Old Lane Cottage, Ashton Hayes, Chester UK

CO_2 Reduction Objectives

Profile:

Old Lane Cottage is a typical 16th Century English farm-worker's cottage built without foundation using brick on top of stone with slated roof.

When first purchased in 1973 by Rod and Jenny Trippier, the current owners, it had two rooms upstairs and two on the ground floor, with a slated lean-to extension at the rear, added in 1936, the toilet was outside connected to a shared septic tank.

A lounge and bedroom were added in 1974, enabling one of the existing bedrooms to be converted into a bathroom.

During 2004/7 the property was again extended and extensively refurbished, firstly using a professional builder, but as so often happens in the UK, progress was slow, and Rod took on the challenge. Not easy whilst working for clients around the UK, all from a mobile caravan that was to be their home, not for the planned twelve months, but for three years!

The slated lean-to was demolished and two gabled extensions added, each running at right angles to the existing roof. The rear wall was extended by 1 metre, this allowed enlargement of the kitchen together with walk in pantry/storage room and a wet-room, and open corridor access to the garden,

Upstairs; two more bedrooms were added, the 1974 bathroom became a feature landing; a dressing room and en-suit bathroom were added to the existing main bedroom.

Inside; the plumbing and wiring have been replaced throughout.

The existing roof slates were removed and re-laid on top of modern insulated felt.

Outside; a new septic tank has been installed at the top of the garden, together with a macerator adjacent to the property, this pumps the foul water up to the septic tank; the overflow percolates into a drainage field lower down from the septic tank at a depth of 1 metre beneath the garden.

The outline plan was to;

1. Replace coal fired central heating with a combination of oil and wood
2. Use solar power to supply top-up heat and further reduce energy usage
3. Reduce heat loss
4. Use reclaimed materials where practicable, e.g., doors, sanitary ware/ furniture, and feature items

What we looked at but rejected:

- geothermic heating, because of the added installation costs associated with an older property
- photo voltaic electricity cells, because current technology is weak and, by comparison with other carbon reducing technologies, is costly; although new technology currently being developed could see the balance change in the next five years
- wind power, because of cost and low return on investment; but it is likely that a wind generator will be installed in the future using a 24V D.C. car alternator feeding batteries, converting to 230V A.C. through an inverter
- rain water harvesting, based on adverse environmental grounds

What we looked at and installed;

- high efficiency external wall mounted oil fired condensing boiler (to save internal space), with a wood burning stove in the lounge working in combination, i.e.,
- oil boiler providing central heating and hot water; the boiler is powered up through a time clock for peak periods, e.g., 0630 to 0930, and 1730 to 2200
- 7Kw wood-burning stove plumbed directly into the heating circuit so that when the wood-burner attains an output greater than the oil boiler set-point, the oil boiler switches off automatically, and the reverse happens should the wood-burner heat output drop. This is only possible with an “open system”, because we’re combining uncontrolled and controlled heat in one system
- had we not been restricted by space, a screw fed wood-chip system would have been installed, giving greater heat out-put
- during the day in winter the wood-burner provides back-ground central heating and hot water independent of the oil boiler, output is controlled manually through dampers

Solar thermal panels; these work independently through a circulation coil in the hot cylinder. As fluid in the roof panels reaches the set-point temperature, heated by UV light, the pump switches on automatically; the reverse happens when UV levels drop. Solar heat also acts as a pre-heater for the central heating, therefore reducing boiler demand

Although a 3Kw immersion heater has been fitted, it has never been used

Because the Jury’s out on low energy bulbs we’ve only fitted 25% of the total lighting

Most energy is wasted by buildings, and this is where most CO_2 savings can be made. The following heat saving measures were installed;

- 400mm insulation beneath concrete raft in the new build, approx 30% of the existing floor area (this meets current UK Building Regulations)
- 300mm loft insulation
- 300mm equivalent (foil blanket), insulation beneath first floor floors, difficult to achieve in property of this age because of the narrow floor spaces
- insulation filled cavity walls
- the original 9” (215mm) solid brick, 16th Century walls were dry lined internally
- new walls were lined internally using dot and dab techniques
- windows double glazed; 25mm gap
- window frames in wood
- external doors weather sealed

Other CO_2 reducing measures;

- to help reduce electricity consumption from our 30 x 50w kitchen down-lighters, and to help select appropriate lighting combinations, we fitted four switched circuits
- main car converted to LPG
- grey water recycling
- where possible wood is gathered locally from fallen trees; current usage, 6 tonnes p.a.
- raised garden using excess soil from the drainage field for growing vegetables

How much did the CO_2 reducing technology cost in £'s Sterling?

- 2 x 2 square metre solar panels, including controls and fitting	£ 3,000.00
- 250 litre twin coil hot tank	250.00
- wall mounted condensing boiler	1,800.00
- hot water manifold	400.00
- labour; difficult to put a price on this, but for a retro system fitted by a good heating engineer who knows his stuff, say;	1,000.00
	£ 6,400.00
- plus cost of converting the car to gas	£2,300.00

To what extent have the measures reduced the carbon footprint of Old Lane Cottage?

CO_2 Producer	**Saving**	
- electricity	7%	- this will be improved by modifying heating control circuits, reducing the running time of circulating pumps
- bottled gas	0%	
- heating	26%	- mainly because we've moved from coal to oil & wood
- leisure	0%	
- car	10%	- based on current mileage, pay-back is 11 months

- grey water recycling; CO_2 savings not calculated, but it saves 40 litres per day, and means we can water the garden from the grey water tank without feeling the guilt of using precious mains water
- not known how many CO_2 miles the vegetable garden will save

Overall CO_2 saving, post carbon reducing technology installation; >**30%** ***

*** this can vary depending on who's chart you use to achieve the calculations

What can <u>WE</u> do to help reduce our carbon foot-print?

- buildings waste more energy than anything else; so to reduce CO_2, insulate roofs, walls and floors, draught-proof doors and windows, and as a last resort fit double glazing

- when carrying out extensions or refurbishments, look at ways to incorporate energy saving ideas that suit your needs

- reduce energy consumption by turning off computers and other equipment that is not in use, i.e., equipment on stand-by and phone chargers

- drawing curtains will reduce heat loss, particularly at night

- where practical, fit passive infra-red sensors, and timers to lighting circuits, this ensures that lights only illuminate when movement's detected

- check energy labels when buying white goods; also, it's more economical to have a full fridge/freezer than an empty one

- think carefully before buying low energy lights, the cost of replacing them is high, and they don't (yet) last as long as claimed, and more worryingly, low energy lights are classed as hazardous waste under the E.U.. WEEE regulations, and MUST be returned to a retailer for disposal, NOT PUT IN THE HOUSE HOLD WASTE BIN

- turn the central heating down a notch or two and put on a sweater

- improve car usage by reducing journeys through better planning; if practicable, think about car sharing

- and keep your Foot Off the accelerator (Gas), think "FOG"; you're not racing anyone so this will improve fuel consumption , cut costs and reduce your CO_2

- DON'T sell your present car to buy a smaller, or "green" car, run it into the ground, then replace it with a second-hand one; each new car helps increase our carbon foot-print, whether alternative fuel or not

- use public transport if its available and if the cost isn't too prohibitive

- walk more often

- cycle more often

- if you can manage on a combination of foot, bike, taxi and public transport, sell your car; not only will it reduce your carbon footprint, but it's cheaper and healthier

What can governments do to help reduce our carbon foot-print?

- plan an integrated national CO_2 Policy, including an education programme, rather than the installation of piece-meal initiatives

- research to help find ways of separating the carbon from the oxygen so that both can be used economically, instead of paying for carbon capturing

- improve wind farm technology, and look at other renewables such as gas generation from sludge digestion

- encourage people to use public transport, put it on where people want to go and when, keep it clean, and with heating in winter; make sure it always turns up, and on time, and improve safety and security by bringing back bus and train conductors, and give them the powers to eject anti-social characters; also, brighten up bus and railway stations

- nationalise both power and transport; integrate both and develop a strategy to manage fuel technologies;
    - take away the profit element and reduce costs to the community
    - increase rail-freight transport
    - bring in railheads where goods can be distributed locally using lighter alternative powered vehicles
    - develop the canals even further
    - electrify all railways, and phase out diesel engines; reduces CO_2 and helps the balance of payment deficit

- construct “clean” solid fuel power stations, convert oil and gas powered sites to coal; re-open the coal mines; this will help supply our energy needs and reduce our balance of payment deficit, and by reducing global freight journeys it will help reduce the global carbon foot-print

- encourage local community electricity generation schemes, currently nearly twice as much energy is wasted getting power to consumers, as the consumer uses, that’s why it costs so much, and CO_2 emissions are higher than other energy sources

- discourage out of town shopping developments, this will reduce car journeys and by providing better public transport to town centres it will be easier for people to shop, helping much needed town regeneration

- encourage reductions in population growth

- put in measures to change life styles, bring back community living and help reduce vehicle journeys

- look at spectator events such as football, and put in measures that will help reduce mass transportation of fans by road vehicle; in 1935 spectators attending Man U matches could walk straight off trains directly into the ground.

Domestic Heating Fuel CO_2 Emission Comparator:

The UK Biomass Energy Centre lists domestic heating fuel CO_2 emissions as follows;

FUEL TYPE	kg of CO_2 per kWhour
Wood Logs	<0.006
Wood Chips	0.160
Wood Pellets	<0.061
Mains gas	0.220
LPG	0.225
Oil boiler running on kerosene	0.255
Coal	0.270
Anthracite	0.320
Manufactured Smokeless Fuel	0.392
Electricity	0.460

Actual CO_2 emissions will vary with age and condition of the boiler and effectiveness of the management system, e.g., thermostats, and whether radiators are fitted with thermostatic valves.

The above table compares CO_2 emissions only, and do not compare calorific values or cost of purchase.

On a scale of 1 to 10, different transport systems producing CO_2 score as follows:*

- cars and light vans 10.0
- lorries 2.8
- aircraft 1.3
- ships 0.7
- rail passenger & freight 0.3

Summary;

There is no silver bullet to help reduce CO_2 emissions, or indeed methane, which is twenty two times more harmful; therefore it's important not to be carried away by CO_2 saving concepts.

To achieve an actual drop in CO_2 levels we must consider the life cycle of energy reducing products, e.g., the amount of energy put into manufacturing and decommissioning , not just their operational CO_2 savings.

This means assessing CO_2 saving technologies on a cradle to grave basis, e.g., from raw material extraction, to production, to use and servicing/repair, through to disposal.

Our Government has a responsibility to invest heavily on public transport, stop out of town development and rebuild communities by encouraging "cottage industry" thereby generating local income, helping to keep people in the community.

To help take pressure off the environment, Government should also be considering population reduction measures. Anything we can do to reduce population will significantly reduce our emissions to air, water and land.

Local Government has a duty to plan more sensibly, encourage public transport initiatives, and reducing land-fill, either by better recycling, or incineration.

As individuals we can do our "bit" by changing our life-styles, considering our needs rather than wants, planning and limiting our car journeys, and walking or cycling more. And, anything we do to reduce our use of manufactured products, and return to a more agrarian life style will reduce both CO_2 and methane.

In the meantime Local Government can take a lead from companies like Shotton Paper in North Wales, that for over twenty five years has been using energy reducing technologies commercially, including waste incineration, and in so doing, has helped reduce its carbon footprint.

Let's hope that where initiatives such as the Ashton Hayes "Going Carbon Neutral Project lead", world governments will follow.

Please note:

Opinions expressed in this article are those of the writer, and do not necessarily reflect those of the Ashton Hayes Going Carbon Neutral Project.

Rod Trippier
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