Examination of segregated bio-waste dehydration method to obtain an alternative biomass material for lignocellulosic ethanol production

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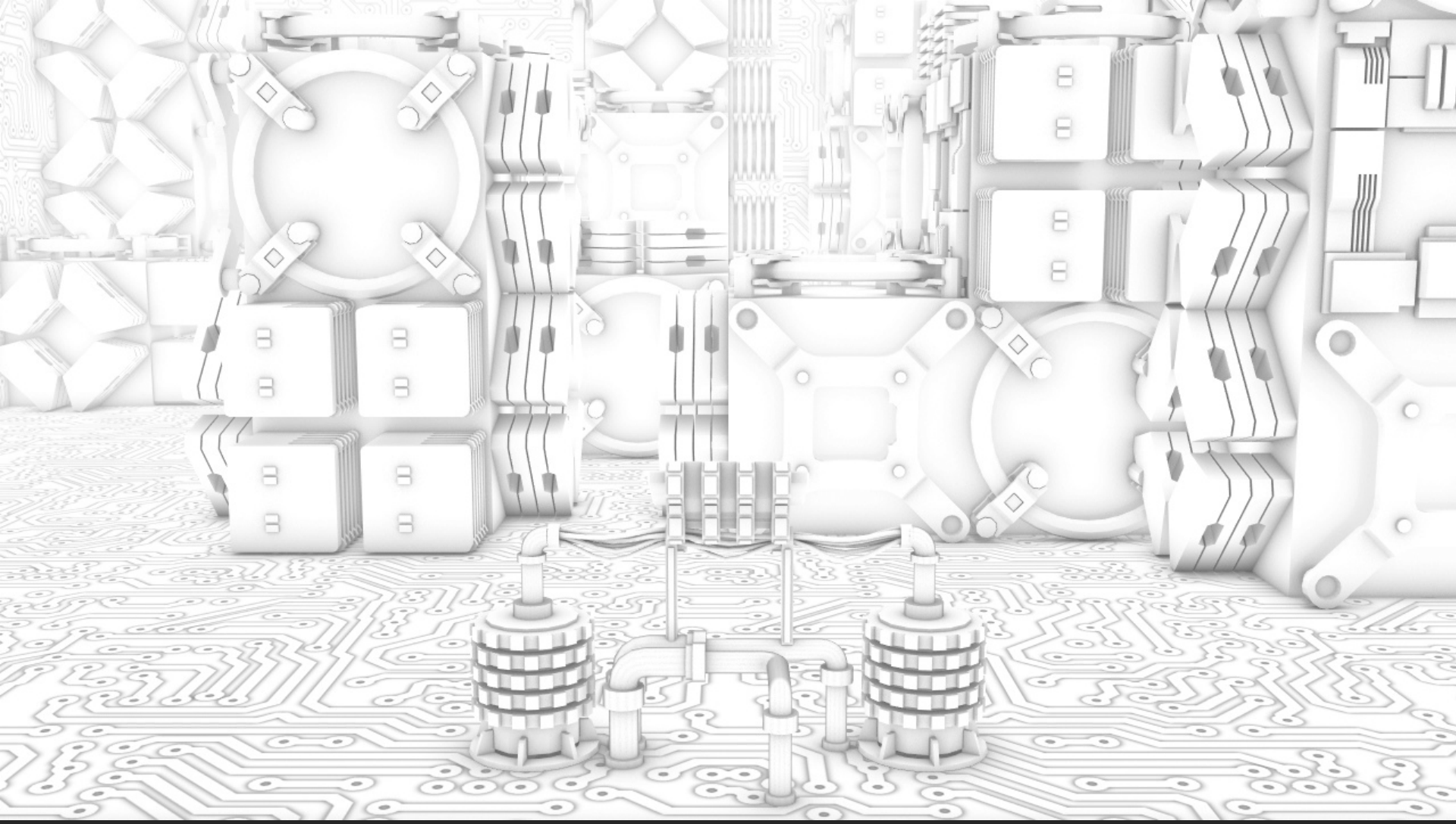
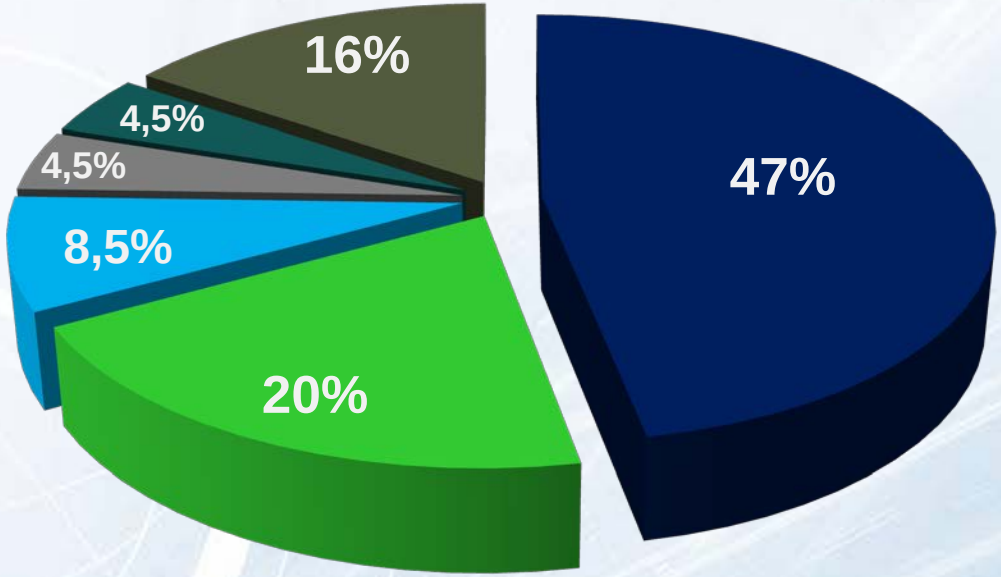


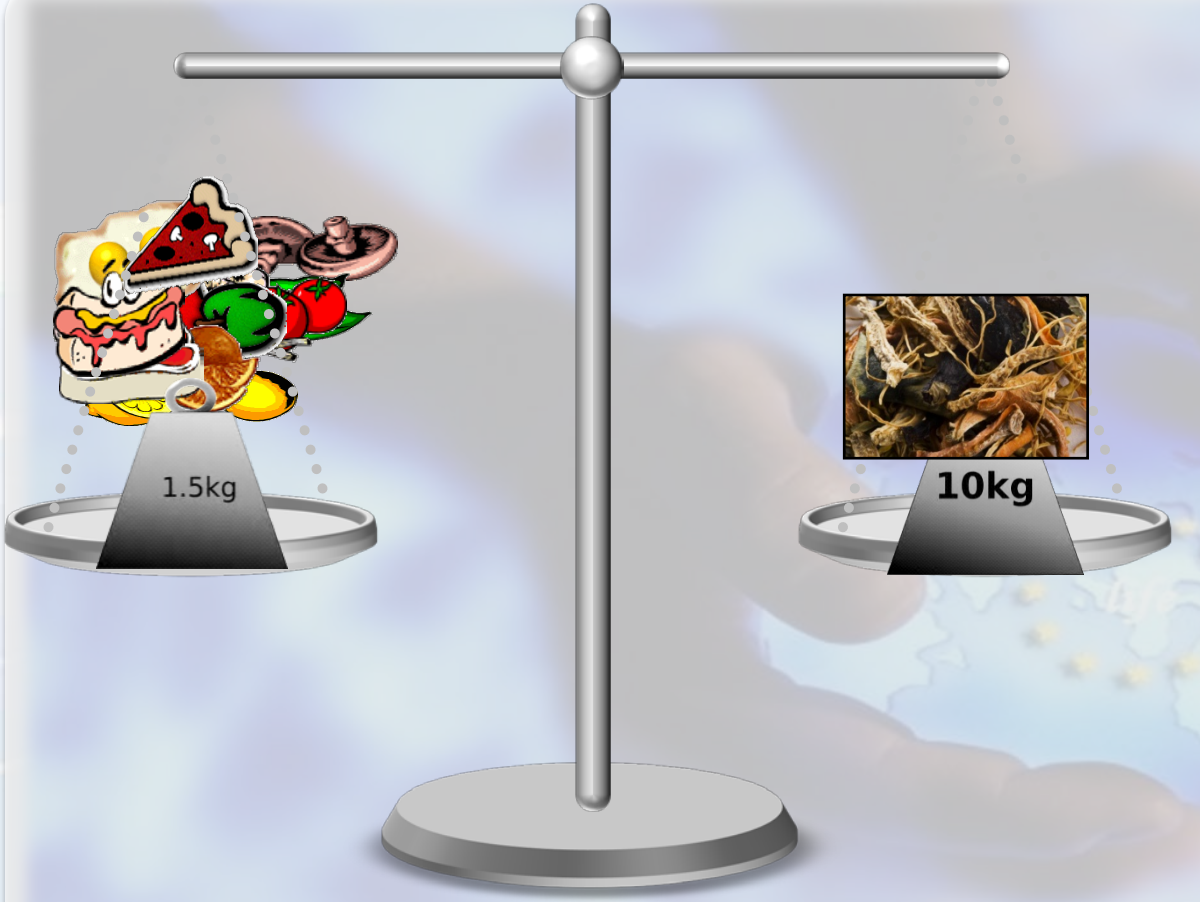
Greek Municipal Solid Waste Composition



- Organic
- Paper
- Plastic
- Glass
- Metals
- Other


DRYWASTE

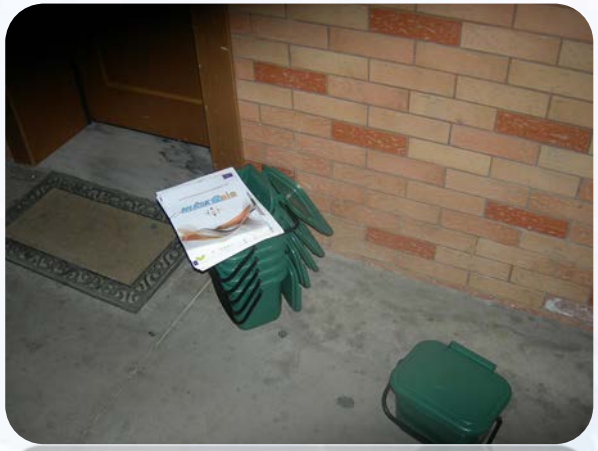
Innovative Waste Drying Technology

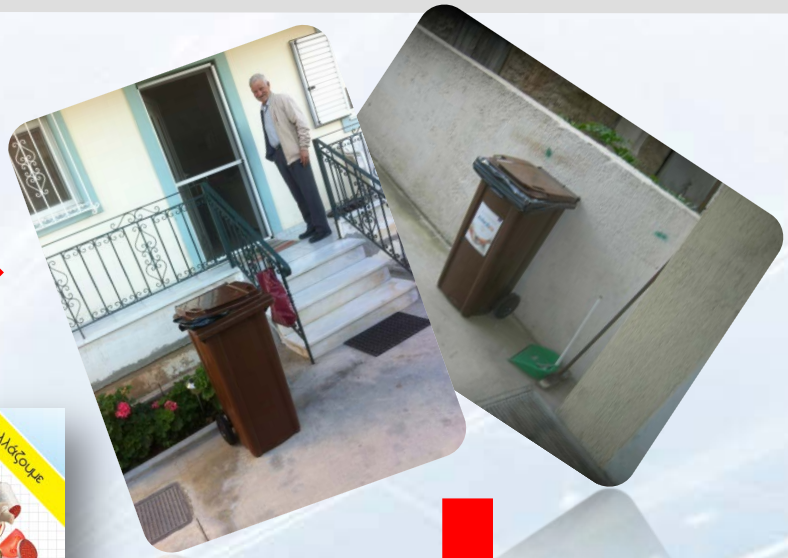


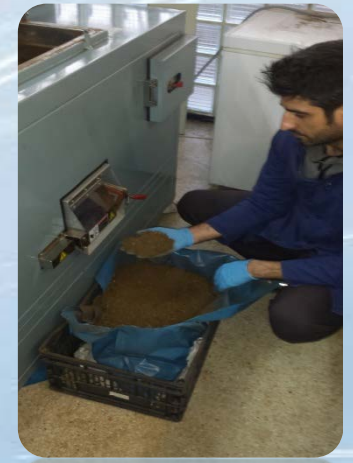
Waste Management Scheme Description

82 households were trained in source separation and send their bio-waste at the NTUA facilities for a period of 14 months now. The households have reached the number of 200 by this day.

Waste Management Scheme Description





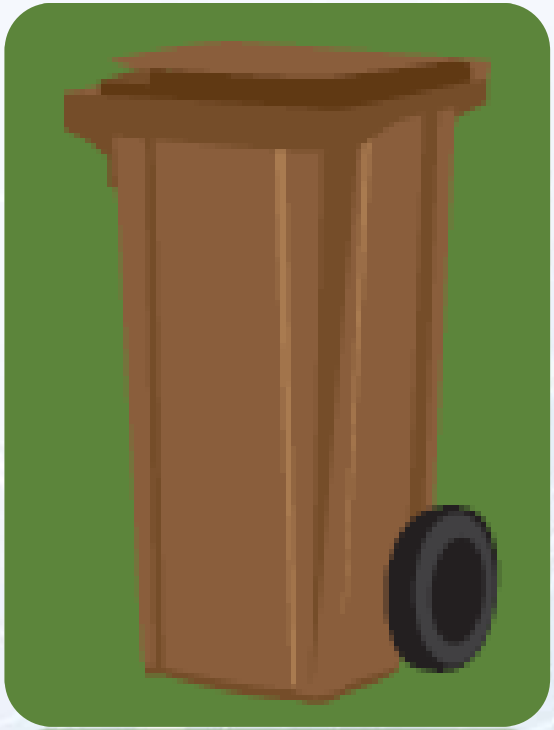


Waste bins for the collection of domestic Bio-waste

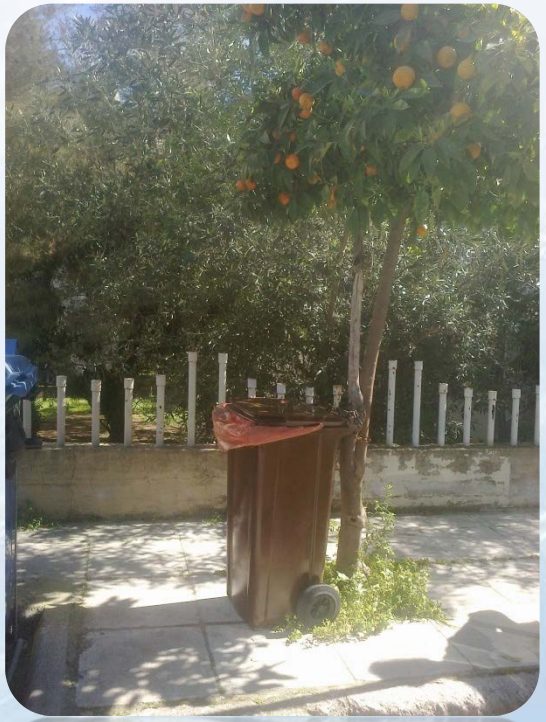
Waste bin 5 L

Waste bin 23 L

Large Waste Bins



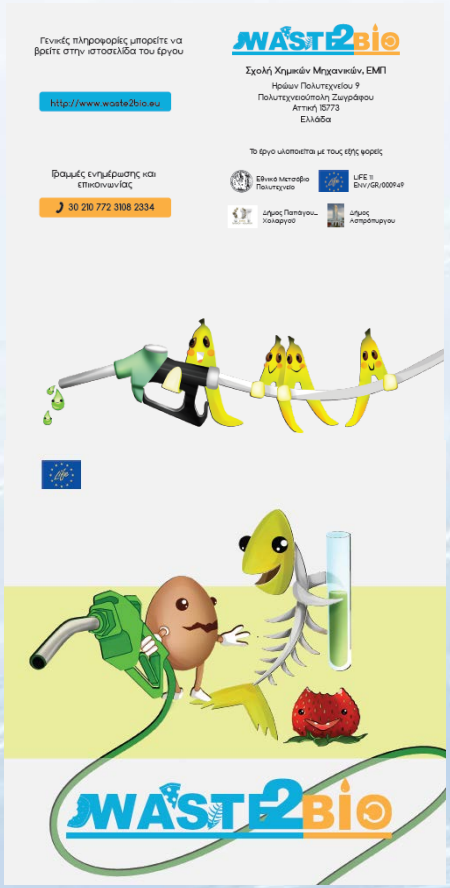
Waste Bin 120 L



Bin placed in Papagos-Cholargos Municipality

What do people throw and do not?

Bio-waste Manual

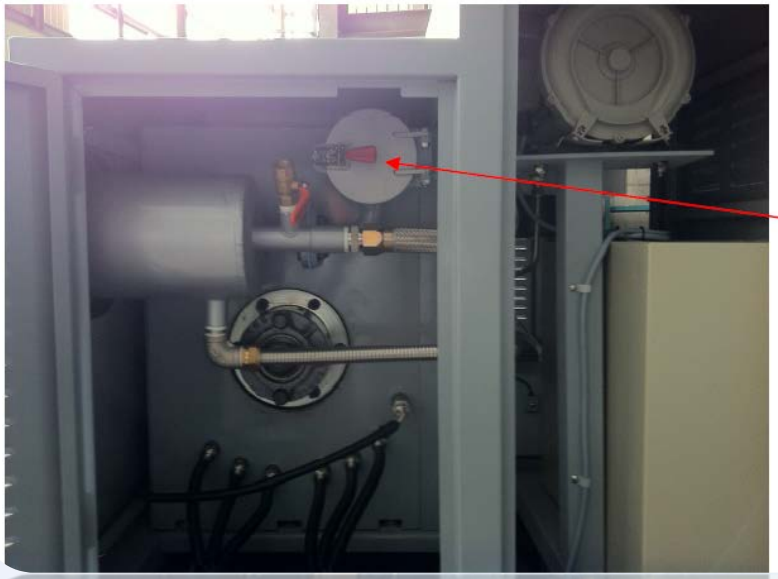


Commercialized Biomass Dryer

How does the drying takes place?

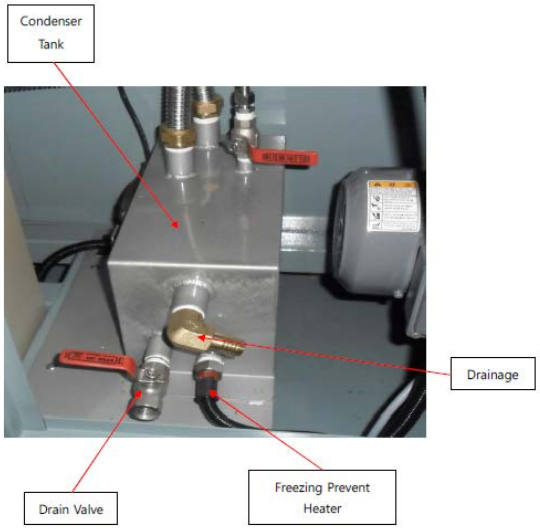
Commercialized Biomass Dryer

How does it work?



Commercialized Biomass Dryer

How does it work?



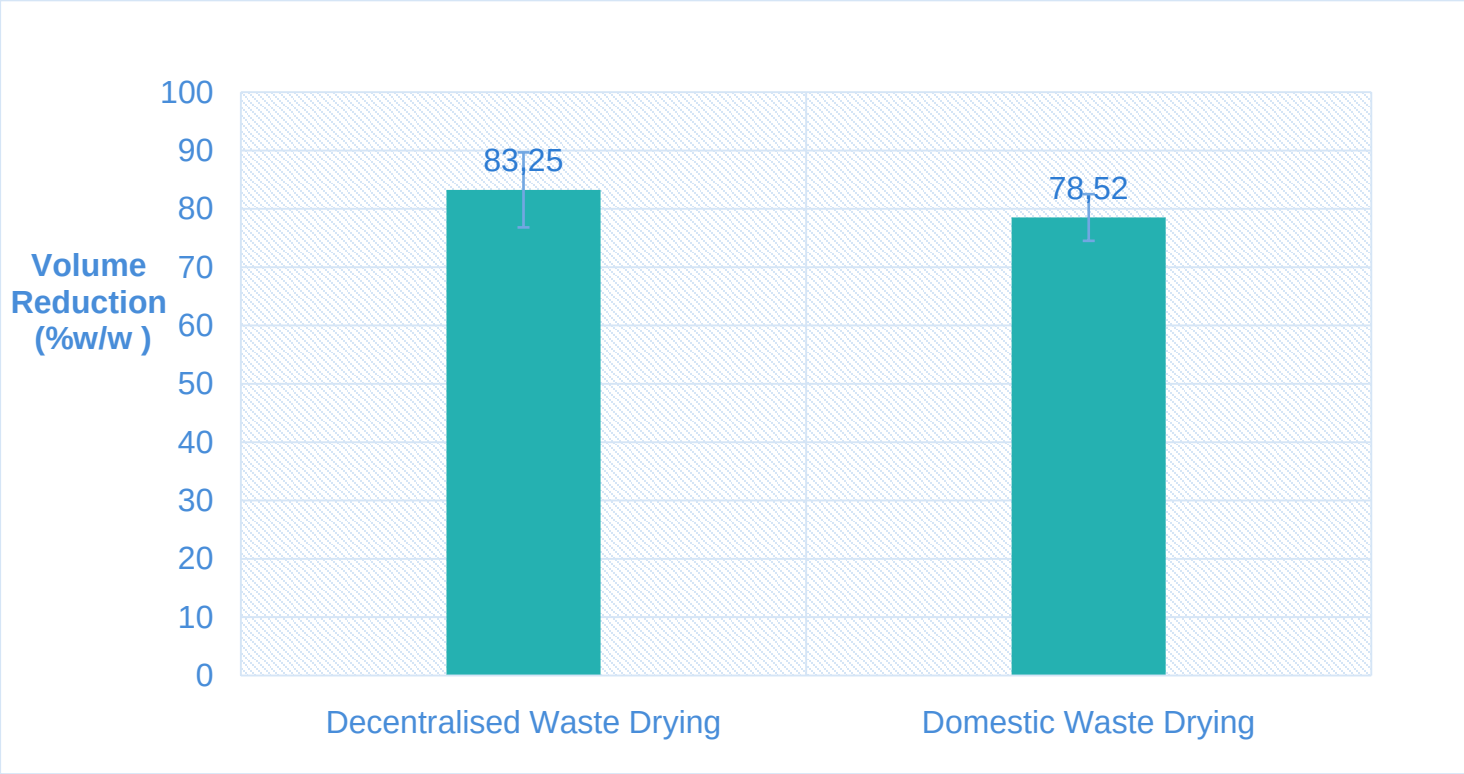
2. Machine Specification

Item	Specification
Model	GC-100
Capacity	50kg/cycle, 3 cycles/day
Dimension	
- Length	1,400 mm
- Depth	950 mm
- Height	1,291 mm
Motor	0.4 kW, 150:1, 380V, 50Hz
Blower:	
- Pressure	Max. 700 mmAq
- Flow	Max. 1.0 m³/min
- Motor	0.2 kW
Thermal-oil Heater	9kW (1.6kW*6ea)
Condenser Fan	0.112kW (56W*2ea)
Thermal-oil	24 L
Power Required	6.7 kW (380V, 3-phase, 4-wire, 50Hz)
Current	10.2Amp
Weight	600kg
Serial Number	

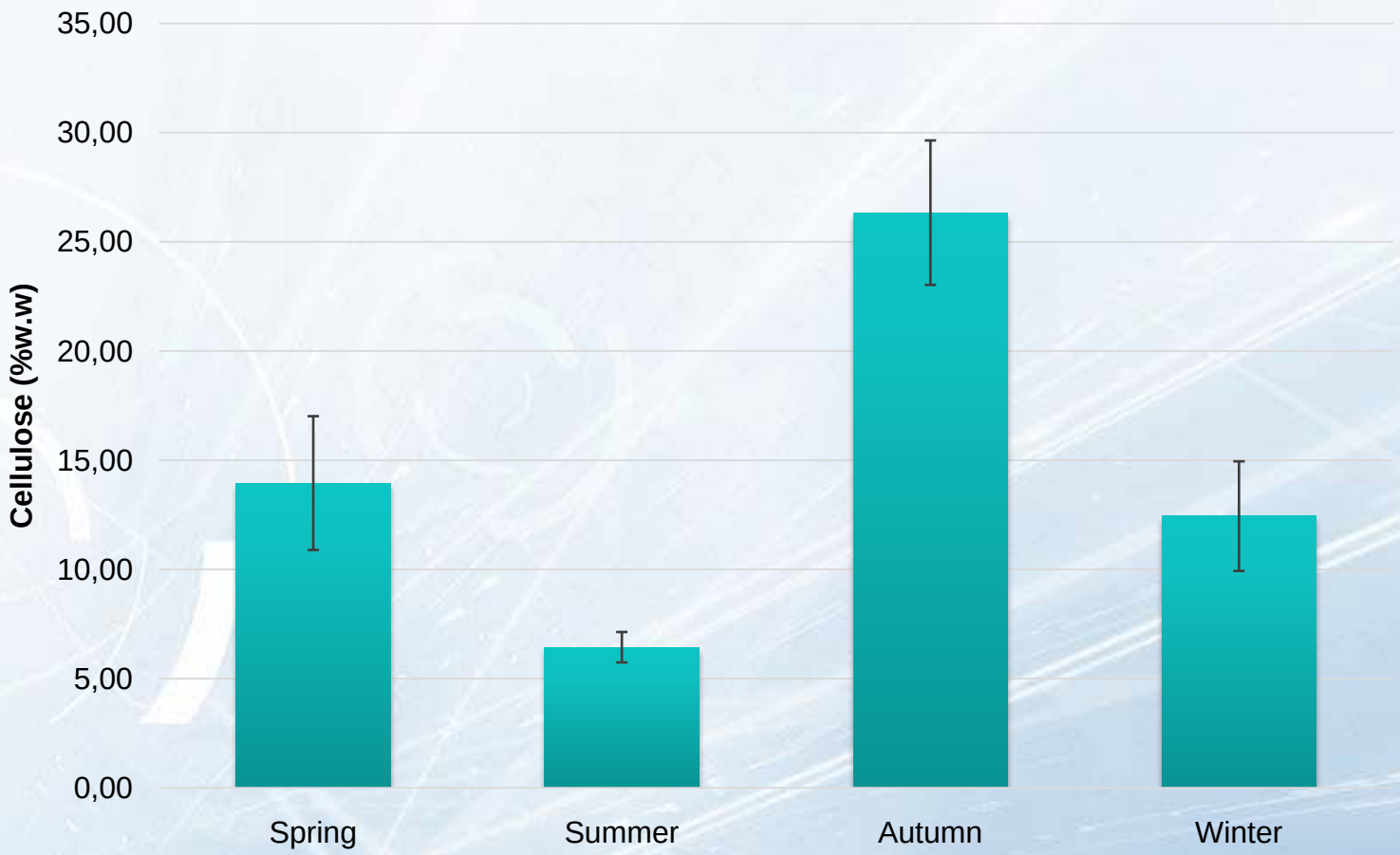
Commercialized Biomass Dryer

Decentralized Waste Dryer

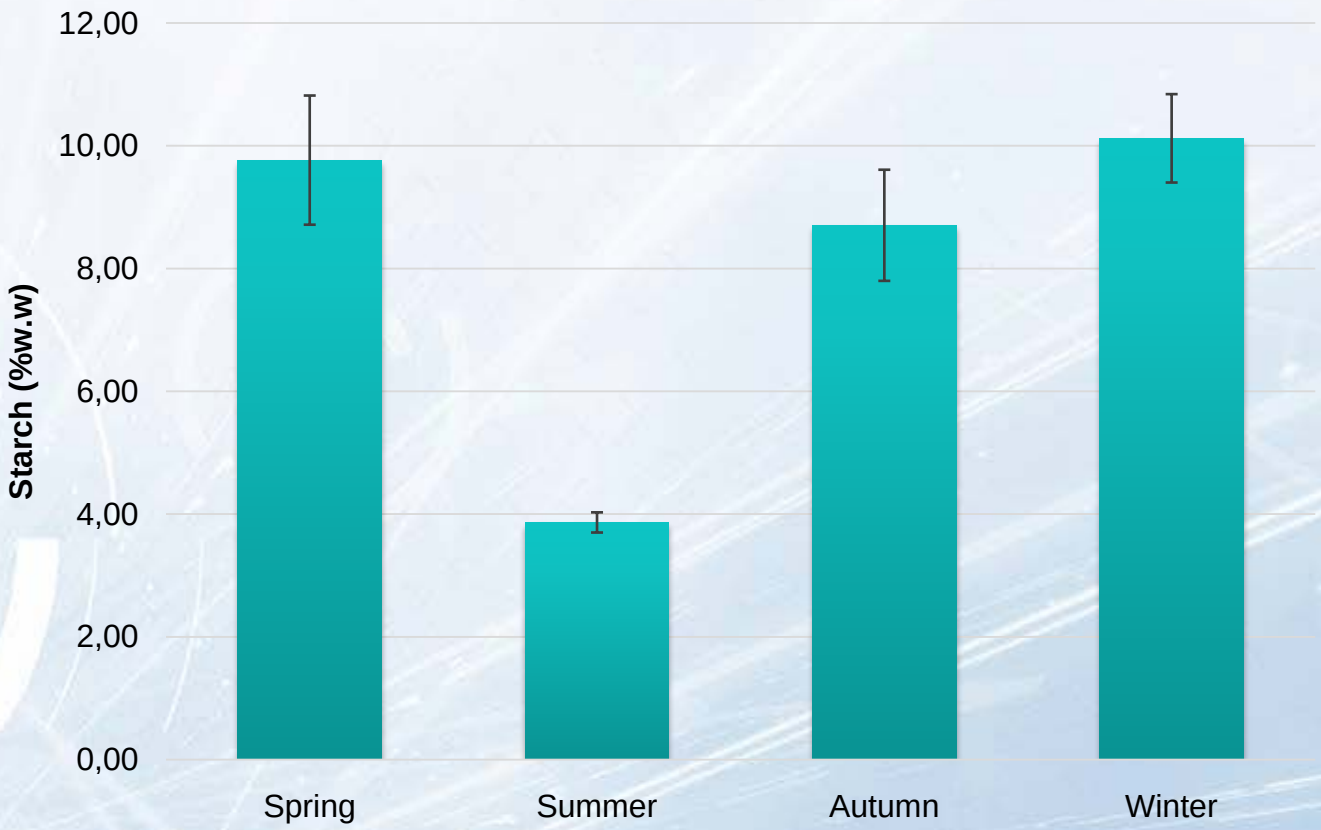
Volume Reduction



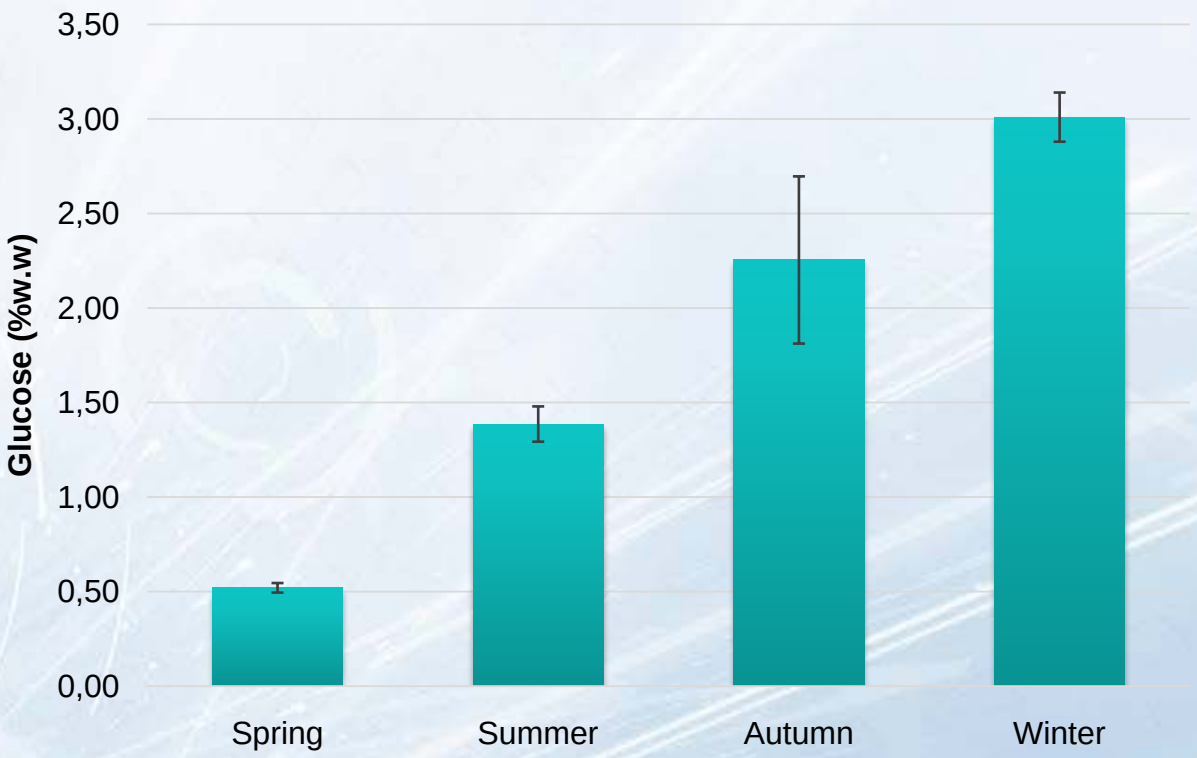
Cellulose Seasonal Variation



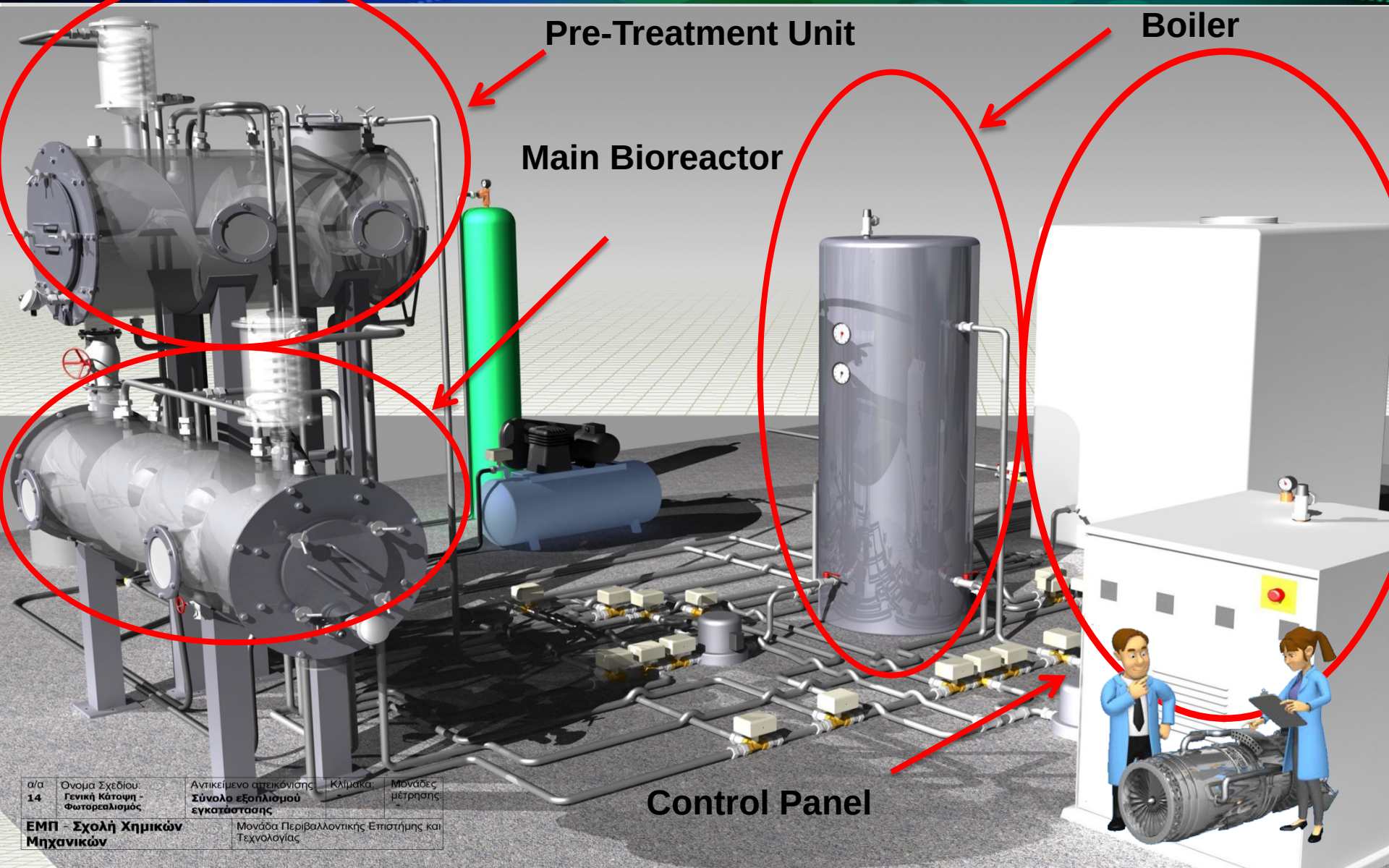
Starch Seasonal Variation



Glucose Seasonal Variation

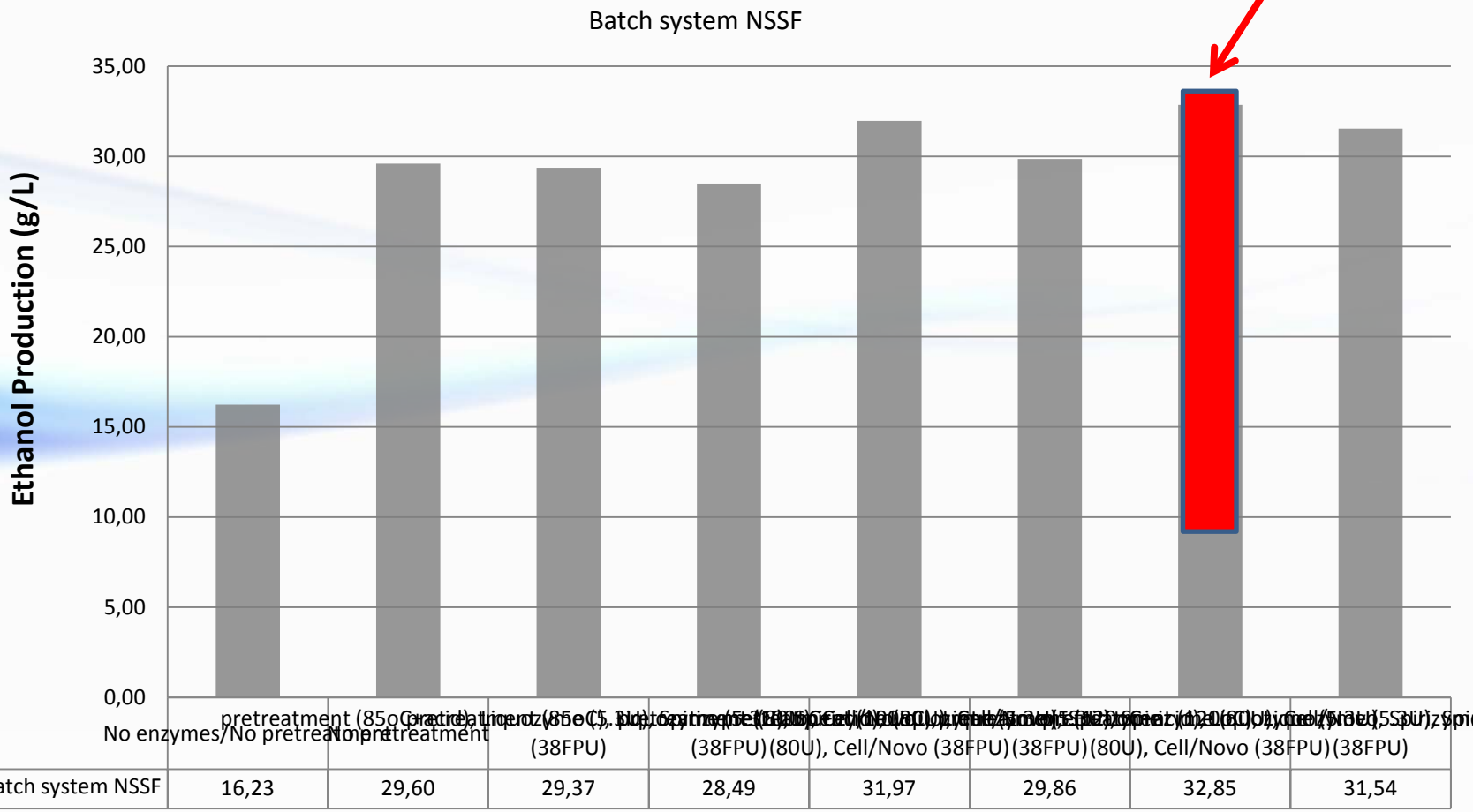


200L Bioconversion Facility



α/α	Όνομα Σχεδίου:	Αντικείμενο απεικόνισης	Κλίμακα:	Μονάδες μέτρησης
14	**Γενική Κάτοψη - Φωτορεαλισμός**	**Σύνολο εξοπλισμού εγκατάστασης**	-	-
ΕΜΠ - Σχολή Χημικών Μηχανικών		Μονάδα Περιβαλλοντικής Επιστήμης και Τεχνολογίας		

Ethanol Production



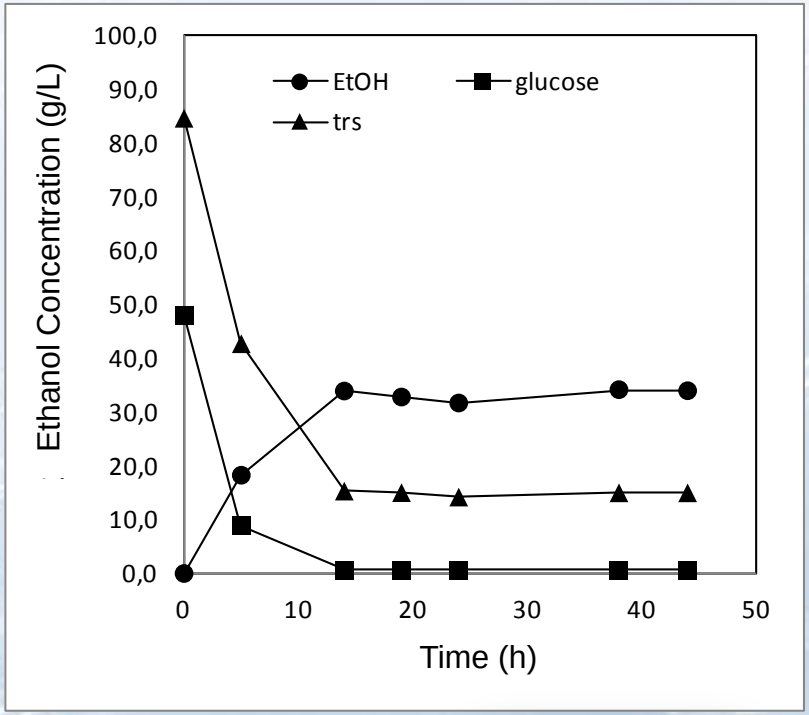
	No enzymes/No pretreatment	No pretreatment	(38FPU)	(38FPU)(80U), Cell/Novo (38FPU)	(38FPU)(80U), Cell/Novo (38FPU)	(38FPU)
Batch system NSSF	16,23	29,60	29,37	28,49	31,97	29,86	32,85	31,54

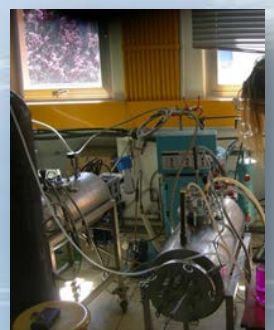
Results After the Process Optimization

Process: NSSF Semi Batch
Pre-treatment: 120°C/1h
Concentration : 30%w/v
Enzymes Used:

1. Liquozyme SC DS 5.3U/g Starch
2. Spirizyme Fuel 80U/g Starch
3. Celluclast 1.5L/Novozyme 188 (5/1 v/v) 38FPU/g Cellulose.

Fungi: *Saccharomyces cerevisiae* (15 mg/g DM)





Conclusions

- **The use of Decentralised drying technology as part of a waste management scheme reduces the mass of the produced domestic biowaste at source by 78%w/w**
- **The volume reduction reaches 80%**
- **Low moisture level of the end product (~5%w/w) guaranties the stabilisation of the dry product (non important microbial activity observed)**
- **Preservation of sugar content (especially Glucose content)**
- **Production of second generation ethanol 34g/L through a new resource (dried domestic biowaste).**

Questions?

Information?

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