

DESTROY YOUR LANDFILL METHANE FOR CLIMATE RECOVERY

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Abstract

The earth is coping with a crisis. The effect of technology in the industrialised world has resulted in greenhouse gas emission levels that are damaging the earth. Global warming will affect all of us if changes are not made to the amount of greenhouse gases including CO₂ and methane being put into the atmosphere. The operators of landfills are able to make their contribution to the minimisation of the effects of global warming, as every little bit will help.

The capture of methane created from the breakdown of the rubbish in landfills and its controlled combustion will be up to 23 times less damaging than letting the gas escape into the atmosphere. With the larger landfills, the generation of green electricity is viable and the possibility of a royalty payable to the operator from the contractor operating the landfill gas power station. For the smaller sites, where electricity generation is not viable, the collection and flaring of the gas is a logical choice.

This paper will consider the effects of landfills on the atmosphere and discuss the methodologies for the collection and burning of the landfill gases generated to make a safer environment.

Key Words: Climate change, landfill gas collection, flaring and power generation, renewable energy, emissions trading

Introduction

The earth is coping with a crisis and action has to be taken. The effect of technology within the industrialised world has resulted in greenhouse gas emission levels that are damaging the earth and threatening our way of life.

This paper will consider the effects of landfills on the atmosphere and discuss the methodologies for the collection and burning of the landfill gases generated to make a safer environment.

Background

The increase of the emission of greenhouse gases into the atmosphere, attributed to human activity, has led to global warming and changes to our climate, resulting in less rain in some parts of Australia leading to prolonged drought conditions and more intense storms in other parts of the country. Temperatures are increasing and wildfires are becoming more severe. These changes have been happening for the past 150 years, but have been accelerating in the last 50 years. Anyone who witnessed the first moon walk by Neil Armstrong will be able to identify changes to the climate within their lifetime.

Stern and Garnett have proven the economics of global warming.

Global warming will affect all of us if changes are not made to the amount of CO₂ we are putting into the atmosphere. We have to break the world's reliance on fossil fuels for meeting our energy needs.

The capture of methane created from the breakdown of the rubbish in landfills and its controlled combustion will be up to 23 times less damaging than letting the gas escape into the atmosphere.

There are six greenhouse gases contributing to global warming these being:

- Carbon Dioxide (CO₂)
- Methane (CH₄)
- Nitrous Oxide (N₂O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF₆)

Landfills emit both carbon dioxide and methane. According to the Methane to Markets Landfill Subcommittee, landfills were the third largest source of methane emissions in 2005.

Methodology

The operators of landfills are able to make their contribution to the minimisation of the effects of global warming and thus climate change, from the discharge of landfill gases.

This is one option to minimise the environmental risk from landfills. In many cases there will be an environmental landfill operational licence requiring the capture of landfill gas and its destruction on the larger or more recently constructed landfill sites.

With the larger landfills, the generation of green electricity is viable and the possibility of a royalty payable to the operator from the contractor operating the landfill gas power station. In Landfill Gas and Power's (LGP's) case, we believe the landfill would need to service a population of 150,000 people before the generation of electricity would become economically viable.

For the smaller sites, where electricity generation is not viable, the collection and flaring of the gas is a logical choice.

There are several key elements to a landfill gas recovery and utilisation system:

- The wellfield to collect the gas from the landfill;
- Gas pre-treatment plant to clean the gas for combustion;
- The power station to generate the electricity;
- Connection to the grid; and
- Flare to destroy any gas not combusted in the engines.

The landfill gas capture system comprises the installation of a series of wells on a grid layout to collect the gas, being post closure or during construction of an active cell. The design of the grid is determined by the landfill characteristics, such as surface area, depth of waste, type and compaction rates of the waste, surface slopes and type of final cover provided. These wells are connected by pipes to the collecting manifold, which delivers the gas to the power station via a vacuum pump. The wellfield operates under a slightly negative pressure to draw the gas out.

Gas delivered to the power station has to be prepared for combustion in engines modified for landfill gas. The pre-treatment process will vary depending on the composition of the landfill gas.

Once the gas has been cleaned ready for combustion, it is delivered to the engines. The number of engines and generating units will depend on the volume of gas being delivered from the landfill wellfield. New

engines typically have the capacity to generate from 1MW to 2MW of electricity. In LGP's case, we have a mix of engines generating from 650kW to 1MW of electricity at our four power stations thereby providing added flexibility and the opportunity to maximise electricity generation from the available gas supply.

The gas supply is generally constant, but can vary depending on a number of factors, including seasonal changes. Thus it is important to continually monitor the wellfield to ensure optimum gas that is being produced is captured and is available for combustion, thereby maximising electricity generation.

Electricity generated is pumped into the electricity grid and in LGP's case, sold to our contracted customers. The electricity grid provider charges an access service fee for using their infrastructure in getting the electricity to our customers and provides the meter reading service at the customer's end. Generally this type of landfill gas management system will have a flare, which is available for use in the event of the power station being out of action. This ensures compliance with the environmental requirements to dispose of the gas generated from the landfill in an acceptable environmentally friendly manner.

In time and beyond the closure of the landfill, the amount of gas generated will be insufficient for viable electricity operations. At this time, the power station would be removed and any remaining gas generated would be flared using the existing facility, or in some cases, where gas has declined considerably, a smaller flare may be required. Power station operations can be monitored from a remote central location and thus the stations can be down the street, in another state or even another country. On site personnel are required to attend to wellfield monitoring and undertake routine maintenance works.

In 2008, a total of US\$155 billion was invested in clean energy. This represents 10% of all infrastructure spending. Landfill gas recovery and its utilisation would represent a very small portion of this expenditure, yet its benefits to the environment are substantial.

Way Forward for Waste Management

Local governments are now starting to treat their waste by alternate waste treatment technologies known as AWTs. These plants already exist around Australia. Some of these AWTs use anaerobic decomposition processes thereby generating methane gas that is collected and either flared or combusted for electricity generation depending on the quantity of gas being generated by the process used. This is another option for reducing the greenhouse gas emissions for the management of waste. Likewise, bio-reactor landfills turn landfilling into an on-going business by re-using the same land indefinitely operating on three cells being: Phase 1: filling; Phase 2: decomposition including landfill gas recovery; and Phase 3: mining of the waste for re-use of the cell. There are already a number of bio-reactor landfills operating in Australia.

Federal Government Action

The Howard Federal Government set its targets under the Mandatory Renewable Energy Target (MRET) through until 2020 and was looking for further gains from technological advances. The target saw an increase in generation capacity from 300GWh in 2001 to 9,500GWh before 2010 and to maintain this level until 2020. With the new Rudd Federal Government, the MRET target is being reviewed and it is expected to be increased to 20% by 2020 and will incorporate the existing State schemes. This is subject to passage through Parliament.

As well, the Rudd Federal Government has announced Australia will have an Emissions Trading Scheme (ETS), to be known as the Carbon Pollution Reduction Scheme, and it will be operational by 2011. Again, this is subject to passage through Parliament. The proposed ETS will cover stationary generators, the transport and waste sectors making it a more comprehensive scheme than the European model (EU ETS). It will be a cap and trade scheme.

Our Company

LGP is owned by ACE Holdings, a West Australian company, which has taken the extraction and application of landfill gas as a safe, clean and reliable energy source from

concept to reality in Western Australia. With a growing list of successful projects and recognition for its work, LGP is emerging as a market leader in the development of waste to energy technologies. From its 16 years experience in the waste to energy industry, LGP has developed the **LGP Clean Technology Process**.

LGP currently owns and operates four waste-to-energy Power Stations in Perth, Western Australia located at Red Hill, Canning Vale, Kalamunda and Tamala Park and manages the gas emissions from six metropolitan landfill sites located nearby to these power stations. The company derives income from the sale of electricity to private industry consumers, pursuant to supply contracts and the sale of the RECs it creates from its generation of renewable electricity. More information is available from the LGP web site at www.landfillgas.com.au

Conclusion

Our planet is changing as a result of human activity. The level of awareness around this issue is changing rapidly and it has now become a major political issue in many countries and policies supporting renewable energy are being implemented. Immediate action is required to reverse the trends and to ensure the long term viability of the planet and the lifestyles that we enjoy.

Local government, regional councils and landfill operators have an obligation to operate their landfills in an environmentally sustainable manner. One key aspect of this is the collection and proper disposal of the landfill gas generated.

The generation of electricity, in addition to minimising the environmental effects of the gas generated by the landfill is producing renewable green electricity and is therefore offsetting the need for additional black electricity generated from fossil fuel products. It therefore has a compounding benefit for the environment.

If your landfill does not presently have a gas extraction system and a method of burning the collected gas, the time to consider the option is now.

References

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