WASTE PLASMA

GASIFICATION

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- Consultancy
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- Management

Company Profile

Vision & Mission

ITC Ltd was founded in London in the year 2002.
It's a Consultancy and EPC Company operating in the renewable energies field.
With time, the company has grown and has roadened its interests towards new technologies and fields of application.
We have invested in the renewable energies and in the green economy aiming at providing not only products, but complete and cutting edge solutions.
The company Mission is to create a **cleaner world** thanks to the technologies that we are able to offer, which we perfect day after day, based on the requests coming from the countries that are interested in developing our projects.

We aim at creating a sustainable development that respects the environment and the humankind, by cooperating with those who have acquired our trust and those who would like to become our Partners, so that we can face this great adventure in the most responsible way possible.
The most important projects developed in recent years aim to solve the serious enviromental problems caused from **bad management Waste in the World.**
The Partership with important design engineering , with many experiences in Energy Renewable, allow us to customize any project based on customers needs.

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WASTE MANAGEMENT IN THE WORLD

The problem of waste affects all countries in the World. With the increase of population, the problem of waste increases exponentially.

Each country chooses different solutions to solve problem of waste management: **from separate collection, to management landfills, installation incinerators,** but any of theese solutions gave results expected. For example, the separate collection of waste, prove that the costs for this activity is higer respect the value of the material recovered.

In many Countries the waste management don't exist !!

Waste materials are abandoned on the streets, or burned outdoors, or dumped in the sea !

The most developed Countries are managing the waste disposal with Landfill.

But Landfill are not the best way to dispose waste, because wastes are only allocated in a specific area called landfill and covered. We cannot consider this system as a final disposal of waste.

All previous mentioned waste management cause serious Enviromental Problems:

- Air Pollution;
- Groundwater Pollution;
- Soil Pollution; (fly ash from inceneritors and gas from landfills);
- Food contamination for farm animals;
- Contamination food produced from farm animals (milk, meat, eggs..);
- Contamination of the soil and the agricoltural products that arrive on our tables;
- Serious healt problems for people;
- Big costs for Healtsh Systems in each Country;
- Hygh maintenance costs to manage landfills for many years , even after closing for exhaustion.

According to the World Bank, the world currently generates about 4 billion tons of all types of waste per year.

The world's cities alone generate about 1.5 billion tons of solid waste per year.

This volume is expected to increase to 2.4 billion tons by 2025. In lower income countries, waste generation will more than double over the next 25 years .

Currently, three-fourths of this waste is disposed of in landfills, with only one fourth being recycled .

This municipal solid waste (MSW) includes "trash" such as kitchen waste, electronics, light bulbs, plastics, used tires and old paint, and yard waste. In the U.S., Japan, and Europe, laws and regulations have significantly increased recycling and reuse of materials from MSW.

However, despite significant increases in recycling and energy recovery in those areas, only about a fourth of the total MSW is recovered, leaving the remaining three-fourths to be disposed of in landfills or incinerated (burned).

But these traditional methods of waste disposal are increasingly becoming less viable.

In some countries, where there is limited landfill space, are increasingly becoming less viable.

In some countries, where there is limited landfill space, or where new laws and regulations either ban disposal of MSW in landfills or have very high landfill disposal fees, the traditional options of landfilling and incineration are becoming less feasible.

In addition to consuming valuable land, decomposing MSW generates methane, a greenhouse gas, and the leaching wastes may also pose a threat to surface water and groundwater.

Further, some areas have banned incineration of waste because of the negative environmental impacts.

WASTE MANAGEMENT SOLUTIONS

THE GASIFICATION

Process

Gasification is a flexible, reliable, and commercial technology that can turn a variety of low-value feedstocks into high-value products, help reduce a country's dependence on imported oil and natural gas, and can provide a clean alternative source of baseload electricity, fertilizers, fuels, and chemicals.
It is a manufacturing process that converts any material containing carbon—such as coal, petroleum coke (petcoke), biomass or waste—into synthesis gas (syngas).
The syngas can be burned to produce electricity or further processed to manufacture chemicals, fertilizers, liquid fuels, substitute natural gas (SNG), or hydrogen.
Gasification has been reliably used on a commercial scale worldwide for more than 60 years in the refining, fertilizer, and chemical industries, and for more than 35 years in the electric power industry.

TYPES OF

Waste Gasification

There are many types of gasifiers for waste gasification including Plasma Gasifiers.
These gasifiers vary in size and the type of MSW that they can gasify.
Some gasifiers are designed to gasify construction and demolition debris, others are for MSW.
Many gasifiers require some type of pre-processing of the MSW to remove the inorganic materials (such as metals and glass) that cannot be gasified.
Some gasifiers require the shredding, drying and sizing of the feedstock before it is sent into the gasifier.
A number of companies are developing smaller, compact gasifiers designed to be used by cities and towns or on military bases.

SYNGAS

Syngas Production

There are several common “non-gasification” processes that are used to produce synthesis gas (syngas) on an industrial scale. They are

1) Partial Oxidation,
2) Autothermal Reforming,
3) Steam Methane Reforming.

Syngas Cleanup

Syngas typically requires some level of cleanup in order to meet specific requirements for downstream processes.

This includes removal of particulate matter, sulfur compounds, chlorine compounds, nitrogen compounds, unreacted hydrocarbons, and heavy metals.

These contaminants can plug up reactors, cause corrosion, poison downstream catalysts, or prevent the plant from complying with environmental permits.

Syngas cleanup can also be used to selectively remove and concentrate specific gases, such as carbon dioxide (CO2) removal for compression and transportation by pipeline for either permanent underground storage or for use in enhanced oil recovery.

Several of the most common syngas cleanup processes are described below.

- Particulate Removal Processes;
- Tar Removal Processes;
- Mercury Removal;
- Sulfur and CO2 Removal Processes;

PLASMA GASIFICATION

Some types of gasification use plasma technology, which generates intense heat to initiate and supplement the gasification reactions.

Plasma gasification or plasma-assisted gasification can be used to convert carbon-containing materials to synthesis gas that can be used to generate power and other useful products, such as transportation fuels. In an effort to reduce both the economic and environmental costs of managing municipal solid waste, (which includes construction and demolition wastes) a number of cities are working with plasma gasification companies to send their wastes to these facilities.

One city in Japan gasifies its wastes to produce power. In addition, various industries that generate hazardous wastes as part of their manufacturing processes (such as the chemical and refining industries) are examining plasma gasification as a cost-effective means of managing those wastes streams.

Inside the gasifier, the hot gases from the plasma torch or arc contact the feedstock, such as municipal solid waste, auto shredder wastes, medical waste, biomass or hazardous waste, heating it to more than 3,000 degrees Fahrenheit.

This extreme heat maintains the gasification reactions, which break apart the chemical bonds of the feedstock and converts them to a synthesis gas (syngas).

The syngas consists primarily of carbon monoxide and hydrogen—the basic building blocks for chemicals, fertilizers, substitute natural gas, and liquid transportation fuels.

The syngas can also be sent to gas turbines or reciprocating engines to produce electricity, or combusted to produce steam for a steam turbine-generator.

Because the feedstocks reacting within the gasifier are converted into their basic elements, even hazardous waste becomes a useful syngas.

Inorganic materials in the feedstock are melted and fused into a glassy-like slag, which is nonhazardous and can be used in a variety of applications, such as roadbed construction and roofing materials.

What is Plasma

Plasma is an ionized gas that is formed when an electrical discharge passes through a gas. The resultant flash from lightning is an example of plasma found in nature. Plasma torches and arcs convert electrical energy into intense thermal (heat) energy. Plasma torches and arcs can generate temperatures up to 10,000 degrees Fahrenheit. When used in a gasification plant, plasma torches and arcs generate this intense heat, which initiates and supplements the gasification reactions, and can even increase the rate of those reactions, making gasification more efficient.

BENEFIT OF PLASMA GASIFICATION

Commercial Use

Plasma technologies have been used for over 30 years in a variety of industries, including the chemical and metals industries.
Historically, the primary use of this technology has been to decompose and destroy hazardous wastes, as well as to melt ash from mass-burn incinerators into a safe, non-leachable slag.
Use of the technology as part of the waste-to-energy industry is much newer.

Benefit

Plasma gasification provides a number of key benefits:

- It unlocks the greatest amount of energy from waste;
- Feedstocks can be mixed, such as municipal solid waste, biomass, tires, hazardous waste, and auto shredder waste;
- It does not generate methane, a potent greenhouse gas;
- It is not incineration and therefore doesn't produce leachable bottom ash or fly ash;
- It reduces the need for landfilling of waste;
- It produces syngas, which can be combusted in a gas turbine or reciprocating to produce electricity or further processed into chemicals, fertilizers, or transportation fuels—thereby reducing the need for virgin materials to produce these products;
- It has low environmental emissions;

Gasification Application And product

Carbon monoxide and hydrogen, the major components of syngas, are the basic building blocks of a number of other products, such as fuels, chemicals, fertilizers and substitute natural gas.
In addition, a gasification plant can be designed to produce more than one product at a time (co-production or "polygeneration"), such as electricity and chemicals, (for example, methanol and ammonia) or electricity and fertilizers.
The inherent flexibility of gasification to run different feedstocks, to produce a variety of products, and to co-produce products, makes it unique among manufacturing technologies

Waste Gasification - Recovering Energy

Faced with the costly problem of waste disposal and the need for more energy, a growing number of countries are turning to gasification, a time-tested and environmentally-sound way of converting the energy in MSW into useful products such as electricity, fertilizers, transportation fuels and chemicals.
On average, conventional waste-to-energy plants that use mass-burn incineration can convert one ton of MSW to about 550 kilowatt-hours of electricity.
With gasification technology, one ton of MSW can be used to produce up to 1,000 kilowatt-hours of electricity, a much more efficient and cleaner way to utilize this source of energy.
Gasification can help the world both manage its waste and produce the energy and products needed to fuel economic growth.

GASIFICATION VS INCINERATION AND PYROLISYS

Incineration literally means to render to ash

Increasingly, gasification is being used to convert municipal solid waste, or MSW, into valuable forms of energy.

While this type of waste has been burned, or incinerated, for decades to create heat and electricity, the gasification process represents significant advances over incineration.

In order to understand the advantages of gasification when compared to incineration, it's important to understand the significant differences between the two processes:

Incineration uses MSW as a fuel, burning it with high volumes of air to form carbon dioxide and heat.

In a waste-to-energy plant that uses incineration, these hot gases are used to make steam, which is then used to generate electricity.

Gasification is significantly different and cleaner than incineration

- In the high temperature environment in gasification, larger molecules such as plastics are completely broken down into the components of syngas, which can be cleaned and processed before any further use;
- Dioxins and furans need sufficient oxygen to form or re-form, and the oxygen-deficient atmosphere in a gasifier does not provide the environment needed for dioxins and furans to form or reform;
- Dioxins need fine metal particulates in the exhaust to reform; syngas from gasification is typically cleaned of particulates before being used;
- In gasification facilities that use the syngas to produce downstream products like fuels, chemicals and fertilizers, the syngas is quickly quenched, so that there is not sufficient residence time in the temperature range where dioxins or furans could re-form; and
- When the syngas is primarily used as a fuel for making heat, it can be cleaned as necessary before combustion; this cannot occur in incineration.

Gasification vs. Pyrolysis

- Pyrolysis is the thermal decomposition of the volatile components of an organic substance, in the temperature range of 400-1,400°F (200-760°C), and in the absence of air or oxygen, forming syngas and/or liquids. An indirect source of heat is used. A mixture of un-reacted carbon char (the non-volatile components) and ash remains as a residual. Burned toast is an example of pyrolysis.
- Gasification takes this to the next step. It occurs in a higher temperature range of 900-3,000°F (480-1,650°C) with very little air or oxygen. In addition to the thermal decomposition of the volatile components of the substance, the non-volatile carbon char that would remain from pyrolysis is converted to additional syngas. Steam may also be added to the gasifier to convert the carbon to syngas.
- Gasification uses only a fraction of the oxygen that would be needed to burn the material. Heat is supplied directly by partial oxidation of the carbon in the feedstock. Ash remains as a residual.

ENVIRONMENTAL BENEFITS OF GASIFICATION

Converting Waste to Energy

Each year the bulk of the world's municipal waste is disposed of in landfills. Gasification can convert this waste into electricity and other useful products, reducing the need for landfill space, decreasing methane emissions from the decomposition of organic materials in the landfill, and reducing the risk of groundwater contamination for landfills.

Gasification-based systems offer significant environmental advantages over competing technologies, particularly coal-to-electricity combustion systems and other waste-to- energy systems.

Carbon Dioxide

Gasification plants can capture carbon dioxide, the leading greenhouse gas, much more easily and efficiently than coal-fired power plants. In many instances, this carbon dioxide can be sold for Enhanced Oil Recovery (EOR) and other uses, creating additional value from the gasification process.

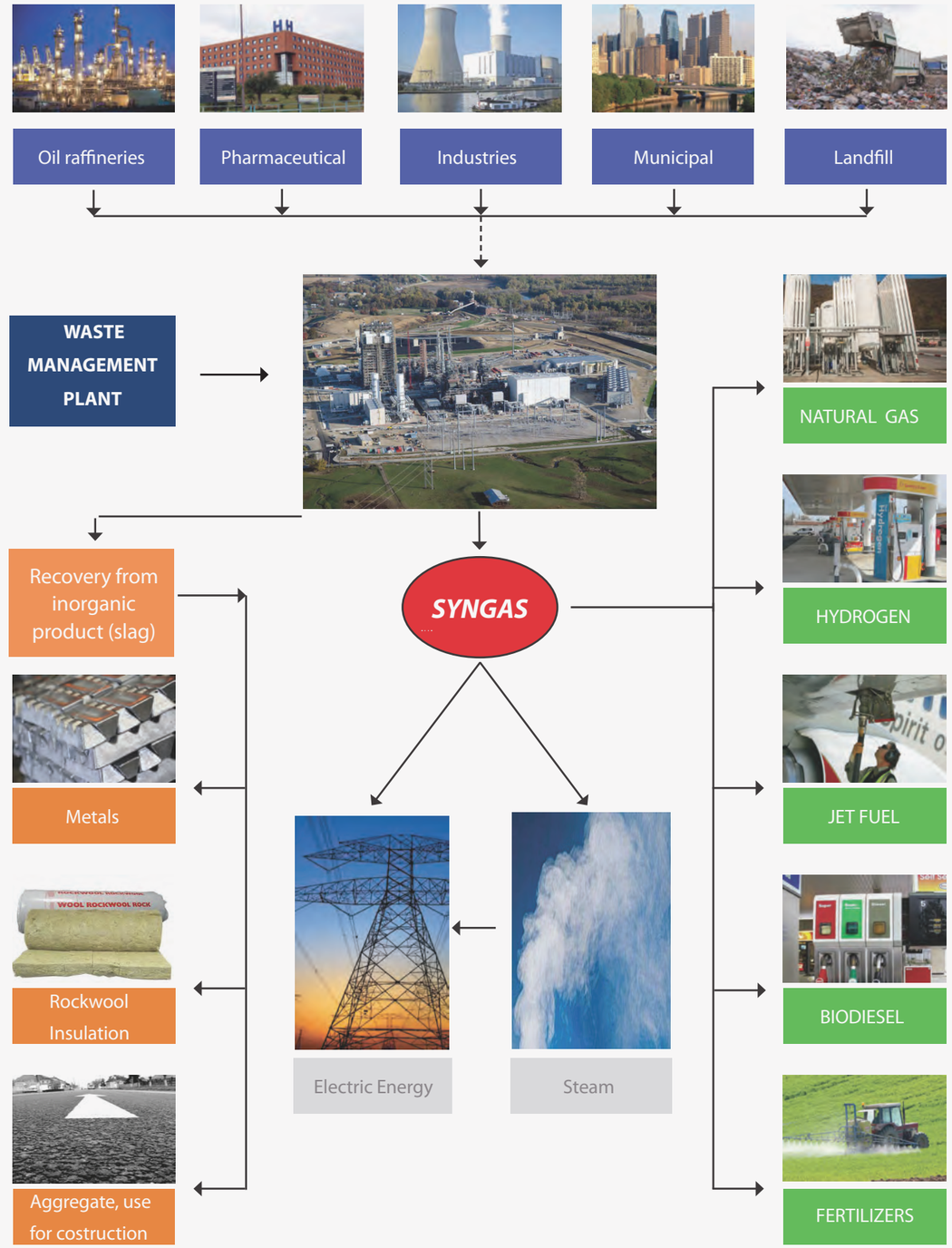
In a gasification system, carbon dioxide can be captured using commercially available technologies before it would otherwise be vented to the atmosphere.

Converting the carbon monoxide to carbon dioxide and capturing it prior to combustion is more economical than removing carbon dioxide after combustion, effectively "de-carbonizing" or, at least, reducing the carbon in the syngas.

Gasification plants manufacturing ammonia, hydrogen, fuels, or chemical products routinely capture carbon dioxide as part of the manufacturing process.

Solids Generation

During gasification, virtually all of the carbon in the feedstock is converted to syngas. The mineral material in the feedstock separates from the gaseous products, and the ash and other inert materials melt and fall to the bottom of the gasifier as a non-leachable, glass-like solid or other marketable material. This material can be used for many construction and building applications.



ECONOMIC BENEFITS OF GASIFICATION

- Gasification can be used to turn lower-priced, or negative-value feedstocks, such as petroleum coke, or municipal solid waste, into valuable products such as substitute natural gas, electricity, fuels, chemicals, and fertilizers;

- Gasification offers wide fuel flexibility. A gasification plant can vary the mix of solid feedstocks, or run on gas or liquid feedstocks-giving it more freedom to adjust to the price and availability of a feedstock;

- Gasification can convert municipal solid waste into power and valuable products-both reducing a city's cost for managing waste and providing a source of income as the waste becomes a commodity feedstock;

- The ability to produce a number of high-value products at the same time (polygeneration) also helps a facility offset its capital and operating costs.;

- Gasification byproducts (sulfur and slag) are readily marketable. For example, sulfur can be used in fertilizer production and slag can be used in roadbed construction and roofing materials;

- Gasification reduces a company's or a country's dependence on expensive imported natural gas by using its domestic resources to produce needed products and power;

- Gasification units require less emission control equipment because they generate fewer emissions, further reducing a plant's operating costs.

Gasification can compete effectively in high-price energy environments to provide power and products .
The ability to produce a number of high-value products at the same time (polygeneration) also helps a facility offset its capital and operating costs.

WASTE PLASMA GASIFICATION

The Plant is able to Process any kind of Waste toghether

The wastes are not burned but processed with Plasma Torch

The waste process does not produce pollution and ashes

The Wastes are transformed into energy, fuel, or subproducts.

The Plasma Gasification is able to process wastes deposited on Landfills

The Products recovered from Waste Process allows a very fast pay back

THE BEST TECHNOLOGY IN THE WORLD

OUR SERVICES IN THE WORLD

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- FEASIBILITY STUDY;
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- DESIGN AND PLANNING;
- INSTALLATION AND CONSTRUCTION;
- SUPPORT START UP PLASMA GASIFICATION PLANT;
- TECHNICAL TRAINING START UP;

OPTIONS:

- PARNERSHIP WITH LOCAL COMPANY OR COMPANIES FOR CONSTRUCTION AND MANAGEMENT PLANT;
- FINANCING INVESTMENT WITH OUR BANK PARTNERS;
- SUPPORT AND EQUIPMENT FOR WASTE COLLECTION.

REFERENCES

U.S.A.

UNITED KINGDOM

KOREA

CANADA

CHINA

JAPAN