# EARTH CUBE
# Earth Qbic

## Low Temperature Pyrolysis Equipment

**Uses the natural magnetic force to**
**decompose environmentally friendly organic matter**

**Sustainable Technology Company Limited.**

20210601Rev6

# 1. Features of Earth Cube

- Much lower installation cost than for an incinerator with the same capacity
- Uses pyrolysis (thermal decomposition) rather than incineration

- Big reduction in operating and maintenance expenses
- Processes almost all organic materials; no need for sorting
- Ideal for remote locations with no refuse processing facilities
- Decomposition produces Pyroligneous acid and ceramic ash that meet safety standards
- No need for fossil fuels
- Breaks down organic materials to 1/200 to 1/300; residual substances can be recycled as a fertilizer ( be sure to inspect the ingrediwnts before use )
- Operates without any fuel; less smoke (pollution) even when processing petrochemical materials; able to process gases too
- Exceeds environmental standards for air pollution, dioxin and nitrous oxide levels in gas emissions, and other properties (see certification forms)

# 2. Earth Cube solves these problems!

- Processes organic materials: Breaks down materials to 1/200 to 1/300; can be recycled as fertilizer
- Reduces air pollution: Levels of dioxin, nitrous oxides and other substances in emissions to not exceed environmental standards
- No need for fuel: Produces no smoke even when processing petrochemical substances and can even process gases

Companies must find ways to cut costs due to the current unpredictable economic environment. Earth Cube helps cut costs at companies that have reached the limit on reducing personnel expenses.

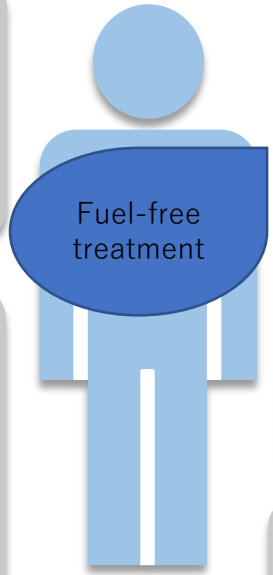
Hospital, Nursing home

Fishing net

Industrial waste, construction materials

Chemical factory

Tire manufacturer




## Suitable for processing many materials

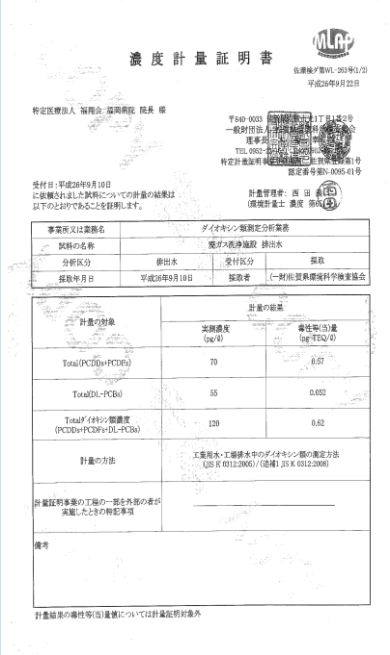
- Waste materials of medical institutions (non-metallic diaper materials, blood collection tubes, IV packs, syringe cylinders, gauze, gloves, food leftovers, and other materials)
- Ocean trash, such as trash carried by ocean currents and other seashore refuse (debris, plastics and other materials)
- Fishing nets and other materials (nets, raw garbage, foamed styrene)
- Chicken and other manure; excess heat can be used for heating (manure can be incinerated after drying)
- Used tires (pulverized, only metal parts are removed)
- Waste materials at many types of companies (confidential documents, floppy disks, business documents)
- Trash collected by municipalities

Many other types of organic materials (waste in diapers can be converted into a ceramic in 24 hours)

# 3. Dioxins

Stable performance without a single dioxin reading that exceeds the standard.

Inspection scene



濃度計量証明書

佐環検ダ第WL-203号(1/3)

平成26年9月22日

特定医療法人 福翔会 福岡病院 院長 様

〒840-0033 [illegible]
一般財団法人 [illegible]
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TEL 0952-[illegible]
特定計量証明事業者 [illegible] 佐賀県知事第1号
認定番号第N-0095-01号

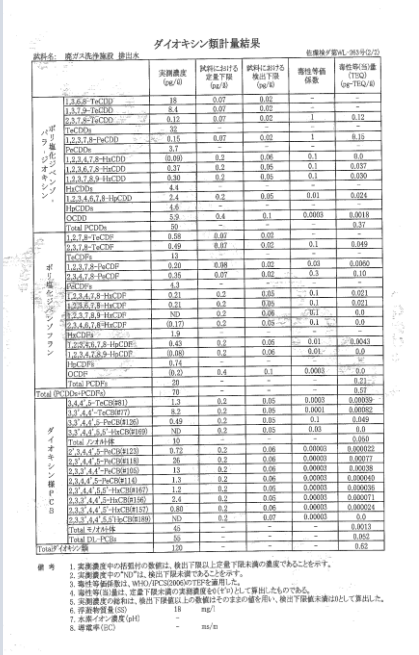
受付日：平成26年9月10日
に依頼されました試料についての計量の結果は
以下のとおりであることを証明します。

計量管理者：西 田 [illegible]
(環境計量士 濃度 第[illegible])

| | | | |
|---|---|---|---|
| 事業所又は事務名 | ダイオキシン類測定分析業務 | | |
| 試料の名称 | 廃ガス洗浄施設 排出水 | | |
| 分析区分 | 排出水 | 受付区分 | 採取 |
| 採取年月日 | 平成26年9月10日 | 採取者 | (一財)佐賀県環境科学検査協会 |

| 計量の対象 | 計量の結果 | |
|---|---|---|
| | 実測濃度 (pg/l) | 毒性等(当)量 (pg-TEQ/l) |
| Total(PCDDs+PCDFs) | 70 | 0.57 |
| Total(DL-PCBs) | 55 | 0.052 |
| Totalダイオキシン類濃度 (PCDDs+PCDFs+DL-PCBs) | 120 | 0.62 |
| 計量の方法 | 工業用水・工場排水中のダイオキシン類の測定方法 (JIS K 0312:2005)/(追補) JIS K 0312:2008) | |
| 計量証明事業の工程の一部を外部の者が実施したときの特記事項 | | |
| 備考 | | |

計量結果の毒性等(当)量値については計量証明対象外



ダイオキシン類計量結果

佐環検ダ第WL-203号(2/2)

試料名: 廃ガス洗浄施設 排出水

| | | 実測濃度 (pg/l) | 試料における定量下限 (pg/l) | 試料における検出下限 (pg/l) | 毒性等換算係数 | 毒性等(当)量 (TEQ) (pg-TEQ/l) |
|---|---|---|---|---|---|---|
| ポリ塩化ジベンゾ・パラ・ジオキシン | 1,3,6,8-TeCDD | 19 | 0.07 | 0.02 | - | - |
| | 1,3,7,9-TeCDD | 5.4 | 0.07 | 0.02 | - | - |
| | 2,3,7,8-TeCDD | 0.12 | 0.07 | 0.02 | 1 | 0.12 |
| | TeCDDs | 32 | - | - | - | - |
| | 1,2,3,7,8-PeCDD | 0.15 | 0.07 | 0.02 | 1 | 0.15 |
| | PeCDDs | 3.7 | - | - | - | - |
| | 1,2,3,4,7,8-HxCDD | (0.09) | 0.2 | 0.06 | 0.1 | 0.0 |
| | 1,2,3,6,7,8-HxCDD | 0.37 | 0.2 | 0.06 | 0.1 | 0.037 |
| | 1,2,3,7,8,9-HxCDD | 0.30 | 0.2 | 0.06 | 0.1 | 0.030 |
| | HxCDDs | 4.4 | - | - | - | - |
| | 1,2,3,4,6,7,8-HpCDD | 2.4 | 0.2 | 0.05 | 0.01 | 0.024 |
| | HpCDDs | 4.6 | - | - | - | - |
| | OCDD | 5.9 | 0.4 | 0.1 | 0.0003 | 0.0018 |
| | Total PCDDs | 50 | - | - | - | 0.37 |
| ポリ塩化ジベンゾフラン | 1,2,7,8-TeCDF | 0.58 | 0.07 | 0.02 | - | - |
| | 2,3,7,8-TeCDF | 0.49 | 0.07 | 0.02 | 0.1 | 0.049 |
| | TeCDFs | 13 | - | - | - | - |
| | 1,2,3,7,8-PeCDF | 0.20 | 0.08 | 0.02 | 0.03 | 0.0060 |
| | 2,3,4,7,8-PeCDF | 0.35 | 0.07 | 0.02 | 0.3 | 0.10 |
| | PeCDFs | 4.3 | - | - | - | - |
| | 1,2,3,4,7,8-HxCDF | 0.21 | 0.2 | 0.05 | 0.1 | 0.021 |
| | 1,2,3,6,7,8-HxCDF | 0.21 | 0.2 | 0.05 | 0.1 | 0.021 |
| | 1,2,3,7,8,9-HxCDF | ND | 0.2 | 0.06 | 0.1 | 0.0 |
| | 2,3,4,6,7,8-HxCDF | (0.17) | 0.2 | 0.05 | 0.1 | 0.0 |
| | HxCDFs | 1.9 | - | - | - | - |
| | 1,2,3,4,6,7,8-HpCDF | 0.43 | 0.2 | 0.05 | 0.01 | 0.0043 |
| | 1,2,3,4,7,8,9-HpCDF | (0.08) | 0.2 | 0.06 | 0.01 | 0.0 |
| | HpCDFs | 0.74 | - | - | - | - |
| | OCDF | (0.2) | 0.4 | 0.1 | 0.0003 | 0.0 |
| | Total PCDFs | 20 | - | - | - | 0.21 |
| Total (PCDDs+PCDFs) | | 70 | - | - | - | 0.57 |
| ダイオキシン類PCB | 3,4,4',5-TeCB(81) | 1.3 | 0.2 | 0.05 | 0.0003 | 0.00039 |
| | 3,3',4,4'-TeCB(77) | 8.2 | 0.2 | 0.05 | 0.0001 | 0.00082 |
| | 3,3',4,4',5-PeCB(126) | 0.49 | 0.2 | 0.05 | 0.1 | 0.049 |
| | 3,3',4,4',5,5'-HxCB(169) | ND | 0.2 | 0.05 | 0.03 | 0.0 |
| | Total ノンオルト体 | 10 | - | - | - | 0.050 |
| | 2',3,4,4',5-PeCB(123) | 0.72 | 0.2 | 0.06 | 0.00003 | 0.000022 |
| | 2,3',4,4',5-PeCB(118) | 26 | 0.2 | 0.06 | 0.00003 | 0.00077 |
| | 2,3,3',4,4'-PeCB(105) | 13 | 0.2 | 0.06 | 0.00003 | 0.00038 |
| | 2,3,4,4',5-PeCB(114) | 1.3 | 0.2 | 0.06 | 0.00003 | 0.000040 |
| | 2,3',4,4',5,5'-HxCB(167) | 1.2 | 0.2 | 0.06 | 0.00003 | 0.000036 |
| | 2,3,3',4,4',5-HxCB(156) | 2.4 | 0.2 | 0.06 | 0.00003 | 0.000071 |
| | 2,3,3',4,4',5'-HxCB(157) | 0.80 | 0.2 | 0.06 | 0.00003 | 0.000024 |
| | 2,3,3',4,4',5,5'-HpCB(189) | ND | 0.2 | 0.07 | 0.00003 | 0.0 |
| | Total ノンオルト体 | 45 | - | - | - | 0.0013 |
| | Total DL-PCBs | 55 | - | - | - | 0.052 |
| Totalダイオキシン類 | | 120 | - | - | - | 0.62 |

備考
1. 実測濃度中の括弧内の数値は、検出下限以上定量下限未満の濃度であることを示す。
2. 実測濃度中の"ND"は、検出下限未満であることを示す。
3. 毒性等換算係数は、WHO/IPCS(2006)のTEFを適用した。
4. 毒性等(当)量は、定量下限未満の実測濃度をゼロ(ゼロ)として算出したものである。
5. 実測濃度で総和は、検出下限値以上の数値はその全ての値を用い、検出下限値未満は0として算出した。
6. 浮遊物質量(SS) 18 mg/l
7. 水素イオン濃度(pH) -
8. 導電率(EC) - ms/m

Dioxins inspection chart
Safety certification varies by region

# 4. Materials that can be decomposed (carbonized)

Can be carbonized thing

**Earth Cube can process almost all organic materials (no sorting needed)**

▶Petrochemical products (plastics, foamed styrene, plastic bags, vinyl, trays and other items), raw garbage, food leftovers, paper (magazines, catalogs, telephone books and other items), wood (garden refuse, branches, wood scraps, sawdust and other materials), marine products, fishing waste materials (fish bones and guts, fishing nets and other items), livestock waste materials (manure and other items), textile products (apparel, stuffed animals and other items), medical waste (bed sheets, diapers and other items), and many other materials

▶Note: Moist substances must first be reduced to a water content of less than 70% and then processed with paper or other substances with a low water content.

**There is still no cost required for fuel.**

# 5. Thermal processing with no flame

Smoke processing that does not use fire directly

## Inexpensive processing due to the absence of fuel

The magnetic generator produces magnetic ions and the resulting ionic air maintains a reactor temperature of 180 – 250 ºC for thermal decomposition.

A flame is used only once to create the core. No supplementary combustion or fuel is required afterward. (No cost for main unit. The monthly cost of water and electricity for Earth Cube's odor and smoke removal units is about JPY20,000. US$ 1 = approx. JPY110, in case of Japan)

Daily maintenance is required only to remove tar and ash and dispose of them as trash.

# 6. Earth Cube cannot process these materials

Things that can not be carbonized

**What can not process**

Metal, glass, stones, gypsum boards, asphalt, concrete and battery materials in accordance with the company's principles, Earth Cube cannot be used to process military materials or explosive materials.

Organic materials with water content of more than 70% must first be dried using a machine, sunlight or another method prior to processing.

# 7. Possible by-products

**Pyroligneous acid (wood vinegar)**

Weakly acidic effluent like wood vinegar will be released from the effluent valve.

Tar-like residue should be collected and returned to the reactor. As with commercially sold wood vinegar, the wood vinegar produced as a byproduct can be used as an insecticide after dilution by 500 to 1,000 times.

**Ceramic ash**

Almost all of the magnetized materials (organic materials) reduced to 1/200 to 1/300 and converted to a negative ion magnetic material end up as a ceramic ash. Normally, ceramic ash produced by a single cycle retains its properties as a magnetic ion ceramic. A total of 14 to 17 days is required to produce magnetic ion ceramics with an even higher purity.

Ceramic ash radiates negative ions at a high density. This ash can be mixed with wallpaper paste, used as a fertilizer in fields or in other applications.

# 8. The Earth Cube Pyrolysis Reactor

- Organic materials with water content below 60%: 12 hours per cycle (two cycles per day)
- Organic materials with water content above 60%: 24 hours per cycle (one cycle per day)

## EARTH CUBE

- ✓ Dioxin and odor levels comply with requirements
- ✓ Complies with the manual for infectious medical waste materials in accordance with the Waste Material Processing Act
- ✓ Handles industrial waste that requires thermal processing by magnetizing air, thereby eliminating the need for fuel

| type | Model 150 | Model 220 |
|---|---|---|
| Inner volume (capacity) | 3.0m³ (1.5㎥/day) | 4.5m³ (2.2㎥/day) |
| Dimensions | D 2,610 × W 1,950 × H 2,490 | D 2,910 × W2,680 × H2,780 |
| Weight | Ca. 2.6 t | Ca. 3.7 t |

# 9. Reactor structure 1

- Dimensions: 2723(H) x 2210(W) x 1950(D) (the size of one parking space)

## ① Smoke removal unit

There are two water spraying units to produce steam within the reactor. The air flow is used to pull steam into the reactor in order to cleanse the gas.

## ② Ash removal outlet

Ash that collects as organic material decomposes is swept to the back of the reactor by a screw mechanism.

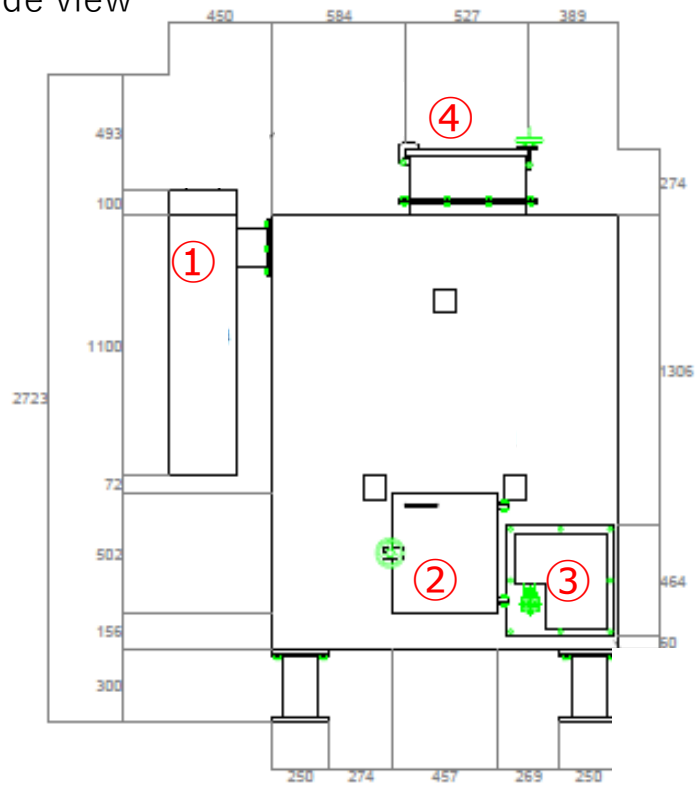
## ③ Magnetic box

A magnetic box with 25 samarium-cobalt magnets is linked to the unit's nozzle.

## ④ Inlet

A dual-lid construction prevents steam from escaping when organic materials are placed in the reactor.

Side view



# 10. Reactor structure 2

- ✓ Oxygen level inside the reactor is 5% to 10% (low oxygen level prevents the production of dioxins).
- ✓ The reactor uses carbonization with no flame to break down organic matter.
- ✓ Decomposition using magnetism (the flow of magnetic materials allows processing organic materials even in an oxygen-free environment)

## ⑤ inspection opening

An opening for the removal twice each year of fats that accumulate during processing

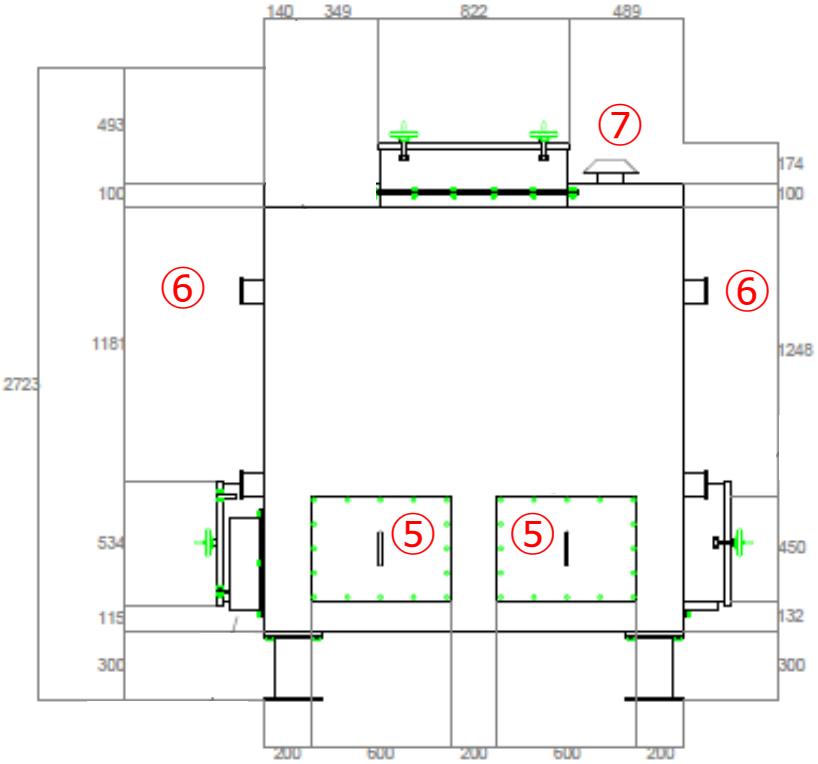
## ⑥ Cleaning rod opening

A steel rod is inserted through this opening to knock down materials that collect within the reactor as organic materials become lighter as they dry.

## ⑦ Exhaust (Smoke outlet)

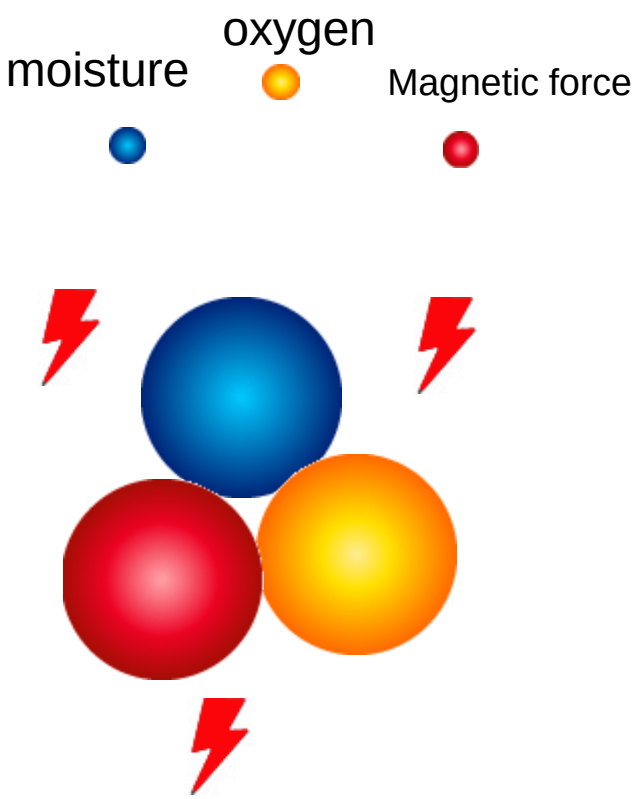
An outlet for gases after emissions are treated by using steam

Front view

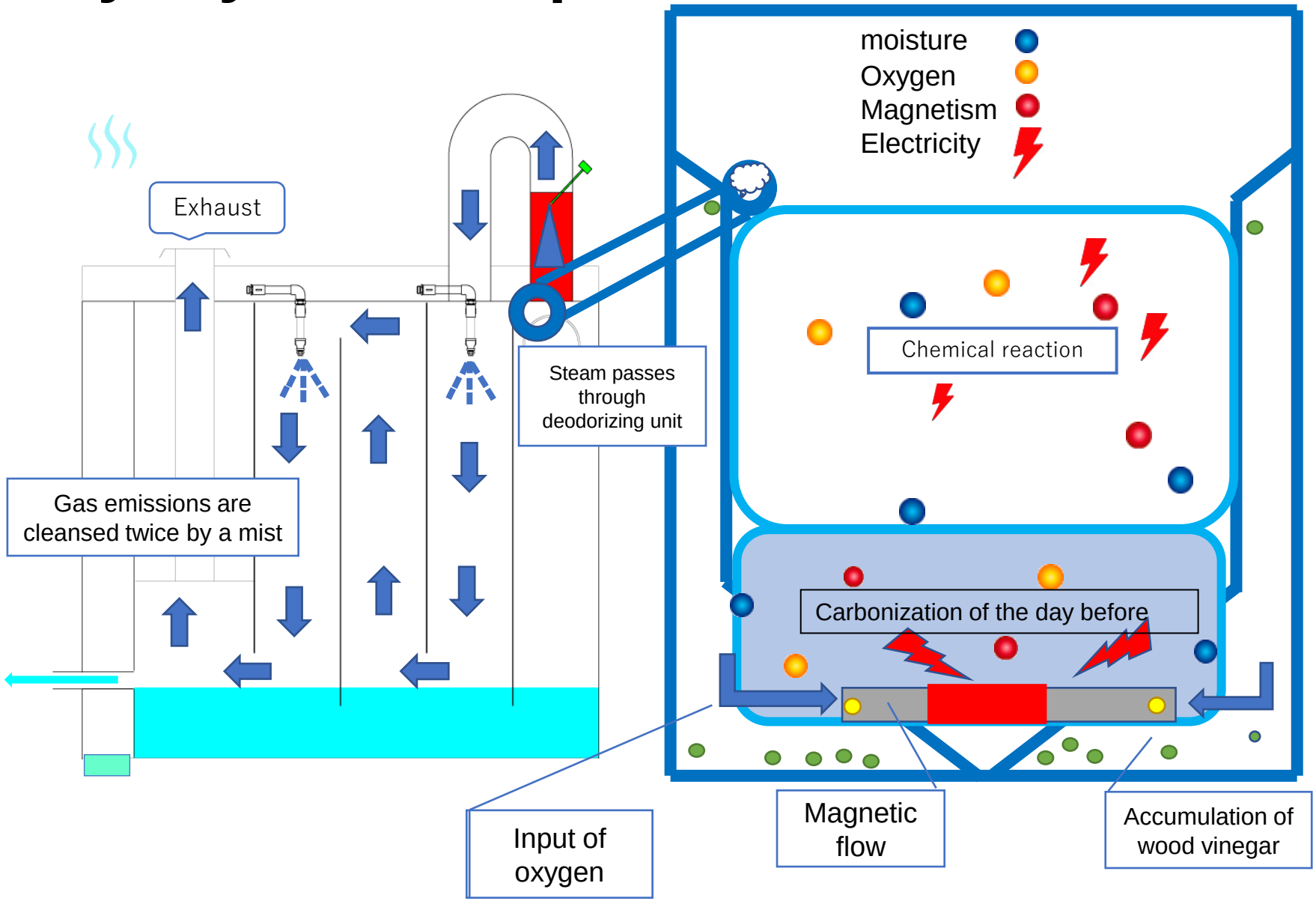


# 11. Pyrolysis Principle 1

- **All organic materials are pulverized before insertion in the reactor.**
  Organic materials must be broken down into small particles due to the use of thermal conduction. Larger pieces prevent the transmission of heat needed for pyrolysis. There is no need to pulverize excrement and other contaminants.
- **Decomposition process using magnetic substances in a low-temperature thermal decomposition unit.**
  Magnetization of air = The interior of the reactor is filled with negative ions.
- **Carbonization of materials.**
  Moisture in the air and organic matter undergoes a weak electrolysis due to magnetism that produces hydrogen ions and oxygen ions. Ions with magnetic energy strike the carbon atoms in the organic matter. Heat produced by these collisions trigger thermal decomposition in an oxygen-free environment.



# 12. Pyrolysis Principle 2



# 13. Difference between Incinerator and Pyrolysis

Difference between combustion and pyrolysis

1) Combustion is supplied with sufficient oxygen (air), While burning out, it burns completely and becomes ash,
Thermal decomposition decomposes dry with minimal oxygen (air),
Make things asy in steamed condition without putting out flames.

2) If the charcoal is exposed to the air, it emits flames and burns vigorously (this is called combustion), but if it is put in ash, it will take in the surrounding oxygen (air) to a minimum and decompose gently. (This is called pyrolysis)
The volume of treated ash is reduced from about one-hundredth to two-hundredths of that of the treated material.

| | Nitrogen smoke type incinerator | Thermal decomposition processor |
|---|---|---|
| fuel | Fossil fuel | Unnecessary |
| Furnace temp. | 800degC or higher | 180～250degC |
| Combusti method | Flame combustion | Magnetic low temperature pyrolysis |
| By-pro | Incineration ash | Magnetic ceramic ash (acceptable for fertilizers) |
| Pollution | Dioxin generation potential | Extremely small (within the reference value) |

# 14. Order from input to processing

(in the case of cardboard)

- Crush the cardboard and put away the stock.
- Before putting in the new organic substance, stir the remaining material from the punched hole of the machine with a hammer and push it evenly.
- Put the crushed cardboard, put the organic matter, put the cardboard again. By repeating this, the amount of water is determined by the amount of water.
- After 12 to 24 hours, when the organic matter has dried and the volume has decreased, add the new organic matter. Weight is heavy and natural pressure is applied to the remaining material to facilitate heat transfer.
- After 72 hours, the organic matter turns into a fine ceramic ash of 1/200 to 1/300.

# 15.Machine features

Furnace inside

Ceramic inside

Interior part of the furnace

Magnetic force port setting
Outflow of magnetic force

Magnetic force installation place

Attach the pipe

Machine internal, oxygen concentration 5 to 10% (no dioxin generation due to anoxia)
The inside of the machine breaks down while being carbonized without flames. It is possible to decompose by magnetic force (process the organic matter even with low oxygen by magnetic flow).

# 16. Daily maintenance and running costs

Visually inspect the entire equipment and check for abnormal smoke leaks.

Check the drainage of the deodorant and smoke exhauster for clogging

Check the discharge storage tank of the main unit and check the amount of drain

## running cost

- About $200-300 by use of water charges, electricity charges (120V, 240V) every day
- Odor control (air care) compressor electric power cost and mist liquid (approximately 2 months $150)
- Dioxin inspection (it varies according to each area) once a year

As ceramic ash is accumulated in the furnace, it will be removed in about 10 days.

Check the discharge storage tank of the main unit and check the amount of drainage

# 17. Monthly inspection and maintenance

- Monthly inspection (working with two or more people)

・ Magnet generator valve closing Shower valve closing Heater power off Clean the furnace body
・ Remove the wastes stuck to the door and the wall
・ Clean the inside of the PS inspection port of the furnace body
・ Clean the deodorant and smoke eliminator
・ Scrap floats in water tanks
・ Drain all storage water
・ Wipe the inside clean with Wess etc.

Maintenance (machine never stop)
1 Once a half year, twice a year
2 The interior of the machine has a double structure, and wood vinegar accumulates on the bottom, so the wood vinegar that has become solid is removed from the inspection opening, and the removed solid is re-injected into the machine for decomposition
3 Water treatment of smoke eliminator
4 Grease Strap Water Treatment
5 Check packing

Design, manufacturing and sales companies invested to create "**Sustainable Technology Co.,Ltd.**".


**"Earth Cube" won the product certificate in the environmental section of the Asian Golden Star Award 2019.**