

Thinking outside the energy box

In-store refrigeration 2022

South Africa is still in the thick of an energy crisis. In the middle of every crisis, though, says the Chinese proverb (and Albert Einstein) lies great opportunity.

“ With refrigeration units, chillers, freezers, cold rooms, and HVAC accounting for a significant portion of a store’s electricity bill and one of the biggest expenses overall, finding alternative solutions also offers a way to reduce costs and trade in a more environmentally friendly manner. ”

Legislation: South Africa moves towards a low-carbon economy

Energy efficiency and sustainability have been watchwords in the industry for quite some time now, and this is not about to change. To the contrary, efficiency and sustainability are going to become increasingly important as local and international legislation comes into play and business starts paying the price of carbon tax. Industry research and development is still focused on producing the most energy efficient model possible, while also decreasing carbon footprint and minimising environmental impact.

In a recent newsletter published by The Conversation titled South Africa’s carbon tax rate goes up



Image courtesy of Andrea Schettino, Pexels

but emitters get more time to clean up, Lee-Ann Steenkamp writes about the Climate Change Bill (formally introduced in parliament on 18 February 2022) and the carbon tax rate increase announced in the National Budget Speech on 23 February 2022. This transition to a “low-carbon and climate-resilient economy” means that retailers will feel the pressure to have the most efficient systems installed to reduce electricity consumption and carbon emissions.

Under a carbon tax, a government sets an amount that must be paid for each ton of greenhouse gas emissions.

An increase of the carbon tax rate to R144 (about US\$9) was announced in the budget speech and, in order to uphold South Africa’s COP26 commitments, the rate will increase each year by at least US\$1 (currently about R16) until it reaches US\$20. This rate will increase in 2026 as the South African government aims to reach at least

“ Smart technology paired with easy-to-use dashboards make keeping track of pertinent data relatively easy, and changes can be spotted quickly. Investing in the latest technology is not an unnecessary expense. ”

US\$30 by 2030, and US\$120 by 2050. Despite an extended first phase for the roll-out of the carbon tax, business and the built environment will start to see an impact in the not-too-distant future and should be prepared for this by engaging with refrigeration and cooling suppliers, implementing environmentally friendly processes and systems, and taking advantage of energy-saving and carbon footprint-reducing technology.

Achieving an energy efficient refrigeration system

In addition to new tech and innovative design, there are several steps that can be taken to maximise efficiency and savings that don't involve investing in an entirely new set up. This includes effective maintenance, digital monitoring, and switching to natural refrigerants.

Preventative maintenance is based on effectively monitoring your system and picking up on small problems before they become major issues. Planned maintenance and repairs reduce unexpected downtime and can also maintain a superior level of efficiency, which can help cut costs as even a small loss of efficiency can mount up. Intelligent digital monitoring is an essential part of effective maintenance.

Smart technology paired with easy-to-use dashboards make keeping track of pertinent data relatively easy, and changes can be spotted quickly. In this case, investing in the latest technology is not an unnecessary expense.

“ The transition to a “low-carbon and climate-resilient economy” means that retailers will feel the pressure to have the most efficient systems installed to reduce electricity consumption and carbon emissions. ”



Image courtesy of Chris Leboutillier, Pexels

Natural refrigerants – combining 'green' energy with efficiency

When it comes to new refrigeration systems, the technology has developed to such an extent that the energy efficiency of a freon-based system versus that of a natural refrigerant system such as propane, ammonia or CO₂ is negligible as they all have a COP (coefficient of performance) of around 2. The terms COP (coefficient of performance) and EER (energy efficiency ratio) describe the heating and cooling efficiency of any heating engine. These terms indicate the ratio of heating or cooling provided by a unit relative to the amount of electrical input required to generate it.

A good coefficient of performance is around 4.5. The higher the COP the more efficient the system.

Some older systems that are being run using HFC refrigerant can be successfully converted to a natural refrigerant, and this can positively affect the efficiency of the system. Older refrigeration systems that have reached end-of-life and that need to be replaced, however, often cannot be replaced like-for-like as they use banned refrigerants.

According to Jason George, Director at Energy Banq Consult, "A new CO₂ system will be significantly more efficient than legacy, existing freon systems because of advancements in



Up to 40% energy saving with our Close the Case Glass Doors

Ways to save

With energy costs rising and food retailers looking to improve the shopping environment for customers, Insulated Structures has developed an effective solution to reduce the cost of in-store refrigeration while enhancing the customer experience.

Insulated Structures doors are easy to retrofit on in-store cabinets to reduce the energy required to keep chilled foods at the correct temperature.

Meanwhile, customers are able to clearly see and access the products on offer. Reduced energy requirements means smaller refrigeration plant selection for new stores. These savings will offset the cost of the doors. Up to 40% reduction in refrigeration requirement has been achieved.

Benefits

- Reduced energy consumption
- Extended product shelf life
- Double glazed argon filled void for Better insulation
- Optimal product temperature
- Glass doors have optional mullion lights
- Handles included
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refrigeration technology in general. Upgrading an existing refrigeration system can result in an electrical efficiency increase of 15 – 30%.” This means that with the current cost of electricity, you will likely see an ROI sooner rather than later.

Certain freon-based refrigerants are still available as they claim to be more environmentally friendly than older, now-banned versions, but as these have only been available for a handful of years the long-term effects of using these refrigerants are as-yet undetermined. CO₂ and ammonia have a demonstrably decreased environmental impact. Of the two, carbon dioxide is practically odourless, non-toxic, and can be run using a single plant system, whereas ammonia requires two plants. CO₂ systems have an added environmental advantage of replacing freons and removing CO₂ from the atmosphere. While the option is yours, from an environmental perspective choosing a CO₂ refrigerant is the most sensible choice.

Choose the right case, lighting, and closures

When it comes to refrigeration cabinet types, the latest technology and innovations keep competition fierce and, to some extent, level the playing field. To choose the right solution for your needs, you will need to take into consideration your specific refrigeration requirements, your store’s footprint and design, and of course your shopper profile which determines the stock you carry in these cabinets. There are several options to choose from, such as upright, plug in or self-contained, and semi-vertical.

Miniplex, polyplex, and modiplex systems all have their benefits, and thanks to the latest technology and energy efficiency innovations, new systems will always ensure savings when compared to or existing systems. In addition, refrigeration

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Energy Comparison

System	Energy Efficiency
Miniplex	High (Purple bar)
Aqualoop	Very High (Blue bar)
Polyplex	Medium (Green bar)
Modiplex	Low (Yellow bar)

Note:
 • Miniplex and Aqualoop require increased installation, setup and maintenance skills
 • Better suited for urban areas with skills availability

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suppliers are constantly investing in research and development to ensure their offering meets and surpasses the expectations of their customers. A good example of this is Colcab’s trademarked Aqualoop design. It is an ultra-efficient waterloop refrigeration system, however much like a miniplex system, it requires increased installation, set-up and maintenance skills from all the technicians involved and, as such, may be better suited to more urban areas.



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Refrigeration displays and accessibility

“ Choosing the right refrigeration solution, from the system right through to cabinet styles, is also about product display and accessibility, as well as food safety and product shelf life. ”

Choosing the right cabinet style is as important as filling it with the right products.

While starting from the design stage is always going to give you the best results in terms of the latest design options and a fresh, clean look, there are many retrofit options available. These can take an older system and upgrade it functionally as well as aesthetically.

By changing the siding and panelling, replacing any old lighting with energy efficient and effective LED lighting that enhances your displays, and incorporating effective and easy-to-use close-the-case solutions to your fridges and freezers, you can revamp your entire refrigerated and frozen display. Close the case solutions, including hinged doors



Images courtesy of Insulated Structures

and sliders, have the added benefit of increasing energy efficiency by preventing the excessive

escape of cold air, and help maintain a steady temperature which can extend product shelf-life.





Staycold International, a South African manufacturer of self-contained commercial fridges and freezers, ensures that all units they manufacture are tested and fully comply with stringent international safety standards. This includes their latest range of even more environmentally friendly coolers which utilise flammable hydrocarbon R290 refrigerant. Staycold therefore have their Letter of Authority (LOA) that is issued by the National Regulator of Compulsory Standards (NRCS) in South Africa.

There are no independent 3rd party testing laboratories in South Africa that offer full IEC (International Electrotechnical Commission) testing of hydrocarbon refrigerant units to IEC 60335, so Staycold have to send their cabinets to SGS's laboratory in Turkey for it to be assessed and tested to this requirement. Without this test report confirming their compliance, Staycold would have been unable to obtain their LOA from the NRCS.

One of Staycold's hydrocarbon units, their HD1140-HC cooler, last year was listed in the London-based Environmental Investigation Agency's (EIA) Pathway to Net-Zero Cooling Product List. The product list has been designed to support and accelerate the race to zero emissions by 2050. The flammable refrigerant (R290) used in the HD1140-HC and its sister products is a net-zero compatible alternative to more common HFC-based systems. Safety measures and compliance to internationally recognised standards are paramount in these products, to safeguard the public and other users of these coolers throughout their lifespan.

Retailers, corporates, and independents alike are thus encouraged from a procurement due diligence

perspective to ask suppliers to provide evidence that their products comply fully to a recognised test standard as well as provide a valid LOA from the NRCS at the same time.

The context to this move to hydrocarbon refrigerants and the subsequent safety compliance of cabinets which include this flammable gas, is in relation to the global warming emergency that exists and the contribution of refrigerants to the presence of greenhouse gases in our atmosphere. The Kigali Amendment to the Montreal Protocol requires a HFC (hydrofluorocarbons) refrigerant Phase-down – HFC's such as R134a have been the prevalent gas used in refrigeration since the phase out of CFC refrigerants in the late 80's and early 90's. South Africa is one of the 150 countries that have signed the Kigali Amendment, and have agreed to reduce HFC consumption by 80% by 2047. SA has an initial freeze date of 2024 and the first phase down step then follows in 2029. It aims to have 80% phased out by 2045 and if achieved globally, this could avoid more than 0.4C of global warming by the end of the century. Hence Staycold's R&D department have been working on this urgent transition to hydrocarbon and making all their units safe.

A background note is that refrigerants are compounds typically found in either a fluid or gaseous state. It readily absorbs heat from the environment and can provide refrigeration or air conditioning when combined with other components such as compressors

and evaporators. CFC's was a refrigerant found to be depleting the ozone layer, but the effort to get rid of CFCs resulted in many chemical manufacturers choosing to replace them with two groups of chemicals with a different problem – hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs). These refrigerants break down ozone molecules far less, but are extremely potent greenhouse gases. The transition to the more climate friendly hydrocarbons is now accelerating, but brings with it additional safety measures to consider.

Lena le Roux, Staycold's MD had this to say, on the topic that is gaining momentum ...

“ Staycold units are manufactured in our ISO 9001:2015 certified factory in Parys, and are fully compliant and registered with the South African regulatory body as well as tested to internationally recognised safety standards, giving our customers peace of mind as always. ”



For more information on the safety measures Staycold's coolers and freezers have undergone, contact ...

056 819 8097

www.staycold.co.za

<https://www.linkedin.com/company/staycold-international-pty-ltd/>



Power outages and load shedding

Load shedding is an inescapable reality for South Africans, but alongside that is the instability and unreliability of a system that regularly experiences reduced production caused by equipment failure, damage to power generating stations, and reduced production of renewable energy due to weather conditions. is.



Image courtesy of Los Muertos Crew, Pexels

Constant load shedding puts undue strain on an already compromised system, resulting in extended unplanned power outs when components of that system fail. Many electrical systems are adversely affected both by load shedding and by unpredictable and sometimes immensely powerful electrical surges.

Retailers need to engage with their suppliers and ask the right questions to make sure their systems

“ Many electrical systems are adversely affected both by load shedding and by unpredictable and sometimes immensely powerful electrical surges. Backup power systems are non-negotiable, and whether you opt for generators or solar power linked to a new-generation lithium-ion batteries, the need for an alternative power source is inescapable. ”



Image courtesy of Pixabay, Pexels

can withstand these conditions. Backup power systems are non-negotiable, and whether you opt for generators (keeping in mind the rising cost of fuel and unpredictable fuel availability as the war in Ukraine continues) or solar power linked to a new-generation lithium-ion batteries, the need for an alternative power source is inescapable.

Retail refrigeration needs a continuous, seamless energy supply to prevent damage to the system and a loss of efficiency.

Energy Banq’s George, who consults with Matador Refrigeration on clean and green energy, energy-efficient solutions, and power generation, says, “You need to go as high-end as you can afford to. Retailers need more advanced refrigeration control systems and infrastructure to protect

their refrigeration system from potential issues caused by frequent power outages. Matador has invested in substantial R&D to best adapt and optimise their refrigeration offering, considering practical issues such as frequent power outages. For example, specific blowoff reduction controls, as well as system infrastructure to save clients on the amount of CO₂ that needs to be replaced due to system stagnant time during power outages, are two areas that can assist with protection from damage caused by power outs.”

In short, your alternative power supply needs to provide a seamless transition between grid and back-up power, and both your UPS and battery bank should have top of the range controllers to protect against surges and unpredictable supply.



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Refrigeration and HVAC

For South African retailers, refrigeration and HVAC combined can cost up to 50% or more of your monthly electricity bill. This does depend on your overall floorspace, and your floorspace to- refrigeration-needs ratio, as well as ambient temperatures and climate, but it's safe to say that together, these are your two biggest energy consumers.

Traditionally, refrigeration and cooling/HVAC are two separate systems that work in isolation, but the question – asked by among others the team at Matador, says George, resulted in research and development by the company of CO₂ systems that provide not only a system's refrigeration requirements, but also cooling requirements for air conditioning. This combined refrigeration

and cooling system offers cost, footprint, and environmental advantages because a single plant is servicing two client requirements. This is a big change in thinking, particularly for the South African built environment, but it is one that makes good financial and environmental sense.

George says, "Combining your systems has several benefits. You save on footprint because you only need space for a single system, and your installation and maintenance costs also decrease. A single system will use less electricity, and you decrease your carbon footprint."

A combined heat exchanger can also make a difference to your energy savings. One of the greatest benefits of combining your system is that you can take real advantage of Thermal Energy Storage (TES).

Taking savings a step further – Condensation collection

In tests run by Matador Refrigeration, relatively clean condensate was collected from their cooling and refrigeration coils. This condensate can be used in grey or bio water systems, which means there is no need for it to go into the general drain system and end up at a wastewater treatment plant. This is a small saving, to be sure, but for businesses interested in reducing their environmental impact, it is an important one.



In many Houston buildings, HVAC condensate is discarded, simply sent down the sewer. However, at Rice University, a long history of environmental stewardship makes that kind of waste unacceptable.

Instead, the condensate from Brockman Hall and six other buildings is captured and pumped back for reuse on campus, primarily as makeup water for the central plant's cooling towers. Knezevich figures that Rice recovers about 14 million gallons of water per year, and that is probably a conservative estimate. That means that instead of buying 14 million gallons of treated, potable water from the city to replenish its cooling towers or tapping the university's own well, Rice saves a precious resource and a considerable amount of money.





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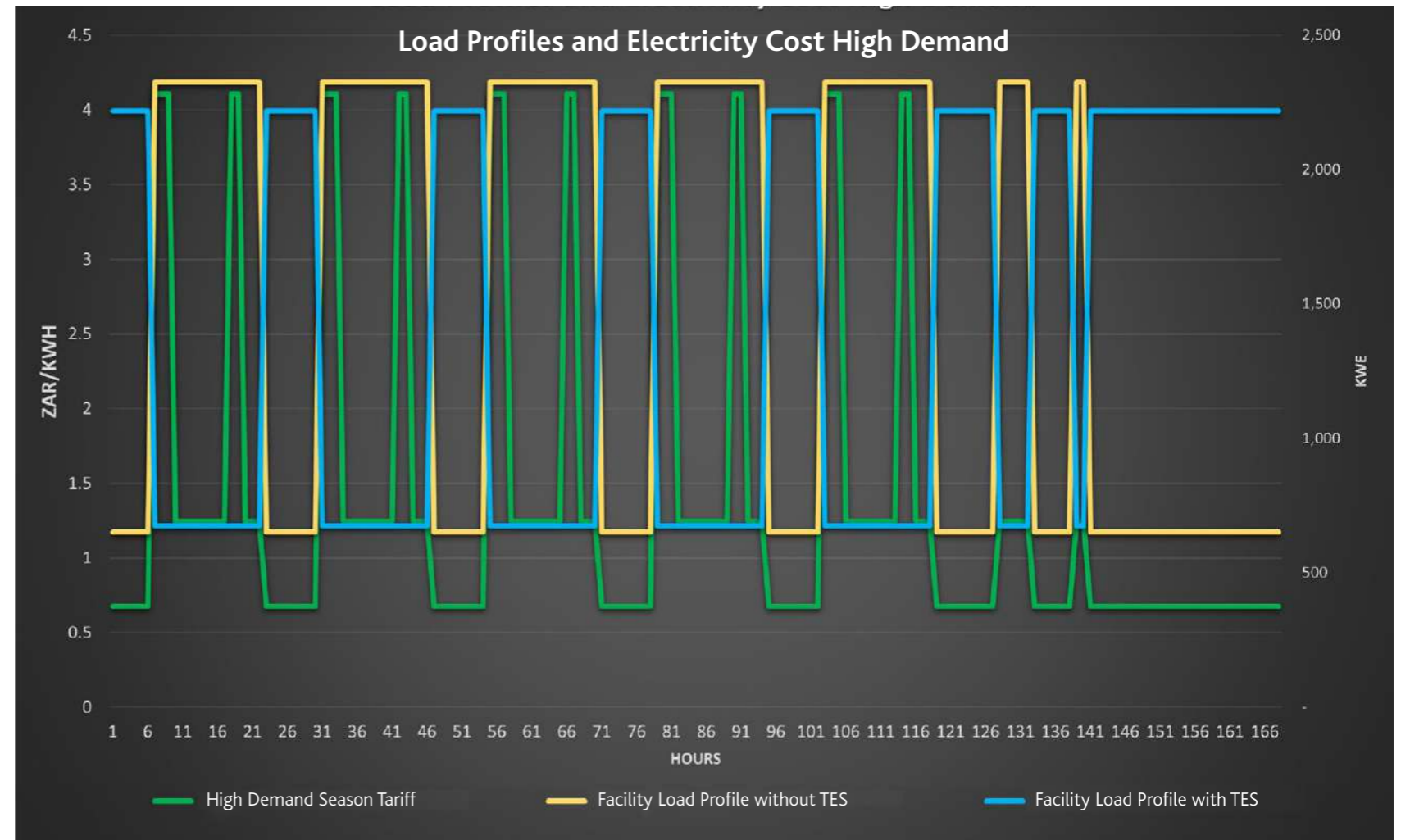


Thermal energy storage: energy-saving innovation

As anyone who pays for electricity in South Africa knows, our tariff system can make energy consumption during peak hours a costly undertaking. However, this same tariff structure means there is significant scope for cost saving by producing and storing cooling at night during low tariff times and deploying the stored cooling during the day during high tariff times.

The benefit here is two-fold. You still use as much energy as ever, but you are using it during off-peak hours, which makes it cheaper. You are also reducing the load on the grid during peak hours, which can help stabilise the system and reduce the need for load shedding. George explains, "By using the active components of your refrigeration and cooling system and running it at night, you can see a massive cost saving. For example, during May, June, and July in South Africa, peak tariffs can have electricity costing more than R4/KWh, whereas off peak costs can be as little as 90c/KWh. Store cooling is produced at night and stored in ice, which is then deployed during peak hours to provide cooling for the facility." This can reduce energy consumption annually by about 60%. The current technology works for HVAC, but research and testing are underway to see how it can be used for refrigeration as well. A combined refrigeration and HVAC system would see optimal savings from thermal energy storage technology.

TES also means that cooling systems can be sized more appropriately, as the active component



Thermal energy storage lowers aggregated electricity tariffs by operating cooling systems at night during low tariff times. Annual aggregated tariffs graph courtesy of Energy Banq Consult

of a cooling system is sized for approximately 50% of the maximum cooling requirement of the facility. The maximum cooling requirement only occurs for a few weeks in the year, so sizing the cooling system for this requirement means that the cooling system is severely oversized and less efficient for most of the year. Because it operates at a turndown ratio, the contribution of the cooling system to the facility's maximum monthly MVA (Mega Volt Amp) charge is higher. The good news is that TES technology can, in many cases, be retrofitted to an existing system. The caveat is that this would need to be confirmed by a qualified

technician and while most existing refrigeration systems should be able to incorporate this, not all legacy HVAC technology will be compatible with a TES retrofit.

Heat recovery systems

Retailers and refrigeration/cooling suppliers are no strangers to heat recovery systems. The idea of harnessing waste heat produced by your refrigeration and HVAC systems to heat water for the facility is not new but gauging the overall efficiency and energy savings provided by a heat recovery system can be tricky. According to

Environmentally Energy Efficient Future Proof Refrigeration Systems



CUBO2 Smart is a compact, plug & cool, high efficiency CO2 transcritical condensing unit equipped with a brushless DC variable speed compressor with an advanced control system.



The MWT SMKT & MWT Industrial BOOSTER product lines are high efficiency CO2 transcritical systems that can be configured as MT only or booster MT/LT.

The modular design allows for superb customization as well as system optimization for control, configuration and layout. This makes the MWT SMKT/Industrial range the best option for supermarket & industrial applications.



SCM Ref Africa, distributed through Metraclark supplied Natcool with a MWT SMKT BOOSTER CO2 transcritical system for Pick n' Pay in Randfontein.

The system supplied is a high efficiency 6 compressor MWT indoor Booster LT/MT unit. (3xMT+1xIT+ 2xLT)



THERMAL ENERGY STORAGE

Systems without Thermal Storage	Solutions with Thermal Energy Storage (TES)
<ul style="list-style-type: none"> ● No thermal storage → no cooling during upset conditions. HVAC needs to be on backup power leading to a bigger generator ● HVAC is sized for maximum cooling demand which occurs <5% of the year → For most of the year, the HVAC is oversized and not running at its best efficiency point ● HVAC needs to run when cooling is required which is during the Peak and Standard tariff hours 	<ul style="list-style-type: none"> ● TES provides cooling during upset conditions. HVAC does not need to be on backup power ● TES and HVAC are each sized for 50% of maximum demand → HVAC is not oversized and more efficient ● HVAC builds ice during Off-peak tariff hours and does not have to run during Peak and Standard tariff hours
	<ul style="list-style-type: none"> ● TES: Reduces electricity consumption (kWe) due to increased efficiency ● TES: Reduces maximum demand (kVA) due to small HVAC ● TES: Lowers average cost of electricity since HVAC runs during Off-peak tariff hours (ZAR/kWh) ● TES: Reduces backup generator size which saves CAPEX ● TES: Can provide cooling during loadshedding or other upset conditions

The beneficial effect of Thermal Energy Storage on energy consumption and efficiency is significant. Table courtesy of Energy Banq Consult.

The Renewable energy Hub UK, The Carbon Trust (www.carbontrust.com) estimated that fitting a low-grade heat recovery system for a smaller system or a superheater for a larger retail refrigeration system can offer good savings on waste heat could supply between 75 and 90% of the hot water demand of an entire supermarket.

Heat recovery from ventilation systems is more variable, however, with The Carbon Trust estimating that thermal wheel ventilation units can deliver a maximum of 80% efficiency, and typical values can vary between 65 and 75%. Plate heat exchangers offer a maximum efficiency of 80%, with normal variations between 55 and 65%. Run around coil systems have a maximum of 55% with typical values between 45 – 50%. Heat pumps can produce 60% as a maximum, typically varying between 35 – 50%. And finally, heat pipes can produce a high efficiency rating of 70% with typical values of between 50 and 65%.

The best place to start is to engage with your in-house refrigeration experts and specialists, talk to your suppliers and find the most suitable and efficient solution for your existing system. Utilising reliable suppliers and forming effective partnerships is also imperative, as your system is only as good as the people who are installing it, monitoring it, and maintaining it.

Thinking outside the box

As technology continues to advance and environmental concerns continue to affect legislation, retail refrigeration suppliers are guaranteed to continue innovating. What is clear is that it is time to start thinking outside the box, challenging your existing refrigeration system, and making changes that benefit both your business, your customers, and the planet. **SR**



Image courtesy of Singkham, Pexels

Energy-saving tips

- Replace legacy systems using freon with alternate technologies like CO₂ or other natural refrigerants.
- Thermal energy storage reduces electrical consumption of cooling systems by up to 60%, depending on the size of the cooling systems, load profile, and electrical tariff structure of the facility.
- New cooling systems are 15 – 30% more efficient than older cooling systems.
- Combining HVAC and refrigeration systems to be powered by a single plant can save 10 – 20% of associated costs, such as the electrical, maintenance, consumables, installation, and project costs.



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CASE CLOSED

Energy Saving Solutions

Glacier Door Systems has introduced the Air Shield ('Close the Case') Glass Door retrofit solution for refrigerated supermarket display cases, as well as the Eco Leaf Replacement Glass Door for existing glass door freezer rooms and glass door freezer display cabinets. Both solutions guarantee energy-savings in an ever-increasing energy cost environment. Part of the well-established Universal Industries Group, Glacier has 26 years' experience and are acknowledged industry leaders in refrigeration door technology. Innovative and forward-thinking, the company is built on cutting-edge technology, technical expertise and a customer-centric approach.

Air Shield Glass Doors

Features and Benefits

- Double glazed glass doors with Argon gas fill for superior insulation.
- Glass durability and clarity with torsion bar for positive closing.
- Glass door heating option for high humidity environments.
- Glass doors available with hold open brackets and LED lighting options.
- Flex modelling means glass panels are customised to fit existing cabinets and are tailored to suit each store's specific environment.

A quick and easy energy-saving retrofit solution, Air Shield Glass Doors can be fitted to any existing open refrigeration case, saving up to 40% on energy consumption.



Note: The value proposal is based on R1.31 per kWh and 40% energy saving. These are averages based on our experience and can be validated per store.

The value benefit

- High-quality locally manufactured solutions featuring the latest energy-saving technology.
- Demonstrated good pay back periods can be expected.
- Customised solutions to suit your store.
- ISO 9001 accredited factory.
- Safety toughened glass in accordance with SABS/SANS certification.
- Flexible installation timing to offset any customer disruption.
- Financing options available.

You can trust a Glacier door



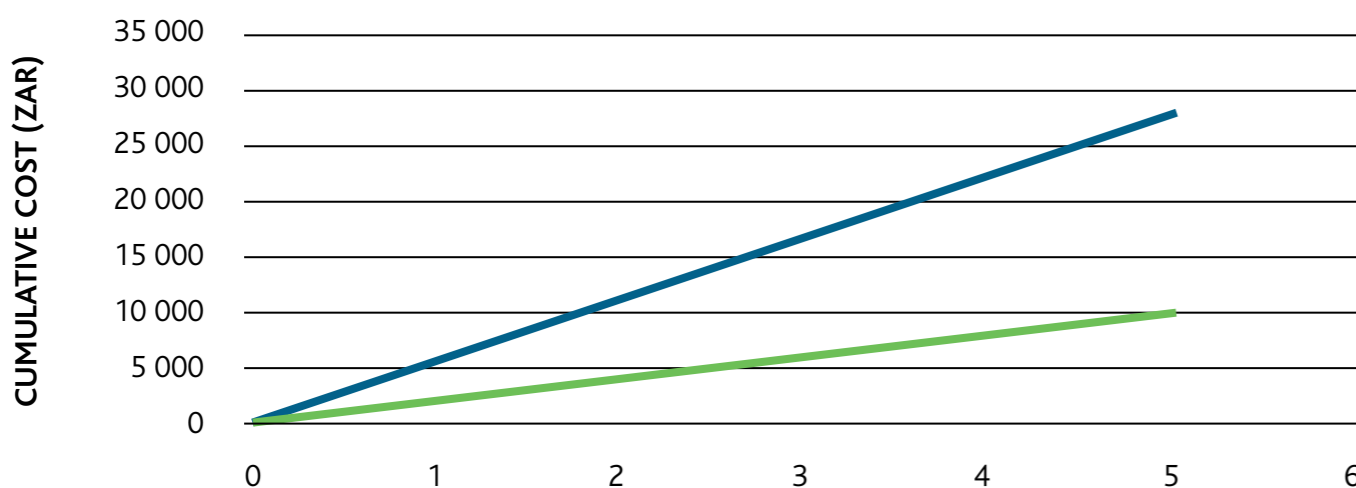
CASE CLOSED

Energy Saving Solutions

Eco Leaf Freezer Doors

Designed as a 'swop-out', energy-saving replacement glass door utilising 220V technology that eliminates the need for voltage-reducing capacitors. This results in an amperage reduction from 1.29A on the standard door to 0.46A (64%) with the replacement Eco Leaf Door.

The Eco Leaf door is 64% more efficient than the standard door. The value proposal is based on R1.31 per kWh and 64% energy saving. These are averages based on our experience and can be validated per store.



	AMPS	VOLTS	WATTS
Glacier Eco Leaf Door	0,46	230	105.8
Glacier Standard Door	1,29	230	296.7



This article is based on information provided by the RACA Journal.

FRIGAIR 2022's theme is 'Natural refrigerants'

Since 1980, FRIGAIR has been a leading influence in the HERVAC sector's most relevant topics. The 2022 event will carry this forward as the world makes quick moves towards better choices in environmental impacts and the drive to mitigate climate change.

South Africa, as a signee to the Kigali Amendment to the Montreal Protocol is legally bound to the forced phasedown of hydrofluorocarbons (HFCs). HFCs are commonly used alternatives to ozone depleting substances (ODS) used in the past. While not ozone depleting substances themselves, HFCs are greenhouse gases which can have very high global warming potentials (GWPs).

Hydrochlorofluorocarbons (HCFCs) were developed as transitional substitutes for the high ODS and GWP refrigerants and will also be subject to a phaseout schedule in the near future. The theme selection of FRIGAIR 2022 was therefore simple as natural refrigerants will be the norm of the future and are in fact already here as replacement refrigerants have to be implemented.

Natural refrigerants have zero ODS and zero to extremely low GWP figures, and therefore are aligned to mitigate the challenges of environmental effects in the HVAC&R sectors.



Image courtesy of Polina Tankilevitch, Pexels

Non-Article 5 parties		Article 5 parties – Group 1 (South Africa)		Article 5 parties – Group 2	
Baseline	Average HFC for 2011–2013 + 15% of HCFC baseline*	Baseline	Average HFC for 2020–2022 + 65% of HCFC baseline	Baseline	Average HFC for 2024–2026 + 65% of HCFC baseline
Freeze	–	Freeze	1 January, 2024	Freeze	1 January, 2028
10%* reduction	1 January, 2019	10% reduction	1 January, 2029	10% reduction	1 January, 2032
40%* reduction	1 January, 2024	30% reduction	1 January, 2035	20% reduction	1 January, 2037
70% reduction	1 January, 2029	50% reduction	1 January, 2040	30% reduction	1 January, 2042
80% reduction	1 January, 2034	80% reduction	1 January, 2045	85% reduction	1 January, 2047
85% reduction 1 January, 2036					

HFC phase-down schedules for developed and developing countries.

Department of Forestry Fisheries and the Environment



Natural refrigerants include hydrocarbons (HCs), hydrofluoroolefins (HFOs), ammonia (NH₃/R717), carbon dioxide (CO₂/R744) and water – which is not very well developed as a refrigerant at this point in time.

These natural refrigerants are seen as the most sustainable replacements for existing options as they are able to reach the temperature requirements of the end user, they meet legislative and legal aspects, they meet environmental requirements and are also reasonably priced. These refrigerant solutions are also highly efficient in operation – so essentially tick all the boxes.

Globally, trends have been moving towards natural refrigerants for quite some time with CO₂ systems gaining a lot of traction and being known currently as a specialised field for engineers and technicians alike and are therefore still relatively 'unfamiliar' on a larger scale in South Africa.

Their deployment and associated training has seen only selected participation in the industry. Until now, CO₂ systems have also been considered suitable for cooler regions due to the high pressures required in system operation.

Ammonia as another popular choice has in fact been around for more than a hundred years and has an established and stable market, particularly in the industrial space. Due to the fast adaptation of produce development, ammonia could soon be found in commercial air conditioning applications as well.

On the domestic market, hydrocarbon R600a (isobutane) has already been used for several years



“ Natural refrigerants are also subject to concerns around certain safety aspects. With correct design and mitigation of potential risks these concerns are easy to resolve or avoid. ”



and in the retail sector R290 (propane) has seen large adoption too – specifically in display fridges. R290 is already being used in other countries for unitary air conditioning products and it is just a matter of time that these will find their way to the local market. R290 further has the scope to be used in commercial and industrial air conditioning applications as well as the greater refrigeration market.

As with all refrigerants, natural refrigerants are also subject to concerns around certain safety aspects. With the correct design and mitigation of potential risks these concerns are easy to resolve or avoid. The limit of a system charge being smaller has also reduced risk significantly.

This then opens the conversation around training which has seen considerable review and development recently. The new national safe handling of refrigerants framework is but one example. Local training centres are equipped with many resources

already to be able to offer required training in natural refrigerants and updating of certain elements of that training is ongoing.

Resistance to change forces companies and individuals to become ignorant (to the inevitable in this case) and in so doing the usual response is to be apprehensive or unwilling to change their mindset – while natural refrigerants, when handled correctly, don't pose any more danger than older refrigerant choices.

One of the South African Institute for Refrigeration and Air Conditioning's (SAIRAC) premier events, the FRIGAIR expo is the largest dedicated HERVAC trade exhibition in Africa. Dates are set for 01 – 03 June 2022 and will be held at the Gallagher Convention Centre in Midrand. This event is brought together by SAIRAC partners Interact Media Defined and Specialised Exhibitions – a division of the Montgomery Group. **SR**