Removal of mineral oils from recovered paper using thermal and mechanical processes

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Background

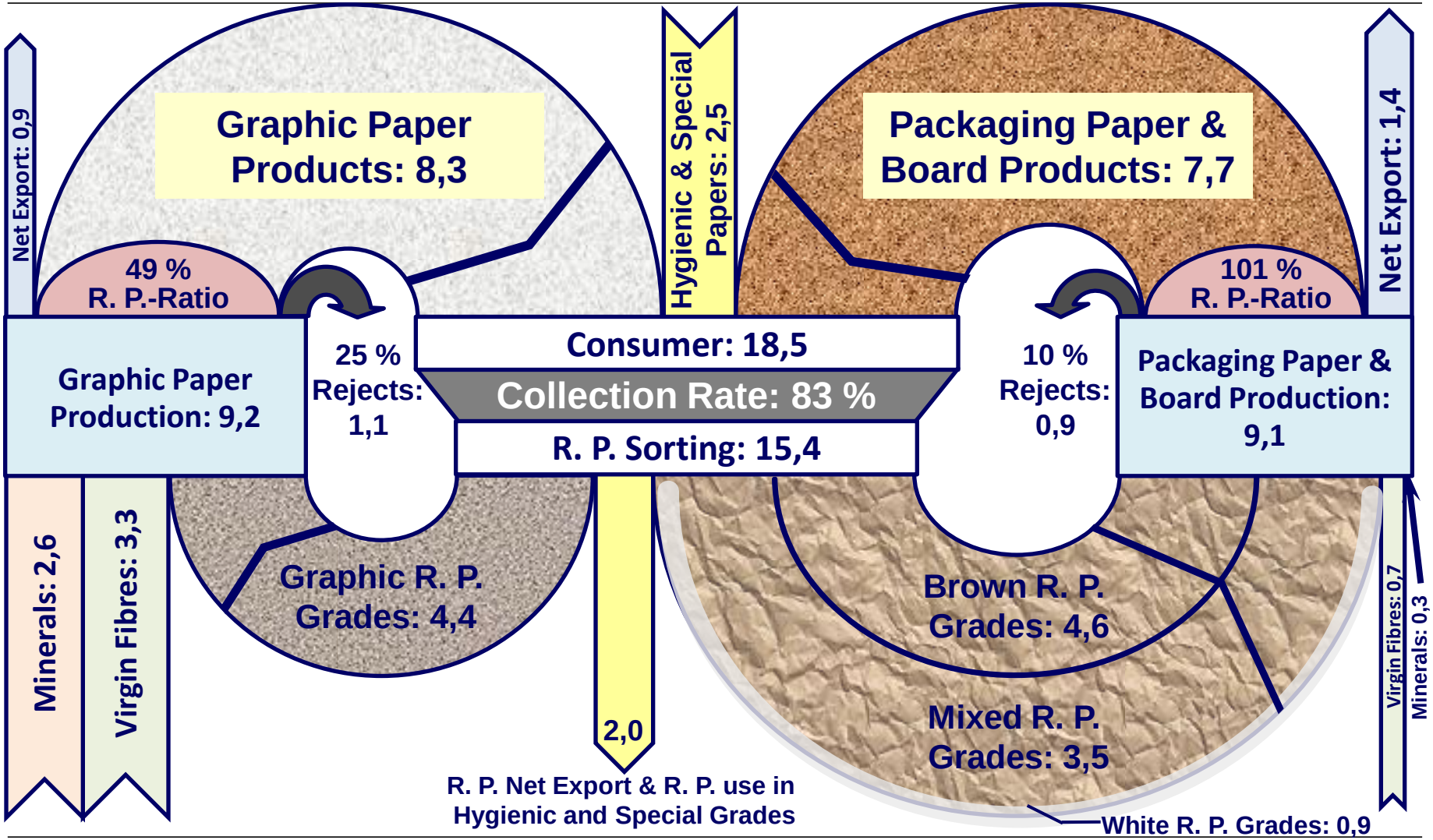
- **Food packaging made from recovered paper is contaminated by mineral oils.**
- **Some mineral oil components are suspected of being carcinogenic.**
- **They are capable to migrate into foodstuff at ambient temperature.**

Possible Sources of Mineral Oil Components in Recycled Food Packaging

- ~~Constituents of chemical additives for paper production (e. g. defoamers, retention agents) and converting~~
- ~~Printing inks for packaging printing of the current packaging~~
- Printing inks for newspaper and magazine printing or packaging printing in former use of paper and board

Detrimental substances enter the paper production via the recycling circuit

The German Recovered Paper Cycle in 2009 (Figures in Mio t)



Characterisation of Mineral Oils

Mineral oil components in cardboard made from recovered paper

Mineral Oil Saturated Hydrocarbons (MOSH)

- Open chained, mostly branched alkanes and cycloalkanes
- Joint FAO/WHO Expert Committee on Food Additives (JECFA) Classification of mineral hydrocarbons (medium and low viscosity) class III = ADI 0.01 mg/kg body weight ➡ 0.6 mg/kg foodstuffs

Mineral Oil Aromatic Hydrocarbons (MOAH)

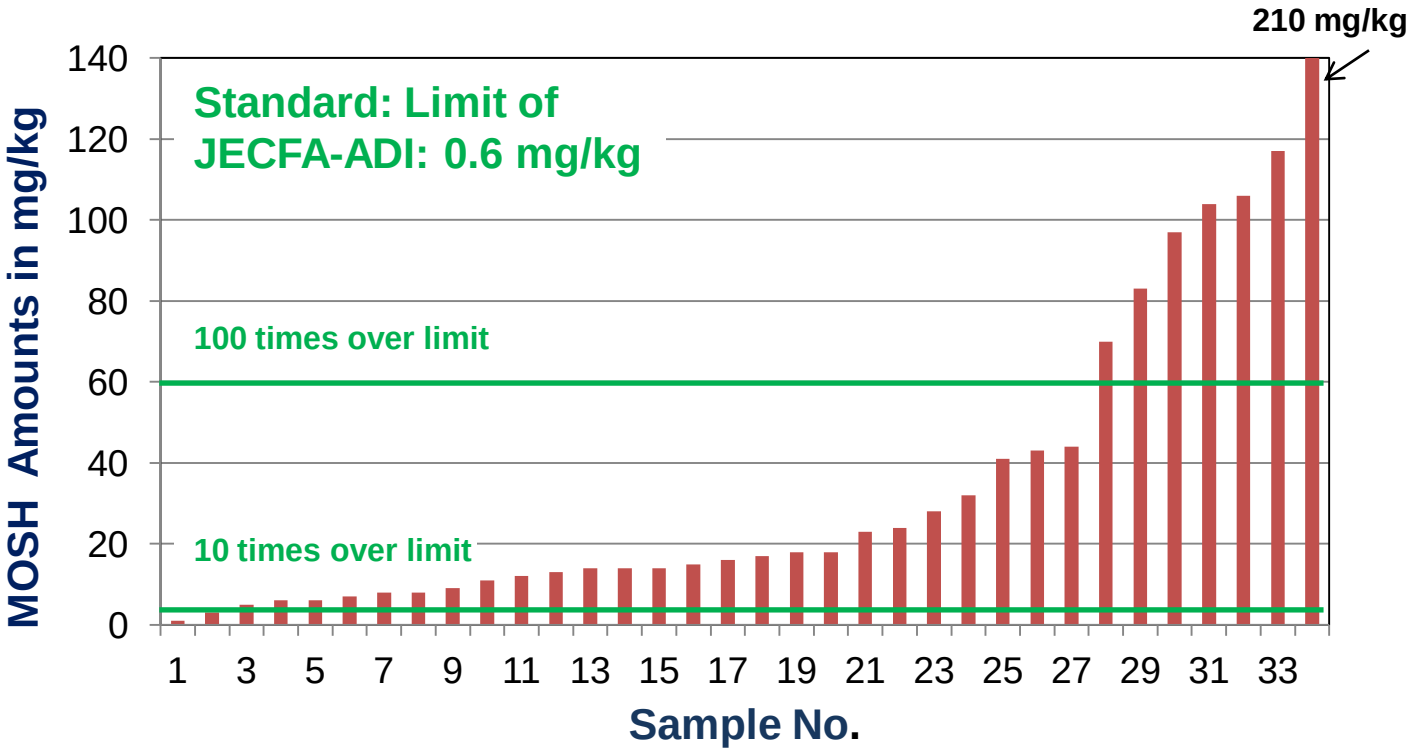
- Highly alkylated aromatic compounds
- Not separable by chromatography
- Some substances with proved carcinogenic potential other substances with suspicion of carcinogenic effects ➡ 0 mg/kg foodstuffs

Problems: **Migration from compounds ≤ C24 via gas phase into foodstuffs**

Source: **Printing inks from offset printed newspapers (Coldset)**

MOSH Concentrations in Foodstuff

MOSH in dry foodstuffs, packed in recycled cardboard, and stored at room temperature



Source: Grob, K.: Mineralölanalytik im Lebensmittelbereich

Analytical Methods

1. **Non-standardised online HPLC-GC-FID method by Grob et al.**

   → ***For detection of mineral oils in foodstuff and its packaging***
   → ***Differentiation between MOSH and MOAH***

2. **Basis Criteria for Award of the Environmental Label „Blue Angel“**

   → ***For detection of mineral oils in office papers***
   → ***Differentiation between VOC and SVOC (mostly MOSH and MOAH amounts <C24)***

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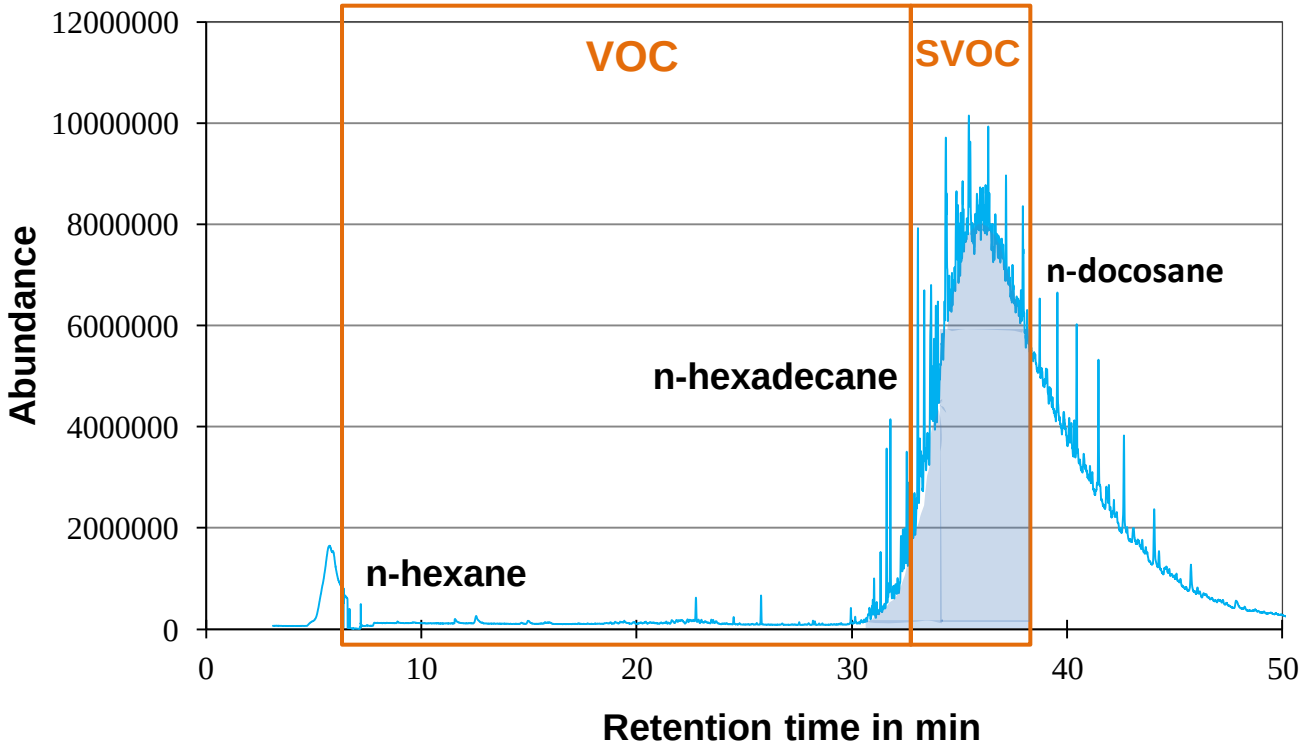
Mineral Oils in German Newspapers

Chromatogram of a German newspaper after thermodesorption-GC/MS with identification of VOC and SVOC areas



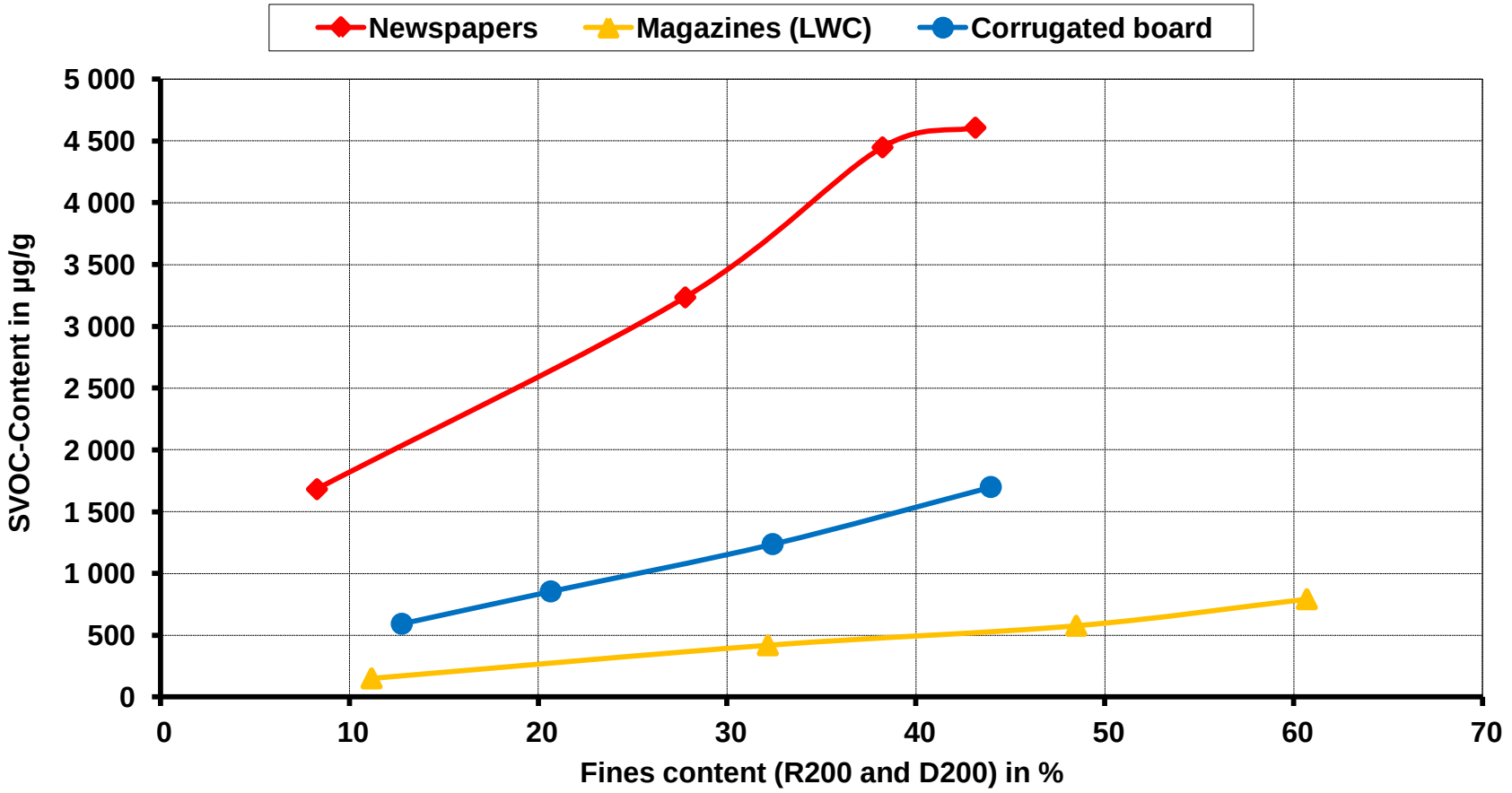
Results of VOC Determination

SVOC-Amounts in different printed newspapers and magazines (calculated as SVOC in µg/g)

Newspaper from	Black printed area	Coloured printed area	Not printed area
Germany (offset printed)	**9,204**	**7,653**	**1,725**
Japan	6,022	6,349	3,434
Vietnam	3,345	3,737	1,646
China	4,484	3,868	2,802
United States	6,099	6,857	3,203
England (flexo)	**665**	**651**	**489**
German magazine (gravure printed)	**1,269**	**1,062**	**532**

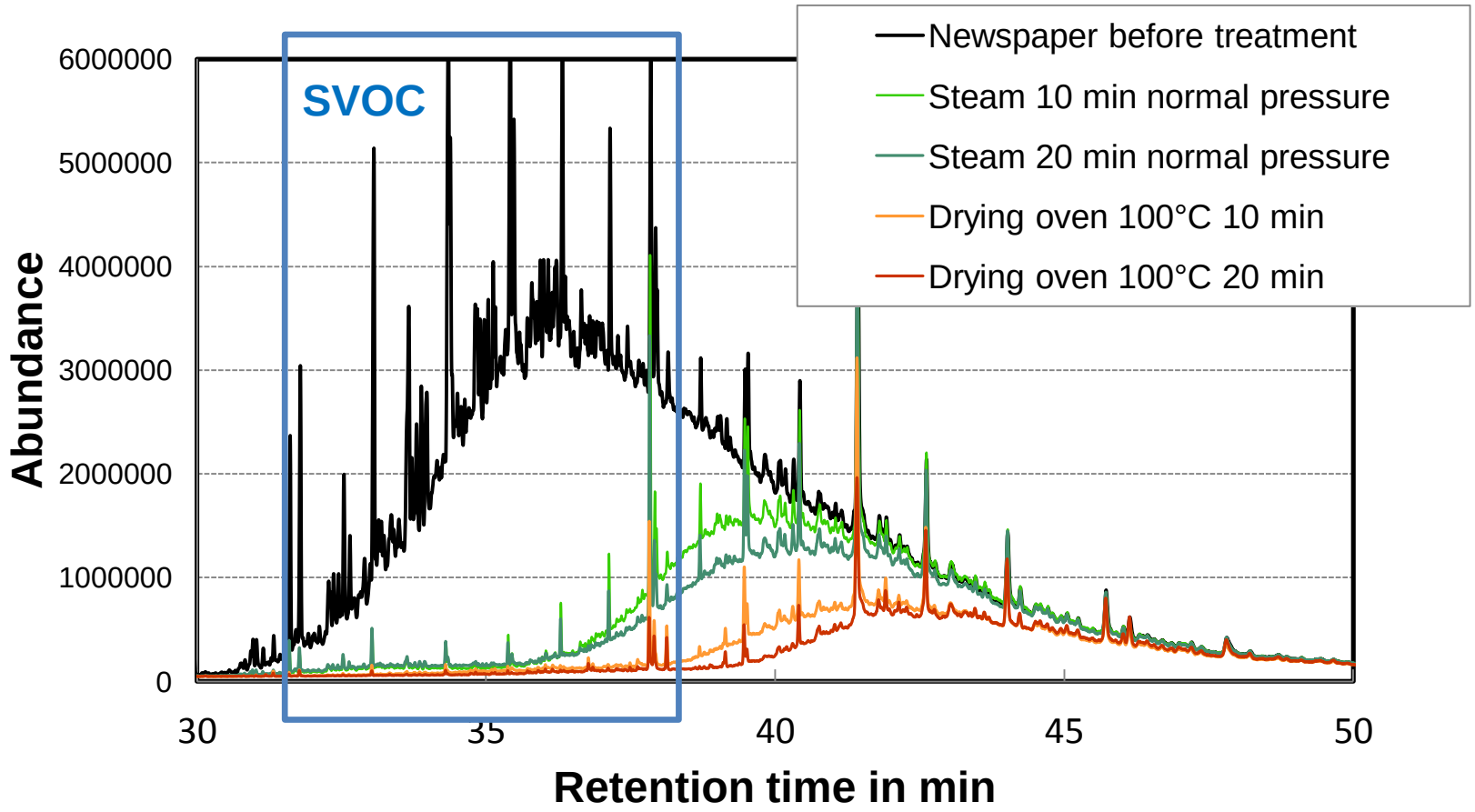
SVOC Removal for Washing Processes

The fines fraction contains the highest amount of SVOC



Measures for SVOC Removal in Recovered Paper Processing

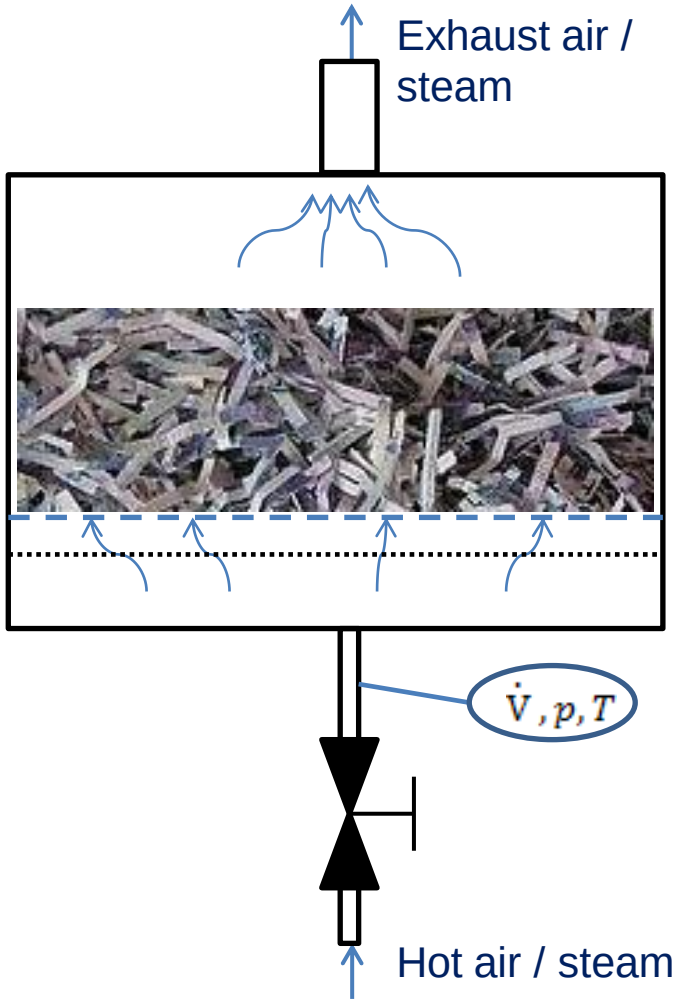
SVOC-Amounts in differently treated newspaper samples



Summary

- **Chemical additives in paper industry do no longer contain mineral oil components as well as printing inks used for food packaging printing;**
- **Mineral oil contaminations in food packaging are mainly coming from printing inks;**
- **Most of the SVOC are located in the fines fraction due to the high specific surface;**
- **The volatility of the SVOC components increases at high temperatures; so it can be used for removal of SVOC from the recovered paper and recovered paper stock**

Further Tasks (1)



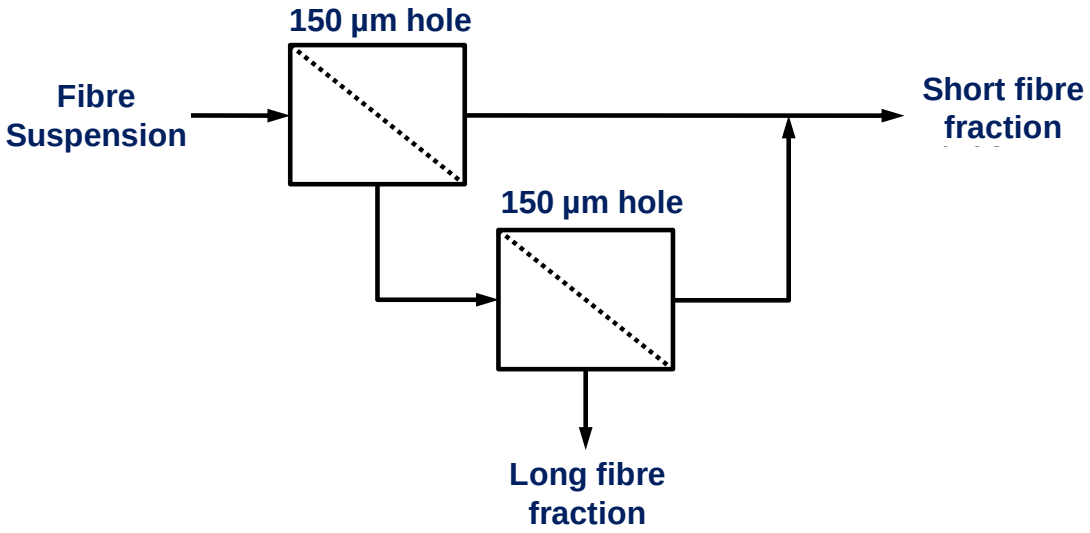
Examinations on removal behaviour of mineral oils during high temperature treatment.

- **Effects on physical and optical paper properties;**
- **Maximum removability for different raw materials;**
- **Economic viability.**

Further Tasks (2)

Maximum removal potential for fines separation methods, depending on raw materials.

- Determination whether organic or inorganic fines are enriched with mineral oils;
- Maximum removal potential in comparison with lab flotation;
- Economic viability.



THANK YOU FOR YOUR KIND ATTENTION.

QUESTIONS???