ZERO WASTE NEWSLETTER

MARCH 2013

WATCH OUT! NEW WAYS OF WASTING ARE COMING.

Two recent developments in manufacturing promise to shake up a basic assumption about manufacturing that we use here at the Zero Waste Institute without even realizing it.

Up to now, we have assumed that a product gets conceived, designed, manufactured in some central production facility and then gets distributed, sold and used. Maybe this simple picture won't work in the future.

The first change came about with the invention of the 3D printer (1). If you don't know what these are, they came about as a spinoff from the dot matrix printer that was widely used with computers. Like that device, they have a head that shuttles back and forth, spitting out liquid or fine solid dots (formerly ink) onto some work which keeps advancing (formerly paper).

The most amazing adaptation of these devices came when biologists realized that cells are so small they could be emulsified into a supporting liquid and sprayed onto a substrate shaped like a human organ. Then the cells could be nourished and encouraged to grow into that organ. It could be a liver, a kidney or even a beating human heart.

But growing human organs is not the subject of this writing. A more widespread application of 3D printers is for making plastic objects. A cable made of some plastic, often the one called ABS which is widely used in computer cases or sanitary piping, is fed into the head, melted and sprayed out in carefully controlled patterns where it sticks to what is there as it solidifies in layers. Different colors and kinds of plastic can be serially substituted to build up three dimensional objects that have built in coloring and even golden or silvery surfaces. One of the most amazing achievements is to make pieces that have interlocking parts, much like a steel watchband, all built up with the hinges and connectors in place and working.

At the moment, they still cannot spit out steel or metal alloy parts though there is progress in that direction. Perhaps chemical reactions that produce metals on contact with the air can be found. The plastics being sprayed can have fillers to strengthen them, to such an extent that the claim is made that a working wrench can be made that can then function as an ordinary tool. Replacements for broken plastic parts for mechanical devices like appliances can be created but not a circuit board or resistor. It isn't likely that this will revolutionize the provision of replacement parts for car bodies and bicycles anytime soon.

The patterns, or designs, for the products come in the form of software, usually the kind called CAM/CAD or other representations of solids. These designs can be created by anyone and sent around on the internet for anyone with a machine to use.

The machines themselves are coming down in price so far that a simple desktop version can be had for a few hundred dollars, though industrial versions are still large monsters costing tens of thousands. You can see what this will lead to. Just like the dot matrix printers made it possible to start using up reams of paper, for pictures that used to be difficult to make, these new, cheap printers will lead to the creation of tons of cheap, throwaway, plastic junk like keychains or alligators or a 3D picture of the baby. Forget wrenches and screwdrivers. There will be a few replacement parts but I expect to find huge swathes of junk coming out of them.

If the made object is some simple plastic, like ABS, it can be remelted into a new cable and reinserted into the machine to make a new product. This suffers from the usual drawbacks, such as the reused plastic not being “virgin” or totally clean or being mixed colors. Machines owned by individuals or small companies are not likely to have the specialized equipment for remelting and re-extruding plastic so any malformed or broken or prototype object will just go – you know where – into the everpresent and broadly beckoning garbage can. I expect to see a flood of plastic trash pouring into the dumps of the first world very soon.

Here at the Zero Waste Institute we don't concern ourselves with garbage or its management, so that is not our direct concern. Our direct concern is with the ability to design products that are designed from the start to be beneficially reused on every level, from their initial high function to their final lives as materials. This new model of manufacturing is breaking the paradigm of design and production that our thinking depends on. When everyone is capable of designing, then no one is responsible. Is it conceivable that software designs can be monitored to insure that they create products with built in reuse potential? Or will social responsibility step in, like the free software movement, and control what its members create? I see no movement in that direction but it is early yet.

ROBOTIC INSECTS

The second development leading to distributed garbage not designed for reuse, came in layman's form in the pages of Scientific American for March (2). The authors describe their research in creating tiny drones, or flying robots, that can mimic, and someday substitute for, bees. Unlike the larger aircraft, these tiny ones don't have rotating engines and propellors. They take their cue from real insects making use of vibrating wings and use piezoelectric actuators to move them. The challenges reported in the article are several. How to provide power for movement and flying is one that is not solved. Another is how to program the central processing units – the “brains” - to mimic the astoundingly successful ability of bees to do whatever is needed, both while flying, avoiding predators and finding nectar and at home in the colony, keeping it clean and functioning. They don't see any profit in trying to program all such complex behaviors into the computers. Instead, they want to make simple instructions that lead to complex, supportive behaviors on their own, by the interaction known as emergent behavior. In this theory, simple interactions lead to complexity when large numbers

of independent actors need to respond to and interact with each other. Like real bees in a real colony.

There is one disturbing implication in this work that is only hinted at in the article. Would these artificial bees replace real bees in pollination after pesticides have been allowed to destroy the real ones? Are these being put forward as a technofix to allow the destruction and contamination of the natural environment so that the real bees can be let go of? All technofixes are end-of-pipe and this would be no exception. First destroy nature, don't apologize and don't control or eliminate that destruction but come up with some technical measure afterwards that you can pretend is just as good as the natural one. More common examples are: proposed attempts to allow the carbonization and heating of the atmosphere but following it with heroic geoengineering attempts to cool the whole planet. Or create tons of carbon dioxide from coal burning but pretend you can capture the carbon dioxide and store it safely away in a propaganda move called sequestration. In no case, do the investors in technical manipulations consider conserving the natural world to be preferable to their post-facto, profitable fixes. Real bees can be dispensed with, just like the idea of not producing carbon dioxide in the first place is never considered. Of course the connection to Zero Waste designing comes when we realize that recycling is the end-of-pipe technofix par excellence which is used to blunt any efforts to not produce garbage in the first place.

Let us return now to my primary interest in these robobees considered as a new form of manufacturing. The key come in various quotes in the article. The overall goal is stated:

The Robobee project aims to create an autonomous flying object the size of an insect. Robobees will be able to fly under their own power, navigate toward an objective, adapt to changing circumstances and work together as a group.

A further description is:

… every robot must be cheap, easy to make and simple to operate.

Does this begin to sound like the word used today – disposable? It is no accident.

The future is discussed thus:

Within five to ten years … you may see them in widespread use.

The authors admiringly discuss a book about robots in space called Fast, Cheap and Out Of Control. Then they go on to explain:

This is of course a play on the old engineer's adage that consumer products can be typically characterized by any two – but not three – of the following adjectives: fast, cheap and reliable. With many individuals, the failure of one matters little. … Provided you can make many simple things that effectively work together, who cares if the individuals fail periodically?

Yes indeed, who cares? Who wants to think where all of those little bees, the size of a vitamin pill end up? Littering our roads, sidewalks, roads, lots and rooves. Covering our gardens and forests and lawns. Keep in mind that these are just the opening wedge. Once the wrinkles are

worked out, who can resist using these for surveillance with the same kind of disposable thinking? If that little buzzer hovering outside your bedroom window runs out of power and falls in your garden, there will be another and another to replace it. And what a great kid's toy. Imagine your own swarm of little robobees being controlled by your smartphone. Is your neighbor a Goliath of a jerk? How would he like a swarm of bees around his head for a few hours just out of reach? The possibilities are endless, until there are heaps of abandoned, dead robots lying everywhere.

What are the rare materials being used up in this orgy of uncontrolled wasting that is coming? Microchips and piezoelectric actuators can be based on silicon but for extreme efficiency it is common to turn to arsenic, indium, gallium, lithium, niobium, tantalum, cerium, lanthanum or rhodium.

At the moment, there is an immense agitation about the Pacific Gyre, a collection of plastic detritus that circulates in the ocean in a pile larger than Texas, poisoning and killing birds and sea life. We lament it but do nothing serious about it, such as by redesigning the manufacturing and distribution of plastic objects (soon to get worse as shown in the first part above). Here we have a new plague being formed. Will birds and other animals be eating these little robobugs until their stomachs are filled with metals and expired batteries? Are we facing the beginnings of a terrestrial plague of platypus and ocelot extinctions out of sight and out of mind?

The authors said it all. Who cares?

These newsletters are written by Paul Palmer and distributed for the Zero Waste Institute. If you know someone else who should be receiving them, please let me know.

Paul Palmer
zwi@sonic.net
http://www.zerowasteinstitute.org

1 – http://en.wikipedia.org/wiki/3D_printing
2 - Scientific American March 2013, p. 61, The Flight of the Robobees by Robert Wood, Radhika Nagpal, Gu-Yeon Wei.