TEHNOLOGII NOI PENTRU OBȚINEREA DE BIOETANOL DIN PLANTE ENERGETICE ȘI DEȘEURI DIN FRUCTE /

NOVEL TECHNOLOGIES FOR OBTAINING BIOETHANOL FROM ENERGY PLANTS AND FRUIT WASTES

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SUMMARY

There are several technical plants that have the capacity to produce bioethanol, such as Jerusalem artichoke or Sweet sorghum, which are known to produce smaller negative effects on soils. These species however have some peculiarities, creating several difficulties in the alcohol production processes.

This project aimed to evaluate novel technologies for producing bioethanol from several technical plants and agricultural wastes highlighting:

A. Development of a technological flow and a novel distillation equipment, that has the potential to produce high quality bioethanol from technical plants and fruit wastes

B. Development of an improved bioethanol production system through multidisciplinary research (development of hybrids, development of equipment and processing technologies, etc.)

A. Development of a technological flow and a novel distillation equipment, that has the potential to produce high quality bioethanol from technical plants.

The equipment designed for obtaining bioethanol from technical plants consists of the special constructed furnace (**1**), which includes the technological vessel (**2**), above having placed the expansion vessel (**3**). The alcohol vapors are being taken by the steam column (**4**), and led to the water condenser (**5**). The technological vessel is provided with a stirring system (for homogenizing the temperature), which is driven through the shaft (**6**) by the motor (**7**), that is positioned on the support (**8**). The motor is provided with a speed variator, so that the speed can be adjusted according to the density of the processed material. The combustion in the furnace is made through the adjustable gas burner (9), the air is entering the furnace through the vents (**10**). The gas burner is also improved, being able to adjust the temperature in the furnace very precisely, by means of 3 valves. In the cooling tank, in order to increase the contact surface with the coolant, the steam column takes a helical shape (**11**). The cooling vessel is provided with an overflow (**12**) and a drain valve (**13**). The toxic gases are evacuated through the exhaust pipe and the evacuation hood (**14**). The technological vessel is provided with pressure and temperature sensors (**15**), while the cooling vessel has a temperature sensor (**16**).

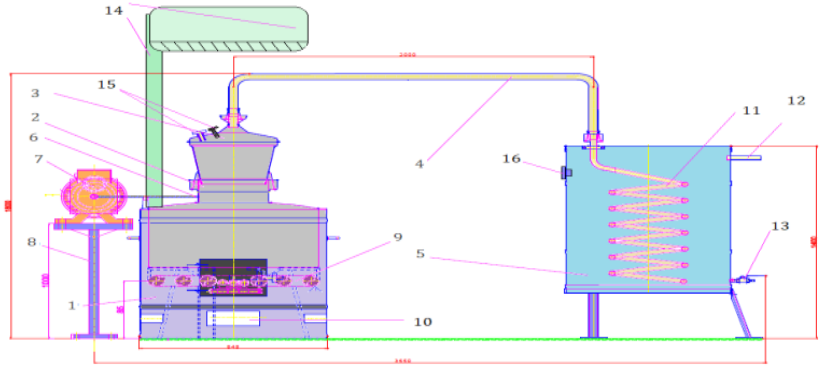
B. Development of an improved bioethanol production system through multidisciplinary research (development of new hybrids, development of equipment and processing technologies, etc.)

The multidisciplinary consortium of partners had complementary activities consisting in:

- Improving energy plant varieties and hybrids to maximize the amount of sugars produced by crops;
- Improving cultivation technologies and crop maintenance;
- Adoption of new crop monitoring systems using sensors and drones for crop mapping and evaluation;
- Increasing processing yields by developing new equipment and technologies;
- Use new modified enzymes, mechanics and technologies to improve biochemical processes;
- Use the generated wastes in improved composting to promote green agriculture and the circular economy;
- Improve decision making, as well as strategies of optimization and control of bioprocesses.

CONCLUSIONS:

1. The tested hybrids and varieties showed very good yields of bioethanol production, as well as improved characteristics of resistance to drought, heat and development difficult soils.
2. More efficient equipment and procedures for cultivation, crop maintenance, harvesting have been developed.
3. The advanced monitoring systems that use sensors and drones have reduced crop management costs and protected the environment by optimizing the amount of chemicals applied to soils.
4. The proposed technological flow, the novel distillation equipment and the use of the new techniques that use enzymes has contributed to improving the yields of biofuels obtained.



1. Furnace	5. Cooling tank	9. Gas burner	13. Draining valve
2. Technological vessel	6. Shaft	10. Vents to ensure air supply	14. Exhaust pipe and the evacuation hood
3. Expansion vessel	7. Motor	11. Steam column in helical shape	15. Pressure and temperature sensors for the technological vessel
4. Column for steam	8. Motor support	12. Overflow for coolant	16. Temperature sensor for the cooling tank