



# GREENER BLAZE TIRE-TO-ENERCY TIRE-DERIVED FU

# RECYCLING DISPOSAL & OF TIRES

- ALL TYPES AND MANUFACTURERS
- ALL SIZES, INCLUDING DUMP TRUCK TIRES
- ALL STAGES OF WEAR AND DECOMPOSITION

## **GLOBAL TIRE RECYCLING PROBLEM**

Waste tires pose a modern danger to all humanity. The United Nations Conference on Environment and Development predicts that the global stockpile of used tires is estimated at 25 million tons, with an annual increase of at least 7 million tons.

The number of worn-out tires in the world is increasing exponentially! For this reason, scrap tires all over the world are usually just dumped in landfills where they are stored for decades. The natural decomposition of auto tires is over 150 years.



#### **ENVIRONMENTAL DAMAGE FROM AUTO TIRE STORAGE**

During the storage of tires, natural decomposition occurs, resulting in the formation of fine dust containing dangerous carcinogens and toxicants. Tires emit up to 100 types of chemical pollutants substances, 15 of which are harmful carcinogens (benzopyrene, etc.) other polyaromatic hydrocarbons). There are also 4 of the 12 types of N-nitrosamines. Under the hot sun, waste tires release methane into the atmosphere. The decomposition products of tires causes the following diseases: allergic reactions, bronchial asthma, infectious diseases respiratory tract infections and respiratory oncological diseases.



#### ENVIRONMENTAL DAMAGE CAUSED BY TIRE FIRES

Tire storage requires constant vigilance. Unfortunately, tires catch fire more often than we would like. During combustion, huge amounts of toxins are released into the atmosphere. When tires thermally decompose, tires release class 1 and 2 hazardous substances: styrene, furans, lead, sulphuric acid. For this reason, tire fires cannot be extinguished with water. When it rains, the decomposition products filter into groundwater and contaminates lakes and rivers, which are sources of drinking water. In humans, these contaminants cause an increase in respiratory and oncological diseases.



#### **INFESTATION BY INSECTS AND VIRUSES**

Rubber tire graveyards are the perfect environment for rodent and insect colonies. The open center of each tire collects rainwater, which becomes a puddle of still water. These small pools are the perfect place not only for insects, but also for viruses and pathogens. Tire dumps are perfect for the spread of vector-borne diseases. For humanity, the issue of ecological and cost-effective recycling of old tires has become an international issue.



The growth of tires worldwide is growing exponentially, which requires a constant increase in scrap tire landfills.



Tire landfills are a source of vector-borne transmissible diseases and oncological diseases in humans and animals.



Waste tire landfills are centers of environmental pollution with long-term impact.

There is no physical capacity in landfill dumps to sort and segregate tires by size, to determine the amount of polymer sheeting, resins, soot and metal cord contained in stored tires per volume.



Low-temperature tire incineration produces Furans, dioxins, and other highly toxic and contaminating substances.



There are many kinds of tires in landfills – different manufacturers, from small sizes to dump truck tires, and different stages of decay.



Tire rubber - a high-molecular weight material, a thermosetting polymer, which cannot be processed at high temperatures.

CHNOLOGICAL PROBLEMS RECYCLING OF SCRAP AUTO TIRES

DANGER

## EXISTING METHODS OF TIRE RECYCLING DOES NOT HAVE ECONOMIC AND ENVIRONMENTAL FEASIBILITY

Tire disposal is a global problem. Worldwide experience shows that the most common methods of scrap tire recycling are:

- Combustion with energy recovery;
- Pyrolysis at relatively low temperatures;

#### Production of crumb rubber.

Existing methods are economically and environmentally unattractive and therefore have not been developed on a large scale.



#### **TIRE GRANULATES**

The safest and easiest way is to shred used tires with further use of the obtained crumb (granulate) for sports and playgrounds, for modified rubber asphalt, for landscaping and in molded and extruded products. However, it is the final stage of using the resulting crumbs that is the stumbling block.

More than a century of experience in the use of rubber waste in road construction has had a negative result. The slow swelling of rubber particles trapped in the structure of the pavement leads to decompaction and collapse.



#### **TIRE PYROLYSIS**

Pyrolysis separates used tires in the absence of oxygen, the tires are separated into solid, liquid and gaseous substances (pyrolysis oil, carbon black and metal). However, the resulting pyrolysis oil is of low quality, as pyrolysis is critically dependent on homogeneous feedstock and conditions. During pyrolysis, especially at low to medium temperatures, toxic substances, dioxins and furans are formed. In order to prevent the formation of dioxins and furans, the energy balance of the technology is negative at temperatures above 1100°C. The production process becomes unprofitable.



#### **TIRE BURNING**

The incineration of tires occurs primarily in the cement industry and in thermal power plants. Tires are used here as a substitute material for coal and fuel oil. Tire burning is an inexpensive way of generating energy. However, it has dire environmental consequences. It produces poisonous substances such as chlorinated dioxin and furan. 3,700 kg of  $CO_2$  are produced during burning 1 ton of tires. When tires are burned in the cement industry, the steel they contain shows up in the cement as iron oxide, which colors the material.



## GUARANTEED SOLUTION FOR COMPLETE & ECOLOGICAL RECYCLING OF WORN TIRES

GreenBLAZE is a mobile closed-cycle processor without open combustion, operating on the principle of high-temperature vacuum decomposition of any carbon-containing materials and compounds, designed for utilization, neutralization and complete recycling of used car tires without harmful emissions into the atmosphere and obtaining commercial products at the output: boiler fuel, heat, electricity, graphite, and metal.



Recycling of all types of scrap car tires, regardless of their quantity, size, manufacturers, amount of polymer sheeting, metal cord, and stage of tires decomposition.



**OUTPUT PRODUCTS** 





Heat





Chopped metal

(carbon)

## GREENBLAZE TIRE RECYCLING PLANT is a highly efficient market solution for processing of tires into energy resources and fuel

#### PURPOSE OF THE GREENBLAZE PLANT:

- Recycling of newly formed used tires at the place of their formation;
- Recycling of tires in landfill with subsequent elimination of tire landfills;
- Elimination of accumulated environmental damage at existing tire dumps;
- Mobile Thermal Power Plants and Fuel Stations running on used tires.

#### OBTAINING COMMERCIAL PRODUCTS AT THE OUTPUT FROM 1 000 KG OF TIRES PER HOUR:

- Boiler fuel (~ 45%): up to 450 kg;
- Heat: 550 kW (heat or electricity);
- Electricity: 300 kW (electricity or heat);
- Graphite (~15÷20%): up to 200 kg, depends on the type of recycled tires and the percentage of carbon content in them;
- Chopped metal (~10÷15%): up to 150 kg, depends on the percentage of metal content in the tires, the value of which varies among different manufacturers.

#### GREENBLAZE PLANT OPTIONS BY CAPACITY PERFORMANCE, AVAILABLE FOR DELIVERY:

- 100÷400 kg/hour;
- 1,000 kg/hour;
- 2,000 kg/hour.

All GreenBLAZE Plant options can be supplied both in a stationary and mobile version based on standard containers.









#### No Sorting of Tires Required -

tires of any size, manufacturer, at any stage of decomposition are recycled.

#### **Environmental Safety -**

a sustainable way for humanity to eliminate the excessively growing landfills.

#### **Complete Destruction of**

Pathogens - pathogenic microflora located on the outside and inside of the tires is completely destroyed and disinfected during tire recycling.



No Harmful Emissions into the Atmosphere - the Exhaust Gases Treatment Unit ensures complete environmental friendliness of the tire recycling plants no pollution.

#### High Profitability –

affordable CAPEX, low OPEX and commercial product output provide a quick payback for the Plant.

# 100% GUARANTEED TIRE RECYCLING

#### **Commercial Feasibility** obtaining

in-demand and profitable commercial products from recycling tires.

Versatility of Execution - the Green-BLAZE Plant is available in both stationary and mobile versions.

#### Autonomy and Energy Independence – the GreenBLAZE Plant provides itself with electricity and heat if necessary.

**Modularity and Mobility -** placement of all GreenBLAZE Plant equipment in one, two or three 40-foot containers (depending on the configuration), which ensures the possibility of delivery of the Plant and its deployment in almost any required location.

## PROCESS FLOW CHART OF GREENBLAZE TYRE RECYCLING PLANT

ADGEX presents a universal integrated solution, which is capable of 100% turnkey approach for recycling worn-out car tires, regardless of their quantity, size, manufacturers, amount of polymer fabric, metal cord and stage of tire decomposition.



\* In terms of commercial product output, there are combined options with simultaneous generation of heat, electricity and fuel. In this case, the output parameters are custom calculated at the buyer's request.

## TECHNICAL CHARACTERISTICS OF THE GREENBLAZE PLANT USING THE EXAMPLE OF PROCESSING 1 TON OF TIRES PER HOUR

PARAMETERS	INDICATORS
CAPACITY OF TIRE PROCESSING (with 24-hour operation): • Per day: • Per year:	24 000 kg/day 8 760 tons/year
COMMERCIAL OUTPUT PRODUCTS (as a percentage of the number of recycled tires) Option 1 - Boiler Fuel Production: • Boiler fuel (~ 45%): • Graphite (~15÷20%): • Chopped metal (~10÷15%): Option 2 - Heat Production: • Heat: • Graphite (~15÷20%): • Chopped metal (~10÷15%): • Electrical Energy: • Graphite (~15÷20%): • Chopped metal (~10÷15%):	10 800 kg/day 4 800 kg/day 3 600 kg/day 550 kW 4 800 kg/day 3 600 kg/day 300 kW 4 800 kg/day 3 600 kg/day 3 600 kg/day
<ul><li>SHREDDING OF USED TIRES:</li><li>Capacity of the cutting-chopping machine:</li><li>Size of tires to be shredded:</li></ul>	1 500 kg/hour All types of tires up to diameter 4,600 mm
GREENBLAZE PLANT DESIGN OPTIONS: • Stationary, required area: • Mobile in container design	100÷120 m² Three 40-foot containers
TOTAL POWER CONSUMPTION OF THE PLANT: (380 V, 50 HZ, THREE-PHASE CURRENT	48.0 kWh
<ul> <li>SERVICE STAFF PER SHIFT:</li> <li>Operator (engineer):</li> <li>Labourer (unskilled):</li> </ul>	1 employee 2 employees
SERVICE LIFE OF THE PLANT:	15 years
MAINTENANCE SERVICE:	Once per annum
WARRANTY FOR EQUIPMENT OF THE PLANT:	12 months

RECYCLING OF WORN CAR TIRES

## **CUTTING-CHOPPING MACHINE**

## This machine is universal and has no analogues in the world.

#### ADVANTAGES OF CUTING -CHOPPING MACHINE:

- Shreds all types of existing tires in the world up to and including 4,600 mm diameter. No need to sort tires before shredding.
- Takes up little space one ÷ two 40-foot containers (depending on modification).
- 3. Low OPEX:
  - Low energy consumption only 24 kWh.
  - Only two employees are needed to operate the machine.
- 4. High productivity from 1,500 up to 2,500 kg/hour.
- 5. The machine immediately enters the mode after switching on. It also immediately stops after switching off. When switched off, it can hold on in standby mode without harm to the machine equipment.

#### COMPARISON WITH EXISTING ANALOGUES ON THE MARKET:

All available models of such equipment with the same productivity as a cutting and chopping machine have significant drawbacks. They consume approximately  $6\div8$  times more energy (from 150 to 200 kWh). They occupy an area of up to 200 m<sup>2</sup> and require  $5\div6$  staff at a time to service them. They often fail due to breakdown of engines and gearboxes.

## **EXHAUST GASES TREATMENT UNIT**

The GreenBLAZE Plant does not contain any harmful pollutants in relation to the progressive method of cleaning exhaust gases on a special Environmental Unit, which includes four-stages cleaning.



In terms of emission limits for harmful substances, the GreenBLAZE Plant currently significantly exceeds the European Euro-5 Standard.



## **HEAT PRODUCTION**

Heat is generated by the exothermic reaction of partial oxidation and destruction of tires. The released heat isremoved in a special Heat Extraction Unit and goes to the needs of the consumer or to the production of electricity.

#### **ELECTRICITY GENERATION**

Electricity generation occurs through the utilization and conversion of released heat into mechanical energy in a special external combustion engine with subsequent generation of electricity in an alternator.

#### **BOILER FUEL PRODUCTION**

Boiler fuel up to 45% of the amount of processed tires is obtained by synthesis and precipitation of hydrocarbon chains of purified synthesis gas in the SUS block. In terms of quality, boiler fuel is superior to fuel oil obtained at oil refineries from crude oil.

#### Advantages of boiler fuel compared to heavy fuel oil:

- Boiler fuel does not contain foreign impurities (sulfur, paraffins and asphaltenes) and aggressive substances (heavy metals).
- 2. Boiler fuel provides 25-30% more heat than heavy fuel oil.
- **3.** Boiler fuel has a higher vaporability, and therefore has a higher rate of combustion, due to which it is possible to obtain more power per unit of time per volume of furnace space.
- 4. Boiler fuel has a lower viscosity than that of heavy fuel oil, so the fuel, even in the in winter, it doesn't need to be heated up for good atomization by nozzles.
- 5. Boiler fuel doesn't have a pungent unpleasant odor.







### Physical and chemical parameters of boiler fuel:



## GREENBLAZE -A CLEAN, SUSTAINABLE SOLUTION FOR THE DISPOSAL & RECYCLING OF SCRAP AUTO TIRES

## TECHNOLOGY

A new approach to recycling all types of tires. No sorting required.

## ECONOMY

Making tire recycling a highly profitable business

# ECOLOGY

Elimination of tire dumps and accumulated environmental damage



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