



TECHNISCHE
UNIVERSITÄT
DARMSTADT

Herstellung von Papier aus Altpapier

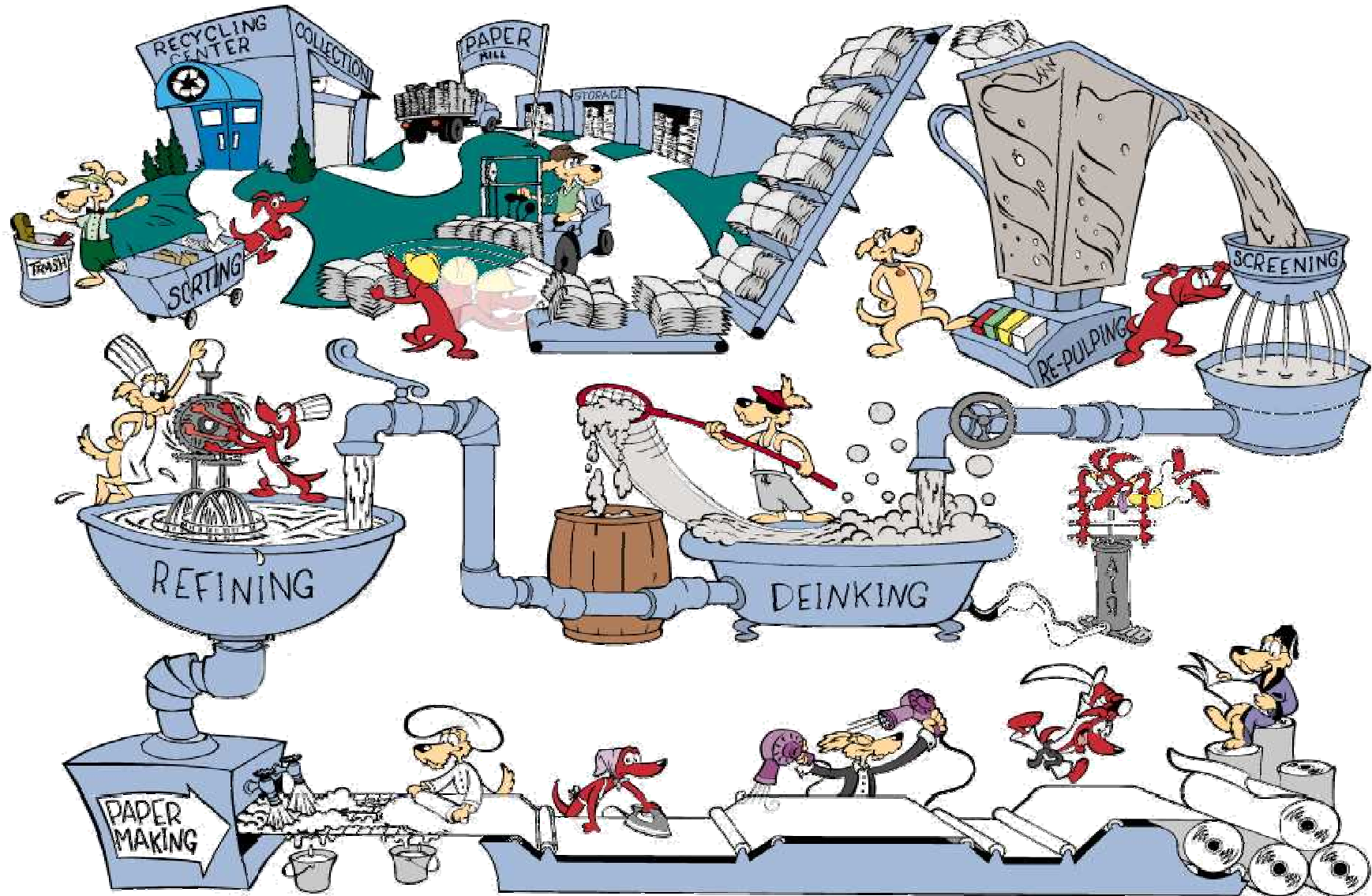
BfR Verbraucherschutzforum



Samuel Schabel

Technische Universität Darmstadt

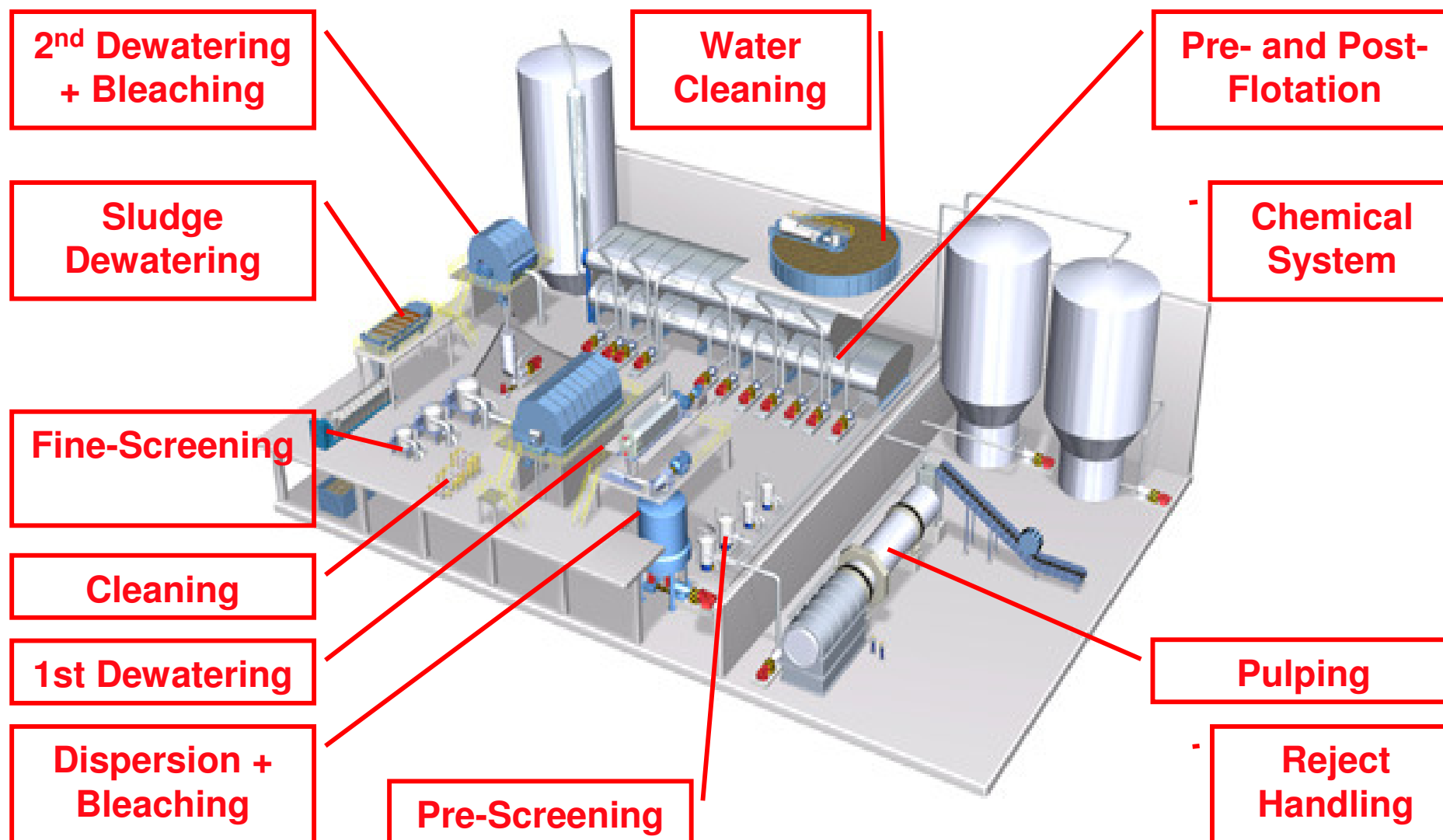
Das Altpapierrecycling



Sortierung von Altpapier

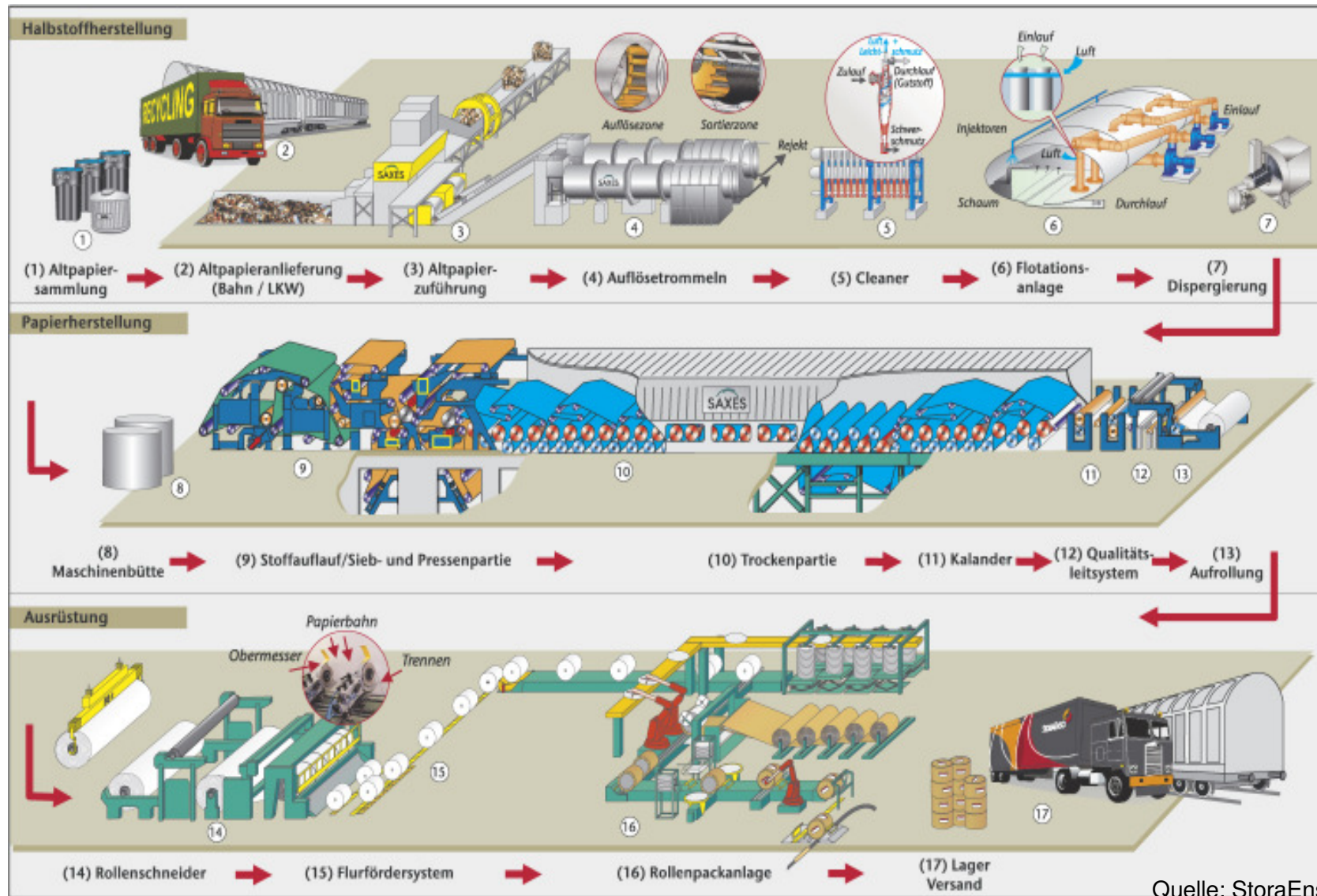


3D-Ansicht Stora Enso Deinkinganlage Werk Sachsen



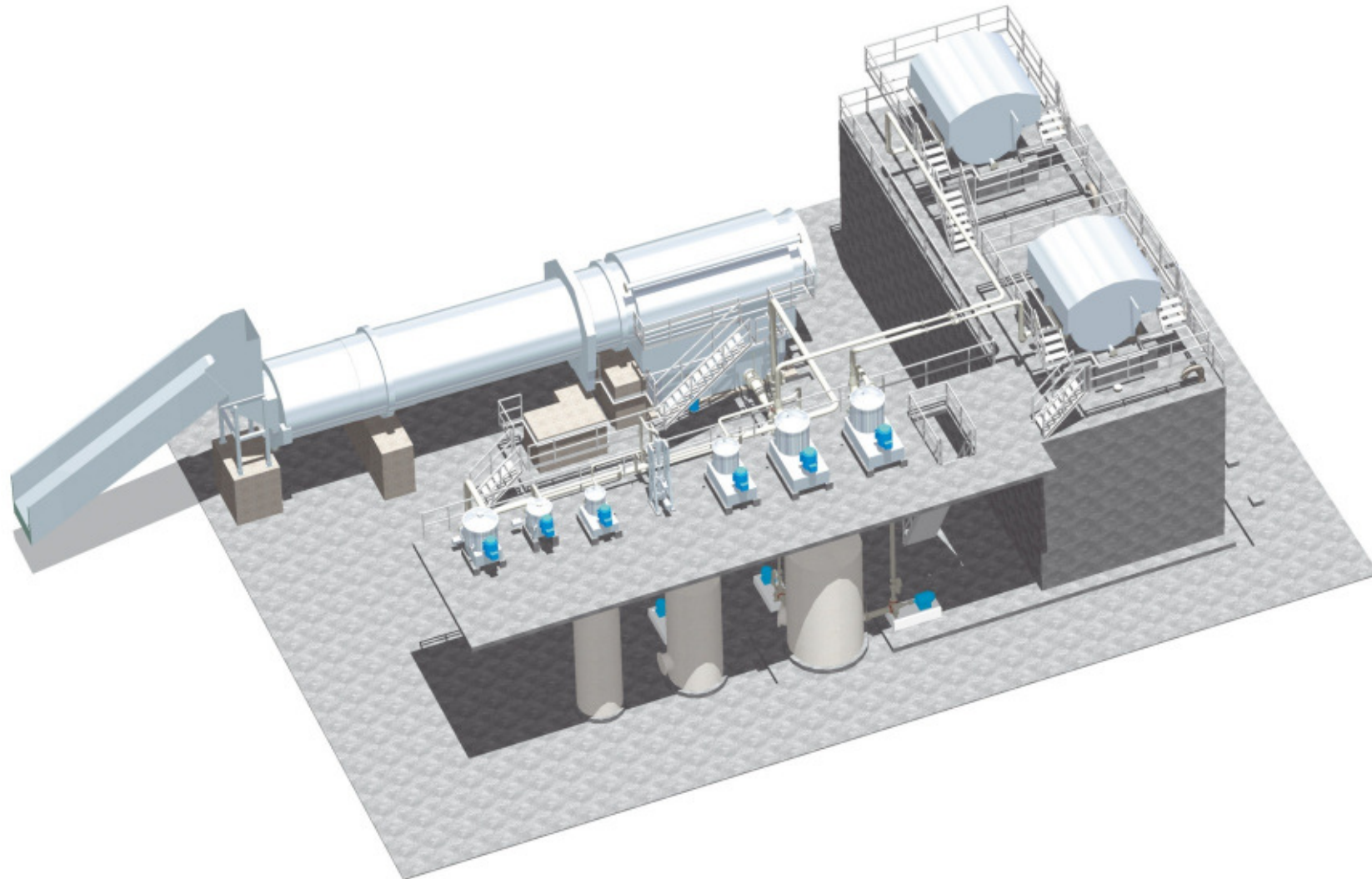
Source: Picture by Andritz

Schema einer Papierfabrik



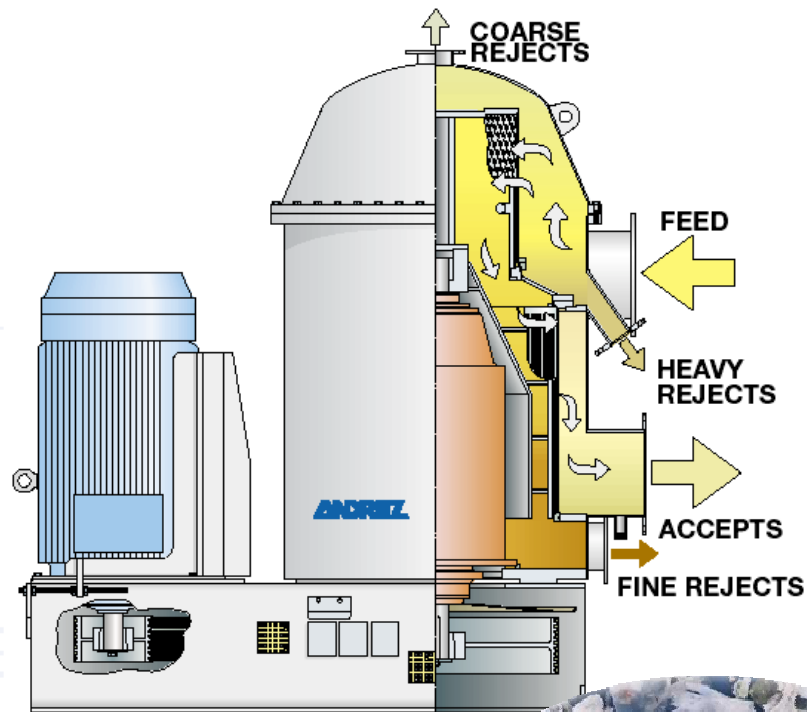
Quelle: StoraEnso, Eilenburg

Stoffaufbereitung für OCC



Source: Picture by Andritz

Trennprozess nach Größe: Sortierung



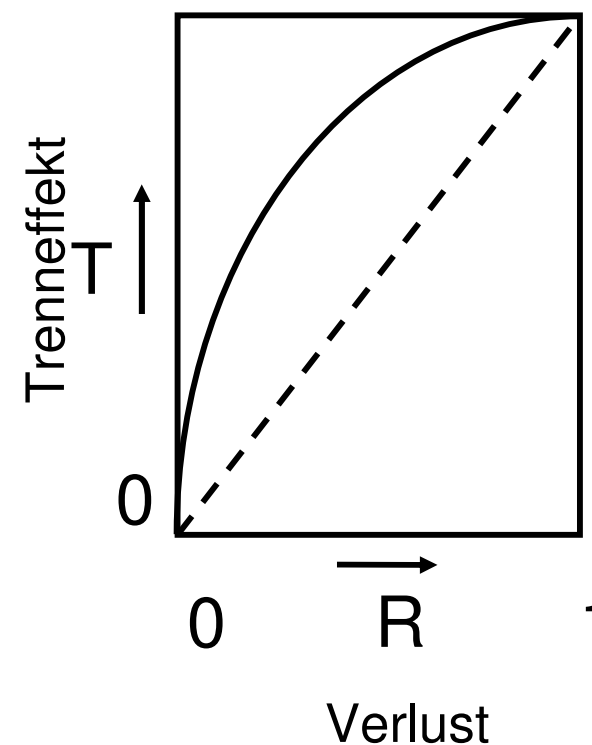
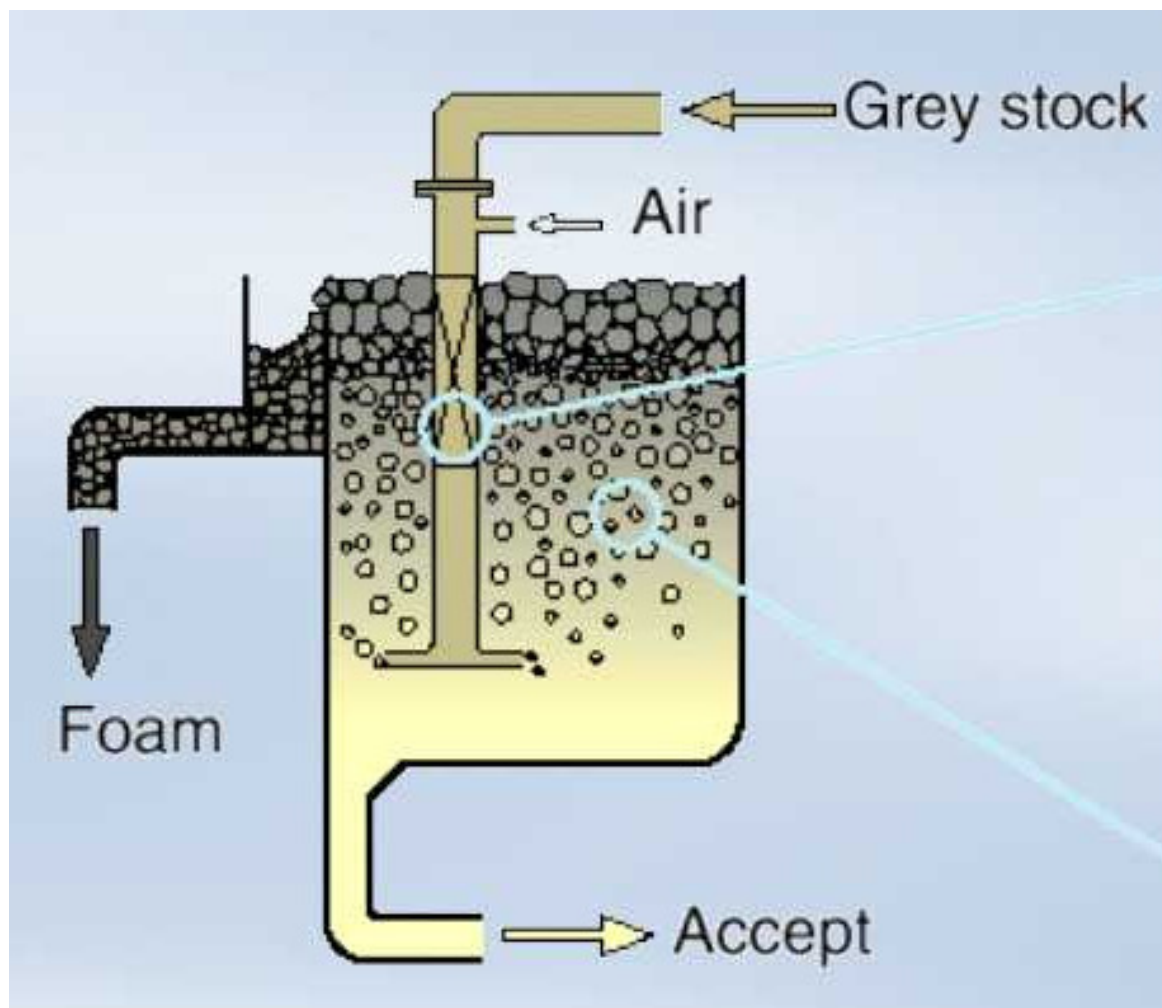
Source: Picture by Andritz



Quelle: Voith Paper

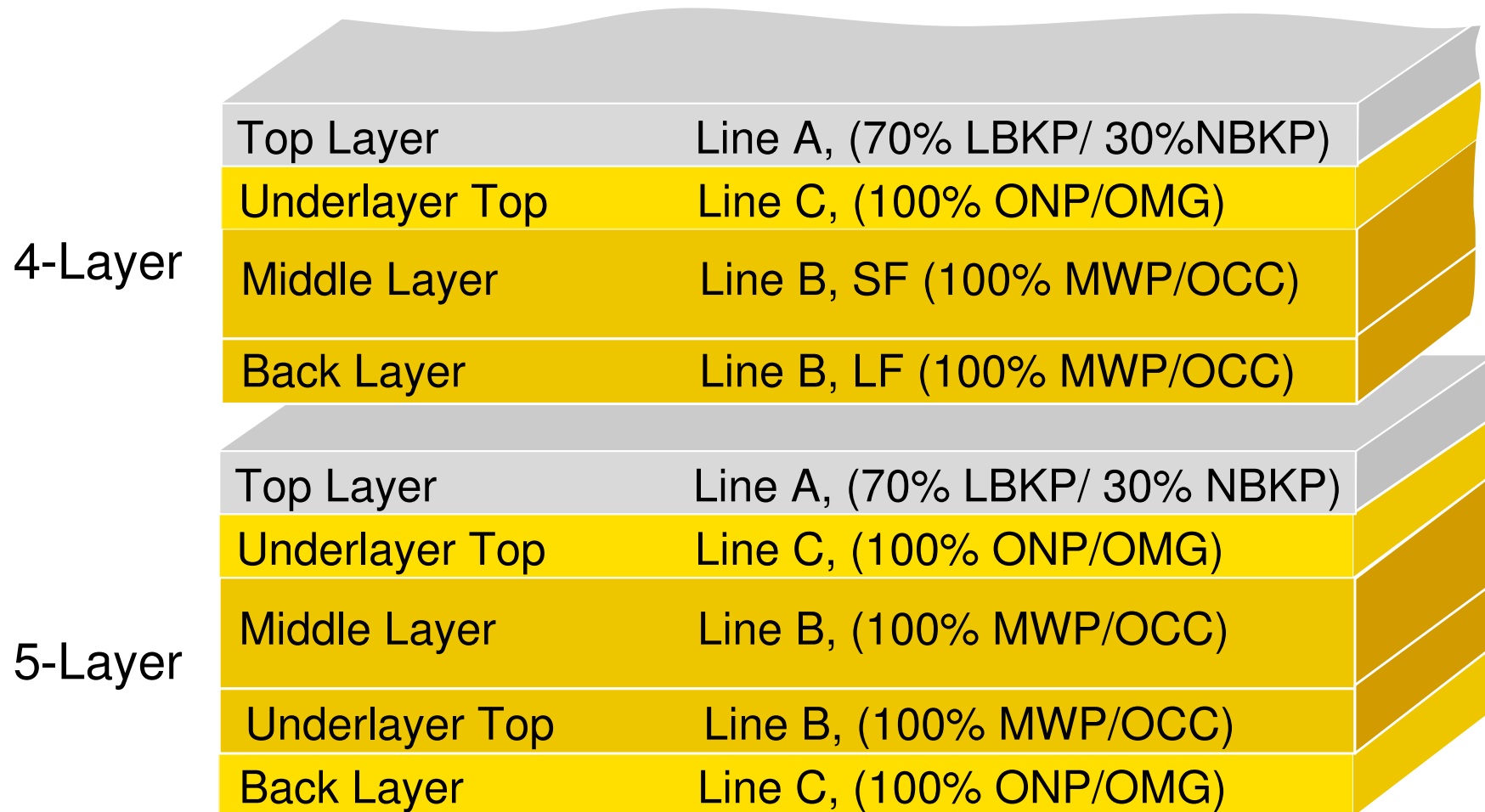


Trennprozess für hydrophobe Partikel: Flotation

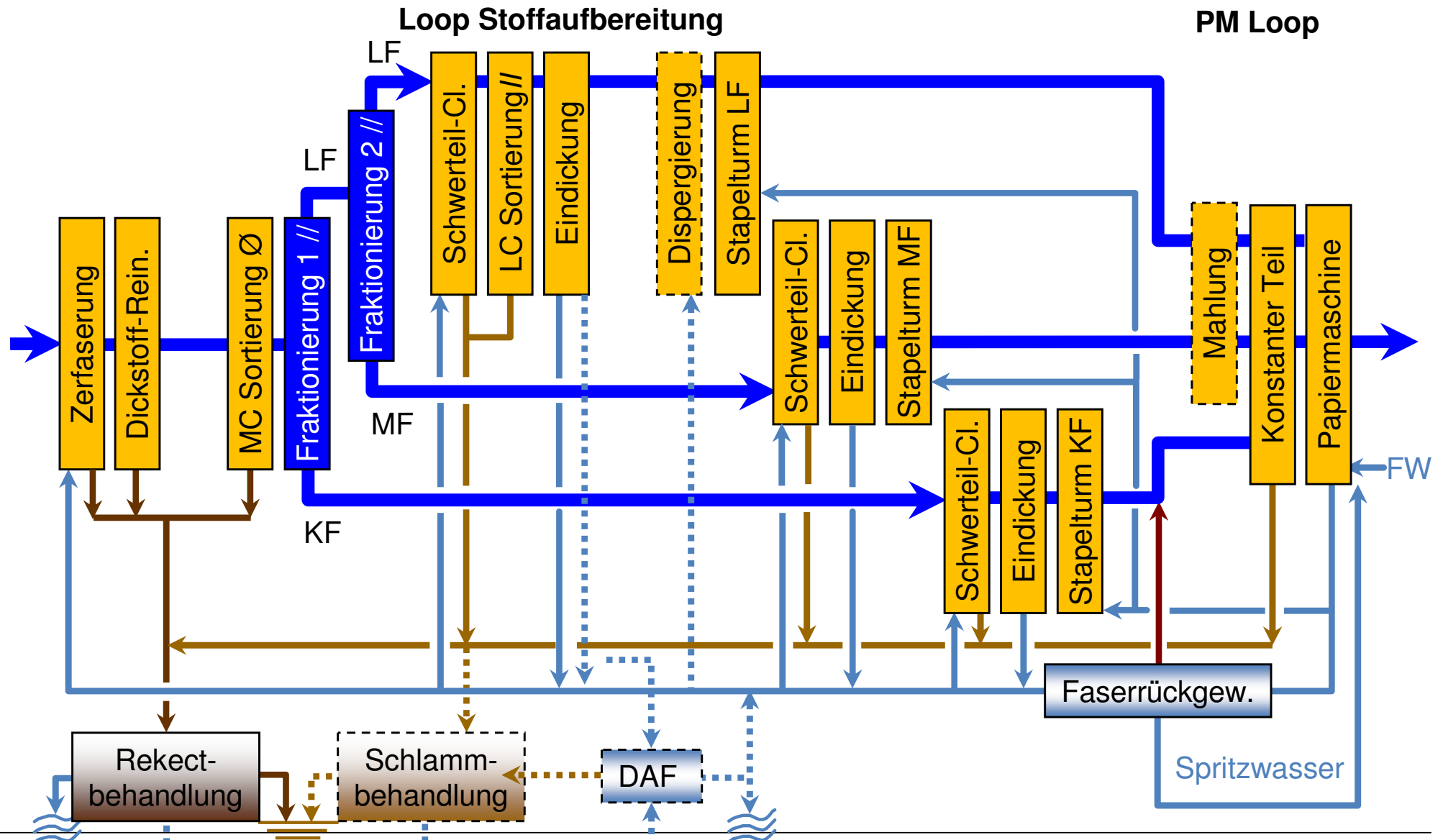


Quelle: Voith Paper

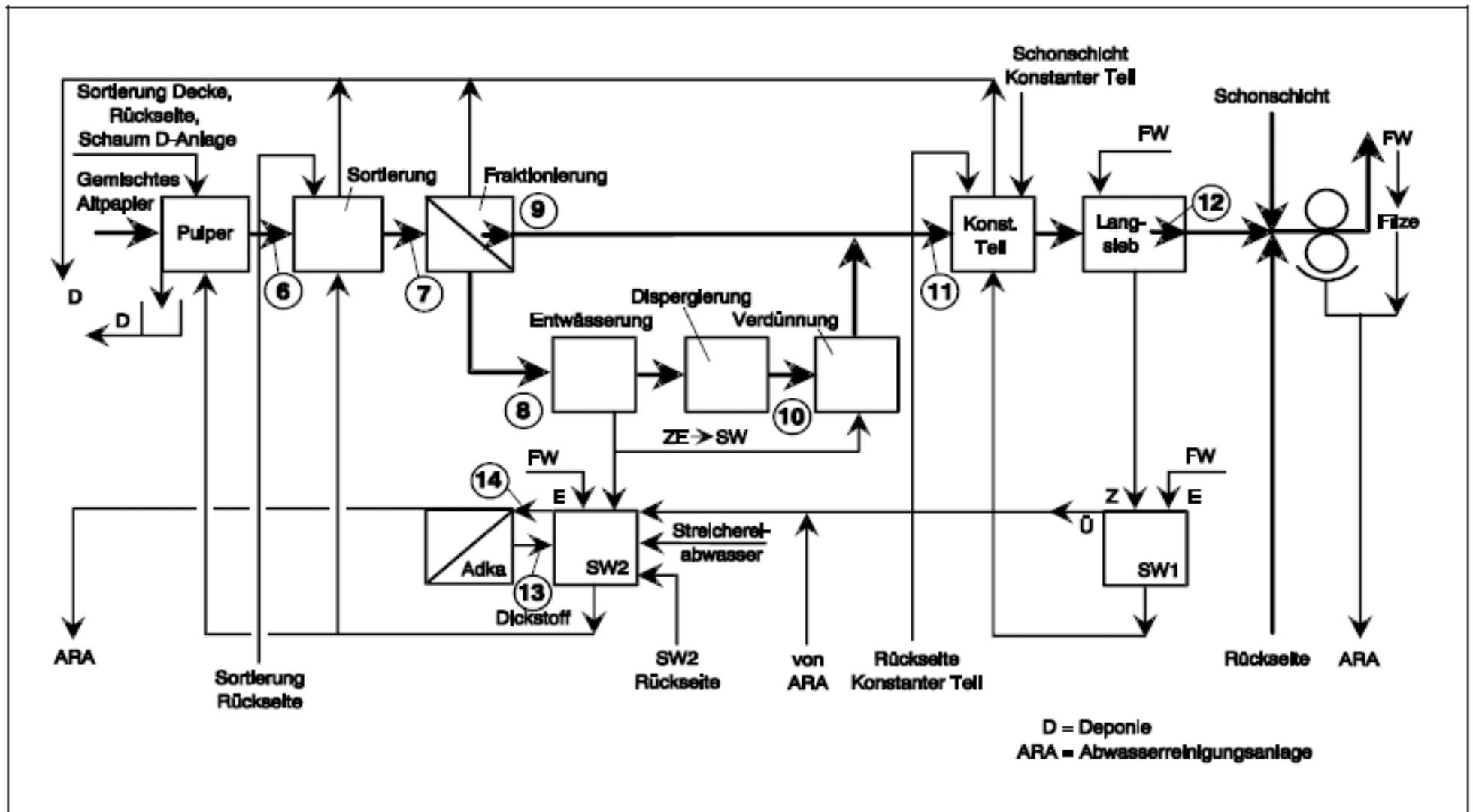
Aufbau White Lined Chipboard (WLC)



Stoffaufbereitungssystem mit Doppelfraktionierung



Fließschema einer Kartonfabrik



Possible sources of undesired ingredients in recovered paper

- Components of natural raw materials
- Chemical additives for paper production
- Substances for paper processing
(printing inks, adhesives, lacquers, plastic foil etc.)
- Erroneous disposal during recovered paper collection

Research on undesired substances at PMV, TU Darmstadt (I)

- Path of heavy metals in recovered paper processing
AiF-project, 1991
- Undesired substances in papers made from primary and secondary fibres
INFOR-project, 1992
- Investigations on the possible formation of aromatic amines during reductive bleaching of recovered paper
INGEDE-project, 1997 (in cooperation with ISEGA, D-Aschaffenburg)
- Minimisation of undesired substances with simultaneous quality improvement of recycled pulp by application of flotation technology in the production of packaging paper and board
AiF-project, 1998

Research on undesired substances at PMV, TU Darmstadt (II)

- Composition and quality of recovered paper depending on regional and seasonal collection
AiF-project, 2000
- **Balancing of undesired organic substances**
AiF-project, 2001
- **Use of secondary raw materials for the production of food packaging material – Minimisation of contaminants in paper**
BMBF-project, 2002
(in cooperation with Fraunhofer Institut Verfahrenstechnik und Verpackung IVV)
- Accumulation of undesired constituents in the recovered paper-new paper-circuit
INFOR-project, 2005

Effect on different process-levels on the concentration of DIPN and PCP in the recovered paper

Process-level	Effect on	
	DIPN-concentration	PCP-concentration
purification, sorting	reduction by 2 % - 5 %	reduction by 2 % - 5 %
fractioning	accumulation in short fibre-fraction by 25 % reduction in long fibre-fraction by 25 %	no effect
dispersion	no effect	no effect
refining	no effect	no effect
Flotation-deinking	reduction by 65 %	reduction by 25 % - 30 %
Process water treatment with dissolved air flotation (DAF)	DIPN-concentration in clear water: < 0,02 mg/l	PCP-concentration in clear water: < 0,005 mg/l

Use of secondary raw materials for food packagings

Results BMBF-project (IVV Freising + PMV), 2002

Investigations in the PMV laboratory by means of the IfP flotation cell

Process	Matter	Effect on	
		DIPN-concentration	Phthalate concentration
Flotation (single stage)	Grey board	reduction by 41 %	reduction by 60 %
	Folding box board	reduction by 58 %	reduction by 63 %
	Newsprint paper	reduction by 56 %	reduction by 39 %
	SC paper	reduction by 89 %	reduction by 45 %
	Mixed sample	No reduction	reduction by 34 %

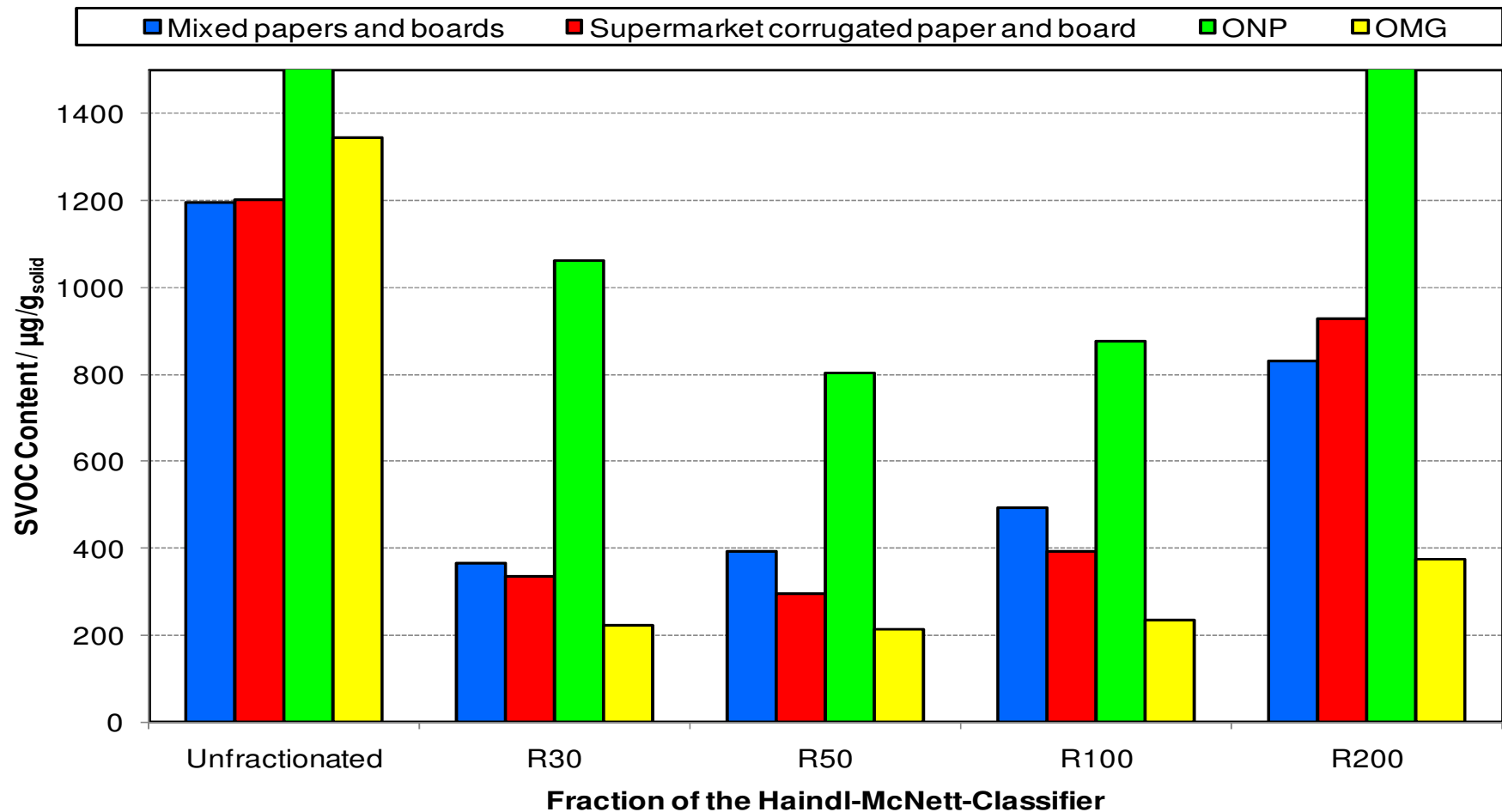
Use of secondary raw materials for food packagings

Results BMBF-project (IVV Freising + PMV), 2002

Investigations in the PMV laboratory by means of the IfP flotation cell and a Degussa-Labor-Washing cell

Process	Matter	Effect on		
		DIPN-concentration	Phthalate concentration	PCP-concentration
Deinking in combination <u>Flotation</u> (single stage) and <u>subsequent</u> <u>Washing</u>	Newsprint paper	reduction by 93 %	reduction by 71 %	————
	SC paper	reduction by 80 %	reduction by 80 %	reduction by 41 %
	Corrugated board	reduction by 75 %	reduction by 76 %	reduction by 27 %
	Folding box board	reduction by 76 %	reduction by 58 %	————
	Tissue	reduction by 87 %	reduction by 72 %	reduction by 93 %

Mögliche Lösungsansätze: SVOC-Gehalt nach Partikelgröße



- **Highest SVOC concentration in the unclassified suspension**
- **SVOC concentration in R200-fraction 2 to 3 times higher than in R30, R50 and R100 fraction, but clearly lower than in the unclassified suspension**
=> the D200 fraction must have the highest SVOC concentration

Zusammenfassung

- Papierrecycling ist ein wichtiges Element für einen nachhaltigen Umgang mit der Ressource.
- Mit den bekannten Technologien sind Entfrachtungsraten für flüchtige organische Substanzen bis etwa 80 % möglich. Darunter sind die am besten geeigneten Verfahren Flotation und Wäsche, jeweils verbunden mit entsprechendem Stoffaustrag und Ausbeuteverlusten von bis über 40 %.
- Prozesse für die Herstellung von Verpackungspapier bzw. Karton verfügen üblicherweise nicht über solche Trennprozesse.
- Für die Entwicklung von „besseren“ Entfrachtungsprozessen und geeigneten Verwertungswegen sind F&E-Aktivitäten erforderlich.
- Wünschenswert (notwendig) ist die Vermeidung des Eintrags von Stoffen, die das Papierrecycling stören bzw. behindern.



Danke!

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