AN ALTERNATIVE APPROACH TO ELECTRICAL INDEPENDENCE?

Generator? Solar panels? Wind power? Now you can aspire to a FUEL CELL.

The SFC A25 Smart Fuel Cell was launched into the leisure vehicle market on August 26th, 2003 by SFC Smart Fuel Cell AG at the Caravan Salon Düsseldorf. In the UK an example of this leading edge technology power solution was on display on the “Van Bitz” stand at the Warners Southern Motorcaravan Show at Newbury in May 2004.

(Fig2)

Fuel cells will be the way in the future we provide quiet environmentally friendly power to places previously without electricity. Large fuel cell installations are already in use providing domestic power in some parts of the world. Smaller fuel cells are already being developed by Samsung and Toshiba for powering Laptop computers. Medium size units are running busses or small housing conurbations.

This small SFC A25 fuel cell system can be carried in an Motorhome and provide electricity to power TV, lights or other devices as well as charge a conventional lead acid leisure battery. The fuel cell system SFC A25 provides 50 ampere hours if run for 24 hours which covers the typical electricity demand of a Motorhome.

With a single fuel cartridge containing 2.5 litres of neat liquid methanol the SFC A25 runs 24 hours a day for three days at full power. A cartridge has a weight of 2.2 kilograms. (Fig3)

Traditionally, owners and users of Motorhomes have used large batteries, engine driven generators, wind power or solar panels. Solar panels require the sun and generators make noise. Wind power – wind! This Fuel cell just gently purrs like a pussy cat if you put your ear to it! The gentle purring coming from small internal pumps used to feed the cell with methanol and air.

In a typical UK motorhome application it is likely that a moderate lead acid battery will still be required to supply the peak loads. High power consuming items such as those run via an inverter – Microwave oven for example - will certainly need a decent
battery to support a peak load of 70 amps or so. However, microwaves only run for a few minutes. The fuel cell will be gently purring along in the background, 24/7 if necessary to re-charge your battery and keep it in tip top condition.

**Controls. (FIG1)**

A rotary selector knob enables 4 modes of operation. OFF, ON, SILENT & CHARGE.

In SILENT mode the unit is providing power only from its internal sealed lead acid 4 ampere hour buffer battery.

Set to ON the unit will operate to maintain the internal buffer battery in a charged condition.

In CHARGE mode the unit will charge an external lead acid battery.

Situated above the selector switch are the four diagnostic LEDs. Green, Yellow and two Red which indicate the units status and mode by means of their combination. (FIG8)

Above the LEDs and behind a cover is the units DATA port. This is intended primarily for use by the manufacturer as no reference is made to it in the sales literature or operators manual.

At the bottom of the control panel is the DIN ISO 4165 socket (*European cigarette lighter socket*) which can provide a maximum current of 5.5 amperes at 12 volts. The unit has electronic overload protection which is backed up with a 10 amp fuse.

**Specification basics**

Output power - 25 watts at 11 – 14 volts.

Fuel – Undiluted pure Methanol.

Fuel consumption 1.5 litre / kWh during continuous operation.

Size - 484 x 258 x 163mm. This includes the full 2.5 litre methanol fuel cartridge and the on board buffer battery.

Weight - 9.7 Kg including fuel cartridge.

Maximum output - 80 watts (from buffer battery)

Noise – about 40db(A) at 1 meter. *(About the same as a laptop computer)*

One 2.5 litre cartridge which weighs 2.2 Kg will provide the same energy as can be stored in a 140 ampere hour battery. But re-charging is just a matter of replacing the cartridge, a few seconds job. (Fig4)
Life / Guarantee
The unit is designed for more than 3000 operating hours. The guarantee is 1000 operating hours minimum or 12 months. This being equivalent to having produced a minimum of 24 Killowatt hours with a design aimed at 72 Kwh. After this the units output is likely to drop slowly to around 70% of its original capacity over several months. SFC A25 units can be returned to SFC to be re-worked and have any defective cells replaced.

Sales/Service – Currently SFC are establishing a UK network through Recreational Vehicle dealers and similar in the yachting fraternity to represent them. Commercial outlets are also being sought.

The Technology. (FIG7)
All batteries generate electrical energy by a chemical reaction. The normal Lead-Acid battery used for both engine starting and leisure use is a stack of series connected "secondary cells". This battery can be re-charged by reversing the current flow and therefore reversing the chemical reaction to restore the "cells" to their original chemical condition. The disposable use once battery is made up of a series of "Primary cells" and uses a different chemical process than cannot be reversed electrically. When all the active chemicals are used up the battery or primary cells is dead. A fuel cell works similar to a battery. In a primary cell there are two electrodes which are separated by an electrolyte. At least one of the electrodes is generally made of a solid metal (Zink) This metal is converted to another chemical compound during the production of electricity in the battery. The energy that the battery can produce is limited by the amount of this solid metal that can be converted. In the fuel cell the solid metal is replaced by an electrode that is not consumed and a fuel that continuously replenishes the fuel cell. Thus the FUEL CELL is similar to a disposable battery in many respects but the chemical components that require replacement are continuously replenished to constantly keep the cell "charged".

In the SFC A25 fuel cell unit the chemical components necessary to keep the cell alive are Methanol and Air, from which the oxygen is used. This type of fuel cell is called the "Direct Methanol Fuel Cell" (DMFC). It is relatively simple in concept and runs at ambient temperatures. Each DMFC cell will generate somewhere between 0.3 to 0.9 of a volt depending on load and temperature, so several series connected cells in a "stack" are required to make a nominal 12 volt battery of fuel cells. The DMFC converts methanol and oxygen electrochemically into electrical energy, heat, carbon dioxide and water.

The platinum/ruthenium catalyst on a carbon substrate within the cell first splits the methanol into the hydrogen and carbon dioxide, then it splits the hydrogen directly
into electrons and protons. The protons then diffuse across the polymer membrane to
the cathode (positive electrode), while the electrons pass as current through the
external circuit.
At the cathode, the electrons then recombine with the protons that have passed across
the membrane and with oxygen taken from the air to form water.
The cathode reaction is catalyzed by platinum particles on a carbon substrate.
The overall process in the methanol/air fuel cell is thus the direct conversion of the
energy of methanol fuel to electric power, with carbon dioxide and water vapor as the
only two by-products. Exhaust gasses being similar to humans!

Fuel cells require absolute cleanliness of the fuel. In the case of the DMFC the
methanol fuel is sometimes a dilution of Methanol in pure water. In the case of the
SFC A25 the Methanol is undiluted and very pure. One 2.5 liter can hold a lot of
energy! (The water required remains within the A25 and is re-cycled)
Any contamination of the fuel will result in rapid deterioration of the cell. Because of
this the can is a semi-sealed cartridge which must be replaced with another sourced
from SFC.
The SFC A25 is between 30 – 40% fuel-efficient depending on load conditions. This
is about twice as efficient as a road vehicle piston engine at some 19% true fuel
efficiency.

Smart Fuel Cell AG is located in Munich and was founded in 2000 by Manfred
Stefener.

**The Costs**
Leading edge technology does not come cheap! The guide price is EU 26800 (£1800
ish) for the SFC A25. A replacement 2.5 litre fuel cartridge will set you back about
EU 14.9 (£10 ish) if picked up from an appointed dealer. Sending replacement
Methanol cartridges via the UK post will not be cheap either, so the quicker the
dealer network is established the better! In Germany the TUV have already certified
the container and its contents safe for transportation and SFC have certification that
permits world wide distribution.
Smart Fuel Cell AG offers a doorstep delivery for Methanol cartridges where
necessary.

**The future**
If the DMFC continues to thrive then prices will surely tumble in the same way they
have for digital cameras and computers. Military use of the DMFC for powering man
portable electronic devices is well established due to its light weight and much
improved power density compared with batteries.
Laptop and palm top computers are already lined up by Toshiba and others for the
Fuel cell treatment miniature style.
For more information on the SMC A25 look at [www.smartfuelcell.com](http://www.smartfuelcell.com)

For an animation of how a fuel cell works look at [http://www.humboldt.edu/~serc/animation.html](http://www.humboldt.edu/~serc/animation.html)

Clive Mott-Gotobed. 18th May 2004
THE FUEL CELL

Clive Mott-Gotobed looks at how this technology has advanced

EFOY fuel cell units do not require any regular maintenance, and I am told that units on lifetime test have exceeded 5000 hours and are still running successfully. That equates to about ten years of usage - so far. This is no longer a development product but a fully commercialised product range.

I was pleased to note that the initial one-year warranty is now increased to three years.

SFC believes that these products are perfectly designed to meet the requirements of today’s motorhome travellers who want reliable, carefree power, wherever and whenever they need it. They need no longer be reliant on solar panels, driving every other day, or noisy generators that might upset neighbours.

Knowing that you can be pumping over 5A into your leisure battery at any time means that one can use that large inverter to power the microwave oven or hairdryer, and the children can hammer the computer games all evening. You will remain secure in the knowledge that the battery will be fully charged next morning, sunshine or not! Interestingly, both Hymer and Monaco offer the fuel cell as a factory-fitted option.

EFOY fuel cells and fuel cartridges are available at more than 500 stores across Europe. For motorhome owners they are sold through qualified motorhome retailers, able to carry out a proper installation (if required). Contact Transaisline at Leeds on 0113 252 2900 for more details.

One can also order safety-certified EFOY fuel cartridges and the fuel cells directly from EFOY. The prices? The top of the range 5.4A unit sells for around €5000 and the bottom of the range 2.1A unit for €1800. Three years ago the previous 2A unit was £2000. Prices have fallen considerably.

The recommended retail price for Europe of the 10-litre M10 EFOY fuel cartridge is €21.99, the price of the 5-litre M5 EFOY cartridge is €13.99 (the M5 is always shipped in a double pack). Fancy some fun? How about complementing your motorhome with a fuel cell powered idea? Yes EFOY offers one - although in reality it’s a trifle.

For more information log on to www.efoy.com or call 00 49 89 675 592 0 (Germany).
A

impromptu suggestion from road test editor Dave Humell resulted in a modest convoy of M&M motorhomes heading towards Düsseldorf’s Caravan Salon in late August. The convoy consisted of Dave Humell in a brand-new Compass coachbuilt, Pete and Di Johnson in a brand-new Muni, and ourselves in a mature Auto-Trail Scout. To make matters interesting, all three vehicles were fitted with two-way radio, so we could keep in touch — very useful when getting lost in big towns. Also, the other two vehicles had satellite navigation units, which did not always agree. For example, having got lost in Düsseldorf on our way in, one team was heard to ask over the radio: “Does Sally say take the next left or the next right?”: to which the response was “Helga thinks we have arrived and turned off”.

Having established camp at the show campsite and taken the (every ten minutes) bendy bus to the show proper it was plain to see that this was a massive event. Although my prime objective was to look at what was available to replace our ten-year-old faithful Scout (but that’s another story), we (well I at least) also planned to look at anything even vaguely technical...

LED LIGHTING

This promises to be great for the future with low consumption units providing high levels of illumination. At the moment several suppliers offer LED light units — and for vehicle applications where the field of view is well defined they work well and have a very long life.

However the use of LED lighting inside motorhomes (to replace incandescent or fluorescent lights) has not taken place big time as yet. Some manufacturers do use LED light units for specific duties but always alongside more conventional lights.

A common feature of LED lighting is that the light output is very focussed in one direction. White (with a cool blue tint) LED lights are commonplace. Labcraft, from the UK, displayed its Goran strip assembly (50 high intensity LEDs), the Astro strip (light output equivalent to a 10W bulb at 20 per cent of the running current), and the circular Orbit range suitable for ceiling mounting. Labcraft also offers ‘warm’ LED lights, which do not give such a clinical light output.

Other companies showing internal LED lights included Hella, and Wench & Brothers from Taiwan (also marketing a range of DC-AC inverters).

AWNINGS

Both Fiamma and Omnistor (Thule) were well represented, although Fiamma said it had ceased marketing its fifth roll-out awnings due to “technical” problems. The range of accessories available continues to increase.

ELECTRICAL SYSTEMS

Disappointingly, apart from Labcraft, no UK manufacturers of motorhome electrics were found at the show. The bigger European names were well represented though. Schaufl had several examples of its Elektroblock range of combined charger and distribution units on show, alongside various customised control panels and ancillary equipment.

Victor Energy had various upmarket charger/inverter/energy management systems on display. These systems allow one to parallel up the prased output of the inverter and that of a small engine-powered alternator to enable devices that require lots of power to be used without hook-up. One of the comprehensive systems has a 6kVA generator, married to a 6kVA inverter and can provide a 15kVA output. Impressive, especially the 800 amp hour battery-bank required to support it. Smaller systems do exist, some are even quoted as being suitable for fitting to a panel van conversion.

Damatic makes systems for more than just motorhomes (buses and fire engines are part of the core business). The range of digital charge controllers and inverters was impressive and the three-cylinder diesel powered Whisper generator set was quite chunky.

Dometic had an impressive stand. The new Tec Tower is a 150 or 175 litre fridge, topped by a capacious freezer, topped by a small grill/oven (suit only for the UK market). The whole assembly will require two massive ventilation grilles in the side of the motorhome and a chimney through the roof. Interestingly Dometic now offers a small 12V brushless DC fan as a ventilator set — to help keep the hot end of the fridge cool and improve its performance. As well as fridges the Dometic portfolio includes stainless steel sinks, gas hobs, gas hobs with ceramic tops, mini ovens, hoods and ventilators, dishwashers (230V but

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Pete, Di and Dave chill out at the Düsseldorf campground.

The EPOT electric taxi. Futuristic or retro?
designed for motorhome use, roof air-conditioning units, rooftops, windows, blinds, doors, cassette and bulk tank vacuum toilet systems, generators, exterior barbecues, cool boxes, safari, vacuum cleaner systems - and this doesn’t count recently acquired Waeco with an equally impressive portfolio of products.

**SATELLITE TV SYSTEMS**

Alden, Oyster and Carneo were among the many automatic satellite-locating systems on show at the Messe. It was interesting to watch new arrivals at the show campsite inch their motorhomes up and down trying to find a clear view of a satellite while parked under the many trees.

**FUEL CELL**

The niche market for this product continues to grow. The ruggedness and reliability of the current range of units from EFOY is now well established, with several thousand at work all over the world. The largest, the 1600, is a suitcase-sized package, capable of supplying 5A on a continuous basis, the smallest, the 600, supplies 2A (intermediate outputs are badged 900 and 1200). Some motorhome manufacturers now offer EFOY fuel cells as part of their options list (Hymer, Niesmann + Bischoff and Concorde are examples). Concorde’s Autonomy package consists of an EFOY 1600 fuel cell and M10 fuel cartridge, a 100W solar panel, and a Mastervolt combi charger; in fair weather the solar panel keeps the battery charged; in poor weather the fuel cell automatically kicks in (purchasers should expect a price of around £6000 Euros for this). EFOY also had on show its fuel cell power assisted electric taxis - reminiscent of the Prisoner series on TV so many years ago.

**CHASSIS**

Al-Ko had its own stand showing many galvanised chassis for the caravan and motorhome industry. Iveco also displayed a new twin-axle running chassis for all to see. The star of the show for me was the new rear-wheel drive base for coachbuilt and A-class motorhomes on offer from Mercedes-Benz. This is built on the latest Sprinter and has the powerful and silky smooth V6 3-litre engine at the front. At the rear we find an Al-Ko galvanised chassis but with full independent suspension replacing the traditional live rear axle at the rear. This combination was able to offer a 205mm lower platform for motorhomes (akin to the deck height Al-Ko achieves with the Sevel front-wheel drive chassis). In essence the prop shaft and differential units have been retained but the differential case and rear suspension is now solidly bolted to the rear sub-frame. Within the Mercedes-built sub-frame two drive shafts connect between each side of the differential and the wheels, with constant velocity joints. Coil springs and dampers each side provide the suspension although the coils tend themselves to being replaced by air suspension type units if required. This one should drive like a dream.
PORTABLE POWER

In the first of a short series, Clive Mott-Gotobed finds that fitting a fuel cell to your vehicle doesn't need to be tricky

Having reviewed the initial unit and, more recently, one of the latest EFOY (Energy For You) units from the range manufactured by Smart Fuel Cells, it was only a matter of time before MMMM obtained one for a proper test. Grove Products, the new UK distributors for EFOY, had generously loaned one to the magazine for a better look.

I found myself volunteering - by esteemed editor Mike Jago - to put the EFOY 900 (with an initial 10-litre pack of methanol fuel) through its paces. The 900 unit provides 3 amps, which initially does not sound a lot, but at 75 amp hours of battery energy every day it becomes useful.

The figure 900 in the model name refers to the number of watt hours provided in each 24 hour period. For example, if you run a small microwave oven via an inverter for 5 minutes in the morning to make your porridge this will roughly consume 100 watt hours.

WHAT IS A FUEL CELL?

A fuel cell is an electrochemical device that produces electricity from fuel and oxidant. Fuel cells can operate virtually continuously as long as the fuel is supplied. Since the conversion of fuel to energy is an electrochemical process, not combustion, the process is clean, quiet and highly efficient.

Fuel cells are different from batteries in that they consume reactants, which must be replenished, while batteries store electrical energy chemically in a closed system. Additionally, while the electrodes within a battery react and change as a battery is charged or discharged, a fuel cell's electrodes are catalytic and relatively stable.

UPDATE
The SFC EFOY is now available with a hybrid control system that can be used in tandem with a solar panel. This means that, on sunny days, the solar panel will charge up the battery while on days with low light, the EFOY system will automatically kick in.

The electronic control, developed by Böttner-Elektronik in Germany, calculates and controls the time intervals at which the EFOY fuel cell is switched on depending on weather, season and sunshine duration, saving fuel needed for the cell. You can opt for the whole EFOY system with a solar panel or retrofit the EFOY fuel cell and hybrid control to an existing solar system.

THE KIT
1. The unit came in two tough cardboard boxes. The smaller box was straightforward: two 5-litre plastic containers of methanol.
2. The larger box was a serious bit of packaging with a specific sequence to open the lid. This revealed another cardboard box, which could be lifted out. Under this was the main unit, strapped onto a tray which was to become its mounting in the vehicle. Another plastic support with a tie-down strap was also supplied to retain a methanol cartridge.
3. The top box contained operating and installation manuals in six languages. The English version provided light bedtime reading, with installation split into three basic sections: fixing securely, providing adequate ventilation, and the electrical.
4. The components in the fixing kit included: Ducting to exhaust cooling air outside, a flange for fitting to the EFOY unit to the ducting, a right-angle unit to turn the ducting through 90 degrees if required, a flange for fitting to the enclosure to allow fresh air to enter, and two moulded stout plastic trays for the EFOY unit and the methanol cartridge.
5. All the controls of the EFOY unit are via a remote display touch panel, which is connected to the main EFOY unit via a standard 5-metre long computer network cable, which is in the kit. Even a template for the hole you may need to cut is supplied.
6. The only consideration is connecting it to your battery. Some new, Continental motorhomes have a connector on the low voltage control unit for the EFOY unit, and a cable set is provided for this. For other motorhomes (like our Scout) the unit connects directly to the leisure battery. EFOY has

7. But why are there are two sets of everything? One cable set is for charging the battery from the EFOY unit. As amps flow along a cable there will be some small voltage drop due to the small resistance of the cable. If the voltage at the EFOY unit is used to determine the battery voltage this voltage reading will be high (because of the amps flowing) which would result in the charging being terminated prematurely. Therefore the actual battery terminal voltage is monitored using another pair of cables between the EFOY unit and the leisure battery just to monitor its voltage.

FITTING
8. The EFOY unit needs to be securely mounted upright in a location with adequate air-flow, as it generates some heat while in use. Although this is less than 100 watts of warmed air, it needs to be regularly exchanged with fresh air - access to an outside wall is therefore required and suitable ducting is provided. The EFOY unit should be protected from the elements. Separate from the cooling air, the exhaust from the EFOY unit is a low internal diameter flexible plastic pipe and sufficient length is provided for most eventualities. As already featured in MMMM, we've fitted a bulk...
gas tank, meaning the gas bottle locker is now vacant. It’s ideal because the floor already has two generous vents, one for fresh air and the other for exhaust air.

10. Fuel cells typically generate twice as much heat as electrical energy but are still more efficient than generators. Laying the two trays in position with the EFOY unit and a methanol cartridge in position proved that it was possible but just a little too snug! Once the tray for the methanol cartridge was removed there proved just enough extra space to accommodate the cartridge without it being squashed.

11. As both vents were in the floor of the cupboard I made a wooden plinth to mount the unit. By raising it on a pair of battens, fresh air could be drawn from under the plinth. Ducting would be routed to the front vent to exhaust heated air. Drilled holes were jigsawed out for the retaining belt to secure the methanol cartridge. (You can tell it is a ‘working’ garage by the state of the table!)

12. The grille was removed from the front floor vent for the exhaust and replaced with a thick plywood spacer that could be cut to accept the re-shaped end of the exhaust pipe.

13. The thin clear pipe is the silicon rubber tube supplied in the EFOY kit and is the exhaust from the cell. Outflow is small and is moist carbon dioxide - the same as us humans.

14. Now the electrics. The amount of wiring provided is generous but to make the wiring a little tidier I taped together the outgoing DC wires and the data cable for the display to make them into one cable bundle inside the locker. A 30mm hole saw was used cut a sufficiently large hole for the wire end connectors to pass out of the locker. After routing the wires the hole was filled with silicone rubber compound and left to cure overnight.

15. The cable assembly for the battery has two mating connectors - one is a two-pole and the other is a three-pole - that fix to those fitted to the fuel cell end. I terminated the battery-end ring terminals at two large stud terminals hidden behind the drivers seat. I fitted these previously for another duty and they connect to the leisure battery bank with a short length of thick welding cable. You can also take a look at the wiring diagram.

16. Lastly the display. Not wanting to drill large holes in the habitation area, I left the cable a little on show. The display box is fitted first with the groove for the outgoing cable at the bottom left corner. Attach the cable to the connector on the back of the display and then fix the display on using the supplied four small screws. Lastly, the lid is clipped on top. Then the time came to connect it all up and turn it on. A double check of the voltage polarity of the 4-way plug before it was connected to the fuel cell indicated that smoke was unlikely. Once connected it just sat there! Silent, no flashing lights, nothing. I walked around and stepped inside the camper to check the display, which stated ‘automatic standby’. Then, almost like magic I could hear a small rumbling noise, like a fish tank pump very quietly in the background. I went back outside and could hear that the EFOY was alive and happy.

Back to the display. I pressed the on-off button on the left. It lit up the display, which indicated off. So I pressed it again and it read ‘start phase’. After a few moments it indicated a fault and automatically restarted. It then began to purr away to itself. I pressed the right hand menu button for a measure of the battery volts and charging amps and it was certainly working. I pressed the off button and it displayed ‘shutdown procedure’. After a quick cup of tea, I came back and it still said ‘off’ so the unit was uncoupled and taken back indoors. The handbook warns against letting the unit be exposed to sub-zero temperatures unless connected to a battery and a charged methanol bank so it can keep warm automatically.

I think we will find her the ET (Electrochemical Technology). The forthcoming camping season should be illuminating!

**FACT FILE**
- **Price (RRP subject to exchange rates):**
  - EFOY 600 - £11579
  - EFOY 900 - £11999
  - EFOY 1200 - £12479
  - EFOY 1600 - £12899
  - 5-litre fuel cartridge - £19.99
  - 10-litre fuel cartridge £89.99
- **Web site:** www.efoyo.com
- **Stockists:** Call Grove Products on 0161-367 7070
Motorcaravanning matters

PORTABLE POWER
Clive Mott-Gotobed reports on his first few months with a methanol fuel cell

"You're testing what," said the voice on the other end of the telephone.
"A fuel cell," I responded.
"Um, what does it run on," they asked.
"Methanol," I said.
"Isn't that highly flammable? This is a forest, you know," was the response.
That was the conversation that took place when I was trying to book a pitch at the open
title year Setthorns campsite in the New Forest. I pointed out that the unit is compact, briefcase-
sized, quiet, unobtrusive, and has far less chance of setting fire to the forest than a
generator or even a hot exhaust.
The exhaust from the fuel cell is actually a small amount of water vapour discharged through a 6mm diameter plastic pipe. The nice people at Setthorns said, yes, and I agreed to show them the kit on arrival.

The weekend in question arrived and, once
on site, Mel and Sue duly inspected the kit,
during a gap in the rain (using a torch). It
seemed that the concept of having a fully
recharged 75 amp hr battery every day was fascinating to these caravanners.
Questions continued on the complexity — or,
in this case, lack of it — of the installation. The £1500-ish starting price tag did not seem to phase them at all.

Having found a plot on the far-from-empty
even in early January site, we established camp for the evening, put on the television, turned on all the lights and, later,
commissioned a small 12V, 45W electric blanket
called her, was also manually switched from
to automatic mode to on, and it was not long before
she was indicating 3A-5.1A charge current.
Although she would start once the battery
voltage had dropped sufficiently, why wait?
Eventually the TV and sudoku eyes were
affected by the QTX and we switched off the
lights, box and electric blanket and went to bed. ET switched herself off a few hours later after the
cell volts were back up to the required level.

Overnight it blew and howled, pine cones
dropped on the roof with an alarming effect on the occupants within. In the early hours, the day was quiet. After a coffee, and egg and bacon
burellies, we took advantage of the unseasonably good weather and went for a
wander in the forest aiming towards Sway.
It was a bit far to Sway on foot, so we
returned to the site for lunch and headed back
to Sway with the camper to get some papers.
Back at the camp, yet more interest was shown
in ET where her finer details could be appreciated in daylight. A little later, and she
was powering the laptop via the inverter.
The afternoon and evening provided more
bad weather so, after some friends had
departed, the TV got thrashed for a while until
the thoughts of laying in bed listening to the
howling wind became more attractive. ET was
putting quietly in her locker, we were snug and
the hustle and bustle of the world at large
seemed a long way away. The electric blanket
was turned on an hour before bedtime making
even more comfortable.
We had a late rise on Sunday morning, after
watching Andrew Marr's version of Frost on
Sunday. The solar panel was pumping a
massive 0.1A into the battery, so having an all-
weather alternative to keep batteries charged
was very welcome.
Without doubt, the fuel cell could keep us
independent of mains hook-up for as long as
we had methanol. It had only operated for 16 of
the possible 60 hours we were on site, and we
also used some ham radio equipment, further
draining the battery.

Our space heating comes from a Carver
convecto and doesn't consume any battery
current. However, the EFOY unit should be
able to support heating systems that rely
on the battery supply for their control/air
circulation.

Met and Sue Reed, the wardens at Setthorns, were extremely intrigued by the fuel cell concept
During sunny periods, it is always a dilemma deciding when to turn on the fuel cell. I always wonder if the solar panel will be sufficient to make up what we have taken out on the previous evening?

EFOY, in conjunction with a firm called Busscher-Elektronik, can now optimise the combination of a fuel cell and a solar panel. The hybrid control system monitors the performance of the solar panel and typical usage over time, deciding if and when the fuel cell should come on, to minimise methanol use.

After sunrise, the electronic control determines whether the solar panel will be able to top up the power consumed the night before. If this is so, the fuel cell will remain in standby mode. If, however, the weather turns bad over the course of the day, resulting in less power from the solar system than expected, the hybrid controller will start the fuel cell to ensure that the battery will be recharged ready for the demands of the evening. It’s no longer necessary to guess. Next trial, perhaps?

FUEL CONSUMPTION
The fluid level in the 5-litre methanol container fell from 200mm to 180mm. So, this means we used about 10 per cent of the 5-litre can over three days and two nights.

INFORMATION
EFOY 900 direct methanol fuel cell
Grove Products Limited, Broadway, Hyde,
Cheshire SK14 4QF
Tel: 0161-367 7070
Web site: www.efoy.com
Call Grove to find your local dealer; there are 37 distributors across the UK in Hampshire, York, Essex, Thetford, Nottinghamshire, Sheffield, Sussex, Stoke-on-Trent, Dorset, Kent, Hereford, Ipswich, Northamptonshire, Oxfordshire, Gloucestershire, Cornwall, West Sussex, Cumbria, Co Durham, Croyde, Lancashire, Weston-Super-Mare, Cheshire, Wales, County Down, Kirkcaldy, Bangor and County Tyrone.

WEB GRAB
Campervanstuff.com: This online shop is selling the EFOY unit at below – just – the RRP (recommended retail price). Call 08000 320980 free or visit www. campervanstuff.com for more information.

WE STAYED AT
Setthorns Forest Holidays site, Wootton, New Milton, Hampshire BH25 5WA.
Tel: 01590 681020
Web site: www.forestholidays.co.uk
There are no toilets or showers, but plenty of emptying/filling points. This is the only New Forest campsite that is open all year and has many pitches with hook-up.
For a pitch, during low season, fees start at £7.90 for Camping & Caravanning Club members or Forest Experience cardholders. Others pay £3 more. Bank Holidays will cost £15.50 for non-members.
FUEL CELL FREEDOM

In the last part of our long-term test, Clive Mott-Gotobed tries the EFOY’s bigger sister, for a direct comparison with the mid-sized model we tested previously.

As regular readers will be aware we have decided to change our beloved 11-year-old Auto-Trail Scout for a newer motorhome, after putting the deposit down in September. Aware that modern motorhomes have a greater reliance on 12V power when there is no hook-up available, we decided to try the top of the range EFOY 1600 unit. From a thread on the MMM forums at www.outandaboutlive.co.uk it was fairly apparent that those people who had or were intending to get themselves a fuel cell had all opted for the top of the range 1600 unit. EFOY agreed to swap our little EFOY, affectionately named ET (Electrochemical Technology), for a big ET to compare the differences. For those who have not read our previous waffle, the EFOY fuel cells quietly purr when in operation and, hence, have a sort of personality. It’s a bit like the French language, everything has a gender and our ET is a she.

What is a fuel cell? Just think about ordinary batteries. Those that we use once, throw away when they go flat, and the effective chemicals have been used up. These are primary cells.

There are those that we can re-charge by passing a reverse charging current through them and use over and over again. Car batteries, leisure batteries and even in your mobile phone fall into this group. These are called secondary cells.

The third option is to take a primary cell and provide a way of continuously renewing the effective chemicals. This is the fuel cell. The idea is not complicated but the engineering to reliably achieve this can be.

To continue with our trials, we booked ourselves into the Forest Holidays campsite at Postern Hill for Easter. The warden advised that all the premium pitches had gone. Those are the ones with hook-up, but the lack of such facility was fine with us and we booked.

We arrived midday Friday and after going into the local town for tea, we returned at about 5.30pm just before a massive hailstorm began. I turned on a load of lights, the inverter to power the laptop and “big ET” for the first time. The display went through its normal start-up routine drawing the fuel from the adjacent five-litre container. But there was something new. A small flashing red LED and an alarm told us to check the exhaust hose. Amps indicated 0.0.

Fortunately the hail had stopped, so armed with a torch I inspected ET – only to find that I had trapped the 12mm plastic pipe that is the exhaust hose. Cue rapid rearrangement. Back inside, I pressed the reset button and all was well, she started up normally and purred quietly. Amps worked up to 5.4.

That evening we had everything 12V-powered running – TV, laptop, electric blanket, three fluorescent lights and a halogen spotlight, as well as a small ham radio transceiver that I used to speak to an ex work colleague in Exeter who I had not seen since 1967. We eventually went to bed leaving ET purring to herself. Overnight we listened to the wind with leaves and twigs hitting the motorhome roof. I am not sure when ET went to sleep.

In the morning one blind was lowered to reveal snow falling. I turned over and buried my
Motorcaravanning matters

Voller's LPG-powered unit is too expensive...

...and production has stopped due to lack of funding

Head under the bedclothes waking some hour or more later, it was still snowing! Later the snow stopped and the hail returned, then the hail stopped, then the wind then more snow.

Over the next night it went quiet, the wind stopped, the temperature dropped and sometime in the small hours I heard ET start up to keep herself warm, she only ran for about 5 minutes. Much later, when one eye opened we found a falling snow and a light dusting on the ground.

Since, we have been on several expeditions with ET. Knowing that we can keep pace with five-amps or so continuous discharge from the battery we have changed our awning/awning lighting when we have friends round for an evening barbecue. Previously it was the very effective Coleman petrol storm light, but now we use a couple of 100W equivalent low-energy mains light bulbs operating from a small inverter. These bulbs only consume 20 watts each and the input to the inverter allowing for its inefficiency will still be around 4 amps.

The EFOY unit appears to be well developed and well engineered for production. The software that drives the remote display is intuitive as well as being configurable in many languages. After all, it did point me in the right direction (in plain English) when I got the plastic pipe crushed.

However, the 1600 model when compared to the 800 unit is slightly noisier. Don't get me wrong, both units are very quiet in operation and you would be hard pushed to know that either were running during the day under normal use. But, Janet after lying in bed during a quiet night listening to big ET buzz ing away for an hour suggested we change back to little ET. Perhaps I will mount it differently when we get the new motorhome.

RUNNING COSTS

As I write, we have still not used up a whole five-litre container of methanol and we have gone through the winter. In summer our 80W solar panel is having a significant influence in the use of ET. A five-litre can of methanol costs about £20. It's important that only the purest cleanest fuel is used, as any impurities will finally damage the cell.

Groove Products continues to grow its UK retailer base from the initial 37 outlets. At the 2008 Düsseldorf Caravan Salon, EFOY announced that it had sold 10,000 units. The company also reported a 20 per cent improvement in conversion efficiency for new units (advances in technology) as well as further reductions in noise (improved insulation within the units).

WHAT ELSE?

An American company is testing potential UK acceptance of a larger methanol powered fuel cell and is considering both 10A and 20A variants in a package only slightly larger than the EFOY. One suggestion from this firm is to mount the unit under the chassis rather than occupy a locker. Price is hoped to be more competitive than the EFOY. How this company plans to introduce a parallel network of distributors of methanol remains to be seen.

Truma which has been promising an LPG powered 250W (20A) fuel cell for some time, now has about 50 units on limited field trial and had examples on show at the 2008 Caravan Salon in Düsseldorf. The target price is 4000 euros and we're told it should be available in spring 2010. The space needed is 600mm x 400mm x 250mm (LxWxH) which would fit a double underseat locker. The unit would weigh about 25kg. Daily output is quoted at 6 kilowatt hours per day with a gas consumption of 90 grams of gas per hour.

The amount of hot air expelled from the demonstration motorhome at Düsseldorf was said to be 500W and the noise not dissimilar to that from an air-conditioning unit in operation. (Note that it often the noise of air-con units that puts many people off from having them.)

Voller had the massive Emerald, producing 800W of electrical energy (86A) as well as twice as much heat that can be used to heat water and/or space. It cost S$1,000 plus fitting and needs to be designed into a motorhome from the outset to take full advantage of its capabilities. Two-thirds of the contents of the Emerald enclosure are for the reformer that extracts the hydrogen gas from the LPG (see Fig 8). This unit that weighs the same as a small motorcycle (120kg) and is quite large (800mm x 580mm x 450mm). It will produce 25kWh for 9kg of propane. However, Voller has been unable to secure extra funding to further develop the product and so has ceased production.

Samsung has released details of a 200W LPG-powered fuel cell, weighing 23kg and with a space profile of 512 x 314 x 200. It is currently on trial.

Fuel cells have already found applications in road and industrial vehicles as the prime source of power, and even aircraft! In August 2006 a fuel cell-powered, unmanned photographic aircraft was flying in America. In 2008 Boeing had a manned aircraft powered in this way.

At this time the EFOY remains the only engineered and developed unit on the market for leisure vehicles, being offered on the options list of 37 motorhome manufacturers.

Aiming at increasing the customer base SFC (EFOY) also has a new 250W (20A) fuel cell, which has passed US Army testing at Fort Hood, Texas. What next for motorhomes?

CONTACT

EFOY 1600 direct methanol fuel cell supplied by SFC. To find your local distributor phone Grove Products on 0161-367 7070.

SFC (EFOY) also has a...
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