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FUTURE TRENDS IN WASTE MANAGEMENT

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I. INTRODUCTION

Future trends in Waste Management totally depend on production, generation and disposal of Waste and will affect the future of this industry. Amounts of waste are largely determined by two factors: first, the population in any given area and the second, its consumption pattern- which are controlled by the developments surrounding the Gross Domestic product per capita (GDP/c). According to the United Nation report, between now and 2025, the world population will reach at least 8 billion inhabitants (from about 7 billion today). More over by 2050, the world population will be around 9.5 billion unless specific control measures are adopted to curb population growth. This is also expected to boost urbanization of population, and the extended zones of poverty around and inside megacities and metropolitans. The number of slum inhabitants will double around 2025 to reach 1.5 billion. Beside overpopulation, a remarkable increase in GDP/c is also on its way. Obviously, both the increase in population and the remarkable growth of global GDP/c will drive an increase in waste volumes. Also the bigger the GDP/c, the more advanced and effective waste management systems and technologies will be put into place. So this increase in global GDP/c will certainly multiply modern landfills, mechanical biological treatment (MBT) and waste-to-energy (WTE) facilities around the world.

It has been estimated that a 1% increase in national income creates a 0.69% increase in municipal waste amount. But there is also some good news. It is known that the bigger the GDP/c, the more advanced and effective waste management systems and technologies are put in place. So that global GDP/c growth will certainly multiply modern landfills, efficient collection systems, Mechanical Biological Treatment (MBT) and waste-to-energy (WTE) facilities around the world. A lot of waste infrastructure development is coming and technological advances will be globalized much more than they are today.

II. MODERN LANDFILL

Modern landfills are designed, sited, engineered, operated, regulated, tested and monitored in a safe and environmentally responsible manner. Protective landfill liners made of clay and plastic cover the bottom of the landfill preventing landfill liquids, called leachate, from entering the ground or

surface waters. This leachate is collected and treated, often at the waste water treatment plant. At the end of each working day, that day's waste is covered usually with six inches of soil. This soil serves to prevent unwanted animals from digging into the trash, prevents wind-blown litter, and reduces odors.

Modern landfills collect and treat gas that is produced by decomposing organic material in the waste. The significant role of new technologies in landfill development and management may surprise some. This is a science-based industry that employs civil and environmental engineers, chemists, soil experts, biologists, geologists and hydrologists to protect today's environment while developing the sustainable waste management practices of the future.

III. MECHANICAL BIOLOGICAL TREATMENT (MBT)

A mechanical biological treatment (MBT) system is a type of waste processing facility that combines a sorting facility with a form of biological treatment such as composting or anaerobic digestion. MBT plants are designed to process mixed household waste as well as commercial and industrial wastes.

The terms mechanical biological treatment or mechanical biological pre-treatment relate to a group of solid waste treatment systems. These systems enable the recovery of materials contrained within the mixed waste and facilitate the stabilisation of the biodegradable component of the material. The sorting component of the plants typically resemble a materials recovery facility. This component is either configured to recover the individual elements of the waste or produce a Refuse-derived fuel that can be used for the generation of power. The components of the mixed waste stream that can be recovered include Ferrous Metal, Non-ferrous metal, Plastic and Glass.

Mechanical sorting: The "mechanical" element is usually an automated mechanical sorting stage. This either removes recyclable elements from a mixed waste stream (such as metals, plastics, glass and paper) or processes them. It typically involves factory style conveyors, industrial magnets, eddy current separators,

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trammels, shredders and other tailor made systems, or the sorting is done manually at hand picking stations. The mechanical element has a number of similarities to a materials recovery facility (MRF).

Some systems integrate a wet MRF to separate by density and floatation and to recover & wash the recyclable elements of the waste in a form that can be sent for recycling. MBT can alternatively process the waste to produce a high calorific fuel termed refuse derived fuel (RDF). RDF can be used in cement kilns or thermal combustion power plants and is generally made up from plastics and biodegradable organic waste. Systems which are configured to produce RDF include the Herhof and Ecodeco Processes.

IV. BIOLOGICAL PROCESSING

The "biological" element refers to either: Anaerobic digestion harnesses anaerobic microorganisms to break down the biodegradable component of the waste to produce biogas and soil improver. The biogas can be used to generate electricity and heat.

Biological processing can also refer to a composting stage. Here the organic component is broken down by naturally occurring aerobic microorganisms. They breakdown the waste into carbon dioxide and compost. There is no green energy produced by systems employing only composting treatment for the biodegradable waste.

In the case of biodrying, the waste material undergoes a period of rapid heating through the action of aerobic microbes. During this partial composting stage the heat generated by the microbes result in rapid drying of the waste. These systems are often configured to produce a refuse-derived fuel where a dry, light material is advantageous for later transport and combustion.

Some systems incorporate both anaerobic digestion and composting. This may either take the form of a full anaerobic digestion phase, followed by the maturation (composting) of the digestate. Alternatively a partial anaerobic digestion phase can be induced on water that is percolated through the raw waste, dissolving the readily available sugars, with the remaining material being sent to a windrow composting facility.

By processing the biodegradable waste either by anaerobic digestion or by composting MBT technologies help to reduce the contribution of greenhouse gases to global warming.

V. WASTE-TO-ENERGY (WTW)

Waste-to-energy (WTE) or energy-from-waste (EFW) is the process of generating energy in the form of electricity and/or heat from the primary treatment of waste. WTE is a form of energy recovery. Most WTE processes a combustible fuel commodity, such as methane, methanol, ethanol or synthetic fuels.

The first incinerator or "Destructor" was built in Nottingham UK in 1874 by Manlove, Alliott & Co. Ltd. to the design of Albert Fryer. The first US incinerator was built in 1885 on Governors island in New York, NY. The first waste incinerator in Denmark was built in 1903 in Frederiksberg. The first facility in Czech Republic was built in 1905 in Brno.

Incineration:- Incineration, the combustion of organic material such as waste with energy recovery, is the most common WTE implementation. All new WTE plants in OECD countries incinerating waste (residual MSW, commercial, industrial or RDF) must meet strict emission standards, including those on nitrogen oxides (NO_2), sulphur dioxide (SO_2) heavy metals and dioxins. hence, modern incineration plants are vastly different from old types, some of which neither recovered energy nor materials, Modern incinerators reduce the volume of the original waste by 95-96 percent, depending upon composition and degree of recovery of materials such as metals from the ash for recycling.

Incinerators may emit fine particulate, heavy metals, trace dioxin and acid gas, even though these emissions are relatively low from modern incinerators. Other concerns include proper management of residues: toxic fly ash, which must be handled in hazardous waste disposal installation as well as incinerator bottom ash (IBA), which must be reused properly.

Critics argues that incinerators destroy valuable resources and they may reduce incentives for recycling. Because of stringent regulations, waste incineration plants are no longer significant in terms of emissions of dioxins, dust, and heavy metals.

VI. WTE TECHNOLOGIES OTHER THAN INCINERATION

There are a number of other new and emerging technologies that are able to produce energy from waste and other fuels without direct combustion. Many of these technologies have the potential to produce more electric power from the same amount of fuel than would be possible by direct combustion. this is mainly due to the separation of corrosive components (ash) from the converted fuel, thereby allowing higher combustion temperatures in e.g. boilers, gas turbines, internal combustion engines, fuel cells. Some are able to efficiently convert the energy into liquid gaseous fuels.

The rapidly growing stream of Electrical and Electronic equipments Waste (WEEE) is also to be considered. As the world becomes more and more networked and interconnected, and as electronic and electric products are rapidly devalued and become waste due to fast updates, the WEEE stream will become a major challenge for future waste management. As the electronic goods become less and less expensive, the willingness to throw them away will also increase, and which will make reuse more difficult.

As the time passes by, our world will be overpopulated and more and more networked and interconnected. This increased capability demands new forms of global cooperation. And although there are appropriate waste management solutions, the main problem is the global framework that should put them in place in an effective manner, which will help counter the increasing amount of waste-related problems and will achieve the target of a system with a maximum potential to deal with waste related issues.

New challenges are emerging and the current situation must be seen in a different way. Our waste management systems and our market conditions are incapable of handling the growing amounts of waste globally. So unless a new paradigm of global co-operation and governance is adopted a tsunami of uncontrolled dumpsites will be the prevailing waste management method especially in developing countries of Asia and Africa. We need to outline the major trends and challenges that will shape the future of waste management for the next few decades. Although in our complex and unpredictable world prediction is very difficult, especially about the future trends in waste management. There are certain trends and facts that more or less create the bigger picture in which the waste management system will evolve.

The waste management industry relies on material science innovation and big data, and the companies use these two tools well will win the competition. Material science innovation will help recyclers know how to smartly use their waste stream to make valuable products, which is to improve profitability of these companies. Big data guides recyclers about how they can optimize their supply chain and realize low cost in the whole process of waste material collection, waste processing, and recycled material delivery to customers.