

## Aim and objectives

The aim of the project is to design, develop & implement an advanced gasification testing unit for the energy exploitation of the non-recyclable stream of a modern material recovery facility in Ano Liosia, Greece.



EPANA material recovery facility in Ano Liosia, Greece

The main objectives are:

1. Mechanical treatment of the residual urban waste from EPANA facility towards the production of Refuse-Derived-Fuel/Solid-Recovered-Fuel (RDF/SRF).
2. Characterization & standardization of produced RDF/SRF according to the developing standard EN/TC 343.
3. Gasification of the classified RDF/SRF to produce gaseous fuel potentially used for power production and high added value products.
4. Demonstration of an advanced RDF/SRF energy exploitation technology, which meets serious difficulties for implementation in Greece, while being applied in other EU countries.
5. Environmental impact assessment of the proposed action and dissemination activities to promote the energy exploitation of urban waste. The replication potential of the proposed project in Greece and other EU countries will be investigated, as well.
6. Review and sustainability analysis based on the experience acquired throughout project execution.
7. A Cost Benefit Analysis as a tool for the economic evaluation of proposed methods, scenarios and schemes, in order to determine the most promising options.

## Project team

### **EPANA SA (EPANA)**

EPANA is a prominent company and pioneer in the field of material treatment and recovery in Greece. EPANA holds two of the most modern recovery facilities in Europe, specialized in packaging waste recovery, providing high quality waste treatment and recovery services ([www.epana.com.gr](http://www.epana.com.gr))

### **Institute for Solid Fuels Technology and Applications / Centre for Research and Technology Hellas (ISFTA/CERTH),**

ISFTA is the main Greek organization for the promotion of research and technological development aiming at the improved and integrated exploitation of solid fuels and their by-products ([www.lignite.gr](http://www.lignite.gr))

### **Region of Central Macedonia (RCM)**

RCM has been established from 1/1/2011 with the law 3852/2010. It comprises from the Prefectures of Imathia, Pella, Pieria, Serres, Kilkis, Chalkidiki and Thessaloniki. The Department of Planning of European Union Projects / Directorate of Planning, has the goal to establish cooperation networks with other EU authorities and organizations by implementing innovative EU projects ([www.pkm.gov.gr](http://www.pkm.gov.gr))

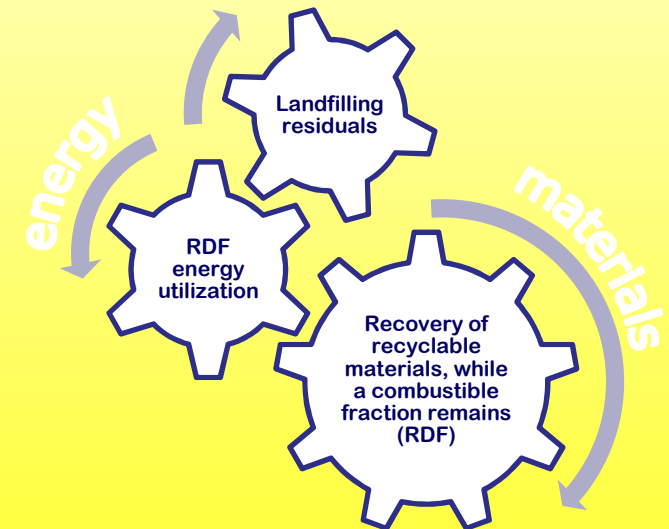
### **European Renewable Energies Federation (EREF)**

EREF is a federation of associations from EU Member States, which are working in the sector of energy produced from renewable energy sources, such as small hydro, wind, tidal, wave, bioenergy, solar and geothermal sources ([www.eref-europe.org](http://www.eref-europe.org))

# ENERGY WASTE

*“discover how much you can recover”*

**Energy exploitation of non-recyclable urban waste in a sustainable waste-to-energy market**



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## “emerging RDF from pre-sorted waste handling”

EPANA SA operates two modern material recovery units of pre-sorted waste (blue bin collection system). During the standard production process, a series of materials are recovered (i.e. different types of plastics and papers, ferrous and non-ferrous metals and glass) while a certain stream of remaining materials results. This stream consists of species that are not recovered due to technical limitations and from materials that are not targeted for recovery (i.e. organics, wood, stones). This residual stream is characterized as Recovered Derived Fuel (RDF) due to its considerable energy content. The size of the RDF is between 65-280mm (sieved through the process, see below).



RDF as produced through the standard production line

The tested process of gasification requires size reduction of the handled material and absence of long parts that could cause the blocking of the feeding system such as ropes, metal wires, long plastic stripes and ribbons etc. Size reduction also leads to fuel homogeneity which is critical for the control of the gasification process. To obtain both size reduction and fuel homogeneity the first essential pre-treatment step is RDF shredding at 40 mm (see below).



Shredded RDF 40 mm (indicative size of the pen)

RDF quality is monitored and optimized through setting the selection criteria of advanced optical separators. The flexible production chain gives the advantage of maximizing the recovery of recyclable materials, producing qualitative RDF, while keeping the residual fraction (suitable only for landfill) at low levels.

## “defining waste production and utilization”

State of the art analysis and benchmarking is the first set of actions focusing on the outlining of the current waste production and utilization profile in national and European level. To obtain a good overview for the present situation, it is important to be informed in the latest legislation in effect as well as the current practices. The European waste hierarchy supports any means of management/utilization instead of land filling with the following priority:



Waste management hierarchy

[Follow the link and find more in the deliverables:](#)

- 1.1 Current waste management systems in Europe
- 1.2 RDF utilization applications & technical specifications
- 1.3 Potential waste streams for RDF/SRF production

## “RDF characterization following CEN/TC 343”

CEN/TC 343 is an emerging standard for the characterization and classification of RDF/SRF. Standardization is considered as a key issue for the acceptance and trading as a substitute fuel in the energy markets. By the standardized monitoring of key properties, RDF/SRF fuels can be classified and a preliminary assessment of their combustion and environmental performance is achievable.

Classification, parameter	1	2	3	4	5
LCV, MJ/kg (ar)	≥25	≥20	≥15	≥10	≥3
Cl, % wt (wf)	≤0,2	≤0,6	≤1,0	≤1,5	≤3,0
Hg, mg/MJ (ar), mean, 80 <sup>th</sup> %	≤0,02	≤0,03	≤0,08	≤0,15	≤0,5
	≤0,04	≤0,06	≤0,16	≤0,30	≤0,1

Following the standardization guidelines, RDF is sampled on a daily basis for the determination of physical and chemical properties and the classification following the CEN/TC 343. These properties are also used for the design of the thermochemical process of gasification.

[Follow the link and find more in the deliverables:](#)

- 3.2 RDF/SRF sampling protocol
- 3.3 RDF/SRF characterization report and database
- 3.4 Report on comparison of produced RDF/SRF

## “disposing the right way..ste”

Material	Category	Examples	
Paper	Print	Newspapers, magazines	☑
	Cardboard	Hard packaging, office folders	☑
	Tetra pack	Food and drink packaging	☑
	Soft paper	Tissues, hygiene paper	☒
Plastic	LDPE	Super market bags, wrapping film	☑
	HDPE	Detergents, shampoo bottles	☑
	PET	Water bottles, drink cups	☑
	PP film	Snack packing bags	☑
	PP packaging	Yogurt, butter cans	☑
	PVC	Grey color plastics, cable coating	☒
Aluminum	Soft	Refreshment cans, foil	☑
	Hard	Construction parts	☑
Metals	Packaging	Tins and cans	☑
	Other	Construction parts	☒
Wood	Untreated	Logs, branches	☒
	Treated	Furniture	☒
Glass	Packaging	Bottles, vases, containers	☑
	Flakes	Broken glass, glasses	☒
Leather, textile	Leather	Jackets, shoes, accessories	☒
	Textile	Clothes, blankets	☒
Inert	Household	Porcelain vases, plates, ash trays	☒
	Construction	Stones, bricks, demolition waste	☒
Rubber	Household	Soft toys, shoes, boots, sleepers	☒
	Other	Tires, gaskets, hoses	☒
Organic waste	Kitchen	Food, fruits, sweets	☒
	Yard	Green waste, flowers, leaves	☒
Special waste	Household	Electronics, batteries	☒
	Medical	Pills, syringes, bandages	☒
	Bulky	Furniture, appliances	☒
	Oils & waxes	Cooking oil, lubricants, grease	☒