

## **Useful Work**

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***Letter as published (24<sup>th</sup> March 2007)***

## **Useful Work**

*From PeterBorrell*

I accept that the Aircon advertisement Feedback mocks implies something astonishing by saying their products "heat pumps ... generate more heat than they use".(3rd March). In the context of the many barmy claims which Feedback frequently and rightly exposes, this one is a bit too close to nit-picking for my taste.

Like refrigerators, heat pumps use electrical power to transfer heat from cold to somewhere warmer - a practical manifestation of the second law of thermodynamics (heat can only be transferred from cold to hot with external work) So the heat out can indeed be much greater than the electrical energy supplied to the pump.

Practically, we would all be better off if those presently using electrical heating were able to deploy heat pumps instead. Not only would our electrical demand decrease appreciably, but we would substantially diminish our output of carbon dioxide.

*Newcastle-under-Lyme  
Staffordshire*

***My Reply to the Feedback Editor (8<sup>th</sup> March 2007)***

Dear John,

It was kind of you to take the time to answer my letter to the editor. I also accept the point you make that the detailed wording does imply something astonishing. However there are two points to make.

a. In the context of the many barmy claims which you frequently, and rightly, expose, this one is just a bit too close to nit picking for my taste. There is endless confusion both with the second law, and the equivalence (and non-equivalence) of heat, work and energy - so I am perhaps more easily satisfied if someone gets it nearly right (I used to teach thermodynamics).

Secondly: heat pumps, where you can use them, genuinely do use less electricity to produce a given amount of heat than an electric radiator - and I think people should be aware of this - they could save quite a lot of CO<sub>2</sub> if those who could deploy them, did so.

Once again, many thanks

Peter

***Reply from the Feedback Editor (8<sup>th</sup> March 2007)***

Dear Peter,

Actually, we knew this. But Aircon says the pump "generates" heat. It doesn't. It just moves it from one place to another. As an engineering company producing electrical goods, they should know better.

The point about running a generator off the pump was ironic - but justified by what Aircon says the pump does.

Regards,

John Hoyland (Feedback editor)

***Original letter (7<sup>th</sup> March 2007)***

The Editor New Scientist

Dear Sir,

It was unfair of Feedback (3rd March) to pillory Aircon for the statement that "heat pumps generate more heat than they use". It is, after all, true!

Like our refrigerators, heat pumps use electrical work to transfer heat from cold to hot - a practical manifestation of the second law of thermodynamics (heat can only be transferred from cold to hot with external work) and a corollary of the law, developed by Carnot and Kelvin, showing the impossibility of constructing a heat engine which can convert heat to work with perfect efficiency. So the heat out can indeed be much greater than the electrical energy supplied to the pump.

Feedback's confusion may arise from the apparent contradiction of the first law, but you will find that the electrical energy plus the heat absorbed at low temperature, equals the heat given out at the high temperature (plus any frictional losses).

Practically, we would all be better off if those presently using electrical heating were able to deploy heat pumps instead. Not only would our electrical demand decrease appreciably, but we would substantially diminish our output of carbon dioxide.

Yours faithfully

Peter Borrell Newcastle-under-Lyme