



*Above: The 1959 tractor photographed with the side panels removed to show the bulky fuel cells.*

*Left: This diagram view shows the general layout of the 1959 Allis-Chalmers tractor with the bank of fuel cells at the front.*

cell is used to power a vehicle, an electric motor is needed to turn the electrical power into mechanical energy to drive the wheels and this significantly reduces the overall energy efficiency.

What prompted Allis-Chalmers to invest time and money in a series of experiments with fuel cell powered tractors is far from clear. The project started in the late 1950s, a time when fuel prices were still low, particularly in America, and a modest gain in overall fuel efficiency would have impressed few farmers. It was also a long time before driver comfort had become an issue on farms, and quiet, vibration-free tractor power would probably have attracted less interest than it would 40 years later.

As well as farm equipment, Allis-Chalmers was also an important manufacturer of electrical equipment including electric motors. In 1958 this division began work on a fuel cell research project. The technology was available to the tractor engineers, but by

modern standards the cells they used had some disadvantages and generated only a small amount of power.

The Allis-Chalmers fuel cell programme produced at least two experimental tractors, the world's first fuel cell powered vehicles. Development work started in 1958 using a much modified model D-12 with the standard four-cylinder petrol engine and four-speed gearbox replaced by a fuel cell pack and an electric motor. Results from this project were sufficiently encouraging to justify a specially designed fuel cell tractor, demonstrated and used in a publicity programme in 1959.

Under the bonnet of the 1959 tractor were 1008 individual fuel cells, each measuring 12in square and 0.25in deep. Fuel was supplied to all the cells when the 15 kW maximum output was needed, but the driver could use the fuel supply to vary the number of working cells and adjust the output and travel speed. The direct current produced by the fuel cells was used to power a 20hp Allis-Chalmers electric motor, and this provided sufficient power to pull a two-furrow plough in what the original press release describes as 'dry, hard ground'. A control lever allowed the driver to make forwards/reverse changes by altering the polarity of the current going to the motor. The fuel was a mixture of compressed gases carried in cylinders attached to the tractor, but apart from



*A small control panel by the driver's left hand side includes levers to adjust the power output and travel speed and for forward/reverse changes.*