

## ARTICLE 5: Waste Recycling is our Future – Introduction of GLO Technology

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Abstract:

The EU community in its declaration and in compliance with the reference document of the waste incineration techniques - BREF-WI, ranks pyrolysis among the top future technologies for solving problems of non hazardous waste. In accordance with the adoption of the directive for integrated pollution prevention and control – IPPC, that encourages companies to start implementing best available techniques (BAT), the BHRI marketing Ltd. has come up with the idea for improved pyrolysis technology. The GLO (Green Line Oil) improved technology - is a direct result of BHRI's own innovation. The innovative aspect, called Bi-molecular EF Pyrolysis System of GLO technology is that it helps to reduce greenhouse emissions by decomposition of the NO<sub>x</sub> and SO<sub>x</sub> particles and with its own resources of power and water supply it helps preserving natural resources. The closed process of the pyrolysis system enables clean and environmentally acceptable process while the classical incineration plants are still ecologically questionable. The GLO aims towards introduction of ecological and innovative technology and towards entering the European markets whose goal is to prevent and reduce negative effects on the environment (decreasing greenhouse gas emission) and to contribute to an optimum use of resources. The BHRI Institute's goal is overcome the gap between development and commercialization of ecological solutions by introducing innovative technology to EU markets. This sort of device that produces gasoline and diesel through pyrolysis procedure (waste plastic that cannot be recycled through existing technologies, according to statistic data it has to be transported to an incineration plant in Austria) is new to Slovenian and EU market and it represents a whole new approach to waste recycling.

## Introduction:

The procedure of thermal molecular decomposition of waste material through pyrolysis process – GLO presents highly complex and innovative technological solution that introduces a new eco-friendly waste recycling and therefore contribute to reduction of negative environmental impacts and contribute to optimal use of resources. GLO presents low cost, energy effective closed loop technology that does not contaminate the environment because the output products are uncontaminated warm water and energy rich and neutralized hard and liquid particles. The introduced pyrolysis process is based on the innovative procedures of the BHRI marketing Ltd. In compliance with the 2000/76/ES Directive it does not classify under incineration plant or under waste removal plant because the process of recycling goes on without oxygen. The main goal is to produce energy resources and raw materials while at the same time contributing to the environment and economic efficiency. In the described procedure the input waste is thermally degraded at around 450C. In this decomposition the released heat produces matters in gas or liquid phase which can be used as energy source for further pyrolysis process handling or can partially be sold. The described technological procedure is energetically accomplished solution where as a part of obtained products can be reused as combustion means for raising the temperature and for incinerating input materials-waste. The hazardous gases (NO<sub>x</sub> and SO<sub>x</sub>) are not emitted into the environment but are neutralized in the innovative process reaction hard-gas. They are extracted as liquid and hard particles with higher energy value. The whole procedure can be described with generally known phases of flue gas diffusion. Simultaneously the heat is released which is thermally bound into cooling water and that is used as pre-warming means for another process. With correct contact time frame the smoke gases are absorbed into active surfaces with high efficiency and with well adjusted process parameters (temperature, flow, retention times, reaction parameters, constant speed). The content of harmful gases is much lower than by the EU law permitted values. The system of reverse - reaction pyrolysis enables the reactor for high efficiency use of 94%, 0% emissions, while being extremely silent. The output products (gasoline, diesel) are extremely clean and in compliance with the EURO5 standards. System's advantage is in its self-efficient power supply because the produced gas from the recycling process is entirely (100%) returned into the production process. It does not need any external energy source therefore it is optimal investment. It has a self-sufficient reactor cooling system with water obtained from its own recycling - production process. Another advantage of this reactor is the use of unrefined waste plastic including PVC. This is because it has a special system for forced decomposition of harmful molecules, which are then turned into non-harmful molecules. Recycling-production plant Green Line Oil exceeds all environmental, health&safety and all general requirements (frequent automatic supervision, control systems, automated sensor system, non

refundable security elements). “Green Line Oil” technology functions on the principal of decomposing hydrocarbon, which means that all kinds of plastic can be used as the input raw material. Current costs of recycling these types of materials are very high. Technology of the system/device for recycling non hazardous waste is in accordance with the highest European standards, which are also the foundation of Slovenian environmental legislation. Content of SO<sub>x</sub> and NO<sub>x</sub> particles are removed with the innovative reversal process - Bi-molecular EF Pyrolysis System in separate chambers. With a great difference from other pyrolysis systems that produce harmful emissions the output products in our technology are water steam and industrial salt.

The innovative system - Bi-molecular EF Pyrolysis System is a new part of technology, engineered and implemented by BHRI marketing Ltd. Its unique function is to mix the industrial salt NPKCa in correct sequence with a particular automatized procedure. In a cylinder, made for this particular process SO<sub>x</sub> and NO<sub>x</sub> particles are pollinated. Due to mass and gravitational acceleration the particles than fall into a closed water collector. With further procedure, the liquid that is collected is then being processed in a functioning pyrolysis system where the output is hard matter obtained through hydrating process. The obtained substance is partially CaSO<sub>3</sub> 47%, NaCl 48% and 5% complete H<sub>2</sub>O distillate.

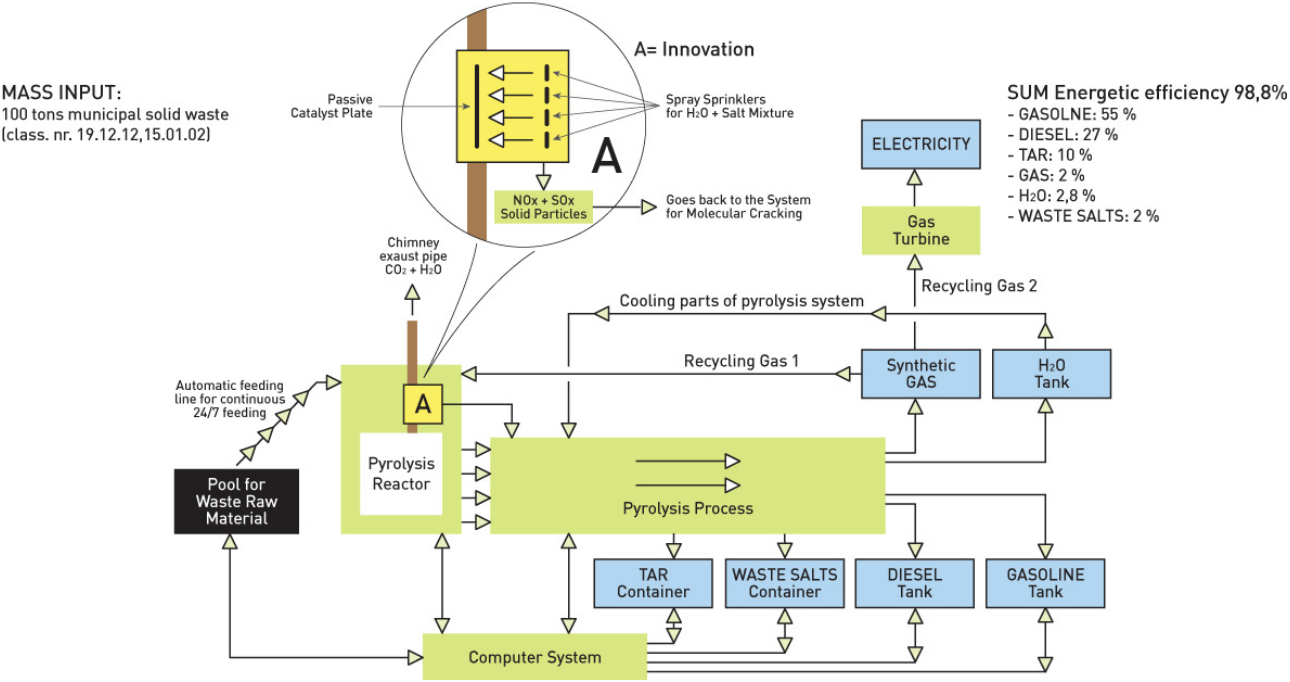
Taking into consideration similar or comparable solutions on the market, existing competitors, looking at the purpose in waste recycling the only competition represent:

- classical incineration plants that operate at around 2.500 °C and are extremely wasteful (they need plenty of external power and water supply). Their output product is only heat which cannot be stored and it has enormous losses of energy.
- cement plants that use plastic and rubber materials with high calorie value along with other power resources for enabling high temperatures for the production process.

The majority of known recycling process, considering the ratio between input of raw material and the produced output, the efficiency is very low e.g. 15-20%. The existing recycling systems are inefficient investments, at 35 million EURO per plant because of the input amount of waste that can be received (10 - 200 tons/daily) and the output products of poor quality (gasoline, diesel, tar, fertilizer, water and gas). The biggest problem is to guarantee the purity of output products (gasoline, diesel, etc.) in recycling in other pyrolysis processes. Another issue is large water consumption and large amounts of contaminated wastewaters, emissions and oxygen. Existing systems are environmentally questionable because the waste material is incinerated causing harmful emissions (high quantity

release of CO<sub>2</sub>, 4 out of 12 most toxic gases e.g. dioxin, PCDF, PCDD) that consume most of the available energy. The by-product from existing systems is a hazardous waste (400 kg of waste per 1 ton) in form of slag and ashes that require expensive and complex disposal procedures. Additionally all the waste has to be cleaned and separated beforehand and during the incineration process itself. Diesel has to be added which results in destroying secondary raw materials.

## Green Line Oil Plant FLOWCHART



**Conclusions:**

The amount of waste plastic is increasing and it has negative impacts on the environment. Waste plastic presents one of the biggest problems in environmental protection because of the enormous amount of it and its long-term decomposition (up to 1.000 years). The GLO technology aims to decrease the amount of waste that ends up in landfills because it cannot be recycled with any existing technology. According to Slovenian statistical data there is 50.000 tons of plastic waste per year, which is transported to Austria, at very high costs, for incineration. Because of pressing environmental European and Slovenian laws that require proper disposal, storage and the decrease of waste amount, BHRI marketing Ltd. has developed innovative solution that recycles plastics waste

into secondary raw material. The products from pyrolysis procedure have a wide spectrum of use. Further use and sale of these pyrolysis products is possible in bigger areas and different branches of the industry. Their use it's not only cost effective but it brings many benefits for the environment. Use of pyrolysis products will help in decreasing the use of fossil fuels, with it the greenhouse gas effect and overall decrease of waste disposal which is required by the EU as the R1 factor (recovery and use of waste energy). The GLO technology helps improving the environmental indicators (decreased emission of greenhouse gases - CO<sub>2</sub>, CH<sub>4</sub>, SO<sub>x</sub>, NO<sub>x</sub>) because of the innovation - Bi-molecular EF Pyrolysis System for purification and reduction of SO<sub>x</sub> and NO<sub>x</sub> particles which results in better air quality (PM<sub>10</sub>) and minimization of carcinogen matters. The GLO technology also contributes to a better use of natural resources use. The by - products of our technology are synthetic gas and water 100% of produced synthetic gas is used for starting the reactor and the produced water is used for reactor cooling. Because of these indicators our technology does not use external energy, which also helps preserving the natural resources. High market potential of the project contributes to improvement of economic indicators because financing the GLO project will contribute to a balanced regional development with new jobs. The project will also contribute to connecting the recycling industries in accordance with EU policies and to creation of new partnerships based on synergy effects and long-term cooperation between partners. With established value chain dialog a higher level of synergetic cooperation will be established.