



Mechanical Processing of Post-Consumer Plastics for Feedstock Recycling

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





Table of contents



- **Current situation**
- **Feedstock**
- **Process**
- **Products**
 - Light fraction
 - Middle and heavy fraction
- **Conclusions**
- **References**

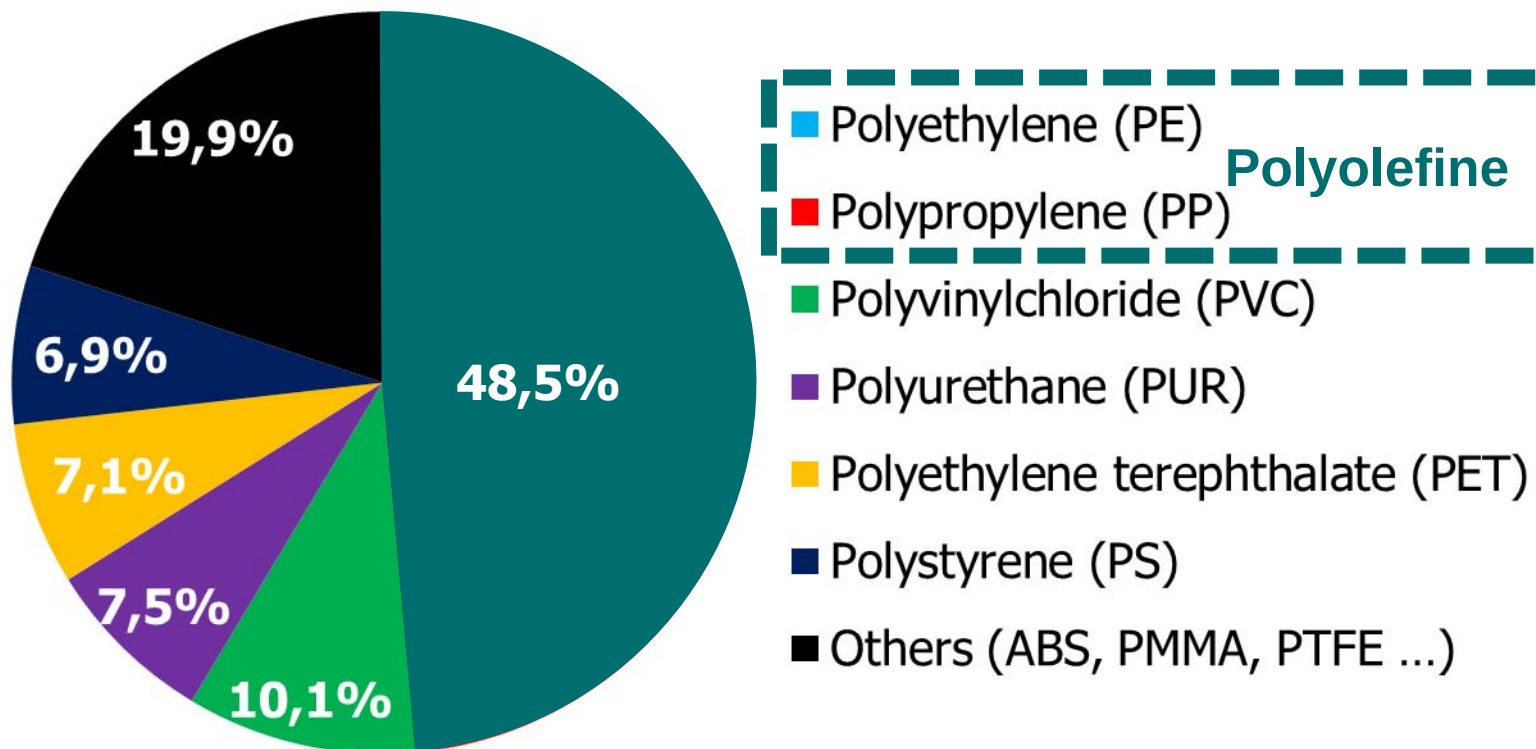
Current situation

Polymer production and consumption of 2015:

[1]

- 4-6% of the global petroleum production was processed into polymer products
- This amounts to 322 Mt of polymer products
- Europe* produced 58 Mt and consumed 49 Mt
 - Germany 12,0 Mt (Greece 0,8 Mio. t)

[1]



*Europe in [1] consists of the 28 EU member states, Switzerland und Norway

Current situation

[1][2][3] [4]

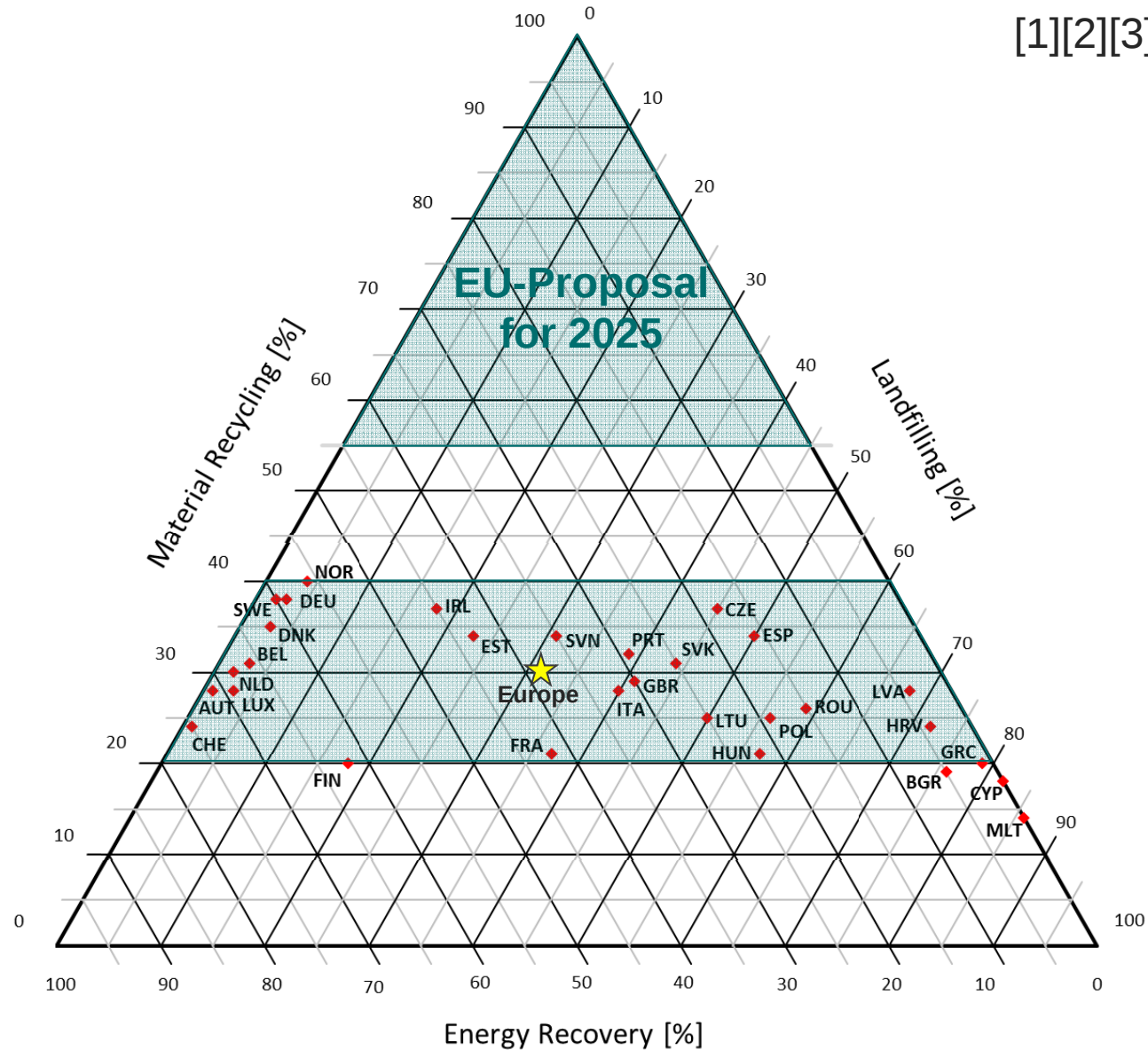


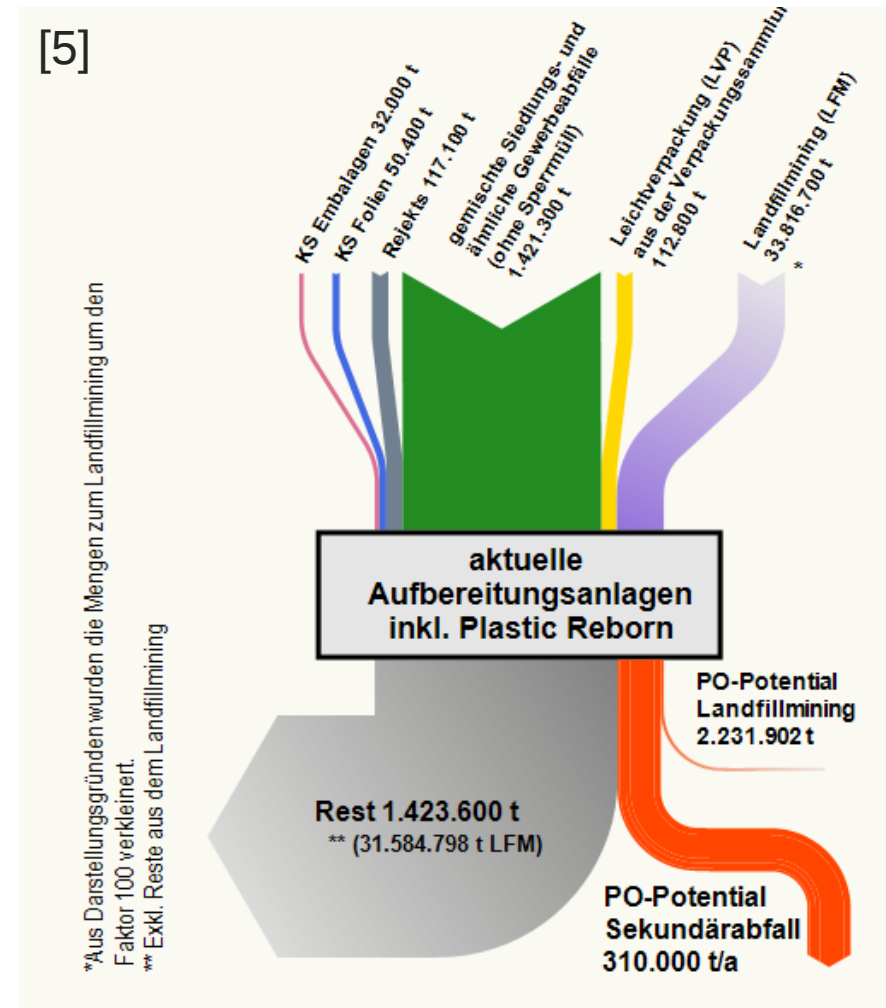


Table of contents

- **Current situation**
- **Feedstock**
- **Process**
- **Products**
 - Light fraction
 - Middle and heavy fraction
- **Conclusions**
- **References**

Feedstock

- Feedstock criteria:
 - Non-hazardous
 - PO-content of at least 20 %
 - Mass flow of at least 20.000 t per year in Austria
- A PO-potential of up to 310.000 t per year was estimated
- Additionally about 2,2 Mt are estimated to be recoverable by landfillmining



Feedstock

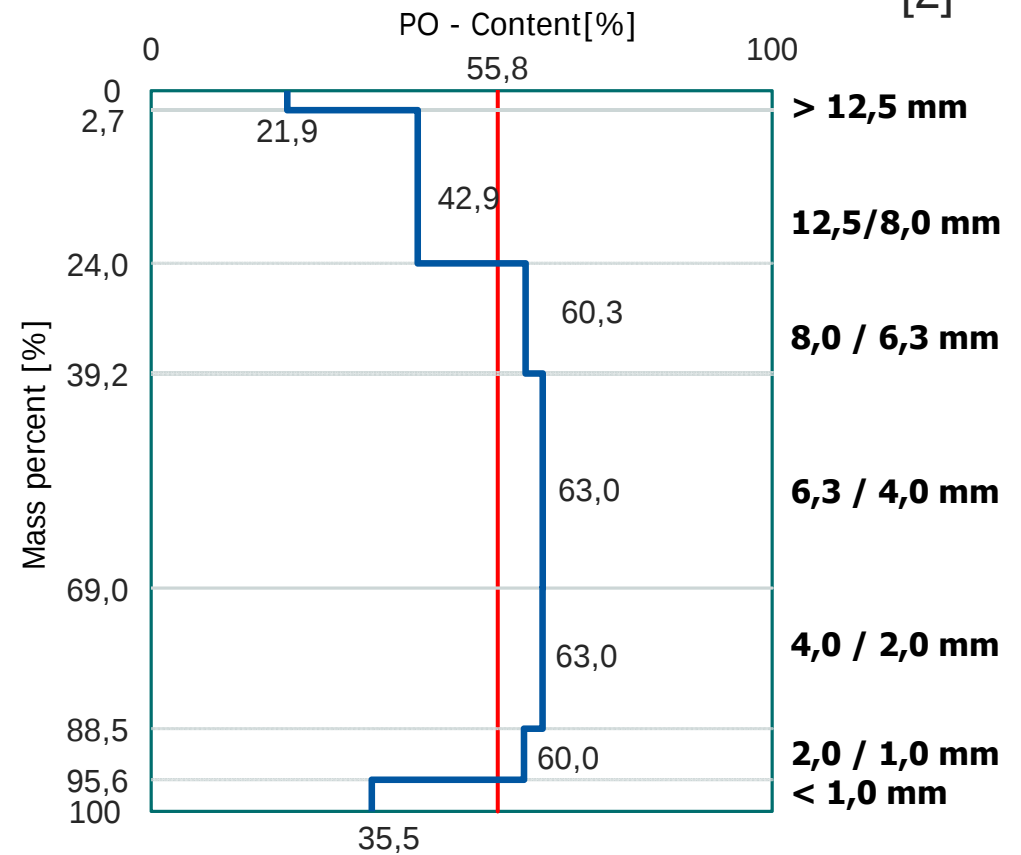
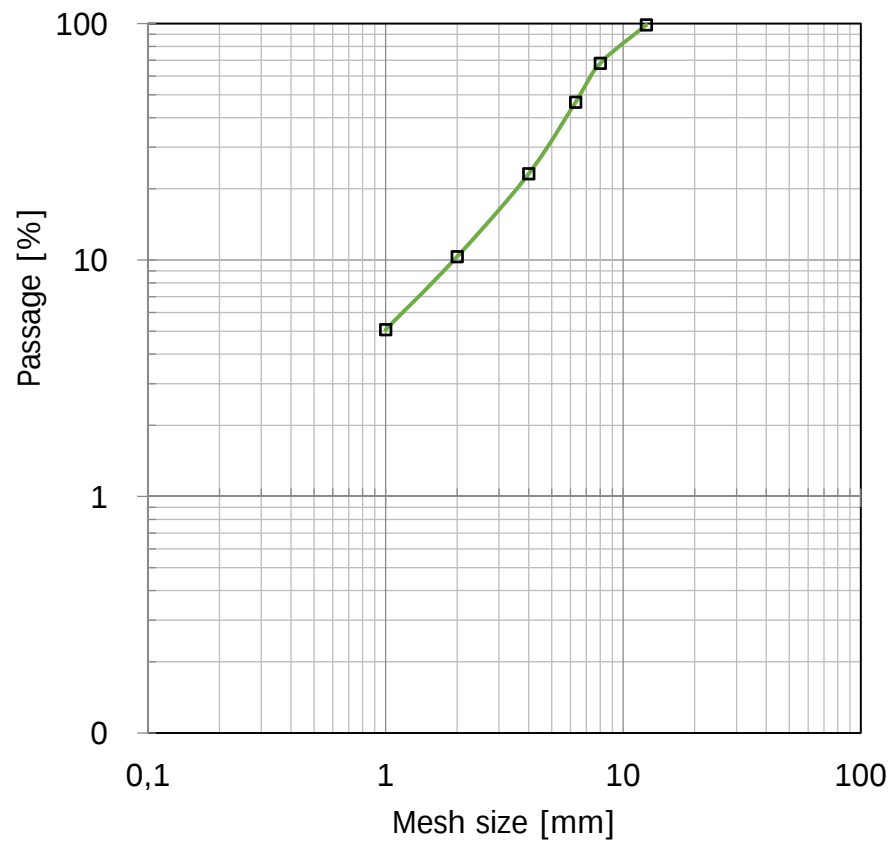


Particle size distribution



PO-distribution

[2]



Feedstock



Waste fraction A

Waste fraction C

Waste fraction	k_{80} [mm]	$\bar{g}_{PO,A}$ [2] [%]
A	7,8	55,8
B	9,8	34,4
C	10,9	11,8



Waste fraction B



Table of contents

- Current situation
- **Feedstock**
- **Process**
- **Products**
 - Light fraction
 - Middle and heavy fraction
- **Conclusions**
- **References**

Process



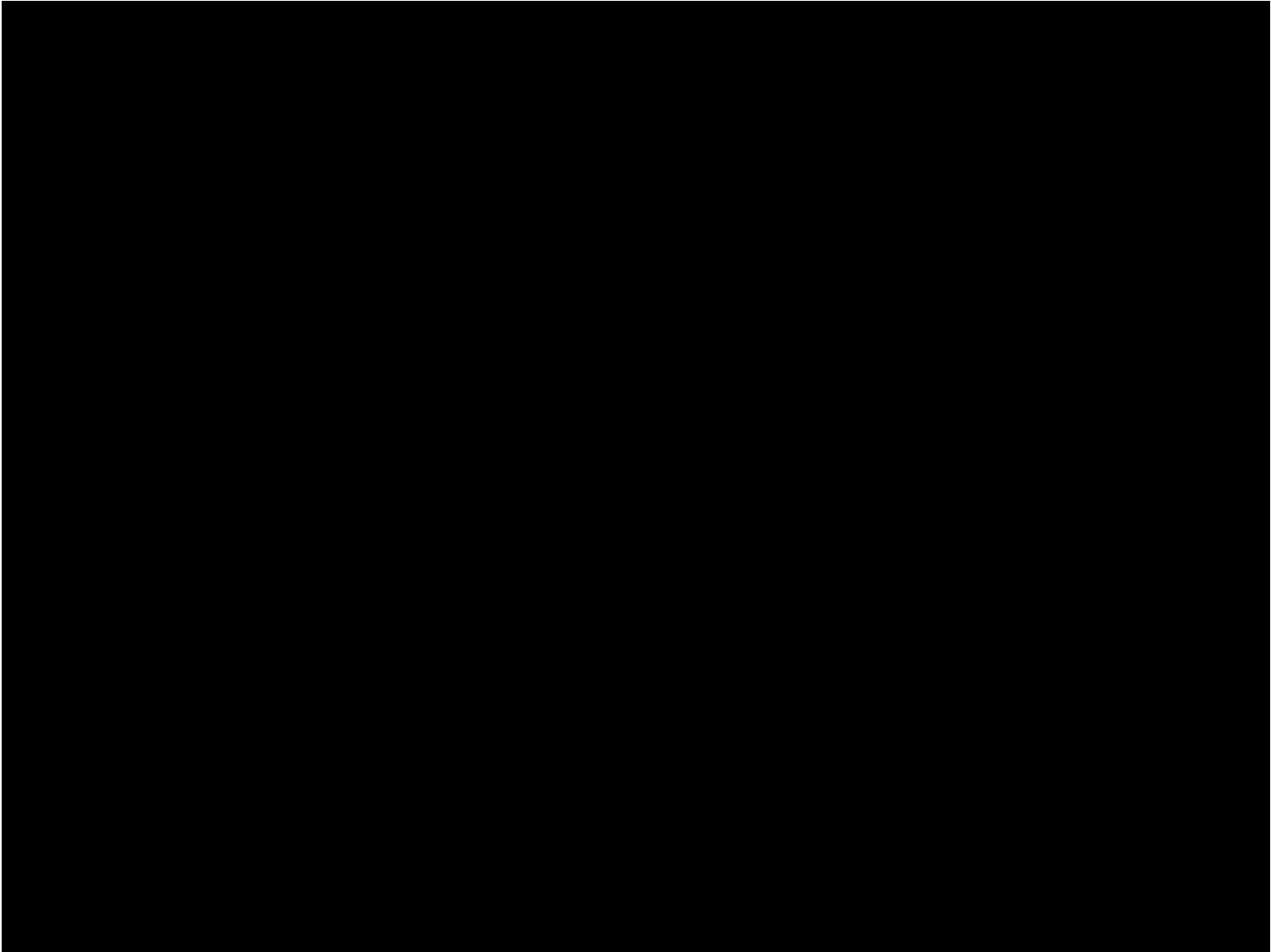
— · · · → Heavy fraction (HF)

— · · · → Light fraction (LF)

— · · · → Inter fraction (IF)

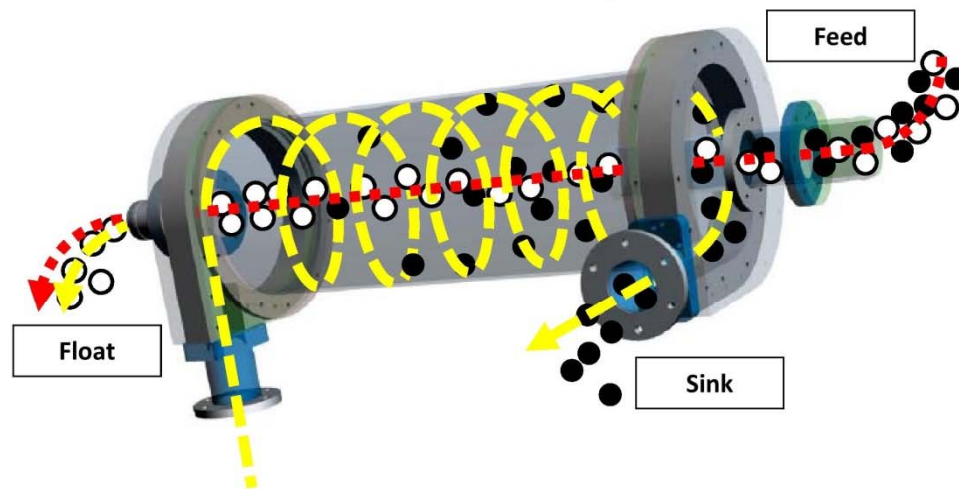


Process

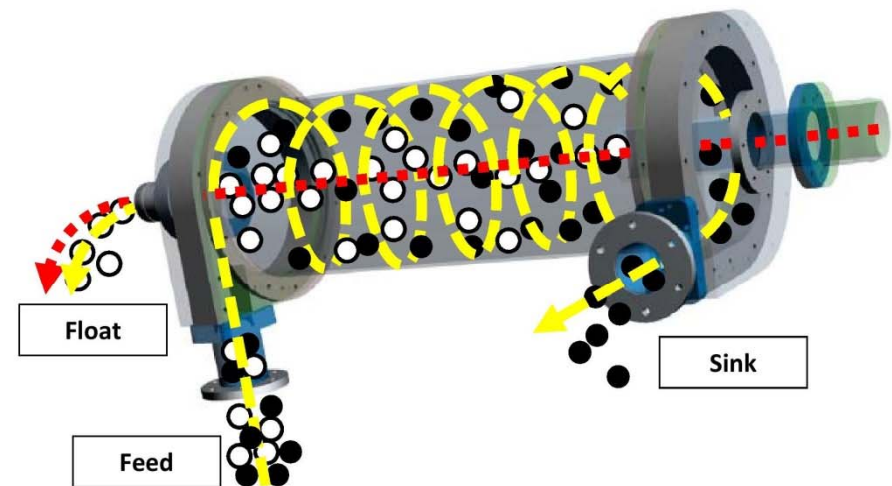


Process

Counter-current operation:

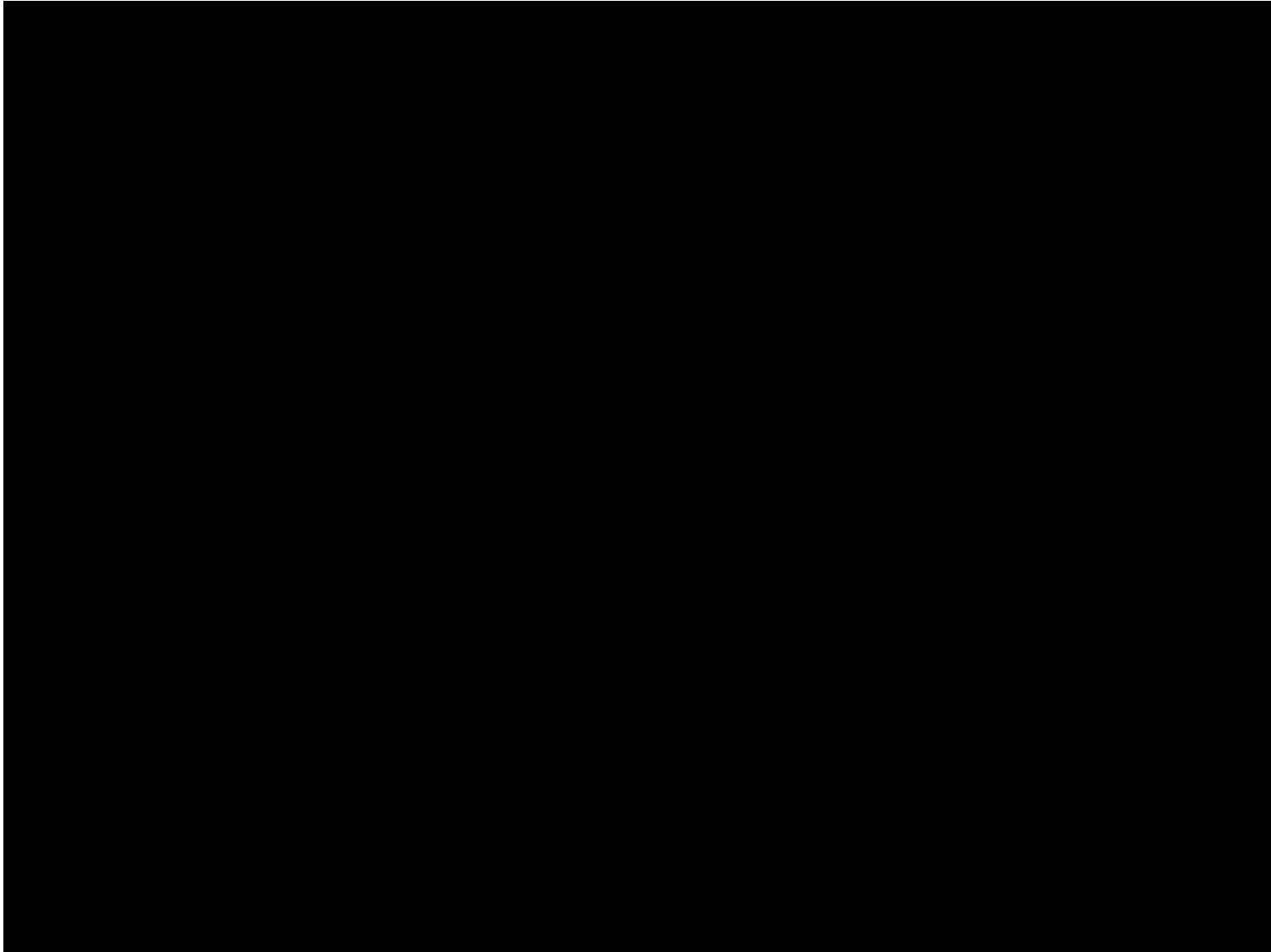


In-current operation:



●	Particles $\rho > \rho_{\text{Medium}}$	→	Medium	Feed	Feed material	Float	Float fraction
○	Particles $\rho < \rho_{\text{Medium}}$	→	Air	Sink	Sink fraction		

Process



Process

[3]

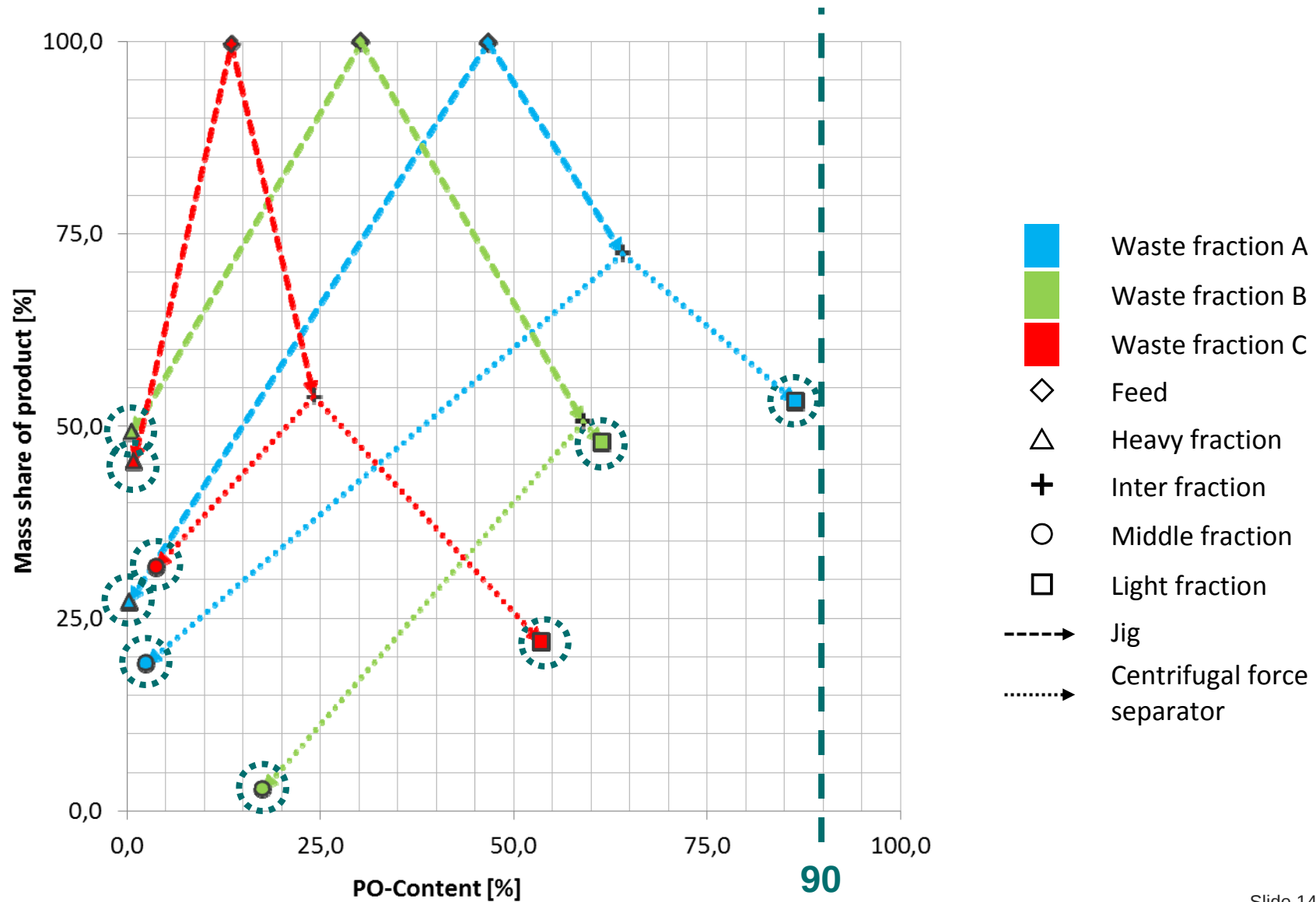
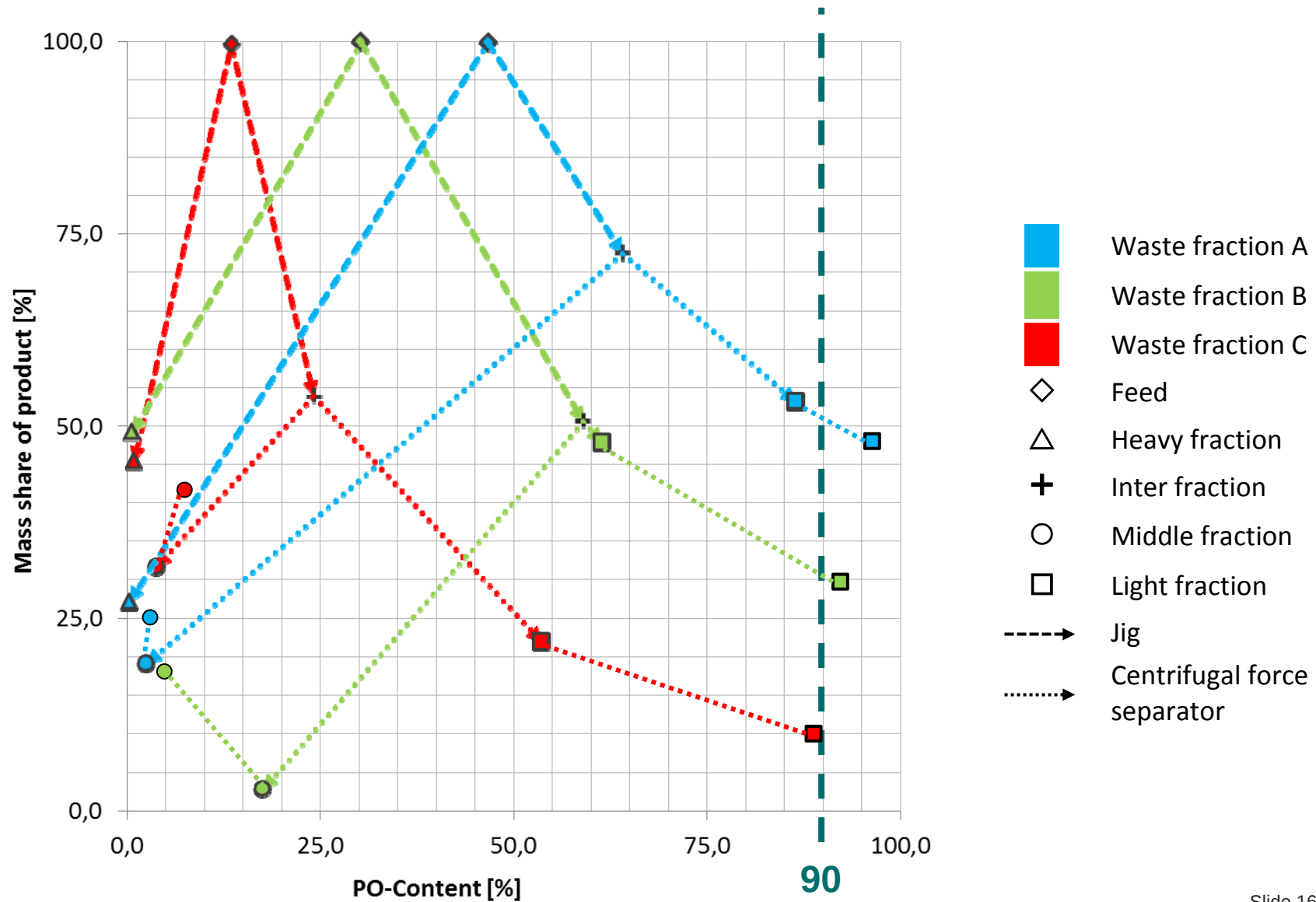




Table of contents

- Current situation
- Feedstock
- **Process**
- **Products**
 - Light fraction
 - Middle and heavy fraction
- **Conclusions**
- **References**

Products – LF



Products – MF and HF

Waste fraction		Exceedance of pollutant limit according to AVV**						Energy recovery	
		Sb	As	Pb	Cd	Cr	Hg	wet	dry
A	MF	-	-	-	-	-	-	FBI*	ICC*
	HF	-	-	-	-	-	-	FBI	ICC
B	MF	-	-	-	X	-	-	ICC	ICC
	HF	-	-	-	-	-	-	ICC	ICC
C	MF	-	-	-	X	-	-	FBI	ICC
	HF	-	-	-	X	-	X	ICC	ICC

***Fluidized bed incineration (FBI), Industrial co-combustion (ICC)**

**** Austrian Incineration Act (Abfallverbrennungsverordnung)**



Table of contents

- Current situation
- Feedstock
- Process
- **Products**
 - Light fraction
 - Middle and heavy fraction
- **Conclusions**
- **References**

Conclusions

- The results show, that treating post-consumer plastic fractions by wet mechanical processing using a jig and multiple centrifugal force separators enable the separation of a highly pure PO-fraction.
- This light fraction has a PO-content of over 90% and is therefore suitable for feedstock recycling by thermochemical conversion.
- The processed middle and heavy fraction have the potential to be used for energy recovery.
- Therefore this process can be used as a bridge technology to make additional shares of post-consumer plastics, especially polyolefins, available for feedstock recycling and to be a first step towards the proposed EU's goal of 55 % material plastic recycling by the year 2025.



Table of contents

- Current situation
- Feedstock
- Process
- Products
 - Light fraction
 - Middle and heavy fraction
- **Conclusions**
- **References**

References

- [1] Plastics Europe: Plastics - the Facts 2016. Wemmel, Belgium (2016)
- [2] Schwabl, D., Flachberger, H., Kranzinger, L., Bauer, M., Hofer, W.: Innovatives Verfahren zu Anreicherung von Polyolefin-Konzentraten aus industriellen Reststoffströmen zum Zwecke einer stofflichen Verwertung. In: Thomé-Kozmiensky K. J., Goldmann D. (eds.) Proceedings of the 10th Recycling und Rohstoffe-Conference, pp. 199-218. TK-Verlag, Berlin (2017)
- [3] Pomberger, R., Sarc, R. and Lorber, K.: Dynamic visualisation of municipal waste management performance in the EU using Ternary Diagram method. Waste Management 61, 558-571 (2017)
- [4] EC (European Commission): Proposal for the Directive 94/62/EG of the European Parliament and of the Council 5 December 2015 on packaging and packaging waste (ed.). Brussels, Belgium (2015)
- [5] Kranzinger L., Pomberger R., Schwabl D., Bauer M.: Quo vadis Kunststoffrecycling – Bestandsaufnahme der polyolefinen Kunststoffe in der österreichischen Abfallwirtschaft. In: Pomberger R. et al (eds.) Proceedings of the 13th Recy and DepoTech-Conference, pp. 583-588. AVAW-Eigenverlag, Leoben (2016)



**Thank you for your
attention!**





**Thank you for your
attention!**

