A gradual transition from landfill disposal to industrial processing is the key trend in solid waste management in the world practice. The involvement of solid waste in industrial processing, in many ways, solves the conflict between the city with a large amount of waste generated, and the suburbs, where the waste must be disposed.

The concept of the industrial solid waste processing is based on interrelation of ecological-economic and technological issues, whereas solid wastes should be considered as a technogenic raw material of complex organic and mineral composition.

The solid waste processing technology offered by our company should be considered as an engineering method of environmental protection, excluding landfill disposal.

Polymers can be referred to as especially challenging type of solid waste, requiring special developments and technologies for disposal. The fact is that many of polymer containing wastes, for instance, car tires, tire casings, as well as PET bottles and office equipment can only be safely recycled using the **pyrolysis** method.

There are other recycling methods, but tire recycling, that we are going to discuss in this concept, is most effective when depolymerizing.

According to the European Tire Recycling Association (ETRA), about 3.7 million tons of depreciated car tires are produced in Europe annually, and the volume of their recycling by shredding does not exceed 10%. Most of the collected tires (20%) are used as fuel.

According to the forecasts of the UN Conference on the Environment and Development, the volume of solid waste will grow by 4-5 times by 2025. The total world stocks of worn-out tires is estimated at no less than 50 million tons with an annual increase of at least 5-7 million tons.

Of this amount in the world, only **23 percent** of tires are recycled (export to other countries, incineration for generating energy, mechanical crushing/shredding for road surfacing, etc.).

The other 77 percent of used tires are not recycled in any way due to the lack of a cost-effective disposal method.

When tires are burnt the following hazardous chemical compounds are emitted into the atmospheric air, becoming a source of an increased risk to humans:

- biphenyl; - fluorentane; - pyrene; - anthracene; - benzopyrene.

Two of the listed compounds - biphenyl and benzopyrene - are among the strongest carcinogens.

It is no coincidence that the European Council adopted a special Directive "On landfills", banning their incineration since 2003.

Tires thrown or buried in landfills decompose for longer than a hundred years in natural conditions.

The contact of tires with rainfall and groundwater results in leaching out of toxic organic compounds: diphenylamine, dibutyl phthalate, phenanthrene, etc. All these compounds end up in the soil.

Rubber, being a high-molecular material, refers to thermosetting polymers, which, unlike thermoplastic polymers, cannot be processed at high temperatures, which creates serious problems when recycling rubber waste.

According to ETRA (the European Tire Recyclers Association), the European Union has banned the disposal of whole tires since 2003, and since 2006 the ban extended to shredded tires.

Many developed countries are ready to pay for the recycling of car tires for **150EUR and more** per ton.

Worn tires out of service are a source of long-term environmental pollution:

tires are not biodegradable;

tires are flammable and, in case of fire, it is quite difficult to extinguish it;

when stored, they are an ideal breeding ground for rodents, blood-sucking insects and are a source of infectious diseases.
At the same time, depreciated tires contain valuable raw materials like **rubber, metal, fabric cord.**
During the oil crisis, the first plant of this kind was built in England based on the FasterWhealerPovProd technology. The plant still produces fuel oil and carbon sorbent.

The problem of recycling worn-out automobile tires and out-of-service rubber products is of high ecological and economic importance for all developed countries of the world. And the irreplaceability of natural petroleum raw materials urges to use secondary resources with maximum efficiency, i.e. instead of getting mountains of garbage we could get a new industry for our region - commercial waste processing.

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On the other hand, tires and plastics are valuable polymer raw materials: 1 ton of tires contains about 700 kg of rubber, which can be reused for the production of fuel, rubber products and materials for construction purposes. **At the same time, if 1 ton of tires is burnt, 270 kg of soot and 450 kg of toxic gases will be released into the atmosphere**.

Investing in the recycling of tires and recycled polymers is profitable since the waste disposal is paid for, and, additionally, the intermediate products obtained during the processing get sold, namely, **the liquid fuel fraction, carbon-containing residue and scrap metal**.

The disposal of tires and tire casings is currently done in several ways.

Processing of rubber into crumb. Recycling tires by shredding is the simplest and most common method. It allows to preserve the physical, mechanical and chemical characteristics of rubber. After processing, the rubber is used as a road surface (in road construction, in the construction of sports- and playgrounds). Also, crushing rubber into crumb allows for its compact transportation and storage before processing it by cold pyrolysis.

Disposal of rubber by incineration. A completely unjustified method, both from the economical and environmental standpoints. Tires are mainly burnt in the cement industry or in heat-and-power plants.

The method was invented at the time when no cost-effective alternatives were available, besides, worn-out rubber partially replaced fuel (fuel oil and coal). Incineration is just barbaric from the ecological point of view, since many substances do not degrade during rubber burning, and therefore, polluting the atmosphere.

Currently, the pyrolysis of tires is the most cost-effective and environmentally friendly method of recycling.

It doesn't only solve the issue of processing recycled materials, like tirecasings, but also allows for obtaining fuel and electricity from waste.

Low-temperature pyrolysis (depolymerization) allows to decompose rubber into its constituent components, and use each of them for specific purposes.

The following are the finished products that a tire recycling plant can produce:

- ***carbon black used in various mixtures and manufacturing processes;***
- ***pyrolysis gas, being an alternative to natural gas;***

- ***pressed steel cord for metallurgical industry;***
- ***synthetic oil that may replace many petroleum products by 100%.***

All these products are in demand in various industries, so recycling car tires by pyrolysis is also a profitable business.

The advantages of tire pyrolysis are obvious:

the recycling process is environmentally friendly, and there are no highly toxic substances in the processed products;

there is zero waste in production - everything obtained during the processing of tires becomes a marketable product;

the technology does not require large energy consumption, and, in general, is very cost-efficient;

the fuel obtained from rubber processing can be used for internal technological processes.

In general, tire pyrolysis can be regarded as the only correct rubber recycling solution for those who care about the environment and think about the future, whereas for business it is the most profitable way to process old automobile rubber.

Quick facts of the PYROLY-TAEBLA project.

The project implies a step-by-step development:

1. License No. KL-509045 issued to CATALANA OÜ Reg. No. 10651017, entitles to receive and process used rubber, allows for primary processing in the amount of up to 30,000 tons per year. The resulting fractions from 2 to 6 mm and 25 × 25 mm, before the start of the 2nd stage, will be shipped for the needs of Riigiaktsiaselts Estonia - international energy concern. Fractions from 0.1 mm to 2 mm can be used for the internal needs - the production of rubber and rubber products, in accordance with the business project.

Annual turnover:	**5 353 000 €**
Costs including taxes: 334 290 + 2 142 200	**2 476 490 €**
Net, annual profit after return on investment:	
The 1st year	**876 510 €**
The 2nd and subsequent years	**2 876 510 €**

2. Installation, launch of the production complex "PYROLY-ECOPYR 200", obtaining the relevant permits and licenses. Taking into account the technological indicators, the launch of

the production will allow to process up to 50.000 tons / year of crushed rubber, obtaining heat, electricity, pyrolysis oil or tire reclaim at the output.

Financing required:	**13 500 000 €**
Annual turnover:	**10 339 800 €**
Costs including taxes:	**5 242 740 €**
Net, annual profit approx:	**5 097 060 €**

Each stage is self-sustaining and allows to finance the subsequent phases of the project development.

The complexes being created with the use of modern high-tech equipment are aimed at the construction and commissioning of production facilities using modern technologies to comprehensively solve the problems of processing all types of human waste (from I to V hazard categories), in the absence of secondary emission, creating new segments in various sectors of industry and agriculture, compatible with each other, as well as at making a profit, creating additional jobs and, therefore, increasing tax revenues in the budget, increasing the social level of the society and protecting from environmental disasters.

The proposed technology allows:

• to solve environmental problems - processing of all waste types generated as a result of human activity, at specialized, environmentally safe sites, without creating new landfills for waste disposal that take vast territories;

• to vacate land plots currently occupied by solid waste landfills, flooded with oil sludge and acid sludge, agricultural waste, etc., with subsequent recultivation and use (construction of housing, shopping centers, parks and cultural centers).

• to recycle waste using our technology (which is dozens of times cheaper than world equivalents) and obtain highly purified, completely desulfurized pyrolysis liquid (synthetic oil), light oil products, gas, heat, electricity, organic fertilizers for agriculture, etc.

Reference information for the PYROLY-ECOPYR200 complex:

1.The installation allows to process any solid waste types, oil sludge, rubber goods, plastics, organic matter, medical waste, agricultural waste and others except glass and metal.

2. The operating temperature range of the reactor is adjusted from 350° to 1150°, which makes it possible to operate in the low-temperature mode from 350° to 850° and high-temperature pyrolysis from 850 ° to 1150 °.

3. The possibility of varying the temperature makes it possible to transfer the reactor to heat and power generation mode in a short period of time (in this case it is necessary to add the price of the gas turbine unit, the gas control unit).

4. The equipment has a unique ecological safety (there is no exhaust pipe) and versatility in terms of input raw materials, as well as an unparalleled system for obtaining light fractions of oil (gasoline, diesel) from mixed garbage in compliance with GOST.

5. The manufactured equipment can process from 10 to 100,000 and more m³ of waste per day, the volume of daily processing is determined by the customer.

The proposed combination of well-known and field-proven technologies into a single technological chain in the investment project allows for the efficient and complete use of waste, the extraction of energy, heat and other products contained in waste, which become raw materials for the production of renewables.

The rational integrated use of advanced technologies solves the problem of neutralization, concentration, release and disposal of toxic components and harmful emissions, including dioxins and salts of heavy metals, and thus minimize the impact on the environment.

The proposed set of equipment and the correct proportions of various technologies ensure a highly profitable production of secondary raw materials and commercial products, which doesn't increase the costs of the city budget for sanitary cleaning and waste disposal.

Over a short time, the project allows the city authorities, enterprises and organizations, entrepreneurs and the society on the whole to solve the problem of waste disposal using state-of-the-art methods, improve the ecology in the area of the installed complex and provide tangible prerequisites for the social and economic development of the city.

The launch of the second stage is scheduled 12 months after the first one.

OFFER TO INVESTORS.

stage 1	**15% of profit**	**3% in the company**
stage 2	**15% of profit**	**5% in the company**
stage 3	**15% of profit**	**5% in the company**

This offer implies 100% financing of one of the stages and participation in the project and, accordingly, the profit is made based on the financed stage.

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