

Biotek Ltd. - Polish perennial crop breeder
Botanical name of taxon: *Sida hermaphrodita* (L.) Rusby
Common name of taxon: **Pensylvanian Malva**
Variety denomination: **PETEMI**
CPVO Variety reg. No.: **UE 20546**
European Patent: **1397470**



Biotek System

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Model 1. Plantation + Gas Generator

In principle this system for production of alternative energy is a combination of two novel solutions:

- Production of biomass on plantation of fast growing perennial crop "PETEMI" (CPVO reg. no 20546) with the efficiency of 15-20 tonnes of dry matter per hectare. The usable material is harvested in pieces similar to woodchips of energetic value equal to 18 MJ/kg;
- Gas generator – unit converting biomass to gas using pyrolysis process with the efficiency of 2000 m3 of gas which can be used for heating boilers, running electric turbines and piston engines.

Components and infrastructure needed for the functioning system consists of standard farm equipment, commercially available boilers and turbines without any need for redesign. The basic idea for this system is to bring together all components needed to produce biomass heat and electricity in one location which allows substantial reduction of costs. Implementing such concept enables to produce biomass converted to energy by the same entity – producer of biofuel generates energy. The system for production of alternative energy may be implemented by developing the entire infrastructure from scratch („green field”), however the most efficient approach is to modernize the existing facility producing heat from coal burning. Such entities have already established a network for energy distribution to permanent customers. The advantage of implementing the system by existing heating facilities is through lowering the cost of fuel and generating additional income from co-production of electricity. The system is particularly attractive for municipal companies localized in typical rural areas. From a social standpoint the important aspect is contributing to creation of new jobs and helping rural economy through utilizing abandoned land for non food production.

Potential for sludge disposal on PETEMI plantations to improve soil fertility is of great importance for safe waste management. Another important feature of the system is complete combustion of gas generated by pyrolysis which makes emissions of toxic substances negligible and eliminates environmental penalties. The amount of combustion ashes is minimal, on the other hand it can be used as a natural fertilizer. Our well documented data clearly indicate that the performance of proposed system can not be compared to any similar solution offered by the market in Poland and other countries.

System Efficiency example:

1 ha = 20 tonnes of biomass = 30 MWh of electrical en. + 60 MWh of thermal en.

Model 2. Plantation + Pellet Plant

Worth of mentioning is a fact that, the other way of PETEMI biomass use is a **densification**. This process could be performed by standard pelletisers without major changes in their devices. The only known change regards a redesign of ties.

The advantages of model 2. are lower investment costs, much better logistical flexibility of product and wider market demand.

There is already one manufacture in Poland producing this solid biofuel for company established by Poul Bondesen from Denmark. This product is registered as the Brix(TM) and it's protected by Polish and EU patents.

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Component 1. The source of bio-mass Pennsylvanian Malva – PETEMI variety

PETEMI is planted from seeds and can grow for 30 years on the same field. The first commercial harvest can be achieved in the second year after planting. Permanent nature of this crop and stable yielding provide ideal conditions for developing a long term relationship between the bio-mass producer and the industry generating heat and energy. PETEMI is not particularly demanding in terms of soil quality, moisture and climate conditions. This allows production of PETEMI in sites closely located to the end user reducing transportation cost. The crop management and harvesting is done using standard methods and farm equipment.

The biological and technological properties of PETEMI were developed through long term breeding program based on selection method conducted on poor quality soils, periodically to dry and of low nutrient content. Studies conducted in different soil and environmental conditions show that there is no risk for the uncontrolled spreading of PETEMI since seeds can not germinate without coating. Stable productivity was confirmed by 40 years long research conducted by crop scientists.

PETEMI is a variety developed by Biotek of Pulawy and is being tested by the Main Center of Agricultural Varieties in Poland (COBORU) and CPVO. Varieties are registered in Poland and EU according to the law complying with EU standards and receive full legal protection in Europe. All rights for industrial use of PETEMI are reserved and protected by international law.

Component 2. Pyrolysis Gas Generator

Traditional furnaces used for burning bio-mass are characterized by low energy efficiency which is resulting from incomplete combustion of low caloric gases generated in the first phase shortly after loading the fuel. Proper combustion requires maintaining constant conditions and appropriate ratio between fuel and air. These requirements are met by gas generating unit using pyrolysis process.

The temperature for pyrolysis is ranging from 400 to 850 oC. In such conditions 1 tone of biomass generates 2000m³ of gas of following composition:

| | | | |
|----------------------|----------|-----------------------|-----------|
| CO | 17 - 25% | CH₄ | 2 - 4% |
| H₂ | 3 - 5% | CO₂ | 25 - 33 % |
| N₂ | 30 - 36% | H₂O | 1 - 5% |

Gas produced by the pyrolytic generator is used for:

- Combustion in a heating water furnace or steam boiler,
- Combustion in a heating water furnace or steam boiler combined with a grill furnace
- Combustion in a system consisting of turbine for electricity generation.
- Combustion in a system with piston engine – electricity generator in which initial gas conditioning is required
- Methanol production.

During pyrolysis and combustion of generated gas there is no detectable emission other than CO₂, N₂ and water vapour.

The benefits of such a system are identified as follows:

- High energy efficiency of furnaces and boilers due to complete utilization of fuel
- Low emissions thanks to complete combustion

The gas generator is produced using design licensed by Marek Dudynski (Ph.D.) from Warsaw (www.mtf.pl).

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