Hand and Jack Stepanian at the 2008 convention, the next convention is likely to see the reintroduction of the VASA annual general meeting with an open forum, to encourage debate among all delegates whether they are VASA members or not.
- Also likely to be introduced at the Saturday morning plenary session will

be a presentation by all of the trainers with short explanations of the training they will be conducting on the Sunday and Monday. This is intended to help delegates decide which training sessions they might like to attend.

- Also under consideration is a 'soap box' arena with a mini stage as a feature of the trade show, where exhibitors can conduct mini training sessions on new tools or services.

If there are any VASA members who would like to contribute their time, energy and ideas to make the 2010 convention a massive success, they are encouraged first to call one of the committee members so that they know what the role entails.

Committee members and phone numbers are:

Mark Mitchell 0409 392 319
Tim Grimes 0417 376 050
Jeff Smit 0417 262 374
Deyan Barry 0412 912 504
Shayne Quaile 0417 127 926



Gold
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Auto Air Products

Heatcraft has joined forces with the ADRAD Group to distribute ADAIR auto air parts. The ADAIR brand has an impressive reputation for quality parts.

Heatcraft is a leading wholesaler of commercial refrigeration and climate control solutions in Australia and New Zealand.

Through its Lovelock's connection, Heatcraft has more than 20 years experience as a distributor of auto air conditioning parts.

"The ADRAD Group is Australia's leading manufacturer and distributor of automotive heat exchangers. This partnership means Heatcraft can offer superior auto air parts supply and availability to metro and regional trade customers, especially specialist and general workshops, auto electricians and marine and transport service/repair outlets," said Oliver Taylor, Heatcraft's Director of Marketing.

HEATCRAFT SPEEDS INTO AUTO AIR PARTS MARKET

Heatcraft offers easy access, great prices and fast shipping of auto a/c parts through their Australia-wide network of 55 branches. Combine their distribution footprint and HVAC expertise with the extensive ADAIR range and you've got a purpose built partnership.

According to Taylor, Heatcraft is now a one-stop supplier of new A/C parts for passenger vehicles, campers, light commercial vehicles and light, heavy and articulated trucks.

"Through our partnership with ARAD and our alignments with other OE auto air suppliers, we can provide the best brands at competitive prices. Our large inventory allows us to carry all major OE auto air brands and we meet most orders in a matter of hours. Heatcraft now provides a comprehensive range of automotive air conditioning parts, along with specialist tools and refrigerant," Taylor said.

Twenty six of the 55 branches are designated auto air specialist stores, which have guaranteed stock of "must have" auto air parts and can provide the expert advice or information you need. This "around the corner" convenience and know-how means turbo-charged delivery of parts within a couple of

hours."

HEATCRAFT AUTO AIR SPECIALIST STORES NSW/ACT

Bankstown 1 Homedale Rd, Ph 9709 4822
Coffs Harbour 14A Lawson Cres, Ph 6651 3390
Fyshwick 6/19 Tennant St, Ph 6239 1570
Lismore 2/36-38 Wyrallah Rd, Ph 6622 2272
New Lambton 14 Kings Rd, Ph 4956 2722
Orange 2-3/243 McLachlan St, Ph 6362 8849
Port Macquarie U1/50 Jindalee Rd, Ph 6581 4040
Silverwater 46-48 Derby St, Ph 8737 7400
Tamworth Cnr Avro & Jewry Sts, Ph 6765 2566
Tuggerah 4/22 Reliance Dr, Ph 4353 3218
Wollongong 4/103-107 Auburn St, Ph 4229 1313.

VIC/TAS

Dandenong Bldg 3 Cnr South Gippsland Hwy & Southlink, Ph 9799 5900
Preston 60A Albert St, Ph 9480 0321
North Hobart 18 Wellington St, Ph 6231 5711.

QLD

Archerfield 4 Parkview Dr, Ph 3277 7088
Cairns 88-90 Buchan St, Ph 4035 4300
Geebung 1/452 Bilsen Rd, Ph 3865 1399
Mackay 4/21 Victoria St, Ph

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Toowoomba U3/2 Prescott St, Ph 4639 7900
Townsville 25 Keane St Currajong, Ph 4775 1800.

SA/NT

Mile End 19-21 East Terrace, Ph 8354 0100
Darwin U2/Lot 4324 Cnr Bowen St & Tiger Brennan Dr Winnellie, Ph 8984 3840.

WA

Belmont 2/130 Francisco St, Ph 9478 5033

Call your Auto Air specialist store direct or phone Heatcraft on 13 23 50 for more information.



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BOC

retail outlets and more than 1000 agents and equipment partners.

BOC is an industry leader, delivering expert solutions to customers around the world. Our success is built on a record of service, dedication to the highest safety standards, and the commitment of our people.

The products BOC provides includes gases, equipment, safety and PPE products as well as a breadth of technology services and solutions to the industrial, scientific, hospitality, medical, agriculture, refrigeration and packaged chemicals industries.

Many people come into contact with BOC every day, because our products and services touch almost every area of business, industrial, commercial and domestic life.

BOC is market leader across the South Pacific

BOC has a strong regional and state presence in the South Pacific, with production facilities in all Australian capital cities, Auckland and Christchurch in New Zealand and in Papua New Guinea, Fiji, Tonga and the Solomon Islands.

The South Pacific head office is located in North Ryde, Sydney.

BOC is a member of The Linde Group, which operates in more than 50 countries, and is one of the largest and most global of the world's leading gas companies. It employs some 50,000 people worldwide.

In the South Pacific, BOC is one of the top 100 companies, with an annual turnover exceeding \$A1 billion. The South Pacific, which includes Australia, New Zealand and the Pacific Islands, services over 400,000 customers through 40 production facilities in almost every capital city, 90

IN THE NEXT ISSUE OF HOT AIR WE WILL PICK UP WHERE WE LEFT OFF ON REFRIGERANT CHARGING:

'Lack of subcooling, and using subcooling to determine charge rates.'

We apologise for the absence of the promised technical article in this issue. The space was taken by the Wire & Gas Convention coverage.