

Implications of changing to lower grammage newsprint

WORLD PRINTERS FORUM REPORT



IMPRINT

IMPLICATIONS OF CHANGING TO LOWER GRAMMAGE NEWSPRINT

PUBLISHED BY:

WAN-IFRA
Rotfeder-Ring 11
60327 Frankfurt am Main, Germany

PUBLICATION DATE:

February 2018

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INDEX

ABOUT THE WORLD PRINTERS FORUM.....	4
ABOUT THIS REPORT	7
EXECUTIVE SUMMARY	9
INTRODUCTION.....	12
NEWSPRINT TESTS	14
ISSUES AND CHALLENGES.....	33
FEEDBACK AND RESPONSE	38
INTERVIEWS.....	40
CASE STUDIES OF PRINT PRODUCTION UNITS.....	46
WORKING IN PARTNERSHIP	52
OUTLOOK.....	54
CONTRIBUTORS	57
LITERATURE LIST	59

1. About the World Printers Forum

The World Printers Forum (WPF) promotes the printed newspaper. Its mission is to serve WAN-IFRA members in promoting and sustaining printed newspaper business and technology through collaborative research and developments, global exchanges of experience, creating new standards, implementing environmental guidelines, developing new strategies and fostering innovations.

It addresses all print-related questions. Its objective is to encourage innovation and productivity as well as product development that can be instrumental to publishers seeking to exploit future-oriented news media products.

WPF aims to be the central point of the international news media print community, including publishers, printers, materials suppliers, and equipment manufacturers for the print production value chain, from prepress to press to product finishing and delivery.

The World Printers Forum organises:

- International exchange
- Research and innovation
- Standardisation of processes and materials
- Print strategy development

WPF is the print community within the World Association of Newspapers and News Publishers (WAN-IFRA). It advises WAN-IFRA in all aspects of the printed newspaper. Newspaper production is defined as the business of production planning, prepress data handling and processing, and press and mailroom operations, including related topics in terms of management and technical implementation.

WPF is open to all WAN-IFRA members who are interested in the future of the newspaper printing business and print-related areas. It also partners with other organisations working toward the same objectives.

The World Printers Forum promotes:

- Improving productivity and profitability
- Sustainability
- Benchmarking
- The power of print

WPF's objectives are:

- Exploring customer expectations in communication with publishers and customers
- Strategy development for the newspaper printing business, including new and emerging business models
- International exchange of experience regarding business optimisation and innovation in product development, marketing, sales and technology

WPF achieves its objectives by organising:

- Temporary and permanent working groups
- Research projects, reports and guidelines
- Standardisation and certification projects in technology and business processes
- Benchmarking projects
- An annual international conference

Other WPF activities include:

- Advising WAN-IFRA regarding production-related events
- Maintaining a blog for discussion, working group interaction and community engagement
- Promotion of “unique selling propositions” of print in an increasingly digital media environment.

To join the network go to www.wan-ifra.org/wpf

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2. About this report

In 2016, WAN-IFRA's World Printers Forum Board noted two trends that seem to contradict each other in the newsprint market. On the one hand, publishers and printers are striving to upgrade their publishing products and expand their market radius with the help of improved newsprint or even higher quality (coated) paper. On the other hand, the trend continues towards papers with lower basis weight. In the United States, this means switching from 48 to 45 g/m², in India, the conversion from 45 to 42.5 g/m² and in Europe the conversion from 42.5 to 40 g/m².

In fact, the two paper trends do not contradict each other. On the contrary, they show how the business field of newspaper publishers and printers is expanding and how publishing products are differentiating themselves. This expansion is on the one hand in the area of higher quality products and on the other hand with the aim of reducing costs for standard publishing products, advertising and free weeklies.

We have addressed the trend towards higher value products in the WAN-IFRA report "High-Value Print Production," which was published in October 2017. This report deals with the trend towards switching to newsprint of lower basis weight.

Newsprint contributes roughly 50% of the cost of producing a newspaper. Hence, this shift to paper of lower grammage makes sound financial sense. However, it comes with quite a few operational challenges. For the printer, the use of lower grammage newsprint presents problems vis-à-vis sustaining quality and optimising productivity.

WAN-IFRA presents a study on the economics behind the use of lower grammage newsprint, challenges in production and best practices that can effectively solve problems associated with the use of newsprint of lower grammage. This report has been compiled from the inputs provided by industry experts in newspaper printing houses, newsprint mills and ink manufacturing companies across the world, laboratory test results on newsprint and data collected from trial production with lower grammage newsprint.

The inputs were in the form of responses to general questionnaires, specific interviews and presentations at WAN-IFRA events. These have been put together as a composite document, to cover the rationale for the changeover, issues and challenges and best practices from a cross-section of stakeholders – printers and suppliers of both newsprint and inks. The report includes interviews and case studies.

We gratefully thank the contributors for their valuable support. Please find the complete list of experts who contributed to this report in Chapter 12.

3. Executive summary

The dominant grammage of newsprint in many regions (UK, Europe, Japan) is 42.5 g/m². Paper of 40 g/m² has been used for many years already in Japan and now also by most newspaper printers in Denmark, who collectively purchase paper for the whole country.

The fast-growing Indian newspaper industry is currently transitioning from 45 g/m² to 42.5 g/m². There, the cost pressure is enormous given low selling prices and growing volumes.

Reasons enough to deal with the questions that newspaper printers face when they want to switch to lower grammages.

This report documents the results of laboratory tests involving 34 paper samples. Basic paper parameters were recorded and compared with the requirements of valid standards. It turned out that about 3/4 of the tested papers met the requirements. For some papers, the main problems were opacity, tear resistance and stiffness.

In conversations and interviews with experts from newspaper printers and manufacturers, experiences and advice for the change to newsprint papers with lower basis weight were collected and documented.

The following measures are recommended by the surveyed experts:

- Reduction of the maximum total ink coverage (TIC) of CMYK to 220% or lower
- Application of a strong grey component replacement (GCR) in the colour separation of images and display ads¹
- Slight reduction of web tension in the printing press
- Optimisation of the ink/water balance in print
- Selection of higher pigmented inks
- Selection of lighter and bulkier paper types

¹ WAN-IFRA's generic newspaper ICC colour profile "WAN-IFRAnewspaper26v5" provides a TIC of 220% and an automatic application of a strong GCR. It can be downloaded free of charge at: wan-ifra.org/articles/2015/09/30/newspaper-colour-profile-download

The interviewed representatives of papermaking companies confirm the trend towards newsprint papers with a lower basis weight. While the grammage of 42.5 g/m² has already been established in practice for years, with the grammage of 40 g/m² the limit of the technical feasibility of newsprint paper making seems to have been reached at the moment.

From an economic point of view, printer and publisher expectations may also be dampened by higher production costs and lower paper machine speeds in the production of very low basis weight papers: “If the tendency towards lower grammage substrates will continue, we have to set up a pricing system where paper producers and paper buyers can find a common commercial platform for both parties involved. As efficiencies of paper machines will get under pressure, it is very crucial to set the right pricing model.” (Anu Ahola, UPM)

Experience has shown that moving to lower basis weights can best be accomplished when printers and materials manufacturers work closely together to share their experiences and work together to solve problems.

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4. Introduction

4.1 The business case

The trend towards lower grammage newsprint is driven by the fact that it offers better yield. Newsprint of less than 45 g/m² provides additional printable area for the same weight of the reel. Besides, fewer newsprint reels are required for an equivalent print run; there is less reel preparation to be done, less tape because of fewer splices, less white paper waste and fewer shipments and deliveries. It also involves less damage, lowered storage and warehousing requirements and potentially fewer web-breaks due to splice failures. Roughly there is a 6% saving when changing from 45 g/m² to 42.5 g/m² and another 6% from 42.5 g/m² to 40 g/m². There are also savings in copy distribution, as the weight of copies is reduced. Importantly, there are also environmental benefits.

“We moved from 45 g/m² to 42.5 g/m² in 2010, we were the first inside of the printing group to make the change,” says Mario Milošević, Project & Print Manager, Styria Print Holding / Tiskara Zagreb, Croatia. The main trigger was the financial benefit and ultimately a saving of around 4% was achieved. The shift also resulted in a lowering the number of reel changes per production and less waste.

His words were echoed by Matthias Presotto, Axel Springer SE / Group Procurement, Berlin, Germany, who said cost saving – on both the logistic and the procurement fronts – was the main reason for choosing 42.5–40 g/m² newsprint. “Our experience in using paper with 42.5–42 g/m² for the last 10 years has not resulted in any negative effect on our business or the attractiveness of print quality,” he affirmed.

Vallabhaneni Srinivas, General Manager Production, The Printers (Mysore), a leading Indian newspaper printer, said financial benefits due to the increased mileage promised by lower grammage newsprint was what prompted the transition in his organisation too. While 45 g/m² newsprint yielded 235 pages, 42 g/m² produced 252. Transportation and packaging cost less too, resulting in a saving of 6 to 7%.

Reducing costs was the primary motivator for Christian Wilms, Managing Di-

rector, Styria Print Group, Austria. His organisation recorded a 3 to 4% reduction by using 42.5 g/m² paper in relation to the total cost of production with 45 g/m². The company was particular, though, that the shift should not be noticed by the reader – in other words, the reading experience should be no different. And in this, they were more or less satisfied. For the daily newspaper 42.5 g/m² paper is OK, Wilms noted. For that, the only thing that counts is the cost factor. “And for external customers who want ‘better quality,’ we have many different papers with a better look and feel (48.5 / 52 up to 80 g/m²) to choose from,” he said. The Austria-based Styria publishing house uses highly-modern newspaper printing facilities.

Harvesting the best of low grammage newsprint – Anand Bazar Patrika (ABP), an Indian media conglomerate with 11 premier publications, reports:

- 16,000 extra pages printed from every metric ton of paper
- Better detail reproduction due to dispersed fine screening (FM)
- Better registration – sharper prints – less set-off – cleaner prints
- Savings due to reduction of ink film thickness
- Increased mileage of press chemicals

Milošević too does not consider quality an issue with lower grammage newsprint. He expressed confidence that print is in a situation where paper grammage reduction will not reduce circulation. He felt that even with lower grammage, the look and feel of newspapers can be retained.

Srinivas said his organisation had a slightly different approach to ensuring the attractiveness of the product despite lower grammage. This was done by bringing in innovations into the printed newspaper.

4.2 The research approach

The WPF Board commissioned a research project on the question what has to be done when changing to a lower grammage newsprint in daily production. This is why we looked at the properties of lower grammage newsprint samples and how they conform to existing norms.

Also, we were interested to learn how the newsprint properties correlated to practical experiences of newspaper printers. In addition, we asked a number of international experts of printing and supplier companies about their experience and practical advice.

5. Newsprint tests

5.1 Parameters and standards

The properties of newsprint can be broadly classified as:

- Basic properties: grammage, moisture content and ash content
- Optical properties: newsshade, brightness and opacity
- Structural properties: surface roughness and porosity
- Mechanical properties: tensile strength, tearing resistance

Each of these properties directly affects the printability and runnability of newsprint and specifications are needed for these parameters.

There is no international newsprint standard, but there is a German DIN standard for “technical delivery conditions for newsprint” – DIN 19306-4. It specifies the minimum requirement for grammage, roughness, tensile strength, specific volume (bulk), opacity and tearing strength.

Table 1. Parameters and standards of newsprint tests

No.	Parameter	Target Value	Testing Standards
1	Newsshade	L* 85 (± 4) a* 1 (± 2) b* 5 (± 2)	ISO 12647-3 (white backing)
2	Basis weight for 45 g/m ² newsprint	45 g/m ² (± 2%)	DIN EN ISO 536
3	PPS Roughness, µm	2.0 to 6.0	DIN ISO 8791-4
4	Tensile strength MD (kN/m)	≥ 2.0	DIN EN ISO 1924-2
5	Elongation MD (%)	0.9 to 1.4	DIN EN ISO 1924-2
6	Specific volume bulk (cm ³ /g)	1.2 to 1.6	DIN EN ISO 534
7	Opacity %	40 g/m ² : >91 42.5 g/m ² : >92 45 g/m ² : >92.5	ISO 2471:1998
8	Tearing strength CD (mN)	>250	DIN EN 21974
9	Printability	No paper dependent dusting, picking or linting may occur	Due to lack of testing methods, the minimum number of impressions before paper-related cleaning should be agreed upon
10	Oil absorption (g/m ²)	10–25	DIN EN 20535, but the medium is Castor oil

MD: Machine Direction, CD: Cross Direction

WAN-IFRA's Research and Material Testing Center (RMTC) in Chennai, India, conducted and organised tests on newsprint samples with various newsprint basis weights and checked their conformance to DIN and ISO standards.

Since DIN 19306-4 doesn't specify standards for newsshade, conformance tests for these were conducted against ISO 12647-3 norms.

5.2 Conditions and equipment

At RMTC, 34 newsprint samples were tested, including grammages of 40 g/m², 42 g/m², 42.5 g/m² and 45 g/m².

Samples were collected from printers and publishers as well as from paper manufacturers. Research was done on 8 samples of 40 g/m², 19 samples of 42 g/m² and 42.5 g/m² together and 7 samples of 45 g/m².

The samples were tested for the following properties:

- Grammage
- Newsshade (ISO 12647-3)
- Roughness
- Tensile strength
- Bulk
- Tearing strength

Also, printability tests were conducted with regard to:

- Ink consumption
- Set-off
- Print-through
- Picking test (linting)

In addition to testing, a technical questionnaire was sent to publishers, ink manufacturers and newsprint manufacturers. The test results were compared with the user feedback to determine if there was a correlation between test results and the actual performance in production.

This report is presented in two parts: a technical evaluation report with reference to DIN and ISO standards and a section reflecting the experience of industry experts.

5.2.1 Test conditions

All tests were carried out in accordance with the procedures specified in DIN 19306-4.

Newsshade was tested according ISO 12647-3 standards with white backing.

The grammage, newsshade and the printability tests were carried out at RMTC and the other tests were done at the newsprint testing facility of ABP Pvt. Ltd., Kolkata, India.

In this report we often combined the 42 g/m² and the 42.5 g/m² newsprint categories into a single entity and referred to it as 42 g/m². Where 42 g/m² is mentioned, the reference includes 42.5 g/m² as well.

Table 2 gives details of the tests and equipment used in the project.

Table 2. Test equipment

No.	Characteristics	Equipment details
1	Grammage	Mettler Toledo precision balance
2	Newsshade	X-rite 530 spectro densitometer
3	Roughness	Bendtsen roughness tester
4	Tensile strength MD [kN/m]	Tensile strength tester (vertical, microprocessor based)
5	Bulk [cm ³ /g]	Thickness micrometer
6	Opacity [%]	Reflectance meter
7	Tearing strength CD [mN]	Elmendorf

5.3 Conformance with specifications

All 34 newsprint samples were tested for conformance with DIN 19306-4 and ISO 12647-3 specifications. All properties were checked against DIN 19306-4 standards and newsshade was checked for conformance with ISO 12647-3. In table 3, “Yes” indicates conformance with norms and “No” means the specifications were not met.

Table 3. Conformance test results

No.	g/m ²	Conformance in terms of ...					
		Grammage	Opacity	Shade	Tensile strength	Bulk	Tearing strength
S 1	40	No	Yes	Yes	No	Yes	Yes
S 2	40	Yes	Yes	Yes	Yes	Yes	Yes
S 3	40	Yes	Yes	Yes	Yes	Yes	Yes
S 4	40	Yes	Yes	Yes	Yes	Yes	Yes
S 5	40	Yes	Yes	Yes	Yes	Yes	Yes
S 6	40	Yes	Yes	Yes	Yes	Yes	Yes
S 7	40	Yes	Yes	Yes	Yes	Yes	Yes
S 8	40	Yes	Yes	Yes	Yes	Yes	Yes
S 9	42	Yes	Yes	Yes	Yes	Yes	Yes
S 10	42	Yes	Yes	No	Yes	Yes	Yes
S 11	42	Yes	Yes	Yes	Yes	Yes	Yes
S 12	42	Yes	Yes	No	Yes	Yes	Yes
S 13	42	Yes	No	Yes	Yes	Yes	Yes
S 14	42	Yes	Yes	Yes	Yes	Yes	Yes
S 15	42	Yes	Yes	Yes	Yes	Yes	Yes
S 16	42	Yes	No	No	Yes	Yes	Yes
S 17	42	Yes	Yes	Yes	Yes	Yes	Yes
S 18	42	Yes	Yes	Yes	Yes	Yes	Yes
S 19	42	Yes	Yes	Yes	Yes	Yes	Yes
S 20	42	No	Yes	Yes	Yes	Yes	Yes
S 21	42.5	Yes	Yes	Yes	Yes	Yes	Yes
S 22	42.5	No	No	Yes	No	Yes	Yes
S 23	42.5	Yes	Yes	Yes	Yes	Yes	Yes
S 24	42.5	Yes	Yes	Yes	Yes	Yes	Yes
S 25	42.5	Yes	Yes	Yes	Yes	Yes	Yes
S 26	42.5	Yes	Yes	Yes	Yes	Yes	Yes
S 27	42.5	Yes	Yes	Yes	Yes	Yes	Yes
S 28	45	Yes	Yes	Yes	Yes	Yes	Yes
S 29	45	Yes	No	Yes	Yes	Yes	Yes
S 30	45	Yes	Yes	Yes	Yes	Yes	Yes
S 31	45	Yes	Yes	Yes	Yes	Yes	Yes
S 32	45	Yes	Yes	Yes	Yes	Yes	Yes
S 33	45	Yes	Yes	Yes	Yes	Yes	Yes
S 34	45	Yes	Yes	Yes	Yes	Yes	Yes

Overall conformance

Of the 34 samples tested, 26 were found to conform to all relevant properties while the remaining eight did not meet one or more of the specified norms.

- In conformance with specified norms 76% of measured samples
- Not in conformance with specified norms 24% of measured samples

Lower basis weight samples: A total of 27 samples of 40, 42 and 42.5 g/m² were tested. Of these, 20 were found to conform to standards while seven samples failed the tests in respect to either ISO 12647 or DIN 19360-4.

5.3.2 Conformance of grammage steps

40 g/m² samples conformance

- Total number of samples 8
- In conformance 7
- Not in conformance 1

Sample S1 did not make it in either grammage or tensile strength tests.

42 g/m² and 42.5 g/m² conformance

- Total number of samples 19
- In conformance 13
- Not in conformance 6

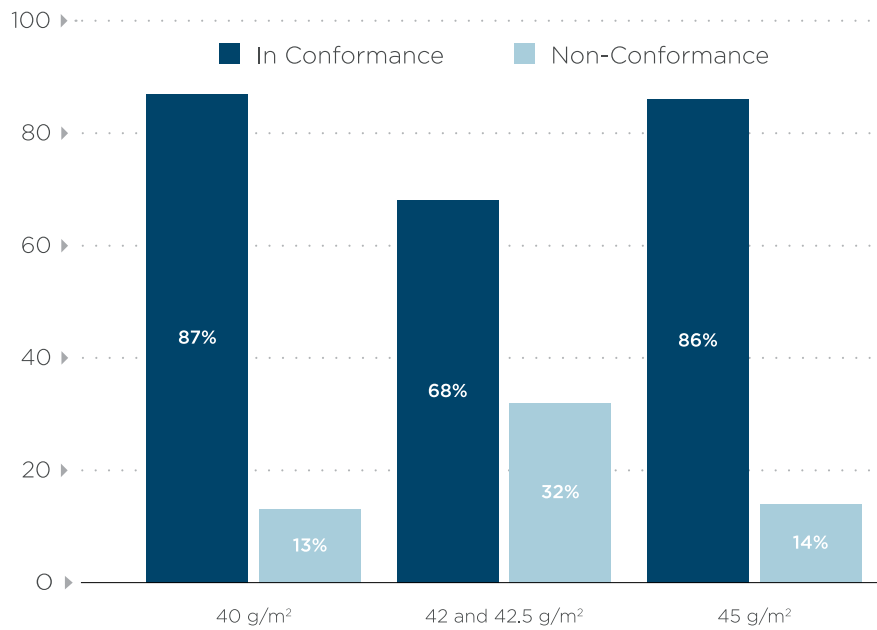
68% of the samples conformed to specifications and the remaining 32% failed to do so. In fact, a few samples failed to qualify with respect to two or more specified norms.

45 g/m² conformance

- Total number of samples 7
- In conformance 6
- Not in conformance 1

Except one, all the samples were within the norms specified. The exception deviated only very marginally.

Graph 1. Conformance of newsprint samples



5.4 Results of conformance tests

5.4.1 Grammage

Grammage conformance tests were done according to DIN EN ISO 536, and the benchmark was 2% deviation for all steps of basis weight.

Table 4.

Basis weight	No. of samples that conformed	No. of samples that did not conform
All grammages	31	3
40 g/m²	7	1
42 and 42.5 g/m²	17	2
45 g/m²	7	0

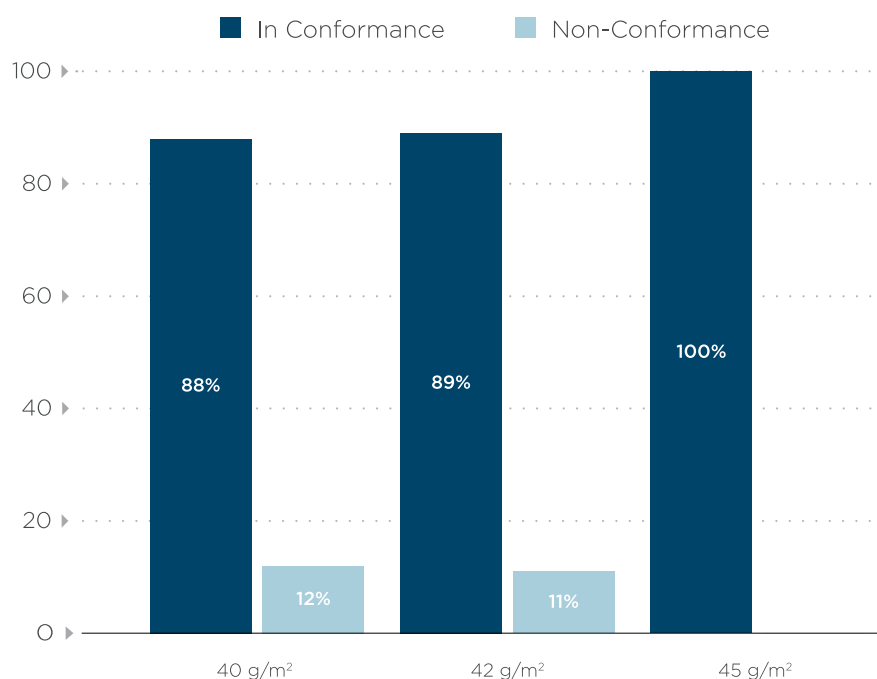
Overall conformance

A total of 34 samples were tested for grammage conformance. Of these, 30 passed the ISO12647-3 test. Of the four that failed, two were of 40 g/m² and one each from of 42 g/m² and 42.5 g/ m². A total of 91% matched the ISO-12647 specifications.

Grammage conformance test

All samples of 45 g/m² were found to conform to ISO 12647-3 standards, but 11% of 42 g/m² and 12% of 40 g/m² newsprint samples failed to match the norms.

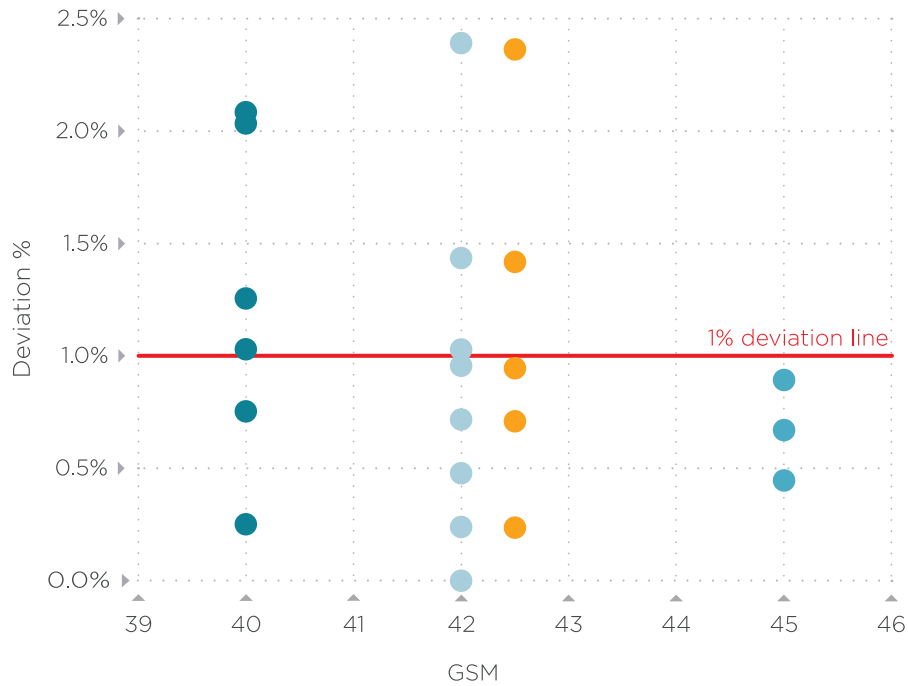
Graph 2. Conformance of basis weight



Graph 2 shows that the lower the grammage the higher the non-conformance rate. Therefore, it can be assumed that it may be a challenging task for manufacturers to maintain the norms. This corresponded with the feedback received from some newsprint manufacturers.

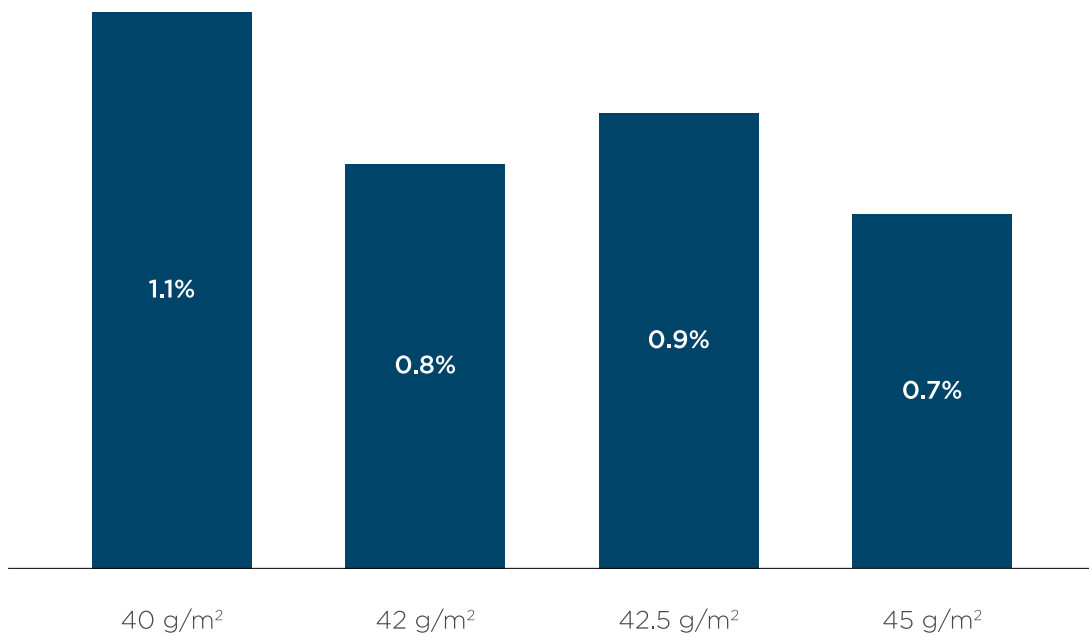
The scatter plot on the following page shows that even though there are deviations in all steps of basis weight, the deviation percentage is far less with 45 g/m² newsprint compared to newsprint of lower specific weight.

Graph 3. Deviation %



Also, a closer study shows that none of the eight 45 g/m² samples had deviations of more than 1%, where this is not the case with lower grammage papers.

Graph 4. Average deviation



Again, a study of the average deviation of values of the different grammage categories shows that 40 g/m² has the highest deviation of 1.1% and 45 g/m² had the lowest deviation of 0.7%.

There is thus evidence to conclude that with higher grammage newsprint there is better control of deviation than with lower grammage paper.

Newsshade

Table 5. Newsshade conformance

Sample No.	Grammage	L*	a*	b*
S 1	40	Yes	Yes	Yes
S 2	40	Yes	Yes	Yes
S 3	40	Yes	Yes	Yes
S 4	40	Yes	Yes	Yes
S 5	40	Yes	Yes	Yes
S 6	40	Yes	Yes	Yes
S 7	40	Yes	Yes	Yes
S 8	40	Yes	Yes	Yes
S 9	42	Yes	Yes	Yes
S 10	42	Yes	Yes	No
S 11	42	Yes	Yes	Yes
S 12	42	Yes	Yes	No
S 13	42	Yes	Yes	Yes
S 14	42	Yes	Yes	Yes
S 15	42	Yes	Yes	Yes
S 16	42	Yes	Yes	No
S 17	42	Yes	Yes	Yes
S 18	42	Yes	Yes	Yes
S 19	42	Yes	Yes	Yes
S 20	42	Yes	Yes	Yes
S 21	43	Yes	Yes	Yes
S 22	43	Yes	Yes	Yes
S 23	43	Yes	Yes	Yes
S 24	43	Yes	Yes	Yes
S 25	43	Yes	Yes	Yes
S 26	43	Yes	Yes	Yes
S 27	43	Yes	Yes	Yes
S 28	45	Yes	Yes	Yes
S 29	45	Yes	Yes	Yes
S 30	45	Yes	Yes	Yes
S 31	45	Yes	Yes	Yes
S 32	45	Yes	Yes	Yes
S 33	45	Yes	Yes	Yes
S 34	45	Yes	Yes	Yes

The ISO 12647-3 white backing was used to evaluate the newsshade conformance of all samples. ISO 12647-3 reference colour value for white backing is:

L^* 85 (\pm 4)

a^* 1 (\pm 2)

b^* 5 (\pm 2)

45 g/m² conformance: All 45 g/m² samples were in conformance with standards, as expected.

42 g/m² conformance: Three samples of 42 g/m² did not match ISO 12647-3 specifications, i.e 16% of the total of 19 samples failed to meet ISO specified tolerance levels. All three samples had lower b^* values. This is a “positive” deviation from the standard since it means a less yellowish paper or a more neutral newsshade.

40 g/m² conformance: In this category, all samples are well within conformance range.

Table 6. Samples of 42 g/m² that did not conform

Sample No.	Grammage	L^*	a^*	b^*
S 10	42 g/m ²	82.52	0.65	2.05
S 12	42 g/m ²	82.12	0.67	0.56
S 16	42 g/m ²	82.84	2.09	2.34

Opacity

All conformance tests were conducted according to DIN ISO 2471:1998.

The target values were as follows:

40 g/m² >91.0

42.5 g/m² >92.0

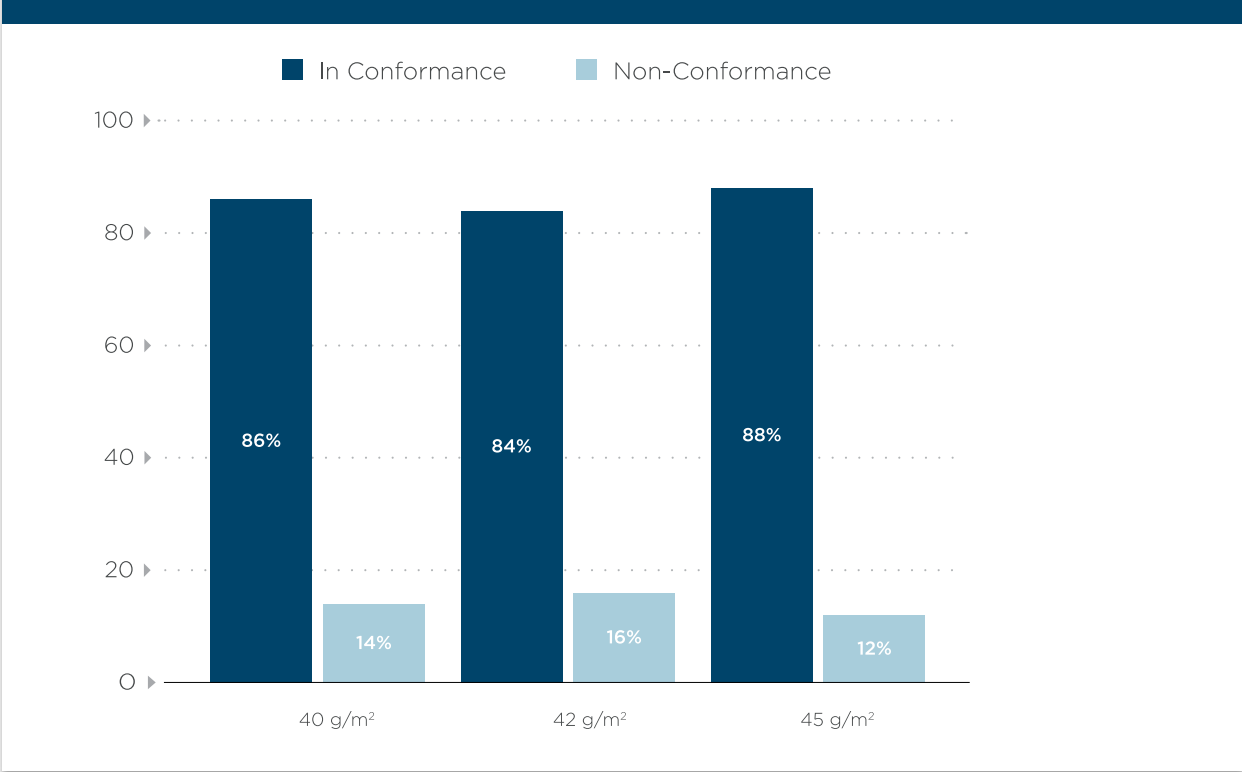
45 g/m² >92.5

Table 7. Opacity conformance

Basis weight	No. of samples that conformed	No. of samples that did not conform
All grammages	29	5
40 g/m ²	7	1
42 and 42.5 g/m ²	16	3
45 g/m ²	6	1

Table 7 shows that 29 samples passed the conformance test and five failed, i.e., 86% of all samples were in conformance with standards and 14% were not.

Graph 5. Opacity conformance



In no grammage category was there 100% conformance with DIN standards.

In the 40 g/m², 42 g/m² and 45 g/m² categories, 13%, 16% and 14% of the samples respectively were not in conformance with norms. The print-though property of the samples has to be related with the opacity of each. This will be discussed later in this report.

Here are the values of the samples that failed the test.

Table 8. Samples that failed the opacity test

Sample No.	Grammage (g/m ²)	Opacity	Conformance status
S 3	40.0	90.9	No
S 13	42.0	91.7	No
S 16	42.0	91.1	No
S 22	42.5	91.5	No
S 29	45.0	92.1	No

Sample S3, which is a 40 g/m² sample, failed the test by just a fraction. However, the two samples of 42 g/m² and one 45 g/m² sample had larger deviations.

Tensile strength conformance

The tensile force required to produce a rupture in a strip of newsprint is expressed in kN/m. It is indicative of fibre strength and fibre bonding. Tensile strength can be used as a potential indicator of resistance to web breaking during printing.

As per DIN EN 21974 the tensile strength MD target is greater than or equal to 2 (kN/m).

Table 9. Tensile strength

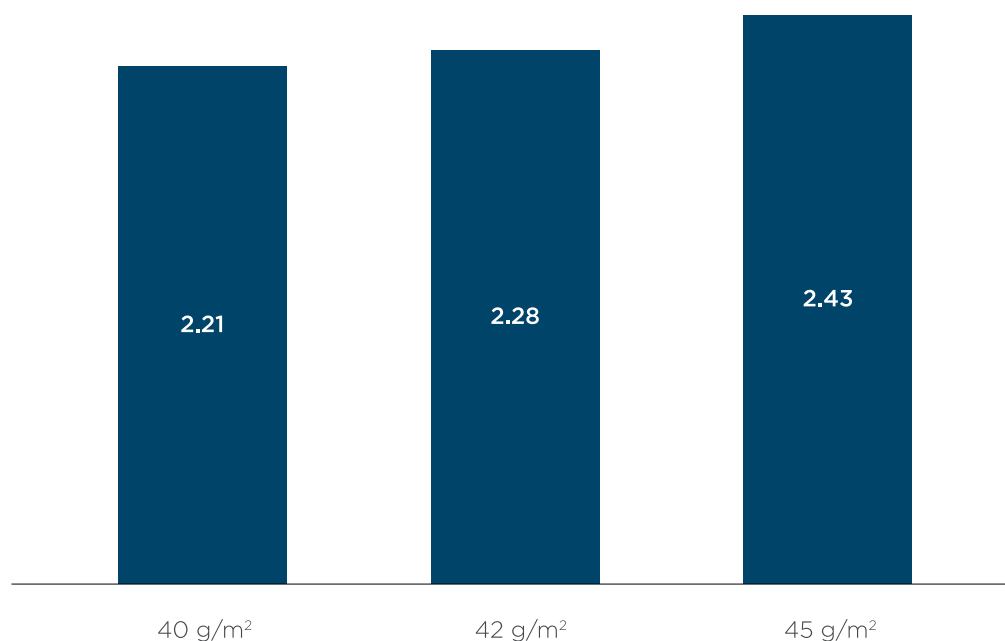
Grammage	No. of samples that conformed	No. of samples that did not conform
All grammages	31	2
40 g/m ²	7	1
42 and 42.5 g/m ²	18	1
45 g/m ²	7	0

In total, only two samples failed the conformance test, out of which one was of 40 g/m² and the other of 42.5 g/m². Even those two fell short by a very small margin. Values of those two samples are 1.98 and 1.96 kN/m.

All samples of 45 g/m² were well within the conformance range. It may therefore be assumed that if grammage is smaller, the probability of non-conformity increases. But that cannot be a firm conclusion because even the failed samples almost reached the target value of 2 kN/m, being only a few decimals short of target.

Since a breakthrough could not be reached via the conformance test, it was decided to determine the average tensile strength of various grammage categories. Even though the two failed samples did not conform to DIN 19306-4 specifications for tensile strength, the average tensile strength of all grammage categories are higher than 2 kN/m, which is a target for conformance.

Graph 6. Average tensile strength (kN/m)



Graph 6 demonstrates a trend that as basis weight reduces, the average tensile strength value also reduces. This should not be a problem as long as the manufacturers are able to maintain standards.

Specific volume (bulk)

The target standard value range is between 1.2 to 1.6 cm³/g. All samples were well within the DIN tolerance. However, surprisingly, average bulk values were inversely proportionate. Lower grammage newsprint had higher bulk and vice-versa.

40 g/m ²	1.41 cm ³ /g
42 g/m ²	1.39 cm ³ /g
45 g/m ²	1.35 cm ³ /g

Tear strength

The samples of all grammage categories were within the conformance range and the average tear strength. No abnormal trend and observation was noticed.

Roughness

The roughness of the newsprint samples was also measured. However, the instrument that was used could only measure roughness in terms of ml/min (Bendtsen) and not as microns. Therefore, the conformance of roughness (vPPS) of newsprint to DIN 19306-4 could not be determined. Nevertheless, there is a direct relation between ml/min and microns. Newsprint of higher roughness shows valleys and peaks on the surface and a higher volume of air will escape in the instrument.

Table 10. Roughness

Grammage (g/m ²)	Average roughness (ml/min)	Min. (ml/min)	Max. (ml/min)
40	112.5	100.0	130.0
42	111.1	95.0	130.0
45	110.0	100.0	120.0

Table 10 shows the average roughness value for 45 g/m² was lower than with the other two grammage categories. Again, there was a tight range between the minimum value of 100 and maximum value of 120. It shows higher grammage newsprint will have better control on roughness. Of course, roughness also depends on the type and source of fibre used in paper manufacturing. Since roughness is nearly similar among all grammage categories, paper caliper (thickness)

and bulk of paper should also be considered while comparing printability properties like show-through and strike-through. Graph 7 (see below) shows the relation between grammage and roughness. It does not permit any firm conclusion on correlation.

5.5 Printability tests

The printability properties of newsprint depend mainly on the structural characteristics of newsprint. For the purposes of this project, ink consumption, set-off, print-through and pick resistance of the newsprint were evaluated.

Table 11. Roughness, ink consumption, pick velocity, set-off and print-through

Grammage (g/m ²)	Roughness (Ml/min)	Ink consumption (g/m ²)	Pick velocity (m/s)	Set-off density	Print-through
40	110	1.18	0.79	0.06	0.05
40	120	1.12	1.37	0.04	0.06
40	130	1.26	0.84	0.07	0.09
40	120	1.15	1.02	0.03	0.07
40	110	1.10	1.17	0.03	0.05
40	110	0.91	1.27	0.01	0.05
40	100	1.18	1.20	0.04	0.06
40	100	1.14	0.90	0.06	0.06
42	110	0.97	0.91	0.02	0.07
42	110	1.01	0.72	0.03	0.05
42	95	1.03	0.78	0.05	0.05
42	110	0.91	1.54	0.02	0.07
42	130	1.20	1.05	0.03	0.09
42	100	1.27	0.51	0.08	0.07
42	100	1.04	0.72	0.05	0.06
42	120	0.96	0.78	0.06	0.07
42	100	0.99	1.36	0.04	0.04
42	115	1.05	1.26	0.03	0.07
42	125	0.99	0.74	0.01	0.04
42	110	1.05	0.94	0.03	0.05
43	115	1.05	-	0.03	0.06
43	100	1.05	1.02	0.04	0.07
43	115	1.12	0.79	0.05	0.07
43	115	1.19	0.98	0.02	0.05
43	110	1.07	1.03	0.01	0.05
43	120	1.12	0.57	0.12	0.05
43	110	0.99	0.95	0.02	0.05
45	100	1.05	1.06	0.03	0.03
45	110	1.09	0.76	0.03	0.06
45	115	1.05	0.98	0.04	0.04
45	120	1.05	1.11	0.01	0.04
45	110	1.09	1.03	0.03	0.04
45	100	1.13	0.59	0.05	0.03
45	115	1.00	0.88	0.04	0.05

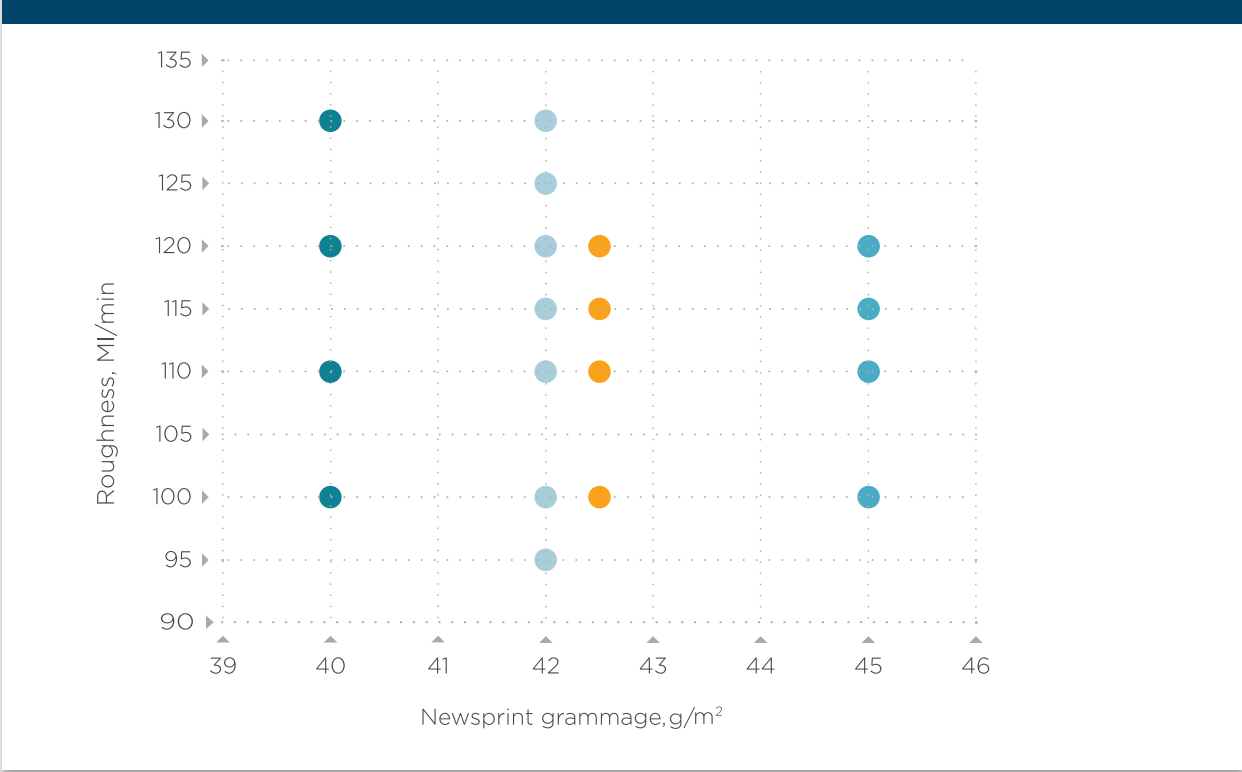
Table 12. Strength of correlation

Coefficient range	Strength of correlation
0.00–0.19	very weak
0.20–0.39	weak
0.40–0.59	moderate
0.60–0.79	strong
0.80–1.00	very strong

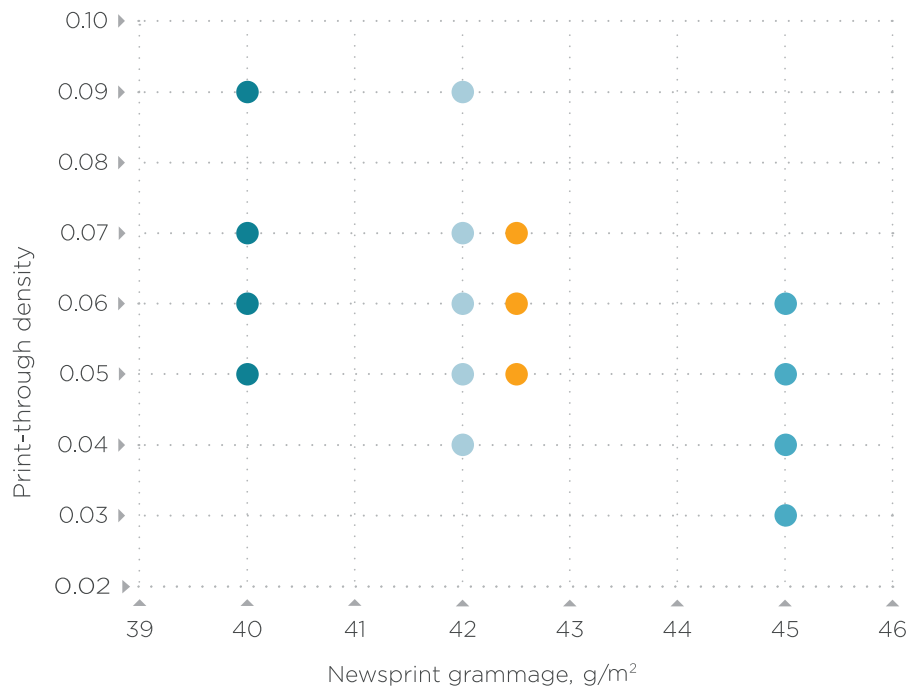
Test results were compared and checked for specific correlations and the correlation coefficient was calculated for each of the printability parameters against grammage.

On the basis of the coefficient, it was concluded that there was a connection between grammage and printability properties. Table 12 shows the strength of the correlation for different coefficient ranges.

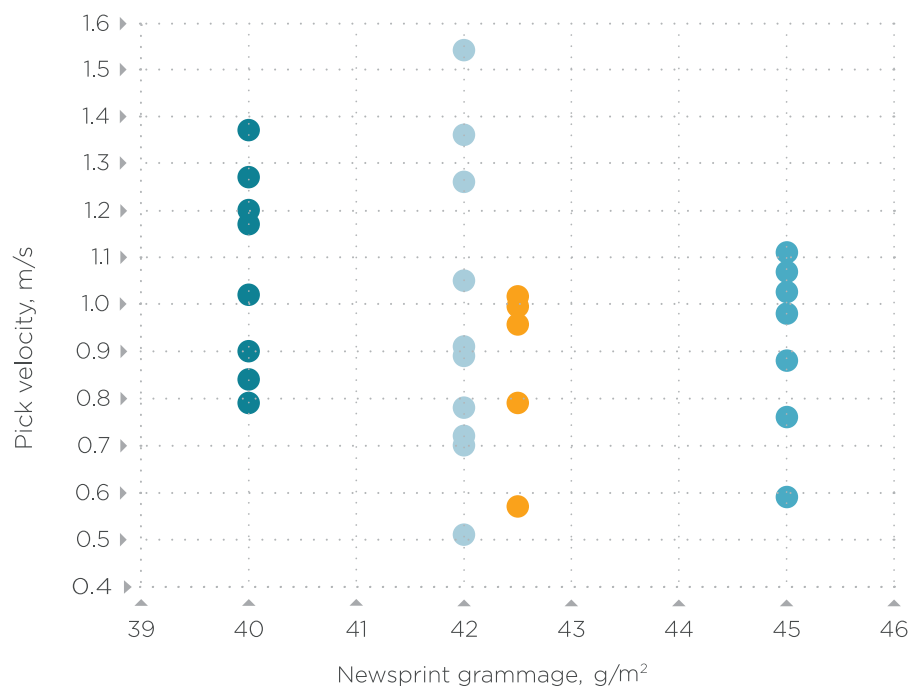
Graph 7. Grammage versus roughness (MI/min)



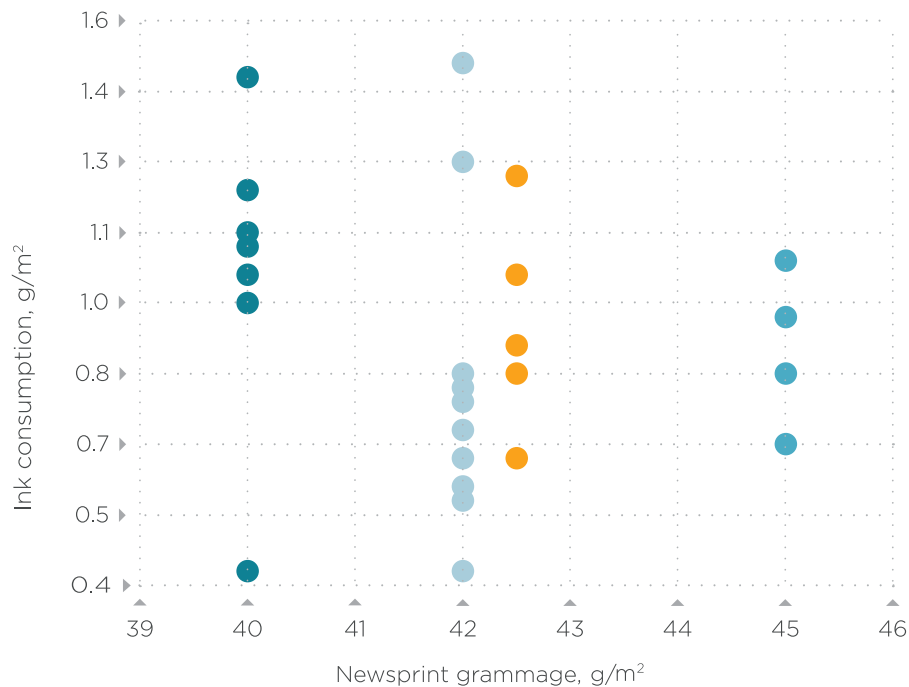
Graph 8. Grammage versus print-through density



Graph 9. Grammage versus pick velocity (m/s)



Graph 10. Grammage versus ink consumption (g/m²)



Correlation between grammage and printability properties

Set-off and print-through tests were carried out with the IGT printability tester. The samples were printed on the SID 1.10 device and then rolled over a plain sheet of the same newsprint at a specific pressure after three seconds. Set-off density was then measured on the plain sheet of newsprint.

For print-through, samples were printed with black ink using solid ink density (SID) 1.10 and the print-through density was measured on the reverse side of the paper.

The correlation between grammage and print-through was a moderate negative correlation with a correlation coefficient of 0.54. It may be concluded that newsprint of higher grammage will have less print through. This was the expected result. Many print experts had given the same feedback in their responses to questionnaires and during interviews.

Table 13. Thickness versus print-through

Grammage (g/m ²)	Average values	
	Thickness	Roughness
40	56.60	112.5
42	58.16	111.1
45	60.48	110.0

Table 13 shows that newsprint of 40 g/m² had slightly higher roughness and less thickness than 45 g/m² newsprint. Both facts have a lot of bearing on strike-through. For example, if there are two samples of the same roughness but of different thicknesses, the thicker paper will show less strike-through. Thinner paper will show a strike-through effect.

Ink consumption: The ink consumption is calculated as the amount of ink required to produce standard solid ink density. For this project, an ISO 2846-2-compliant black ink was used with the IGT printability tester. A solid ink density of 1.10 was achieved.

Hardly any correlation could be established between grammage and ink consumption with a correlation coefficient of 0.21 (very weak). One observation was that 45 g/m² newsprint showed a lower deviation range than the other two grammage categories.

Pick test: There was no correlation found between grammage and pick resistance, with a coefficient as low as 0.22. Graph 9 shows the correlation between grammage and pick resistance, but no clear trend or relationship can be identified.

6. Issues and challenges

6.1 Availability of lower grammage newsprint

Most newspapers that have changed to lower grammage newsprint do not face much of a problem in procuring supplies.

The needs of Axel Springer (Germany) are satisfactorily supplied by newspaper mills in central Europe and North America.

The Procurement Association of the Danish Press, Denmark deals with three suppliers, the Norske Skog mills of Skogn and Hylte as well as the UPM Kaipola mill. At one point, Bravikken and Aylesford were also on the suppliers list. Availability of the required newsprint was never an issue, Thomas Isaksen, CEO of the Procurement Association of Danish Press, Denmark, avers. The association serves as a single newsprint source to all newspapers in Denmark. The Procurement Association of Danish Press has been in close association with a number of paper mills during the past 95 years, and they facilitate a technical support group consisting of managers from the country's leading printing houses.

Mario Milošević (Tiskara, Zagreb, Croatia) has ties with two suppliers – UPM and Norske Skog – and inventory management is a routine process. Barcodes are available and deviations are very small between 42 and 43 g/m². The Printers (Mysore, India) too reports that it has not faced any availability issues. The Indian concern gets its supplies from eight mills.

As a printer, Christian Wilms says the Styria Print Group (Austria) works with an ERP System (Enterprise Resource Planning) and customers are informed that delivery of special paper, which they do not have in stock, will take three to four weeks.

6.2 Steady growth in demand

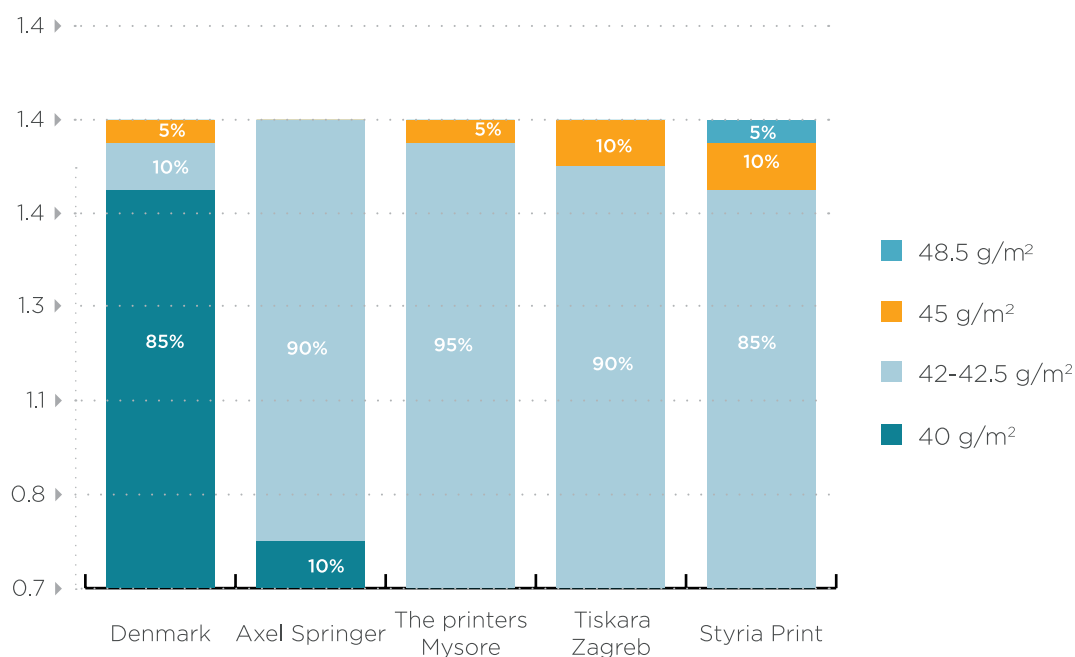
Regarding the market for lower grammage newsprint, Winfried Schaur from UPM said his company has seen a steady growth in the demand for 42.5 g/m² newsprint in Europe since 1994. Currently 42.5 g/m² newsprint accounts for about 42% of newsprint demand on that continent. Consequently, demand for 45 g/m² is steadily falling. However, “We have not seen any significant increase in demand for 40 g/m² newsprint since 1994,” Schaur added.

In India, the trend in using lower grammage newsprint is at its peak. About 60% of newsprint used in India is 42.5 g/m².

Share (%) of different grammage of newsprint used by various newspaper houses:

- 45 g/m²: 5%, 42.5 g/m²: 10%, 40 g/m²: 85%. All in all 95,000 tonnes. But we have improved newsprint on top (approximately 15,000 tonnes) – Thomas Isaksen, Denmark
- 42.5 g/m² to 42 g/m²: 90%, 40 g/m²: 10% – Matthias Presotto, Germany
- 45 g/m²: 10%, 42.5 g/m²: 90% – Mario Milošević, Croatia
- 45 g/m²: 10%, 42.5 g/m²: 85%, 48.5 g/m² and higher: 5% – Christian Wilms, Austria
- 45 g/m²: >5%, 42.5 g/m²: 30%, 42 g/m²: 65% – Vallabhaneni Srinivas, India

Graph 11. Mix of newsprint basis weights in practice



6.3 Challenges in production

According to Winfried Schaur, Senior Vice President, UPM Paper, “42 and 42.5 g/m² are technically state-of-the-art today. Paper quality has improved over the years, making possible lower grammage papers with equivalent performance targets to higher grammage grades.”

However, applications of 40 g/m² need more attention, he warned. Several customer trials and satisfaction studies are needed before moving to this grammage level, in his opinion.

The ultimate aim is that the end-user must not feel any difference and should have the same feel and value while holding a newspaper copy of different grammage.

Printers must consider some key parameters before starting to use lower grammage newsprint, Schaur advised. The tensile strength of paper far exceeds the tension applied in the press. However, lower grammage newsprint is more sensitive to sheet defects. Hence more care is needed while handling reels.

He also feels that combined effect of ink and water absorption will lead to higher print-through in lower grammage paper.

Schaur further suggested a few tips to control the print-through issue with lower grammage newsprint. He says tighter inking (optimum amount of ink) and water control will solve the issue of show-through to a reasonable extent.

TIP

“IT IS A GOOD IDEA TO REDUCE THE TOTAL INK COVERAGE (TIC) OF CMYK FROM 240% TO 220%, WHICH IS IN LINE WITH THE LATEST ISO 12647-3 SPECIFICATION.”

– WINFRIED SCHAUER

Trouble-shooting tips

- Reduce paper tension slightly
- Adjust web tension to minimise risk of web breaks and to handle paper elongation to avoid misregister
- Running hybrid heatset/coldset requires different web tension for heatset and coldset
- With low grammage paper the difference of both tensions mustn't be too high
- Tensile strength of paper varies depending on moisture content and also behaves differently depending on grammage
- Reduce total ink coverage of CMYK from 240% to 220%
- Start-up with hybrid screening (combination of AM and FM)
- Change blankets
- Paper feeding depends on the blanket characteristics and has to be observed to gain best possible runnability
- Adjust all paper rollers in the press
- Change breaks on reelstands
- Optimise or reduce the ink/water balance (start-up curves) by 10%
- Reduce dampening solution by 1%
- Balance and re-setup the ink saver software
- Reducing ink and water is helpful to stabilise the process in general, e.g. reducing the risk of web breaks
- Lower grammage also affects fan-out behaviour and needs to be handled accordingly e.g. by setting the shrink wheels.
- This is relevant for blanket-to-blanket printing units single, double and triple width.
- Folding during production is resolved by implementing two different qualities of 40 g/m² paper.

6.4 Quality issues with lower grammages

Thomas Isaksen faced a few issues in their production units:

- Increased ink consumption
- Linting (has to be controlled)
- Breakage (can be controlled)
- Curling
- Folding and wrinkles
- Folding in the production of newspaper
- Opacity goes down from 94% to 92%

Another parameter to look for is opacity. For every 1 g/m² basis weight reduction, the opacity reduces by 0.3% to 0.5%. Paper manufacturers try to reduce the loss of opacity by using additional fillers. From a paper manufacturer's point of view, manufacturing lower grammage newsprint is a challenging process, says Winfried Schaur. The problem is mainly with 40 g/m² newsprint. Newsprint grades from 42 to 48 g/m² have no production challenges. Some challenges in manufacturing 40 g/m² newsprint are potential edge defects, lower papermaking speed due to higher draws in the press section of the paper machine, and increased sensitivity towards sheet defects like holes, wrinkles and fibre clusters. However, all these challenges can be mitigated by modern process control and operational focus, Schaur noted.

6.5 Changeover challenges: Nordjyske Medier – a case study

The Danish publisher Nordjyske Medier has an older blanket-to-blanket Wifag press, so they have to be especially attentive to colour misregister potential, and make alterations on the machine each time they try out alternative materials.

The newspaper Nordjyske Medier faced a severe challenge because of the increased opacity of the lower grammage paper. They changed the ink/water curve and “played around” a little with the density in order to balance the elements to get a nice print, one that didn’t go straight to the other side (print-through). The paper reported increased amount of “dust” problems (linting). They have since changed their cleaning procedures, which has helped but not eliminated the problem. There is also a slight increase in web breakage, the paper finds.

The biggest challenge is in the mailroom. The lower grammage paper has a tendency to be more soft than stiff, which makes inserting difficult. They tested a different type of 40 g/m² paper that is produced of pure virgin fibre. This helped with the stiffness but there was an increased tendency for web breaks. As a result, the pressmen have had to slow down production when changing the reels.

Thinner paper in combination with thinner plates has also given rise to a greater tendency towards misalignment problems. In Aalborg (Denmark), they have solved this problem to an extent by using different blankets and a fan-out control system, which allows them to change the fitting of each plate individually.

7. Feedback and response

7.1 Feedback from readers and advertisers

“I don’t think they (readers) even realised there was a change. We had some complaints from advertisers, because ‘heavy’ full page advertisements sometimes appeared ‘dirty’ and there was show-through,” reports Mario Milošević.

The Printers Mysore too received some complaints from a few advertisers about show-through with 42/42.5 g/m² newsprint.

On the other hand, Christian Wilms said the Styria Print Group did test prints and proved that from advertisers to editors, no one observed any difference. Christian Wilms feels that only an expert can see the difference between 42.5 g/m² and 45 g/m² newsprint.

“We haven’t received negative feedback or complaints from our customers,” said Matthias Presotto of Axel Springer.

Thomas Isaksen echoes this. “Not many complaints at all, and that is why we decided to continue using lower grammage newsprint.”

7.2 Feedback from newsprint manufacturers

Stora Enso received mostly positive feedback from their customers, who use lower grammage newsprint. The majority of customer complaints was about increased show-through but finally this characteristic has been accepted by customers. The web break performance on press with lower grammage newsprint remains stable and good runnability of the paper sheet has been maintained.

UPM News had to go through some hiccups in the initial stage, but nothing which couldn’t be overcome. In the initial days they had to go through a trial and error phase. Changing the furnish composition like adding special fillers to reduce strike-through (which was often the main concern of printers) was required.

7.3 Feedback from press experts

What do industry experts think of the pros and cons of lower grammage newsprint? Here are different opinions from experts of different printing houses.

Mario Milošević from Tiskara, Zagreb, says: “Some lower grammage newsprint papers are dirty and readers get dirty fingers. And sometimes there is poor register due to paper fan-out.”

Show-through was the main problem after changing to lower grammage newsprints, according to the experience of Srinivas from Printers Mysore Ltd.

Thomas Isaksen, CEO of Danish DDPFF, thinks that the performance of 40 g/m² newsprint was quite good and Matthias Presotto, head of corporate purchasing of Axel Springer, also feels the same in respect to last years' experience with reference to newsprint made of fresh fibre.

Overall it can be quite cost effective to change to lower grammage newsprint with no noticeable compromise on quality if the shift is handled carefully.

8. Interviews

8.1 Interview with Pertti Pitkänen, Vice President Productivity and R & D, Stora Enso

Finland-based paper manufacturer Stora Enso provides best-in-class paper solutions for print media and office use. The wide selection the company offers covers paper made from recycled and fresh wood fibre. It numbers publishers, retailers, printing houses, merchants, converters and office suppliers among its clients. Stora Enso forecasts a trend towards lower basis weight paper on the basis of distribution costs, pagination and print quality requirements.

The company is confident that even if demand for lower grammage newsprint increases, the business model of newsprint mills will remain unaffected, as long as volumes are sufficient for trim reasons. “We had on average 2.5% less output due to a lower average grammage per year during the past three years,” says Pertti Pitkänen, Vice President Productivity, Paper Division.

Here’s what he has to say on newsprint of grammage lower than 45 g/m² and related issues from a paper producer’s perspective:

- Declining quality of PfR (paper for recycling) might make it more difficult to produce newsprint from 100% recycled material.
- Basis weight must be seen in relation to caliper/bulk.
- New printing technologies (waterless offset, liquid toner, inkjet) place new demands on paper properties. For example: Inkjet printing on papers below 45 g/m² is currently not possible.
- Print density controlling and as a consequence controlling show-through can be achieved by controlling ink density using a tonal range up to 98–99%, and a small screening dot. This affords a better chance to control the ink/water balance. In this way, the effect of show-through can be reduced. This is not a very common technique, but it is being followed successfully by some printers.

Q: Is it realistic to go below 40 g/m²?

For certain applications, yes, depending on the end-use, pagination and print quality requirements (advertising / editorial).

TIP

“OPTICAL VALUES CAN BE CHANGED AS L*, A* AND B* VALUES. THIS ENABLES HIGHER OPACITY.”

– PERTTI PITKÄNEN

In general, we are using more filler today compared to the past. Ash content is now up to 15% while earlier it was at 12%.

Q: What level of quality and efficiency has been achieved in manufacturing 42 and 40 g/m² newsprint?

Depends on paper machine and furnish (the proportion in a mixture of fibre and additives). Stora Enso has achieved the same quality (runnability and printability) compared to 45 g/m². But in the matter of efficiency, a lower output in tonnes per hour was recorded.

Q: Are there any specific problems in manufacturing lower grammage newsprint?

Nothing that cannot be overcome. Furnish composition could be modified or special fillers added in some cases to improve strike-through.

Q: Do you have to make additional investments for maintaining consistency in grammage?

Only the normal investment programme for continuous improvement was carried out, nothing specific related to lower basis weight was done.

Q: The most common problems cited in the use of lower grammage newsprint are print-through and fan-out. What can be done to solve these issues?

Fan-out is not an issue. Adjustment of printing process (ink/fount etc.) is required to reduce print-through.

Q: Is any cost-efficient surface treatment possible?

No.

Q: What kind of support do you offer?

Declining quality of PFR (paper for recycling) might make it more difficult to produce newsprint out of 100% recycled material.

We provide technical services to obtain best settings in prepress, press and finishing for using lower basis weights efficiently.

Q: Do you think that 40 g/m² will become the norm in the near future?

That depends on the development of pagination, number of inserts/supplements and distribution costs.

8.2 Interview with Anu Ahola, Senior VP, News & Retail, UPM Paper ENA, Helsinki (Finland) and Augsburg (Germany)

Q: Is it realistic to go below 40 g/m²?

Producing standard newsprint below 40 g/m² would be challenging and for highly efficient and fast paper machines it is not realistic. There is also a tipping point with deteriorating show-through and stiffness performance below 40 g/m².

Q: What level of quality and efficiency has been achieved in manufacturing 42 and 40 g/m² newsprint? Are there any specific problems in manufacturing lower grammage newsprint? Do you have to make additional investments for maintaining consistency in grammage?

Efficiency gets affected by higher number of breaks as the paper sheet gets more and more sensitive.

Consequently, this would result in a loss of production time. In terms of quality, there is a risk of lower opacity, higher air permeability, higher print-through, more pinholes and less stiffness. All these parameters would impact the readability of a newspaper.

Q: The most common problems cited in the use of lower grammage newsprint are print-through and fan-out. What can be done to solve these issues? Is any cost-efficient surface treatment possible?

Technically an additional refining process for TMP (Thermo Mechanical Pulp) consuming mills could be applied to increase opacity but would on the other side result in higher variable costs and lower strength properties of the paper sheet. In consequence this would affect the paper machine performance negatively. Increasing the ash content is only possible up to a certain limit as it affects the bulk character of the paper sheet and indirectly the printing performance of the press (built-up). Additional surface treatment might be cost intensive and leads to a non-economic cost/benefit proportion. Fan-out is in general not seen as a common problem.

Q: What kind of feedback do you receive from your customers, who use lower grammage newsprint? What kind of support do you offer?

Customers mainly complain about increased show-through, but this feature is now being accepted by customers. Web break performance on press with lower substance remains stable and good runnability of the paper sheet has been maintained. No problems regarding fan-out have been reported so far.

Post-press might sometimes be challenging due to lower stiffness of the paper. During the transition period, our Technical Sales network is supporting customers but no further special support has been requested or offered.

Q: Ink suppliers also play a vital role when thinking about reducing show-through effect. High pigmented inks can help to keep pigments on the paper surface. Do you think that 40 g/m² will become the norm in the near future?

Not in all cases, as some publishers believe that the deterioration in show-through and thinner look and feel of the printed copy is not acceptable for readers and advertisers. Therefore, some publishers will remain with 42.5 g/m² or even higher. As said before, this development might be depending on different local market trends, meaning there will be countries where this development will be more distinctive than in others.

Q: Any other specific experiences you would like to share or issues that you face?

We do not share the opinion that publishers would gain a “huge financial saving” due to savings in paper cost as a pricing model for paper is not yet agreed. We are not in a position to comment if the “huge financial saving” refers to decreasing distribution cost of the publishers. If the tendency towards lower grammage substrates will continue, we have to set up a pricing system where paper producers and paper buyers can find a common commercial platform for both parties involved. As efficiencies of paper machines will get under pressure, it is very crucial to set the right pricing model.

8.3 Interview with Dr. Michael Hirthammer of DIC and Sun Chemical, Eurolab, Karlstein, Germany

Ink plays a pivotal role in the success of shifting over to lower grammage paper. Dr. Michael Hirthammer of Global Paste Technologies Screen & Industrial, DIC and Sun Chemical, Eurolab, Karlstein, Germany, responds to questions regarding this crucial subject.

Q: Do you produce a different type of ink for lower grammage newsprint, if yes, how does it differ from the normal ink?

At the current time we don't need different type of inks for lower grammage newsprint.

Q: What kind of challenges, both technical and financial, do you face when you tailor the inks for lower grammage newsprint?

Speaking from experience, we expect to see more strike-through or show-through, due to the possibly increased transparency of the paper. In addition, picking can become critical and some problems in press settings (web tension, dimensional variations, ink/water settings) could affect the outcome.

Q: What sort of complaints/expectations do you receive from the clients, and how do you meet these expectations? What kind of technical support do you offer?

I can say that we do offer customers the full support of our analytical and application laboratories to check and understand the ink/paper behaviour and to determine whether any modification of paper or ink is required. Close cooperation with paper manufacturers is a given.

9. Case studies of print production units

9.1 The Hindu – a case study on best practice

Newsprint of lower grammage – around 42 g/m² – is the need of the hour for the newspaper industry to contain costs of production. The use of such newsprint results in nearly 6% savings in newsprint costs, said Mohanraj P, AGM, Production, The Hindu, India. However, for the printer, the use of lower grammage newsprint presents a great challenge vis-à-vis sustaining quality and optimising productivity.

The newspaper started trials with 42 g/m² in 2012 and subsequently began using it in selected printing centres. In 2014, production was shifted entirely to 42 g/m².

The Hindu operates Manugraph and Mitsubishi presses. They also use coldset and heatset production technology. Two printing facilities operate with hybrid heatset/coldset Mitsubishi presses, while three others with Mitsubishi presses operate in coldset. Manugraph presses are operated in seven locations and print in coldset.

“Heatset and coldset printing processes demand different newsprint properties. That is the first hurdle we faced. What we needed was a ‘best fit’ that would suit both processes so that we did not need special efforts to manage our inventory. Using many varieties will lead to quality inconsistency. Hence we decided to use only a few select brands,” Mohanraj said.

Several trials and laboratory tests were carried out before venturing into lower grammage newsprint. Newsprint of 42 g/m² has about 10% lower tensile and tearing strength, higher porosity, lower thickness and lower opacity when compared to the 45 g/m² variety, Mohanraj said. These are sure to affect production.

As for printability parameters, high print-through was noticed. To reduce the effects, the total ink coverage of CMYK was reduced from 240 to 220% to be in-line with the latest ISO 12647-3:2013 specification, Mohanraj said.

Insider tips

- Be aware of the properties and issues with lower grammage and reduce web tension for better runnability.
- Use less opaque, good strength and smoother papers in a heatset machine.
- Use brighter and bulkier paper for top sheets in coldset printing for better reproduction.

Considering that many Indian newspapers are using frequency modulated screening (FM) as a means to reduce the amount of ink on paper and assist in easy migration to 42 g/m² paper, The Hindu made trials with FM screening. “We found that FM screening produced good results with good quality originals, reduced ink consumption and also reduced print-through,” Mohanraj revealed.

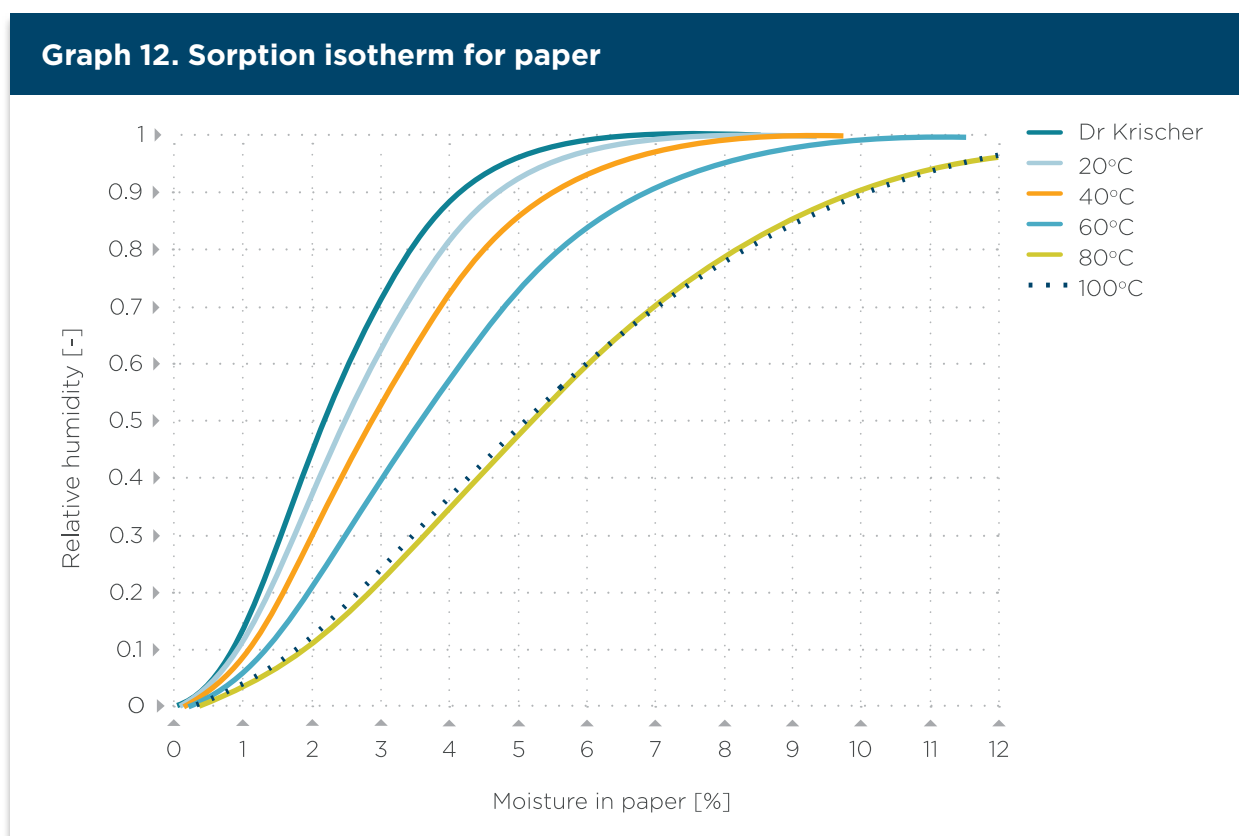
However, pictures were grainy if the original was bad, dot loss was reported in highlights and very high levels of process control were needed in press and prepress. “After much consideration, we decided to stick with amplitude modulated screening (AM) and we use 120 lpi for the coldset process and 133 lpi to 150 lpi for the heatset process. At high lpi, the tones are smooth and the quality is good.”

The Hindu feels that, using recycled lower grammage newsprint has more advantage than using virgin fibre lower grammage newsprint. Here is the reason why they said this:

“With experience and constantly testing the materials, The Hindu found that recycled newsprint has better strength, runnability and yield than virgin fibres. Fluff accumulation levels are also lower in recycled fibres. Now, more than 90% of paper used by the organisation is recycled newsprint.”

Paper and heatset drying (background from supplier)

Drying of a paper web results in shrinking in both machine and cross direction. This results in higher web tensions and changing web widths during production. An important paper property, which helps to predict this phenomenon, is the sorption isotherm of a paper. This is the relation of absolute and relative humidity, an example is shown below:

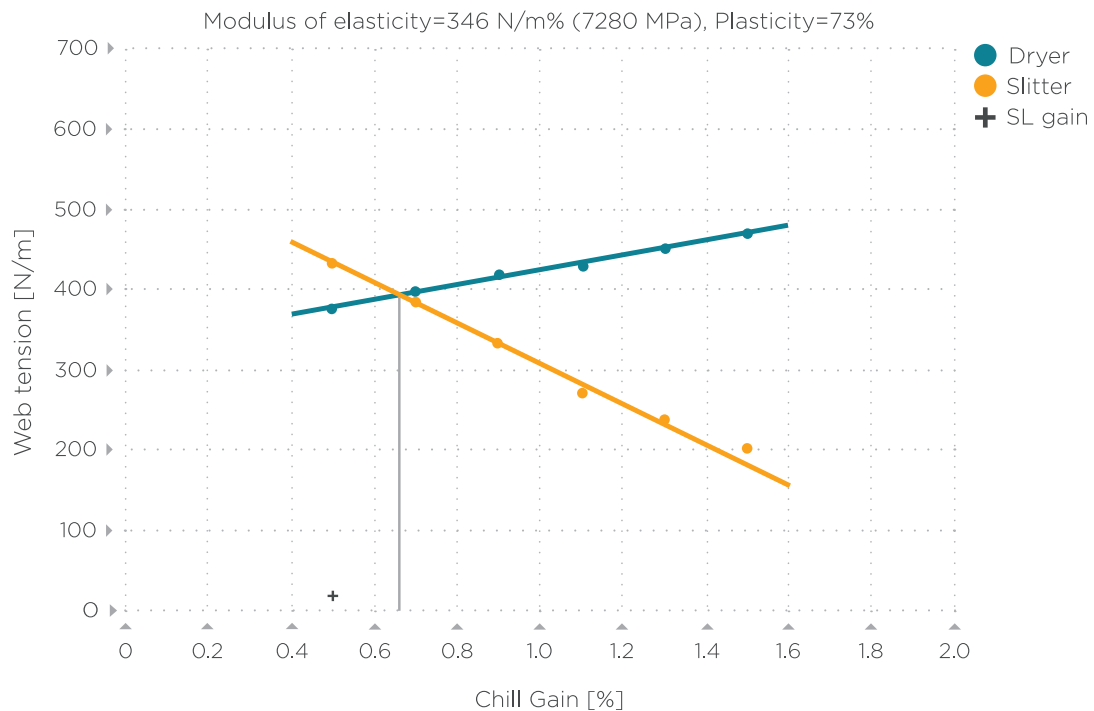


The dotted blue line is for a paper at 20 °C. This graph is also important to determine the basis weight, because this changes with humidity.

Another important phenomenon occurring in a dryer is that a large part of the total strain put on the web is transferred from elastic to permanent strain. This is always happening with paper under the influence of changing moisture content. The extent to which this is present is a paper property, which can be measured when the draw of the downstream pull roller is increased, and web tension is recorded. An example is shown below:

Blue is the tension in the dryer, red the tension downstream. Almost $\frac{3}{4}$ of the total strain is transferred into permanent strain. The product gets longer.

Graph 13. Dryer and slitter web tension versus chill gain



This is also a means to determine the actual modulus of elasticity of the paper expressed in kN/m, or in N/m per % draw. This modulus determines the tension level in a press at a given draw. The normal web tension is a factor 5 lower than the tensile strength. This means that the tensile strength is not a good predictor of the possibility of web breaks. That is more the occurrence of edge defects or wrinkles in combination with a high web tension.

- Clemens de Vroome, Senior Development Engineer, Contiweb, Boxmeer, the Netherlands

UV / LED systems require little space and also offer the possibility of retrofitting into existing (newspaper) presses. For this purpose, a set-up suitable for UV inks must be made with regard to the materials and consumables used.

The drying process fixes the UV / LED ink on the surface, reducing the ink penetration. This has an advantageous effect on the image quality. Due to the high speeds, and especially with LEDs, the heat input into the substrate is negligible. Thus, the UV / LED drying can be a way to reduce the newsprint grammage.

Experiments have shown that even a single LED system can realise drying speeds of 10 m per second and more. Also, no problems were observed in the web lead over the former.

- Stefan Feil, Director Applications Development, IST METZ, Nürtingen, Germany

9.2 Case study of ABP Pvt. Ltd.

Pointers from Snehasis Roy, an expert in newsprint technology, drawn from his experience at ABP, Kolkata, India.

Q: Can we harvest the benefit of extra pages printed with same or better quality, look and feel?

The answer is, yes, we can.

Remember, in spite of financial benefits, neutral fount solution also gives life to environment, mankind, ink and machinery.

Roy says the organisation not only gained the benefit of 16,000 extra pages printed from every metric ton of paper, it was also able to maintain the quality of the print without compromises when changing to 42.5 g/m².

“Once you re-look at and re-design your process right from prepress and include even the consumables, you can.”

Q: How can we achieve better quality in the print with reduced grammage newsprint?

Here are some guidelines to achieve better quality while using lower grammage newsprint:

- Rethink the prepress
Use dispersed fine screening (FM) instead of conventional halftone (AM).
- Reduce TIC (total ink coverage of CMYK) to 200% or even 180%
Take the benefit of reduced dot size, zero spreading, zero overlapping and least strike-through and show-through.
- Redesign the newsprint
Improve bulk by introducing virgin fibre (15–50%). This improves thickness, bulk, show-through, strike-through and strength.
Reduce load in pressing/calender section of paper machine – this enhances bulk.
Introduce PCC (precipitated calcium carbonate) – this reduces show-through/strike-through.
- Re-develop the ink

High solid and high-strength ink help to reduce ink film thickness and hence reduce show-through and strike-through.

Here are a few of the benefits ABP gained:

- Better detail reproduction due to dispersed fine screening
 - Better colour register and sharper prints
 - Less set-off and cleaner prints
 - Savings due to ink film thickness reduction
 - Increased mileage of press chemicals
- Review the fountain solution
Replace old acidic fountain solution with pH neutral fountain – this helps with a quick and clean start-up, reduced water consumption, quick setting/drying, reduced ink consumption, reduced set-off, enhanced ink/water balance, elimination of deposits on rollers and much more.

“We not only gained the benefit of 16,000 extra pages printed from every metric ton of paper, we are also still able to maintain the quality of the print without compromising.

Once you re-look and re-design your process right from prepress and even the consumables, you can still achieve better quality in the print with reduced news-print,” he said.

10. Working in partnership

Any change can be successfully rung in only with the cooperation of all stakeholders. The printing industry is no exception to this rule.

Here is how a few well-known printers and publishers worked closely with their newsprint and ink suppliers to standardise the raw material to achieve the best quality with lower grammage newsprint.

Mario Milošević says, “Initially, in the testing phase, we had joint technical meetings with our material suppliers and went through this project as partners.”

He also says the ink/water balance is crucial in offset printing, especially if the substrate (paper) is changed. “We tested a lot of different inks and found solutions with our partners to find a mutually acceptable standard and the best interface among paper-ink-dampening solution,” he said. “A quick ink drying process and reducing paper fan-out are musts for clean print in good colour register,” he stresses.

Thomas Isaksen adds, “There was a lot of communication to resolve various issues, such as increased ink consumption, curling, folding and wrinkles.”

“We have a specification for 45–42 g/m² newsprint, which is part of the delivery contract. This specification has served as the basis for the standardisation existing for the last 10 to 15 years. In addition, we stay continuously in contact with the technical service and development department of our paper supplier. At the moment we are in discussion about the specification for 40 g/m² newsprint.”

– Matthias Presotto

TIP

“WE SHIFTED ABOUT A LOT AMONG OUR SUPPLIERS IN ORDER TO GET THE BEST MATCH BETWEEN PRINTING MACHINE AND PAPER PRODUCER.”

– THOMAS ISAKSEN.

“We asked ink suppliers for an optimisation to avoid disruption. Three to four runs were required before the best results were achieved. And from that time till the present, things have been stable. We got a test paper and satisfied ourselves that there was no need to change anything.”

– Christian Wilms

“We asked our ink suppliers for a stronger ink to reduce the ink film thickness on the paper.”

– Vallabhaneni Srinivas

“Printers should expect to make adjustments in prepress and press to reduce the impact of differences in comparison to 45 g/m² paper,” he added.

Srinivas stressed that, in order to reduce show-through, printed samples along with his organisation’s feedback were sent to mills.

11. Outlook

11.1 Possibility of even lower newsprint grammage

Will the future see a bigger role for 40 g/m² newsprint and a further downgrading of newsprint grammage? Here are different opinion from experts:

Yes, it is possible, says Mario Milošević. “We have to find a way to survive. Lower grammage newsprint will gain popularity with publishers bringing focus back on content rather than appearance. Reducing 4 over 4 colour printing, changing layout (design) and accepting that coldset printing is not magazine printing,” he says.

“If printing within the parameters of ISO 12647-3 with 40 g/m² is possible (without the hurdles of show-through etc.) and the printing efficiency (speed, ink consumption etc.) is not touched and the costs are reduced, why not?” asks Christian Wilms.

Srinivas feels it may be difficult to standardise on 40 g/m² as there are only a few mills supplying this kind of paper.

On the other hand, Isaksen says, the Procurement Association of Danish Press has decided not to pursue further lowering of grammage below 40 g/m².

Anu Ahola (UPM) says, 42.5 g/m² and 40 g/m² will be the main grammages during the next 5 to 10 years, with a tendency towards 40 g/m². This development might depend on various local market trends, meaning there will be countries where this development will be more distinctive than in others, she says, as a corollary.

TIP

“VERY FEW MILLS PRODUCE GOOD QUALITY 40 G/M² NEWSPRINT WITH LOW SHOW-THROUGH.”

– VALLABENENI SRINIVAS

On the other hand, she cautions, paper machine efficiencies might decline because of lower strength properties of the sheet and lower speed of the paper machine. In consequence, this would negatively impact the cost structure and increase the specific production costs.

On the printers' side, Axel Springer does not, at the moment, have any plans for paper below 40 g/m². "We expect that we have arrived at process limit in particular for recycled paper," said Presotto.

11.2 Unresolved issues

The change to newsprint of lower grammage is an ongoing process. Not all the issues have been ironed-out to user satisfaction.

Some quality issues are not fully solved, such as opacity, folding, curling, and some degree of increased ink consumption, says Isaksen.

Presotto records the following challenges posed by 40 g/m² recycled newsprint:

- Newsshade of significant difference when compared to 45–42 g/m² in the b*-value towards blue and in the a*-value towards red (measured CIELAB spectrophotometer according to ISO 2496 with an Elrepho 3000, with a UV filter – standard according to ISO 11457, illumination D65/10).
- Opacity lower than 45–42 g/m², depending on reverse side and colour placement (colour assignment). Stiffness lower than that of 45–42 g/m² newsprint, including temporary production problems in the postpress department measured in accordance with DIN 53121.

11.3 Advantages of migrating to 42.5 g/m²

Of course, there could be plenty of cons in terms of quality concern, but there are numerous advantages as well.

Thomas Isaksen says the advantages are mainly financial.

Cost of newspaper will go down by 2–3% just by migrating to lower g/m². Also, there will be gains on the transportation front. A truck can fit in more reels of lower grammage.

“Also one tonne of newsprint will be longer than before, and will reduce the number of reel splices as well, leading to less core waste,” he says.

That’s not all, newspaper distribution costs will also come down, and the savings will be up to 6% or even more, he added.

In short, overall savings of 8–9% can result just by migrating from 45 to 42.5 g/m².

If consumption is taken to be 20,000 tonnes at a price of \$460 per tonne, then savings could be more than 750,000 euros every year, Isaksen says.

12. Contributors

We thank all the contributors who supported this project through their advice, their expert experience and their reports!



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Nordjyske Medier is the second largest media company in Denmark with a history dating back to 2 January 1767. It owns and operates television channels, radio stations, and local web-sites. It also publishes newspapers, magazines, telephone directories, and free classified paper. The company is based in Aalborg, Denmark.



Pertti Pitkänen is Vice-President, Productivity and R & D, Stora Enso, based in Düsseldorf, Germany. The company's biomaterials division is a provider of pulp grades for various paper, board and tissue producers.



Matthias Presotto is Head of Corporate Purchasing Printing at Axel Springer SE, the largest publishing house in Europe, controlling a large share of the German market for daily newspapers.



Winfried Schaur is Chairman of UPM Paper ENA (Europe and North America) and member of the Group Executive Team at UPM.



Snehasis Roy has academic as well as practical exposure to the entire print manufacturing value chain and has project implementation experience in newspaper manufacturing. He has worked with Anand Bazar Patrika (ABP) and Time Magazine, and at present he is the technical director at The Times of India Group.



Vallabhaneni Srinivas is General Manager, Production & Materials, The Printers (Mysore), a leading news media company based in Bangalore, India, and publishers of the popular Deccan Herald and Prajavani newspapers as well as Sudha and Mayura magazines.



Christian Wilms is Managing Director of the Styria Print Group. Together with Alexander Marko, he manages the Austrian printing works of Styria and is responsible for production, technology, core processes and sales. As far as paper goes, the group's tagline is: We produce newspaper media of various formats. From the usual "tabloid" to the "broadsheet" format, to trimmed products with magazine character.

13. Literature list

- WAN-IFRA Report, High-Value Print Production, Frankfurt am Main, Germany, 2017
- Paper Guide, Optimised Paper Handling & Logistics (www.ophal.info), Frankfurt am Main, Germany, 2017
- WAN-IFRA Report, New and emerging business models of newspaper printing companies, Frankfurt am Main, Germany, 2015
- WAN-IFRA Report, ISO 12647-3:2013: Quality standard for newspaper production, Frankfurt am Main, Germany, 2013
- WAN-IFRA Research and Material Testing Centre, Conformance of Imported and Indian Newsprint to DIN 19306-4, Chennai, India, 2012
- WAN-IFRA Research and Material Testing Centre, Conformance of Indian Newsinks to ISO 2846-2, Chennai, India, 2010
- WAN-IFRA Research and Material Testing Centre, Reduction of colour gamut after printing in a coldset process, Chennai, India, 2009
- WAN-IFRA Research and Material Testing Centre, Study of newsprint and newsink used in Indian news publishing industries, Chennai, India, 2008
- WAN-IFRA Report, Revision of ISO 12647-3, Darmstadt, Germany, 2005
- WAN-IFRA Report, Newsshade 2003, Darmstadt, Germany, 2004
- WAN-IFRA Report, Value Added Coldset, How to run coated paper in a newspaper press, IFRA Special Report 1.20, Darmstadt, Germany, 2001
- WAN-IFRA Report, The phenomenon of linting in newsprint printing, Darmstadt, Germany, 2000
- WAN-IFRA Report, Potentials and restrictions of grey component replacement (GCR) in newspaper printing, Darmstadt, Germany, 1996
- WAN-IFRA Report, Introduction to the problem of copy curl in newspapers, Darmstadt, Germany, 1996
- WAN-IFRA Report, Newsshade 95: A new proposed IFRA standard for newsprint shade and its measurement, Darmstadt, Germany, 1996
- WAN-IFRA Reports can be found and downloaded from the WAN-IFRA website: wan-ifra.org/microsites/wan-ifra-reports
- Reports of the WAN-IFRA Research and Material Testing Centre can be found and downloaded from the WAN-IFRA website: wan-ifra.org/articles/2014/06/17/research-reports
- Articles and news can be found on the WAN-IFRA website: wan-ifra.org/microsites/world-printers-forum wan-ifra.org/microsites/industry-upda

