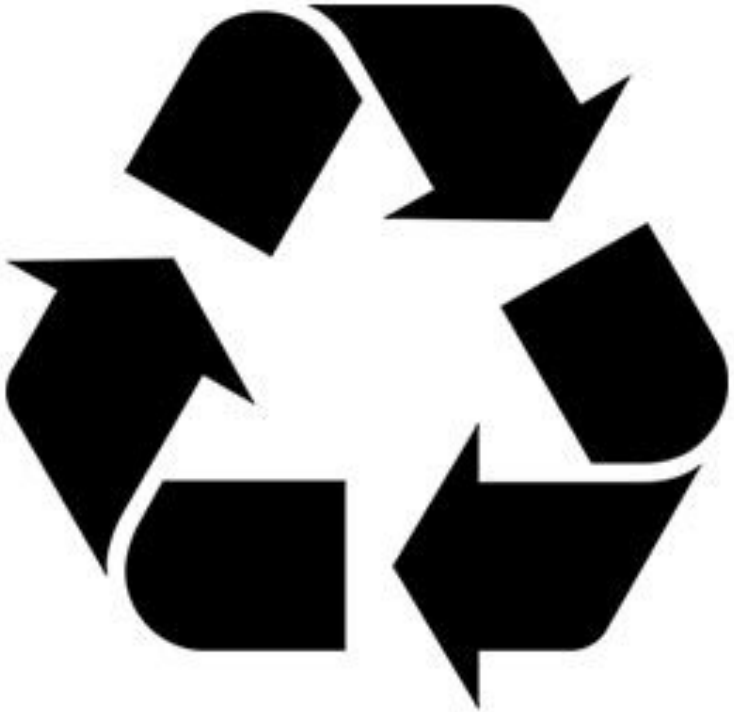
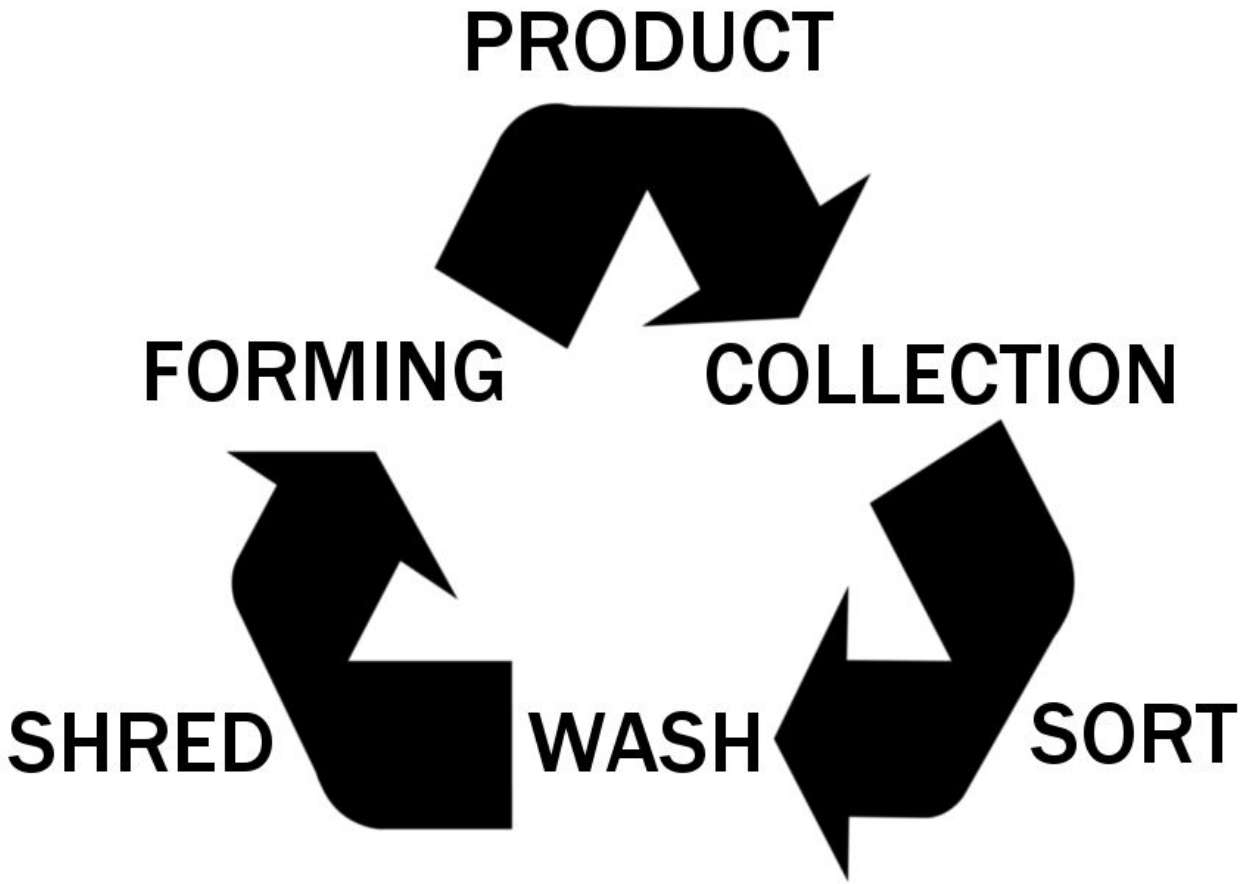
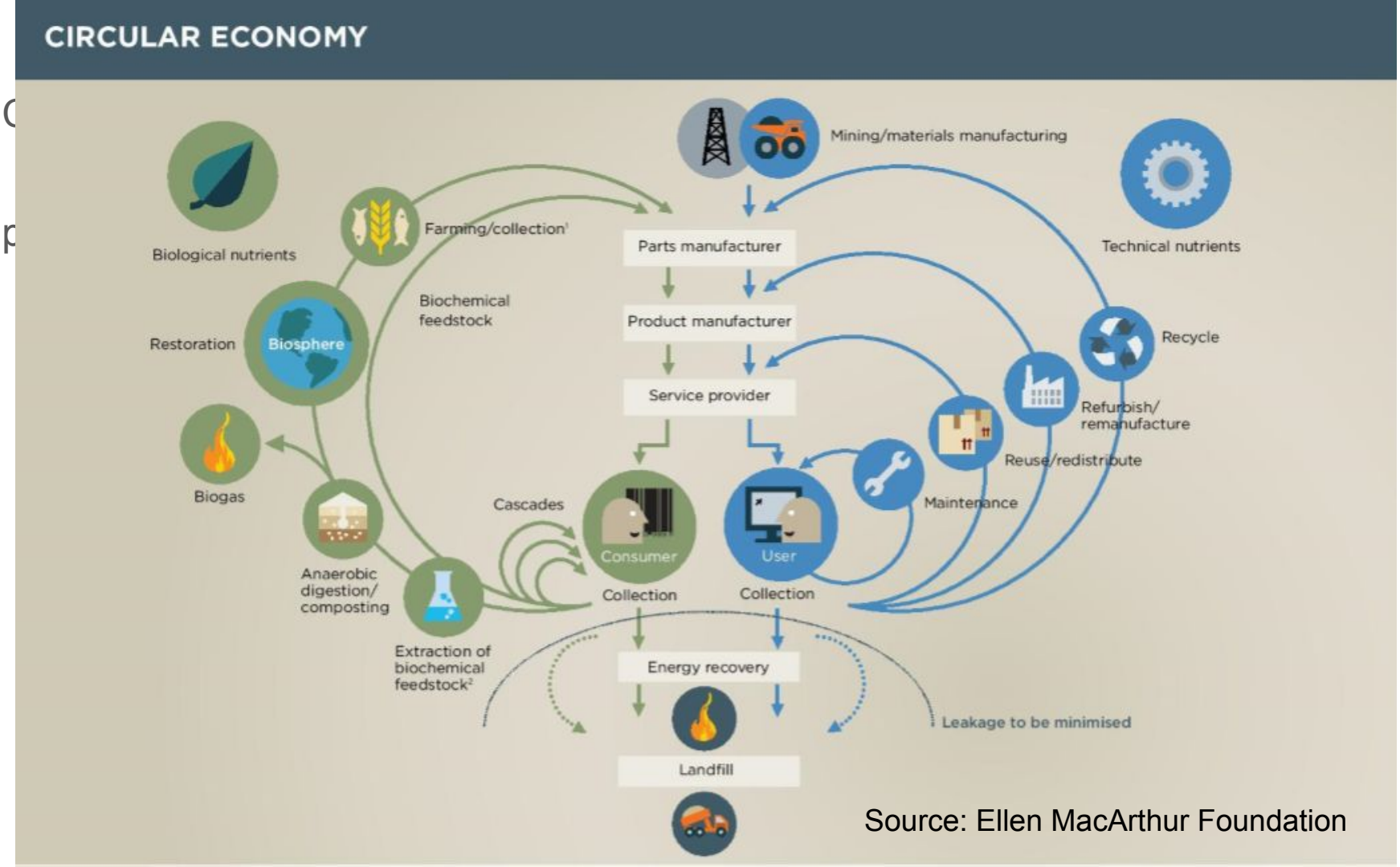


Small Scale Plastics Recycling
Dan Hettinger
Living Web Farms - 2018


PRODUCT
COLLECTION
SORT
WASH
SHRED
FORMING



Source: Ellen MacArthur Foundation

Small is Beautiful: small scale plastics recycling

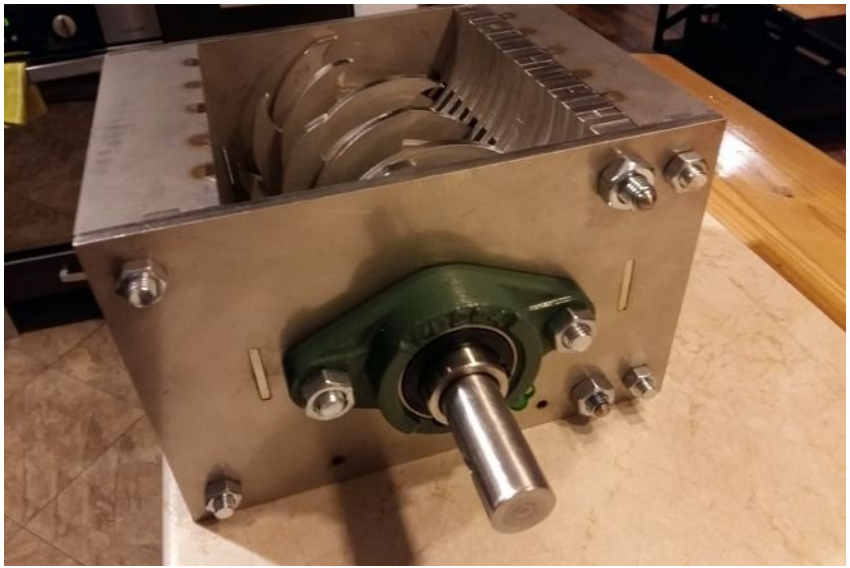
Pros:

- More responsive to changing feedstocks
- Can potentially maintain purity of single feedstocks
- Can respond to local niche markets
- Much lower capital investment
- Less transport at all stages of processing

Cons:

- Little environmental monitoring
- Very labor intensive
- Requires broad knowledge of many complex processes

Shredding




STOP


START
STOP

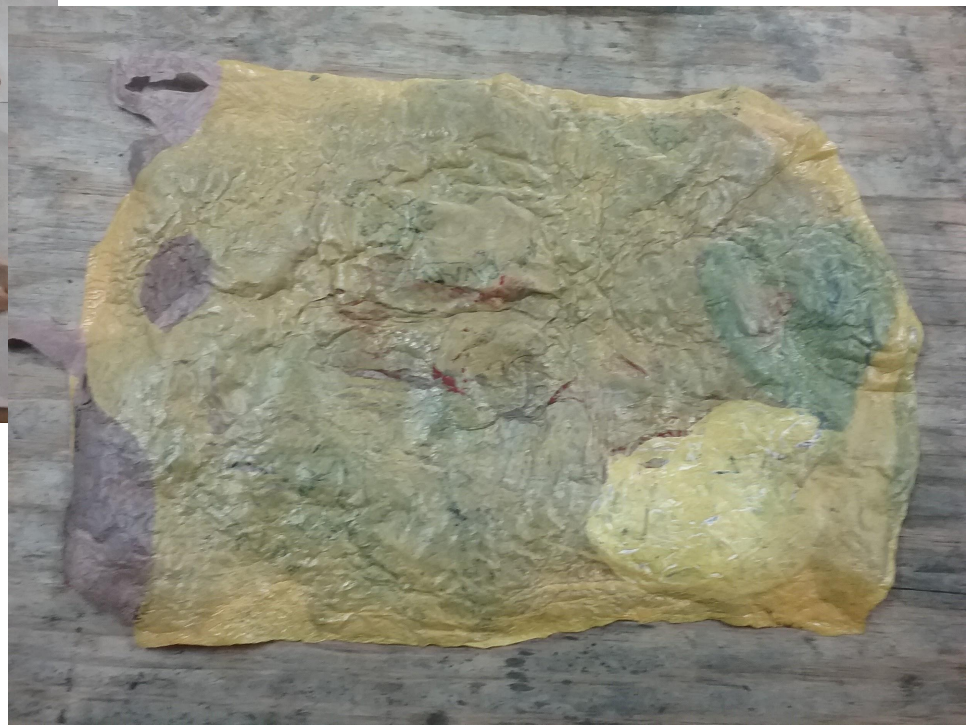
Compression Molding

Compression Molding

Source: precious plastics forums: users trasholicious via @davehakkens, @markbertbach

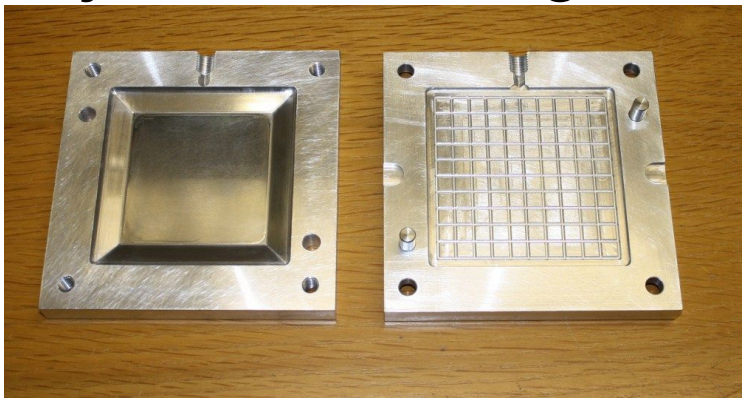
Source: precious plastics forums:
Users @flo-2

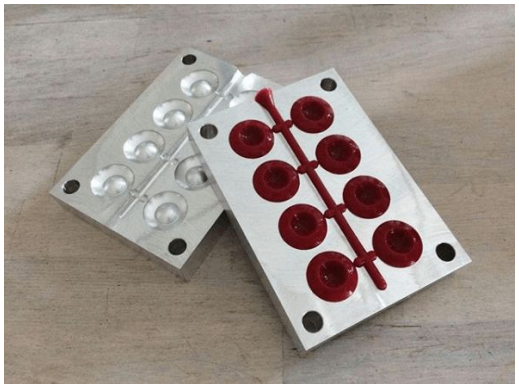
First attempt at easy method of shopping bag consolidation



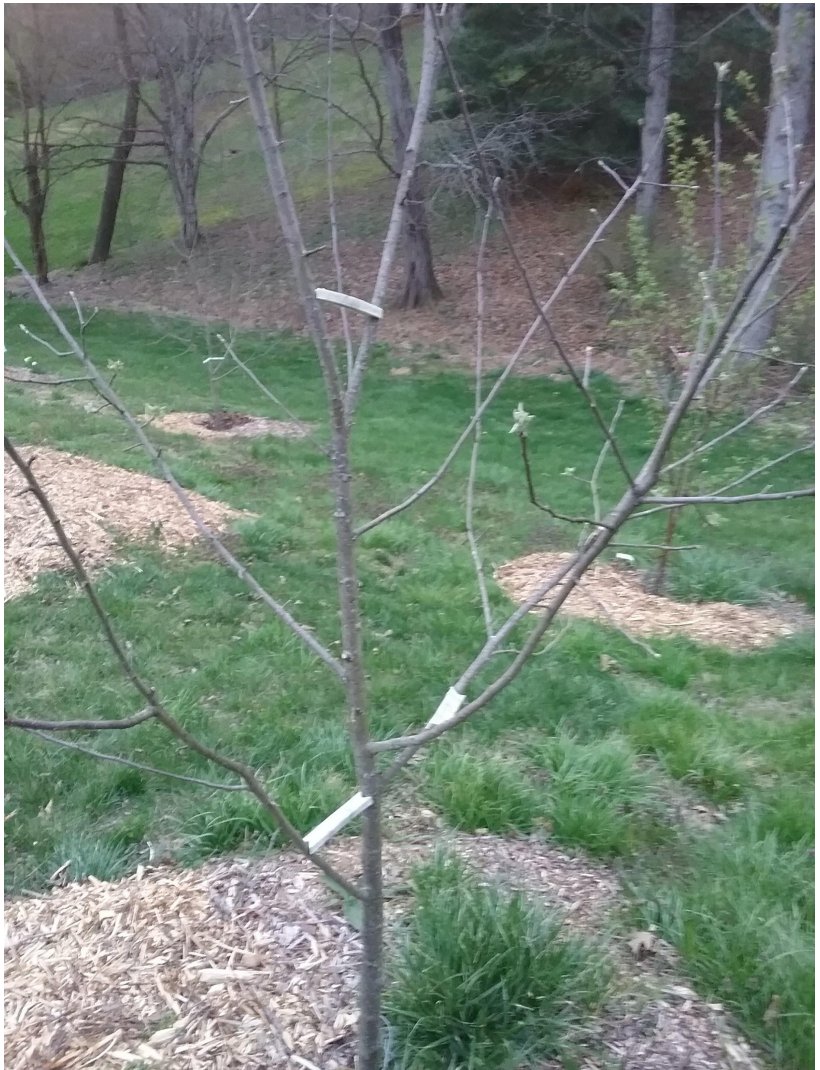
Injection Molding

Injection Molding



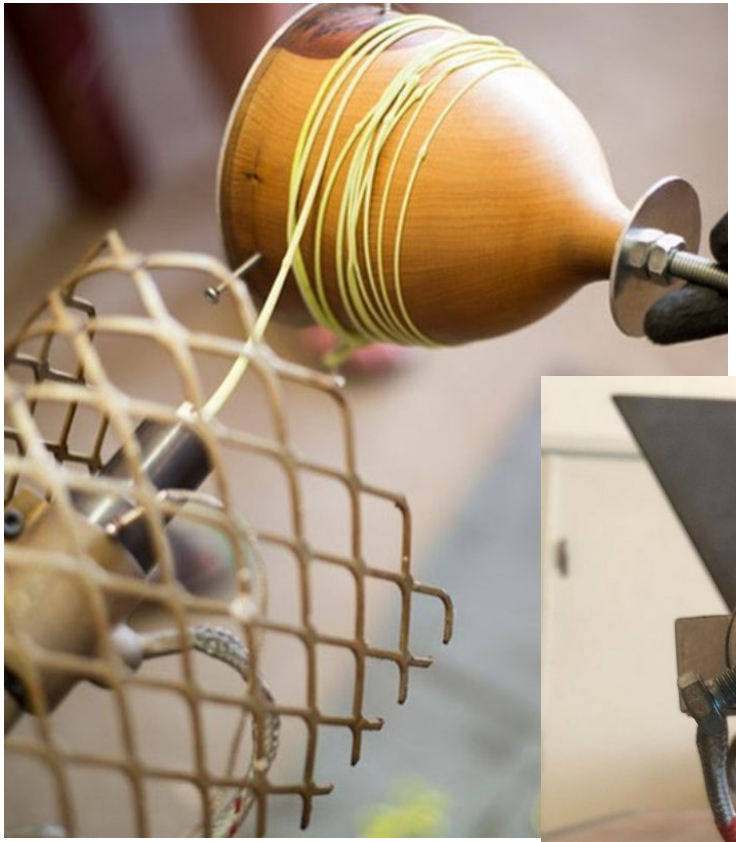


Source: precious plastics forums: Users @Andyn, trasholicious and @talleresferica via @davehakkens



Extrusion

Extrusion



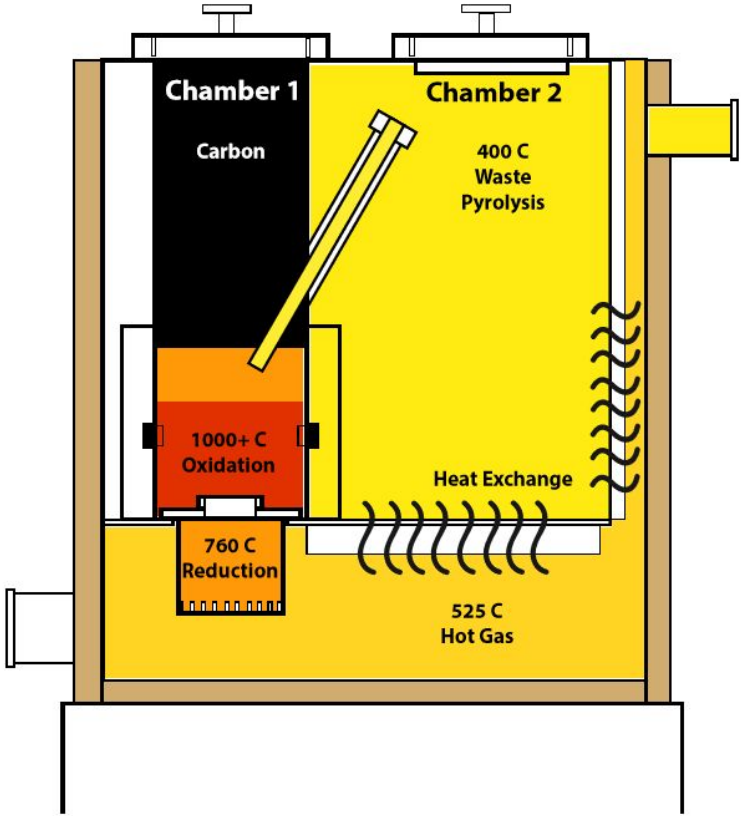
Images via instagram user trasholicious, on Precious Plastics equipment in South Africa

Filabot

Lower Tech alternatives: EcoBricks

Ecobricks

the “Wastebot”



Output 1: Gaseous Heating Fuel

Synthesis gas

Gas composition (variable): Fuel gases- 20% H_2, 20% CO, 5% CH_4, Inert gases- 47% N_2, 8% CO_2

140+ BTU/cubic ft. Varies by feedstock.

Approx 485 cubic ft per hour, but can vary by suction source.

The total gas heating value is about 20 kw/h thermal or 68,000 BTU/hr. Varies by waste type.

Output 2: Hot Water/ Radiant Heat

Heat recovery

3.5 kw/h thermal or 12,000 BTU/hr from waste heat recovery.

Output 3: Fuel Oil & Propane

Requires simple reconfiguration and a water bath to quench vapor to oil.

Plastic to oil pyrolysis

Turn shredded or unshredded plastic into 1 liter of oil per hour with 1.25 kg of plastic. Propane type gases are a byproduct, though the yield is small. Best stored in a gas bag for cooking and water heating.

From: Wastebot FAQ

How does it work?

Carbon has unique properties. It can behave as both a heat source and a catalyst. These are two primary functions needed for chemistry. Wastebot uses the properties of carbon in a 2 stage reactor to make fuel from trash. Option 1: In the first stage carbonized yard waste (aka charcoal) is oxidized to a temperature of 1000 C (as hot as a nuclear reactor) then injected with waste vapor. Next the hot carbon becomes oxygen starved, creating a reducing environment. This reducing environment makes carbon capable of behaving like a catalyst breaking the molecular bonds in waste vapor to create hydrogen rich fuel. In the second stage 400 C heat breaks the solid waste down into vapor and injects it into the first stage reaction. The hot fuel gas is then mined for heat and combusted in heating applications or filtered and used in electrical power generators. Option 2: Water vapor is injected over hot carbon to create hydrogen rich gas while separately heating plastic into vapor to be removed and quenched into oil in a water bath.

Are you burning plastic? What are the byproducts, environmental effects?

No we aren't burning plastic, we are breaking it down at a molecular level and burning hydrogen and carbon gases. The main byproduct is ash, carbon fines and CO2 from combustion. Burning plastic is bad because it is incomplete combustion and #3/ #7 plastic can release dioxins when burned, WHICH IS WHY WE DON'T DO IT!

Redesign

Reduce

Reuse

Repair

Refurbish

Recycle

Retort

Remove