<table>
<thead>
<tr>
<th>Title</th>
<th>Efficient use of newsprint and case studies on waste management.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author(s)</td>
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<td>Date</td>
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Efficient Use Of Newsprint
&
Case Studies On Waste Management
Session 6:

Efficient use of newsprint

Newsprint reel transport, handling and storage
Classification of reel defects
Web break control
Waste control

Case studies on waste management
Efficient use of newsprint

- Newsprint reel transport
- Reel handling in the printing plant
- Storage: different types of warehouses
- Classification of newsprint and reel defects
- Newsprint waste control
  - Waste definitions
  - How and where to measure waste?
  - Setting waste targets
  - Useful equipment and tools
  - How to reduce waste?
- Web break control
  - Web break as a cost factor
  - Web break recording
- Case studies on efficient waste management
Efficient Use of Newsprint

Reel Transport, Handling and Storage
The mill roll and winder

The web from the paper machine is wound onto a steel cylinder to form a mill roll or tambour with a width corresponding to the width of the paper machine. Once the mill roll has been fully wound, it is transferred to the winder where:

1. the web is slit by rotating knives to produce reels to the ordered widths, and
2. the web is wound onto a reel core to the diameter or, when such is the case, to the web length ordered by the printer.
Wrapping

To protect the body of the reel against damage, several layers of wrapper are wound around the outside of the reel. The ends of the reel are protected by paper discs. Once the inner discs have been set in place, the body wrapper is folded over the end discs and an additional disc is glued over each end.

The reel wrapping serves mainly:
- to protect the paper against light mechanical pressure, impacts and friction, and
- to provide temporary protection against dirt and moisture, but not water.
Reel Transport, Handling and Storage
Transport to the printer


Rail transport: make best use of the space. Example:

Sea transport: Different kind of loading possible. Important: water damage should be prevented and sufficient ventilation ensured.

Containers: Special containers can be used to transport newsprint reels. They can be transported by road, rail or sea.
Reel Transport, Handling and Storage

Reel Handling in the Printing Plant

Reel receiving: careful visual inspection should be carried out to detect damage (physical damage of the body, damage to the heads or edges, water damage or out-of-roundness). All damages should be recorded and reported to the supplier.

Off-loading of reels:
Reel Transport, Handling and Storage
Clamp trucks and truck handling
Reel Transport, Handling and Storage
Clamp trucks and truck handling

1 = Test cylinder  
2 = Pressure gauge  
3 = Clamp plate  
4 = Gripping arm  
5 = Pivot-mounted friction plate
Reel Transport, Handling and Storage

The Newsprint Warehouse

- Large enough for several days' use
- Good location (near the presses)

Temperature and humidity:
- Moisture content of newsprint very important for runnability properties.
- Should be controlled as much as possible (esp. when extreme temp. and hum. are reached outside)
- If possible, climatization system to control temperature and humidity. If not, humidifiers are recommended.
- Water condensation should be avoided (formation of water droplets).

The Golden Rule of Storage:
--> The reels should be arranged in a proper manner: each grade and size should be accessible and the "first in-first out" (FIFO) principle should be used.
Reel Transport, Handling and Storage
The Newsprint Warehouse

- To estimate the floor area:
  - take about 1 tonne/m² for the calculation in the case of several grades and reel sizes.
  - take 2 tonnes/m² in the case of few grades and sizes.

- Main reels should not be stacked more than 4 high. Max. height: 6.5 m. The stacks should be straight and stable.

The reel storage building:
- think water and fire damage
- should be as clean as possible
Reel Transport, Handling and Storage
New Developments in Newsprint Warehouses

IFRA Special Report 1.4 (Oct. 90):
- High-rack storage: reels handled automatically with carriages and lifts, commanded by a central data management system.

- Alternative to clamp trucks: vacuum lifts or overhead cranes
Efficient use of newsprint

Newsprint waste
Efficient use of newsprint
Different waste reasons

- Transport damage of paper reels
- Damages during storage
- Wrong preparation of paper reels
- Incorrect start-up of presses
- Change of print speed of the press
- Incorrect ink/water balance
- Web breaks
- Miscount of copies
- Damages in mailroom handling
- Badly controlled distribution
- Bad maintenance of equipment
WASTE DEFINITIONS

According to IFRA specification

1. Wrapper waste
   The actual weight of all wrapper protection stripped from the reels, including the heads and body wrapper but not including the core or any white paper which may be removed when the wrapper is stripped off.

2. White make-ready waste
   The total weight of all white paper stripped from the reel prior to the actual running of the reel through the press. White make-ready waste may be subdivided into:
   a) Claimable make-ready waste: damage to the reels during transport and handling for which the newspaper is not responsible.
   b) Non claimable make-ready waste due to normal make-ready procedure.

3. White core waste
   The total weight of white paper remaining on the reel core when the reel stub has been removed from the press. Shall not include the weight of white paper remaining on partially run reels which are set aside for re-use in later production.

4. Core tare waste
   The weight of the reel core, but not including the weight of any white paper remaining on the core when the reel stub is removed from the reel-stand.

5. Reel stub waste
   Total weight of the reel stub, i.e. the sum according to the definition with 3 and 4 above.

6. Total tare waste
   The total weight of the reel core and wrapping material, i.e. sum of wrapper waste and core tare waste.

7. White press waste
   The total weight of all white, i.e. unprinted, paper taken from the reel from the time the reel is started through the press to the time the reel stub is removed from the reel-stand.

8. Start-up waste
   The total weight of all printed paper which does not leave the pressroom between press start-up and the start of delivery to the mailroom.

9. Production printed waste
   The total weight of all printed paper which does not leave the pressroom, e.g. spliced copies, waste following web breaks, waste from the time copy delivery to the mailroom commences to the time at which the mailroom order has been completed.
10. Production waste
The sum of start-up waste and production printed waste. The difference can usually be obtained by subtracting the net copy count from the gross copy count at the rotary press.

11. Mailroom waste
The total quantity of saleable copies, sent from the pressroom until the end of the run, is compared with the total quantity of copies dispatched from the mailroom for that run including the in-house copies.

The corresponding number of copies can usually be determined by subtracting the copies dispatched from the mailroom from the net copy count at the rotary press.

12. Over-production
The difference between the net copy count at the rotary press and the ordered circulation. This figure is included in the mailroom waste.

13. Total waste
The sum of waste according to the definitions with 2, 3, 6, 7, 10 and 11 above.

14. Apparent weight difference
The gross weight of all reels used in the printing of a given product, minus (a) the total waste; and minus (b) the theoretical weight of the circulation dispatched from the mailroom.

This can be expressed as follows:

\[
\text{apparent weight difference} = \frac{\text{gross weight of all reels used}}{\text{total waste}} - \frac{\text{theoretical weight of circulation}}{}
\]

by which definition the apparent weight difference serves as a correction factor.
RECORDING STATION

Storage, reel receiving station

Reelroom, reelstand

Reelroom, reelstand

Reelroom

Reelroom

Pressroom

Pressroom

Mailroom

Production + Total waste = Weight of all reels used
Example of figures for damaged waste:

Average value for American newspapers concerning damaged waste: 0.26% of the total consumption

Extreme examples:
Daily News:
   Damaged waste: 1.06% (1/4 of total waste)
Lancaster Newspapers:
   Damaged waste: 1.9% (1/4 of total waste)

Other example: Het Laaste Nieuws (Belgium)
Claimable damaged waste: 0.30%
Non-claimable damaged waste: 0.09%
Damaged waste: 0.39%
Printed waste: 1.21%
Total waste: 3.13%
Waste statistics NAA

Newsprint consumption between 1000 and 5000 tons/y:
(averaged from 70 newspapers)
- Damaged waste: 0.29 %
- Printed waste: 3.11 %
- Total waste: 4.82 %

Newsprint consumption between 5000 and 20000 tons/y:
(averaged from 70 newspapers)
- Damaged waste: 0.26 %
- Printed waste: 2.47 %
- Total waste: 3.91 %

Newsprint consumption over 20000 tons/y:
(averaged from 60 newspapers)
- Damaged waste: 0.26%
- Printed waste: 2.91%
- Total waste: 4.33 %

--> In average, damaged waste represents about 6% of total waste
Waste Control

How and where to measure waste?

Number of waste categories: up to you
Aim: produce statistics (and see the evolution between productions, days, months, deliveries...) and give ideas on how to reduce waste.

How to measure waste?
- as actual weight
- in number of copies
- in terms of length
- or by combination of these factors.

Ex: wrapper waste can be weighed but mailroom waste is often counted in number of copies.

Weight determination of the printed products: Not easy!!
- Newsprint grammage varies
- Moisture content
- Damping
- Possible dryers
- Inks
Waste Control

How and where to measure waste?

Total calculation of consumed paper and produced waste:
- Record in kilograms and/or copies
- Whatever suits you the best

Where should waste control be exercised?
- Reel receiving station
- Reelroom
- Pressroom
- Mailroom

Let's look at these individual stations
Waste Control
How and where to measure waste?

Reel receiving station:
Several checks should be made:
- reel condition must be recorded (types of damage, depth of damage...)
- reel weight, labelled versus actual
- check of reel number

Claimable make-ready waste: (for which the newspaper is not responsible) has to be recorded by weight or depth of damage.

| Percentage of loss caused by newsprint reel damage |
|---------------------------------|------------------|------------------|------------------|
| Depth of damage mm             | Paper loss as % of gross weight |
|                                | Diameter 900 | 1070  | 1250  |
| 2  | 0.9        | 0.8    | 0.6    |
| 5  | 2.3        | 1.8    | 1.6    |
| 10 | 4.5        | 3.7    | 3.2    |
| 30 | 13.1       | 11.0   | 9.4    |

Check the total weight of a delivery.
Any weigh bridge or scale has to be calibrated regularly.
Waste Control
How and where to measure waste?

Reelroom:
Wrapping inspection: last inspection before unwrapping
Several waste categories in the reelroom --> different practices:
- using one or more weighing scales to weigh reels individually --> costly and time-consuming
- collecting and weighing waste components individually
- taking some waste components as constant figures
Reel make-ready:
- important to avoid missplices
- reel control and repair of small damages
- stripping the reel: only one or two layers
- prepare the splice carefully.
Waste Control
How and where to measure waste?

Pressroom:
White press and production waste:
White waste: webbing-up with the furthest unit first.
Start-up waste: preparation before the start and pre-settings, clean blankets
- Adjustments during the start-up
- Bad copies
- Copies produced during the pasteur cycle
- Deceleration phase
- Control copies

Mailroom:
Difference between the number of copies entering the mailroom and the number of copies leaving it
<table>
<thead>
<tr>
<th>Reel diameter</th>
<th>Reel weight (kg)</th>
<th>Wrapper waste (%)</th>
<th>Reel stub waste (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>800</td>
<td>6.8</td>
<td>0.9</td>
<td>8.7</td>
</tr>
<tr>
<td>115</td>
<td>1050</td>
<td>8.0</td>
<td>0.8</td>
<td>8.8</td>
</tr>
<tr>
<td>125</td>
<td>1250</td>
<td>8.8</td>
<td>0.8</td>
<td>9.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.4</td>
</tr>
</tbody>
</table>

(Reel stub: 10 mm, Core: 8kg, 160 cm width)
Waste - Expensive?

Case:
- 45 g/m2, 550 $/ton
- 350 edit./year
- 32 pages broadsheet
- circ. 100,000 cps./day
Costs, 12 % waste

Consumption 18.3 ton/day
Waste 2.2 ton/day = 1207 $/day
Annual losses 422,500 $

Reduce waste from 12 % to 8 %
Savings 141,000 $/year
Copy counting

Case:
- 45 g/m², 550 $/ton
- 350 edit./year
- 32 pages broadsheet
- circ. 100,000 cps./day
Extra in bundles

Needed 2000 bundles x 50 cps
Manual stacking, 51 cps/bundle
Needed overproduction 2000 cps
Waste 2 %, losses 83,000 $/year
Efficient use of newsprint

Web breaks

- General aspects
- Causes of web breaks
- Web break as a cost factor
Efficient use of newsprint

Web breaks

General aspects:
- Big influence on plant efficiency
- Better paper but increased demand on it (faster presses, multi-colour printing...)
- When do web breaks occur?
Figure 3-15. An example of web tension as a function of time during reel change at T2. Measurement after reel stand before the first printing unit.

Figure 3-16. An example of web tension as a function of time during reel change at T2. Measurement performed after the first printing unit.

Figure 3-17. An example of a change in web tension level after reel changeover. (Measured at KA, after the infeed unit).
Efficient use of newsprint

Web breaks

Causes for web breaks:
- press-related breaks
- reelstand related breaks
- folder-related breaks
- material-related breaks
- operating errors
- unknown causes

--> See NNG!!

2.15 burrs on tension belts
2.16 loose tension belts
2.17 dirty or worn-out pasteur brushes or rollers
2.18 improper setting of tension on pasteur brushes or rollers
2.19 incorrect load on brake
2.20 improper adjustment or malfunction of pasteur carriage
2.21 other pasteur malfunction

3. FOLDER-RELATED BREAKS
3.1 draw rollers pulling insufficiently or excessively
3.2 slitter and/or slitter check dull or not set properly
3.3 former angle is wrong
3.4 turner bar angle is wrong
3.5 excessive air
3.6 foreign matter accumulating on former and/or turner bars
3.7 imperfect web tension
3.8 improper cutting or folding
3.9 fly damage or incorrect adjustment
3.10 incorrect setting of guiding elements
3.11 other folder malfunctions

4. MATERIAL-RELATED BREAKS
4.1 Newsprint- and reel-related breaks
4.1.1 Sheet defects/holes
   - slime hole
   - water drop hole
   - plucking hole
   - wire hole
### IDENTIFICATION AND PREVENTION OF WEB BREAKS — TROUBLE SHOOTING LIST

In the following a list of possible reasons for web breaks is given. This list should be regarded as a training aid for those who are working either in the pressroom or on the reelstand level. It clearly classifies the defect with regard to the time a break occurred, to the location where it happened and gives some possible reasons for it. Finally the appropriate counter-measures are shortly described which you will also find in other sections of subchapter 7.2 and 7.3, especially in 7.3.1.

<table>
<thead>
<tr>
<th>Defect</th>
<th>Location/symptom</th>
<th>Reason</th>
<th>Counter-measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web break at press start</td>
<td>Before printing unit</td>
<td>Improper adjustment of tension control roller</td>
<td>Adjust tension control roller in the reelstand and/or in the infeed unit</td>
</tr>
<tr>
<td></td>
<td>In or after the printing unit</td>
<td>Knife is activated by the web break detector</td>
<td>Check setting of web break detector, the side-lay register and the web for “baggy” parts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Imperfect start-up sequence</td>
<td>Check start-up sequence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Too tacky ink</td>
<td>Make sure that press and pressroom have a temperature of about 20°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water in cylinder gap</td>
<td>Reduce water feed and clean gap with compressed air</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cleaning agent in the cylinder gap</td>
<td>Clean more thoroughly, use tape to cover the gap during cleaning</td>
</tr>
<tr>
<td>Web break during reel change</td>
<td>Start of the web fails to loosen from the new reel in the reelstand</td>
<td>No glue on the reel</td>
<td>Apply glue according to instructions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Applied glue has dried out</td>
<td>Renew glue; check glue properties; don’t apply glue too early and make sure that no dust sticks on the glued part</td>
</tr>
</tbody>
</table>
Breaks At Reel Changes

Represent 30% to 50% of all breaks

Causes Are:

- Tension variations
- Paste makeup and operation
- Faults near core of outgoing roll
- Structural faults in new roll
- Surface faults in new roll (roll damage)
Suggestions

• Keep tension on the paper to an absolute minimum
• Use only newsprint from one supplier on any one reelstand
• Use damaged rolls on runs that have flexible deadlines
• Be aware of the stress from angle bar leads
• Offset press stops and sheet absorbency
• If edge damage has been corrected by making a cutout on the edge, do not use the roll on a split-sheet or angle bar lead
Break Frequency in Swedish Pressrooms

Break frequency per 100 rolls

Total

Paper-caused

Pressroom Newsprint Runnability

Breaks per 100 Rolls

1981 82 83 84 85 86 87 88 89 90 91 92 1993

10/11/93: Source: Abitibi-Price PDM data through August 1993. Based on 3,000+ rolls/year. No correction for increasing average roll diameter.
Efficient use of newsprint

Web breaks

Web breaks as a cost factor:
An example:
- Large offset newspaper printing plant.
- Production of a broadsheet product with 58 cm cut-off and page width of 41.5 cm. Paper is standard 45 g/m² newsprint.
- Production at 60,000 copies/hr

Assumptions for the calculations:
A: Duration of emergency stop --> 10 s
B: Normal re-webbing time --> 10 min
C: Severe re-webbing time --> 90 min
D: Duration of press re-start --> 60 s

(All the prices in German Marks)
Efficient use of newsprint

Web breaks

Web breaks as a cost factor:

10 minutes downtime (timeB)
Press and reelroom: 42 DM
Mailroom: 10 DM
Transport: 15 DM
67 DM

90 minutes downtime (timeC)
Press and reelroom: 372 DM
Mailroom: 84 DM
Transport: 135 DM
591 DM

5. Costs for replacing plates and blankets: In case of severe breaks, plates and blankets might be changed. Estimated cost: 750 DM

6. Loss of sales
Efficient use of newsprint

Web breaks

Web breaks as a cost factor:

1. Newsprint costs:
Waste produced during A: 84 copies
Waste due to rewebbing: 50 copies
Re-start during D: 500 copies
Total: 634 copies
Pagination: 24 --> 84 kg of paper at
1300 DM/t --> 110 DM for paper waste

2. Ink costs: 4 DM for wasted inks

3. Energy costs: Difficult to estimate, about 10 DM and 90 DM for a severe break

4. Labour costs:
Hourly rates: 31 DM for press- and reel room personnel, 28 DM for mailroom and 30 DM for transport personnel
8 persons in the press- and reelroom, 2 in the mailroom and 3 responsible for transport
### Efficient use of newsprint

#### Web breaks

Web breaks as a cost factor:

<table>
<thead>
<tr>
<th></th>
<th>Normal break (10 min)</th>
<th>Severe break (90 min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. paper</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>2. ink</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3. energy</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>4. labour</td>
<td>67</td>
<td>591</td>
</tr>
<tr>
<td>5. plates</td>
<td>-</td>
<td>750</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>191 DM</strong></td>
<td><strong>1545 DM</strong></td>
</tr>
</tbody>
</table>
Waste Control - Case Study
Helsingin Sanomat (FIN)
Forsssa Plant

Presentation of the Sanoma Corporation:
- Helsingin Sanomat: biggest Scandinavian morning newspaper (circ. ~500,000)
- Ilta-Sanomat: afternoon newspaper, second in Finland (circ. ~200,000)

Three printing plants:
- Vaanta: 15 km of Helsinki - built 1977
- Varkaus: 300 km N of Helsinki - built 1988
- Forsssa: 110 km NW of Helsinki - built 1992

--> With these three plants, 95% of the Finns can have Helsingin Sanomat delivered to their homes before 6.30 a.m.
Waste Control - Case Study
Helsingin Sanomat (FIN)
Forssa Plant

Presentation of the Forssa Plant:
Built in 1992
Total surface: 25,000 m2
Production: ~80,000 Helsingin Sanomat
~130,000 Ilta-Sanomat
Newsprint usage: 15,000 tonnes/year
Number of employees: only 59

Machines and equipment:
- 2 WIFAG OF7 offset presses with 6 printing units, 28 printing couples and a folder
- Honeywell Printa Press Control System
- Reel unwrapping: two mechanical unwrapping stations from Von Roll
- 6 AGVs from BT
- Platemaking: 2 automatic line with Krause and Nela machines
- Ferag mailroom system
1. Paper storage area
2. Pressroom
3. Mailroom
4. Bundle handling
5. Loading area

Fig. 3. The layout of the printing plant in Forssa
Delivery to the stripping station.

Stripping station with removal of wrapper.

Weighing and data recording.
Waste Control - Case Study
Helsingin Sanomat (FIN)
Forssa Plant

Reel handling and storage (1):

Paper storage capacity: 5,000 tonnes
Handling in the storage with fork-lifts
From storage to intermediate storage: mechanical conveyor which brings the reels to the unwrapping stations.
The mechanical unwrapping stations include also weighing scales
After unwrapping, the bar code is read by the BT AGV. From that time, the system knows the location and status of each reel. If the bar code cannot be read the data is input manually.
Depending on the number of copies needed, the AGVs bring the right number of reels to each reelstand.

-----
Waste Control - Case Study
Helsingin Sanomat (FIN)
Forssa Plant

Reel handling and storage (2):

The Wifag Autorob system moves the reel automatically to the reelstand arm.
When the old reel is changed to a new one, a container comes to take the core.
A button has to be pressed to unload these containers.
After production is over, all the reels still remaining near the reelstands are taken back by the AGVs to the intermediate storage. (This has to be made because the grammage of Ilta-Sanomat is 48.8 g/m2 and the grammage for Helsingin Sanomat is 40).
Waste Control - Case Study
Helsingin Sanomat (FIN)
Forssa Plant

Paper waste and its handling (1):

There are several types of waste.
In the reelstand and intermediate storage, there are 3 different types of containers:
- One for the wrapper waste from un­
wrapping station
- one the control samples from the con­
trol cabinets (belongs to production printed waste)
- one receives waste from the folder (white make-ready and white press waste) when the press speed is under 8000 ex/h.

The containers can be weighed by a scale form BT which lays on the route of the AGV. The AGV computer system stores the different weights coming from these different containers.
Waste Control - Case Study
Helsingin Sanomat (FIN)
Forssa Plant

Paper waste and its handling (2):

When the newspaper is not ready but the speed is over 8,000 ex/h, the waste copies drop to the storage containers.

When the press is running, the Ferag net and Wifag gross counters are sending the real time figures to the Printa control system.

From these figures it is possible to get:
- the start-up waste
- the production printed waste
- the mailroom waste

In the mailroom, there are two waste containers which are emptied and weighed by AGVs.
Waste Control - Case Study
Helsingin Sanomat (FIN)
Forssa Plant

Reel and waste handling systems - Automatic control (1):

Five different systems integrated together via interfaces:

1. **BT Carrier system**: gets the reel info from the IFRA bar code. When a reel is given to the Wifag autorob, the code is transmitted.

2. **The reelstand program of Printa** (software Wifag and hardware Honeywell): transmits the IFRA code to Printa. Gives also the real-time diameter of the reels. When AGV comes to empty reels from the arm, it gives the remaining diameter and the IFRA-code.

3. **Printa Control System**: controls the number of net and gross copies for each production (gets the values from Ferag and Wifag counters). Receives the needed reel information from Wifag system. Gives the production information (time, copies, breaks, ...) to the production management system called FOHA.
Waste Control - Case Study
Helsingin Sanomat (FIN)
Forssa Plant

Reel and waste handling systems - Automatic control (2):

4. FOHA Production Management System: (developed by Honeywell and HS). Connects the three printing plants. For this system: 70 PCs. Handles all the production information and produce diagrams (press speed, facsimile transmission, printed copies...). Makes daily, weekly, monthly and yearly production reports. Counts the weight of the half-used reels from their diameters and grammages and send the information to the SOMA system. When a reel is used, the system sends its IFRA code to the SOMA system.

5. SOMA Material Management System: Real-time paper storage information. All the information concerning the reels come from the mill via an electronic mailbox.
Waste Control - Case Study
Helsingin Sanomat (FIN)
Forssa Plant

Waste statistics:

Most important figures: start-up waste, printed production waste and mailroom waste.

Results: Through 1993, the waste figures have decreased. The start-up waste has been many times under 500 copies.

Total waste percentage:
8.5% for Helsingin Sanomat
8.1% with Ilta=Sanomat

Advantages: The targets for the different types of waste can be fixed and solutions can be discussed to reach these targets. The trends on the waste figures of the proposed solutions can be immediately followed.
Bar coding of the newsprint reels

The 16-digit bar code by IFRA

(Approved by the IFRA Newsprint Committee on October 1, 1991)

Digits 1 to 8: Reel number

The reel number is in general as follows:

Scandinavian manufacturer:
Digit 1: Paper machine No.
Digits 2 and 3: Week of manufacture
Digits 4 to 8: 5-digit serial number
  No. 00001-49999 even years
  No. 50000-99999 uneven years

Central European manufacturer:
Digit 1: Paper machine No.
Digits 2 and 3: Week of manufacture
  Digits 4 to 6: 3-digit tambour number
    No. 001-499 even years
    No. 500-999 uneven years
Digit 7: Set from tambour
Digit 8: Position in tambour

Digits 9 to 12: Reel weight

The digits 9 to 12 represent the gross reel weight.
For example, here, the gross weight of the reel is 732 kg.

Digit 13: Copacking + Manufacturer code

Copacking:
If digit 13 = odd number (1, 3, 5 or 7): 1 reel per wrapping.
If digit 13 = even number (2, 4, 6 or 8): 2 reels per wrapping.
Manufacturer code:
Digit 13 = 1 or 2: Previous classification
  3 or 4
Digit 13 = 5 or 6
  7 or 8

Digit 14: Grammage and quality

The ten possibilities for digit 14 are:
1 = 40 g/m² standard newsprint
2 = 45 g/m² standard newsprint
3 = 48.8 g/m² standard newsprint
4 = 52 g/m² standard newsprint
5 = other standard newsprint
6 = 45 g/m² upgraded newsprint
7 = 48.8 g/m² upgraded newsprint
8 = 52 g/m² upgraded newsprint
9 = 55 g/m² upgraded newsprint
0 = other

Digits 15 and 16: Manufacturer code

See enclosed list for the manufacturer codes.