



## Energy Harvesting and Energy Re-Use

Pedalite International specialises in highly efficient energy harvesting and energy reuse. These specialisations have been utilised in a range of safety products for cyclists, horse riders, walkers and other outdoor pursuits. While the energy reuse technologies are similar across the range of products the efficient energy harvesting is different for different types of product.



Ankelite



Pedalite Lights



Green Oil



Baglite



Toe Clips

### Pedal Lights – Efficient Energy Harvesting.

The Pedalite battery free 360 degree visibility pedal lights harvest kinetic energy. This is the energy of motion. An object which has motion - whether it be vertical or horizontal motion - has kinetic energy. There are many forms of kinetic energy - vibrational (the energy due to vibrational motion), rotational (the energy due to rotational motion), and translational (the energy due to motion from one location to another).

The Pedalite battery free 360 degree visibility pedal lights principle is to convert mechanical energy into electrical energy from the movement of the pedal spindle. Pedalite pedal lights multiply the spindle rotation using a gearbox and generator. Sufficient energy is available to energise the LEDs immediately and charge a storage capacitor. The capacitor provides residual energy enabling the pedal to flash when the cyclist freewheels or stops. Even at a pedal speed of 40rpm energy is rapidly stored.

So, without the technical jargon, when the pedal rotates around the spindle it generates kinetic energy. However, by itself the kinetic energy generated would not be enough to power something and also store energy for using again later. In the past this problem has been solved by adding an additional “drive belt” but this causes the cyclist to not just turn the pedal, to move the bicycle, but also to turn the drive belt and thus generate extra energy. It would be like being on an exercise cycle with the resistance turned up high !



Therefore, Pedalite developed and patented a clever gearing system that produces the additional energy BUT without the cyclist doing any more work or having any additional resistance. Using Pedalite battery free 360 degree visibility pedal lights a cyclist will expend less than 0.5% (0.3W) of their propelling energy to energise a pair of Pedalite pedal lights. The reality of this is that the difference between Pedalite Pedal Lights and ordinary pedals is undetectable by a human cyclist.

### Baglite and Anklelite – Efficient Energy Harvesting.

The Pedalite Baglite and Anklelite products harvest light energy, which is a form of solar energy. However, when most people think of solar energy all they can imagine are the garden lights that have a massive solar panel, sit in the sun all day and then give off a fairly short, low intensity light as it gets dark. Pedalite designers have taken a different approach, the light energy transfer panels within the Anklelite and Baglite products are only 5cm by 3cm and take light energy from any light source. Of course the light source could be the Sun, however, equally it can be ordinary house lighting, office lights, ambient light within a room, etc.

As the light energy transfer panel is inside the actual Baglite/Anklelite units it is directly connected to the electronics of the units, this means that the energy goes almost directly into a storage capacitor.

The ability to harvest any light source means that the products are almost continually topping themselves up with energy.



On the Anklelite and Baglite products the lens that covers the light energy transfer unit is also unique and very important to the harvesting and reuse of the energy. At first glance it just looks like a lens, however, closer inspection will show that there are two V shaped grooves down each side, frosting at the ends and striations vertically down the lens. These features are functional (in addition, we hope, to being stylish). Any light that enters the lens will not find it as easy to get out, meaning that the light “bounces” around inside the lens and more is absorbed by the light energy transfer panel.



### Pedalite products – Efficient Energy re-use.

Although the Pedalite range of products are different, the principles for highly efficient energy re-use are similar. Through the highly efficient energy re-use in the pedalite products we are able to get over 5 minutes of continued flashing lights in the pedal lights after pedalling has stopped (vital at road junctions where 75% of all cycling accidents happen, according to the Royal Society for the Prevention of Accidents, and where cyclists stop pedalling and need to be seen from the side). We are also able to get over 6 (six) hours of strong flashing light from the Anklelite and Baglite products, enough to see most people through most activities.

In addition to some really clever electronics inside the units the lens’ on Pedalite products are key to the energy re-use. As I discussed the Anklelite/Baglite lens earlier I will start with that. The two V shaped grooves down each side, frosting at the ends and striations vertically down the lens work in almost exactly the same way when light is released as when it is being captured. First, please consider what a light, such as an Anklelite or Baglite is for, it is a light to be seen by at any time that is necessary. If it is a nice bright day or you are in a well lit room then if you turn on Anklelite or Baglite you will not see much strong light coming from them (this is intentional as the lights are not designed to be seen by when they are not needed). However, if you turn on the lights in a dark place (if you want to test this try an under stair cupboard or store room with the light off) then the lens bounces all the light and you get a very strong FLOODLIGHT effect. It is so good in the dark that there are bicycle couriers that tell us they use Baglite to read their instructions and maps by. The floodlight effect (improved by the V grooves forcing light out through 360 degrees) also means that the units can be seen from 1km away when it is dark.

If you now look at the lens’ on the pedal lights you will see that these also are not flat lens’ and are designed to reutilise/redirect light in the same way that the Anklelite and Baglite lens’ do.



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