



MSW Processing Overview

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The household waste stream received is generally divided between 'black bag' waste and co-mingled 'recyclable' material.

The recyclables co-mingled materials are sorted and anything of value is separated and sold. The rest are 'MRF Rejects' and end up back in the black bag stream. Recycling rates are falling as MRF rejects increase as strict rules are enforced by the buyers on contamination rates of recyclable materials.

The black bag stream is generally not processed to recover anything of value. It is either sent to local landfill or incineration or it shredded and baled and exported to the Continent for incineration where the gate fees are (or were) more competitive. In fact, it is often shredded and screened with these "fines" being disposed of as cheaply as possible to incineration, landfill or composting and then landfill. Really, the system is a mess and not sustainable.

Shredding the waste is expensive in terms of energy and it also means the valuable metals and rigid plastic are also shredded and these end up being difficult to separate and recover, which is a waste

Landfill tax is a deterrent and the growth and capacity of incineration has seen landfill tax revenues fall, especially as incinerator ash is classed as an inert material and therefore mostly free of landfill tax. It is likely that an incineration tax will be imposed to make up for the loss of tax revenue.

The act of incineration means the destruction of valuable materials that could be recovered. The biomass fraction should be used for renewable energy since around 50% of the MSW is biomass comprising food, card and paper. Instead, it is sent wet and by the tonne, to incineration. The wetter it is, the happier the incinerator operators are as the gate fee is higher.

MSW is probably the biggest source of 'waste' biomass available to the renewable energy industry. The challenge is to economically extract this biomass and have it declared a "biomass product" and therefore satisfy the 'end of waste' requirements. It can be done!

The current MSW management practices are facing increases costs and legislation and new sustainable processes must be found.

Alternative Methods

Many 'high tech' processes are touted such as gasification, pyrolysis, hydro-thermal etc but none are really viable at large scale in spite of being "proven" at bench scale in labs. It is fair to say, they are some still some way out. Then there are autoclaves which have horrendous operational problems which requires another paper to fully describe. All that is needed to know is that every autoclave plant processing MSW in the UK has closed.

If the focus is on separating and extracting the organic fraction - or the biomass - from MSW, this can be done easily with a low cost, sustainable and proven technology called the PulpStar. However, it takes a change of mind-set in the industry to accept the fundamental difference in how the PulpStar operates compared with the conventional processing methods of dry shredding and baling.

The PulpStar is, in effect, a continuous feed, atmospheric pressure, wet mill processor that pulps the 'pulpable' organic fraction in the MSW. In order for the pulping to be successful, process water is added to the MSW as it is fed into the PulpStar. In other words it is essential to raise the moisture content of the MSW sufficiently to allow the wetting of the food, card and paper which then breaks



down the organics to a pulp. This pulp is called the "Raw Organic Fraction" and is continuously extracted from the PulpStar via a small hole internal screen. The process water can be cold but a better pulp is made if warm water is used. Additives like surfactants also improve the pulp. No process water is discharged from the PulpStar but instead is absorbed into the pulped material.

Each PulpStar will process around 60,000 tonnes MSW per year.

The remaining materials are the inerts which are continually discharged from the PulpStar's end cone and these are generally scrubbed clean, de-labled and sent to a MRF for recovery.

The best waste processing facilities which incorporate the PulpStar technology are recovering around 70%- 75% of the total waste stream. Further, it is far better for the facility to receive the MSW as a "single stream" and let the facility process and sort rather than pursuing the policy of kerb-side recycling and the subsequent collection of multiple waste streams. However, this is considered heresy to those brought up with principles of householders doing the recycling but this policy has, for many reasons, hit a wall and recycling rates are reducing.

So, once the mind-set has accepted that process water is added to the MSW for operating the PulpStar, the rest makes sense. The water can be low grade water and may produce a revenue stream. The water addition depends on the moisture content fo the MSW received but could be from 400 litres to 1000 litres per tonne of MSW processed.

Turning to the Raw Organic Fraction (ROF). This isn't pure biomass at this stage and is still a waste product. Think of it like crude oil which is full of impurities. The ROF will contain sub 20mm inerts and these must be removed in a refining process. The most effective and well proven method is to use a version of the "old cardboard" recycling method.

The idea is to take the ROF and dilute it too around 3% solids. Then the with various process steps, the inert can be separated out and an end product of a very clean cellulose fibre can be delivered via a dewatering screw press.

The process water for the washing system is recycled and the system is closed loop with zero discharge. This process water has a high COD as it is rich is soluble sugars from the food waste and can go to a liquids, high rate AD biogas plant. Alternatively, a water treatment plant such as electrocoagulation can be used to clean the process wash water.

The refined cellulose fibre is now very clean and has multiple uses. The most obvious would be to have it declared 'end of waste' and pelletise/briquette it to make a biomass fuel. It will have around the same calorific value as wood pellets. Or it can be sold back to the paper and card makers. Or it can be used to make animal bedding.



PulpStar MSW Processing with Raw Organics Refining & Biogas Production

