Refrigeration and Air Conditioning Africa

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Heating | Energy | Ventilation | Air Conditioning | Refrigeration

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STAYING "IN THE KNOW"

With the advancement of technology and the rise of smart systems comes the need for more learning... but this is not actually getting the attention it deserves.

The biggest reasoning for not keeping up to date these days, as I'm sure you would have experienced yourself, is "I don't have time."

I have been quite surprised when talking to people lately that they are not aware of certain legislative changes, new principles and regulations that will affect the industry or even the critical elements around energy efficiency. Nor knowledge of new design methodology or the latest technology that is being researched, developed or implemented in other leading countries. Similarly, no knowledge of how the global supply chain dynamics affects delivery and costing – all above the latest smart solutions, IoT and AI.

The mindset is a concern and I hope it's not a case of "we'll get to that later". Having a look at other countries around the world, this seems to be a common occurrence these days as people have eased up on the essential need to keep up to date with what is happening directly in, and influencing factors to the industry you are in. How do you stay up to date?

All of the *RACA Journal* platforms bring that information to you in the way that you prefer to keep ahead – including things that are, or will shape the sector in future. *RACA Journal* has print, emagazine, online, social media and other digital platforms that keep you informed as a preferred industry resource, so connect or get registered to receive the content you prefer – its really easy.

In this issue we primarily cover a review of FRIGAIR 2022 and I hope that you were able to attend in person to gain all of the knowledge and networking opportunities shared. The feedback was excellent from both visitors and exhibitors.

Our cover project is the new Alberton Netcare Hospital that provides the local and surrounding communities with not only standard facilities but a state of the art trauma unit and access to several specialists. On its official opening the facility already experienced well over a 50% occupancy having over 400 beds.

We carry our regular contributors and other content that we hope you will find useful - for yourself or your staff as they also continue to learn and come up with their own ways to benefit the industry. Local and international news features new much-needed training providers being added to the country and internationally some interesting passive cooling technology developments. Our profile is on Ricardo da Silva who believes in a balance between function and environmental impact. There is a lot of other interesting content to keep your attention from cover to cover!

This month's quote is one that reminds me of the process behind every success I have had in my own life, been involved in, as well the those key ingredients in teamwork...

"Patience, persistence, and perspiration make an unbeatable combination for success." - Napoleon Hill

I welcome your feedback, as always and look forward to hearing from you on your news, projects, opinions and technology to share with the local, and international community. As I mentioned in my last comment - you have the information and we have the channels to tell the world!

As the RACA Journal serves you the reader, it is important to us that we get your feedback. What do you like and what you don't. Every suggestion is valuable. Get in touch – we would love to engage with you... especially since we are in the process of a review of all of the platforms within this unit, so be a part of it! Have a great month ahead. RACA

Ben

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32
Cutting edge designs and tech for flagship facility

RAETECH - AN INVESTMENT TO UPLIFT INDUSTRY SKILLS

By John Ackermann

Highly efficient systems ARE within reach of any business reliant on air conditioning or refrigeration for sustainable positive bottom line results.

What role does refrigeration play in your daily life? What role does refrigeration play in the economy of South Africa? Cooling in the form of air conditioning and refrigeration!!!

Cold chain logistics from farm gate to fork of fresh vegetables, sub-tropical fruits, table grapes, pome fruits. Fresh fish from offshore to restaurants. The distribution and storage of vaccines to remote rural areas. Air conditioning of operating theatres and intensive care units in hospitals. Comfort cooling in homes, restaurants, playhouses, banks, shopping malls, hotels, and luxury passenger coaches. The export of fruit, fish and meat boosts our foreign revenue. Close to 1 million people are directly employed in the refrigeration and air conditioning sector.

Ineffective refrigeration and air conditioning systems are energy guzzlers, costly in capital investment, high in maintenance costs, environmentally unfriendly, add to food wastage and a threat to the health of our citizens and foreign visitors.

The answer to high-efficiency lies in the technical experience and competency of those individuals that design, install, commission, maintain and repair A/C and R systems and plants.

The art and science of refrigeration has been studied and researched for centuries, and the development of new techniques, new refrigerants and energy saving innovations is ongoing.

The technological strides have re-affirmed the vital role of sound technical expertise and quality hands-on skills. There is no quick route or short cut to acquire quality hands-on skills backed with thorough theoretical knowledge.

All image credits John Ackermann

All training in hands-on skills is given on well-maintained equipment.

Hennie Basson welcomed guests in the laboratory, having 8 miniature cold rooms with R290 charged refrigeration systems.

Hennie with guests from Tru-Temp Air Conditioning (Jolanda Blom) and Apollo Air (Carlo van Wyk and Nols Lubbe).

A course in pipe joining is offered and included in various courses.

Training is given on different electrical panel layouts.

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A selection of training material compiled by Hennie Basson.

The training of hands-on skills in South Africa has been in a state of flux and constant change for the past 30 years. Three-to-four-year apprenticeships at the many state-owned enterprises have given way to learnerships, short courses, training at TVET colleges, and thankfully at privately owned training providers.

The voluntary registration by ACRICSA of persons as being competent to safely handle refrigerants has given way to being a legal requirement in terms of the Pressure Equipment Regulation introduced in 2009.

Regrettably a common finding is that staff who have passed through formal training at a recognised institution and then been employed in the industry, must be re-trained before commercially viable.

The difficulties in sourcing qualified artisans for his A/C & R contracting business motivated Hennie Basson to establish a state-of-the-art training college in one of his properties in Paarl.

The 20 apprentices on the payroll of Cold Fact transformed the building into the Raetech college - which was showcased to industry role players on 14th June 2022.

"The erection of the trade test centre, the installation of the many configurations of air conditioning units, the laboratory with R290 equipment, a cold room connected to a package

A life size cold room with a CO_2 system for the training in natural refrigerants.

A Variety of different air conditioning systems are used in the training of skills for the A/C industry.

Louis Vermeulen of Kovco (left) with Eugene Snyman, assessor, and instructor (Raetech).

Stripping and rebuilding of compressors is a valued learning path towards understanding basic refrigeration.

The opening of Raetech was supported by Metraclark, Daikin, Euro Cool and African Cooling Systems.

All courses have a theoretical element taught in a comfortable lecture room.

The accredited Raetech Trade Test centre.

Life size equipment to train the skills needed for the setting of system controls and safety devices.

CO_2 system, and setting up of a welding shop proved invaluable training for our apprentices at different levels in their career paths. With the generous support by Daikin and Metraclark of equipment at reduced prices, the Raetech college represents a capital investment of R1,1m," as stated by Hennie Basson.

As a training provider accredited by QCTO, the college will serve as a trade test centre and structure courses in line with the present learnerships, apprenticeships and the SARACCA Safe Handling of Refrigerants handbook.

Basson went on to say, "We aim to keep our operating costs low to be able to offer quality training at an affordable level. It is not our intention to undercut the rates of other training providers but we feel strongly about uplifting industry skills even at the very low level of small R290 systems. Part of our development plant is to build a life size ammonia training plant in our adjacent empty building. With an ammonia plant, Raetech will offer hands-on training in all commercially used natural refrigerants." RACA

> *"We feel strongly about uplifting industry skills."*

ENTREPRENEURIAL SKILLS DEVELOPMENT MUST DRIVE JOB CREATION FOR SA YOUTH

By Yershen Pillay, CEO, CHIETA (chemical industries SETA)

Empowering youth to become successful entrepreneurs delivers a multiplier effect, with sustainable SMMEs creating jobs for other unemployed youth.

This support in turn also contributes to SETAs with their levies, enabling further support of small businesses.

CHIETA's experience underpins the strong premise that entrepreneurship is undeniably one of the key means at our disposal to dramatically increase job creation among our nation's youth. With our rampant unemployment numbers, particularly among young people, which Stats SA placed at 66.5% earlier this year, and which was reported as the highest in the world by tradingeconomics.com in December 2021, the need to address this reality is urgent.

We know that there is no silver bullet to address this crisis, but we also recognise that comprehensive skills development for young would-be entrepreneurs must be an essential part of the country's efforts to create jobs for youth.

The OECD (Organisation for Economic Cooperation and Development), which represents 38 countries including South Africa, published an article late last year which highlighted the global disconnect between young people's aspirations to be entrepreneurs and the reality.

The article stated, "Young people show a high level of interest in entrepreneurship. Overall, about 45% of young people report that they would prefer to work as an entrepreneur rather than an employee, and 41% think it would be feasible. However, few young people are actively working on start-ups or managing businesses. Only about 8% of people aged 18 to 30 years in OECD countries were doing so between 2016 and 2020. The gap is quite a drop-off from the proportion who indicate a desire to be an entrepreneur, suggesting that there is substantial untapped entrepreneurial potential among youth."

This is exactly the scenario that is driving CHIETA's Vision 2025, which aims to support 2 000 SMMEs and 200 start-ups by 2025 with wide-ranging skills development and financial investment. By the end of this year, CHIETA will be about a third of the way to achieving this goal. In 2021 we supported 125 entrepreneurs and by the end of this year we will be equipping a further 500 for successful small business growth.

This multi-pronged strategy is producing job creators rather than job seekers, and we are working with higher education institutions and other partners to ensure the entrepreneurs-in-the-making will be enabled through wide-ranging skills development, financial support, and access to market linkages.

CHIETA has an allocated budget of R20 million for small business support within the chemical industries sector in our 2022-2023 financial year. This will assist in delivering training in entrepreneurial skills, incubation programmes, learnerships, bursaries, adult education and training, and other initiatives that contribute overall to small business growth, all of which will be carefully monitored and evaluated throughout the duration of the programmes to ensure success and sustainability.

This is going some way towards offsetting the strong non-entrepreneurial culture in South Africa and instead instilling an entrepreneurial mindset within the ranks of our youth and, working with large-scale enterprises, throughout the supply chain.

Clearly though, CHIETA's mandate is restricted to the chemical industries sector. It behoves organisations and industries throughout the country to recognise the impactful benefits of entrepreneurial and SMME development to the nation. These benefits include job creation, a boost in productivity and healthy competition as small businesses often enter markets with lower prices, new market development, an increase in national income, and the introduction of new and innovative products, services, and technologies.

As we move into Youth Month, we can choose to celebrate it with an unequivocal commitment to building a powerful cohort of young entrepreneurs and SMMES in South Africa, for the good of the economic and social development of South Africa. RACA

> *"The youth need to be enabled to become job generators from job seekers."*
>
> *- APJ Abdul Kalam*

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SAIRAC CAPE TOWN GOLF DAY

By SAIRAC Cape Town Committee

The SAIRAC Cape Town centre hosted their long-awaited annual golf day on Thursday 19 May 2022 at the Parow Golf Club.

Attended by the who's who in the industry, all players were eagerly awaiting tee-off to not only show off their green prowess while enjoying a day out of office, but most importantly, to fight for the title as "Best Overall Team" out of the Western Cape HVAC industry.

The 17 four-balls tee'd off at 12:00 - luckily with the weather playing along as the previous day as well as the morning of the event saw cold and wet weather conditions almost halt proceedings. Thankfully, that did not dampen the spirits of all participating players, and the poor weather subsided, allowing some players the opportunity to quickly get in some green practice before tee-off.

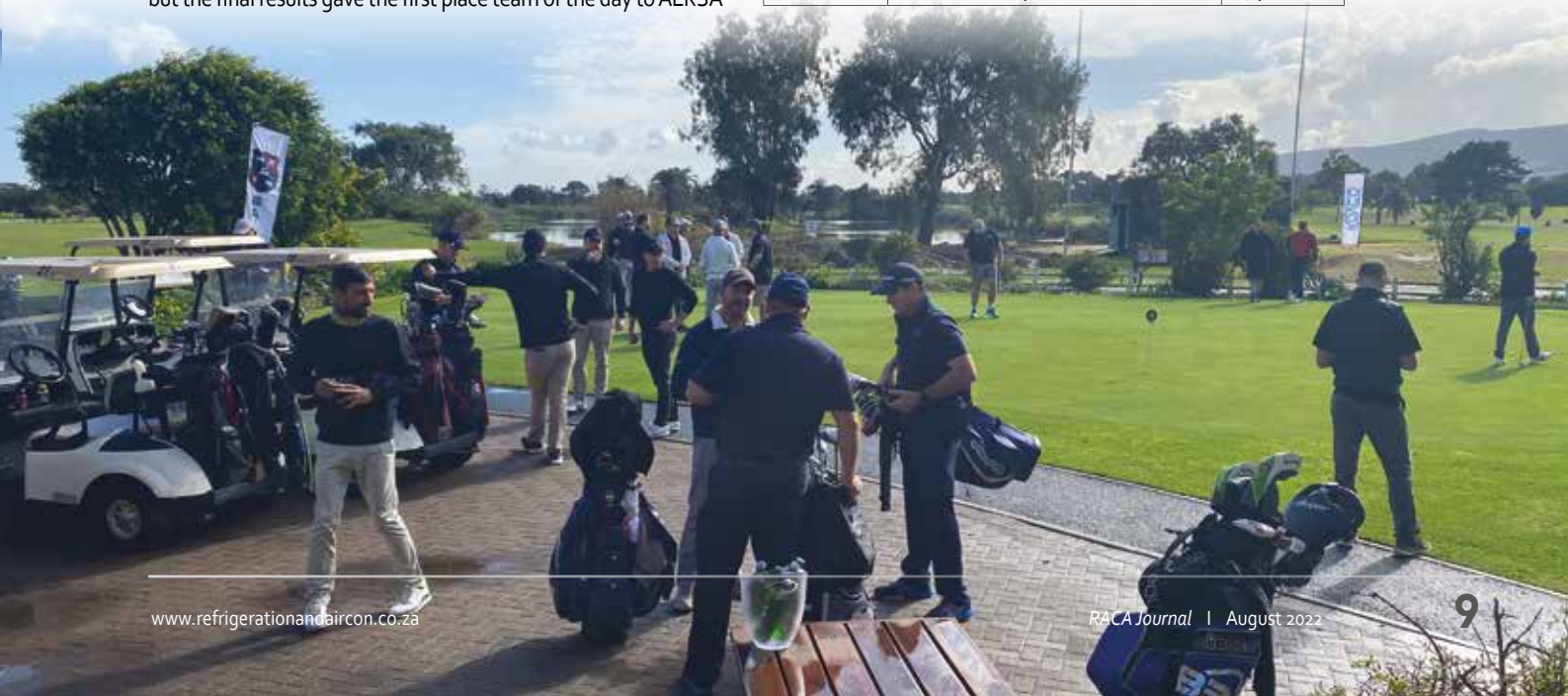
With nothing being able to cool down the enthusiasm of players, and all the jostling for the honours of best team of the day, wet greens and a prevailing wind made the tournament just that much more exciting and challenging. Thanks to the valued sponsors, the four drinks holes saw just as much action and enthusiasm with players taking the opportunity to network over a cold refreshment.

A quick splash-and-dash halfway house stop and off went the players again in the battle for the top position.

After all teams had made their final putt for the day, well-deserved refreshment and networking continued in earnest. The enthusiasm also did not stop there as all players eagerly awaited the final results at prize giving - with many calling the victory early but the final results gave the first place team of the day to AERSA Apollo Air, with each player winning a portable air conditioning unit curtesy of Metraclark.

Congratulations to all the players who made the event possible and one of the most memorable in years.

1st Place	Team Aersa Apollo Air » Kevin Huisamen » Anton Alberts » Paul Louw » Riaan van Zyl	104 points
2nd Place	Team Reftec Refrigeration	90 points
3rd Place	Team Energy Partners	86 points
4th Place	Team Saint-Gobain Gyprol	85 points
5th Place	Team Daikin Chardonnay	82 points
6th Place	Team Advantage Air	76 points
7th Place	Team Filtamatix	74 points
8th Place	Team African Cooling Systems	73 points
9th Place	Team Metraclark Emerson	70 points
10th Place	Team Metraclark Carrier	68 points
11th Place	Team Metraclark Sinclair	67 points
12th Place	Team Electromechanica	67 points
13th Place	Team Livance Midea	65 points
14th Place	Team A-Gas	63 points
15th Place	Team Daikin Pinotage	56 points
16th Place	Team Fourways	52 points
17th Place	Team EBM Papst	43 points



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Best individual player of the day	Kalvin Huisamen	
Longest drive 18th hole	Kalvin Huisamen	
Closest second shot 8th hole	Regard Brand	
Closest to the pin 17th hole	Dean Sanan	
Lucky draw	Jorrie Jordaan	Winner of the air purifier sponsored by Daikin
Luck draw	Lance Killian	Winner of the air conditioning unit sponsored by Kovco. Coil treatment sponsored by Bluchem
Filtamatix' favourite golfer	Lance Killian	Prize awarded by Filtamatix team

Players arriving and networking at the SAIRAC Cape Town centre annual golf day held in May this year.

Some of the players practicing their putts before the tee off.

First place winning team of Aersa Apollo Air included Kelvin Huisamen, Anton Alberts, Paul Louw and Riaan van Zyl, as well as Jacques Mouton (right).

All image credits SAIRAC Cape Town Centre

On conclusion of the Prize Giving, dinner was served with all players and industry attendees enjoying the opportunity to once again socialise and network over a delightful meal, while re-visiting some of the highlights of the day.

A special thanks to all the participating sponsors for the SAIRAC CT Golf Day, with a special mention to Metraclark, A-Gas, EBM Papst and Filtamatix for the drinking hole sponsorship, as all players appreciated the opportunity to network and re-charge for the next holes!

We could not have made this such a special day without the valued support from each role player as listed below:

Parow Golf Club	Metraclark Carrier
Metraclark Emmerson	Metraclark Sinclair
A-Gas	Daikin
Air Movement Supplies (AMS)	Fourways Group
EBMPapst	Electromechanica
Aersa/Apollo Air	Livance (Midea)
Bluchem	Kovco
Saint-Gobain Gyproc	IWC (Tektower)
Coldfact	Filtamatix
Energy Partners	Reftec Refrigeration
African Cooling Systems	SAIRAC Western Cape
Advantage Air	

We would also like to thank all SAIRAC Cape Town Committee members, especially Rozelle Steenkamp and Jacques Mouton for all the hard work, planning and preparation that went into making this golf day so memorable and successful. RACA

Filtamatix' favourite golfer prize handover with Jacques Mouton (left) and Lance Killian (right).

lexeyzhilkin - www.freepik.com

Jacques Mouton (left), the Filtamatix team ladies, and Jorrie Jordaan (winner of the lucky draw air purifier sponsored by Daikin).

Jacques Mouton (left), the Filtamatix team ladies, and Lance Killian (winner of the lucky draw air conditioning unit sponsored by Kovco - coil treatment sponsored by Bluchem).

The drinks and snacks holes on the day were enjoyed by all players.

> *"We could not have made this such a special day without the valued support from each role player."*

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FRIGAIR 2022: A REVIEW

By Benjamin Brits

For those who attended Frigair this year, this article will be a reminder to keep of the great experience, and for those who were not able to attend, we aim to highlight all the best the exhibition and SAIRAC workshops had to offer.

By now you would have heard that FRIGAIR 2022 was, in all respects, a massive success. And for that, the organisers and owners have offered great thanks and acknowledgement for all role players - be they the exhibitors, visitors, or members of the organising teams. Having been a part of this experience hands-on this year was really an honour. From the build-up to the break-down I was enlightened as to the amount of work that actually goes into such a great event.

Not only was it an experience witnessing the operations side of things, but what is involved behind the scenes with marketing, online aspects, social media, photographers and videographers, planning and arrangements, setting of objectives and teamwork. Reality is though, to cover the scope of an event of this nature is not something that can be given justice in *any* amount of pages in a publication, or online. So, my hope is that at least someone from your organisation, or that you know, could give you a first-hand account and information transfer!

One thing is for sure - FRIGAIR 2022 was once again a proven platform that enabled engagement on a variety of products and services where visitors were able to see, touch and explore to their hearts' desire. There were thousands of visitors at this year's event (over 3000 to be more precise) and the quality of participants was praised from both exhibitors and visitors alike. It was very impressive to see the efforts put in and that was evident by the spectacular, eye catching, interactive and well executed delivery of each and every stand.

If you were one of the unlucky to not make it to FRIGAIR 2022, the official website will remain active for the next few months with various media you can have access to. You can also download the official show catalogue to have all of the information you need from the exhibitors directly on your device or workstation for future reference.

"The show was excellent for SAIRAC both in terms of the high number of visitors, and the quality of the exhibitors *and* the quality of their stands. This is especially in light of the past two years and the fact that many people are still 'careful' to meet up in person. The exhibitors have shown that the South African industry is world-class in terms of products and services. Many exhibitors chose to launch or showcase their latest innovations and products on their stands, showing that FRIGAIR is the perfect platform for this. The feedback from exhibitors in terms of the visitor numbers and quality of engagement was also extremely positive. SAIRAC itself also experienced a high number

of visitors to their stand. Many of these were members who came to say hello and chat about the industry. After two years of not seeing anyone, it was really smiles all around as we reconnected with old colleagues and industry members. There were many new enquiries to join the Institute and if they all come through, the institute would in fact add another fifth to its membership. The quality of the networking opportunities was a further standout. All role players are looking forward to 2025, to come together at the next show", said Jaco Pieterse, SAIRAC president.

FRIGAIR was also, for the first time, co-located with four other trade exhibitions, namely Facilities Management, Securex, A-Osh and Firexpo. This combination offered visitors many aspects of learning and contact generation for their businesses and operations. A combination exhibitor function was held as one of the evening events.

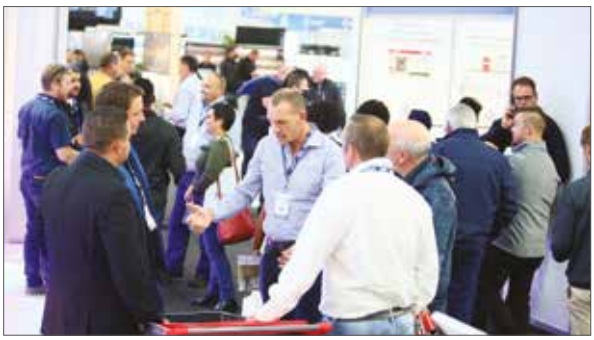
SAIRAC held their now-traditional member breakfast, where industry also partook to celebrate and issue several of the institute's past presidents with recognition certificates for their respective terms, efforts, and leadership. They included:

- Barney Richardson
- Ron Williams
- John Ackermann
- Patrick Burke
- Derick Truscott
- Andre van der Merwe
- Grant Laidlaw
- Marius la Grange

THE SHOW TRENDS FROM ALL PARTICIPANTS

Considering the overall feedback from exhibitors and visitors, several key trends emerged, including the following:

- Good number of visitors and stands to engage on
- High quality visitors and exhibitors alike
- Excellent platform to reconnect with existing customers
- Perfect platform to find and interact with new potential customers, to build awareness, showcase and discover all of the latest products and innovations



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HIGHLIGHT OF PRODUCTS, SERVICES AND TECHNOLOGY

It was not surprising that at this year's event, nearly 50% of exhibitors used the opportunity to showcase something new from their products or services range, demonstrating the changes that have happened in the sector since the last gathering. This in fact mirrors the advancements of technology around the world – particularly over the last two years.

Similarly, the other exhibitors had either refined their focus or expanded their range to address the needs of the ever-changing HVAC&R world. Digitalisation of products and services was further another key trend as the ability to gather data, but also increase efficiency has become critical for all stakeholders that require any HVAC&R functions. What was further evident this year was the fact that great interest in commercial refrigeration and related facilities was on the table, with expected activity in the cold chain to show double digit figures over the next five years and retailers are now more than ever seeking ways to gain a competitive edge. Similarly, air quality has moved high up the list for space occupants and so the need to explore specific technology that can be deployed without re-inventing systems or by using portable solutions held interest.

With the event's theme being "Natural Refrigerants", several suppliers showcased their latest offerings in this line of products that will see a shift as older refrigerants are being phased out.






"Frigair was money well spent for the potential business that we generated off the exhibition floor. We launched our new solar panel cooling tower at the show as it enables people to see and touch something tangible that a website doesn't. We had a mixture of existing customers and potential new customers engaging with us. I would say to anyone the money spent on the show is worth every cent." - Chad Vercuiel, sales engineer at **Evapco.**








The organising team walked well over 500 000 steps (that is over 390km) to capture everything happening and to ensure everyone's experience was great!

Ammonia systems are already used widely while CO_2 systems are seeing increased deployment and even the use of propane is experiencing a fast shift in commercial applications as well as use in AC systems. For retail applications self-contained display fridges and freezers using this refrigerant are already out in the market in their thousands *and* for quite some time.

Several conversations surfaced at the event around leapfrogging certain refrigerant replacements directly to natural refrigerants as technology and system capabilities are moving at such a rapid pace. Also of concern is the trajectory of the country's phase-out of harmful refrigerants with high ozone depleting substances (ODS) and global warming potential (GWP).

Some of the products and services at FRIGAIR 2022 included both locally manufactured as well as imported products:

- Technology and new solutions in insulation and energy transfer
- Progression of, and several new aspects of fans
- Air and filtration solutions (including HEPA)
- Air treatment and air flow, and exhaust systems

"This year I have been impressed with the quality of visitors at the exhibition and have had really meaningful interactions." – Arthur Smal, **Umicore Marketing.**

- Grilles, louvres, and dampers
- Ranges of refrigeration racks and skids
- Packaged units, coils, and heat exchangers
- Retail display equipment in traditional and multi-use applications
- Controllers and control systems (building management systems), and software
- Zone control
- Transcritical CO_2 systems and components
- Latest technology in energy saving products
- Display fridges and freezers
- Air conditioning systems (split units, VRF, portable units)
- Evaporative cooling technology
- Cooling towers
- Refrigerator doors coming in various materials and styles
- Storage and freezer doors and systems
- Insulated panels and systems (and various core materials)
- Humidification and dehumidification units (adiabatic, isothermal, dessicant)

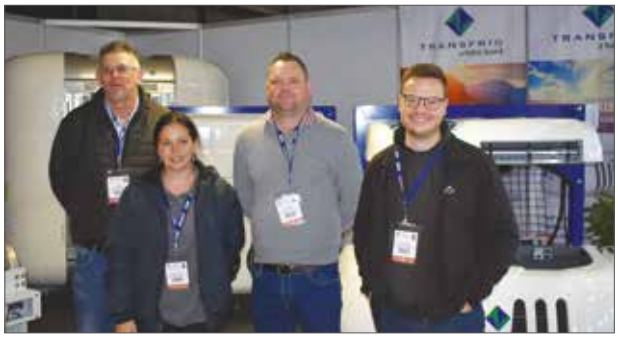
- Traditional and smart/digital tools, measurement devices and detectors
- Transport refrigeration solutions
- Variable speed drives
- High performance lifts and truck restraint equipment
- Components (seals, vibration, valves)
- Refrigerants and refrigerant recovery, and refrigerant lifecycle management
- Biodegradable, environmentally friendly systems and solutions
- Ducting and ventilation
- Training for technology changes and safety
- Associations and official bodies, government department DFFE
- Sensing and control equipment
- Modular HVACR solutions
- Flow-Ice and freezing systems
- Space comfort solutions
- Wholesalers
- IoT technology

EDUCATIONAL LINE-UP

Although this year's exhibition was not able to host the ASHRAE workshops owing to unforeseen circumstances, the owners and organisers have earmarked these courses as a specific highlight for the 2025 experience. Be sure to look out for information related to these courses in future.

The South African Institute for Refrigeration and Air Conditioning (SAIRAC) did however execute the hosting of 10 free-to-attend workshops during FRIGAIR 2022. These included local speakers from industry and government that primarily gave updates to some key elements in the industry from a regulatory, training and process perspective, as well as sharing

"We really enjoyed the opportunity to once again be able to come together and network with our suppliers and run into people we have not seen for quite some time." – Douglas Scott, mechanical engineer at **HCM.**



"This was my first time to SA and to Frigair22 and I was pleasantly surprised at the high quality of visitors to the show. The number of visitors was also very good and together - the quantity and quality of the visitors meant it was a very good show for us." - Waldemar Wagner, product manager (Germany) responsible for digital solutions at **ebmPapst** S.A.

of experience on best practices and technology aspects. Two international specialists were also involved who offered up their expertise to discuss the very impactful topics around HVAC&R systems. These free-to-attend workshops were well attended.

The speaker presentations (where agreed in their work being shared freely) will also be showcased in future. The 2022 workshops included the following topics:

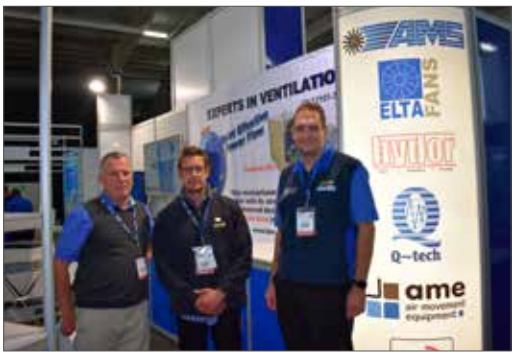
- Refrigerants safe handling, registration of authorised refrigeration practitioners, categories of registration, the registration and renewal processes, time frames and limits. Requirements, roles, and responsibilities. Presented by Barney Richardson of SARACCA.
- Certificates of Conformance (CoC) for refrigeration/air conditioning systems in line with the pressure vessel regulations. Registration for, and issuing of, the new online certificates of conformance. Presented by Eddie Cooke and Virginia Mtshali – SAQCC Gas.
- The South African signing of the Kigali amendment, phase down/out of HCFCs and HFCs, and an update on the South Africa's HCFC Phase-Out Management Plan (HPMP). Presented by Margaret Molefe of DFFE.
- Installation of insulated structures: aspects of design, common types of insulation used for cold structures and clean rooms, planning and installation, quality control, on-site inspections and approval of works. Presented by Archie Steyn of African Cooling Systems.

- Energy efficiency in hydronic cooling distribution systems. In general, the topic dealt with in this workshop was energy efficiency in central air-conditioning (cooling) hydronic systems from the centralised production site to local sub-stations and terminal units. Architecture of chilled water distribution systems and the design and installation of heat pumps and polyvalent heat pumps was covered. Presented by Luigi Rossettini (international speaker) from Aersa/Aermec.
- Servitisation in refrigeration and how it supports the use of natural refrigerants and shifts the focus sharply to life-cycle cost. Servitisation is a well-known tool in many industries and is a relatively new concept in refrigeration known more commonly as Cooling as a Service (CaaS). Preented by Dawie Kriel of Energy Partners.
- The status quo of air conditioning and refrigeration training in South Africa. It covered the latest qualification outline and addressed regular questions involving natural refrigerants, flammable hydrocarbons, apprenticeships, qualifying staff, trade testing, and future training changes and additions. Presented by Grant Laidlaw of ACRA.
- Driving a circular economy and the latest refrigerant trends. The topic included the use and disposal lifecycle for refrigerants and why there is a need to change our outlook on how we deal with refrigerants (phaseout and quota mechanism). Presented by Werner Terblanche from A-Gas South Africa.
- Prevention by design educated participants about the basic elements of SANS 893: Legionella … , as it relates to evaporative cooling equipment. Using the specific written guidance of the SANS 893 documents, it was demonstrated how the proper design, operation and maintenance of evaporative cooling equipment helps to reduce hygiene risks and facilitate better compliance with the guidance and recommendations of SANS 893. Presented by Robert Downey (international speaker) from Baltimore Aircoil Company.
- Using plate heat exchangers in closed circuit cooling towers to save on OPEX and CAPEX highlighted the cost saving benefits of using plate heat exchangers as a substitute for coils. Presented by Louw Nagel of Industrial Water Cooling. RACA

Please view the official FRIGAIR website to gain access to all of the exhibitors at **www.frigairexpo.co.za**

In future issues of both ***Cold Link Africa*** and the ***RACA Journal*** we will be publishing all of the technology, products and services showcased at FRIGAIR 2022.

You can also already diarise the dates for FRIGAIR 2025 which will take place again at Gallagher Convention Centre between 4 – 6 June, 2025!



There were over 3000 visitors from all levels, and from all around the country. Representation also included several guests from Namibia, Botswana, Zimbabwe and Kenya – as well as guests from Italy and America.

"We had an extremely busy show since day one, meeting new faces in the industry. Our goal was to market the business, create new awareness and solidify customer relations as well as generate leads for sales. The show delivered on all of these. We had a wide range of products on the stand, of which visitors wanted to see first-hand how they work. The show provided the perfect environment for this." - Lourwrens Dreyer, sales engineer at **Danfoss**.

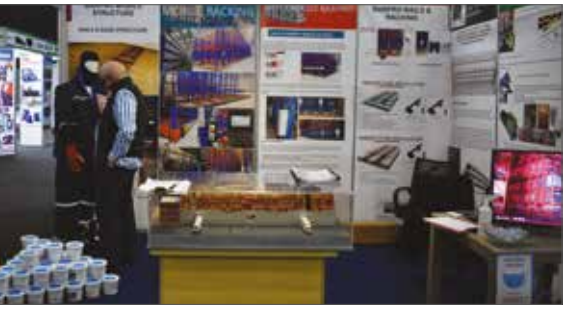
"Awareness and exposure were our two focus areas coming into the show but it delivered so much more through quality conversations with a high-quality visitor. Overall it was a very positive experience for us." - Coenrad Ehlers, national assets manager at **Energy Partners Refrigeration.**

"The show was positive for us both in terms of seeing our existing customers face-to-face and being able to catch up after the past two years, as well as meeting new potential customers. We also introduced a number of new innovations at the show, and it proved to be the perfect platform to do this, generating lots of interest some of which may translate into business for us down the line." - Daniel de Beer, regional manager, sub-Saharan Africa at **Emerson Climate Technologies South Africa.**

"The number of visitors was good. Surprising, as we thought perhaps people might still be a bit reluctant to come out. But the people who have come to the show are good quality visitors. Our goal for the show was to create more awareness around our company, products and services. We definitely achieved that goal." - Kevin Ekron, owner at **Transfrig**.

"The show was very busy for us. While we had more staff than in previous shows, it still felt like we couldn't keep up. The result, apart from sore feet, was that we gathered solid leads that will give us good business. This year's show was better than the last show we attended, which we were surprised at given the circumstances." - Bianca Boshoff, marketing and communications specialist at **A-Gas South Africa.**

"We went to Frigair to reconnect with our existing customers and generate awareness of our company, products and services. That was our goal, but this was surpassed in that not only do we feel we have accomplished that, but we also had some serious inquiries." - Albert Gurwe, sales executive at **Dalucon Refrigeration Products.**



"The interaction with visitors and the number of visitors was excellent. We used the show to launch several new products and the interest that was generated has shown that Frigair was the perfect platform to do this. The show is in fact part of our strategy because we get such good visitors and interaction here." - Kumar Singh, HVAC product manager for the Carrier brand at **Metraclark**.

"Frigair22 was brilliant this year. While it was smaller, it was very busy with lots of activity, keeping us busy all three days. As a result, we had good exposure with many visitors. We also found all these visitors to be top-notch. We have been in SA for 60 years, but last year we became independent. The main goal for us at the show was to show the market that we are now independent, but better than before. The show helped us to achieve this and to increase our footprint." - Naeem Fakir, MD at **Bock Compressors South Africa**







"This was my first show and it exceeded my expectations. It was a great space to meet our customers after lockdown and in-person again. The space is less formal, but still is business-orientated so it made for a good business experience. While we aimed to create awareness around the company and our products, we had some good discussions with businesses that are or have recovered from the last couple of years and are ready to do business again." - Marc Duthoit, general manager of **TCL & TecsaReco.**



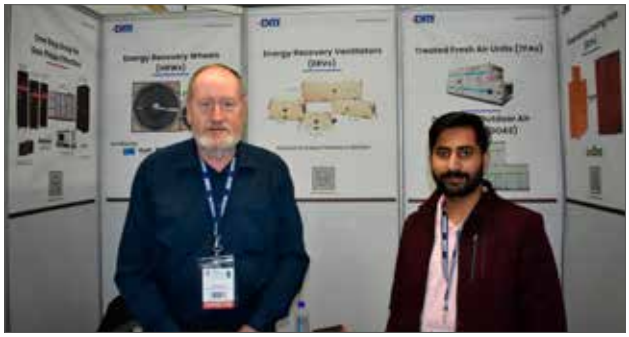
"From the first day, we had traction on our stand with some good leads and potential partnerships. The show was a good place for us to create brand awareness while several new products on the stand generated significant interest from old customers and drew in potential new customers." - Shaun Barker, Africa sales manager at **Seeley International Africa.**



Feedback trends included that this platform remains an excellent channel for all marketing and branding aspects.

There were over 100 exhibitors showcasing their various products and services.

"The show brought together the industry after Covid and lockdown and it was great to reconnect with the rest of the industry. We have a new product out that we showcased to the market which was the main goal of the show for us. We also had a number of good discussions with key contractors." - Hannes Steyn, head of heating and refrigeration at **GEA Africa.**



Before the show even ended, nearly 20% of exhibitors had already submitted enquiry renewal forms for the next exhibition.

"The show generated lots of interest for us. Apart from our existing customers who have visited us to see our new products, we also had good interest from other African countries. With the expansion happening in those countries, there is lots of scope for us and the show was the perfect place for us to connect with these buyers." - Coert Van Zyl, national sales manager from **Stab-A-Load.**

"FRIGAIR is like the Olympics of exhibitions for the local industry. It was great to see so many people attending and especially the interaction with cross border participants from Namibia, Botswana, Zimbabwe, and Kenya that we could talk to about our products." – Michelle Croucamp, filtration specialist at **Filtaire SA.**

"The show was very busy, with visitors especially interested in products on the stand. Much of this interest was from companies that are looking for products for future projects. It was also the perfect platform to reconnect with our existing customers after not being able to see them, apart from virtual interactions." - Torsten Steinborn, managing director at **Bitzer Kühlmaschinenbau (SA).**

South African Institute for Refrigeration and Air-Conditioning

www.sairac.co.za

SAIRAC

MISSION

The mission of SAIRAC is to offer our membership the following:

- Regular monthly Technical Meetings on trending & current subject matters, in each of the Centres.
- Site visits and plant tours.
- Enrichment courses.
- Feedback related to the revision of SANS/NCRS codes of practice.
- Feedback on the HCFC phase-out program and green alternatives to HFC.
- The SAIRAC Technical Data Manual in CD format.
- The Dreosti Memorial Lecture on globally trending research and applications.
- FRIGAIR exhibitions, conferences and workshops every three years.
- The creation of a culture of learning and improvement by means of:
  - The recognition of the achievements of SAIRAC members, in their working environments and professional capacities, in the Environmental Control Industry.
  - The recognition of the achievements of students at tertiary educational institutions.
  - The recognition of the achievements of learners in the Industry.

MEMBERSHIP

Membership of SAIRAC is categorized in the following grades:

- Student • Associate • Member • Fellow

STRUCTURES

SAIRAC is active in the following geographic Centres: Cape Town - Durban - Johannesburg - Port Elizabeth
The affairs of SAIRAC in each Centre are managed by an elected committee, consisting of the Chairman, Vice Chairman, Secretary, Treasurer and representatives of each grade of membership. National control and management of SAIRAC is vested in a Council, headed by the President, who is elected by the Corporate Members. Council members include the Chairman of each Centre, a Vice-President, immediate Past President and Treasurer.

AFFILIATION

SAIRAC is affiliated as an international associate of:

- The American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)
- Institute of Refrigeration (IOR)

ECSA REGISTRATION

SAIRAC is registered with the Engineering Council of South Africa as a Category A Voluntary Association. SAIRAC members in good standing receive a reduction in their ECSA annual membership fees.

TECHNICAL DATA MANUAL IN CD FORMAT

The data manual is written in the form of a disc-based website that starts with a dynamic index. This makes it very easy to find information on any topic just by clicking on the hot links. We have developed the content from the basics much like a text book. The object is not to teach refrigeration and air conditioning, rather it is to provide a rich source of reference material. Some of the information is better handled by software and where appropriate, we have included a number of software programs. Some of these are: a psychrometric chart generator, refrigerant properties, heat transfer coefficient calculator and a world locations database. The contents cover a broad range of subjects highly relevant to HVAC & R.

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STRIKING A BALANCE

Compiled by Benjamin Brits

This engineer enjoys every opportunity to innovate in project design.

Ricardo da Silva was born and raised in Pretoria, Gauteng. He attended Pretoria Boys High School and then proceeded to graduate from the University of Pretoria with a Bachelor's degree in mechanical engineering in 2011. During his time at university he received a bursary from Hatch, and this is where his career in engineering kicked off.

Beginning his working life at Hatch in the mining sector was an extremely beneficial learning experience as he recalls. This however coincided with a drastic downturn in the mining economy and so projects became few and far between.

"As a junior engineer I needed practical on-site experience, which was difficult to come by during that time. I therefore moved to Delta Built Environment Consultants who operate predominantly in the built environment sector for a short stint, and there I was immediately involved in several impressive projects that provided me with invaluable experience. I then moved to Spoormaker and Partners and have been with the company since mid 2015", he says.

Working at Spoormaker and Partners has ignited an innovative streak which has provided interesting and challenging designs that ultimately result in great value-add to clients. As a team member in one of the leading consulting firms in the HVAC industry, this has afforded da Silva the opportunity for involvement on many more renowned building projects which test both the limits of his knowledge and experience, and these aspects are what he enjoys most about his work.

Considering his hobbies and interests, da Silva has been an avid sports fan since his childhood and plays a variety of sports, including soccer and squash. When he is not partaking in sporting activities, he enjoys spending time with his wife and child, and further has travelled South Africa from coast-to-coast a number of times.

Without a doubt, he notes, the most significant career achievement to date has been the design and construction of

R da Silva | Spoormaker and Partners

the newly-opened Netcare Alberton Hospital in Gauteng (also featured in this issue). A large portion of the past five years has been dedicated to this project and there are numerous cutting-edge designs across all engineering fields that have been implemented at this flagship site.

Considering his view on where technology can take us in future, da Silva observes that HVAC technology has been increasing rapidly over the past two decades and he believes this should be at the forefront of any sustainability efforts.

"HVAC infrastructure consumes a tremendous amount of energy and we should try our best to reduce the impact it has on the planet. Building energy modelling and automation are two powerful tools that we use on a daily basis within the industry, and I believe it should be used to greater effect in order to optimise the built environment and strike a balance between a functional facility and the impacts onto the planet", he concludes. RACA

Our personality profile is a regular monthly feature on people in our industry. Appearance in this feature does not signify endorsement of any product or company and equally the views expresses are not those of Samsung.

CUTTING EDGE DESIGNS AND TECHNOLOGY FOR FLAGSHIP FACILITY

By Ricardo da Silva, mechanical engineer at Spoormaker and Partners

The greenfield 427-bed Alberton Netcare Hospital will add capacity in multi-discipline and specialist medical services for the local and surrounding communities.

The original inception and concept phase of this project began in 2011 when Netcare started exploring options in refurbishing the Union Hospital located in Alberton, Gauteng. After various design and feasibility iterations it was decided that a new greenfield facility would be needed in order to reduce the operational impact of the current facility while providing a blank new canvas for which Netcare could roll out their newest design philosophy.

The original premise of the project was to combine the Union and Mulbarton Hospitals into the new facility, while also incorporating a few beds from Clinton Hospital. All three hospitals serve the Alberton area and are critical to Netcare's operational focus.

Concepts on the revised scheme began in earnest in the beginning of 2016. Considering the need by Netcare to create a flagship facility, there were numerous engineering workshops that refined the proposed design.

Earthworks began in late 2019 with the mechanical sub-contract tenders (HVAC and Medical Gas) awarded in June and Sep 2020 respectively.

Practical completion of the facility was achieved in February 2022. This included the project being severely affected by the COVID-19 pandemic, and associated nationwide shutdowns.

The hospital officially opened its doors to the public on 11 April 2022.

DESIGN SPECIFICATIONS/CLIENT BRIEF

As mentioned in the preceding section, the client wanted to create a flagship facility that showcases their design philosophy and the efforts they have made in furthering their sustainability initiatives.

Netcare have focused heavily on optimising the energy usage of their facilities and look to an average of 35 VA/m² of total

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VRF central controller.

© RACA Journal | Benjamin Brits

One of the de-centralised server rooms. Each room at the site is serviced with either DX or VRF units based on room positioning.

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One of the VRF control box.

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A theatre AHU humidifier.

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One of the MCC panels.

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The anaesthetic gas scavenging system.

The energy centre fresh air system.

A decentralised heat recovery hot water plant.

One of the VRF theatre air handling units.

DX condensers (for one of the server rooms).

An example of the ducted cassette units and diffusers located in one of the wards of the hospital.

energy usage on gross lettable area. On the HVAC scope, heat recovery systems would play a major role in obtaining an energy efficient building.

During the course of the project the client brief changed due to the global impact of the COVID-19 virus. The HVAC system in *all* hospitals plays a major role as a first-line defence in the containment of airborne pathogens of this nature. As such, various design changes were implemented in order to prepare the hospital for future outbreaks.

THE HVAC SYSTEM AND INSTALLATION

During the concept design phase, two options were presented to the client for review. This included the use of a 4-pipe chilled water plant and a de-centralised variable refrigerant flow (VRF) system. The 4-pipe chilled water solution made use of hot water instead of electrical elements to provide terminal level heating for all variable air volume (VAV) ducted systems.

The client opted for the de-centralised VRF system due to the familiarity and success they have encountered with similar installations at their other facilities.

This facility was effectively divided into two sections. The clinical areas (which included general wards, ICU/HCU's, emergency department and radiology) that are served by ducted VAV air handling units (AHU). These AHU's provide primary and secondary filtration to the area whilst also optimising the opportunity for free cooling by engaging economy dampers which increase the fresh air flow rate. The AHU's are coupled to a heat recovery VRF condenser located on the roof. Each clinical area is served by one AHU-VRF condenser combination in order to improve redundancy across the facility.

The other areas of the facility (which included doctors suites, back of house/technical departments and administration offices) are served by a conditioned fresh air unit with VRF cassette units for each space. Each refrigerant control box has been selected to have 20% spare ports available in order to expand on the system if required. All refrigerant lines have been equipped with high quality shut off valves (tested to 45-Bar) to enable separate branches to be isolated without shutting off the rest of the system. As with the clinical areas, the unitary system has been sub-divided into block and floor-specific zones in order to improve redundancy.

There are 11-of ISO Class 7 and 4-of ISO Class 5 operating theatres within the hospital. These are also individually served by air handling units with humidity control that are equipped with high efficiency particulate absorbing (HEPA) filters.

The HVAC infrastructure is also utilised to provide hot water generation on site. This is achieved by integrating the hot water plants located around the facility into the VRF heat recovery infrastructure. As hospitals are predominately in a cooling only mode this provides tremendous amount of opportunity to

utilise heat recovery technology. There are five de-centralised hot water plants across the facility and each plant is made up of two heat accumulator tanks. Each tank is coupled to 2-of booster units and 1-of heat exchange (HEX) units that are connected to the closest VRF system. Each tank and its sub-components can act independently if maintenance is required on the other set.

There are also numerous isolation rooms located within the facility which are served by standalone extraction systems that ensure correct air pressure cascading at all times in order to protect both the patient and the staff. In addition, all isolation rooms are monitored by a separate control system which continuously measures the air flow within the treatment room and provides both a visual and audible alarm should the correct conditions not be maintained.

The basement ventilation system comprises of large axial extract fans and numerous centrifugal jet movement fans. These movement fans push the air into these large extraction zones that are then vented to atmosphere on the ground floor. The fans are linked to carbon monoxide (CO) monitors and are controlled by the average reading across a number of de-centralised zones. The entire basement ventilation fan system is also fire rated as they provide a secondary function as a smoke extraction system in the event of a fire within the space.

As the COVID-19 pandemic unfolded across the world more facilities are looking at being prepared for future outbreaks. Netcare requested that Spoormaker and Partners as the mechanical consultants, investigate design interventions that can be implemented during the construction of the hospital that will enable the facility to be better equipped to handle the different operating parameters that are required in these instances.

The following HVAC design interventions were implemented:

Wards

- Wards and other clinical areas served by a ducted system (except the ICU's and theatres) are designed to go into full fresh air mode during a pandemic period.

1. *Part of the smoke extract system on the roof.*
2. *DX condensers (located at the hybrid lab UPS room).*
3. *Another of the VRF theatre air handling units.*
4. *One of the magnehelic gauges (measuring HEPA filters).*
5. *Heat accumulator tanks.*

The theatre plantroom.

Internal view - AHU (fan and LEV kits).

One of the fresh air intakes for the main plantroom located on the roof.

- A minimum of 6 air changes per hour (ACH) is provided into the spaces.
- Standalone extract system will serve each area enabling the ward/department to be under negative pressure.
  - Extract grilles will be placed at the furthest point from the entrance door in order to create the required pressure cascading/air flow direction.

Typical schematic of airflow during Normal and Pandemic modes is shown below:

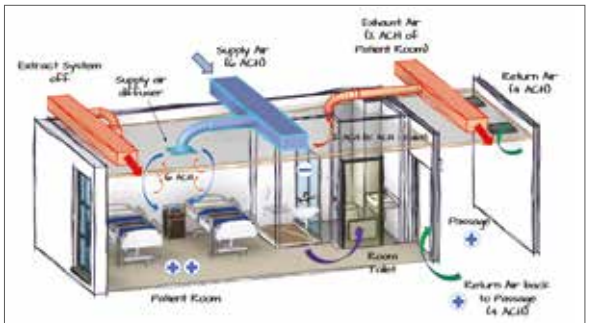

Figure 1: normal mode.

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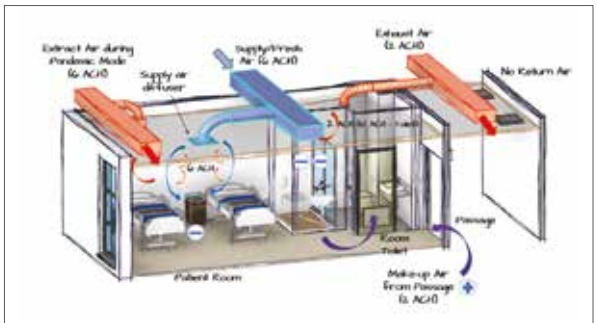

Figure 2: pandemic mode.

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Some of the heat recovery condensers located on the roof.

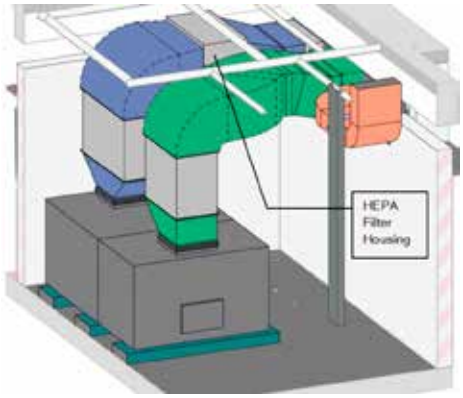
Internal view - AHU (DX coil, electric heater bank and humidifier).

Radiology department (Bucky room).

ICUs

HEPA filters have been shown to be effective in reducing the viral load of airborne contaminants with multiple passes. This coupled with an already high total air change within the ICU/HCU provides an efficient alternative to running the AHU on full fresh air. The following was implemented in these areas:

- All AHUs fitted with HEPA filtration.
- All isolation room fans will be switchable enabling protective and infectious isolation protocols.



The HEPA filtration housing on air handling units.

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DIFFICULTY IN MEETING DESIGN SPECIFICATION/SOLUTIONS

The only element that provided some challenges in this project was the implementation of the COVID-19 design interventions. The technical solution was relatively straightforward, however arriving at the correct result took considerable research given that the information around COVID-19 and HVAC infrastructure was continuously evolving and insignificant research was present at the time.

In the end, the solution that was implemented is still regarded by ASHRAE, and other international bodies, as one of the best design interventions that can assist a facility with providing increased levels of safety for air borne virus similar to the coronavirus family.

PRODUCTS USED IN THE PROJECT

As with all product selections, a reputable and well known product is always sought out for a project of this magnitude. The client cannot afford the risk in implementing untried and untested products on such a scale across a flagship facility.

The two largest HVAC products implemented were the air handling units (46-of) and VRF system (566 indoor units, 104 condensers). These two products were individually tendered to the industry with TROX SA and Mitsubishi Electric Airconditioning winning the tenders respectively. The total VRF cooling capacity is 2.2MW.

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Medical gas pipe reticulation.

© RACA Journal | Benjamin Brits

A jet movement fan in the underground parking area.

© RACA Journal | Benjamin Brits

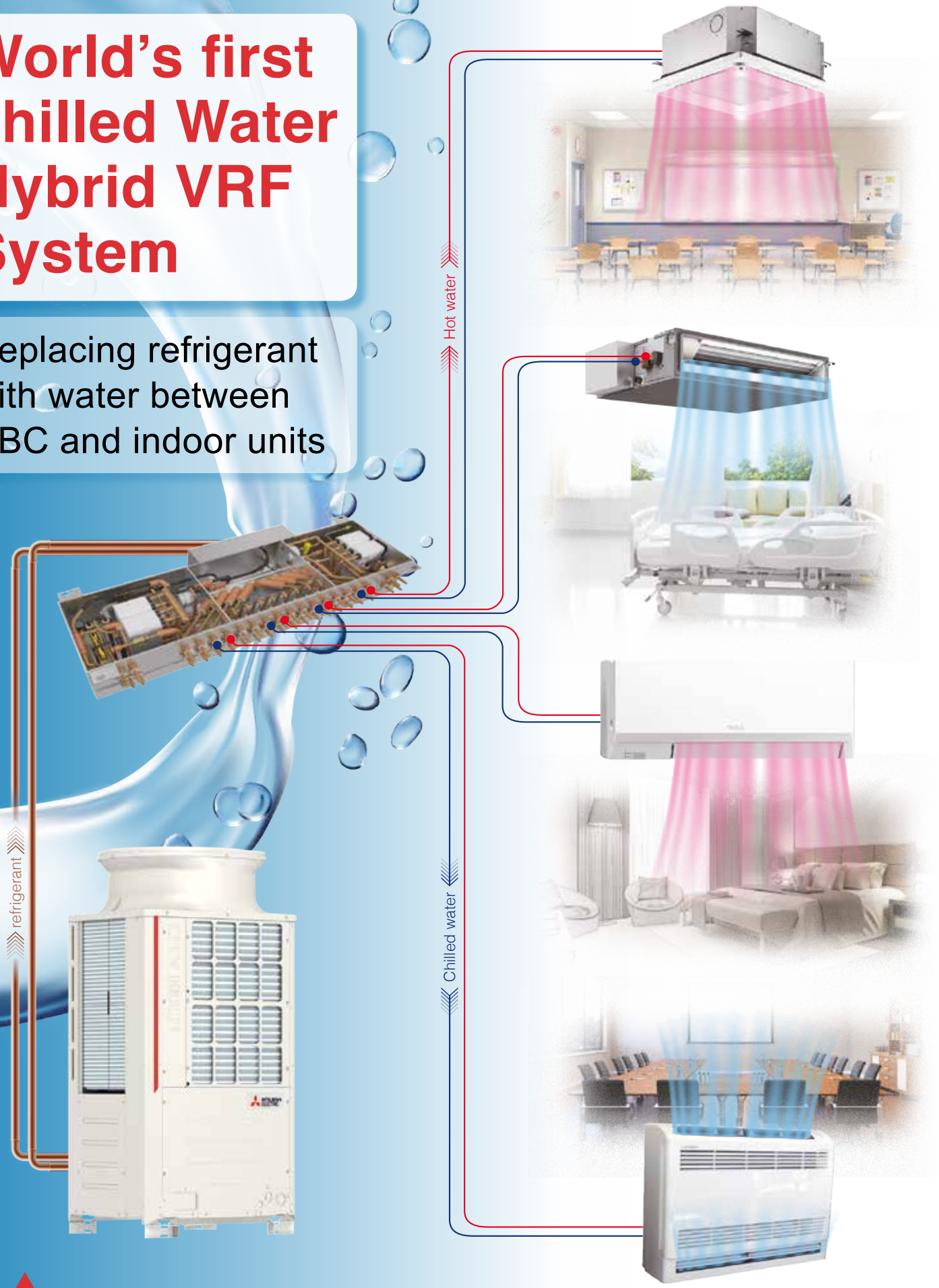
Cold and freezer room condensers.

© RACA Journal | Benjamin Brits

One of the VRF booster and HEX unit installations.

World's first chilled Water Hybrid VRF System

Replacing refrigerant with water between HBC and indoor units



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The combination of feasible capital costs, a quality product, and intensive local technical support meant that the client had no reservations in appointing each supplier.

IMPACT OF THE HVAC SYSTEM ON ELECTRICAL USAGE

The electrical efficiency of the facility was one of the leading priorities for the client in order for them to achieve their sustainability benchmarks. As noted, heat recovery was extensively used (where possible) and forms the backbone of achieving the lofting goals as required for this facility.

The simulated heat load model for this hospital (annualised) is 10.5 W/m² for HVAC energy usage across the entire site. Currently, the hospital is operating within 10% of this which bodes well in that the implemented design closely follows the simulated model.

SPECIAL/UNIQUE ELEMENTS OF THE PROJECT

The hospital has unique structural design elements in order to operate as a post-disaster function facility. The site is built under a special structural classification – both in reliability and in consequence. The facility design as such effectively means that in the event of a 1 in a 100 year natural disaster occurrence such as flooding the facility will still be able to function and provide service to the population.

The structure is also designed and classified as a high risk category. This means that the structure is able to withstand seismic loads (which can be present in the East Rand of Gauteng) and remain standing even if a column is damaged or fails.

The are 24 vertical shear walls dotted around the facility. These are 10-meter-wide reinforced structural concrete walls that run uninterrupted from 5 meters below ground to the roof level. The ground beams are tied to the shear walls to create a rigid structural matrix.

This obviously has an effect on the in-ceiling services which also need to be secured in the case of a seismic event. South Africa does not have prescriptive guidelines for seismic restraints so the professional team used guidelines developed by the Federal Emergency Management Agency in America. These guidelines provided information on support details for various HVAC equipment as highlighted in the schematics Figure 3 and Figure 4:

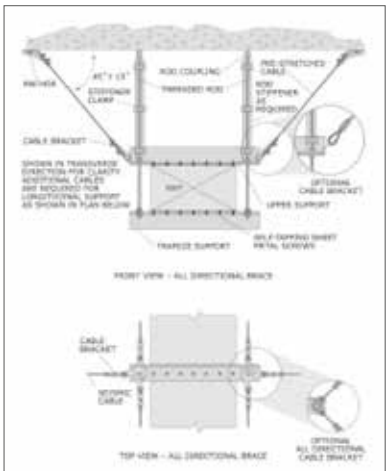

Figure 5: rectangular duct with vertical rods and braced with cables (all directional).

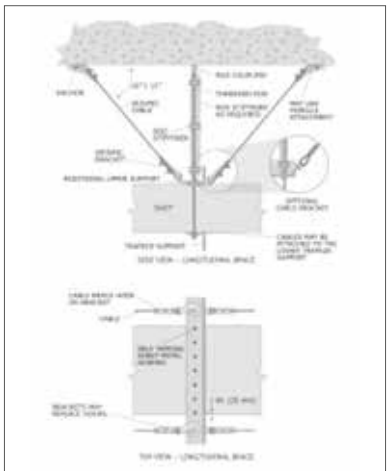

Figure 6: rectangular duct with vertical rods and braced with cables (longitudinal).

Other interesting features – digital hospital:

- Alberton Netcare Hospital is the first facility in the Netcare Group to be fully digitised.
- There are 24 de-centralised server rooms within the hospital with a disaster recovery installation off-site.
- The site has a N+N cooling configuration.
- All clinical areas are access controlled via personalised access keys – the movement of all personnel can be tracked in real time. This is helpful to check rotations and time of care metrics that are important to Netcare. RACA

Spoormaker and Partners | R da Silva

Trauma department (resuscitation).

Figure 3-6: Extracted from Federal Emergency Management Agency America

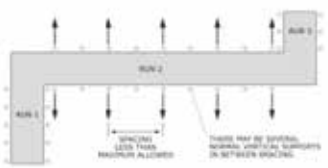

Figure 3: installation of additional transverse bracing as necessary to stay within maximum transverse spacing limitations.

Figure 4: one cost-effective way to rearrange bracing.

© RACA Journal | Benjamin Brits

Internal view - AHU (MCC).

Spoormaker and Partners | R da Silva

One of the private rooms.

LIST OF PROFESSIONALS

Project name	Netcare Alberton Hospital	
Owner	Netcare Limited	
Architect/ Designer	A3 Architects	
Project manager	Profica	
Consulting engineer	Electrical	BFBA
	HVAC & BMS	Spoormaker and Partners
	Medical Gas	Spoormaker and Partners
	Wet services	IX Engineers
	Civil	WSP
Contractors	Main building	Trencon
	HVAC & R	Airgro
	Medical gas	Drager
	BMS	Satchtech
	Wet services	Thermowise
	Electrical	Presto
HVAC and associated product suppliers	AHU/FAU	Trox
	VRF Equipment	Mitsubishi Electric Airconditioning
	DX Equipment	Mitsubishi Electric Airconditioning
	Diffusers	Rickard
	MCC	Merlin Engineering
	Humidifyers	Condair/Humidair
	Jet Fans	Systemair
	HEPA Guages	Dwyer

GRANT LAIDLAW

Grant Laidlaw is currently the owner of the Air Conditioning and Refrigeration Academy (ACRA) in Edenvale. He holds a Bachelor of Business Administration and an associate degree in educational administration. He has a National Technical Diploma and completed an apprenticeship with Transnet. He has dual-trades status: refrigeration and electrical. He has been involved with SAIRAC for over two decades and served on the Johannesburg committee as chairman and was also president between 2015 and 2018. Currently he is the SAIRAC national treasurer.

UNDERSTANDING THE BASICS

By Grant Laidlaw

Getting to grips on the difference between energy, heat and temperature.

Stefan asks: Grant, Thank you for your contributions, we find that many people working in the field do not understand the basics, for example energy, heat and temperature. When I even mention latent heat the wheels come off. Perhaps this would be of value in getting some basic understanding in place. Thanks.

Hi Stefan, yes what you say is correct. Let us then go back to basics - starting with temperature.

The temperature of a body is how hot or how cold the body is; it is measured with a thermometer. In South Africa it is typically indicated in degrees Celsius (°C).

The two fixed points on the thermometer are 0°C for the temperature at which pure water will freeze and 100°C for the temperature at which water will boil at average sea level atmospheric pressure.

Temperature is a measure of the heat intensity of a body. It is a function of the internal kinetic energy and as such is an index of the average velocity of the molecules. Thus the colder a body is, the less the movement of the molecules and the lower the internal energy.

Scientists have calculated the point at which there will be no movement of molecules and thus no internal energy. This point is called the absolute zero temperature (-273 °C). The unit of absolute temperature is the Kelvin (K). Its symbol is T.

The customary temperature (t) is given in degrees Celsius (°C).

When expressing a temperature interval or a *temperature difference*, both units can be used (K or °C). Note that when K is used, the ° sign is not used.

For instance if the outside air temperature is 35°C and the temperature inside a room is 25°C the temperature difference = 35°C - 25°C = 10K.

Note: Temperature and internal energy must not be confused. A body can have a very high temperature but, due to its low mass, have a very low internal energy.

Temperature provides an indication of the direction in which internal energy flows. When two bodies are in contact, internal energy flows from the body at higher temperature to the body at lower temperature regardless of the amount of internal energy in each one.

(The energy flowing is called heat.)

Conversion of temperatures.

The conversion of customary temperature to absolute temperature and vice versa are as follows:

Degrees C = degrees Kelvin - 273, or °C = K – 273.

Degrees Kelvin = degrees Celsius + 273, or K = °C + 273.

HEAT

Heat is a form of energy. It can be made to do work. An example is the steam engine where the heat energy produces steam, which can be used to produce work; or in a petrol engine, heat is used to expand the fuel/air mixture, which pushes down the piston, which moves the car.

Any substance or body has internal energy due to the movement of molecules. The rate of movement depends on its temperature. When energy is transferred due to temperature difference, the energy is called heat.

Thus heat is energy that flows. It simply describes an energy transfer resulting from a temperature difference. If there is no temperature difference, there is no sensible heat transfer.

Heat energy is given the symbol Q.

To indicate a rate of heat transfer, a dot is placed over the symbol.

Thus: $\dot{Q}$ = heat transfer rate.

Heat being a form of energy is also expressed in Joules (J) or kilojoules (kJ). Heat transfer is Joules per second, which equals Watts.

1 J/s = 1Watt – and - 1 kJ/s = 1kW.

SENSIBLE AND LATENT HEAT

Let's look at water being changed from ice to water and water to water vapour.

Continued on page 43

Continued from page 41

Heat, when added to or removed from a substance can either change the temperature of that substance or change its phase. The three phases a substance can exist in are, a solid, a liquid or a vapour.

The best examples of these three phases are ice, water and water vapour (or steam).

To heat water a kettle must be switched on to provide the energy. Initially the water increases in temperature. Once it is boiling the temperature remains the same. It will only keep on boiling if the element remains switched on.

From this we can deduce that to heat the water, energy is required and to make the water boil, energy is also required.

Where does the energy go when the water is boiling because the temperature of the water does not increase?

The heat being added when the water is boiling is used to change the water to water vapour. The heat added does not increase the temperature and cannot be measured with a thermometer, therefore it is called latent (or hidden) heat.

To put this in a refrigeration context, this is the process used by an evaporator; heat is absorbed by the evaporator to boil off a refrigerant at a low temperature.

To change the temperature of a substance heat is required; to change the phase of a substance heat is also required.

Sensible heat

- Any heat which, when added to a body or substance, increases its temperature, is called sensible heat.
- Any heat which, when removed from a body or substance, decreases its temperature, is called sensible heat.

When water is heated from 20°C to 100°C, or cooled from 100°C to 20°C, the heat added or removed can be sensed or felt. This is sensible heat; when you put your finger in the water you can feel the water getting hotter or colder.

Heat is energy, so the unit for sensible heat is the same as for energy, i.e. the Joule.

Specific heat capacity

- The specific heat capacity of a substance is the amount of heat required to raise (or lower) the temperature of unit mass (1 kg) of that substance by 1K.

Different substances require different amounts of heat to raise their temperature by a certain amount.

For instance, to increase the temperature of 1kg of water from 15°C to 16°C requires

4,2 kJ (4 200 Joules), but to increase the temperature of 1kg of air at 20°C by 1K only, requires 1,012 kJ.

To decrease the temperature of the substances the same amount of heat is required.

The specific heat capacity of some familiar substances are as follows:

Substance	Specific heat capacity
Water	4,2 kJ/kg.K
Water vapour	1,89 kJ/kg.K
Ice	2,1 kJ/kg.K
Moist air	1,012 kJ/kg.K

Latent heat

- Any heat which, when added to or removed from a body or substance changes its phase without a change in temperature, is called latent heat.

When heat is added to water at 100°C at sea level it will boil and evaporate and change phase (water to water vapour). The heat added does not increase the temperature but changes the phase. It is thus latent heat.

Similarly, if heat is added to ice at 0°C it will melt and change phase (ice to water). The heat added does not increase the temperature but changes the phase. Thus, this is also latent heat.

The unit is the same as for heat i.e. the Joule.

The latent heat required to melt a solid is referred to as the "heat of fusion".

The latent heat required to evaporate a liquid is called its "heat of vaporisation".

Change of phase

- When a substance is of the same nature throughout its mass, it is said to be in phase.

Water has the same nature throughout and is therefore said to be in phase. The same applies to ice and water vapour.

Again, the three phases in which matter can exist are - solid, liquid and vapour or gas - and thus different changes of phase can occur which have different names.

Solid to liquid and liquid to solid.

- Changing a solid to a liquid (like melting ice) is called melting or fusion.
- Changing a liquid to a solid (like freezing water) is called freezing.

The heat to be added to melt (or fuse) one kilogram of a solid as well as the heat to be removed to freeze or solidify one kilogram of a liquid are both called heat of fusion.

The amount of heat required to melt and to freeze it are exactly the same.

Thus if 333,7 kilojoules must be added to a kilogram of ice to melt it, 333,7 kilojoules must be removed to freeze the one kilogram of water. Liquid to vapour and vapour to liquid.

Changing a liquid to a vapour (like boiling water) is called evaporation.

Changing a vapour to a liquid like the steam coming out of the kettle changing back to water on the wall) is called condensation.

Both the heat to be added to evaporate one kilogram of liquid and the heat to be removed to condense a kilogram of vapour are called heat of vaporisation.

Some solids (e.g. dry ice) change directly from a solid to a vapour. This process is called sublimation and the latent heat required is called "heat of sublimation".

Some typical values of the aforementioned are:

Latent process	Heat to be added or removed
Melting ice to water or freezing water	333,7 kJ/kg
Vaporizing or condensing of water	2 257 kJ/kg @ 100°C
Sublimation of dry ice	577,0 kJ/kg

(Dry ice sublimates at -78°C and in addition to the 577 kJ, a further 63 kJ/kg is required to increase the temperature to 0°C. Thus the total useful heat removed is 640 kJ/kg.)

Thank you for the question Stefan, I will go into this in more detail in the next issue.

REFERENCES:

1. ACRA
2. SANS 10147

Thank you for all your questions. Send your problems (and sometimes your creative solutions) to acra@netactive.co.za with 'Solutions Page' in the subject line. You may include pictures. RACA

"Heat, when added to or removed from a substance can either change the temperature of that substance or change its phase."

BARNEY RICHARDSON

Barney Richardson is the director of South African Refrigeration and Air Conditioning Contractors Association (SARACCA) and sits on various other boards within the HVAC industry, including the South African Qualifications and Certifications Committee for Gas (SAQCC) Gas.

PRACTITIONERS MUST STAY UP TO DATE

By Barney Richardson

Practitioners must be aware of safety and changes in design concepts and the phase-out of HCFC and HFC refrigerants and use of new refrigerants in refrigeration.

The requirements of the SAQCC Gas registration revolve around the safe handling of refrigerant gases by practitioners. The training being followed with the new SARACCA training manual provides an understanding of the Pressure Equipment Regulations, SABS standards and good engineering practice in refrigeration.

There is also continuing training and education in new design concepts, the phase out of HCFCs and HFCs and the procedures for natural refrigerants such as hydrocarbon, carbon dioxide and ammonia refrigerants.

The handling of refrigerants includes the proper pressure testing and leak detection procedures to safely be followed. The training not only gives a basic understanding of refrigeration and refrigerants but also the procedures for recovery of refrigerant, leak detection, repair, pressure testing and charging of the system.

For existing refrigeration systems where a leak is suspected this is usually indicated by lower system pressures and poor performance. The leak must be found and pinpointed. The common methods used would be a visual check first then to use a soap solution to see if any bubbles come up on joints etc. A halogen or electronic detector can also be used.

To repair a leak or the replacement of a faulty component the remaining refrigerant must be recovered into a service cylinder. It is important to avoid leaking refrigerant into the atmosphere. The refrigerant must be recovered into an approved service cylinder with indication of the recommended capacities for common refrigerants in kilograms.

Cylinders have different capacities for refrigerants, for example a cylinder rated for R134a at a capacity of 12.6 Kg will be rated at 9.8Kg for R404. The cylinder must be empty and free of other refrigerant types. Use an accurate scale and fill to the capacity shown. Do not over fill. It is advised to fill only to 80% of the capacity – this allows for expansion if the temperature rises for any reason.

The recovered refrigerant should be tested for contaminants and purity. Always avoid mixing refrigerants. There are several substances that could contaminate the recovered refrigerant. These could be water vapour, acid or metal particles from the moving parts of the compressor left over from installation activity.

There could also be non-condensable gases like nitrogen, carbon dioxide and air that may have been introduced during installation or previous service work. Remember that if the refrigerant was such as a Zeotropic blend, the leak could have resulted in a loss of one of components in the blend in which case new refrigerant will have to be used.

Refrigerants can be recycled after the contaminants are filtered out and removed. This may be difficult to do on site unless a specialist is brought in to do this. In most cases it is advised that the gas is sent to a supplier who has the laboratory facilities to do this. These specialist suppliers can analyse and process a used refrigerant through a reclamation procedure.

This process usually applies to larger capacity systems. The smaller recovered quantities would need to be checked for contamination before being accumulated and recycled through the reclamation process.

Pressure testing after a new installation or repair is always undertaken using dry Nitrogen before pulling a vacuum. Evacuation is an important part of the refrigeration system commissioning process. The pulling of a vacuum lowers the boiling point of water, which if present will evaporate and can then be extracted through the vacuum pump. The lower the pressure in the system, the lower to boiling point it will be.

Therefore, it is advisable that the evacuation should be to an absolute pressure of 5000 microns. An electronic pressure monitoring device should be used to ensure a complete evacuation and removal of moisture. Great care must be taken when connecting and disconnecting the vacuum pump and hoses to avoid losing the vacuum. This procedure is explained in the SARACCA training manual.

When it come to charging, accuracy is important. If oil is to be charged this must be done first and be warm to avoid the refrigerant combining with the oil. Some refrigerants should be charged in liquid form e.g. the 400 group of refrigerants known a Zeotropic refrigerant.

Charging can be done preferably by weighing using an electronic scale for accuracy or by sight glass as a reference until it shows a clear flow of refrigerant. The temperature and pressures need to be monitored carefully until the system is running satisfactorily and to specification. RACA

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We at Livance Air Conditioning are proud to report the partnership with Scania, an international brand that spans 100 countries, in their efforts to further drive the movement towards developing South Africa through more sustainable energy solutions.

PROJECT DESCRIPTION

Launched in May of 2021 and completed in February of 2022, the project consisted of developing a facility for new and used Scania truck sales, spare parts sales, as well as offering a comprehensive servicing infrastructure to boot.
With such a diverse range of working environments and challenges, the HVAC system needed to be carefully considered to minimise energy consumption and improve the *Green Star* rating of the building.

HVAC DESIGN

System 1 utilises a low temperature radiant system, also known as a Thermally Activated Building System (TABS).
System 2 utilises a fresh air tempering system which supplies pre-conditioned fresh air into the necessary zones. This is achieved by Clivet air handling units coupled to a Midea chiller.
Both systems work in conjunction with each other to handle the overall cooling & heating requirements of the building.
The nature of the design allows for the only controlled variable for both systems to be the supply and return water temperatures, which during summer and winter conditions are 18/22°C and 26/22°C respectively. As a result, the chiller efficiencies are increased, and energy consumption is reduced.

PROJECT CHALLENGES

Some of the challenges that were faced and overcome throughout the project, include:

- Maintaining temperature control between internal and external zone surfaces.
- Limited availability of service-space within the ceiling voids.
- Finalising locations and quantities of outdoor units.

LIST OF PROFESSIONALS AND SUPPLIERS

Project name:	Scania Bloemfontein	
Owner	Qwaha Trust	
Developer	Qwaha Trust	
Architect / Designer	RED Arch Pty Ltd	
Project manager	Jankowitz van Zyl Quantity Surveyors	
Consulting engineer	Electrical	FCE
	Mechanical	Deltamech Pty Ltd
	Wet services	RED Arch Pty Ltd
	Civil	Thusabathu
Contractors	Main building	P.C.I.
	HVAC & R	Cooling Solutions
	Wet services	P.C.I.
	Electrical	Electro Africa
HVAC and associated product suppliers		Livance
		Midea
		Clivet

All image credits: Livance Air Conditioning

All Photos of the installation at the site.

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MICHAEL YOUNG

Michael Young is a trainer, coach and mechanical engineer in the HVAC industry. He graduated from the University of the Witwatersrand in the field of Mechanical Engineering (B.Sc Mech Eng) in 2008 and qualified as a Professional Engineer (Pr.Eng) in 2013. Michael is passionate about promoting knowledge and helping other young engineer grow within the industry through his training workshops and coaching sessions. Michael can be contacted on michael@myhvaccoach.com or 073 171 2311 for any questions or HVAC training needs.

THE EASIEST WAY TO KILL THE PERFORMANCE OF A DX COOLING SYSTEM

By Michael Young, Pr. Eng.

Part 1: blindly trust the computer results.

The world that we live in has evolved over the past 20 years. What used to take us years to complete is now done within a matter of hours and this is all thanks to the invention and implementation of computers.

Now, would it be possible to say that while computers have made life simple and more efficient, they have also opened the door for errors to be easily made?

Think about it, to select a cooling unit, all we need to do is input some variables, click on the select button and *bam!* a unit is selected for us without even thinking.

What about doing the design of an AHU unit? We input some variable and *bam!*, the AHU is designed, selected, costed, and even drawn in 3-dimensions within a matter of seconds.

But what if I told you that while these systems have been fantastic in helping us design systems more efficiently, these computer systems/programs are not fool-proof and are prone to error. Think about it, have you ever questioned the results from a computer program?

How do you know the computer program results are even accurate? Have you ever had to insert some crazy inputs into a program and get a crazy result as an output?

I had this experience where I had to select a cooling unit with a return air condition of 37ºC / 50% RH, and I had to increase the unit size to get to the net sensible cooling load.

In reality, it's highly unlikely that air will be returning to the cooling unit at this condition. So, I contacted the client and learnt that a typing error was made on the specification document and that an addendum was to be shortly issued with the correct return air conditions.

Now don't get me wrong, computers are awesome, but they are just a tool. Quality and accuracy come with being able to use these tools correctly and by having a good understanding of the physics being applied.

Let's talk about refrigerant pipe design as an example. There are tons of tools out there and some are even free and are available online. Now if you leave the selection on "auto", the program will size the correct pipe size for you. However, when it comes to sizing the suction line of a DX system, the system has two options, namely a horizontal run and a vertical run selection.

Now why would we have two different options for the same line? Is it insane to install two different refrigerant pipe sizes on the suction line? What are the implications if we get this pipe sizing wrong? Do we size the piping for maximum or the minimum load?

Unfortunately, no computer program will tell you this answer but if you join us in next month's publication, we will share with you the procedure on how to size refrigerant piping without blindly trusting the computer results.

Wishing you a successful month ahead and chat soon. RACA

> *"How do you know the computer program results are even accurate?"*

WHY MENTAL HEALTH IS A PRIORITY FOR ACTION ON CLIMATE CHANGE

By the World Health Organisation

Climate change poses serious risks to mental health and well-being.

Gadiel Lazcano | Unsplash

The impact of climate change is compounding the already extremely challenging situation for mental health and mental health services.

A new WHO policy brief, launched recently, highlights actions for countries in this regard. The WHO is urging countries to include mental health support in their response to the climate crisis, citing examples where a few pioneering countries have done this effectively.

The findings concur with a recent report by the Intergovernmental Panel on Climate Change (IPCC), published in February this year. The IPPC revealed that rapidly increasing climate change poses a rising threat to mental health and psychosocial well-being from emotional distress to anxiety, depression, grief, and suicidal behavior.

"The impacts of climate change are increasingly part of our daily lives, and there is very little dedicated mental health support available for people and communities dealing with climate-related hazards and long-term risk," said Dr Maria Neira, director of the department of environment, climate change and health at WHO.

The mental health impacts of climate change are unequally distributed with certain groups disproportionately affected depending on factors such as socioeconomic status, gender and age. However, it is clear that climate change affects many of the social determinants that are already leading to massive mental health burdens globally. A 2021 WHO survey of 95 countries found that only 9 have thus far included mental health and psychosocial support in their national health and climate change plans.

"The impact of climate change is compounding the already extremely challenging situation for mental health and mental health services globally. There are nearly 1 billion people living with mental health conditions, yet in low- and middle-income countries, 3 out of 4 do not have access to needed services," said Dévora Kestel, director of the department of mental health and substance abuse at WHO. "By ramping up mental health and psychosocial support within disaster risk reduction and climate action, countries can do more to help protect those most at risk."

The new WHO policy brief recommends five important approaches for governments to address the mental health impacts of climate change:

- integrate climate considerations with mental health programmes
- integrate mental health support with climate action
- build upon global commitments
- develop community-based approaches to reduce vulnerabilities
- close the large funding gap that exists for mental health and psychosocial support.

"WHO's member states have made it very clear that mental health is a priority for them. We are working closely with countries to protect people's physical and mental health from climate threats," said Dr Diarmid Campbell-Lendrum, WHO climate lead, and an IPCC lead author.

Some good examples exist of how this can be done such as in the Philippines, which has rebuilt and improved its mental health services after the impact of Typhoon Haiyan in 2013 or in India, where a national project has scaled up disaster risk reduction in the country while also preparing cities to respond to climate risks and address mental health and psychosocial needs.

The Stockholm Conference, where this policy was announced, commemorates the 50th anniversary of the UN Conference on the Human Environment and recognises the importance of environmental determinants for both physical and mental health.

WHO defines mental health as "a state of well-being in which every individual realises his or her own potential, can cope with the stresses of life, can work productively and fruitfully and is able to make a contribution to her or his community."

WHO defines mental health and psychosocial support (MHPSS) as "any type of local or outside support that aims to protect or promote psychosocial well-being and/or prevent or treat mental disorder." RACA

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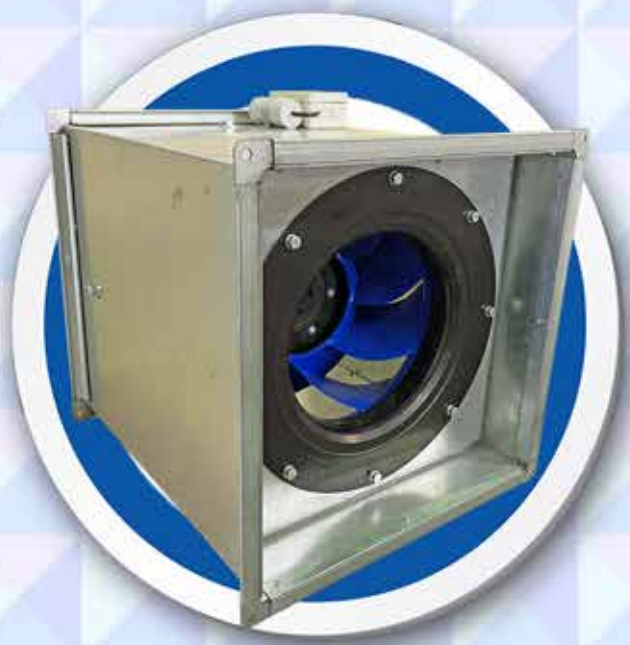

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FINAL FIX

Yes, this is a legit installation!

You have to wonder about the dynamics of some things you see out there. Sometimes the only thing you land on, however, is that these installations are just a joke for the RACA Journal Final Fix! Sadly, in reality it is clear that people who have no clue what they are doing are in fact responsible for installations like this. You can probably think of more than 100 "maybe scenarios" when you look at this photo...maybe its super cold inside the room and the occupant sits in one spot outside where its so hot it is unbearable? Who knows...! RACA

Supplied by DQT Air / W Air & Refrigeration

Have you seen any interesting final 'fixes' lately? (The good, the bad, and the downright illegal.) Send them to **benjamin@interactmedia.co.za** or **WhatsApp: +27 (0) 82 94 00 701** with a description and a comment on how to do things better!

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