

... it's our future

Our world is changing ...

The world about us is changing fast... In environmental terms this is not for the better. Our natural resources are being consumed in ever increasing volumes as we, and the rest of the world, strive to maintain or achieve the westernised ideals of a modern lifestyle.

Overwhelming increases in carbon emissions, together with the erosion of vast swathes of natural habitation are recognised as some of the key contributors to the causes of climate change.

The alarming reality is that regardless of this knowledge, the combination of our desire to maintain our lifestyles, together with the aspirations of the new emerging global economies, suggest that we are unlikely to reverse these trends without some pretty dramatic changes to our current way of life.

This is scary stuff... But is it too late? What actions can possibly be taken that are capable of making the right kind of difference?

Greenhouse gases ...

Waste is a major issue, yet our way of life in this modernised, throwaway world, means we are creating waste material in vast quantities, all of which needs disposal. We clearly recognise the need to divert waste from landfill, as almost everyone of us has heard the message that decaying waste releases methane which, as a greenhouse gas, is many times worse than carbon dioxide.

So we all know and understand that landfill is the wrong option. Recycling is good... This we know! But only when the end result genuinely justifies the means. When the product of a recycling effort has a genuine benefit and when the effort expended in the process of recycling, hasn't created more carbon emissions than would have been generated if the waste had simply gone to landfill in the first place!

So the answer is... Intelligent recycling is good. Recycling merely to comply with legislative edicts or merely for the sake of recycling may have little or no real benefit, and create a "product" with little market appeal or no value whatsoever.

A quandary then... We need to divert waste from landfill, but what should we do with it? Recycling is good, but only with the right materials and then, only sometimes. This leaves a vast amount of material that needs to be disposed of in an alternative way.

Incineration is viewed by the authorities as the easy solution, but we all know that if we burn the waste, we are back to creating vast amounts of carbon dioxide combined with a range of other undesirable emissions. The public have consistently rejected the option of incineration, even when cunningly presented as a means of recapturing limited amounts of energy from waste.

So... Are there any genuinely viable, alternative options?

Carbon emissions ...

One of the single biggest man made causes of carbon emissions is our constant thirst for energy.

Our lifestyles are such that almost everything we now do has a requirement at some point to consume energy. It has become such an intrinsic part of our lifestyle that we instinctively use it without a thought... The obvious things like heat, light and fuel for our cars tend to register somewhere, but all manner of things that are now an irreplaceable part of our lives... Computers, Television, Cooking, Music, Cleaning, Washing, Entertainment (both personal or public on a grand scale), are almost invisible consumers. Our consumption of energy dwarfs any other impact that any of us will make upon the resources of our planet and thus our personal contribution to global warming.

Most of our energy, whether heat, electricity or fuel for our vehicles (both private and public transport) comes in one form or another from fossil fuels. i.e. Coal, Oil or Gas.

Ignoring for just a moment, the effect on global warming created from burning these fossil fuels, the sobering fact is that we are now running out of these precious resources. Our rate of consumption has now risen to the point where predictions suggest that fossil fuel supplies will be incapable of meeting demand in less than 25 years.

Considering that Planet Earth requires around 100 million years to produce coal and between 100 and 300 million years for oil and gas, the omens are not good.

Sounds like we're in deep trouble !

So, we have a few problems then! We are producing waste like never before in the history of this Earth, which if left to decompose produces greenhouse gases... Which adds to global warming.

We are producing additional greenhouse gases as a result of almost every action we take as a part of our modern way of life... Which leads to more global warming.

And, we're running out of the fossil fuels that provide the power for almost everything we do. Unless someone has some serious answers ... Then we really are in deep trouble.

What we really need is something that can eradicate waste (with no emissions) and produce serious levels of energy, to such extent that we no longer need rely upon fossil fuels to provide our energy.

And... We need this now!

EPI ...

The solution to eradication of waste... Without emissions.

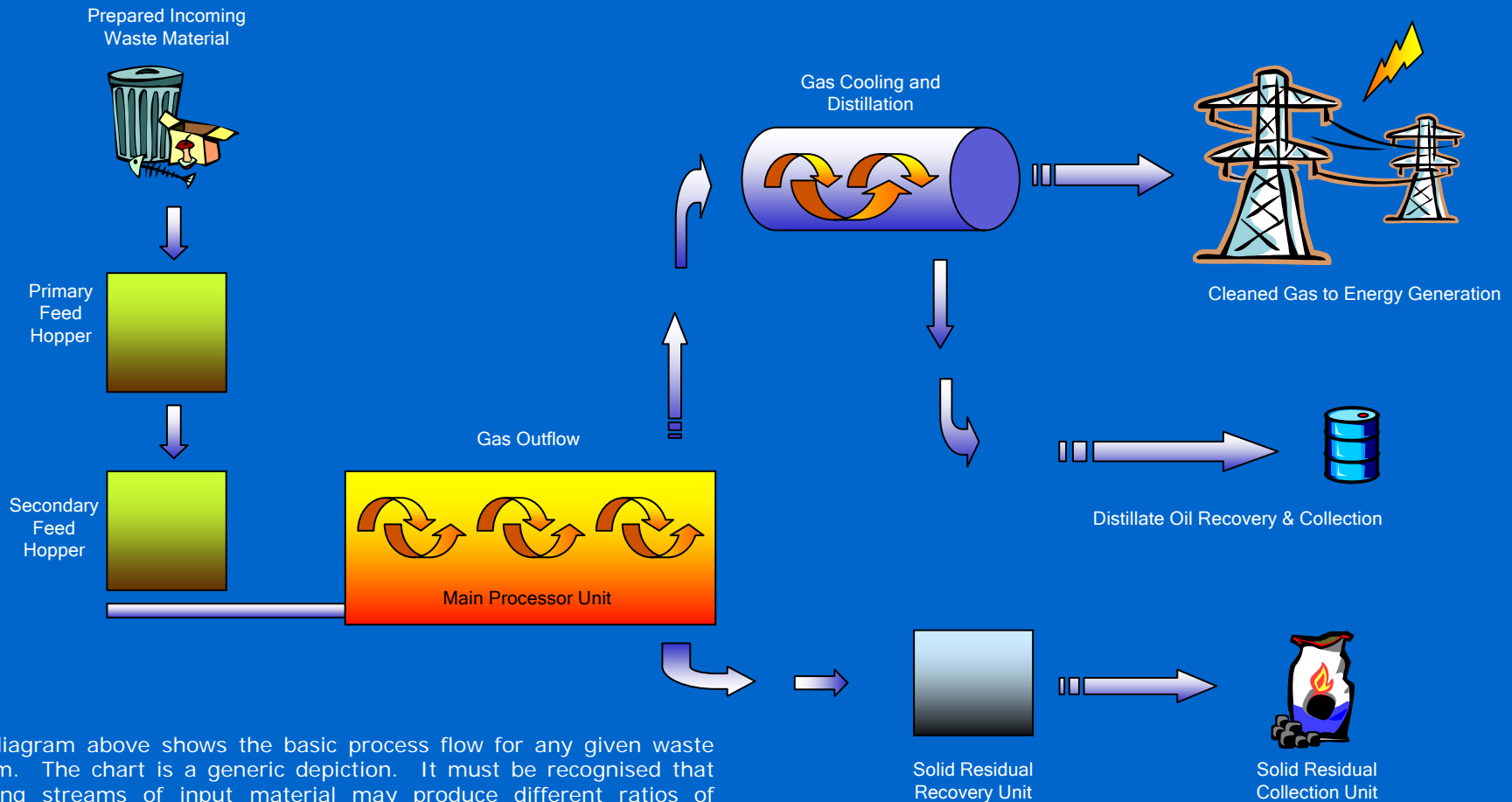
The solution to production of controllable, predictable, reliable, renewable energy.

A technology that's available right now!



... it's our future

EPI – The Process ...



The diagram above shows the basic process flow for any given waste stream. The chart is a generic depiction. It must be recognised that differing streams of input material may produce different ratios of residual products, each requiring slightly different methods of separation, treatment and collection.

EPI – The process explained...

The key principles of the process are simple... Minimum amount of preparation... Minimum amount of manual intervention.

Efficient processing of large quantities of material, efficiently requires uncomplicated, straight forward preparation, a system that is robust and stable and that can deliver the required results day in, day out with the minimum of fuss. The following schematic diagram shows the principal phases and flow of the process. Almost every part of the process utilises known, proven technologies from across a broad range of highly specialised industries... We just apply the technologies in a different manner, allowing EPI to deliver ground breaking technology but with the benefit of time proven, reliable plant and equipment... A unique combination!

Stage 1

Incoming material, having been shredded down to smaller sized particles, is conveyed to the Primary and Secondary Feed Hoppers, where necessary, automated metal recovery processes can be incorporated to remove both ferrous and non ferrous metals. Pre-process drying can also be undertaken at this stage if required.

Stage 2

The prepared material is continuously fed into the Main Processor Unit where a combination of conditions, including high temperature and zero oxygen cause the accelerated decomposition of all organic material. At no point is any of the material allowed to combust.

As the material enters into the Main Processor Unit, the rapid change in conditions causes it to immediately release most of its energy in the form of gas. Any remaining energy is left behind as a solid black, carbon rich, residue.

Process conditions can be varied in order to achieve the best possible results from each of the various types of material being treated. Changes to temperature, pressure, residence time or moisture level, all affect the way the material reacts and can markedly influence both quality and quantity of the end products.

Stage 3

The vastly reduced, remaining solid, representing around 15% of the original material, now passes out of the Main Process Unit.

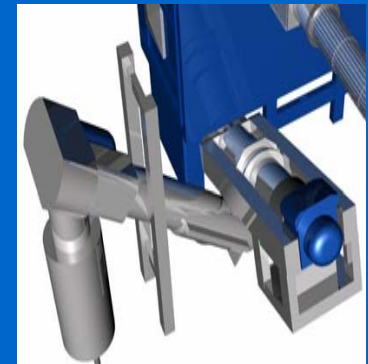
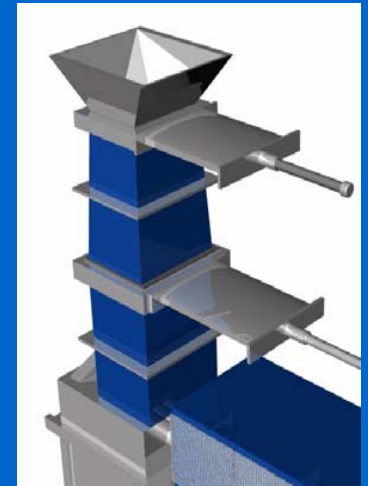
The continuous extended exposure to high degrees of heat, has now destroyed all manner of contaminants, leaving behind an extremely good quality, carbon rich char.

The carbon char is collected and stored in separate containers ready for sale. Being almost pure carbon, with a higher calorific value than most coals, makes this a readily saleable commercial product.

Stage 4

The process produces large volumes of highly combustible hot gas, containing oil in vapour form. The gas is subsequently cooled which allow the oil to condense and drop out as a distillate product, whilst the gas is subjected to a series of processes which condition and clean the gas in order to produce a high quality fuel gas ready for use in gas engines. Electricity produced from such a gas is classified as renewable energy, in recognition of its green credentials. EPI's process is so efficient that it is not just Carbon Neutral but Carbon Negative.

Surplus heat from the gas engines is also available for use in Local District Heating Applications (Combined Heat & Power) whilst the distillate oils offer further opportunities for production of renewable energy. All in all a substantial amount of energy available for re-use.





So... How does it work?

The prepared material passes into the Main Process Unit where a combination of conditions, including high temperature and zero oxygen cause it to immediately release most of its energy in the form of gas. Any remaining energy is left behind as a solid, energy rich, carbon residue. Because the material is prevented from burning at any point, we have the ability to recapture more of the energy than any other process.

Process conditions can be varied in order to achieve the best possible results from each of the various types of material being treated. Changes to temperature, pressure, residence time or moisture level, all affect the way each material reacts and can markedly influence both the calorific value and quantity of each of the end products.

In simple terms this is not entirely dissimilar to the natural process of decay and decomposition that Planet Earth will do on her own, given a hundred million years or so, where organic matter is reduced to coal, oil and gas. The entire process is natural chemistry and it only works if we do not burn.

Isn't this just another type of incineration?

Absolutely Not! Incineration, requires the complete destruction of the material by means of combustion. Many of the new emerging technologies, such as gasification involve controlled partial combustion of the material. EPI's technology is utterly dependant upon the fact that no combustion can take place whatsoever...

In fact, if combustion were to occur at any point of our process, we would have utterly failed to deliver the technology. Those who might choose to regard our process as merely another form of incineration have completely missed the point and failed to grasp the fundamental principles of this natural technology.

Which types of material can we process?

The essence is quite simply, that any organic based material is suitable for the process and within certain bounds will produce similar results every time.

The process is very stable and robust. Any metals or minerals that might find their way into the process will merely pass through the system unchanged.

Any materials with moisture levels in excess of 20% will require a degree of drying in order to bring these down to our optimum levels. Any heat requirement for pre stage drying is likely to be freely available from our own residual process heat.

- | | |
|-------------------------|--------------------------|
| • Mixed Domestic Waste | • Plastics and Rubber |
| • Wood Waste | • Clinical Wastes |
| • Construction Waste | • Sewage Sludge |
| • Bone Meal | • Biomass & Energy Crops |
| • Agricultural Slurries | • Secure Waste |
| • Forestry Residues | • Landfill Remediation |

It's not big and it is clever!

The plant is tiny when compared to almost every other waste treatment process, even including the very latest advanced thermal treatment plants, fitting easily fit inside most existing industrial premises or facilities. The plant is available in multiples of one tonne per hr, enabling a small operation to process, around 8000 tonnes per annum. An average town would ideally look to a 5 module operation processing approx 40,000 tonnes per annum.

A 5 module operation will fit comfortably within most normal buildings, occupying an area of less than 3,000 sq ft. The plant is specifically designed for location within existing waste transfer or local recycling operations.

This provides the operators with an opportunity to eliminate all secondary transport costs, thus removing all of the problems of traffic flow and pollution associated with the onward transportation phases of waste disposal.

A good neighbour?

The process is virtually inaudible in operation and entirely odourless.

It creates no smoke as there is no burning ... We don't even have a chimney... Or a flue

Our environmental credentials are pretty impeccable too! Because we are not burning, we are not producing any of the volatile airborne compounds normally associated with waste destruction processes. Furthermore, any biological contaminants that might have existed within the original material, are completely destroyed by the extreme temperatures applied by our process.

The only point at which any emissions might finally be released to atmosphere, is the point at which the gas, oil or carbon is turned into energy, and that doesn't necessarily even have to happen on site.

Recycling & recovery...

Our process doesn't aim to replace any valid recycling initiatives. Remember that recycling is good, but only when the end result truly justifies the means, not recycling just for the sake of recycling!

Our technology can work with the remaining residues of many first stage recycling processes, providing an unequalled opportunity for additional recovery of energy or recyclables.

In other cases, where little real benefit is derived from general recycling activities, we can take the unsorted material streams and extract the maximum possible amount of energy first time, offering major time and cost savings to collection services and householders alike.



Carbon neutral – What this really means...

The phrase carbon neutral simply means any activity that would normally consume energy provided by fossil fuels in one form or another, and thus produce carbon dioxide, can be balanced out by other activities that produce renewable energy of a similar amount. The principle being that one activity balances out the other.

Our process will produce between 10 and 20 times more renewable energy than the energy it consumes. We may be about to invent a new terminology, but we would describe this as Carbon Negative ²⁰. As we continue to improve our process efficiencies we would expect to improve upon this by some margin.

In real terms, an average sized plant could provide enough renewable energy to supply the total electrical needs of between 7,000 – 10,000 homes. We are unaware of any other technology that can even come close.

To do anything else with our waste ...

Now that would be a waste!

... it's our future



Key benefits ...

- Reduction of almost every waste stream by around 85% in both volume & weight. This enables Government & Local Authorities to immediately achieve European targets for diversion of biomass from landfill.
- The technology emulates the natural decomposition processes of Planet Earth, where organic matter is transformed into fossil fuel. Just as in the natural process we produce Gas, Oil and a carbon rich solid Char.
- Expensive and unpopular waste collection regimes, where waste can be left for up to two weeks between collections can rapidly become a thing of the past. Our fully automated processes separate out the metals from the waste stream, maximising efficiency and helping towards recycling targets, without the need for separate collection facilities.
- The process creates accelerated chemical decomposition: the entire process is natural chemistry and it only works if we do not burn. It is therefore incapable of producing many of the harmful emissions associated with incineration and other thermal treatment or combustion processes.
- This is an entirely closed process. There are absolutely no emissions from our process. Every output is captured, as they have too great a value to simply discharge to atmosphere. This is inherently cleaner than any other known waste reduction technology. Emissions can only occur at the point at which the residual products i.e. Gas, Oil or Carbon, are subsequently turned into energy. This is no different than any other energy generation process.
- The residual outputs from the process. i.e. The Gas, Oil or Carbon Char, will produce substantial amounts of energy. A typical operation, processing around 40,000 tonnes of waste per annum, should produce enough electricity to supply the entire electrical needs of between 7,000 – 10,000 homes. This is renewable energy, provided without burning any fossil fuels and classed as carbon neutral.
- Similar amounts of additional energy are freely available from the residual heat, generated by the gas engines that produce the electricity, opening up opportunities for local district heating schemes. This is undoubtedly one of the most efficient options for re-use of renewable energy currently available to us.
- Almost inaudible in operation and entirely odourless.
- Small footprint and low profile suits local application, often within existing sites, opening up opportunities for placement in every town. In many cases this will entirely eliminate both environmental impact and the overhead associated with transporting waste over ever increasing distances. A full size plant merely requires around 3000 sq ft of covered space.
- Low capital cost combined with minimal operational overhead, enables small operations to be commercially viable.
- Small, simple process assists in fast track Planning & Licensing Applications. Support for EPI's unique process is being given from the very highest levels of the UK Regulatory bodies.
- Capable of processing a wide range of waste streams with minimal pre-process preparation. Local Authority Waste Streams / Commercial Waste / Woodchip / Plastics / Sludge Pellets / Bone Meal and Clinical Waste are just a few of the waste streams suited to EPI's process. Most of these require little more than pre-process shredding and automated metal recovery, although certain wastes with a higher moisture content are likely to require some form of pre-process drying.
- Waste streams that require pre-process drying offer additional environmental benefits through potential for recovery of large quantities of water, which can be captured and re-processed using sophisticated distillation processes. This is clean water entirely suited for return to our natural rivers and streams.