

## An in-depth look at the Green Cone food waste digester

The Green Cone waste digester takes all household food waste, including vegetable scraps, raw and cooked meat or fish, bones, dairy products and other organic food waste such as bread and pasta.

The food waste is converted into water, carbon dioxide and a small amount residue, without the need for user intervention such as the mixing or turning of the waste.

The function of the Green Cone food waste digester is to accelerate the natural decomposition process by

- raising temperatures;
- maintaining aerobic conditions; and
- encouraging the growth of micro-organisms.

It safely encloses the food waste to prevent dispersion and eliminate odours, and to prevent access by pets, wild animals or birds.

The Green Cone meets all relevant health, safety and environmental legislation.



### Design

The Green Cone is a four-part plastic injection moulded system comprising a digestion basket that is installed below ground and which forms the base for an above ground double-walled solar chamber with an access lid. The design of the Green Cone utilises solar heating in the double-walled chamber to facilitate and accelerate the aerobic decomposition process within the digestion basket. The system should therefore be installed to obtain the maximum sunlight in a household's garden. A four-litre receptacle, which can be sealed, is provided for collecting and carrying the food waste to the Green Cone.

The Green Cone will dispose of more than 5 kg of food waste a week, which is over 25% greater than that produced by the average household. In a well operating system the residue will occupy the bottom 250 mm of the digestion basket after the decomposition of about a tonne of food waste. Thus, after about five years this small quantity of residue must be removed and dug into the garden sub-soil.

### Process

The decomposition of organic material is a natural process. Much of the dry weight of plant and animals is attributable to proteins and their remains are eventually converted into soil through a continuous cycle of activity by a wide range of interdependent organisms and micro-organisms. The distribution of these organisms follows that of organic matter and is therefore not uniform, with over ninety percent concentrated in the top 100 mm of the soil. By locating the digestion basket below ground, the Green Cone takes advantage of this distribution of soil organisms. The system works best in fertile, well-drained soil, which means that areas of solid rock or with a high water table are unsuitable. In heavy clay soils, drainage should be improved by using a mixture of gravel and compost around the digestion basket. Soil fertility can be enhanced by the addition of suitable natural bacteria, as described later.

The smallest and most numerous micro-organisms are bacteria, with one gram of fertile soil containing around a billion bacteria. Bacteria are unicellular micro-organisms and amongst the smallest living creatures known. Under favourable conditions bacteria numbers grow rapidly. Some survive in a dormant or spore state when conditions are not suitable, reviving when they become favourable again.

To ensure a healthy population of bacteria, the Green Cone is provided with a mixture of these natural bacteria on a cereal base for use when the system is first installed and if the decomposition process slows because of an imbalance of organic material and bacteria.

Most bacteria grow in a near neutral environment (neither acidic or alkaline) and without light. Under poor oxygen conditions some micro-organisms can produce toxins that inhibit the growth of higher plants and other micro-organisms. These toxins include methane, hydrogen sulphide, phosphine, skatole, indol and various organic acids. It is for this reason that the Green Cone is designed to maintain aerobic conditions through generating air movement, which results from the temperature gradients created by the double walled solar chamber.

## Relevant Legislation

The UK has amongst the most comprehensive legislation and controls related to food waste and animal by-products in the world. The recent EU Animal By-Products Regulations and the UK's National Regulations introduced controls for the processing and end use of composted material derived from food waste. Under the legislation, all food waste that contains, or has been in contact with, meat or other products of animal origin must be disposed of so that animals and birds cannot gain access. This does not just apply to the collection, transportation and centralised treatment of food waste but also to household treatment. Detailed guidance on the treatment of animal by-products and catering (food) waste has been provided by the UK Department for Environment, Food and Rural Affairs (Defra).

Meat or other products of animal origin fit for human consumption are classified under legislation as low risk category 3 animal by-products. Regulation 16 of the Animal By-Products Regulations states that the composting requirements for centralised treatments "do not apply to the composting of category 3 catering waste on the premises on which it originates provided that (a) the decomposed material is only applied to land at those premises; (b) no ruminant animals or pigs are kept on the premises; and (c) if poultry is kept at the premises the material is composted in a secure container which prevents the poultry having access to it during decomposition." As a consequence, the household treatment of food can only take place in an enclosed container that prevents access by poultry, wild and domestic animals and birds. In addition, a household food waste digester must be physically separated from pigs or ruminants (e.g. sheep, cows, goats, deer) by a suitable barrier, such as a fence. This applies to both farmed and pet animals. The design and operation of the Green Cone meets all the relevant legislation.

## Health, Safety and Environmental Impact

The Green Cone is a benign technology and as such causes minimal health, safety and environmental impact. The below ground digestion basket and the sealed solar chamber provide sound physical barriers to odours, insects, birds and animals. With 40% of the unit below ground, the green conical solar chamber of the system creates negligible visual impact. The Green Cone is constructed from as much recycled material as possible, which in practice means that 100% of the digestion basket and inner solar chamber are made from recycled plastic.

Common to all handling of food and food waste, good housekeeping practises are the cornerstone of health and safety. Such practices include not spilling or leaving food uncovered in the home or elsewhere and the washing of hands before and after handling food. One advantage of the Green Cone is that no third party is involved in the collection and treatment of the waste, with householders handling their own food waste of which they know the provenance.

In use, food waste is transferred as soon as practical from the kitchen to the Green Cone, which allows food waste to be removed daily as opposed to weekly or fortnightly with a centralised collection approach. Once deposited in the below ground digestion basket, there is no possibility for unintentional access to the food waste by human activity. As with any gardening activity, particularly those involving soil or compost, gloves should be worn when removing the small amount of residue that accumulates in the digestion basket after several years of operation.

Temperatures in the solar chamber of the Green Cone reach up to 50°C for long periods during summer months in the UK. Although temperatures are lower with natural decomposition in the Green Cone than in commercial centralised treatments, the indigenous micro-organisms can be preserved to grow at the expense of any pathogens present through competition for nutrients and predation. In addition, the process is performed over extremely long periods of up to five years, which allows for effective pathogen destruction.

To purchase a Green Cone waste digester, go to [www.monarchgardens.co.uk](http://www.monarchgardens.co.uk)

