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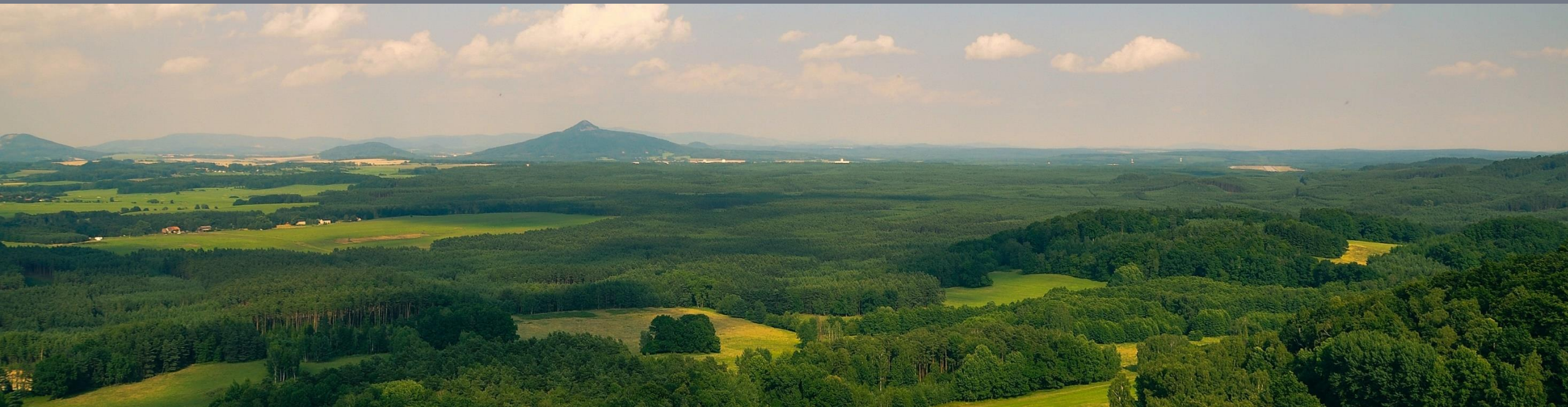
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818351

Research and Innovations in Bioeconomy



Project
„ Bioproducts from lignocellulosic biomass derived from maarginal land due to filling in gap in national economy”
Acronym: BIOmagic
financed by the National Centre for Research and Development in the framework of BIOSTRATEG III Programme

INSTYTUT TECHNOLOGICZNO-PRZYRODNICZY

BIO magic

CBEO

UNIWERSYTET WARMIŃSKO-MAZURSKI W OLSZTYNIE

Narodowe Centrum Badań i Rozwoju

Main aim

Elaboration of bioproducts with contains bioactive substances derived from lignocellulosic biomass of Perennial Industrial Crops (PIC) cultivated on abandoned, marginal land.

BIOmagic – detailed targets

- Establishing link between PIC cultivation on marginal lands and biomass implementation in industry.
- Research above 11 plant species.
- Production chain and logistic chain integration.
- Experiments with many convertion processes of biomass, biomass processing (in termophysical, chemical, biochemical, biological and termochemical ways).
- Experiments with many extracts of bioactive substances and bioproducts which could be used in pharmaceutical, cosmetical, chemical, food, forage and energetical industries.
- Implementation of new strategical approach to cascade type of lignocellulosic biomass utilisation – firstly to extract valuable substances and make from them bioproducts. At the end, wastes from biomass processing utilise to produce energy.

Plant species investigated in the project

1. 4 species from groups of fast growing shrubs and trees - locust (*Robinia pseudoacacia*), purple willow (*Salix purpurea*), basket willow (*Salix viminalis*), poplar (*Populus nigra x P. Maximowiczii*);
2. 4 species from perennials group - willowleaf sunflower (*Helianthus salicifolius*), cup plant (*Silphium perfoliatum*), Jerusalem artichoke – topinambur (*Helianthus tuberosus*);
3. 3 species from grass group with C4 photosynthesis type - giant miscant (*Miscanthus x giganteus*), chinese miscant (*Miscanthus sinensis*), sugar miscant (*Miscanthus sacchariflorus*), praire spartina (*Spartina pectinata*).

ITP tasks

- Experiments with plants in lysimeters.
- Experiments with plants in vases.
- Elaboration of mathematical growth models for plants based on ITP experiments and data from the project partners, from IUNG and UMWW.
- Elaboration of good cultivation practices for PIC growing.

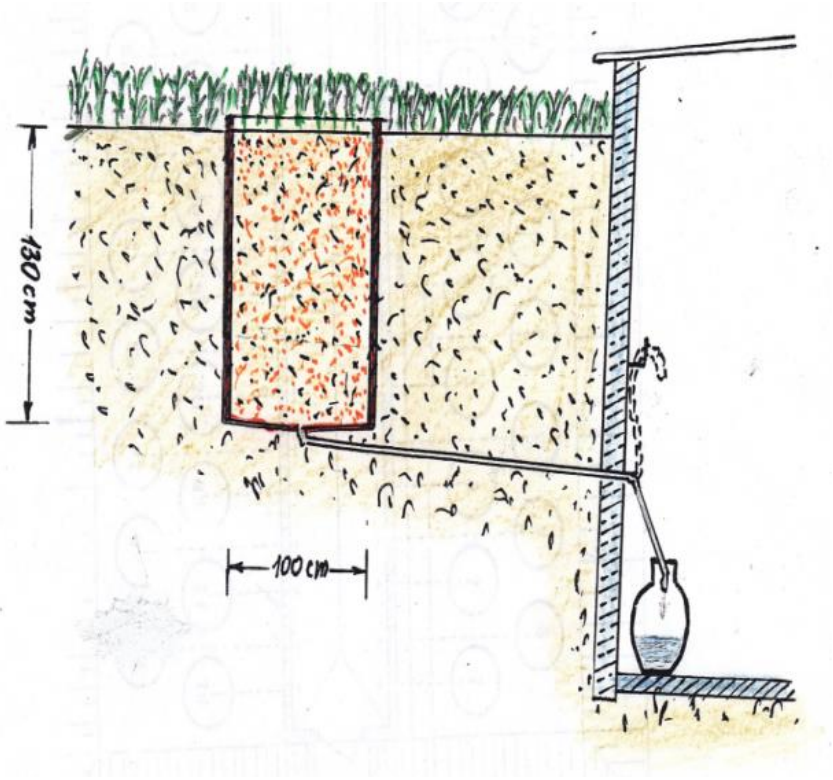
ITP research in the project

Experiments in vases

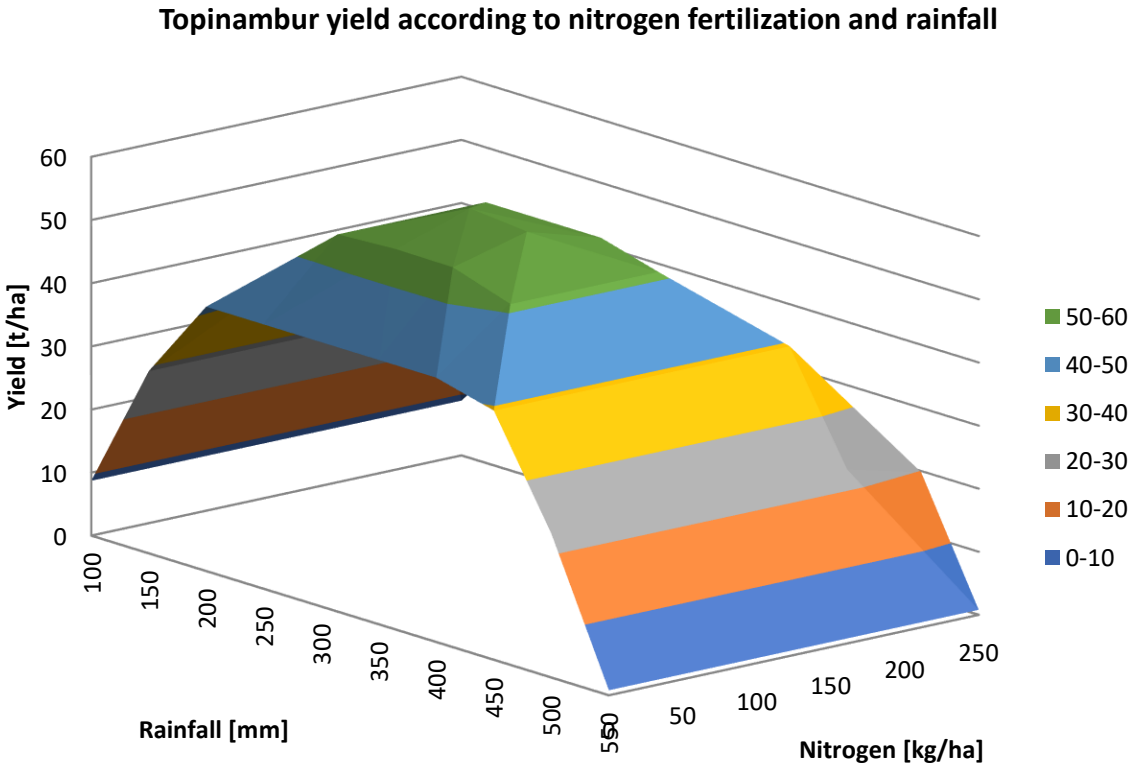
Experiments in lysimeters

Experiments on plantations

ITP – lysimeter illustration



Exemplary research results visualisation for above ground topinambur part yield



Patent applications made in this project

1. **Method of extracting polar substances, of plant origin**
Application No P.434682
2. **The use of plant extracts from the bark and wood of poplar Populus nigra x P. maximowiczi obtained by the supercritical extraction method for the treatment of parasitosis in humans and animals**
Application No P.434105
3. **The use of plant extracts from the bark and wood of the basket willow (Salix viminalis) obtained by the supercritical extraction method for the treatment of parasitosis in humans and animals**
Application No P.434104

There are going to be prepared additional 6 patent applications and 3 utilization patterns.

Project

„ Research and preparation for the implementation of technologies for producing energy and heat in the boiler powered by micronized biomass”

Acronym: **BioCHP**

financed by the National Centre for Research and Development in the framework of BIOSTRATEG I Programme

Aim of the project

The aim of the project is to develop and prepare to implementation the cogeneration boiler based on gas turbine which utilizes the energy and heat production technology from micronized waste biomass.

Innovations in the project

The Project concerns the energy and heat production using micronized biofuels made in the process that hasn't been known (outside the sphere of research) in Poland, and that doesn't have its counterpart in the world. The innovativeness of the above mention solutions will also rely on a combination of micronization set, the gas and dust turbine's set, and hybrid boiler set, which will allow for direct, in-line transformation of biomass into electricity and heat. The boiler will be able to operate on fuel oil and / or gas (depending on the choice of the strategic market area) and microdust biofuel. It will also be generated by the heat in the form of air from the outlet of the turbine. Currently, there are no boilers with a hybrid burner for oil, gas and microdust.

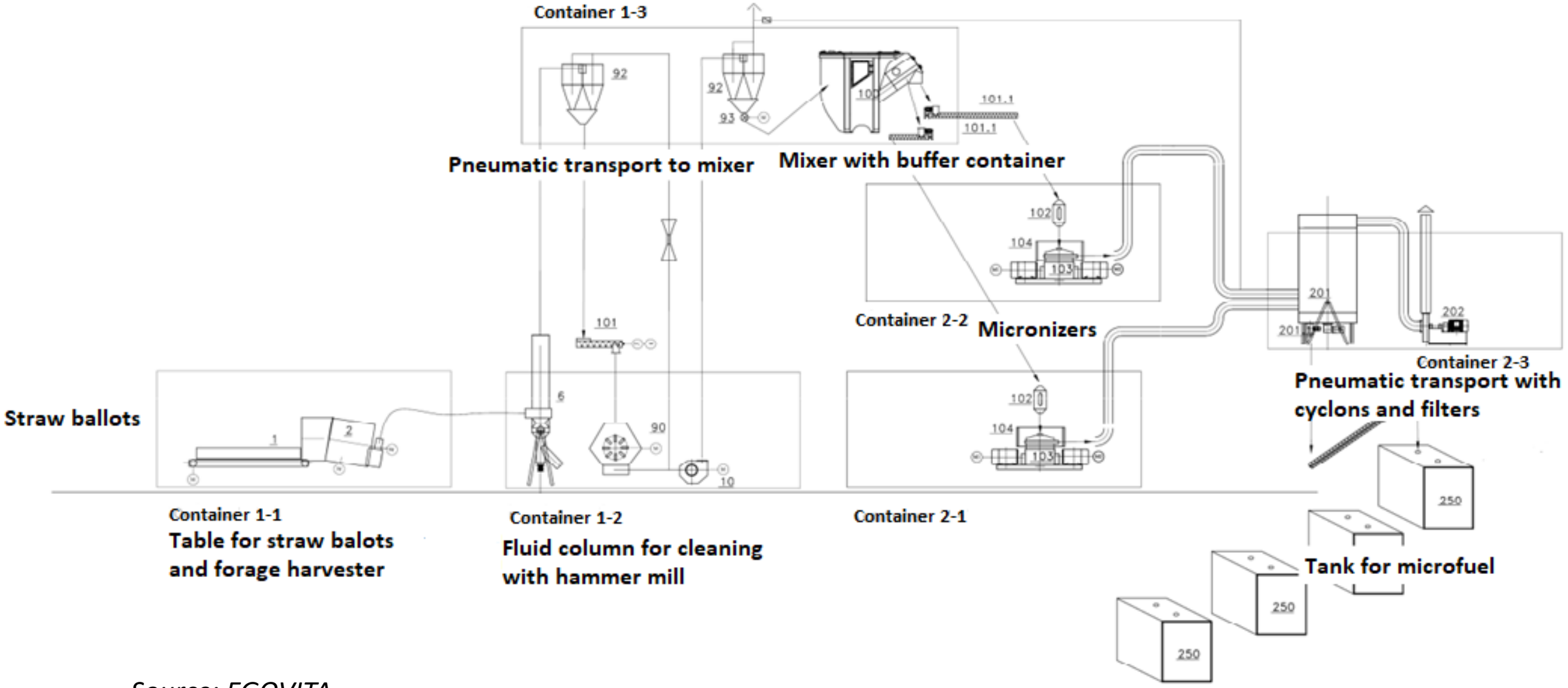
The project framework

- Development of preliminary assumptions for R&D works in the field of biomass cogeneration installations with 1.5 MW electric power and 6 MW heat capacity.
- Development of a model of a modernized gas turbine, computer model tests of a modernized gas turbine, calculations and preparation of a technological design of elements of the modernized gas turbine.
- Development of a model of the boiler heat supply system with turbine heat, model tests of the boiler heat supply system with turbine heat, calculation of the parameters of the boiler heat supply system components with turbine heat and preparation of the technological design.
- Development of a model of a hybrid boiler, powered by an oil / gas mixture and micronized biomass of each fuel separately, model tests of a hybrid boiler, calculation of parameters of hybrid boiler components and preparation of a technological design of a hybrid boiler with a power system.
- Development of a model of the control and monitoring system, model tests of the control and monitoring system for various fuel supply systems and execution of a technological design.
- Making a prototype of the line and conducting research on the prototype

Biomass consumption

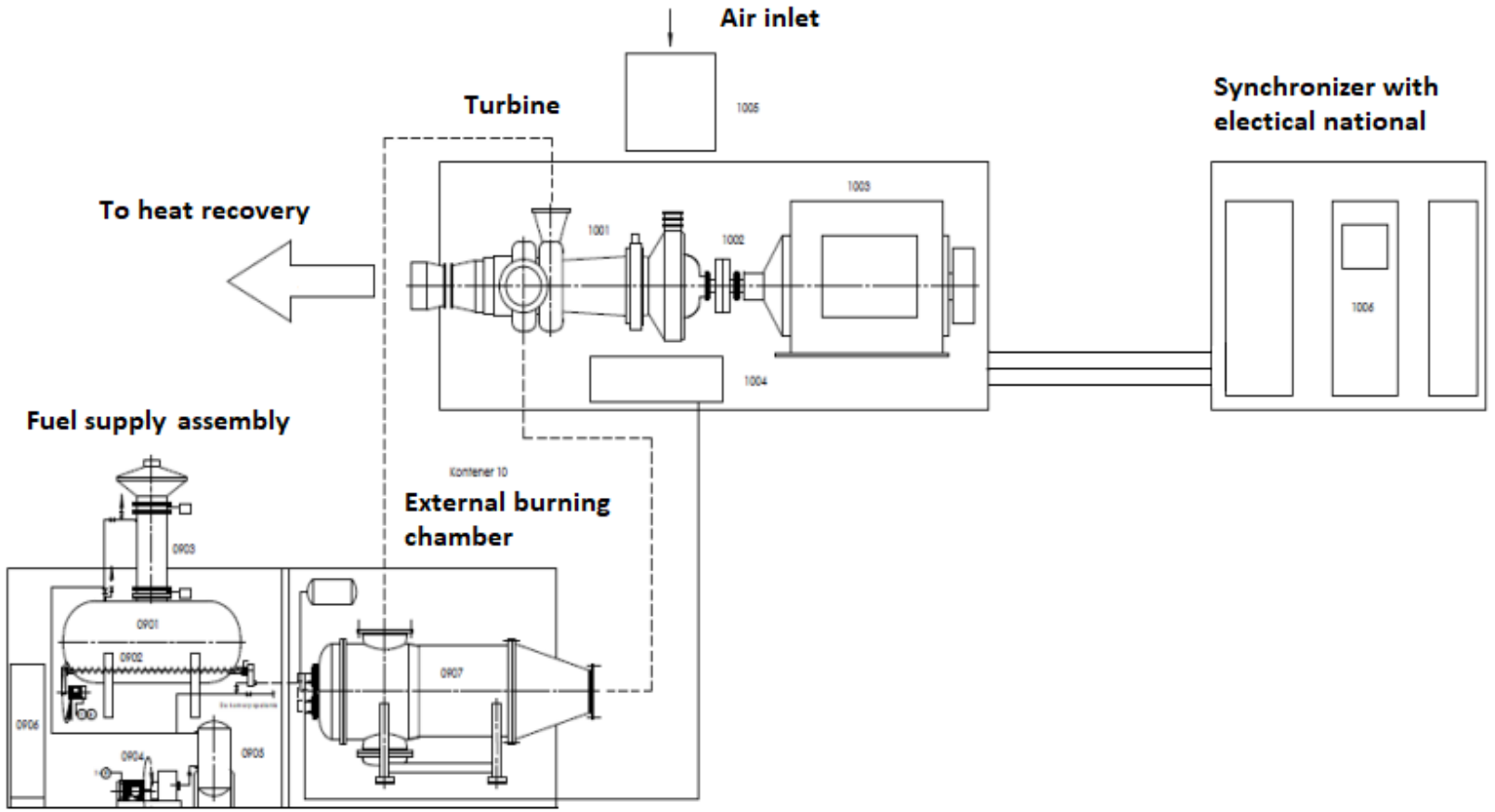
- 2,5 t/h of biomass with 15% moisture content.
- It is expected that installation will work about 80% of time per year - 7 008 $h*year^{-1}$ (0,8 $year^{-1}$*365 days*24h$\cdot day^{-1}$=7 008 h).
- Biomass consumption per year - 17 520 t$\cdot year^{-1}$.

Biomass micronization – technological fuel part - construction in containers



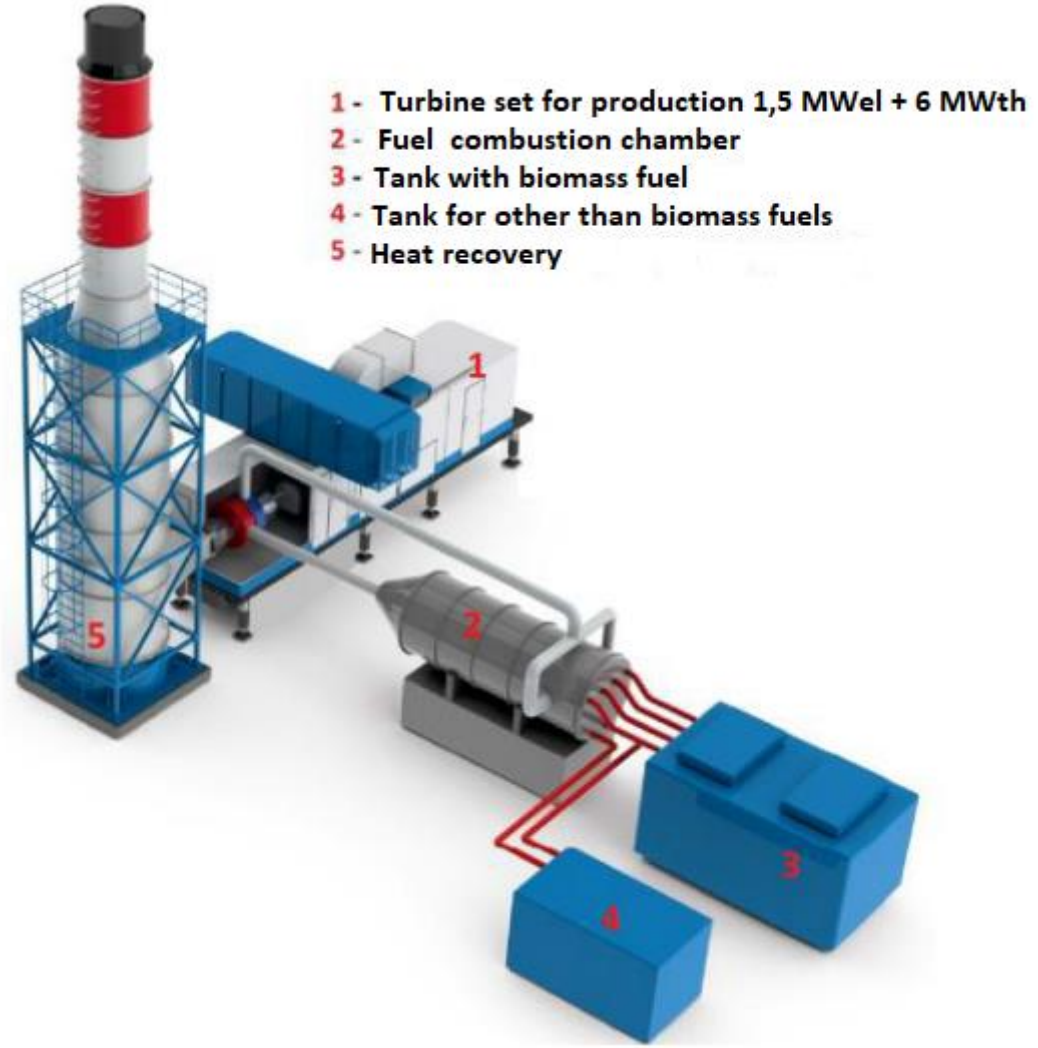
Source: EGOVITA

Turbine assmebly



Source: EGOVITA

Energy production unit visualization



Source: EGOVITA

Parts of energy production unit

Fuel supply assembly

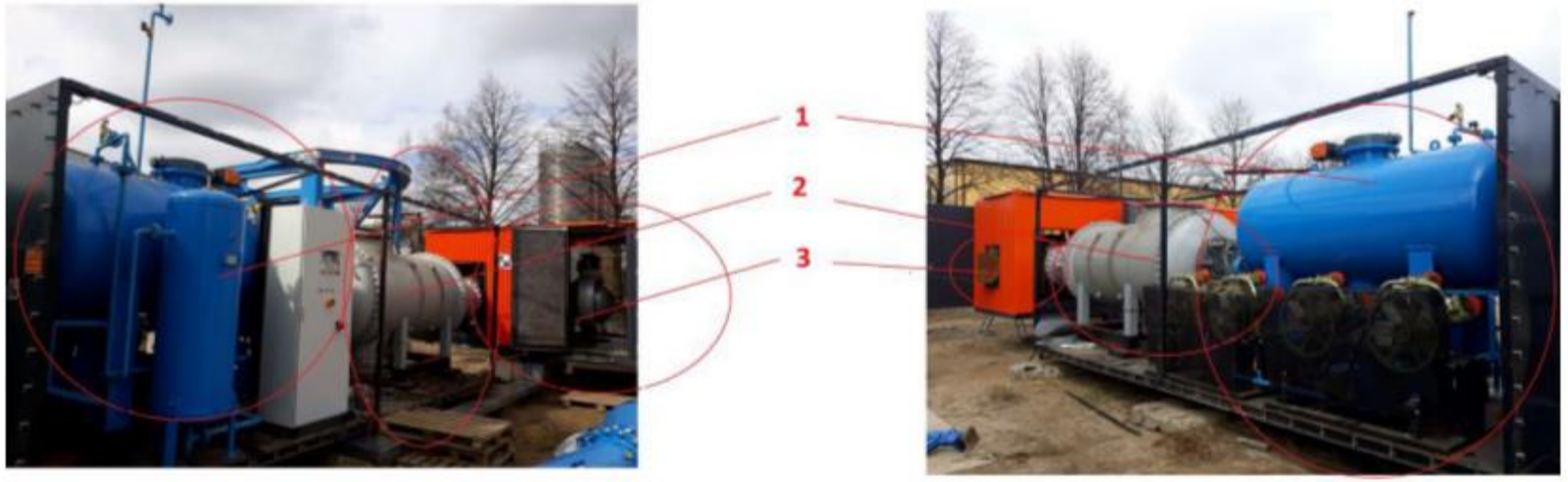
External burning chamber

Source: IMBiGS

Turbine engine AI-20 accomodated to micronized biomass fuel

Source: IMBiGS

Elements of the line



1 – Fuel supply
2 – Burning chamber
3 – Converted turbine AI - 20

Source: IMBiGS

The line during construction and after construction

Source: IMBiGS

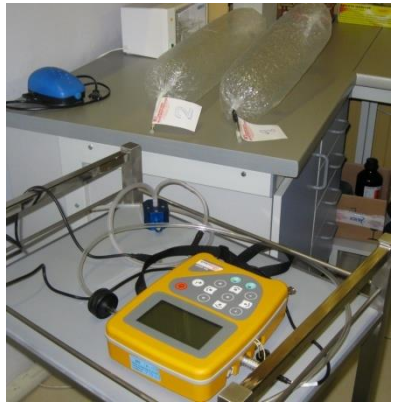
Multitasking Agricultural System powered by Renewable Energy Sources

Source: RAMseS®

Development of unconventional systems for the preparation and use of agricultural biogas

Gas compressing station

Tests of tractor fuelled by biogas



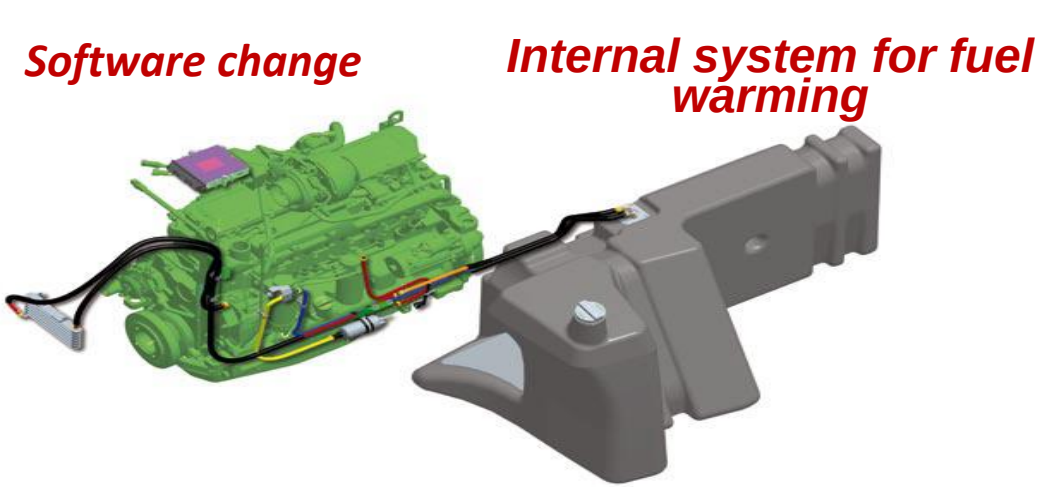
Source: ITP

Elaborated by Jerzy Karłowski, ZOZE, j.karlowski@itep.edu.pl

2nd VegOIL

The use of pure vegetable oil as a second-generation fuel for structurally advanced internal combustion engines

Project TREN/FP7EN/219004 - coordinator John Deere Werke Mannheim



Source: ITP

Project POiG „Straw”

Agreement No POIG.01.03.01-00-096/08

Aim

Elaboration of wet straw dryer. Implementation of waste wet straw in economy as biofiltr of exhaust gases from boiler.

Pictures from project realisation

Source: ITP

Smoke from boiler room without biofiltr and with biofiltr

Source: ITP

Thank you for your attention!

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POWER4BIO
REGIONS FOR BIOECONOMY

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