

Waste Management – A Perspective

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Abstract:- This paper provides the reader with an understanding of the types of solid waste, disposal methods and its advantages and disadvantages as well as available technologies such as ISWM, WTE and Thermolysis solid waste processing with the aim of raising awareness that technology is available. to reduce untreated waste disposal in a manner that is not detrimental to public health. According to the Ministry of Environment, of the Government of India 75-80% of municipal waste is collected but only 22-28% of this waste is collected , processed and treated It is projected that "Garbage generation will increase from 62 million tons to 165 million tons by 2030," It is, therefore, imperative to mention that there is a need to raise awareness and that there is still much to be done in waste management so that the amount of waste

processed or treated in the country increases from 22-28% to at least 70% by 2030.

SYNOPSIS:- According to the Ministry of Environmental & Forests (1) it is estimated that 62 million tons of solid waste are generated annually in the country where only 22-28% of this waste is processed in an environmentally friendly manner. The rest goes to the garbage dump. Declaration In order to successfully achieve a high percentage of solid waste processing, solid waste classification needs to be done. Non-perishable waste can be used to make compost or fuel to remove waste from the Power Plants or to fill the gas thus reducing solid waste sent to the landfill. Hazardous waste such as plastic, waste rubber, debris and medical waste can also be processed using a thermolysis / Plasma process [1] to convert this waste into oil / gas.

Figure 1 is a Pie chart depicting the typical percentage & type of wastes found in I garbage

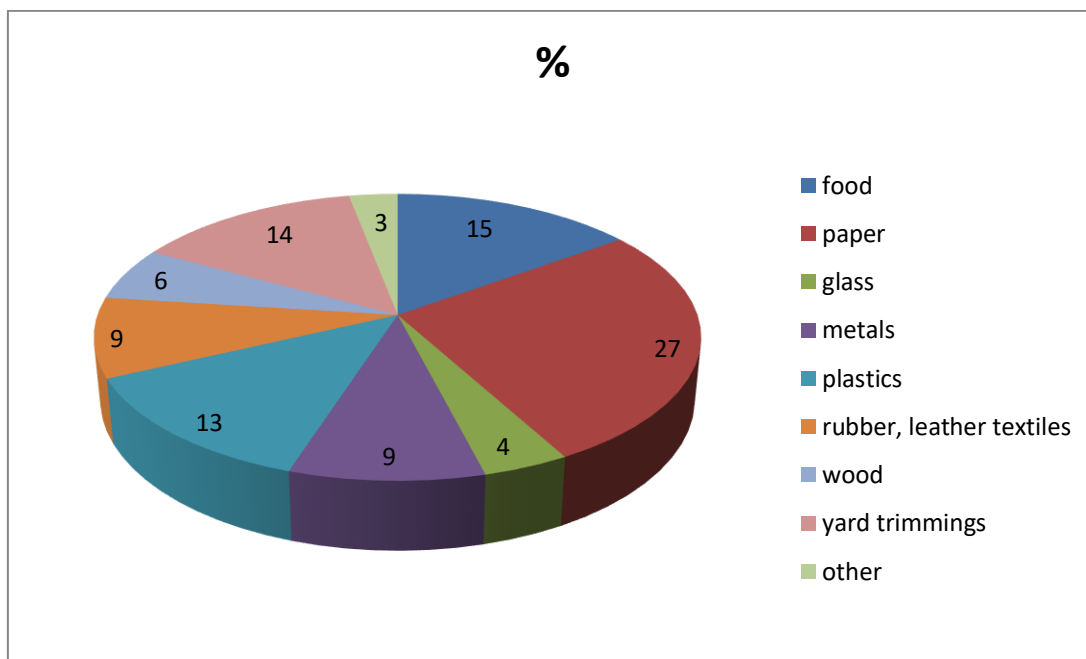


Fig. 1: Typical percentage of wastes found in garbage

I. INTRODUCTION

The Department of Environment in 2016 reviewed Strict Waste Management Regulations after 16 years. The then Minister of State (Independent Paymaster) for Environment, Forestry and Climate Change , Shri Prakash Javadekar [1] said that the Laws are now in place outside municipal areas as well and will extend to the integration of cities, census towns, notified industrial townships as well as areas under government control i.e. Indian Railways, airports, airport, sea port, security centers, special economic zones, regional and central government agencies, tourist destinations and significant religious centers of history.He

added that 62 million tons of waste was generated annually in the country, of which 5.6 million tons were plastic waste, 0.17 million tons was natural waste, hazardous waste production was 7.90 million tons per year and 15 lakh tons. e-waste. He added that per capita waste production in Indian cities ranges from 200 grams to 600 grams per day. Shri Javadekar stressed that 43 million TPAs are collected, 11.9 million are treated and 31 million are dumped in landfills, meaning that about 75-80% of municipal waste is collected and only 22-28% of this waste is collected .processed and treated. "Garbage generation will increase from 62 million tons to 165 million tons by 2030," he said.

The above shows the worst case scenario regarding solid waste management in the Indian state. It is therefore imperative to mention that there is a need to raise awareness and that there is still much to be done in waste management so that the amount of waste consumed in the country increases from 22-28% to at least 70% by 2030.

The key features of the SWM Rules [1] (Solid Waste Management Rules) issued by the Department of Environment and Forestry, India, 2016 are:-

- Trash Generator Bonds have been made to separate waste into three streams, Wet (Decay), Dry (Plastic, Paper, metal, wood, etc.) and hazardous household waste (nappies, nappies, empty containers for cleaning materials, materials, etc.) and to provide separate waste to authorized collectors or collectors of waste or local bodies.
- The integration of garbage collectors / garbage collectors and waste sellers / Kabadiwala into a formal system must be done by the Provincial Government, and the Self Help Group, or any other group to be established.
- No person shall dispose of, burn or dispose of solid waste created by him, on roads, public open spaces outside his or her premises, or in ditches, or in wet areas.
- The Trash Generator will be required to pay 'User Fee' to the Trash Collection and 'Spot Fine' Disposal and Non-Disposal
- All hotels and restaurants must dispose of biodegradable waste and establish a collection system or follow a collection plan established by the local council to ensure that such food waste is used for composting / biomethanation.
- All welfare organizations and markets, community communities and institutions with an area of more than 5,000 sq. M. m should separate the waste from the source of dry waste such as plastic, tin, glass, paper, etc. authorized waste collectors or licensed recyclers, or an urban local body.
- The developers of the Special Economic Zone, industrial area, industrial park will place at least 5% of the total building area or 5 sites / sheds for recycling and reuse.
- All such product owners who sell or market their products in non-perishable packaging should have a packaging waste collection system created for their production.
- All petroleum industries located within 100 km of the RDF waste processing plant will make arrangements to replace at least 5% of their fuel demand with the RDF produced as such.
- A high amount of calories from non-perishable waste will be used for joint processing in cement or thermal power industries.
- Construction and demolition waste should be stored and disposed of separately, in accordance with the Construction and Demolition Waste Management Regulations, 2016.
- Agricultural waste and garden waste generated ANY area must be disposed of in accordance with the guidelines of the local council.
- In the event that the land is not available, efforts will be made to establish a regional landfill site for the use of vacant waste and residual wastes (2,3).

II. SOLID WASTE MANAGEMENT METHODS

Solid waste refers to a large amount of waste from animal and human waste disposal as unwanted and useless. Solid waste is produced by industries, residential and commercial areas anywhere, and needs to be disposed of in an environmentally friendly manner.

Regardless of the origin, content or potential hazard, solid waste must be managed and disposed of in a systematic manner to ensure acceptable local practices. Since solid waste management is an important aspect of environmental cleanliness, it needs to be included in any environmental planning.

Solid waste can also be classified as perishable and non-perishable waste.

A. NON PERISHABLE WASTES:

Ferrous & Non Ferrous Metal Residues, Glass, Sandstones, E Waste, Medical Waste, Plastic and Rubber including other Non-perishable litter in the above system fall under this category.

B. PERISHABLE WASTE:

Perishable waste can be used in a waste disposal facility, i.e. incinerated, incinerated under natural conditions or converted to compost while non-biodegradable waste if disposed of cannot be sent to a landfill or incinerator. Non-Biodegradable waste is also classified as HERFUL as metal, glass, certified sand products AND DANGEROUS such as rubber, e-waste, medical and plastic waste etc. The typical structure of solid municipal waste is shown in Figure 1 on the Pi chart below:

III. DIFFERENT WAYS TO DISPOSE OF WASTE

- **TREATMENT:** The most commonly used waste management methods DISPOSAL. This method is declining in popularity these days due to environmental problems, strict regulations and a lack of space. The strong presence of methane and other dumping gases emanating from dumping sites can be dangerous. Landfills create air and water pollution that greatly affects the environment and can be dangerous to the lives of people and animals living near you.
- **INCINERATING** is a practice in countries where landfills are no longer available,
- **BIO TREATMENT:** Composting is a simple and natural process of bio-degradation that takes up organic waste i.e. plant waste and garden and kitchen waste and turns it into nutritious food for your plants. Composting, which is usually used for organic farming, occurs by allowing organisms to stay in one place for months until the bacteria rot. Composting is one of the best ways to dispose of waste as it can convert unsafe natural products into safe compost. On the other hand, the process is slow and takes up a lot of space.

- **PLASMA GASIFICATION [2,4]** Plasma gasification is another way to control waste. Plasma is basically a gas-charged or highly ionized gas. (Light is a single type of plasma that produces temperatures above 12,600 ° F). With this waste disposal method, the furnace uses plasma torches operating at + 10,000 ° F creating an air intake of up to 3,000 ° F to convert solid or liquid waste into syngas and vitrified residues that do not work .During solid solid treatment. . waste by plasma gasification waste molecule bonds are broken due to high temperatures in the furnace and basic components. Some bacteria are resistant to moderate temperatures so medical waste is best processed in plasma furnaces to ensure safe disposal.
- **RETURN AND REVIEW:** Acquisition is a process of taking useful waste disposal items into solid waste for future use. These discarded materials are then processed to extract or replace raw materials or convert them into commercial articles and / or energy in the form of usable heat, electricity, or fuel.

Recycling is the process of converting waste into new products to reduce energy consumption and the use of new raw materials. Recycling is the third part of the Minimize, Recycle and Recycle the waste category. The idea of recycling is to reduce energy consumption, reduce the amount of landfills, reduce air and water pollution, reduce greenhouse gas emissions and conserve natural resources for future use.

- **WASTE CONTROL:** [3] a solid waste treatment process. Provides a variety of solutions for recycling non-waste products. It is about how garbage can be used as an important resource. Waste management is a requirement for every Government, Business Housing and Home in the world. Waste management disposes of the products and services we use in a safe and efficient manner while providing additional value from recycled products.

Waste management or waste disposal is all the activities and steps required to manage waste from the beginning to the end of its disposal. This includes, among others, collection, transportation, segregation, waste management and disposal as well as monitoring and control. It also incorporates a legal and regulatory framework related to waste management including recycling guidelines and more. ”

There are four main groups of waste management methods, each of which is also divided into many smaller categories. Those groups include resource reduction and

reuse, animal feed, recycling, composting, fermentation, landfills, incineration and land use.

- **Garbage disposal;** - Daily dumping of rubbish / rubbish in landfills is the most popular method of disposing of waste. This waste disposal program is focused on eliminating waste in the country. Garbage dumps are often found in developing countries. However, this method of dumping is frustrating by environmentalists around the world because of the huge impact on the environment and human health.
- **Burning / Incineration:** Burning or incineration is a method of disposal where solid municipal waste is burned at high temperatures to be converted into harmless residues and gaseous products. The main advantage of this type of method is that it can reduce the amount of solid waste to 20 to 30 percent of the initial volume and reduce the space they take up / reduce the waste disposal pressure. This process is also known as heat treatment in which solid waste is converted by Incinerators into heat, flue gas, and ash. However, this method involves the disposal of all waste that may be contaminated by bio / hazardous waste, prior to incineration. This process is still unconventional due to greenhouse gas emissions / toxic gases / emissions from the atmosphere. In addition, the heat generated is not used efficiently leading to wasted energy.
- **Integrated Solid Waste Management (ISWM):** ISWM is a very important term in the field of waste management. Refers to the selection and implementation of appropriate management systems, technologies, and strategies to achieve the objectives and objectives of waste management.

The ISWM process involves transferring waste over magnetic separators to separate metal metals and subsequently transfer over Eddy Current separator to separate incoming metals, glass, discarded debris and plastics. The waste is then passed through a liquid bed dryer where hot air (a mixture of Flue gases from the furnace and cold air) is used to remove the rotting decay and thus wipe it off.

About 2500 to 3500kcal / kg calorific pellets are supplied to the ISWM Bio gas generators to produce gas and use the same in power generators to generate energy.

SWM residues i.e. ash comprises about 30% of the inlet pellets and can be used as a filler in the mud used to make blocks or to be sent to a landfill .Block diagram of a typical ASWM plant scheme is shown in Figure 2

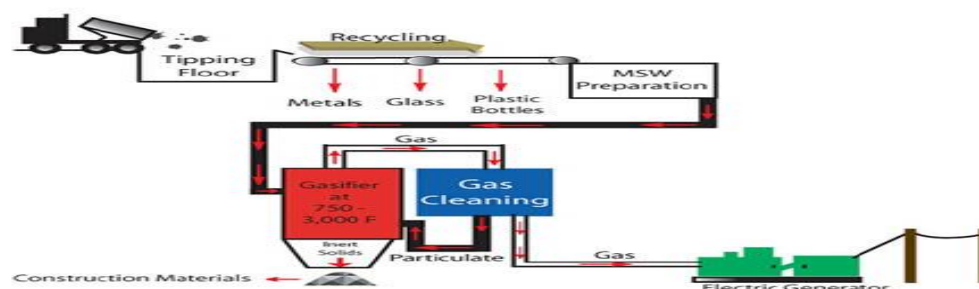


Fig. 2: Typical process flow representation of the ISWM processing plant

• **Waste to Energy (WTE) [3]** The process involves the conversion of recyclable waste into useful heat, electricity, or fuel by various processes. This type of energy source is a renewable energy source as recyclable waste can be used repeatedly to create energy. It can also help reduce carbon

emissions by eliminating the need for energy from fossil fuels. Waste-to-Energy, also known by its acronym WTE for the production of energy by heat or electricity from waste.

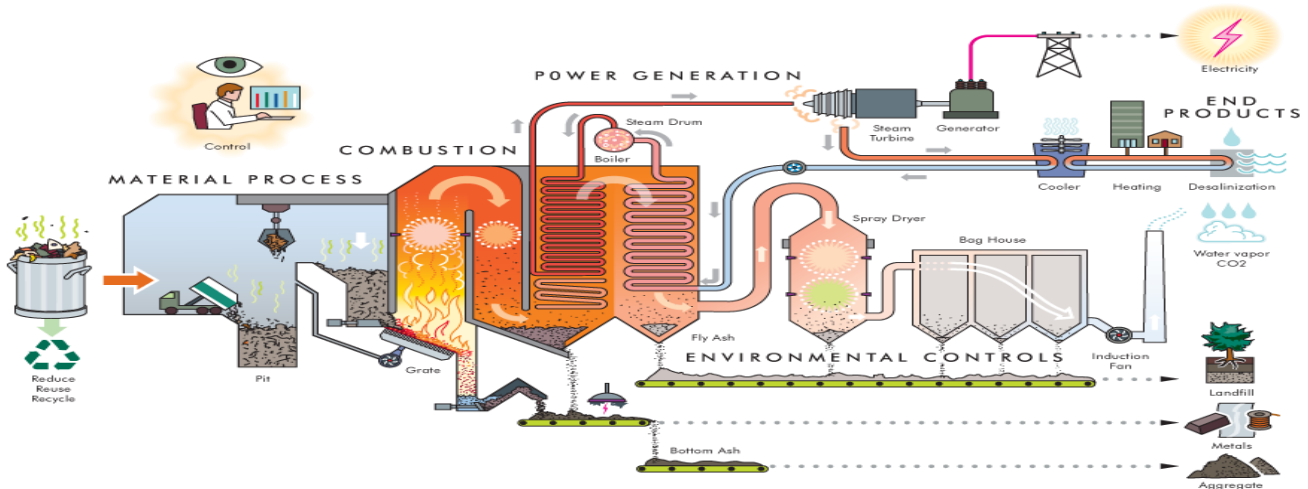


Fig. 3: showing general waste (WTE) on energy plants

WTE Energy plants as shown above comprise of a material process chamber wherein waste is fed. The waste enters combustion chamber where they burn. The hot flue gases pass through the cluster of steam coils water pumped into the coils is converted to high pressure steam which operates the power generation turbine. Environment control

equipments process the spent flue gases to separate ash and other impurities before letting the flue gas enter the atmosphere through the chimney. From the Ash metals and other non-combustibles can be segregated the residual ash can then be used as a filler for cement block.

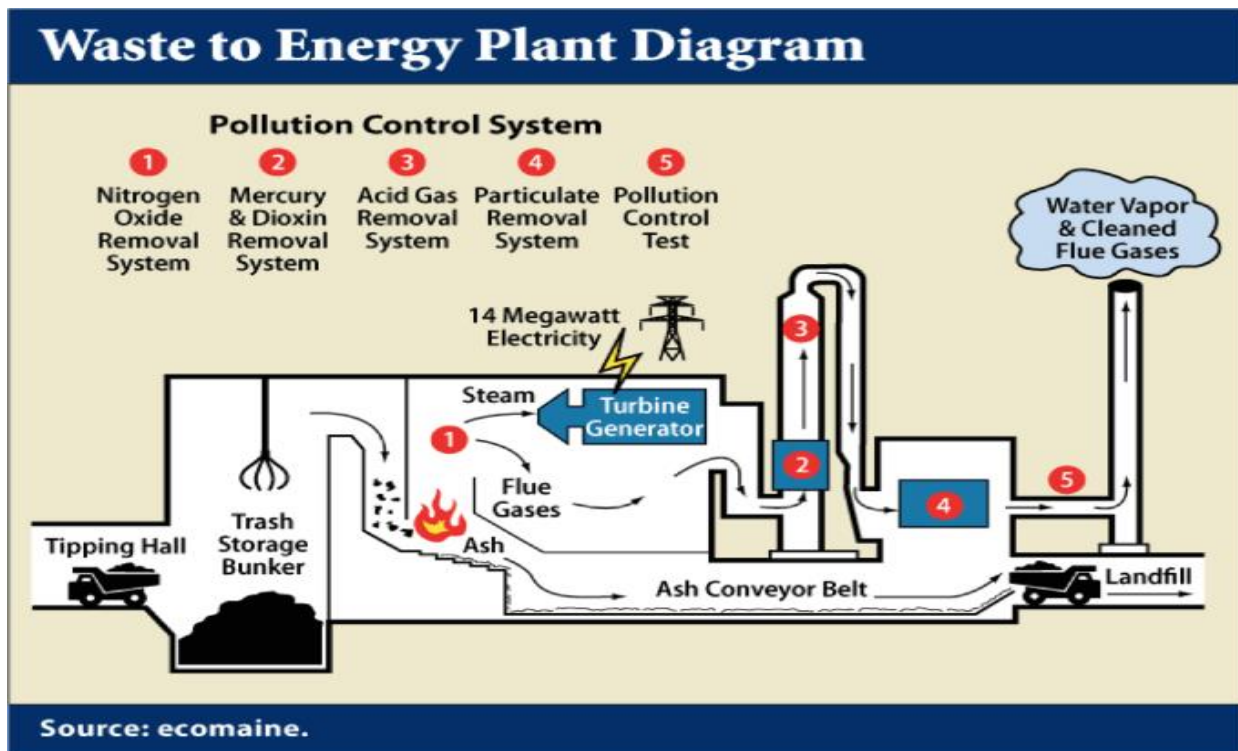


Fig. 4: schematic of another Waste to Energy plant In the ISWM and WTE waste management process, non-ferrous metal residues, rubber, glass and plastics are separated from the furnace litter.

IV. METALS

- **Metal and glass residues** are valuable as they can be sold to dealers in scrap metal and discarded glass to recycled mills for these products to produce additional final products.
- **PLASTICS AND RUBBER:** [4] Plastic and rubber fall into the category of `Harmless Bio Damage` As they burn at high calorie value. However, when used on burning plants it will produce toxic gases that will be released into the atmosphere by flue gases. Therefore, these materials are not used in ISMP & WTE plants About 80% of recycled plastics by melting and recycling of recycled waste plastic. Pellets are used as a combination with stainless plastic pellets in molding machines to produce commercial articles thus recycling plastic waste.

The 20% balance of reusable plastic and rubber for commercial use (in the Indian average of 1.2 million metric tons) cannot be shipped to a landfill or burned but can be processed through a process known as Thermolysis or Pyrolysis.

V. WHAT IS THERMOLYSIS / PYROLYSIS?

It is the technology of the future.— Has great economic strength, 2 oil waste, less ventilation technology especially on disposable plastics and rubber Can work with different types of inputs: discarded tires, disposable wood, car batteries, RDF, electric waste, plastics and much more. With regard to combustion of waste thermolysis decomposes

without hot organic matter and plastics in their original state namely Hydrocarbons. In contrast to the combustion process the thermolysis / pyrolysis process almost never emits.

VI. PYROLYSIS TECHNOLOGY

Plastic waste is delivered to the DE polymerization reactor along with a catalysts in the absence of air through a hydraulic feeder. At a temperature of about 750 o C the plastic melts and depolymerizes into hydrocarbon fractions in presence of the catalyst and under oxygen free conditions. The hydrocarbon vapors are condensed in a water cooled condensers which is the product fuel oil . The non-condensable flammable hydrocarbon gases are used to fire the furnace resulting in the process being self sufficient as far as energy for depolymerisation is concerned Figure -5 shows process flow diagram of a typical plastic to fuel oil plant that could process waste plastics and convert the same to fuel oil which can be further fractionated to produce value added Hydrocarbon chemicals.

The Solid residues left after the depolymerisation consist of carbon and fillers that were in the plastic. The residue is removed from time to time from the reactor and can be used as a filler in block making or sent to a waste disposal site.

Fig-5, Process flow diagram of the " Plastic to fuel oil plant " designed, installed and operated by Ashok Agarwal the author of this paper.

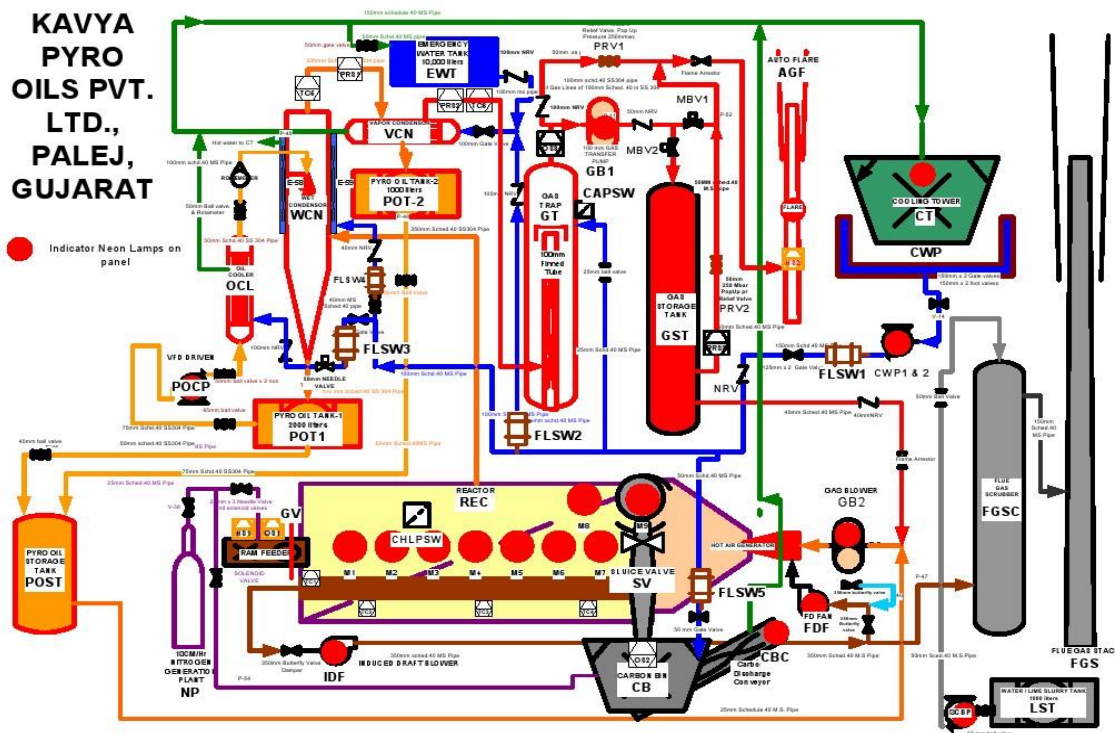


Fig. 5: Process flow diagram of a 10MT/Day continuous plastic pyrolysis plant of a project I installed and operated in village,Palej, Dist Bharuch, Gujarat. (2013-2016)

The product pyrolysis oil does not contain Sulfur or chloride; it is therefore important as a potential raw material in various industrial sectors. It also helps the community at large in disposal of non bio degradable plastic and rubber wastes while producing fuels that replace fossil fuels. Plastic / Rubber plants to Oil are installed in Germany, the United Kingdom, Japan and the United States of America. The overnment provides high levels of support/subsidy for such plants in these countries. However ,such green projects do not enjoy any subsidy or benefits in India and hence provide no encouragement to investor. If government subsidies are made available in such industries in India many such plants processing Plastics/rubber to Fuel Oil plant would get installed to process the hazardous waste now being forcibly sent to the landfill.

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