

Deinkability Certification for Public Procurement and Marketing of Printed Products

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Abstract

When designing a print product, recyclability used to have little priority. In the last years it has become more important. Among other factors, the printing process itself is crucial for the re-use of a printed product – flexo, UV, inkjet, liquid toners as well as some adhesives can be challenges for the production of recycled graphic paper. With rising environmental awareness, paper recycling becomes a more and more important issue also in marketing of printers and – accordingly – in the development of a printer. But very little is known about coherences. During the recycling process, the ink is separated from the paper fibers dissolved in water, and then it has to be removed from the aqueous suspension. This is why current inkjet inks are almost impossible to deink.

Field testing of the deinkability has been done for the last decade but without any rating system to evaluate a certain printed product. The European Recovered Paper Council (ERPC) adopted a Scoring System for Deinkability in 2008. This system is based on the evaluation of the deinkability according to INGEDE Method 11, a lab procedure that has been developed to evaluate and compare the challenge a printed product means for a paper recycling mill.

In 2009, INGEDE began to establish a certificate confirming the deinkability of a printed product, serving frequent requests of both authorities and printing as well as printer industry. The certificate has already been accepted by the Austrian Consumer Organization VKI who was the first to include deinkability into the criteria for their eco-label for printed products.

The underlying procedure for deinkability testing is INGEDE Method 11. Occasionally is being discussed whether it is relevant for all deinking processes, not only in Europe, also in the US. The procedure allows a solid assessment under standard conditions but is not meant to simulate every detail of a deinking plant.

Introduction: Deinked Pulp for Graphic Paper

Today 50% of the European paper industry's raw material comes from recovered paper and board. Paper is the most recycled product in Europe, and Europe is the global champion in paper recycling with a rate of 55.4%, says CEPI, the Confederation of European Paper Industries. In 2007, the European paper industry used almost 50 million tons of recovered paper for the production of paper and board [1]. For newsprint and other graphic papers, 13.3 million tons were used.

In the US, total paper recovery was 54 million tons in 2007, with a total recycling rate of 56.1%, says AF&PA, the national trade association of the forest, paper, and wood products industry. But the use of recovered paper for printing-writing paper decreased from 2.4 million tons in 1997 to 1.7 million tons in 2007. The kinds of paper that have increased recycled content here are

the low end of the paper quality selection: tissue and container-board.

Recovered paper can be divided into different grades. Brown grades can be used for board production only. Standard deinking grades consist of mainly post-consumer magazines and newspapers. Deinked pulp has become an essential raw material for many paper mills. Recycling paper in Europe is understood as using recovered paper to produce graphic paper which involves a deinking step, the removal of the printing ink. In Europe, most newspapers are made of 100% recovered paper, on average the utilization rate for newsprint in the CEPI countries is 87.5%. This is why the European paper industry puts a lot of effort in keeping post-consumer graphic paper deinkable for the production of newsprint and other graphic paper. There is also a strong political demand to use recovered paper also for higher grades as in the production of newsprint paper, board and packaging paper the level is already high and cannot be raised significantly. Deinked pulp is already used as fiber source for SC magazine papers in some mills.

Assessment of Deinkability

To allow successful ink removal in the paper mill, each individual print product meant to be recycled should fulfill minimum deinkability requirements. For INGEDE, the International Association of the Deinking Industry, the assessment of the deinkability of printed products has been on the agenda for years, leading to ample research projects and discussions in the paper chain. INGEDE Method 11 has been developed as a scheme that allows to rate the deinkability of a specific printed product and to compare it to others. A small number of research institutes have proven to be able to perform this test method in a reproducible way. A collaboration with Western Michigan University has started to help scientists there to perform the test procedure.

INGEDE Method 11 is also the basis for a new scheme to allow an easy assessment of the deinkability of a printed product. The "Deinkability Scores" [2] have been adopted by the European Recovered Paper Council as applicable to all kinds of printed products on white paper.

Deinkability Scores

The tests according to INGEDE Method 11 lead to five parameters: luminosity, color, cleanliness, ink elimination and filtrate darkening. To convert these results into a score, threshold and target values are defined. The maximum points achievable for each parameter are different thus indicating the importance of each individual parameter. A score below 0 in one or more parameters leads to the overall assessment "not suitable for deinking". The overall maximum that can be achieved is 100.

For a complete evaluation of the deinkability, the five individual scores are added. For dirt specks, there is also the limitation that the result of the deinkability test has to be "free of visible specks". If one or more individual scores are negative, the assess-

ment of the print product is always “not suitable for deinking”. However, the product may be well recyclable for a process without deinking.

The relevance of the Deinkability Scores is assessed according to the following table:

Rating of the Deinkability Scores

Score	Evaluation of deinkability
71 to 100 Points	Good
51 to 70 Points	Fair
0 to 50 Points	Poor
negative (failed to meet at least one threshold)	Not suitable for deinking

For toner based digital prints, the most relevant parameter is cleanliness, calculating as the area of dirt specks determined by optical image analysis. For inkjet prints, it is the luminosity and the filtrate darkening.

The detailed scheme is available from the European Recovered Paper Council’s website [2].

European Deinkability Survey of Printed Products

At the PTS Deinking Symposium in 2008, the evaluation of 213 printed products all over Europe according to the scheme described above was presented [3].

The 90 newspapers (other tested print products were magazines, telephone directories, catalogues and flyers) were mainly printed by coldset offset. The samples were flexographic prints, in addition four inkjet and three dry toner printed newspapers were tested.

“Not suitable for deinking” were – for different reasons – 16 of the offset printed newspapers as well as all inkjet and flexographic printed papers, also one of the dry toner based prints due to a UV cured pre-print.

One outcome of the study was that none of the five offset printed flyers on uncoated paper was suitable for deinking. The study comes to the conclusion that the “most severe threat is however the use of water based inks as in flexographic newspapers and inkjet prints”.

Testing Digital Prints

The poor deinkability of some digital prints has been identified early as a possible threat to today’s paper recycling systems: Although some of these prints deink quite easily, others lead to severe problems, which may endanger the entire deinking process. A series of initial tests performed by scientists of the French Centre Technique du Papier (CTP) in Grenoble has also shown that all water based inks lead to severe deinking difficulties. Differences between processes currently on the market turned out to be surprisingly high.

Until now, INGEDE and the German research institute PMV collected nearly 300 print products and tested their deinkability according to this scheme. The lion’s share of more than 200 copies

originated from the European survey on deinkability of mainly newspapers and magazines mentioned before. Another big portion is part of a survey on the deinkability of digital prints. A technical committee organized by INGEDE – the so-called Digital Round Table – has developed standard patterns for monochrome and color prints for this survey. Some of the samples were demo prints from exhibitions, test prints from companies or prints from routine deinkability tests. Last but not least the samples comprise also nine US titles – five newspapers and four magazines which were bought at newsstands in 2006 and 2008 [5].

Dry toner usually perform very well in terms of deinkability, the only samples failing the test were experimental prints under conditions that did not resemble commercial prints. On the other hand, the only inkjet prints ever seen to be deinkable were experimental samples presented at drupa 2008 of a system with a bonding agent creating a precipitation on the paper [6]. The manufacturer though decided to discontinue the development of this system for cost reasons.

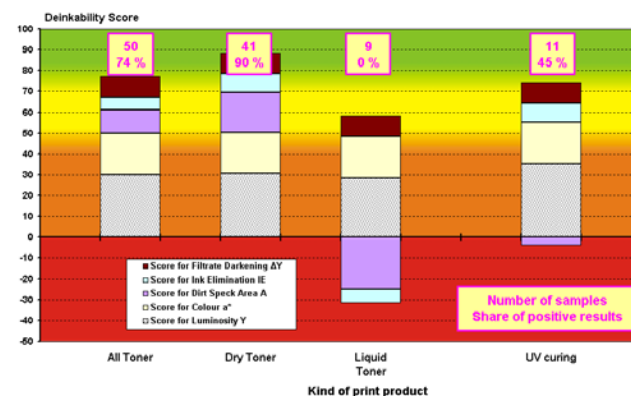


Figure 1. Deinkability scores for toner based prints and UV cured samples

IPA Digital Print Forum

An independent technical evaluation of digital press technologies organized by Abhay Sharma of Ryerson University in 2009 for the second time also included deinkability tests, performed by the German research institute FOGRA: “Green printing and sustainability are becoming important considerations in the marketplace today. Good recyclability of printed products is highly desirable. Processes that improve print quality need to be balanced with the removal of these same particles during the recycling and deinking process” [7]. The outcome of these tests confirmed earlier findings about the good deinkability of dry toners.

Eco-labels

Eco-labels for paper have a long history, beginning with “Blue Angel” or “Nordic Swan” for recycled paper and certifications for fresh fiber paper coming from sustainable managed forests. Recently the property of deinkability has been introduced into eco-labels, the first being the Austrian eco-label for printed products.

The Austrian Eco-Label criteria for printed paper products apply to offset and electro-photographic digital printed products.

Printers, editors, newspapers or other publishers may apply for a license. It requires the use of paper which is eco-labelled by national eco-Labeling systems, ISO 14024 Type I – e.g. the Austrian-, German-, Scandinavian- or the EU eco-label. Toners and inks used for eco-labelled printed products must be free of substances which are classified with any of the following risk phrases in accordance with EU chemical law: dangerous to environment, toxic, very toxic, carcinogenic, mutagenic or reprotoxic.

Toners also have to be deinkable in order to achieve the Austrian eco-label for digital printed paper products. As inks for inkjet printing are not proven to be deinkable by now, digital inkjet printing is not covered by Austrian eco-label criteria yet.

Deinkability has also been introduced into the EU eco-label for printed products which is currently under discussion. Some of the stakeholders involved question a label for this product group being desirable so the time-frame is unclear. Still, deinkability as a necessary feature will be included if this label will be agreed upon.

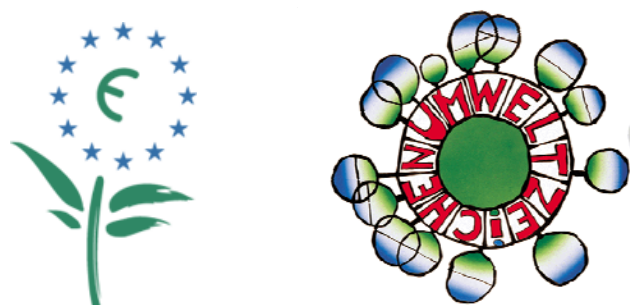


Figure 2. The EU flower and the Austrian eco-label logo, designed by the famous artist Friedensreich Hundertwasser.

The 3D model corresponding of the inkjet sample (with bonding agent, cf. Figure 10) also shows no build-up of a layer at least in the dimensions of the paper roughness.

Conclusion

Paper in general is a sustainable product. Printed products can also be regarded as sustainable as long as they can be recycled. Deinkability as a requirement for a printed product being good recyclable is now accepted not only within the European paper chain but also by more and more authorities also outside of Europe. It can be expected that future eco-labels for printed products will include deinkability as a necessary property.

References

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Author Biography

Axel Fischer studied chemistry at Munich Technical University. He worked as a Science Writer for TV, print media and Germany's major news agency. Since 1994, he is responsible for the public relations of INGEDE, the International Association of the Deinking Industry. Besides dealing with international media, he also represents the association at international events and working groups dealing with recyclability, with flexo inks and digital printing technologies and the consequences of recycling printed materials. He chairs the European Round Table on the Deinkability of Digital Prints.