



## MUNICIPAL SOLID WASTE RECYCLING WITH ECOMACHINE AMR

*Complex EcoMachine for municipal solid waste recycling with producing of electrical and heat energy*

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### TECHNOLOGICAL SOLUTIONS

Municipal solid waste recycling with using of innovative technologies of SPA ECOMASHHGROUP allows of environmentally safe recycling of mixed municipal solid waste with producing of liquid products (electrical and heat energy)



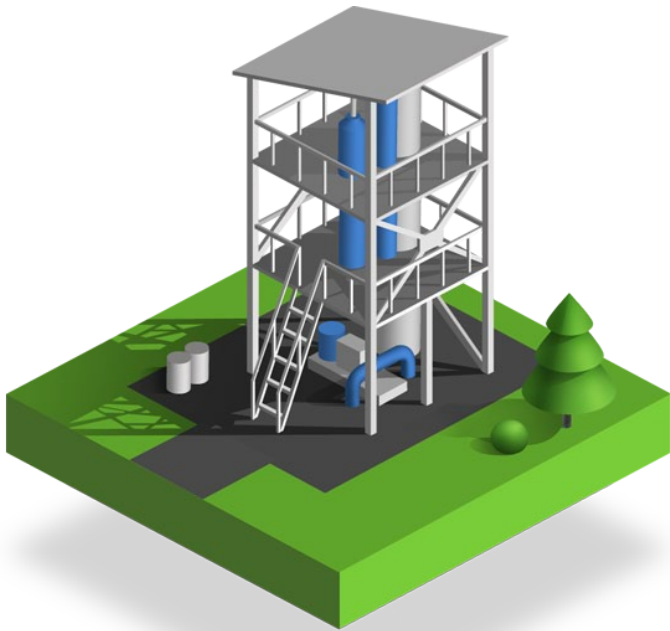
When recycling 1 ton of municipal solid waste  
our technologies allow to produce



up to 500 kW·h  
of electrical energy



up to 300 Mcal  
of heat energy



## Technology of waste recycling by complex EcoMachine AMR

The technological process of recycling complex EcoMachine AMR-100 is based on innovative technologies of fast pyrolysis of the feedstock. There are a fast pyrolysis and a physical or physico-chemical activation at the same time. Using of separate blocks with different thermal treatment of condensate and closed recirculating system provide the most efficient and complete utilization of the heat supplied from the outside as well as formed as a result of chemical reactions.

Condensation of vapor fraction is lead by its indirect cooling with liquid coolant while simultaneously centrifugal separation at sequential passage of the gas fraction of a multistage system of cooling and cleaning. Uncondensed gases that have passed a multi-stage cleaning system and cooling system are served to supply the internal combustion engine that runs on gas and diesel cycle.



The engine is paired with the electric generator of 100 kW for generation of electrical energy supplied to the consumer. In accordance with customer desire cogeneration is implemented with the simultaneous production of electricity and heat.

Municipal solid waste recycling with the new complex EcoMachine AMR-100 is absolutely environmentally friendly - all emissions meet the standards of the MPC.



# PERFORMANCE ATTRIBUTES

No	PERFORMANCE ATTRIBUTES OF THE COMPLEX ECOMACHINE AMR-100	SENCE
1	Generated electrical energy, $\_K \ \backslash$	100
2	Generated heat energy, Mcal/hour	not less 90
3	Waste recycling efficiency, $m^3$ / twenty-four hours	
	◆ - oil-slimes	12-36
	◆ - plastics, polymers	12-36
	◆ - industrial rubber products	12-36
	◆ - railroad ties	12-36
	◆ - oily soil	12-36
	◆ - medical waste	12-36
	◆ - municipal solid waste and their materials	12-36
	◆ - industrial solid waste	12-36
	* <i>YZZ]V]YbV]hXydybXg'cb'h\Y'XYbg]mž`i a ]X]mV]bhYbž'k UghY'V]za dcg]h]cb'UbX'W]b'VY']bV]YUgYX</i>	
4	Humidity of raw products, % no more than	30
5	Size of the raw materials, mm not more than	500 X 500 X 100
6	Category of power supply	I
7	Staff for one plant:	2
	◆ operator	1
	◆ odd-job man	1
8	Volume of water section, $m^3$	2,9
9	Consumption of diesel fuel at work on the gas-diesel power, L/hour* <i>* with a maximum calorie of synthesis gas produced from waste</i>	3-5
10	Rated power of the internal energy consumers of the plant, $\_K \ \backslash$	3,6
11	Calories of the produced synthesis gas, MJ / $m^3$ * <i>* depends on kind of waste</i>	12-36
12	Bottom ash for recycling, in % of the amount of waste * <i>* depends on kind of waste</i>	5-10%
13	Warranty, month	12
14	The life duration of the plant before overhaul, month	72
15	Dimensions of the plant, W x L x H, mm, no more than (see the layout of the equipment)	4500 x 5000 x 9200

# THERMO-CHEMICAL DESTRUCTION IS AN ENVIRONMENTALLY SAFE PROCESS

Thousands of toxic and poisonous compounds (dioxins, furans) are produced released into the atmosphere during the combustion of oil sludge.

The main difference of thermo-chemical destruction process from combustion is the lack of oxygen that is why a lot of toxic compounds are not generated (or just scanty amount but all is conforming to emissions standards).

The equipment for combustion of municipal solid waste should have a major gas cleaning system, which is very expensive both for the initial cost and running costs (high power inputs and large amounts of sorbent materials, which are also should be recycled).

## WARRANTY AND SERVICE

*H\Y'k UffUbhmdYf]cX`]g%&'a cbh\gfVUb`VY`]bVfYUgYXL*

We have "hot line" for our clients. You can call and get an expert advice on the operation and maintenance of the plant.

If the problem cannot be resolved independently, within a day repair team will come to customers (during the warranty period free of charge, after the expiration of the warranty period, technical support is provided through contractual relationships).

*The life duration of the plant before overhaul is 6 years.  
The cost of repair is 20-25% of the common cost of the plant and takes 7 days.*

Routine maintenance (oil and oil filter change in the engine, checking the critical nodes set)

is made every 300 hours of operation of the plant (duration about 3 hours)

# ECONOMICS OF THE WASTE RECYCLING PROCESS WITH ECOMACHINE AMR-100

*9Vtbcā JvJbXJvUhcfgUfY'a UXY'i d'cZ'fYj Ybi YgUbX'Yl dYbgYg*

## INCOME

- ◆ - Fee for waste recycling or savings on waste disposal, fines, etc.
- ◆ - Liquid Fuel Oil fractions depending on the type of waste can be suitable as fuel oil for boilers.
- ◆ - Power of 100 kW is available to supply the consumers, constantly energy production.
- ◆ - The solid residue depending on the type of waste can be suitable for the manufacture of dyes sorbents, and fillers for foam, concrete, addition for road
- ◆ - The synthesis gas produced while waste recycling (calorific value from 12 to 30 MJ/cubic meter, depending on the type of waste) feeds the gas-diesel power plant. The power plant runs on gas and diesel mode, the main type of fuel - syngas, additional is diesel fuel (diesel fuel is used to provide continuous power regardless of changing calorific of produced synthesis gas with changing of the composition and type of municipal solid waste).
- ◆ - **Thermal energy cogeneration is used** to heat the cooling system and exhaust gases of internal combustion engine.

## COSTS

- ◆ Diesel (average consumption from 3 to 5 liters per hour) depends on the type of waste and a complete set of equipment options,
- ◆ Wages of employees (staff 2 people).

*Actual results of the technological process can be different, it does depend on the different types of waste, and as a consequence, different calorific produced synthesis gas.*

# ADVANTAGES OF ECOMACINE AMR-100

1. The plant is superior to combustion equipment with the technical and environmental points of view (technically more advanced process with substantially lower operating costs.)
2. During thermo-chemical destruction waste products are converted first into syngas, which is then used to power an internal combustion engine that provides the best environmental performance.
3. The technological process provides an environmentally safe a wide range of solid waste recycling, including healthcare and other dangerous wastes.
4. There is no need to pre-sort of waste, what saves operating costs.
5. The technological process of waste recycling requires minimal maintenance costs.
6. High energy conversion efficiency is up to 95% of the energy of waste goes to synthesis gas.
7. The technology is also environmentally safe for medical and other hazardous waste recycling.
8. The technology provides a reduction in the volume of solid waste recycled up to 95%.
9. During the municipal solid waste recycling is possible commercial using of bottom ash (carbon black, construction, and petrochemicals).
10. The technology provides renewable alternative sources (waste) for generation of electricity.
11. Air pollution is less than diesel power station makes.
12. Recycling plants with modular components provide optimal processing power, covering different needs.
13. The technology is compact and needs a small area.
14. There are no specific requirements for the place and communications.
15. Potential sources of income:
  - Payment for waste recycling,
  - Recycled materials sale (with the option of pre-sorting)
  - For own use / sale of liquid fuels,
  - For own use / sale of electricity
  - For own use / sale of thermal energy
16. The technology gives the right to receive subsidies and other preferences (including tax) with the account of innovative process of using alternative energy sources.
17. Possibility of buying the complex using leasing



# DOCUMENTS

Patent for invention №2431778



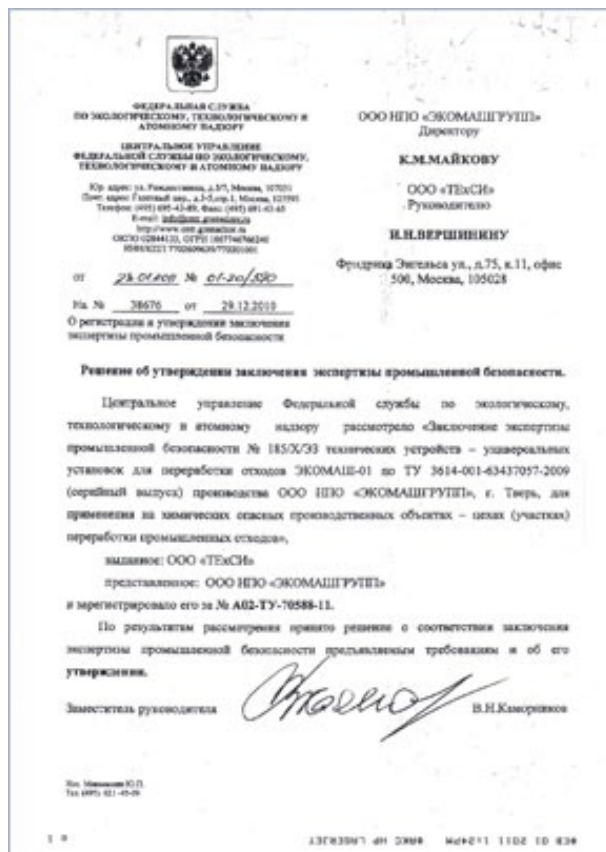
Licence for use of equipment



Certificate of State standard specification



Examination of industrial safety



## ADVANTAGES OF OUR EQUIPMENT

Using of EcoMachine AMR-100 for waste recycling allows to get ecological and economic effect at the same time:

- ◆ The area for waste burial will stop rising, the level of soil, underground water and air pollution will reduce;
- ◆ The cost of waste recycling, which become a raw material. The lack of ecological payment for waste placement and recycling increases economic effect.

Currently the process of thermo-chemical destruction (pyrolysis) has established as a technology of thermochemical conversion of carbon-containing substances with high potential, especially for the high yield of liquid fuels and chemical products.

Pyrolysis is used to obtain the maximum amount of either gas or liquid waste in accordance with fixed temperature of the process.

Pyrolysis allows converting carbon-containing raw materials into an energy valuable synthesis gas, which can be used for generating of heat and electrical energy.

Innovative technologies underlain in the creation of universal systems for oil waste recycling with EcoMachine AMR-100 can turn waste into not only high quality products - electric and thermal energy available to supply all consumers but also into liquid fuel fractions which can be used as fuel oil for boilers or further refined into commodity fuels (gasoline, diesel fuel)



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*technology of ecoenergy*

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