



INGEDE

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INGEDE Project 141 13 PTS – Characterisation of DIPs
Elisabeth Hanecker



PTS
FIBRE based solutions



Project 141 13 – Characterisation of DIPs

Short title:

Characterisation of DIPs VI

Title:

Characterisation of recycled pulps by comparative studies in INGEDE member companies (2013)



Institute: PTS Munich

Project Manager: Dr. Elisabeth Hanecker

Budget: 49.200 € (20 lines) + 1.500 € per additional line

Planned Duration, Begin:

12 month, June 2013



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Current Situation



- The quality profile of deinked pulps (DIPs) depends on the quality of paper for recycling, on the installations available in recycling plants, and on the process chemicals used. Moreover, DIP qualities are determined by the specific requirements imposed on recycled-fibre based papers.
- The quality differences were identified within the framework of the INGEDE projects "Characterisation of DIP's I, II, III, IV and V".
(INGEDE Projects 47 96 PTS, 63 98 PTS, 77 01 PTS, 98 04 PTS, 122 08 PTS).
- Comparative studies were carried out in the years 1996, 1999, 2002, 2005 and 2008 to investigate deinked pulps from all INGEDE member companies.
- Upon completion of the projects, it is suggested that appraisals of the actual state should be conducted every three years in order to keep track of quality changes occurring in DIPs.



Research Targets



The project is aimed at characterising undeinked industrial recycled-fibre pulps and deinked pulps whilst taking recovered paper compositions and the technological conditions of the recovered paper treatment plants into consideration.

Based on the findings quality changes in DIPs are to be identified and analysed.

Continuation of DIP Benchmarking 1996, 1999, 2002, 2005 and 2008 in the year 2013.

What are the future trends?



Research Programme



1. Data collection in terms of

- process information,
- chemical additions,
- relevant process parameters in the deinking plants and
- the composition of the deinking stock.
 - Questionnaire

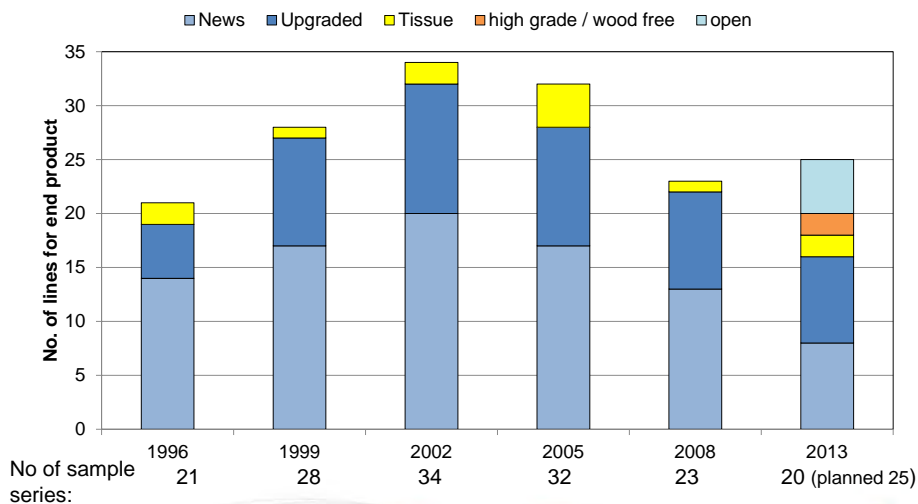
2. Analysis of samples

- undeinked and deinked pulps
- and filtrates

single day of production from the deinking plants of the INGEDE members



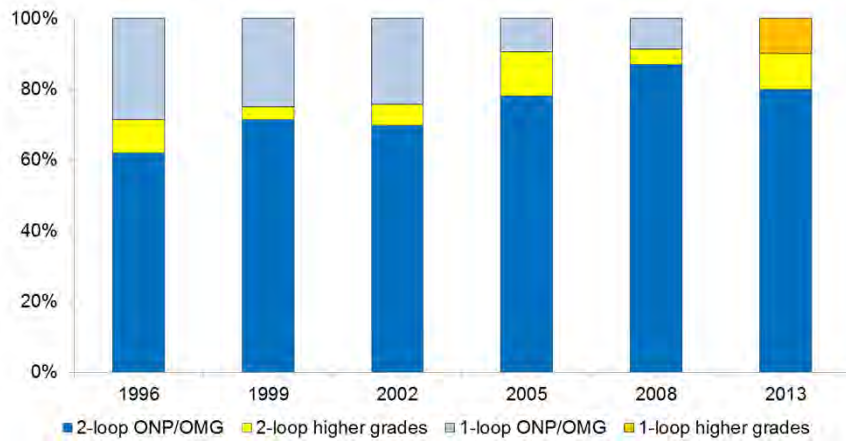
Production structure of participating INGEDE member companies



Process technology



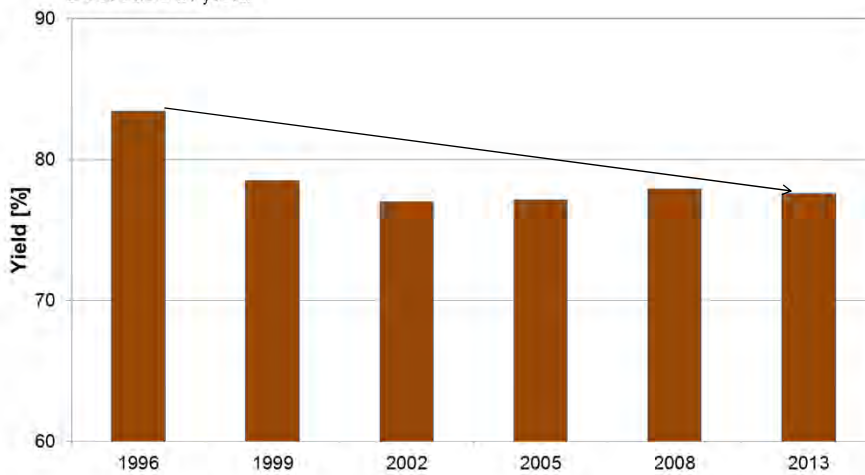
- Process technology has become more sophisticated
 - Increase in costs and loss



Process technology for graphic paper production – yield



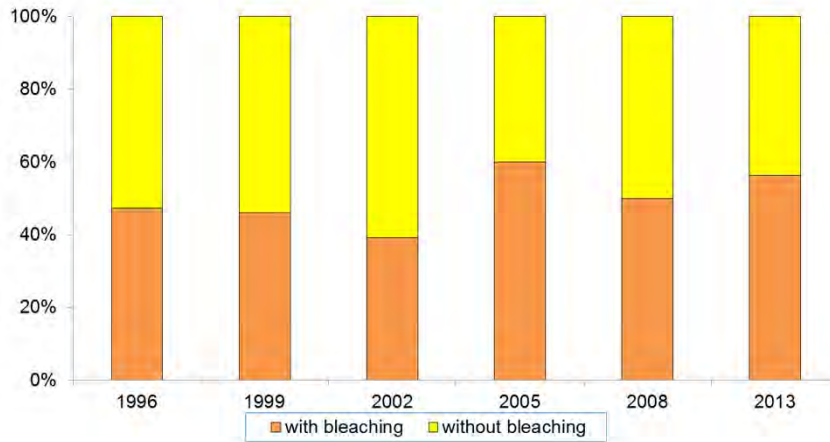
- Decrease in yield



Process technology for graphic paper production (oxidative bleaching)



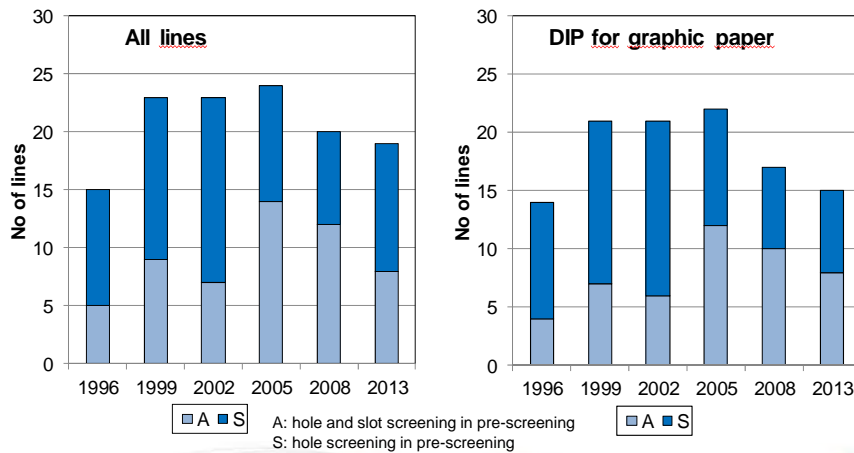
- Bleaching mainly for upgraded paper



Change in process technology



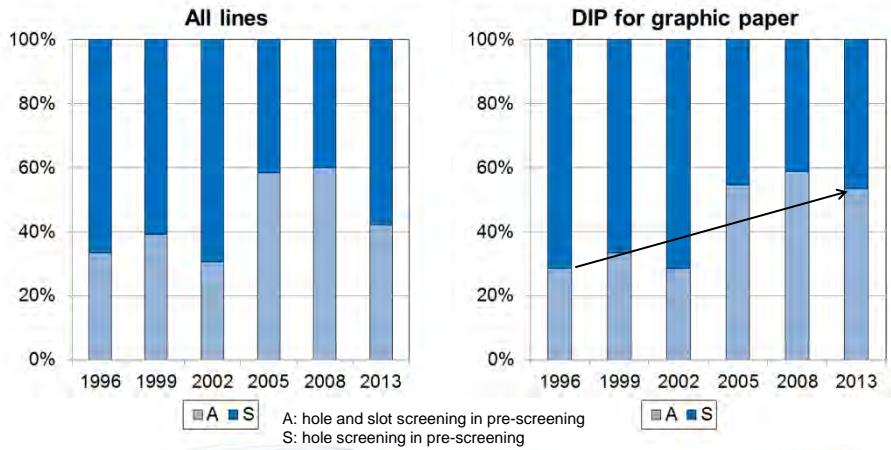
- Change in screening concepts
 - Increase in DIP lines with advanced (A) pre-screening concepts



Change in process technology



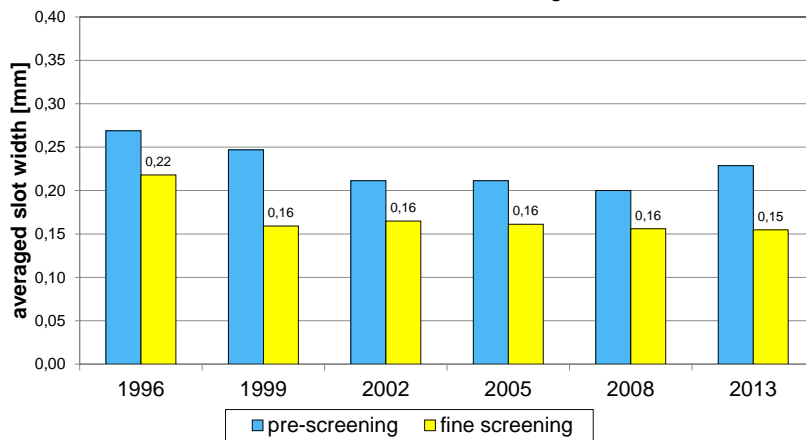
- Change in screening concepts
 - Increase in DIP lines with advanced (A) pre-screening concepts



Change in process technology



- Change in screening concepts
 - Reduction in slot width in fine screening



Sampling procedure



For laboratory testing, samples were taken in the deinking plants. In consultation with the project committee, the following sampling points were determined:

- Undeinked pulp: sampling ahead of the perforated screens (UP)
- Deinked pulp: ahead of a post bleach, if any, and before the pulp is diluted with PM whitewater (in the case of plants including a post flotation: sampling after the 2nd thickener; plants without a post-flotation: sampling downstream of the disperser) (DIP)
- Additional sampling point downstream of disperser 1
- Clear filtrates of disc filter 1, disc filter 2 and PM disc filter or saveall.

1 mixed sample taken during one day was tested. The sampling procedure was the following: random samples of identical volume were taken every 4 hours during 24 hrs.



Characterisation of deinked and undeinked pulps and clear filtrates from deinking plants



Pulp samples:

- Filter pads: optical characteristics
- Handsheets Rapid Köthen: Dirt specks according to INGEDE Method 2
- Ash 525 °C
- Macrosticky levels (INGEDE Method 4): 100 µm

Filtrate samples:

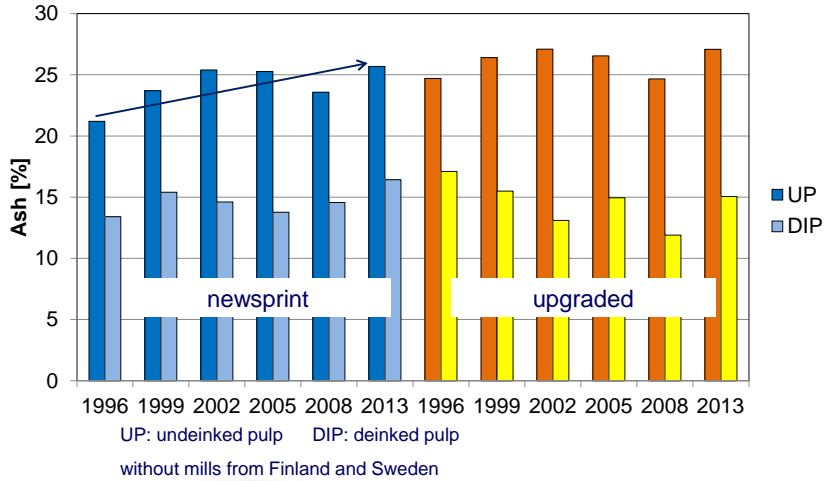
- Optical properties: brightness R457-UV, luminosity Y, tristimulus values L*, a*, b*
 - Process water: sample preparation: 15 g of filtrate for filtration
 - Filter pad filtrate: INGEDE Method 1



Change in ash content



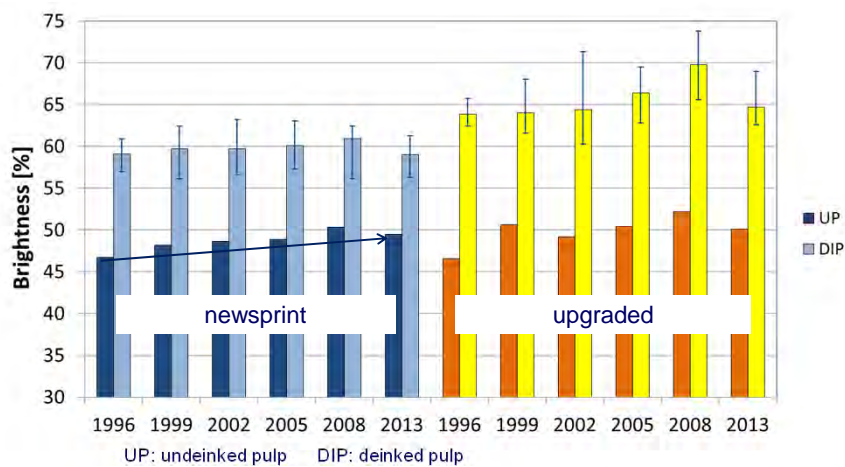
- Increase in ash content of undeinked pulp



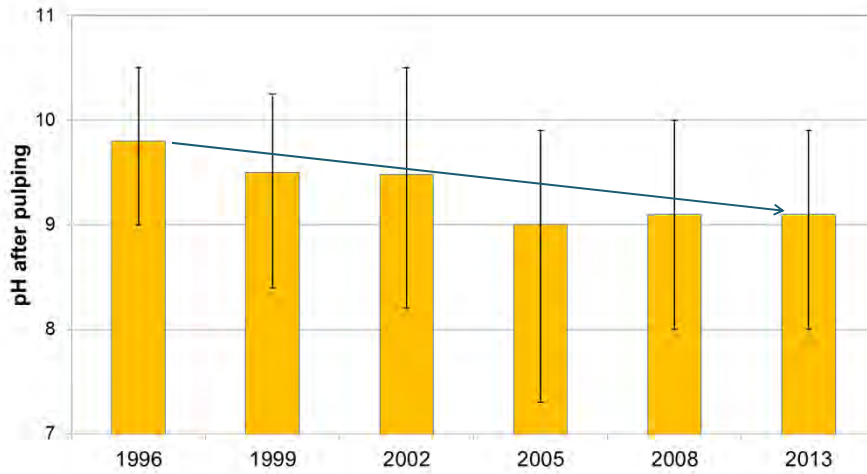
Change in brightness



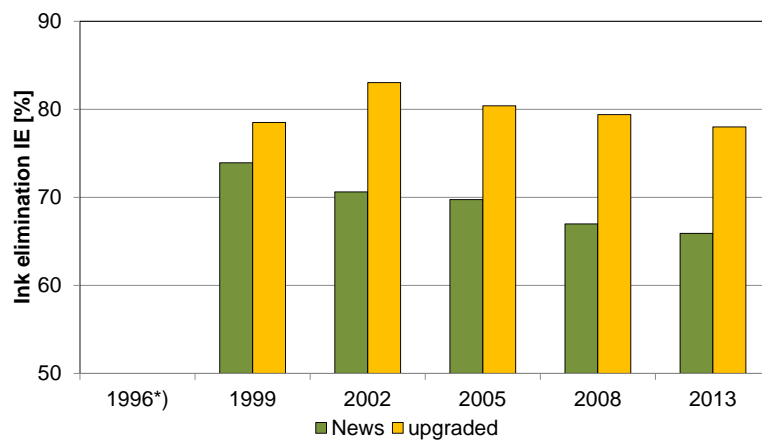
- Increase in brightness of undeinked pulp for newsprint



Trend in pH after pulping



Change in Ink Elimination IE



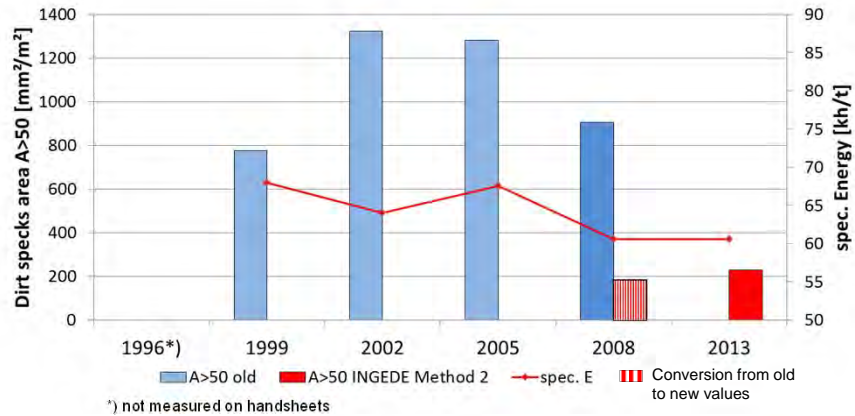
*) not measured, method not available



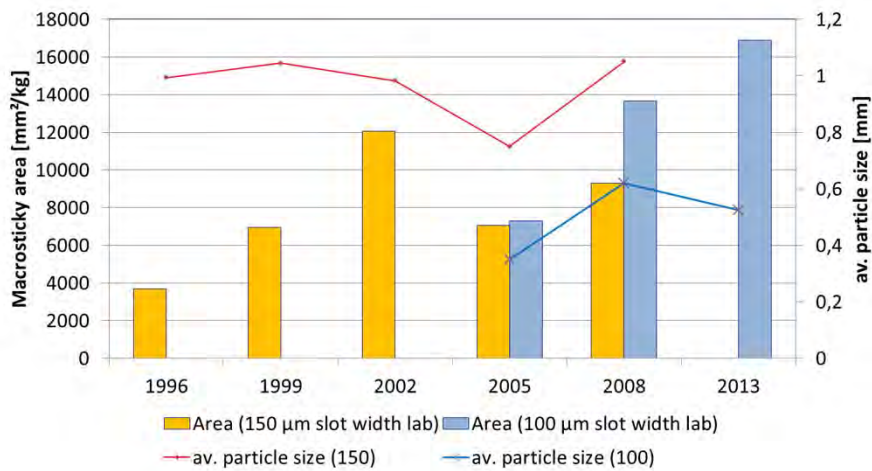
Trend in dirt specks area



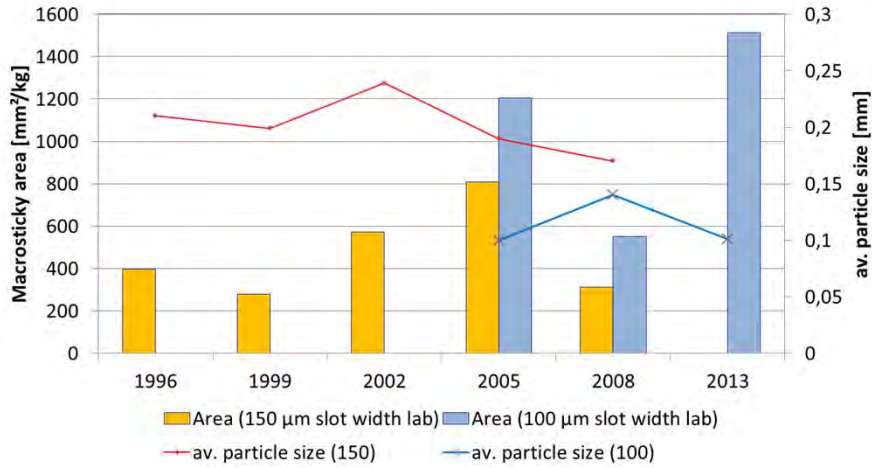
- 1999–2008: Old method, different scanner in 2008
- 2013: INGEDE Method 2



Trends in macrostickiness area and av. particle size of undeinked pulp (graphic paper)



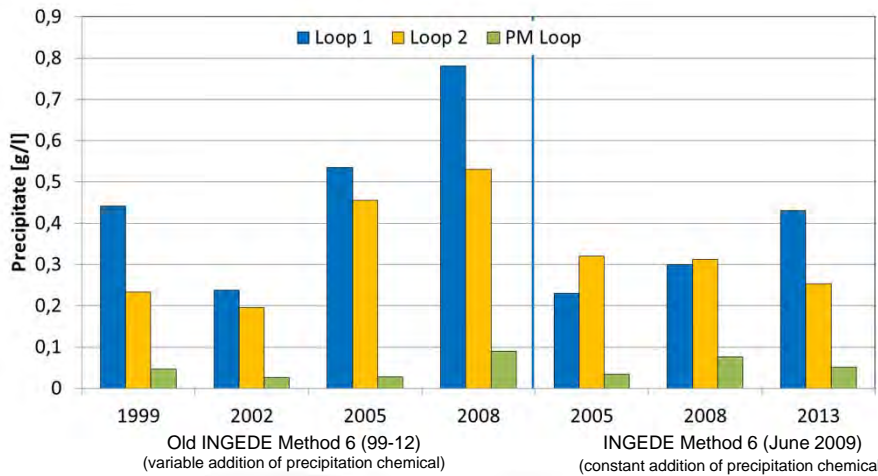
Trends in macrosticky area and av. particle size of deinked pulp (graphic paper)



Trend in filtrate quality



- Increasing amount of precipitate in filtrate from Loop 1



Conclusions



- The process technology has become more sophisticated and more complex.
- Initial brightness and ash increased.
- It was possible to keep the average brightness level of the deinked pulp due to improvements of flotation technology, and extensions of plants with second flotation loops including dispersing. Especially the additional loops lead to a considerable decrease of the total yield.
- The increase in macrosticky content in undeinked and deinked pulps illustrates the unfavourable development concerning adhesive applications.
- The increase of costs due to improvements of technology and decrease of the total yield confirm the need of INGEDE's efforts to improve the recyclability of printed products.