Developing the Combined Magnetic, Electric and Air Flow Separator (KLME) for RMSW Processing

J. Faitli[1], B. Csőke[1], R. Romenda[1], Z. Nagy[2], Sz. Németh[2]

[1]University of Miskolc, Institute of Raw Materials Preparation and Environmental Processing
Hungary, 3515 Miskolc - Egyetemváros,
[2]3B Hungary Ltd. Hungary, 8900 Zalaegerszeg, Wlassics Gy. u. 13.
E-mail of presenting author: ejtfaitj@uni-miskolc.hu

ATHENS2017

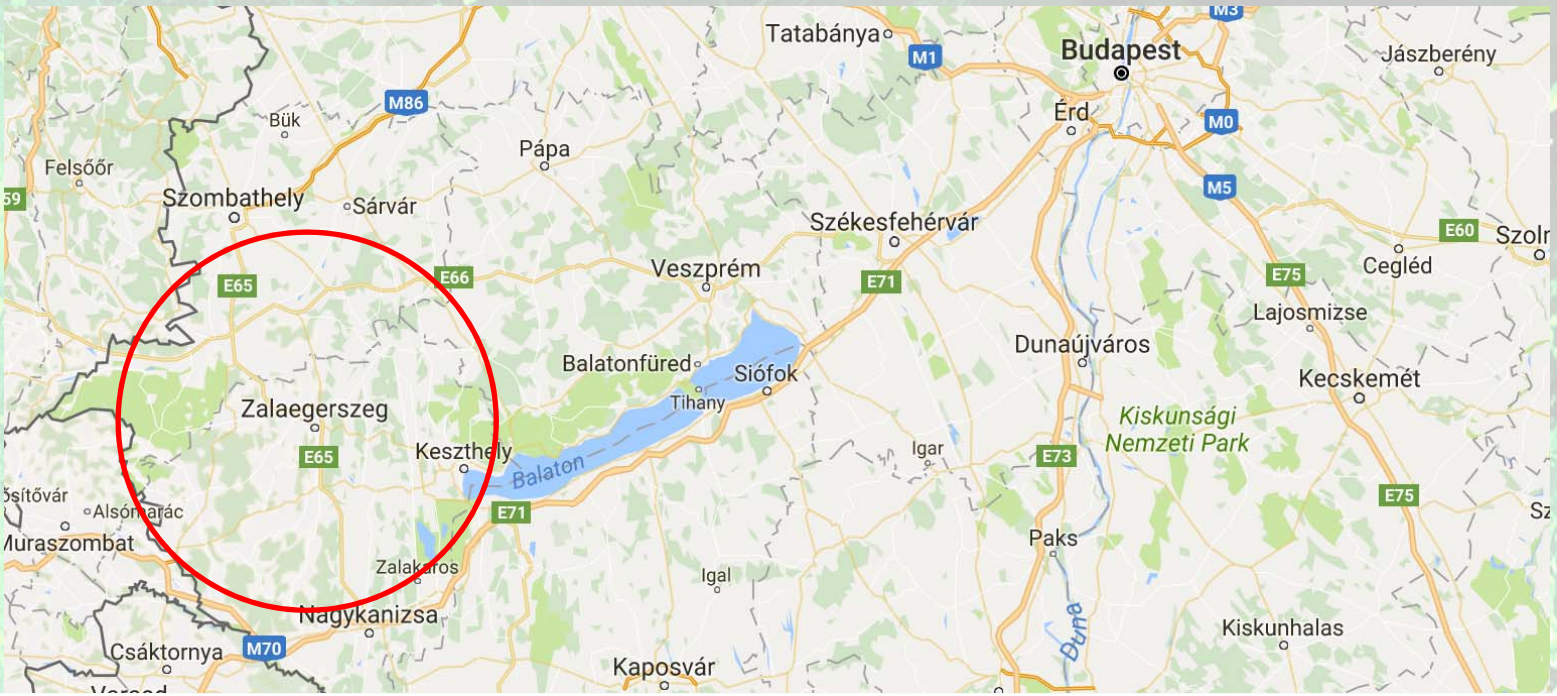
5th International Conference on Sustainable Solid Waste Management
Athen, 2017 June 21 - 24

Content

- Aim
- Design of the mechanical RMSW processing technology
- Development of the KLME separator
- Experiments (just examples)
- Conclusion

Aim

- **In Hungary landfilling is still the most widely used MSW managing option, but the old landfills (many thousands) had been closed and recultivated and some tens new modern landfills have been built.**
- **Municipality of Zalaegerszeg: target - no landfilling, 100 % processing**



Aim

- **Typical: key processing machines are imported from western countries**
- **Aim of 3B Hungary Ltd: producing comminution and separation machines**
- **University of Miskolc is the scientific partner**
- **GINOP-2.1.1-15-2016-00904 “Development of new equipment production for the low and medium capacity RMSW processing technologies” project: building the mechanical processing plant (20 t/h RMSW – Residual Municipal Solid Wastes)**
- **Development of the KLME Separator**

Design of the mechanical processing technology

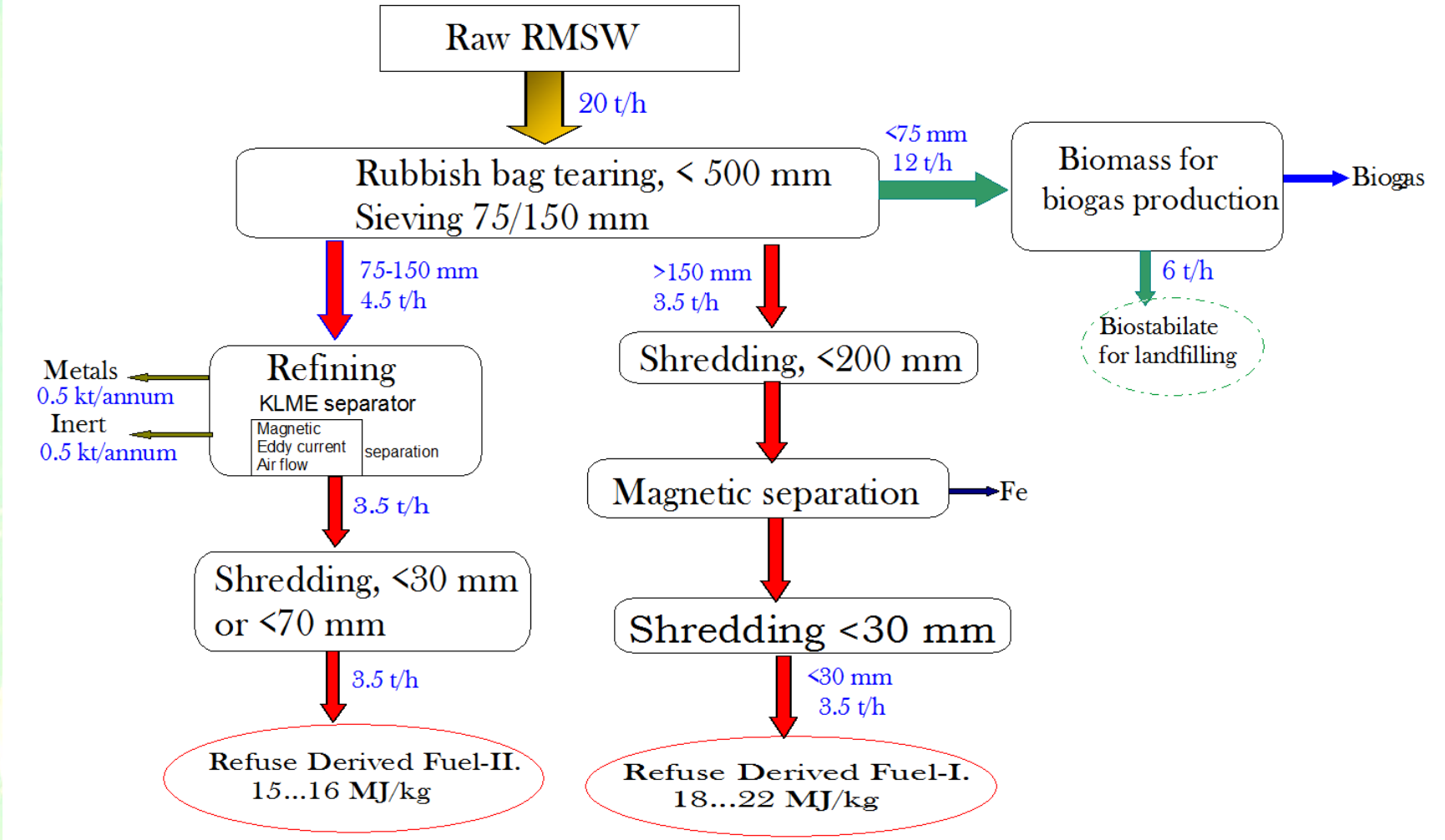
Sampling:
MSZ 21420 28 and 29 Hungarian Standards
More detailed analysis

Design of the mechanical processing technology

1 Bio, 2 Paper, 3 Composite, 4 Textile, 5 Hygienic, 6a 2D plastics, 6b 3D plastics, 6c PET,
7 Combustible, 8 Glass, 9a Fe, 9b Al, 10 Noncombustible, 11 Hazardous, 12 Extraneous

1	2	3	4	5	6a	6b	6c	7	8	9a	9b	10	11	12			mass of size fraction
> 200 mm																	[%]
7.8	15.0	0.7	32.9	5.7	21.4	2.8	0.6	5.4	0	1.5	0	2.6	0.1	3.4	100	%	12.1
150 – 200 mm																	
9.4	18.2	3.1	9.6	11.5	22.1	5.8	1.4	13.2	0.2	2.5	0.2	1	0.4	1.5	100	%	5.6
100 – 150 mm																	
15.5	16.7	4.5	3.2	12.5	10.9	8.0	8.6	7.9	2.8	3.8	0.5	3.6	0.5	0.8	100	%	13.3
75 – 100 mm																	
12.5	16.5	3.0	1.5	8.1	8.9	7.5	10.1	5.2	2.7	6.0	6.9	6.9	3.1	1.0	100	%	11.2
40 – 75 mm																	
37.3	24.0	1.1	0.6	1.9	2.6	7.2	0.9	4.0	2.2	3.2	2.2	10.4	1.7	0.6	100	%	18.5
< 40 mm																	
< 20 mm					20 – 40 mm residual					20 – 40 mm paper – plastic							
57.9					33.1					9					100	%	39.3
																	100

Design of the mechanical processing technology



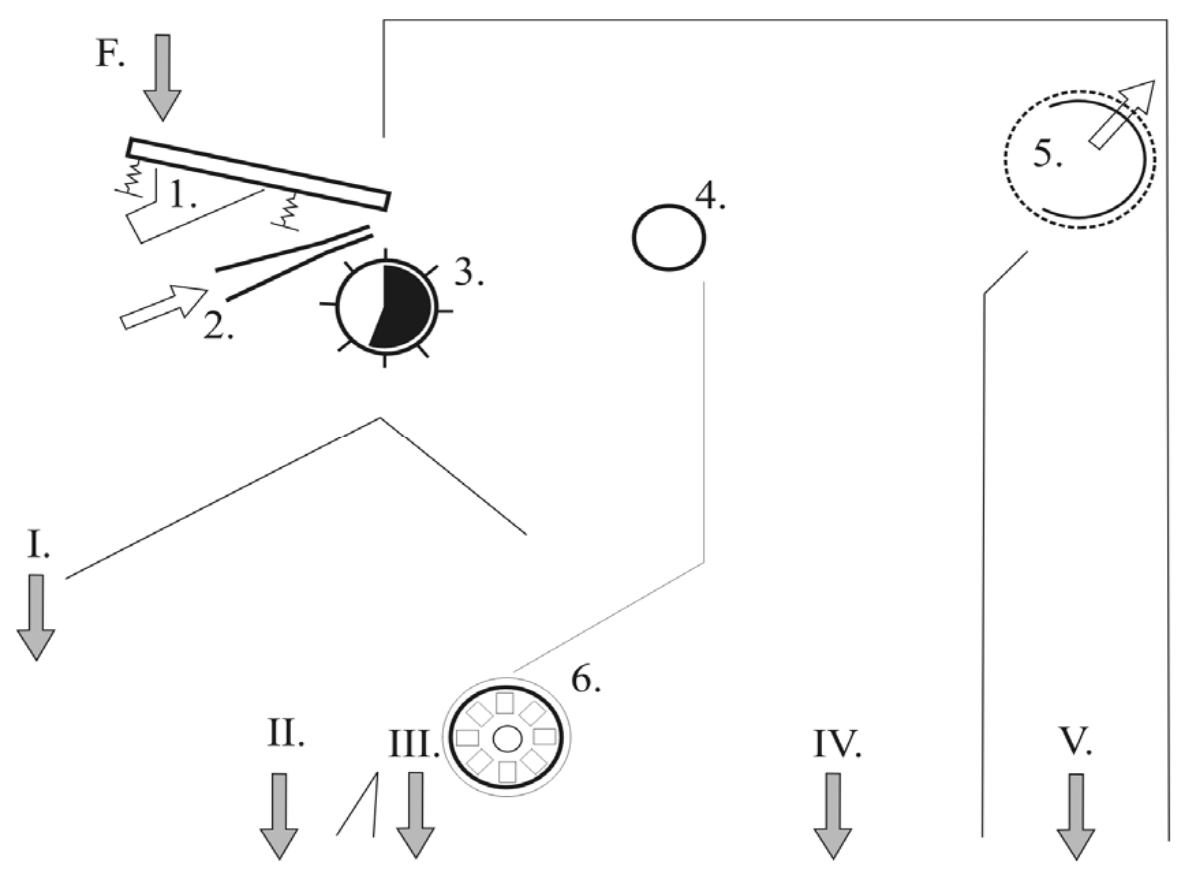
- Idea: combine 4 separators in one unit
- No feeders, buffer containers and connecting belt conveyors among the separators
- Much less plant surface area for these machines
- Less power need
- The fine tune of the common operation of them is a real challenge, but can be fruitful

Development of the KLME separator

History of developments:

- **Model machines**
- **Model KLME separator**
- **400 mm wide „pilot scale” KLME separator**
- **1200 mm wide industrial size KLME separator**

Principle and products of the 400 mm wide KLME pilot scale machine:



I. Magnetic
II. Conductive
III. Inert
IV. 3D
V. 2D

Development of the KLME separator

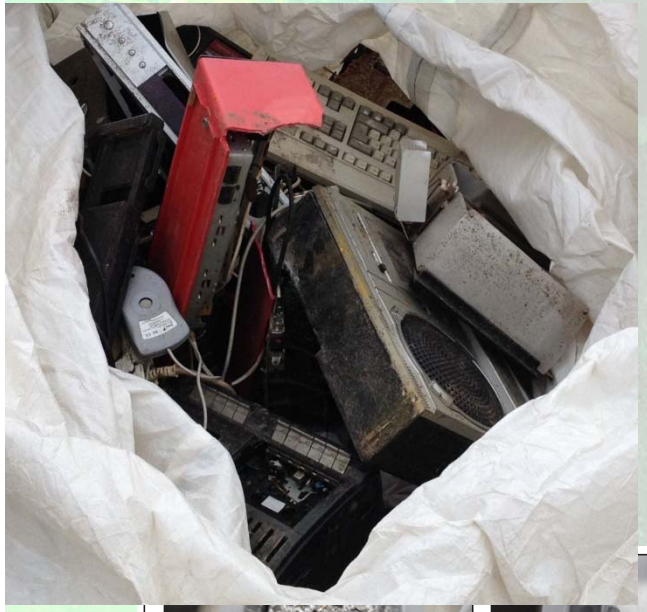
Photo of the 400 mm wide KLME pilot scale machine:

Experiments (just examples)

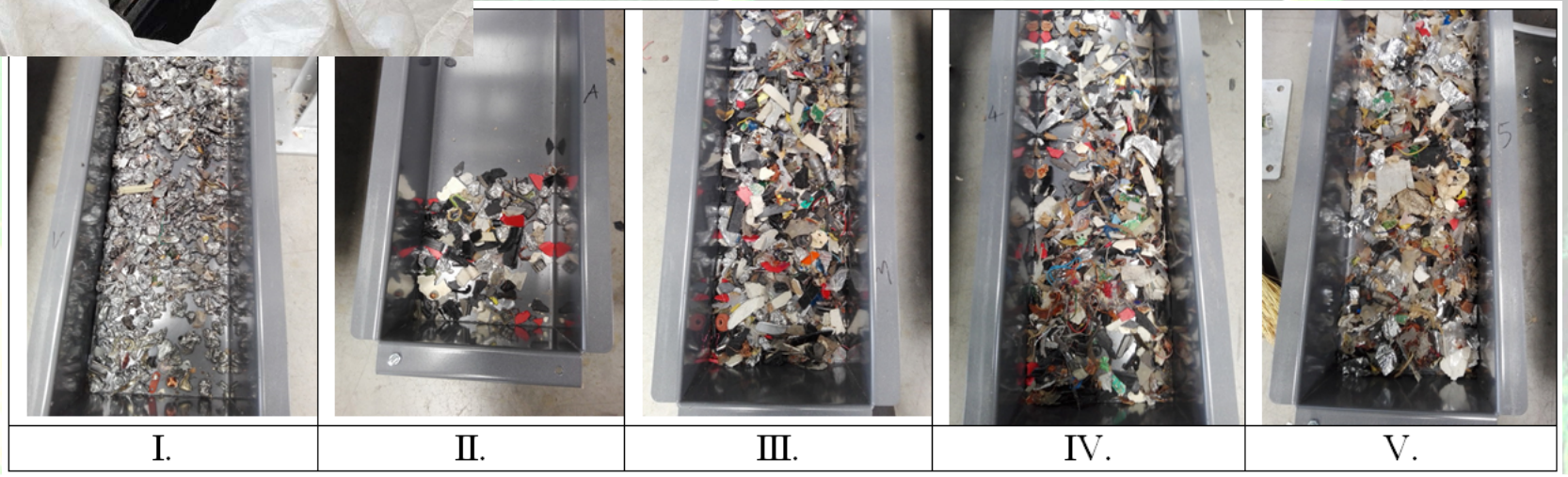
	k – Recovery of components into the products, [%]					m – Yields of products, [%]
	Magnetic	Conductive	PET	Glass	Residue	
I. Magnetic	100	0	0	0	0	1.3
II. Conductive	0	27.3	0	0	0	1.0
III. Inert	0	0	12	66.7	29.8	27.9
IV. 3D	0	72.7	88	33.3	42.3	46.5
V. 2D	0	0	0	0	27.8	23.2
	100	100	100	100	100	100

I. II. III. IV. V.

Experiments (just examples)



The KLME can be used for WEEE (electronical wastes) processing as well



I.	II.	III.	IV.	V.

Present (ongoing industrial tests)

CONCLUSION

- The newly developed KLME separator combines four separators into one unit and eliminates the need of many feeders, storage buffers and belt conveyors.
- The pilot scale 400 mm KLME tests with the 30-120 mm Miskolc RMSW sample have resulted better recovery than 88 % for the magnetic, PET, 2D and 3D plastics, and inert material components. However, the recovery of the aluminum cans was as low as 27 %. It was observed that the body density and therefore the terminal settling velocity of the damaged PET and aluminum can particles are not so different; the separation of these materials is not efficient by the nozzle air flow separator. This observation has resulted the change of the layout of the industrial size KLME separator.
- The pilot scale 400 mm KLME separator was applied for the separation of the Baja WEEE sample with satisfactory results.

Thank You for Your attention!