



**DISPOSAL AND RECYCLING
OF USED CAR**

TIRES

**High-tech and mobile
recovery and recycling line
used tires with an output of
commercial products
based on the greenBLAZE
processor**



GLOBAL TIRES RECYCLING PROBLEM

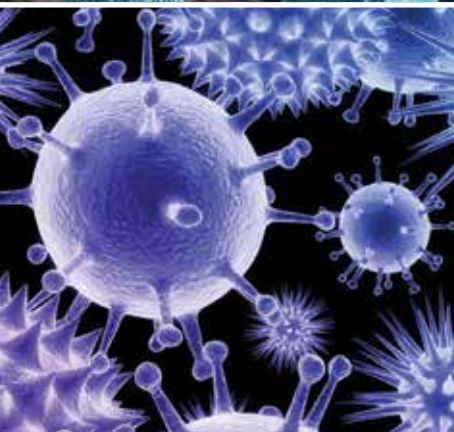
Waste tires pose a modern danger to all mankind. The United Nations Conference on Environment and Development predicts that the global stockpile of used tires is estimated at 25 million tonnes, with an annual increase of at least 7 million tonnes.

The number of used tires in the world is increasing exponentially! For this reason, used tires all over the world are usually just dumped in landfill sites where they are stored for decades. The natural decomposition of tires is over 150 years.



ENVIRONMENTAL DAMAGE FROM TIRES STORAGE

During the storage of tires, their 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. In the sun, waste tires release into the air methane. The decomposition products of tires cause the following diseases: allergic reactions, bronchial asthma, infectious diseases respiratory tract infections and respiratory oncological diseases.



INFESTATION BY INSECTS AND VIRUSES

A rubber tire graveyard is the perfect environment for rodent and insect colonies. The open centre 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.



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 with water cannot be extinguished with water. With water, the decomposition products get on the ground, then into the groundwater and contaminate lakes and rivers, which are sources of drinking water. In humans they cause an increase in respiratory oncological diseases.

For mankind, the issue of ecological and cost-effective recycling of old wheels has become an international issue.



The growth of tires in the world is growing exponentially, which requires a constant increase of tire storage space.



Worn tire dumps are a source of vector-borne diseases and oncological diseases in humans and animals.



Worn tire dumps are centres of environmental pollution of a long-term nature.



PROBLEMS OF ACCUMULATION AND STORAGE OF WORN-OUT TIRES

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



Low-temperature tire incineration produces furans and dioxins.



There are all sorts of tires in landfill sites – different manufacturers, different sizes, different stages of decay.



Tire rubber, which is a high molecular weight material, refers to thermosetting polymers which, unlike thermoplastic polymers, cannot be processed at high temperature.



TECHNOLOGICAL PROBLEMS RECYCLING OF WORN CAR TIRES

EXISTING METHODS OF TIRES RECYCLING DO NOT HAVE ECONOMIC AND ENVIRONMENTAL FEASIBILITY

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

- **Combustion with energy recovery,**
- **Pyrolysis at relatively low temperatures,**
- **Production of crumb rubber.**

Unfortunately, all existing methods are economically and environmentally unattractive and therefore have not been developed on a large scale.



TIRES CRUMBLING

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



TIRES 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 steel). 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.



TIRES 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. During burning 1 tonne of tires 3,700 kg of CO₂ is produced. When tires are burned in the cement industry, the steel they contain shows up in the cement as iron oxide, which colours the material.



GUARANTEED SOLUTION TO COMPLETE RECYCLING OF USED TIRES

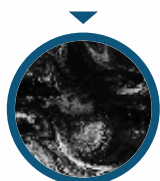
GreenBLAZE is a mobile closed-cycle processor without open combustion, operating on the principle of high-temperature vacuum decomposition of any carbon-containing materials and compounds, designed for utilisation, neutralisation and complete recycling of used car tires without harmful emissions into the atmosphere and obtaining commercial products at the output: boiler fuel, methane-hydrogen ethylene, carbon, refined metal, thermal energy, synthetic fuels (diesel, petrol, etc.), electrical energy.



Recycling of all types of waste car tires,
regardless of their quantity, size,
manufacturer, amount of polymer sheeting,
metal cortex and stage of tyre decomposition.



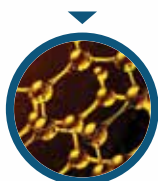
OUTPUT PRODUCTS



Boiler fuel



Methane-hydrogen
ethylene



Carbon



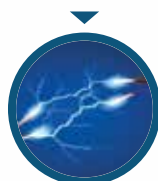
Purified metal



Thermal energy



Synthetic fuel



Electrical energy

GREENBLAZE IS A CIVILISED WAY OUT FOR MANKIND
to eliminate the exorbitant growth of car tires dumps.
and the elimination of accumulated environmental damage

- **Technological solution** – full utilisation and recycling tires directly at landfill sites without sorting
- **Economic solution** – tires recycling becomes economically feasible and commercially profitable
- **Ecological solution** – elimination of environmental pollution, destruction of pathogens and viruses



No sorting of tires is required – tires of any size can be disposed of, manufacturer, in any stage of decomposition.

Environmental safety – no formation of dioxins and furans due to the recycling process at 1200°C.

Complete pathogen eradication – destroying and sanitising of pathogenic microflora on and inside the tires when they're disposed of

No harmful emissions into the atmosphere – ecology and exhaust gas utilisation unit ensures complete environmentally friendly processing.



**100%
GUARANTEE
OF COMPLETE
TIRES
RECYCLING**

High profitability – affordable CAPEX, low OPEX, output Commercial products give a quick payback.

Commercial viability – obtaining demanded commercial products after recycling tires.

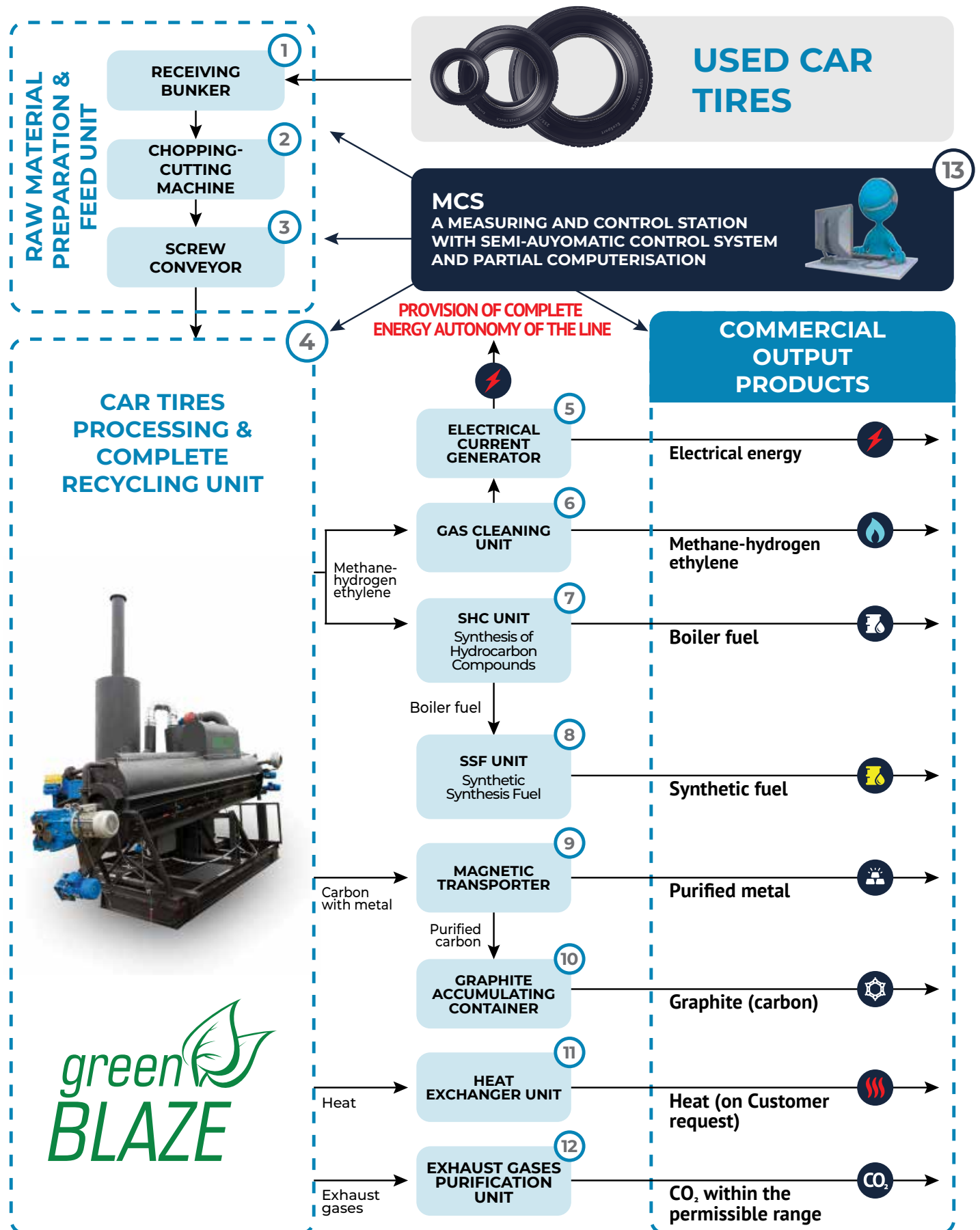
Versatility of design – the greenBLAZE line is available in both stationary as well as mobile version.

Autonomous and energy-independent – if required, the greenBLAZE line supplies itself with electricity and heat.

Modularity and mobility – housing the entire greenBLAZE equipment in one or two 40-foot containers (depending on configuration), which ensures that the line can be delivered to any required location.

CAR TIRES DISPOSAL AND RECYCLING LINE

BLOCK SCHEME



DESCRIPTION OF LINE OPERATION

All consecutive tires stored in landfill sites are loaded into the **Receiving Bunker (1)**. There are at least 2 receiving hoppers in the scheme. Hoppers, each of which acts as a storage tank. The filled hopper provides a supply of tires for the continuous operation of the tires recycling and disposal line.

The tires from the receiving hopper are fed by conveyor belt to the **Chopping-Cutting Machine (2)**, where the tires with metal cord are cut and shredded to a fraction of 20x20 mm. The shredded fraction is fed by the **Screw Conveyor (3)** into the receiving neck of the **GreenBLAZE Processor (4)** for further processing and utilization.

Inside the degassing chamber of the greenBLAZE processor all carbon-containing materials from which the tires are made are heated and oxidized. As a result of the complete thermal decomposition of the carbon-containing materials, methane-hydrogen ethylene is produced in the main oxidation chamber.

The methane-hydrogen ethylene can then be directed to the **Gas Purification Unit (6)**, where it is purified, after which the methane-hydrogen ethylene is used as a final commercial product. Alternatively, the methane hydrogen ethylene is fed to **SHC (Synthesis of Hydrocarbon Compounds) Unit (7)**, where it undergoes deep processing and precipitation to produce high quality boiler fuel.

Methane-hydrogen ethylene can be used as fuel for combustion in the **Electric Current Generator (5)** and obtaining the necessary amount of electric energy for self-powering of all units and assemblies to ensure **⚡ COMPLETE ENERGY AUTONOMY OF THE LINE** if necessary.

Boiler fuel and methane-hydrogen ethylene are commercially demanded energy products of high quality. However, if the customer is interested, the line can be equipped with a **SFS (Synthetic Fuel Synthesis) Unit (8)**, which produces synthetic fuels (diesel, gasoline, methanol, acetylene, alcohols, etc.) from boiler fuel.

Used tire recycling waste at the outlet of the synthesis chamber of the greenBLAZE processor consists of graphite (soot) and fragments of metal cord. This waste is passed through the **Magnetic Conveyor (9)**, as a result of which the metal cord is separated from the graphite and sent to a storage container. The cleaned metal can then be used for the production of metal products and metal structures. The cleaned graphite is accumulated in the **Graphite Accumulating Container (10)**.




As a result of the partial oxidation reaction in the greenBLAZE processor, a large amount of heat is generated, which with the help of the heat exchanger of the **Heat Exchanger Unit (11)** can be used for commercial purposes.

The exhaust gases generated by the combustion of undecomposed organic residues are directed to the **Exhaust Gases Purification Unit (12)**.

The greenBLAZE line is controlled by the operator through the **MCS (Measuring and Control Station) (13)** with semi-automatic control system and partial computerisation.

TECHNICAL SPECIFICATIONS OF GREENBLAZE LINE WITH PROCESSING OF 1 TON OF TIRES PER HOUR

ADGEX presents a universal complex solution based on a mobile complex greenBLAZE, which is capable of 100% turnkey solution to the issue of recycling of waste car tire, regardless of their quantity, size, manufacturer, the amount of polymer sheeting, metal cortex and the stage of tire decomposition.

VOLUME OF RECYCLING OF USED TIRES	1 000 kg/hour
COMMERCIAL PRODUCTS PRODUCIBILITY OUTPUT LINE (as a percentage of tire loading weight):  and/or boiler fuel and/or methane-hydrogen ethylene (according to Customer's choice):  graphite:  purified metal:	~ 50 – 60% ~ 20 – 25% ~ 10 – 15%
TOTAL PEAK POWER CONSUMPTION OF THE LINE (380 V, 50 Hz, three-phase current), no more than:	35.0 kWh
CONTINUOUS OPERATION MODE:	24/7 during 8500 engine hours
COMPLEX ACCOMMODATION • Enclosed premises with an area of:	at least 100 m ²
MAINTENANCE PERSONNEL PER SHIFT: • Operator (engineering education): • Labourer (unskilled): (Training of the Customer's personnel is carried out during commissioning)	1 1-2 (depends on process automation)
WARRANTY FOR THE EQUIPMENT OF THE COMPLEX • Subject to annual service: • If the Customer carries out the service on his own:	36 months 12 months
SERVICE LIFE OF THE COMPLEX (subject to annual service):	10 years
GREENBLAZE PROCESSOR SERVICE • Frequency: • Duration: (Service maintenance is performed under separate independent contracts)	once a year up to 20 working days

COMMERCIAL OUTPUT PRODUCTS

BOILER FUEL

BOILER FUEL CAN BE USED AS INDUSTRIAL OIL IS SUPERIOR IN QUALITY TO THE HEAVY FUEL OIL (MASUT) PRODUCED 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).
- Boiler fuel provides 25-30% more heat than heavy fuel oil.
- Boiler fuel has a higher vaporizability, and therefore has a higher rate of combustion, so you can get more power per unit of time per volume of furnace space.
- Boiler fuel has a lower viscosity than that of heavy fuel oil, so the fuel, even in the winter, it doesn't need to be heated up for good atomization by nozzles.
- Boiler fuel doesn't have a pungent unpleasant odor.

PHYSICAL AND CHEMICAL PARAMETERS OF BOILER FUEL:

- high density – 985 kg/m³
- optimum viscosity – 6.97%
- low sulfur content – not more than 0.5% (high sulfur content in fuel leads to equipment wear and tear, harms the environment)
- low ash content – 0.08% (practically no combustible residue)
- fuel solidification temperature – from -53°C
- the lowest heat of combustion – 45 400 kJ/kg
- flash point in a closed crucible – 47 °C

AREAS OF APPLICATION OF BOILER FUEL:

- In all areas instead of using traditional masut: industry, navy, housing, utilities and agriculture.
- Ideal as a boiler fuel for use in boiler rooms. No boiler conversion is required for its use.
- Boiler fuel can be used as an analog diesel fuel.
- Boiler fuel can be used instead of natural gas. 1 liter of boiler fuel replaces 1.88 m³ of natural gas and exceeds the figures for the amount of heat released and combustion efficiency.
- Boiler fuel can be used as industrial oil.

METHANE-HYDROGEN ETHYLENE

METHANE-HYDROGEN ETHYLENE IS SUPERIOR TO ALL TYPES OF NATURAL GAS DUE TO ITS HIGHER HEATING VALUE

THE COMPOSITION OF METHANE-HYDROGEN ETHYLENE:

- Methane – 37%
- Hydrogen – 11%;
- Propane – 11%;
- Other gases – 41%.

AREAS OF APPLICATION OF METHANE-HYDROGEN ETHYLENE

- Fuel for gas piston engines for power generation.
- Automotive fuel.
- Fuel for boiler houses, cogeneration plants.
- Power source for gas stoves and heating systems.
- For cutting metal in gas cutting tools.

GRAFITE

Graphite (carbon) is used for refractory materials, electrical machinery and plants, in chemical, mining, as well as in manufacturing. It is also used to make is also used to make lead pencils, paints, coatings, and batteries. Graphite is also used as a feedstock for methane and propane.

PURIFIED METAL

Metal is used to produce metal products and metal structures.

SUSTAINABLE TIRES RECYCLING



TIRES STOCKPILING AND STORAGE

A massive increase in waste tires

Increase in global landfills

Accumulating environmental damage

Tire dumps are centres of environmental pollution

Vector-borne diseases and oncological diseases



TIRES LANDFILL RECYCLING

No need for tire sorting

No harmful emissions into the atmosphere

No furans and dioxins

Complete destruction of pathogens

Mobility and placement directly on landfill sites



COMMERCIAL PRODUCTS

Boiler fuel | Methane-hydrogen ethylene

Electricity | Heat

Graphite (carbon)

Synthetic fuels (petrol, diesel, etc.)

Purified metal



ECOLOGY & SOCIETY

Complete elimination of tires dumps

Land reclamation and return to economic use


Commercial viability


Sustainable development of mankind

Preserving the ecological balance of the planet



WE'RE CHANGING THE WORLD FOR THE BETTER!

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