Principal process steps in a deinking plant

- Deinking
- Cleaning
- Pulping
- Bleaching

Source: Stora Enso
The deinking process

- Detaches ink from fibres and removes them from the pulp
- Contains often a mild bleaching stage
- Is not suited to decolour brown fibres or dyed papers
- Therefore: Recovered paper for deinking has to be free of brown components

Deinking process

- The whole process is designed to purify the pulp from unwanted material.
- In the first process step the ink has to be detached from the fibres.
- For effective and complete removal the ink particles have to be in a suitable size distribution.
- Detergent like chemical additives support both parts of the deinking process – the detachment from the fibres and the removal from the fibre suspension.
Unwanted material

- Product related
  - Inks
  - Adhesive applications
  - Lamination, coating, varnish
  - Clips, staples
  - Product samples, CDs, …

- Collection related
  - Cardboard
  - Glass
  - Plastics
  - Sand, Stones, Metals, …

Sophisticated deinking process

- HC Pulping
- Detrashing
- Coarse Screening
- MC Screening
- Main Flotation
- LC Cleaning
- LC Screening
- Thickening
- Dispersing
- Bleaching
- Post Flotation
- Thickening
- Post Treatment
- Final Pulp
- Water treatment
Principal process steps and their tasks

- **Pulping**: Defibering, detachment of ink, gentle treatment of contaminants
- **Screening**: Removal of non-paper components and other contaminants
- **Flotation**: Removal of ink
- **Thickening**: Dispersion of residual contaminants, detachment and fragmentation of cross-linked ink and toner particles
- **Dispersing**: Brightening of fibres, colour stripping of dyes
- **Bleaching**:
- **Final Pulp**:

Recovered paper warehouse
Recovered paper warehouse

**Pulping**

- Defibering, detachment of ink, gentle treatment of contaminants
- **High consistency – continuous pulping**
- **High consistency – batch pulping**

Source: Mika Körkkö & Ossi Laitinen, University of Oulu/COST E 46
Pulping

High consistency – continuous pulping
High consistency – batch pulping

Source: INGEDE member mill

Pulp sample from the pulper
Screening

Removal of non-paper components and other contaminants

Flotation

Final Pulp

Source: Andritz

Removal of adhesive applications in a paper recycling process

The most efficient process step is mechanical separation by slotted screens.

Screen baskets have usually a slot width of 150 µm.

Pulp passes through the slots by pump pressure, a rotor inside the baskets prevents plugging of the screen.

Photos: Kadant
Reject of coarse screening

Cleaning – Removal of heavy or light particles by centrifugal force
Main steps of the deinking process

1. Ink Detachment:
   - The pulper is the key element to detach the ink particles from the fibres

2. Flotation:
   - Air is injected into the suspension and forms small bubbles
   - The hydrophobic ink particles attach to the air bubbles
   - The air bubbles ascend to the surface
   - They are removed as deinking froth
Deinking process

There are two processes for ink removal:

- **Flotation** (predominantly in Europe and Asia for graphic paper)
  material losses 10 to 15%

- **Washing** (in North America and for hygiene paper)
  material losses up to 40%
  (also in North America there is more and more flotation deinking for graphic papers)

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**Specialty: Washing**

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Pulping
   ↓
Screening
   ↓
Flotation
   ↓
Thickening
   ↓
Dispersing
   ↓
Bleaching
   ↓
Final Pulp
```

Removal of ink, fines and filler

Source: Andritz
Thickening

Pulping

Screening

Flotation

Thickening

Dewatering

Dispersion of residual contaminants, detachment and fragmentation of cross-linked ink and toner particles

Source: Andritz
Bleaching

- Pulping
- Screening
- Flotation
- Thickening
- Dispersing
- Bleaching

Brightening of fibres, colour stripping of dyes

Source: Andritz

Final pulp

- Pulping
- Screening
- Flotation
- Thickening
- Dispersing
- Bleaching

Final Pulp

Deinked pulp, dewatered and stacked
Auxiliary process: Water treatment

Sophisticated deinking process

HC Pulping
Detrashing
Coarse Screening
MC Screening
Main Flotation
LC Cleaning
LC Screening
Thickening
Dispersing
Bleaching
Post Flotation
Thickening
Post Treatment
Final Pulp

Water treatment

Water treatment