<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>New damping systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author(s)</strong></td>
<td>Fuchs, Boris.</td>
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<tr>
<td><strong>Date</strong></td>
<td>1994</td>
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</table>
New Damping Systems

By

Boris Fuchs
IFRA/AMIC - Workshop Web Offset Technology in Bangkok, Thailand, 8 - 9 September, 1994

New Damping Systems

Boris Fuchs, IFRA
DAMPING SYSTEMS

PRINCIPLES:
contact - non-contact
direct - indirect
predamping - postdamping

Figure 4. A conventional contact damping system (left) and a contactless system (right).

A preferable way is:
non-contact (to avoid ink feed back)
direct (to avoid over emulsification)
post damping (because of wider tolerances)
1. Insulated water pan
2. Motorised, infinitely-variable water fountain rollers
3. Motorised brush roller
4. Page-wide brush shutters
5. Driven chrome roller
6. Plate dampener.
SPRAY DAMPING

ADVANTAGES:

-No circulating water
-Lower temperature of the water
-Quicker start up
-Less water consumption
-Better adjustability (1/2 page)

PROBLEMS:

-Incoming water must be clean not to block the nozzles
-Nozzles must be maintained from time to time to avoid blockages
ifra
### Examples of the application of damping units in web presses

#### Damping unit with ductor roller
- **Zirkon**: Forta, Supra
- **Miller**: WEB 66
- **Albert Frankenthal**: A 101
- **Heidelberg**: WEB 8, WEB 16
- **MAN-Roland**: Octoman, Lithoman, Rotoman
- **Solna**: C 50 H, C 96 H
- **Harris**: M 110, M 200, M 1000, M 300
- **Hitachi**: 660 E, 1000 E
- **Komori**: 20 A, 38 A, 40 A
- **Koebau**: Compacta S 80
- **Nebiolo**: Target III
- **WIFAG**: OF 9
- **Goss**: Urbanite II, Community

#### Turbo system damping unit
- **(centrifugal force rollers)**
  - **MAN-Roland**: Colorman 35, Uniman 4/2

#### WEKO (centrifugal force plate)
- **MAN-Roland**: Colorman
- **Miller**: OP 16
- **Heidelberg**: not manufactured anymore
- **Goebel**: format print

#### Damping unit with brush
- **WIFAG**: OF 7, OF 9.2, OF 5
- **MAN-Plamag**: Cromoset
- **MAN-Roland**: Octoman, Lithoman
- **Miller**: CW 68, Nohab
- **Koebau**: Commander 40/70, Anilox Commander
- **Hantscho**: Mark 10
- **Goss**: Visa/Gazette
- **Toshiba**: OA-1600/1800, OA 1400/1000
- **Baker Perkins**: G 16, G 12, G 14
- **Harris**: M 850, M 200, M 1000, M 300, M 110
- **Hitachi**: 660 E, 1000 E
- **Albert Frankenthal**: ROF A 500

#### Damping unit with vibrator
- **Nebiolo**: Target

#### Nozzle damping unit
- **Suppliers**: Jimek (Sweden), Roto-Screen (USA), Smith (USA), Ryco (USA)
- **Koebau**: Commander 70
- **MAN-Miller**: OP 1500
- **Harris Marini**: Color Journal, N 1600
- **MAN-Roland**: Uniman
- **TKS**: Anilox Offset

*(Newspaper presses underlined)*
### Performance of damping units

<table>
<thead>
<tr>
<th></th>
<th>Brush damp. unit</th>
<th>Brush damp. unit with damp. duct rollers</th>
<th>Centrifugal force</th>
<th>Spray bar damp. unit</th>
<th>Turbo system damp. unit</th>
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</thead>
<tbody>
<tr>
<td>Metering provided</td>
<td>zonal</td>
<td>page-wise</td>
<td>overdamping possible</td>
<td>edge overdamping</td>
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<td>Metering over the web width</td>
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<td>medium</td>
<td>overdamping</td>
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<td>sensitive</td>
<td>rough</td>
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<td>Maintenance of the damping unit</td>
<td>easy</td>
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<td></td>
<td>20-200</td>
<td>1-50</td>
<td>1-200</td>
<td>10-60</td>
<td>180-360</td>
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<td>Maintenance of the damping unit</td>
<td>maintenance intervals (shifts)</td>
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<td>1-50</td>
<td>1-200</td>
<td>10-60</td>
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<td>Cooling</td>
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<td>Influence of the ink</td>
<td>equal</td>
<td>7(9-20°C)</td>
<td>4(15-20°C)</td>
<td>2(12-16°C)</td>
<td>1(11°C)</td>
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<tr>
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<td>unequal</td>
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<td>Influence of the printing substrate</td>
<td>equal</td>
<td>unequal</td>
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<td>DS increase (cyl. rev.)</td>
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<td>10-20</td>
<td>15-20</td>
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<td>10-20</td>
<td>15-20</td>
<td>0</td>
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<td>Response when increasing printing speed</td>
<td>very good</td>
<td>manually</td>
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<tr>
<td>Response when decreasing printing speed</td>
<td>very good</td>
<td>manually</td>
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<td>0</td>
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<td>Wash interval</td>
<td>1000 cylinder revolutions</td>
<td>0 100</td>
<td>200</td>
<td>100-150</td>
<td>40-100</td>
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<td>Printing stoppages</td>
<td>adjusting the DS</td>
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<td>adjusting the ink</td>
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<td>4</td>
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<td>operating conditions DU</td>
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<td>4</td>
<td>1</td>
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<tr>
<td>Manufacturers</td>
<td>7 Koebau Wifag</td>
<td>2 MAN</td>
<td>3 MAN</td>
<td>9 MAN</td>
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<tr>
<td>DS: damping solution</td>
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<tr>
<td>DU: damping unit</td>
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<td>*: no cooling</td>
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<td>Ø: average</td>
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</tbody>
</table>

Table 3.2.1: Performance of damping units.
Drag flow at the rotating disc | Drag flow at the roller circumference

Example for spray damping system

Spray damping application

Plate cylinder

Strong turbulences at the rim zones

Preferred spray target area

Gathering drag flow

Gathering drag flow

Gathering drag flow

Drag flow
FOUNTAIN SOLUTION

Fountain solution in offset printing has the following tasks and requirements

TASKS

- to keep the non-image areas free from printing ink
- to act as a cooling vehicle
- to act as an anti-friction vehicle
## COMPOSITION OF THE DAMPING SOLUTION

<table>
<thead>
<tr>
<th>Type of component</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surfactant, alcohol</td>
<td>Decreasing surface tension, improving wettability, increasing emulsification</td>
</tr>
<tr>
<td>Buffer system</td>
<td>Maintaining the pH value</td>
</tr>
<tr>
<td>Gum arabicum</td>
<td>Plate protection</td>
</tr>
<tr>
<td>Biocides</td>
<td>Slime prevention</td>
</tr>
<tr>
<td>Anti-corrosion agents</td>
<td>Corrosion prevention</td>
</tr>
<tr>
<td>Anti-foam agents</td>
<td>Foam prevention</td>
</tr>
<tr>
<td>Complex former (EDTA)</td>
<td>Inactivation of calcium and other metal ions</td>
</tr>
</tbody>
</table>
REQUIREMENTS

- Ability to spread quickly and evenly. The better the spreading, the less water is needed to cover non-image areas > less back transfer to the inking unit, less water marks

- Ability to form a homogeneous emulsion with the printing ink to form an ink/water balance. Correct emulsification

- Ability to achieve stable correct pH (4.8 - 5.3)

- Ability to resist slime formation
Damping agent components and their tasks

**Water** 92 to 99%: Limited range of hardness to prevent printing difficulties (foaming when running blind, filling-in, etc.). Possible hardness: 4 to 15°dH. Optimal hardness: 8°dH.

**Additives** 8 to 1%

Wetting agent: Setting of a surface tension that should result in a spreading on the damping agent-carrying surfaces, and that realises an ideal emulsification with the ink.

\[ \gamma_{\text{damping agent}} = 35 \text{ to } 65 \text{ mN/m} \]
\[ \gamma_{\text{water}} = 72.3 \text{ mN/m} \]

Acid: Setting of a pH value to eliminate plate wear and tear and toning. pH value = 4.5 to 5.8

Buffer: Maintaining the set pH value.

Colloid: Maintaining and renewing the diffusion layer on the non-image parts of the plate, a precondition for ideal damping agent spreading and running free (similar to the colloid of gumming).

Glycerol: For maintaining all rubber surfaces.

Algicide agent: To protect against, or inhibit micro-organism build-up or decay.

Anti-corrosion agent: To protect against, or inhibit corrosion.

**Case of alcohol damping**

Isopropanol 5 to 30%: A further reduction in the surface tension leads to better wetting (up to \( \approx 30 \text{ mN/m} \)). Increase in viscosity, approximately double at 20% isopropanol (from about 1 cSt with additives to 2 cSt with additives and 20% isopropanol). Rapid evaporation causes a cooling effect.

Physiologically not generally recognised as safe!
A comparison of Conductivity and pH curves.
Surface tension of different liquids

- Alcohol: 22 mN/m
- Water: 72 mN/m
- Quicksilver: 480 mN/m
Measuring points

- **Eurodamp**
  - $\sigma = 31.9\ \text{mN/m}$
  - $\sigma_d = 29.4\ \text{mN/m}$
  - $\sigma_p = 2.5\ \text{mN/m}$

- **Europlast**
  - $\sigma = 35.3\ \text{mN/m}$
  - $\sigma_d = 28.8\ \text{mN/m}$
  - $\sigma_p = 6.5\ \text{mN/m}$

- **Eurota**
  - $\sigma = 43.7\ \text{mN/m}$
  - $\sigma_d = 5.4\ \text{mN/m}$
  - $\sigma_p = 38.3\ \text{mN/m}$
Isopropanol: clear viscosity increase
Damping solution additive: smaller viscosity increase
Isopropanol: moderate reduction of the surface tension
Damping solution additive: strong reduction of the surface tension
Tap Water:
< 3°d, < 30 mg/l chloride

Comment:
Danger of corrosion
Contact damping systems
Settling of ink on damping rollers

What to do:
Add 0.5 % conditioning concentrate
Tap Water:
7 -12 °d, < 30 mg/l chloride

Comment:
Perfect for printing

Water treatment:
Not necessary
**Tap Water:**
15 -20 °d, < 30 mg/l chloride

**Comment:**
- Having small printing areas on plate (cyan, magenta)
- Too much damping solution into ink
- Ink splitting will be worse
- Ink density of the printed paper goes down
- Precipitates (white) on the damping rollers
- Stripping of ink rollers

**What to do:**
1. Deharden water to 7 - 12 °d (chloride will not be removed)
   or
2. Reversed osmosis (removes 95% of all ions and all fungi and bacteria), then mixing with tap water to give 7 - 12 °d,
   or better (when tap water quality is not constant: add 0.5% conditioning concentrate)
Tap Water:

> 50 mg/l chloride

Comment:

Danger of corrosion

What to do:

Reversed osmosis (removes 95% of all ions and all fungi and bacteria), then mixing with tap water to give 7 - 12 °d,
or better (when tap water quality is not constant: add 0.5% conditioning concentrate)
\[ d_T \approx 0.73 \sqrt[3]{\frac{6 \cdot 1}{g \cdot f_a}} \]
Location of the test damping unit in the Zirkon 660

View into the test damping unit with air guiding elements
• Ink pump system with direct plate dampening
• Ink pump system with ink train dampening