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# It looks like the Popemobile but it's really a D11 bulldozer -

## a unique approach to big equipment air conditioning

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# Saving energy and keeping cool on the big Cats



Cover story by Ken Newton  
Photos by SR Photography Brisbane

**I**f you find yourself motoring along the Eyre Highway across the Nullarbor Plain in early May and you pass a vehicle which looks eerily like the Popemobile, it will not be a religious mirage.

It will be a very special trailer, dubbed the 'Popemobile' by the team that made it because of its boxy shape and all-round big glass windows, and it will be heading for its world debut at the Australian Mining Expo in Perth.

The trailer is a precise representation of an operator cabin on top of a Caterpillar D11 bulldozer, a monster machine used to push the dirt around on most of Australia's big mining sites.

The mission is to prove to the mining giants that a unique air conditioning system called CoolCab Technology, developed at a Brisbane workshop, will save them quite a lot of money because it will allow the big machines to be shut down during lunch or other breaks, while still keeping the driver cool for up to three hours or more – on stored battery power.

It's an air conditioning system capable of coping with the 50°C heat in the Pilbara with relative ease, running on a bank of four 6 V deep cycle batteries.

It sounds simple enough, and indeed many have tried to develop such a system, so far with little success.

## Conventional air conditioning systems just don't cut it

But Gregg Chapman and Jim Cannon, partners in Mobile Air Conditioning Services & Auto Electrical at Darra in Brisbane's west reckon they've got it beaten, after nutting it through with prototypes and different components since they took up the challenge in 2011.

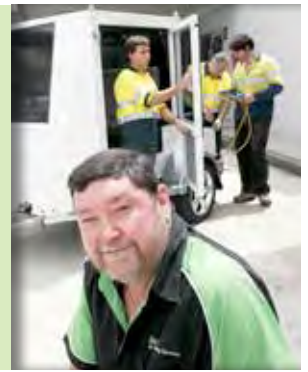
The challenge came during Jim Cannon's audit of equipment at the Century Zinc mine in Mount Isa. He was asked if he could develop an air conditioning system that would run on 24 volts, so that they could turn the big machines off during work breaks, but still keep the operator cool in the searing tropical heat. The company had asked others the same question, and despite trying, nothing had quite met the company's requirements.

Meanwhile, Gregg Chapman was attending a big refrigeration and air conditioning equipment show in China, when he

## FRONT COVER

Co-owner of Mobile Air Conditioning Services, Gregg Chapman poses in front of his battery-powered air conditioning demonstration trailer while his team members prepare for the road.

The team comprises (from left), auto electrician Wil McLuskie, air conditioning technician Dallas March and auto electrician Neil Smith.



found one of the answers they really needed – a different kind of compressor that he thought might work in a battery-operated air conditioning system.

'What the mines wanted was something much more substantial than any normal air conditioning system. Battery life was the big problem which other developers apparently could not resolve. The system needs batteries to maintain cooling temperatures in very high ambient heat for at least two hours, during lunch breaks or while operators are waiting for truck turnarounds.

'Previous attempts to develop such a system involved using the original condensing installed on the big machinery, but this only resulted in the condensing size being too small,' Gregg explained.



Gregg Chapman will invite mining chiefs to test his air conditioning system in the mobile D11 cabin



The 6 V battery pack of four batteries



It looks roomy, but by the time the D11 controls are taken into account, it's a small space to spend your day in 40°C to 50°C heat

'We had already developed a condenser for Komatsu dozers to improve their compressor life and perform better so we were familiar with the benefits of over-condensing. So for this challenge, we had to find a way to get the condensing correct so that we could use the compressor type we wanted to use.

'The advantage of over-condensing is that the discharge pressure becomes lower, hence the compressor doesn't have to work as hard. Depending on the conditions the system may be running at 160 psi instead of 200 psi, so the compressor will draw less current which in turn gives better battery life.

Better condensing provides liquid to the TX valve much better as well. That's why our pack is built the way it is, as the conventionally installed condensers on the machines are marginal,' Gregg said.

'Others who have tried to develop such a system have used a standard compressor and coupled it to an electric motor. It just runs flat out and then cuts out like it does in a car, just like a clutch.

'With the compressor we have adopted, we can ramp it up and down a bit like an inverter system in a house. It starts off low and then works itself up when it needs more capacity and then as the temperature drops, we can ramp the compressor back so that we are not using as much current draw. So it doesn't sit and cycle but just maintains the temperature so that we can get longer life out the batteries. Let's say we are running 53 amps flat out and when we get it down to 22 degrees we are only running at 35 amps.



Gregg Chapman will invite mining chiefs to test his air conditioning system in the mobile D11 cabin

'The compressor is driven by a brushless motor so we control it by pulse width modulation. Changing the pulse width will supply more or less voltage to the motor to make it go faster or slower and so lengthen the life of the batteries,' Gregg explained. ▶



Close up view of the compressor set up

The current model will work flat out for three hours non-stop, but they are working on an even longer-running system.

## Looking after 1,200 buses

Both Gregg and Jim began as qualified motor mechanics, but in their early days were exposed to air conditioning on buses and earth moving equipment.

Gregg was working for a big company dealing in machinery, but when he felt he was going nowhere, he branched out on his own.



Servicing big equipment and bus air conditioning systems is all in a day's work

That was in 1998, and he was joined a year later by Jim Cannon, so with their combined experience, they can tackle any big equipment.

They now have 12 mechanics on the floor and run a large mobile workshop fleet to cover buses and farm and mining machinery in the field.

Mobile Air Conditioning Services & Auto Electrical was the first company to be awarded the Brisbane Transport contract to maintain the air conditioning in the entire fleet of 1,200 Brisbane buses. Four dedicated staff work full time at the four Brisbane City Council depots so that buses don't have to do 'dead runs' back and forth to service centres.

Everyone in the workshop has a qualification of some kind, including a boilermaker to operate the company's extensive

Auto electricians Neil Smith (left) and Wil McLuskie checking the operation of the compressor and battery systems which for demonstration purposes, sit on the back of the trailer, behind the simulated D11 cabin



engineering workshop, where their CoolCab Technology was designed and made.

Gregg admits to being a little nervous about the mining and earth moving industry's reaction to his technology, but he's satisfied he's giving it his best shot by building a replica D11 cabin to prove that his system does indeed work.

In any case, he firmly believes it is the way of the future, with the emphasis on using less energy and protecting the environment from energy emissions.

That alone may not get the orders he needs, but if he can get enough mining execs to climb into his D11 cabin on wheels, he believes he can convince them that his approach can keep their drivers as cool as the Pope on his Popemobile visits to the faithful in tropical climes – and also save them a lot of money in fuel and maintenance costs.



Gregg Chapman and Wil McLuskie with the very early rig they built to test their initial ideas for the CoolCab system