



The wedding day has arrived

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Old clean coal

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Energy: Using photosynthesis to capture exhaust gases from power plants could reduce the emissions produced by coal-fired stations

FOR its supporters, the idea of growing single-celled algae on exhaust gas piped from power stations is the ultimate in recycling. For its detractors, it is a mere pipe dream. Whoever turns out to be right, though, it is an intriguing idea: instead of releasing the carbon dioxide produced by burning fossil fuels into the atmosphere, why not recapture it by photosynthesis? The result could then be turned into biodiesel (since many species of algae store their food reserves as oil), or even simply dried and fed back into the power station. Of course, if it were really that easy, someone would have done it already. But although no one has yet commercialised the technology, several groups are trying.

One of them is GS CleanTech, which has developed a bioreactor based on a patent held by a group of scientists at the Ohio Coal Research Centre, at the University of Ohio. The GS CleanTech bioreactor uses a parabolic mirror to funnel sunlight into fibre-optic cables that carry the light to acrylic "glow plates" inside the reactor. These diffuse the light over vertical sheets of polyester that form the platform on which the algae grow. Eventually the polyester is unable to support the weight of the algae, and they fall off into a collection duct positioned underneath.

GreenFuel Technologies, based in Cambridge, Massachusetts, has a different approach. Its reactor is composed of a series of clear tubes, each with a second, opaque tube nested inside. This arrangement makes it possible to bubble the exhaust gas down through the outer compartment and then bubble it back up through the opaque middle. The bubbling gas causes turbulence and circulates the algae around the reactor. The constant shift between light and darkness as the algal cells circulate increases the amount of carbon that they fix, probably by promoting chemical reactions that occur naturally only at night.

A preliminary test of GreenFuel's reactor design, which was performed at the Massachusetts Institute of Technology's campus power plant, suggested that it can remove 75% of the carbon dioxide from a power station's exhaust. A more serious test is now being carried out by Arizona Public Service, that state's power utility, at its Redhawk plant. Another test is planned in Louisiana.

GreenFuel claims that over the course of a year, a hectare (2.5 acres) of its reactors should be able to produce 30,000 litres (8,000 American gallons) of oil, which could be used as biodiesel, and enough carbohydrates to be fermented into 9,000 litres of ethanol, which can be used as a substitute for petrol.

There is, of course, no free lunch. As Rob Carlson of the University of Washington points out, if money is to be made selling products made from exhaust gas, then that gas goes from being waste matter to being a valuable resource. Far from giving it away, power companies might even start charging for it. That would, indeed, be a reversal of fortune.

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