Mobile Complex for Solid Wastes Treatment and Recycling

MKP «ECOSPAS»

Ecological Safety and Wastes Treatment Issues

International Regulatory and Document Base

- **United Nations** Sustainable Development Goals for the period of 2015-2030
- **Basel Convention** on the Control of Transborder Movements of Hazardous Wastes and their Disposal
- **Stockholm Convention** on Persistent Organic Pollutants
- **London Convention** on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter

Regulatory base of the Russian Federation

- Decree of the President of the Russian Federation No. 176 ‘About Ecological Safety of the Russian Federation for the period to 2025’ dd April 19, 2017
- Federal Law No. 7 ‘About Environmental Protection’ dd January 10, 2002
- Federal Law No. 89 ‘ Industrial and Consumer Wastes’ dd June 24, 1998

Ecological Safety and Wastes Treatment Issues

Urgency of the Issue

- Global volume of wastes annually **increases by** 3 %
- About **40 %** of wastes worldwide are subject to **open burning**
- **163** of 193 countries commonly apply wastes **open burning** in practice
- About **4 billion tons** of wastes are being generated in Russia annually
  Of these **55-60 million tons** are solid household wastes (SHWs)
- Potential **energy, recourse and economic values** of wastes
- **Obvious need to** implement state-of-the-art Solid Household Waste Treatment Complexes

Task

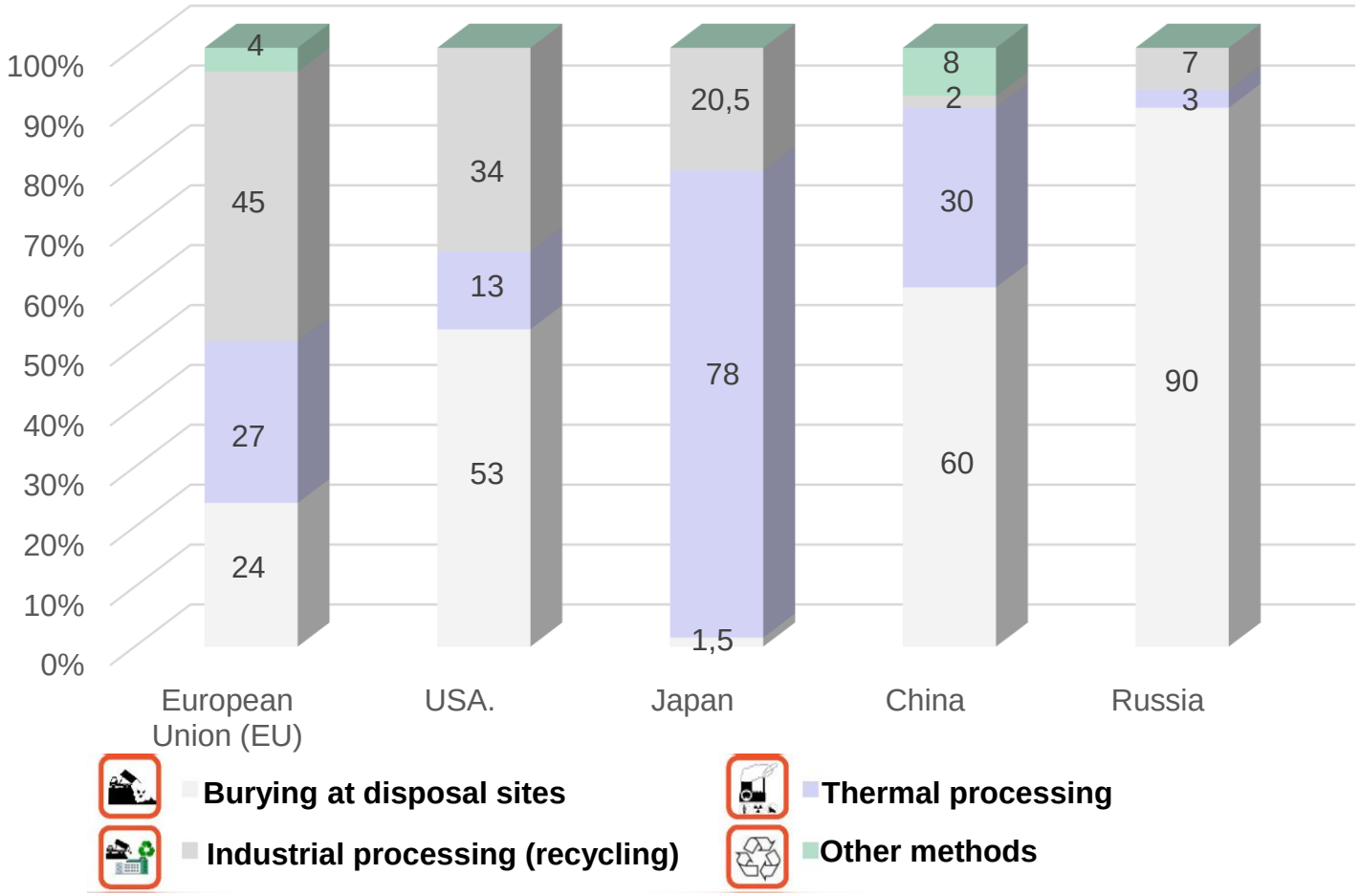
- Development of eco-friendly equipment that allows both to **dispose and treat** waste and to **use its resources** rationally

Solution

- **Science, technology and production** to be synergized for development of innovation process engineering concepts pertaining to Solid Household Waste Treatment Complexes
- The **best available technologies** for manufacturing and upgrading Mobile Solid Household Waste Treatment Complexes shall be applied
- The equipment developed shall be vigorously **implemented and used**

Methods of Solid Household Wastes Treatment in Some Parts of the World

Solid Household Wastes in % of total volume



Sources: Eurostat, EPA (USA), Global Recycling, Elsevier, Waste-tech.ru, 2018

Thermal Processing Methods of Solid Household Wastes

Burning	The most commonly used method. Final products of direct burning (ash and significant volumes of toxic substances) are released into the environment.
Pyrolysis	Organic parts are resolved into less heavy constituent molecules or into lighter components affected by temperature increase in the absence of air.
Plasma methods	High-temperature variety of thermal decomposition of highly hazardous wastes at temperatures from 1300 to 3000 ° C.

Effective and eco-friendly waste recycling shall be based on **deep conversion** with intermediate waste neutralization of toxic components

A **combination of technologies** is needed for effective and eco-friendly solutions

Latest Russian Developments Pertaining to Solid Household Wastes Treatment

NPO «ECOSPAS»

Oboronpromecologiya

- Institute of Electrophysics and Electric Power Engineering of the Russian Academy of Sciences

A unique program for application of **plasma technologies** for wastes burning of I and II class of hazard has been implemented.

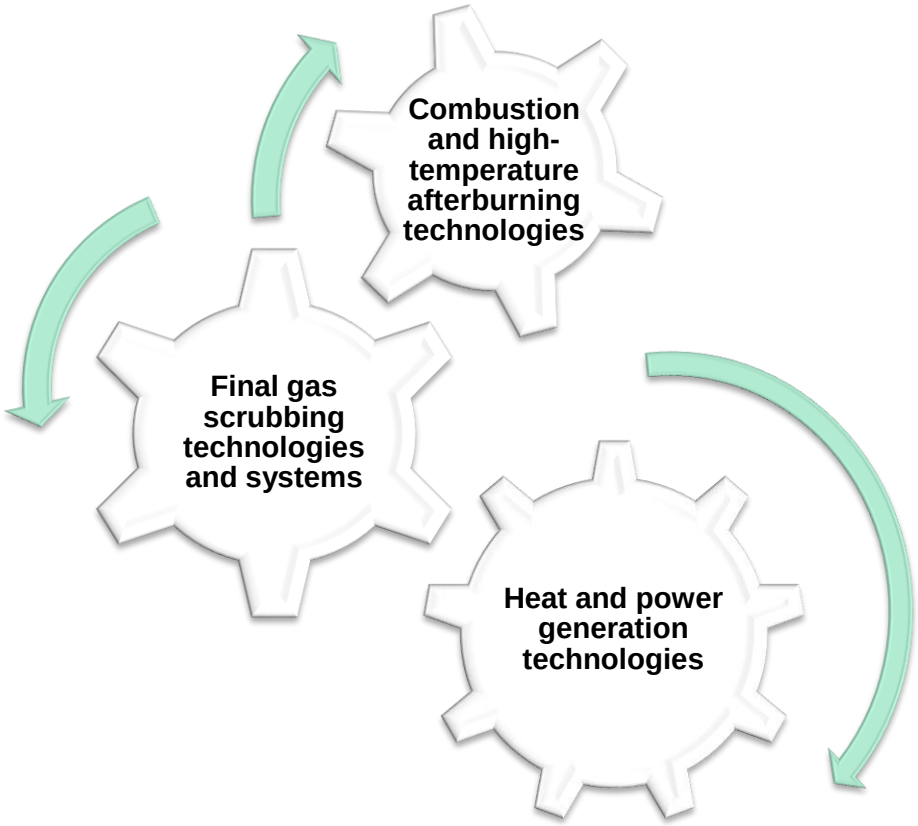
An innovation **plasma reactor** in combination with a wide range of plasma generators of various capacities has been developed, manufactured and successfully tested.

- Semenov Institute of Chemical physics of the Russian Academy of Sciences

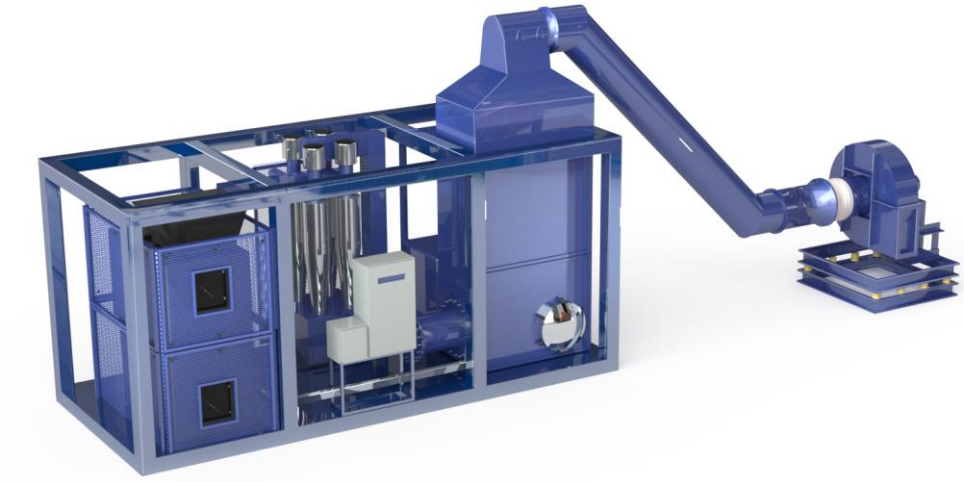
Technical breakthrough has been made in the field of **high temperature infrared burners** for wastes pre-treatment and **off-gas incineration** system.

Mobile Solid Household Wastes Treatment Complex MKP ‘ECOSPAS’

Combination of technologies
for a unified engineering solution



Mobile Solid Household Wastes Treatment Complex MKP ‘ECOSPAS’

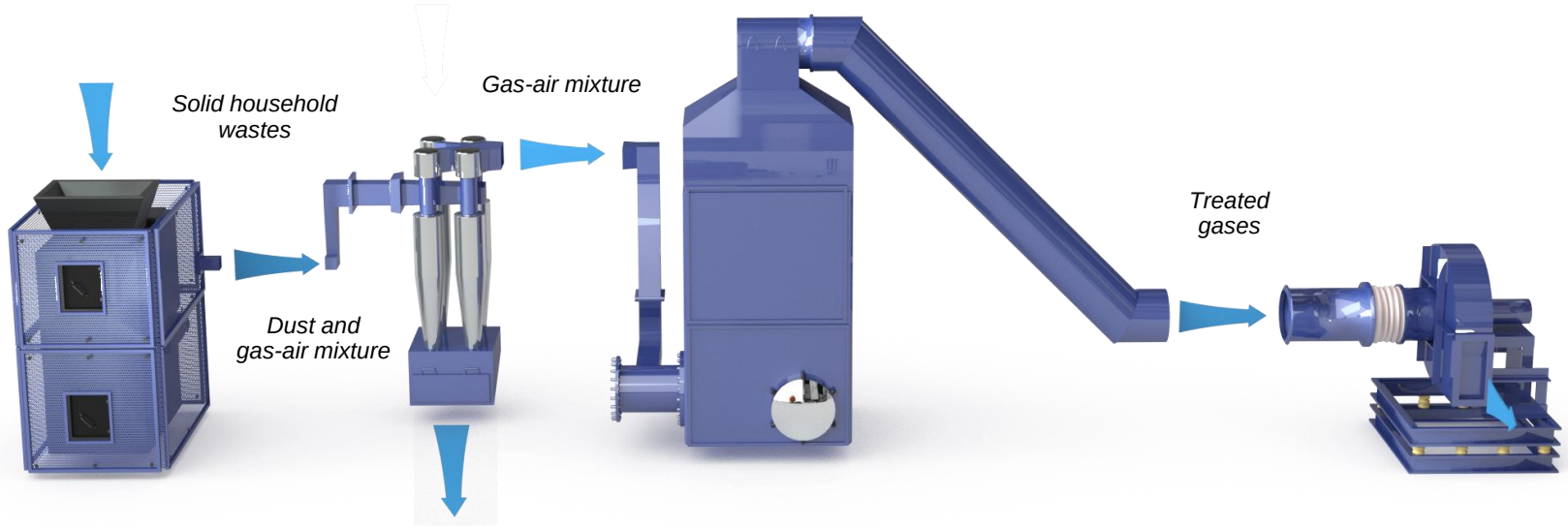


Process Flow Diagram (PFD)

Load hopper

Cyclone module

Wet scrubber



Wastes heat recovery unit with heat exchanger

Mobile Treatment Complex MKP ‘ECOSPAS’

Technical specifications of a module in basic configuration (mobile design)

Parameter	Value
Heat power (depends on moisture content in raw materials and their calorific capacity) - Minimum - Maximum	 40-70 kW 300-500 kW
Capacity	1,000 kg/h
Power consumed	21 kW, max.
Operational temperature in the main chamber	800-900 °C
Operational temperature in the afterburn chamber	1,700 °C
Reactor charging	Top
Noise level	65 dB, max.
Attending personnel	1 person
Overall dimensions in transport position, mm	6,058x2,438x2,895
Module weight in transport position (maximum)	12 tons

Mobile Treatment Complex MKP ‘ECOSPAS’

Thermal destruction reactor with high temperature zone

Is equipped with innovation high-temperature incineration system

Effective module of dry and wet gas scrubbing

Environmental hazards have been eliminated

Multi-level automation and control system

Human errors have been minimized

Integrated heat exchanger

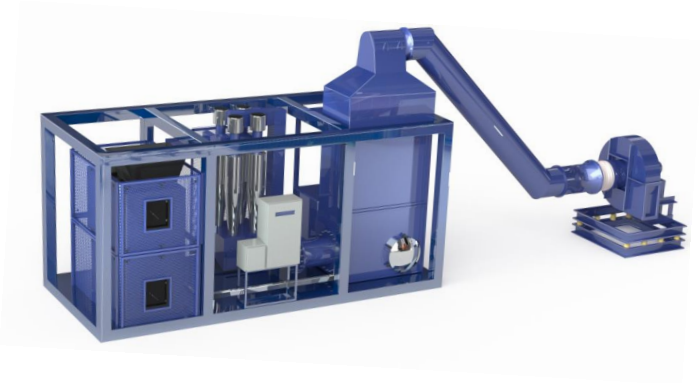
Generates more than 500 kW of heat

Wide range of options

- sort lines
- waste mechanical charging lines
- packing lines
- other options upon request

It is possible to connect various additional equipment for:

- heat metering and distribution
- electrical power generation
- other technological processes upon customers’ request



MKP ‘ECOSPAS’ Advantages

High capacity

The Complex in the basic configuration (mobile design) processes up to 1 ton of wastes per hour (6,000 tons per year)

Energy independence and energy saving

Wastes themselves are used as a fuel

Release into atmosphere is minimized

This fact has been confirmed by investigations conducted by specialized accredited laboratories

Mobility

The Complex may be carried by any means of transportation and installed in one day

Ease of maintenance

Only one operator is required for this kind of works

No specific infrastructure and special preparation of operating floors are required

The number of approvals has been minimized

MKP ‘ECOSPAS’ Advantages

Ash residue generation is minimized

and is 2 to 5 % depending on morphological composition of wastes

Ash residue may be used

for road construction

Various climatic modifications

Including conditions of the Arctic and the Far North

Low noise level

It does not exceed 65 dB

It may be installed nearby residential areas.

Sanitary protection zone is 500 meters and can be reduced

It may be powered by an independent energy supply

A diesel-generator may be connected additionally

MKP ‘ECOSPAS’ Advantages

Successful operation of MKP ‘ECOSPAS’ is ensured by the combination of MKP ‘ECOSPAS’ mobility and fuel tolerance for:

- infrastructure upgrading of existing boiler facilities of residential and industrial infrastructures, transitional settlements and construction facilities accompanied by simultaneous solving of problems pertaining to their solid household waste neutralization
- usage as a central heat and hot water source at solid household wastes neutralization and disposal sites
- providing power supply to contaminated soil washing equipment at locations of accidental oil product spillage
- neutralization of silts, wastes generated during cleaning of automatic screens with simultaneous heating of process water at water and waste water treatment facilities
- usage as a central heat energy source in self-contained liquid waste centrifuge separation and recycling complexes

MKP ‘ECOSPAS’ may be integrated into existing heating and water supply schemes located at enterprises and human settlements, thus providing significant saving of conventional utilities.

Benefits of Mobile Treatment Complex (MTC) ‘ECOSPAS’ Application

MKP ‘ECOSPAS’

= Fuel saving + 14,000 m³ of recycled wastes per year + Documentation for waste management

- Utility saving

- Yearly various types of fuel consumed for heat generation (with 500 kW boiler capacity) are as follows: 351 tons of fuel oil or 280 tons of diesel fuel or 2,000 tons of pit coal or 420,000 m³ of natural gas.

  In terms of money this is 28,000$ (gas) up to 106,000$ (diesel fuel)

14,000 m³ of wastes

= 351 tons of fuel oil = 280 tons of diesel fuel = 2,000 tons of coal = 420,000 m³ of natural gas

Additional Opportunities

Wide range of options to equip:

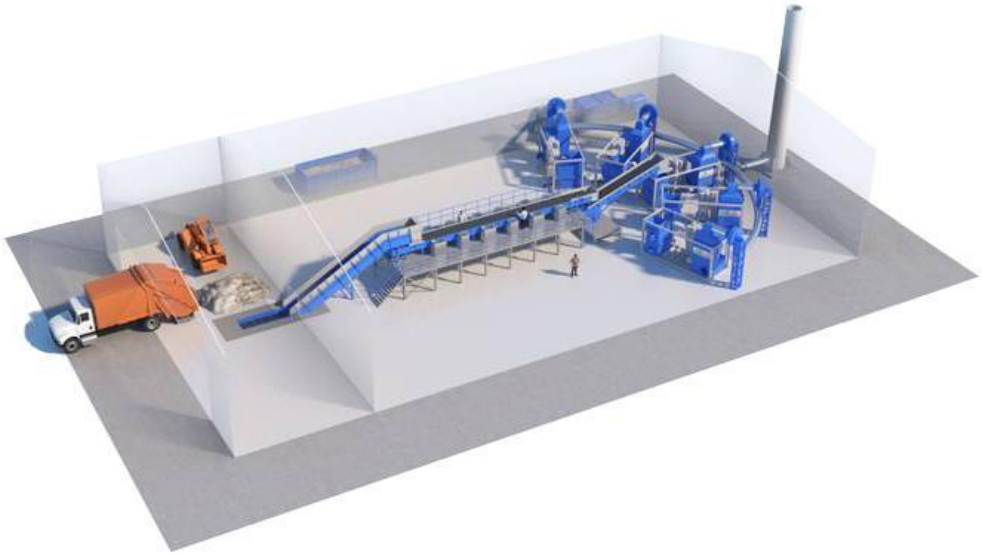
- automated charging unit with an intake hopper
- sort line for collection of metal, paper and plastic wastes
- other technological solutions upon request

Additional equipment manufactured by leading global producers

- steam generator
- electric power generator
- other additional equipment upon request

Capacity and heat power multiplication

Creation clusters
from standard modules



The Complex may be implemented with the use of a **combination** of a specific quantity of **reactors.**

Upon customer request, the Complex may be constructed in a space of any **architectural concept**

MKP ‘ECOSPAS’ Operation and Personnel Training

Design

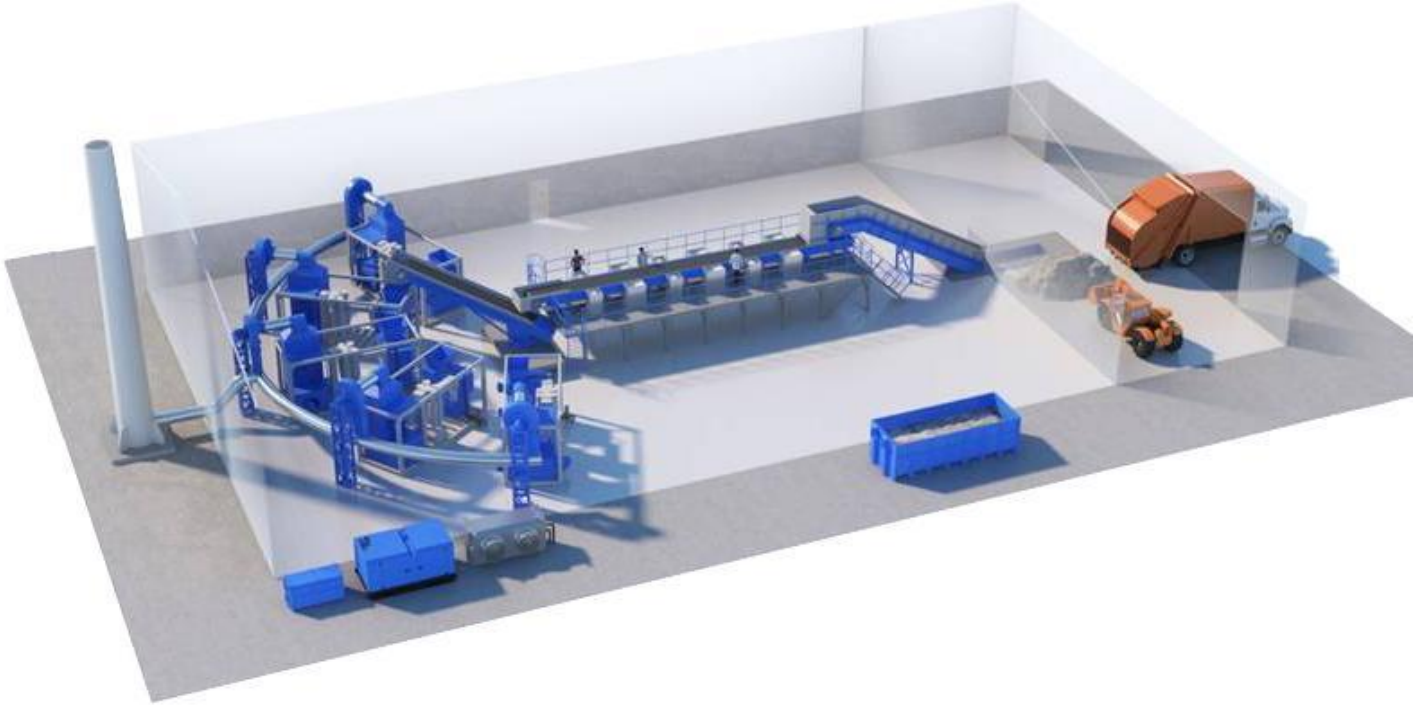
Mobile Complex MKP ‘ECOSPAS’ is operated by **one person** adequately **trained** as per the special program

The training program is composed **individually,** taking into account the configuration, operating conditions of the installation and customer requirements

Training may be provided at the Operators’ **Training and Production Center**

Education requirements - compulsory education
(in Russia - basic general education)

Five Reactor Cluster of MKP ‘ECOSPAS’



The Cluster composition: 5 reactors and a sort line

Capacity: up to 5 tons of wastes per hour (up to 30 000 tons per year)

Personnel required for shift working: 14 persons

Thank you for your attention!