Spengler goes Florentil …
Electrostatic printing assist system – the original

by Alfred Doppler, managing director of Spengler Electronic AG

Our team - comprised of joint venturers and partner companies with whom we have worked together for many years - has been developing and producing for decades the worldwide, renowned Spengler technology and quality in the field of specialised electro-technical devices for electrostatic applications, used in the most innovative, worldwide industrial applications .

One of our core competencies are electrostatic printing assist systems in the rotogravure printing industry.
Electrostatic printing assist systems (ESA) are the current state-of-the-art in rotogravure for illustrations or packaging print and are a „must have“ for all quality printing.

Task

Electrostatic printing assist systems ensure colour transfer from the paint cups of gravure printing cylinders onto the print substrate, paper or film and prevent formation of „missing dots“.
Missing dots are points that are missing in the print where the printing ink has not been transferred from the cup of the gravure printing cylinder onto the paper or the film.
Missing dots mostly occur on rough or uneven surfaces of the printing material or on fast-running gravure printing presses.

Physical principle of electrostatic printing assist systems

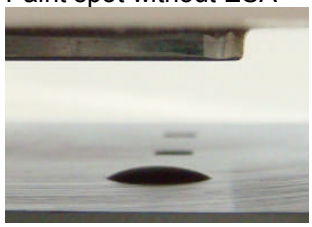
The impression roller is controlled, loaded with a DC voltage and serves as current source over the printing substrate.

The goal here is to achieve an even flow of current to the electrically grounded gravure cylinder over the entire print width.

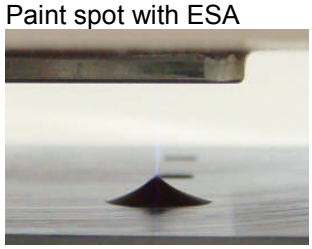
The evenness of the current flow is defined by the loading system and the quality of the impression roller.

The dipoles of the printing ink in the cup of the grounded gravure cylinder, which is comprised of various materials such as pigments, solvent and binding agent, are polarised within the field of the DC current, resulting in an increase in volume that ensures improved colour transfer onto the print substrate.

Paint spot without ESA



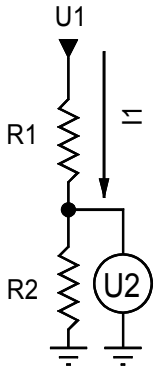
Paint spot with ESA

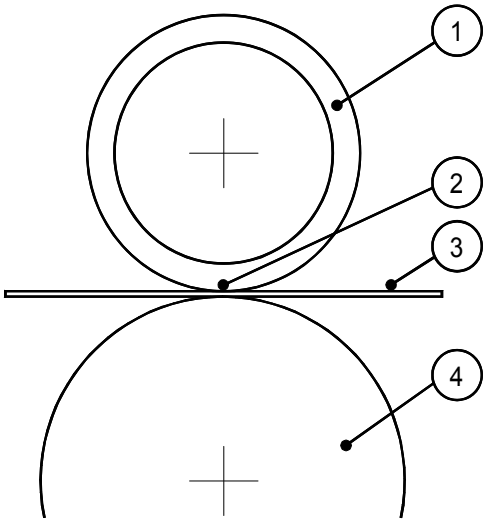


You only need a minimal current that generates a current field for polarisation work in the printing ink to achieve this effect.
We know from experience that in case of indirect loading systems, a current flow of approx. 15-20 µA per cm is required; in case of direct loading systems, a current flow of approx. 30-40 µA per cm impression width is required.
This means that a powerful, direct loading system should be designed for a power of at least 10 mA for an impression width of 308 cm.
The voltage between the print substrate and the impression roller - the „nip voltage“ - is then usually between 600 and 1000 volts using common ESA impression rollers.

U1 Supply Voltage
U2 Nip-Voltage
R1 Semi-conductive layer of impression roller
R2 Printing substrate
I1 DC-Current

1 charged semi-conductive layer of impression roller
2 Nip-voltage
3 Printing substrate
4 Engraved cylinder





An operating voltage of 20,000 volts is therefore required for indirect systems and up to 3,000 volts for direct loading systems to compensate for transfer losses through the semi-conducting impression rollers and air gaps.

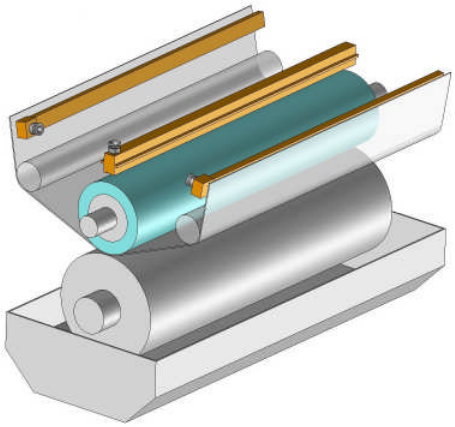
Expected results

We guarantee print-out quality for all of our loading systems, even in case of only partial assignment of the maximum printing width

- throughout all tonal ranges (gravure depth 5-40 µm), especially within the half-tone and quarter-tone ranges
- over the entire paper web width
- over the entire paper web length
- with no high-frequency or low-frequency fluctuations
- The fluctuation in densitometric density, which is not to be attributed to gravure tolerances, is not exceeded by more than ± 0.01in the bright range or by ± 0,05 in the dark range, evaluated as standard deviations.
- The impression contact pressure can be reduced up to 50%. This increases the lifetime of the impression roller and saves energy.

We offer several loading systems depending on the wishes of the respective customer, the conditions at the machine end and the ESA impression rollers.
All systems comply to the current state-of-the-art and therefore fulfil without exception the legal requirements of European ATEX Ordinance 94/9/EU.

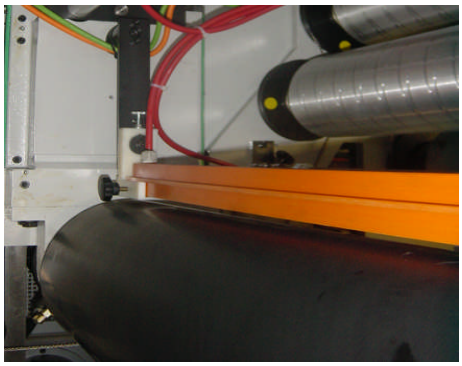
Our classic, the loading system H-35



The power range of the loading electrode is almost that of the impression roller width.

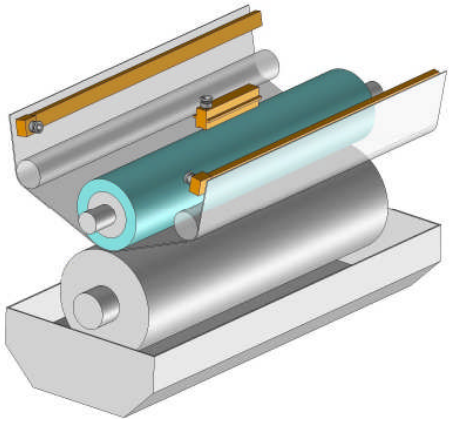
The even current flow of this non-contact loading system is achieved over the length of the loading electrode.
Print-out is guaranteed, even in case of a reduced web width.

The H-35 loading system requires a two- or three layer ESA impression roller.



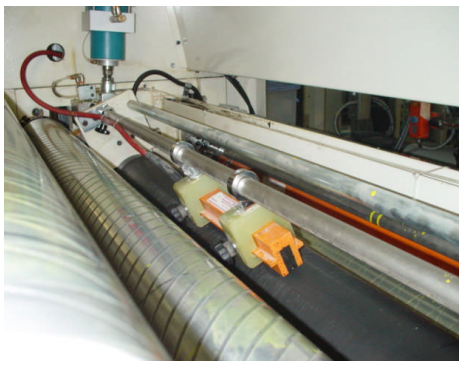
Indirect loading with long electrodes has the advantages of simplicity and reliability. The main disadvantage is that the long electrode gets dirty and has to be regularly cleaned, especially at the border and edge areas.

The short…, the loading system H-98



A patented further development from Spengler is the „short“ electrode. The electrode can be designed at a length of 1/6 of the width of the impression roller. The complete electrode is placed within the print substrate and therefore protected from dirt and spray mist. The cleaning cycles are longer by several factors and handling is therefore simpler.

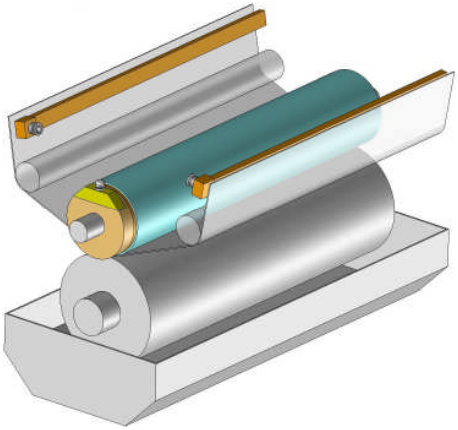
The even current flow of this non-contact loading system is achieved by a highly-conductive layer in the interior of the impression roller.
Print-out is guaranteed, even in case of a reduced web width.



The H-98 loading system requires a three layer ESA impression roller.

This loading system is an alternative to the almost maintenance-free side-loading systems.

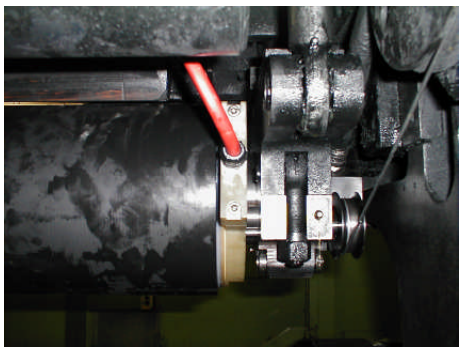
The direct…, the loading system ESA-2000



This side-loading unit works with direct contact to the impression roller and is the most powerful in terms of efficiency – worldwide!

Depending on the design, this loading system requires a single-layer impression roller with insulated bearings (not in conformity to ATEX) or a three-layer impression roller with non-insulated bearings (in conformity to ATEX) and is considered to be maintenance-free.

Due to the constructive design of the Spengler ESA-2000 side-loading unit, no power limitation is specified.



The devices currently used work with a voltage of up to 3,000 volts and a current of up to 15 mA.

This permits greater electrical resistance bandwidths of the semi-conductive coating, and greater production tolerances when manufacturing ESA impression rollers.

Florentil, the „New“ addition in package printing with impression roller sleeve system

This novel innovation on the world market is comprised of an almost maintenance-free side-loading system, constructed on the basis of the powerful ESA-2000 loading principle, which has been tried-and-tested over many years.

Comment on existing solutions from the perspective of standard technology:
In case of already-known side-loading units with direct or indirect loading, voltage is applied to the entire impression core to facilitate replacement of the impression sleeve in the printing unit.
To ensure that the voltage does not leak away, the impression roller bearing or the axles of impression rollers with inner bearings are electrically insulated.
The single-layer sleeve is now contacted with the current-carrying axle, as is the case with antistatic impression rollers.

Please note that for reasons of technical standards, this is not permitted in Europe when operating a gravure printing press with flammable solvent-based inks within an explosive environment.

Observance of the standards laid down according to the European ATEX Ordinance is exhaustive and an absolute „must“ for all operators.

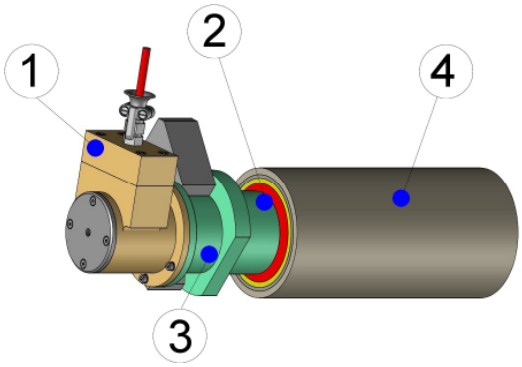
Depending on the type of protection to ensure the loading unit complies to the standards, the power output of these competing systems must be severely limited to prevent dangerous flammable discharges from the live impression roller core.
Please also note that no electrical current may be fed through roller bearings in explosive environments.

In addition to the standards for electrical devices in explosive areas, the mechanical components and their conformity is also unfortunately often ignored.
For instance, EN 13463-5 stipulates that all bearings must be protected against electrical currents, including stray currents. Electrical bearing insulations may also result in dangerous heat states in the bearings.

Axle insulation not permitted EX area

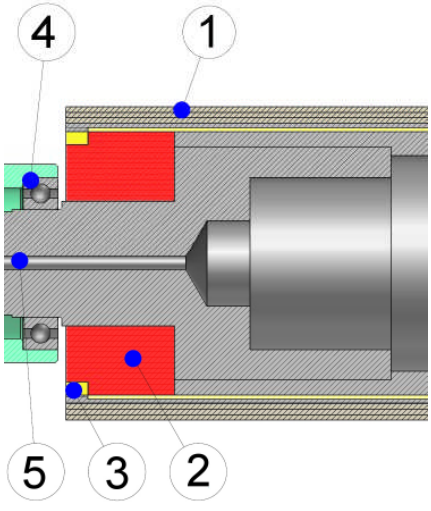
Florentil, the new addition to the Spengler loading unit family
Using this system, which has already been registered for patent, the effective current transfer can also be made outside of the gravure unit and is therefore completely protected from dirt and spray mist.

1 Transfer unit
2 Impression roller axle
3 Impression roller bearing without insulation
4 Three-layer impression roller sleeve with interior contact



Electrical contact of the three-layer sleeve is on a defined contact surface of the impression roller axle that is electrically insulated from the core.

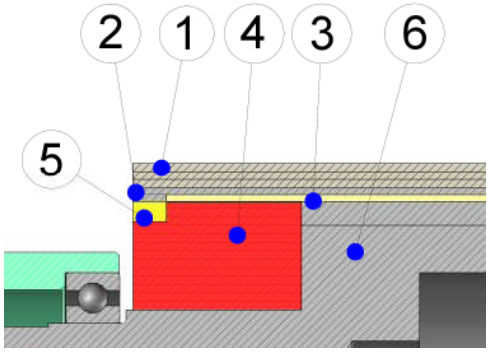
1 Sleeve
2 Insulation
3 Contact surface
4 Impression roller bearing
5 Compressed-air line for sleeve replacement



The impression roller sleeve is constructed in three layers:
GRP is the base material, followed by a highly-conductive layer for load distribution over the entire printing width and then a semi-conductive outer layer to limit the current. The highly-conductive layer is fed on one side to the inner surface of the GRP tube.

An insulation ring is installed at one end in the impression roller core. A live ring is embedded at the outermost end of the insulation; when the impression roller sleeve is pulled on, this then contacts to the highly-conductive layer.

1 Semi-conductive layer
2 High-conductive layer
3 Insulating layer
(GRP base material)
4 Insulator
5 Contact ring
6 Impression roller core



In summary, the advantages of this contact system are:

- more-or-less maintenance free loading of the impression roller
- reduced soiling of the impression roller from spray mist
- longer lifetime of the impression roller bearing
- ESA and ESD impression roller in one unit
  The impression roller also functions as an antistatic impression roller when the ESA system is switched off.
- Conformity to standards (ATEX) fulfilled completely
- High resistance bandwidth and production tolerances of the ESA sleeve impression roller.
- Longer maintenance cycles of the impression roller using tried-and-tested ESA 2000 side-loading technology with a maximum loading voltage of 3,000 volts.
- Can be retrofitted to existing machines

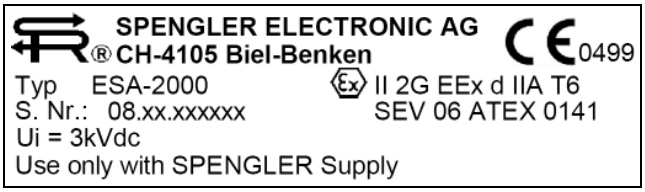
Compliance to the ATEX Ordinance standards is exhaustive. Two important points should be mentioned here:

- no power reduction is required
- no ball-bearing currents

Checklist to evaluate an ESA system for operation in an explosive environment:

- EC-Type Examination Certificate(s) in compliance to ATEX Ordinance 94/9/EU
- Recognition of the quality assurance of the manufacturer by an approved test location within the EU.
- **CE mark with ID number of the location mentioned that is involved during the production phase.**

Example marking of a direct-contact system:



Example marking of a non-contact system:

Systems without appropriate markings and approvals must not be operated in the explosive type of environment typical for gravure printing presses due to reasons of safety and liability.

We will be presenting the new Florentil sleeve loading system at our stand at the DRUPA 2008 (Hall 15, Stand A38).