Skills WORKSHOP
Custom coil design and specification

Digital diagnosis
Going behind the error codes in smart AC units

A NEW REALITY
How VR is changing the way we train apprentices
When teaching refrigeration and air conditioning, it’s not always easy to combine theory and practice. Take, for example, a lesson on how to identify hazards and risks in a supermarket plant room where a CO₂ refrigeration system is operating. First you have to find a suitable supermarket that is close enough to the TAFE and happy to receive a site visit from a large group of apprentices. Then you have to actually organise the trip, as well as all the OH&S rigmarole that goes with it.

Luckily, there is now another way.

Students at TAFE SA are putting the latest in virtual reality (VR) technology to the test. They are donning headsets and stepping into a virtual world where HVAC&R systems can be studied from the safety of their classrooms.

**READY PLAYER ONE**

According to TAFE SA, students studying Certificate III in Air Conditioning and Refrigeration at its Tonsley campus are among the first in Australia to trial new VR headsets in an educational setting.

Teaming up with Adelaide-based firm Lateral Vision, TAFE SA has created virtual tours and environments that students are now using as part of their training in the safe use of CO₂, hydrocarbons and ammonia.

“We have chosen these subject areas as many of our students do not have access to this equipment in their workplaces,” says TAFE SA lecturer, Shannon Baldock, Affil. AIRAH.

“And in the case of CO₂ and ammonia, it is not practical to take an entire class into a plant room due to restrictions around safety and ease of access.”

A total of 46 stand-alone VR headsets have been purchased by the TAFE for the pilot program.

So far, three refrigerant safety courses have been created in VR: a next generation CO₂ refrigeration plant operating in a new supermarket; an ammonia plant running at an ice factory; and content on flammable refrigerants, including hydrocarbons.

This content has been filmed at physical locations using a purpose-built camera designed to capture VR imagery.

Once the stuff of Hollywood sci-fi movies, virtual reality is now being adopted by TAFEs to engage and train students. **Sean McGowan** reports.
Anyone who tells you that you can do everything in VR is selling you something.

“We use a special 360-degree camera that records stereoscopic imagery,” says Lateral Vision director, Alex Tolson. “When students view the content in a VR headset they are able to see things as if they were there.”

The use of stereoscopic imagery gives depth to the visuals. It provides a better representation of the size of the machinery and equipment in the environment, and allows users to see things as if they were on a real-life job site.

“We have learned a lot about the 360-degree video capture process during the pilot,” says Baldock. “We have also learned that VR is most effective when used in specific subject areas, such as hazard identification.”

He says the longer-term plan is for the TAFE to build the capacity for video capture and editing in-house.

“The fact that the content can be made by our lecturing staff who have full ownership of it, and are happy to use something that works, is one of the appeals of this technology.”

ENHANCING, NOT REPLACING

Studies have shown that the use of VR in the classroom increases a student’s ability to retain information by between 60 and 70 per cent. Anecdotal evidence from the TAFE SA pilot program supports this claim, while feedback from students has been overwhelmingly positive.

But can VR really replace hands-on learning?

“It’s not about doing all our training in VR,” says Baldock. “VR works well in certain applications, so it’s about using VR to augment parts of training. Anyone who tells you that you can do everything in VR is selling you something.”

A secondary VR trial at TAFE SA is allowing for the remote delivery of lessons. Students equipped with VR headsets can remotely connect and interact with scheduled classes being held at the Tonsley Campus via a live-stream, 360-degree video from the classroom.
A CALL TO INDUSTRY

Baldock says that with the pilot VR training program now under its belt, TAFE SA is actively seeking the collaboration of the HVAC&R industry to help with more training content.

“We’ve proven that the technology has a practical application in the training environment, so now we need more content to offer students,” he says.

TAFE SA has already received strong interest from industry participants, including those leading the way in natural refrigeration, to provide access to plant rooms and equipment where filming can take place.

“That’s what the project is about now,” says Baldock, “not so much the bells and whistles of the VR hardware but content, which is what it should be about.”

VR vs AR vs MR

With so many realities to navigate, it’s worth knowing the difference between virtual reality, augmented reality, and mixed reality.

According to Philadelphia’s renowned Franklin Institute – one of the USA’s oldest centres of science education and development – the differences are clear.

Virtual reality (VR) implies a complete immersion experience that shuts out the physical world. Using VR devices, users can be transported into real-world and imagined environments.

Augmented reality (AR) adds digital elements to a live view, often by using the camera on a smartphone or tablet. Examples of augmented reality experiences include the lenses on Snapchat and the game Pokemon Go.

Mixed reality (MR) experiences combine elements of both AR and VR, where real-world and digital objects interact.

The lessons learned from this project will allow for a rapid uptake as the technology matures

“This is of particular benefit to the refrigeration department, as we have students that travel to Tonsley from all over the state,” says Baldock.

Such has been the success of the VR refrigeration pilots that similar programs are likely to be rolled out across other TAFE SA courses in the future. The technology is also being considered for use in professional development.

“We see this project as a proof of concept, that we hope will be adopted in some form across TAFE SA,” says Baldock.

“The lessons learned from this project will allow for a rapid uptake as the technology matures.”

AUGMENTED APPRENTICES

Just as virtual reality (VR) is finding its ways into TAFE refrigeration and air conditioning courses, a specially designed augmented reality (AR) tool is also soon to be available for apprentices in the industry.

Being developed by Refrigerant Reclaim Australia (RRA), the AR tool will help TAFEs around Australia better facilitate training in refrigerant recovery.

“Our organisation has been actively involved in industry education for a number of years, through a partnership with TAFE Australia,” says Kylie Farrelley, general manager of RRA.

“Through this relationship, we identified problems with the affordability of new refrigerants and technologies. Given the constant pressure on TAFE funding, it wasn’t always possible for apprentices to train with the latest technologies and products.”

RRA has been working with TAFE NSW, Canberra Institute of Technology, Box Hill Institute and Silversun Pictures to develop the series of technical AR programs that focus on refrigerant recovery training using the latest refrigerants.

The primary goal is to prevent the emission of climate-damaging refrigerants. RRA believes that providing access to training with the latest lower-global warming potential (GWP) refrigerants is crucial to this objective.

“The augmented reality training videos will allow apprentices to view the animated internal workings of equipment and systems to gain a greater understanding of the process of removing gases, before they have to do so in the real world,” says Farrelley.

While the content will be created in VR, it will be transposed to AR so it can be accessed from any device at any time without the need for specialised equipment.

The AR program is the first step in what RRA advisor Michael Bennett hopes will eventually become an “always-available” online tool allowing technicians in the field to have access to a host of HVAC&R topics.

“A sort of Siri or Alexa for fridges,” says Bennett.

Footage of the AR training program can be viewed at https://bit.ly/2J7coLI

Refrigerant Reclaim Australia is making use of augmented reality to teach apprentices how to reclaim refrigerant.