Trash as a Resource (is there an App for that?)

Think for a moment of the amount of trash and recyclables you put to the curbside each week. It's a lot isn't it?, especially over the course of a year (or your lifetime). Now think about 8 billion people and the amount totaled. And we cannot forget that behind every product you purchase, whose wrapper you have discarded, there is another waste stream from the manufacturing. All of this trash, as well as much of the recyclables[1], ends up in landfills in developed countries. The reality is much bleaker as the waste becomes pervasive throughout our world environment, creating serious health hazards and impacting our (and wildlife's) ability to have safe drinking water, air to breath and unadulterated food to eat[2].

In the late 1980s I wrote that landfills would become our mines of the future, where pretty much all of the raw materials we need for production would be found in greater quantities than within our remaining virgin resource mines and wells, and at less cost of extraction. Knowing how to mine landfills meant we could also process waste streams directly thereby eliminating landfills in the near future. At that time I envisioned a series of waste stream separation processes, including magnetics, vibration, specific gravity, etc.; yet the technology was crude and virgin extracted resources remain first preference in industry. Since that time there have been many new areas of research and discovery that have opened up the possibility of making waste stream processing and landfill mining a reality.

In 2003 the Thermal Depolymerization Process (TDP) was announced to the world where any feedstock (in the initial trials this was turkey offal) could be fed in and the output would be raw materials that could feed other industries. While this development apparently never came to fruition, researchers are beginning to advance depolymerization efforts toward the processing of waste plastics. Other areas of development include chemical reduction through specialized enzymes, bacteria and fungi strains. Advances are also being made in non-toxic micro mineral extraction by the mining industries that could help us in waste metal processing, especially from electronics. Similar developments are coming to light for extraction of complex chemicals like pharmaceuticals from our water.

I see the necessity for a 3 step goal for investment and process development. Step 1 is the development of systems to process existing waste streams (think municipal transfer stations). Step 2 would take the developed technologies and allow us to go in and mine and restore exiting landfills. Lastly, step 3 would extend such technologies to allow us to process natural water bodies for removal of (micro) plastics, pharmaceuticals, etc..

Focusing on the waste stream first, investments need to be made toward developing processes and machines that can be integrated into waste management facilities. Presently you are expected to wash your recyclable containers but few do (and the water

[1] Recyclable plastics presently have little to no market, this was a hoax perpetuated upon us by the plastic industry to ensure their growth.
[2] Pharmaceuticals, micro plastic, fabric dyes are all showing up in crops, seafood, etc.

cost is huge if people did); so a recycled water front end is needed, much like car wash facilities employ in California. Beyond this, separation of materials by fluid, magnetics, optical recognition, laser ablation and spectrometry, etc. need to be examined and employed to ensure different material types are not intermingled. Our end goal should be an output stream of highly differentiated, clean materials directly employable by industry.

Step 2 entails employing the evolved technologies and processes developed for waste streams to mine existing landfills (restoring the lands after). Here we will be dealing with solid masses of mixed garbage that will need to be excavated much like mineral resources. Organics would most likely be treated as potential petrol feedstock as this material would not be suitable for composting and agricultural use.

Step 3 is probably the most difficult, and the most consequential – that of extending these processes for in-situ processing of bodies of water. The most obvious of pollutant materials are plastics which range from recognizable consumer objects to microplastics of both degraded consumer origin and industrial process adjuncts (e.g. filter and reaction beads). But pharmaceuticals, fabric dyes, etc. are also being found in growing proportions that need to be removed. Because of the diversity of applications, and the breadth of materials sought for removal, it is the refinement and extension of processes developed in the previous phases (steps) from which we will benefit.

How do we excite the engineers and investors of our Tech 'Valleys' to undertake this important work? It is obvious, in terms of raw materials derived for industrial uses, that there are large profits to be made. Yet we also have a petro-chemical and mining industry that has access to cheap natural resources who continues to push those streams over the (initially) more expensive recycled processes discussed here. And that brings us to resource valuation.

It is my opinion that natural resources are severely undervalued and that such valuation has contributed not only to this widespread waste problem, but also to the decline of our infrastructure and the social and economic well being of our people. Natural resources belong to the people, and not just of this generation, but of future ones as well. Resources need to be valued upon rarity and upon demand. But most importantly, when they are extracted, the rate must be regulated with an eye toward future availability, and the costs paid by the extractive industry need to be invested in the future of our citizenry (e.g. infrastructure, health, etc.), as well as the natural world supporting that population. So we need to make the value of natural resources (raw virgin materials) higher than the cost of recycled materials as a first step.

If we cannot stop the wanton discarding of resources and the commensurate pollution of our ground, water and air, we do not have a future as each of these affect our and other living beings' environments and food sources. The time to begin to develop the necessary technologies is now; and the research and development will lend innovations benefiting a wide range of other industries.

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