

LFC (Liquid Food Composter)

Frequently Asked Questions (FAQs)

1 Functionality

1.1 Is the LFC chopping or grinding up the waste food?

No, the LFC is mixing the new waste food with the old waste food and the Powerzymes (microorganisms). The waste food is decomposed and primarily produces water, CO₂, and heat.

If waste food is chopped or ground, small parts of undigested food will enter the exit stream, increasing the levels of TSS (total suspended solids) and BOD (biological oxygen demand).

The motor on the LFC acts only to mix, or slowly stir, the waste. It runs only a quarter of the time which minimizes the use of electricity.

1.2 Is the LFC a batch process?

No. You add waste food at any time. The machine is constantly digesting the waste.

1.3 Does the LFC smell?

No. The decomposition is an aerobic process (in the presence of oxygen). In a forest, the leaves from the trees fall on the floor and decompose in an aerobic manner. The forest doesn't smell. The same process is used in the LFC, but we accelerate it significantly.

1.4 The waste food is smelly. How does the LFC get rid of the smells?

Waste food only has a bad smell if it has been left for some time to rot. It is then rotting anaerobically (in the absence of oxygen). We recommend that waste food be placed in the LFC at intervals between 30 and 60 minutes, so there is no time for the waste to start to smell.

But if the waste has started to rot and is smelly, the aerobic decomposition will take over shortly after the waste is put into the LFC. This will then reduce or eliminate the smells.

1.5 Is the LFC noisy?

No. The motor in LFC turns the food only for a quarter of the time. The rest of the time there is little source of noise. We use a large motor that is not under stress and it therefore operates quietly. In most kitchens, the last thing you will hear is the LFC!

1.6 How long does it take to decompose waste foods?

The LFC decomposes most waste foods in 12 hours. Within 24 hours, 97% of the waste food is decomposed.



1.7 Is this rate of decomposition based on the size of the LFC?

No. Each machine digests its rated capacity in the same time. For example, if you put 50 kg of waste into an LFC-50 and put 1000 kg of the same type of waste into an LFC-1000 the machines would digest these amounts in the same time.

1.8 How can the LFC decompose the waste food so quickly?

The LFC has a microprocessor that optimizes the decomposition process. The LFC keeps the waste food moist, but not too wet. The LFC allows the waste food to generate significant heat for 75% of the cycle. We have a proprietary blend of microorganisms and enzymes — called Powerzyme — to cause the decomposition to take place as fast as possible. Finally, we use a proprietary method to create our Powerchips. These Powerchips remain in the drum at all times and are very porous. They house the microorganisms and rapidly disperse them among the waste food.

1.9 What is the Powerzyme? Is it safe?

We offer two types of Powerzyme: liquid and dry (powder). Mostly, we provide the liquid Powerzyme as it is lower cost and can last longer. We provide the powder Powerzyme exclusively for exports to certain countries and also where the customer has special requirements for the digestion of the waste food. They are both safe. See also question 9.6 and question 9.7.

1.10 Where does the LFC get the oxygen from to use in the decomposition process?

Oxygen is added each time you add waste food. It is also present in the water that is injected into the drum.

1.11 What happens to the decomposed foods?

They exit the LFC as nutrient rich grey water. You normally put this down the drain.

1.12 Can the output go down a storm drain?

No. The output of the LFC must flow to a sewer drain. This is usually a floor level drain that is commonly found in commercial kitchens.

1.13 Can we use the output of the LFC as fertilizer to irrigate the land?

Possibly. If you feed the machine with only waste from the preparation of fruits and vegetables, then what comes out of the LFC could be used to irrigate the land. It is rich in nutrients just as if you had composted the waste food in a more traditional manner. It will then make an ideal fertilizer. However, if the waste food has meats, fats, grease, and spices such as salt and peppers, the output may not be suitable. You should test the output to see if you can use it.

In any case, you need to filter the output before you can use it. See Power Knot's application note on this.



- 1.14 How does the machine compare to an in-sink disposal unit, in terms of energy and water use?
 Most municipalities do not permit the use of sink disposal units for commercial use. They are common in residences in the US, but are not common in most other parts of the world. We therefore have no comparison available.

2 Weighing the waste food

- 2.1 How does the LFC weigh the amount of waste food?

There are load cells mounted on each corner of the LFC. These weigh the total weight of the LFC. On installation the software calibrates itself so it knows the empty weight. From there, the software knows how much is in the LFC and how much is added each time.



- 2.2 How does this help the operator?

The LFC reports when it is safe to add more waste food. It does this with text on the touch screen and with an LED (green means ok; yellow means wait, and red means overloaded).

- 2.3 How does this help our company?

You can see the amount of waste that is ingested by the hour, day, week, month, and year. This is also converted by the LFC to report the amount of CO₂ equivalent that is diverted from the landfill.

- 2.4 How accurate are these measurements?

On an LFC that is properly installed and calibrated, the results are better than $\pm 1\%$ accuracy. Even the largest LFC (the LFC-1000) can detect something as small as an orange is added to the drum.

- 2.5 How far back can I see the data?

The LFC stores the data for 24 months.

- 2.6 Can I access this data remotely?

Yes. See section 7 for details.

3 Installation

- 3.1 Where do we install the LFC?

The LFC is intended to be installed in the kitchen. This is where the majority of waste food is accumulated and it is therefore more convenient to easily dispose of the waste.



3.2 Space in a kitchen is at a premium. Is footprint an issue for these machines?

The typical machine is the size of a desk or a chest freezer. You may find that you eliminate large buckets of waste food that you accumulate during the day because the waste food now goes directly into the machine. If you eliminate several such buckets, you've got the room for the LFC.

3.3 Can we install the LFC outside?

We do not recommend it. If you must install it outside, it must be under a cover and protected from the elements (rain, snow, and dirt). It must also be in a location that does not get hot. The maximum ambient air temperature is 35°C (95°F).

3.4 What are the basic requirements for installation?

You need hot and cold water (or only hot water or only cold water), a floor drain, and electricity. The LFC-50, LFC-70, and LFC-100 use single phase power, the larger machines use three phase power.

3.5 Why do the larger LFCs use three phase? Can we get them in single phase?

Three phase motors are more efficient, generate less heat and noise, and last longer. The LFC-200 is available in single phase 230 V, but it is normally supplied in 3-phase. The larger LFCs are exclusively available in 3-phase.



3.6 Do the LFCs use lots of electricity and water?

No. For an LFC-200, they cost about a dollar a day. Smaller machines are less and larger machines are more. The maximum amounts of water and electricity used are listed on our [web site](#). Scroll down to **Sizes**, and click on **USA Units** or **ROW Units**. In practice, the amount of water and electricity consumed are typically 80% of those values listed in the table. See also section 8 on page 12.

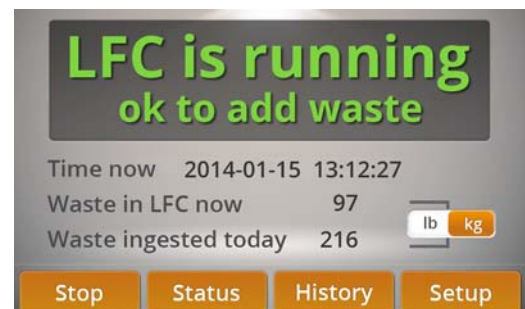
3.7 Does the output have to go to a floor drain, or can we use a wall drain?

The output of the LFC is at the bottom of the machine, 75 mm (3") above the floor. The output is not pumped: it just flows out with gravity. If the drain is higher than the output, you need to connect a sump pump to the output. This will take the output and pump it higher. These pumps are small and low cost. Full details are provided in our User's Manual.

3.8 How do we determine what size of LFC to buy?

Weigh the waste every day and make a record of it. Alternatively, weigh the waste food on Saturday, Monday, and Wednesday if you can't weigh it every day for a week. Take an average. Also, the capacity of a machine is based on the duration of your working day. If you add the same amount of waste food at regular intervals over an 18 hour day you will need a smaller machine than if you dispose of the same amount of waste food over an eight hour day.

- 3.9 We anticipate our business will grow over the next few years. Can we buy a larger machine today than we currently need?
 Yes. Buy some extra Powerchips to fill the extra space. Remove these as the amount of your waste food increases. You need the amount of waste food and Powerchips to be above the shaft of the arm inside the LFC.
- 3.10 How long does it take to install an LFC?
 Usually, a few hours. However, if you need to run power and water to the location, it may take longer.
- 3.11 Can Power Knot arrange for installation?
 Yes, we have arrangements with local service companies throughout the US. They can fully support the installation and commissioning of the LFC. Outside of the USA, please contact the authorized distributor for your territory or region.
- 3.12 Will the installation of the LFC cause a solid waste surcharge?
 The grey water that is discharged is simply that: it has passed through a mesh with holes that are just smaller than 1 mm there is no solid in there. It is healthier than a commercial dishwasher which may have waste food from plates going down the drain untreated.
- 3.13 Will my drain pipes become clogged after I install the LFC?
 This grey water contains nutrients and microorganisms that will continue to digest any waste it encounters on its way. After a while the pipes are cleaner than before.
- 3.14 Does the grey water clog the grease trap?
 No. On the contrary, the grey water discharged from the LFC contains microorganisms that will digest the grease that is in the trap. The grey water contains very little grease or fat because that is digested inside the machine. Although the use of the LFC will not obviate the need to clean the grease trap, it should increase the time between the cleanings.
- 3.15 A local casino treats their own water and recycles it. Would this be an advantage for them, or would it cause more problems for them in their local sewer treatment?
 The grey water flowing to the sewer is beneficial to the environment and to the processing of sewerage. The grey water contains microorganisms and mostly (97%) processed waste food. Unprocessed waste food and chemicals from the dishwasher are a much bigger problem.
- 3.16 Are any special permits necessary to use the LFC?
 No. The LFC connects like a dishwasher. It is more sanitary than a dishwasher and is safe to be installed in the kitchen.



- 3.17 Does Power Knot have LFCs for use where the ac mains voltage is 240 V instead of 110 V?
Yes, we have designed our LFCs for use globally. Our three smaller machines support 240 V single phase and the four larger LFCs require 415 V three phase. The voltages are listed on our [web site](#). Scroll down to **Sizes**, and click on **USA Units** or **ROW Units**.
- 3.18 Can we operate the LFCs on a DC Supply
No. All motors are ac. The larger motors are 3-phase.

4 Purchase

- 4.1 Can we buy the LFC outright?
Yes.
- 4.2 Where does the product ship from?
Power Knot carries stock and ships from Milpitas California. Our international offices and authorized international distributors also carry stock.
- 4.3 When we order an LFC, do we need to buy the Powerchips and Powerzyme separately?
New machines come with the correct amount of Powerzyme (microorganisms) and Powerchips (bio-chips). You should not need any more Powerzyme for about nine months and you don't need to replace the Powerchips for about four years.
- 4.4 Is leasing available for the LFC?
For sales in the USA, Power Knot have pre-approved leases on these machines with a reputable financial company. They can offer attractive terms and based on the needs of the customer they can tailor the lease in several different ways. For a machine that processes up to 770 lb of waste food per day the approximate lease price is approximately \$850 per month (for four years). For sales outside the USA, please contact the authorized distributor for your territory or region.
- 4.5 Can we rent the LFC?
Power Knot rents the LFCs to fully qualified customers. The minimal rental period is one year, there is a deposit of three months' rent due on signing the rental agreement, the first month's rental is prepaid, and freight must be prepaid prior to shipping.

5 Daily Usage

- 5.1 Is the machine easy to use?
Yes. You do not need to adjust the control panel in normal usage.
- 5.2 How often can we put waste food into the LFC?
The machine operates continuously and you add waste food at any time. You can feed the machine 24 hours a day, 7 days a week. However, we recommend you add waste food no more frequently than every 30 minutes. This allows the machine adequate time to start the digestion of the last batch.

5.3 Would I be able to load the LFC's maximum capacity in a single batch?

No. The maximum you can load is 80% of the rated capacity. But we recommend that you usually add no more than 70% of the capacity. If your process permits only being able to add waste in one batch, buy a larger machine. For example, if you want to dispose of 200 kg per day in a single batch, buy an LFC-300 (with a capacity of 300 kg). 70% of 300 kg is 210 kg so this can go into the machine once per day.

5.4 What waste food can be fed into the machine?

Anything that can go in your stomach can go into the LFC. The Powerzyme is designed to digest a mixture of waste foods comprising fruit, vegetables, cheese, breads, fish, and meat. Chop larger items like the heads of pineapple, and watermelons as digestion will occur at a faster rate. Power Knot has a special blend of microorganisms designed specifically to digest waste fish.



Fruit



Vegetables



Bread



Noodles



Nuts



Fish



Fish bone



Meat



Stew



Egg shells

Yes — Can go in LFC

5.5 What waste cannot be fed into the machine?

The following organic materials cannot be fed into the machine: shells such as oyster and mussel, corn husks, large bones, nuts such as those from avocado and peach, and oils. Food that is oily is fine to go into the machine — you just cannot pour liquid oil into the machine.

The following inorganic materials cannot be fed into the machine: paper, china, glass, plastic, rubber, cutlery, and any chemicals. You must also minimize organic materials that are very fibrous, such as corn husks (but corn cobs are ok) and lemon grass.

5.6 Can we add frozen foods to the LFC?

No. This will cause the temperature inside the machine to drop and that will slow the decomposition significantly. Let any frozen foods thaw thoroughly to room temperature before adding them to the LFC.

5.7 Can we add hot stews to the LFC?

No. Wait until the food cools to about 50°C (120°F) before you put it into the LFC. If the waste is too hot, it will kill the microorganisms.



Shells



Meat bones



Paper



Plastics



Metals



Plates



Cigarette



Glass



Cloth



Chopsticks

No — Should not go in LFC

5.8 What happens if you put an entire piece of meat with bones or a big fish? Must we remove the bones first? Can we put in the bones and then take them out once all meat has been eaten?

The LFC will digest the meat, fish, and small bones, leaving only large fish bones or large meat bones. In time, even those bones will be digested, but if you put too many large bones into the LFC, the drum will fill with these bones. The bones may become stuck between the arms and the drum causing the LFC to stop. Further, the bones will take up space and reduce the amount of food that can be digested in a given time.

Yes, you can take the bones out after the meat has been eaten. It is better to cut the large meat pieces into chunks no more than 500 g (1 lb) so that there is a larger surface area for the microorganisms to digest.

[View a video here](#) that shows a customer putting whole fish into the LFC.



5.9 The information about bones is confusing. What size of bones are ok to go in and what are not?

On a regular basis, bones that are smaller in diameter than 2.5 mm (0.1") are ok. Items larger than this are ok if they go in infrequently. So, for example, 50 fish heads a day into an LFC-1000 would be ok. But if you have many large bones you should avoid putting them in the LFC and dispose of them in a different way.

5.10 Our waste food is salty and spicy. Can this go into the LFC?

Yes. If it can go into your stomach, it can go in the LFC!

- 5.11 The pictures show someone putting the waste food into the door. Do the higher capacity models require the same approach or do they come equipped to accept input loads directly from a bin?

All machines are designed to be loaded by hand. We recommend that in your kitchen or food preparation area that you use 20 litre (five gallon) buckets to hold the waste food. This size of bucket can be lifted easily and emptied into the LFC. In current practice, you may be using 200 litre (50 gallon) buckets in the kitchen and empty that into an outside trash container only when it is full. The slight change in operating procedure will result in a cleaner and less smelly kitchen and reduce injuries that may happen by moving a bucket containing 200 kg (400 lb) of waste.



- 5.12 Why is water required by the machine?

Water is used to maintain the moisture content of the waste food as it decomposes. All microorganisms need water to survive. Our LFCs are controlled by a microprocessor to optimize the process and minimize the amount of energy and water required.

The default cycle is 20 minutes. For our LFC-200 (which can process up to 350 kg (770 lb) of waste food per day), the machine sprays hot water onto the waste food for 40 seconds at the start of each cycle. This uses about a gallon of water per cycle.

In addition, during each cycle, the machine uses cold water to wash out the cavity. This uses about the same amount of water. So, in a day this machine uses about 520 litre (140 gallons) of water. Larger machines use more water, smaller machines use less. The default program can be modified to optimize for water temperature, pressure, type of waste food, desired pH level of output, and acceptable concentrations of BOD, TDS, TSS, and COD of the waste water.



- 5.13 How often do we need to clean the LFC

Keep the outside of the LFC clean as you would with any stainless steel item in your kitchen. Wipe the surfaces daily with a damp cloth. Do not use soaps or detergents as these may enter the drum and kill the microorganisms. The LFC is not designed to be soaked with a sponge or a hose pipe.

- 5.14 How often do we need to empty the LFC?

You don't need to clean or empty the inside of the LFC in the normal course of use. The inside remains sanitary because the microorganisms are digesting any waste food they can. You do need to replace the Powerchips periodically as explained in question 8.4 and that might be the only time you clean out the machine.

5.15 Will the LFC decompose eco-friendly compostable plates and cutlery?

Yes, but there are products that claim to be “bio-degradable” that do not decompose on the land-fill, in a compost pile, or in the LFC. We have tested several brands of biodegradable plates and cups. The majority of these items disappeared in minutes, but some leave a residue that takes a long time to decompose. Knives and forks do not decompose.

5.16 Is there a minimum daily waste food production required for the machine?

Yes, the microorganisms need waste food to survive. If they don't get food for 10 days they may die and then need to be replaced before waste food is again added. For any machine, we recommend it should have no less than 10% of its maximum rated capacity of waste food per day. Leaving the machine without food over a long weekend is acceptable.

5.17 What happens if we take a break? Do we have to add food every day?

The microorganisms may die if they don't have food for about 10 days. So, take a weekend off, but if you have a long holiday you may need to add more Powerzyme on your return.

5.18 Can I turn the unit off in the evenings or at the weekend if we don't generate waste food then?

No. Leave the machine running, even if you are away for two weeks.

5.19 We often have intermittent power-cuts – some scheduled and some unscheduled. What will be the effect of such sudden power breaks on the LFC? what precautions need to be taken?

Inside the LFC, all the electronics and the motor are protected against brownouts, blackouts, and surges. When the power is resumed, the LFC continues to operate and resumes its program cycle from where it was when power failed.

If the power fails for a short time (less than 10 minutes) this will have no effect on the operation of the LFC.

If the power fails for a long time (longer than four hours) then the waste food in the drum is not mixed, water is not injected, and oxygen is not introduced. This could turn the decomposition process from aerobic (in the presence of oxygen) to anaerobic (in the absence of oxygen). While the aerobic decomposition (the normal method inside the LFC) does not smell, the anaerobic decomposition does smell. Further, the process is slowed inside the drum of the machine so a user cannot add waste food to the machine at the same rate as when the machine is powered.

After power has been restored, the LFC will resume its cycle and will be working normally again after some time. That time will be at least as long as the power had failed. For example, if the power failed for five hours, then the LFC will be working normally again after a further five hours once the power is restored.

If the power fails for an extended period (longer than 36 hours) then the microorganisms may not recover and may need to be supplemented after power has been restored. This will reintroduce the aerobic microorganisms that are prevalent in the Powerzyme. The power should not then fail for at least 24 hours so that these microorganisms can digest all the remaining waste food in the LFC.



6 Configuration and Data

6.1 How do we configure the LFC?

The LFC has a color touch screen with a modern user interface. Most customers don't need to touch this screen: you can install the LFC, turn it on, and the default program works well.

6.2 Is the touch screen easy to use?

Yes, it is driven by a menu like a tablet or mobile phone.

6.3 What data is available?

Through the touch screen, you access all the configuration, control, status, usage data, statistics, and diagnostics. Data about the amount of waste food ingested are available numerically and graphically.

6.4 What prevents an operator from making changes to the configuration?

The setup is all protected by a password. Clearing the data is all protected by a second password.



7 Remote Monitoring

7.1 How do we access the data through the cloud?

The LFC has an ethernet port. You connect this to your LAN. Once connected, the LFC will send its data to the cloud server.

7.2 Is my data secure?

Yes, we use 64-bit data encryption approved by Google.

7.3 Can I connect my PC directly to the LFC?

No. The LFC must be connected to the internet.

7.4 I can't get an ethernet cable to the LFC. What other choices do I have?

You can connect the LFC to a Wi-Fi router, configured as a client. Or you can use a GSM (mobile phone) router.



7.5 What bandwidth do we need on this connection?

The amount of data is small, about 100 bits/second. However, if you have been using the LFC for a while prior to connecting the LFC to the cloud, it will have much data to upload and until it has completed, the usage of the bandwidth will be greater.



7.6 How do I access my data?

You can use any device that has a browser (such as Safari, Firefox, or Chrome). This means you can use any mobile phone, any tablet, or any PC. This encompasses, for example, a device that can be running Apple iOS, Google Android, Microsoft Windows, or Linux).

7.7 What data can we access?

You can see all data that is accessible from the touch screen. This includes the status and settings of the LFC, all statistics about usage and waste digested, and all diagnostics.

7.8 Is there a charge for all this?

No. It's all free as long as you own the LFC.

7.9 How much data is stored?

The cloud server stores the last five years of data.

7.10 Can we control the LFC through the cloud?

No; for security reasons, this is not possible.

7.11 How do I log in to see the data?

We use the Google Cloud services. You need an account with Google (which is free) and then you can access the data.

7.12 How many people in my organization can see the data?

There is one administrator. That person can add five other people.

8 Operating Costs

8.1 What items do I need to consider for annual operating costs?

The LFC uses water and electricity and has consumable items of Powerzyme and Powerchips.

8.2 Is the electricity usage large?

No. For our largest machine (LFC-1000), the typical operating cost for electricity in the USA is under \$1400 per year.

When installed in a hotel, the electrical energy used by an LFC represents about 0.1% of the electricity used by the hotel.

- 8.3 Is the water usage large?
No. For our largest machine (LFC-1000), the typical operating cost for water in the USA is under \$500 per year.
When installed in a hotel, the water used by an LFC represents about 0.3% of the water used by the hotel.
- 8.4 What is the ongoing cost for the consumable items (Powerzyme and Powerchips)?
You need to add more dry Powerzyme every two to four months and liquid Powerzyme every nine to 18 months, depending on usage. Depending on the size of the LFC, that is about \$125 (for the LFC-50) to \$2500 (for the LFC-1000) when using liquid Powerzyme.¹
You need to replace the Powerchips every three to five years. Depending on the size of the LFC, that is about \$440 (for the LFC-50) to \$8800 (for the LFC-1000).
So, the average annualized cost of consumable items (after the initial items need replacing) is between \$350 (for the LFC-50) to \$7000 (for the LFC-1000).
- 8.5 How do we know when to supplement the Powerzyme or change the Powerchips?
The LFC reports when it is time to service the LFC, including when to supplement the Powerzyme or replace the Powerchips.
However, you may be able to observe when these items need attention. The rate of digestion slows down when you need to supplement the Powerzyme or change the Powerchips. If the digestion has slowed and your Powerchips are less than three years old, supplement the Powerzyme. If your Powerchips are over three years old and when you last supplemented the Powerzyme the rate of digestion was not fully restored, then change the Powerchips the next time you plan to supplement the Powerzyme.
- 8.6 How long does it take to supplement the Powerzyme? What's the process?
For the dry (powder) Powerzyme, you just throw in the bag of microorganisms into the drum on the service schedule indicated by the LFC. For the liquid Powerzyme, you should activate it for five hours in warm water and then gently pour it into the drum over the waste food.
The time to supplement the dry Powerzyme is two minutes. The labor time to supplement the liquid Powerzyme is 30 minutes.
- 8.7 How long does it take to change the Powerchips? What's the process?
Preferably, you should stop putting waste food into the drum 48 hours in advance of the change of the Powerchips. You then scoop them out or use an industrial wet and dry drum vacuum cleaner to remove them. You recycle this plastic.
Once the drum is empty you pour the new Powerchips into the drum.
The total time is between 10 minutes for the LFC-50 to 60 minutes for the LFC-1000.

1. See question 1.9 for a brief description of the two types of Powerzyme.

- 8.8 Are the Powerzyme and Powerchips covered under warranty? Who will do the work?
No. These are consumable items and not covered under warranty. If you have purchased your LFC, Power Knot or its authorized service representative can supplement the Powerzyme or replace the Powerchips. This would be at your expense.
- 8.9 Where do we buy the Powerchips and Powerzymes?
Power Knot's offices and authorized resellers carry stock of these items.

9 Impact on the Environment

- 9.1 The LFC produces CO₂. Isn't this bad for the environment?

When the food was created, it used photosynthesis and CO₂ from the atmosphere to grow. That CO₂ is now released back to the environment. It is a zero sum effect (referred to as the carbon cycle) and is perfectly natural, just like the leaves that decompose on the floor of a forest.



- 9.2 How much CO₂ is created by the decomposition process?

1 kg (1 lb) of dry organic matter creates about 0.44 kg (0.44 lb) of CO₂. Waste food is typically 30% dry matter and 70% water. So, 1 kg (1 lb) of wet organic matter creates about 0.13 kg (0.13 lb) of CO₂. The LFC-500, digesting 500 kg (1100 lb) of waste per day will create 66 kg of CO₂ per day. At standard atmospheric pressure, this occupies a space of 42 litres (1.5 ft³). The rate of discharge is about 1.75 litre per hour (107 in³ per hour).

As a point of reference, the average adult when resting inhales (and exhales) 450 litre per hour of air. About 5% of that is oxygen that we have converted to CO₂, so we typically output 23 litre of CO₂ per hour.

- 9.3 Where does the CO₂ go after the waste food is decomposed?

The amount of CO₂ created by the process is minimal (see the previous question). The CO₂ falls through the bottom of the drum (CO₂ is heavier than air), and also escapes when the door is opened.

- 9.4 What about methane, CH₄? Isn't that created in the process?

No. The decomposition in the LFC is aerobic (see also question 1.3).

9.5 Are there any chemicals used in the LFC?

No. The decomposition takes place in a natural way using microorganisms. Microorganisms are around us everywhere and are responsible for digesting all types of waste. We have a special blend of microorganisms (Powerzyme) that accelerate the decomposition of most foods. Our LFC can decompose most waste foods within 24 hours.

9.6 Is the Powerzyme harmful to people or the environment?

No. The blend of microorganisms and enzymes is safe to touch and the vapor from it is safe to inhale. The Powerzyme is non-toxic and non-hazardous. You need to take no special precautions if you accidentally spill it.

9.7 What are the microorganisms?

All microorganisms used in the LFC are naturally occurring and none is genetically modified. The Powerzyme complies with all applicable rules or orders under the TSCA and does not contain any chemical substance in violation of the TSCA or any applicable rule or order under the TSCA.¹



9.8 How much grey water does the LFC output?

The LFC uses water to maintain the proper environment within the drum to speed decomposition. The LFC also uses water for the washout. The sum of these is shown on the data sheet and our web site (but the amount of water can be adjusted depending on the moisture of the waste food). This water all flows through to the output. In addition, the majority of the waste food is decomposed into water; to a first approximation, 1 kg of waste food is converted to 1 litre of water (1 lb of waste food is converted to 1 lb water (1÷8.3 US gallon)).

For example, if you use an LFC-100, the default water usage is 250 litre (70 gallon) per day. Suppose you put in 100 kg (220 lb) of waste food per day, that is converted to 100 litre (26 gallon). The total water output from the machine is the sum of these: 350 litre (96 gallons).

9.9 What is the composition of the grey water that is output?

This depends on the composition of the input. It is not possible to give fixed numbers for BOD, FOG, TSS, and TDS. See Power Knot's application note for more details on this topic.

9.10 Is the BOD (Biological Oxygen Demand) of the exiting material zero?

No, it is 50 ppm to 1000 ppm (mg/l) depending on the type of food fed to the machine and when the output is sampled. Over 97% of the material in the grey water is decomposed, but some solid material exits the machine through the fine mesh screen. This has not yet decomposed and causes

1. The TSCA is the Toxic Substances Control Act. This is a law of the United States that is enforced by the Environmental Protection Agency (the EPA). Many other countries enforce the TSCA.

the high BOD. If you measure the BOD, accumulate the output over a 24 hour period (or 168 hour period if there are days when the machine is lightly used). Mix the output and send the sample to the lab for testing. The average is less than 300 ppm.

9.11 What is the FOG (fat, oil, and grease) content of the output?

If you throw oil into the machine, it may easily exit the mesh immediately and hence get down the drain untreated. However, lumps of fat (for example on meat) will be digested before they can pass through the mesh. Therefore, do not add liquid oil to the LFC, but solid pieces of fat are ok.

9.12 Will the increased nutrients in the water affect the BOD (biological oxygen demand)?

It is not the nutrients that increase the BOD. It is the undigested waste food that does that. At the bottom of the LFC is a fine mesh that keeps waste food in the machine until it is digested. It then exits as water. However, as some waste food becomes small, it can go through the machine undigested. So, as much as 3% of the product in the grey water is undigested waste food. For this to be digested as it travels to the sewage plant and in the plant itself, the microorganisms require oxygen, hence the demand.

Untreated sewage has a BOD of about 200 ppm (mg/l) in the US. The output of the LFC is typically about the same as this. The BOD of a pristine river is below 1 mg/l and the sewage plant strives to ensure its discharge is no greater than this. The point is that the output of the LFC does not affect the operation of the sewage plant or of what that plant eventually discharges.

9.13 How will the change in composition of the water (organisms, increased nutrients from food) affect the processes at the wastewater treatment plant?

In the US, only about 0.06% of the material going to the sewage plant is solids. The rest is water. The LFC does not alter that balance. In the sewage plant, microorganisms are used to digest the solids. The microorganisms that exit the LFC will continue to digest waste food as it travels to the sewage plant. This actually helps to clean the drains of the facility.



9.14 Have independent or third party studies been conducted to make sure these machines don't have an impact on the wastewater system?

Tens of thousands of the LFC machines have been deployed in Korea and Japan over the past 20 years. In addition, we have sold scores of machines in the USA, Europe, and Latin America. Numerous studies have been conducted and found no more impact than discharging digested waste from humans!

9.15 How does the machine compare to sending the waste to a bio-gas (waste to energy) plant?

The LFC installs in the kitchen. It requires minimal power and water to operate. It is convenient to use because waste food can be added at any time. It reduces smelly trash accumulated outside. Hauling the waste to a remote facility uses resources and is less convenient.

10 Product Quality and Service

10.1 Is the technology of the LFC proven and reliable?

Yes. Much of the mechanical design and all of the hardware and software is developed in Silicon Valley California. Power Knot's joint venture company (Power Knot Korea) completes the mechanical design. In this facility in Korea, we have been making LFC machines since 1999. The current model is the fourth generation machine and joins thousands that are already deployed.



10.2 The biochips from your competitor have to be changed every six months and their microorganisms are added all the time. In question 8.4 you say the Power Knot products last longer. How can your Powerzyme and Powerchips last so long?

With our business partner in Korea, we have been making LFCs for over 15 years. We have more experience than most companies and we have taken care to apply that experience to the product development. Our Powerzyme and Powerchips are both high technology items with significant R&D behind them.

10.3 What is the warranty on the LFC?

Three years, bumper to bumper. We believe we are the only company to be able to offer this and we can do so because of our great experience building reliable machines.

10.4 What is the expected service life of the LFC?

15 to 25 years.

10.5 What servicing do we need to do to the LFC?

Clean daily as described in question 5.13. Check the tension of the chain every six to twelve months. Inspect for leaks every six months. Supplement the Powerzyme (microorganisms) every nine to 18 months. Replace the Powerchips every three to five years.

10.6 What is the LFC made of?

The LFC uses stainless steel throughout. It has:

- stainless steel chassis
- stainless steel outer panels
- stainless steel door
- stainless steel handle
- stainless steel shaft
- stainless steel arms
- stainless steel load cells (to weigh the amount of waste food)

Stainless steel is a hard metal suitable for use in commercial and industrial kitchens. Materials such as aluminum or plastic are soft and are difficult to keep clean. Therefore Power Knot constructs its LFC only with stainless steel because other metals are unsuitable for business use.

- 10.7 What kind of stainless steel is used?
All steel is SAE standard 304 (EN 1.4301) except the load cells. The load cells are 2Cr14Ni.
- 10.8 Where are the LFCs made?
The LFCs are assembled in Silicon Valley, California, USA of US and foreign components. The major component is the stainless steel chassis, drum, shaft, and arms. These are fabricated in Korea.
Our LFCs use motors from Europe, gearboxes from Taiwan, displays from China, and electronics fabricated in the USA and China. All assembly, testing, and burn in are done in Silicon Valley, California.
- 10.9 Why are the chassis of the LFCs made in Korea?
It has been mandatory to properly dispose of waste food in Korea for over 15 years. Much technology has evolved to meet the need. Machines have been exported from Korea to Japan to meet the growing need there. The US is now becoming aware of the problems associated with waste food and we are capitalizing on all the experience learned in Korea.
Further, we maintain very high quality with our LFC machines, again building on 15 years of experience in manufacturing the machines. To replicate this in the US would result in a product that is more costly. We add vital components in the US to tailor the products for the markets we serve.
- 10.10 What is the maintenance and service plan for the LFC machines?
Power Knot has arrangements with service companies throughout the US. They can provide annual maintenance and repairs in the event of a failure. Our international offices and international distributors are responsible for the servicing of the LFCs they sell.
However, the machines are very reliable, are designed for a life time of 15 to 25 years, and require only minimal periodic maintenance or service.
- 10.11 In the event of a failure, how long does it take to repair the LFC?
Power Knot carries stocks of parts in Milpitas California and can ship for next day delivery. Many of our international offices, international distributors, and service companies carry small parts and can therefore repair an LFC the same day.

Power Knot provides safe and economically sound solutions for commercial, industrial, and military customers globally seeking to reduce their carbon footprint. The Liquid Food Composter (LFC) allows customers to reduce the expense, inconvenience, and mess of disposing of waste food that would otherwise be hauled to a landfill. Models are available that process from 100 lb per day to 2000 lb per day of waste food. Our technologies are proven, available today, have been in reliable use for many years, and offer a payback period typically of less than three years. Power Knot has its headquarters in Milpitas California. For more information, access www.powerknot.com.

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