

9 marzo 2023

Sheraton Milano

San Siro



Rotogravure Printing and Sustainability

A Survey and Interview Report

Prof. Lutz Engisch • iP³ Leipzig • University of Applied Science Leipzig (HTWK Leipzig)



**GRUPPO ITALIANO
ROTOCALCO**
By Acima

Outlook

- Overview analysis printing process
- Results Survey Study
- Approaches of a LCA
in the field of gravure printing

How we started

Evaluation positive aspects of gravure printing

- Re-Use of cylinders in printing houses
- Recycling of printing forms / cylinders
- Stability of printing forms
- New developments in printing form making

Evaluation new development areas

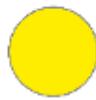
- Evaluation of solvent recovery options
(<90% Energy reducing)
- Evaluation of water based ink (2nd part)

Evaluation of the ecological impact of printing processes.

LCA-Steps Printing Process	Blank Production	Printing Process	Printing Environment	Production Waste	Recycling & Deinking	Ø
Solvent-based Rotogravure	NRE, Cylinder count 5	Low print runs 5 High print runs	VOC, CO ₂ , NRE 5	VOC, CH ₄ 4	Metal, Flotation 2	3.9
Solvent-based Flexo printing	Solvent washable printing plates 6	Low print runs 4 High print runs	VOC, CO ₂ , NRE 4	VOC, CH ₄ 3	Plastics, Flotation 2	3.7
Water-based Flexo printing	Water washable printing plates 3	Low solvents 3	CO ₂ , NRE 3	Low VOC 2	No Flotation 5	3.2
Liquid toner printing (HP-Indigo)	Small cylinders and drums 2	Print-on-Demand 1	VOC, CO ₂ 3	Imaging Oil 3	Two-step procedure (ElectroInk) 4	2.6
Water-based Inkjet	No printing plates 1	Print-on-Demand 1	CO ₂ , NRE 3	Very low VOC 1	No Flotation 6	2.4



1-2 ≈ Low Environmental Impact

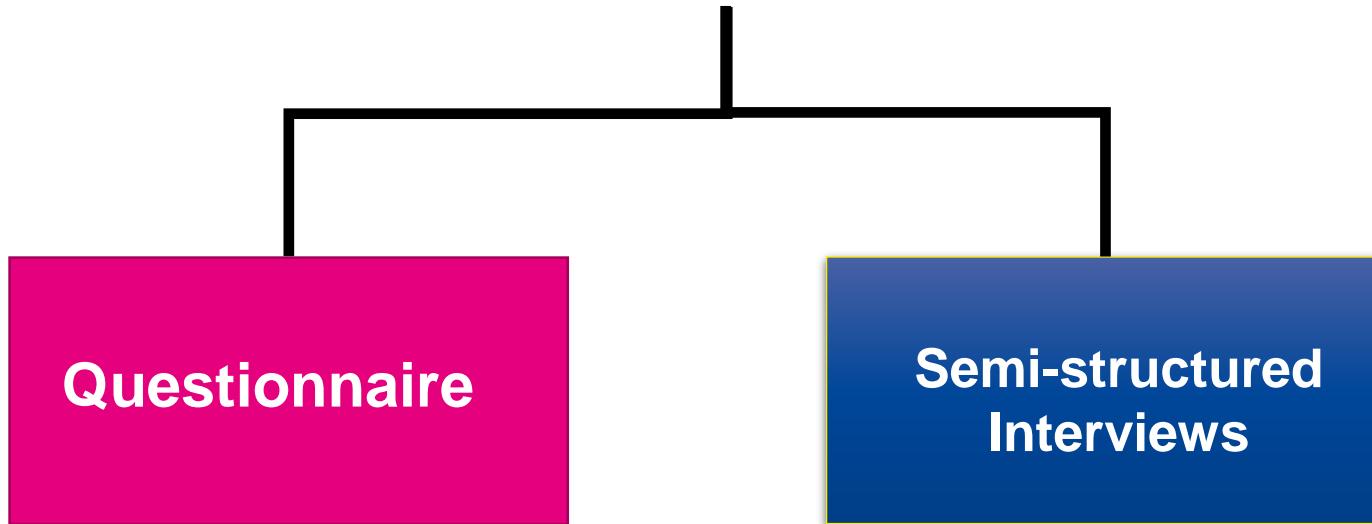


3-4 ≈ Medium Environmental Impact



5-6 ≈ High Environmental Impact

Study „Gravure Printing for Future“



Status Survey Study

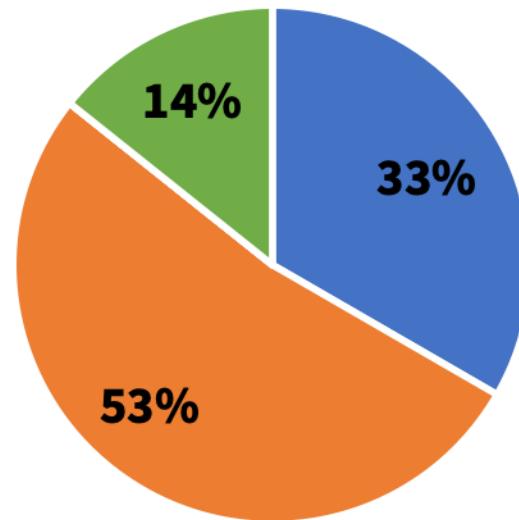
- Online questionnaire created
- Start Online Survey 02/14/2022
- More than 116 contact persons addressed
- Survey end 01/06/2022
- *essentially without the influence of Ukraine conflict*

Status Survey Study

- The survey includes questions to all life stages of the gravure printing workflow.
- Includes upstream and downstream processes, e.g. cylinder engraving and transportation as upstream processes and recycling and deinking as downstream processes.
- Based on the defined role in the gravure printing industry (question 1), the survey contains a certain selection of questions, which are specifically addressed to these stakeholders.

Basis data • Who took part?

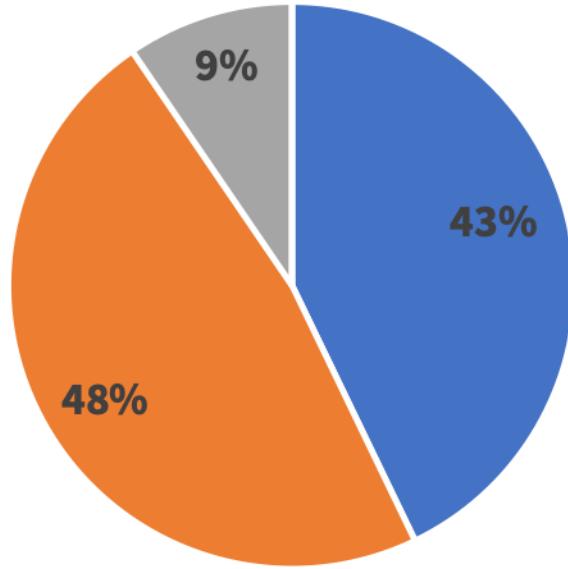
Role in Gravure Printing Industry



- 1 Printer/Converter ■ 2 Cylindersupplier ■ 3 Ink supplier
- 4 Substrate supplier ■ 5 Buyer/Customer ■ 6 Other

Basis data • Who took part?

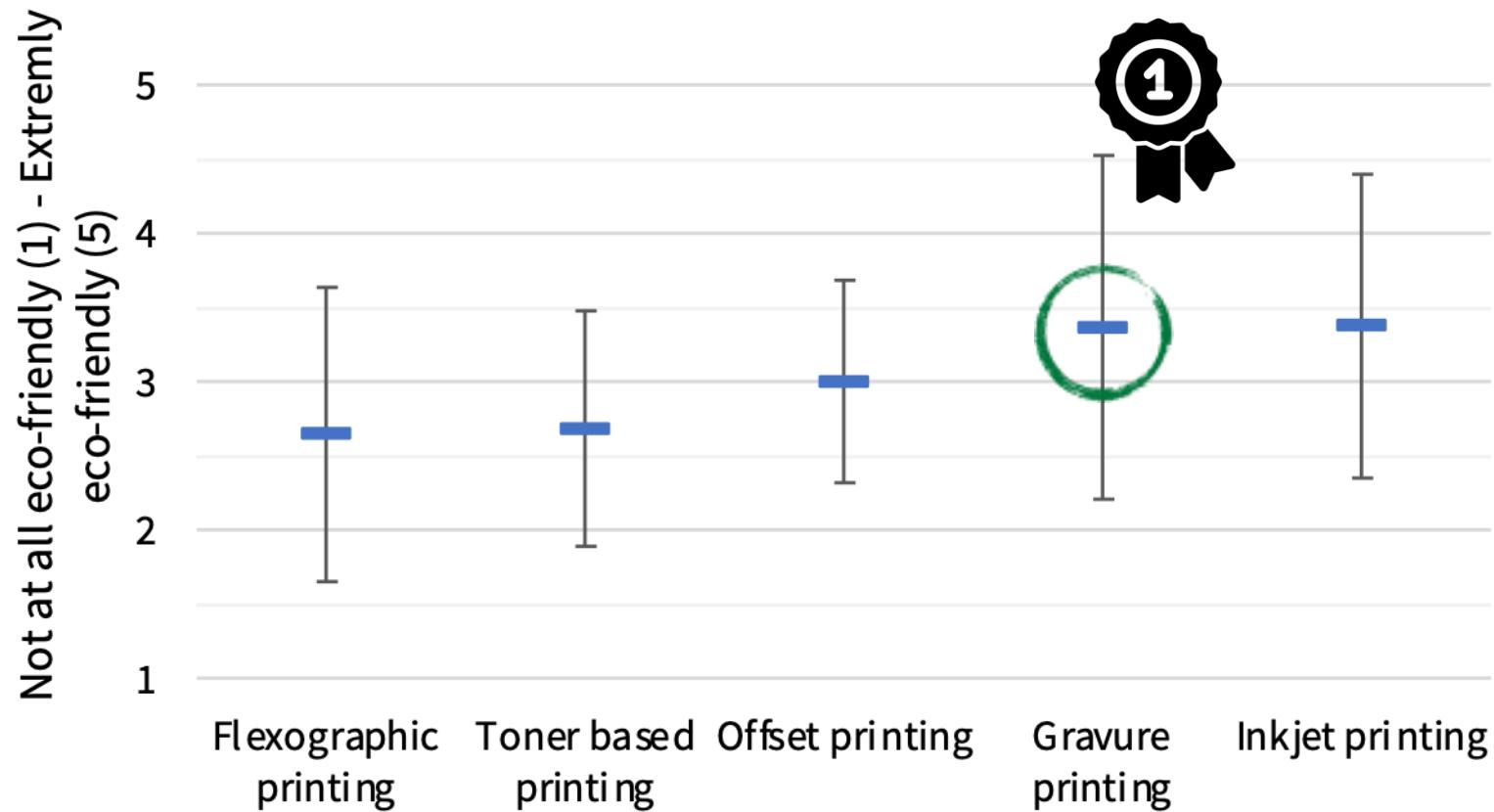
How familiar are you with the issue of ecological sustainability within the gravure printing industry?



- 1 Very familiar
- 2 Moderately familiar
- 3 Somewhat familiar
- 4 Not at all familiar

Comparison of printing methods

Please rate the following printing techniques
in terms of environmental friendliness.



Environmental friendly of gravure printing

In which areas has gravure printing become more environmentally friendly over the past few years?



Advantages and Disadvantages

Which of the following aspects of gravure printing would you rate as an advantage or disadvantage in terms of ecologic sustainability compared to other printing techniques?

- The electrolysis process of chromium trioxide (Cr(VI)) is perceived as the strongest disadvantage of gravure printing.
- The reusability of the base cylinder is perceived as the strongest advantage of gravure printing

Where to improve gravure printing

Please rate the following approaches for improving the sustainability of gravure printing in order of importance.

The strongest approaches are :

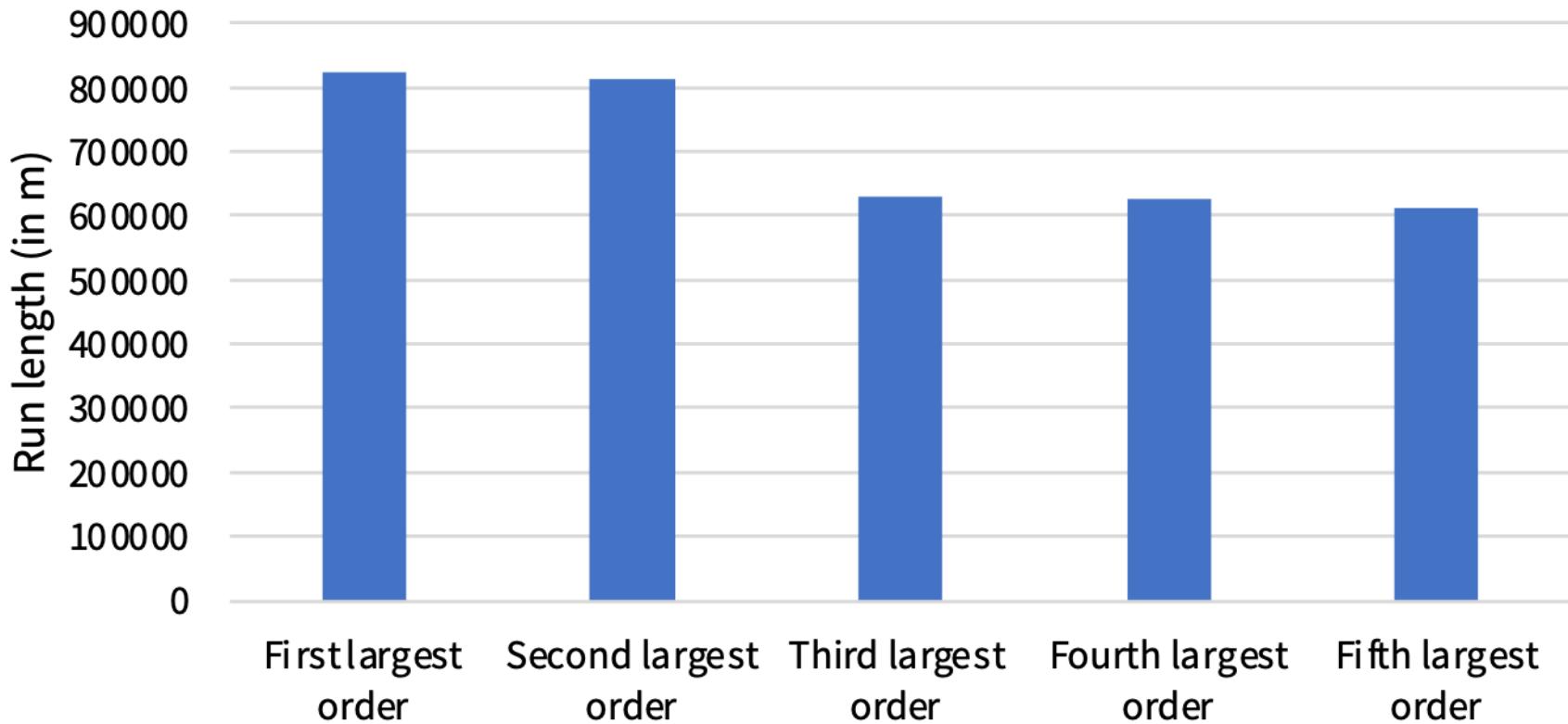
- Recovering solvent
- Using lower ink film (saving ink)
- Substitute Cr(VI)
- Reducing make-ready waste (automation)

Cylinder data

	Mean	Min	Max
As a gravure printer, how many different cylinders do you use approximately per year?	27.500	1.000	70.000
As a gravure printer, for how many jobs is a base cylinder used?	15	4	42
How much make-ready waste is generated by starting the press on average	1.200m	50m	30.000m?
Run length	26.000m	2.000	800.000m

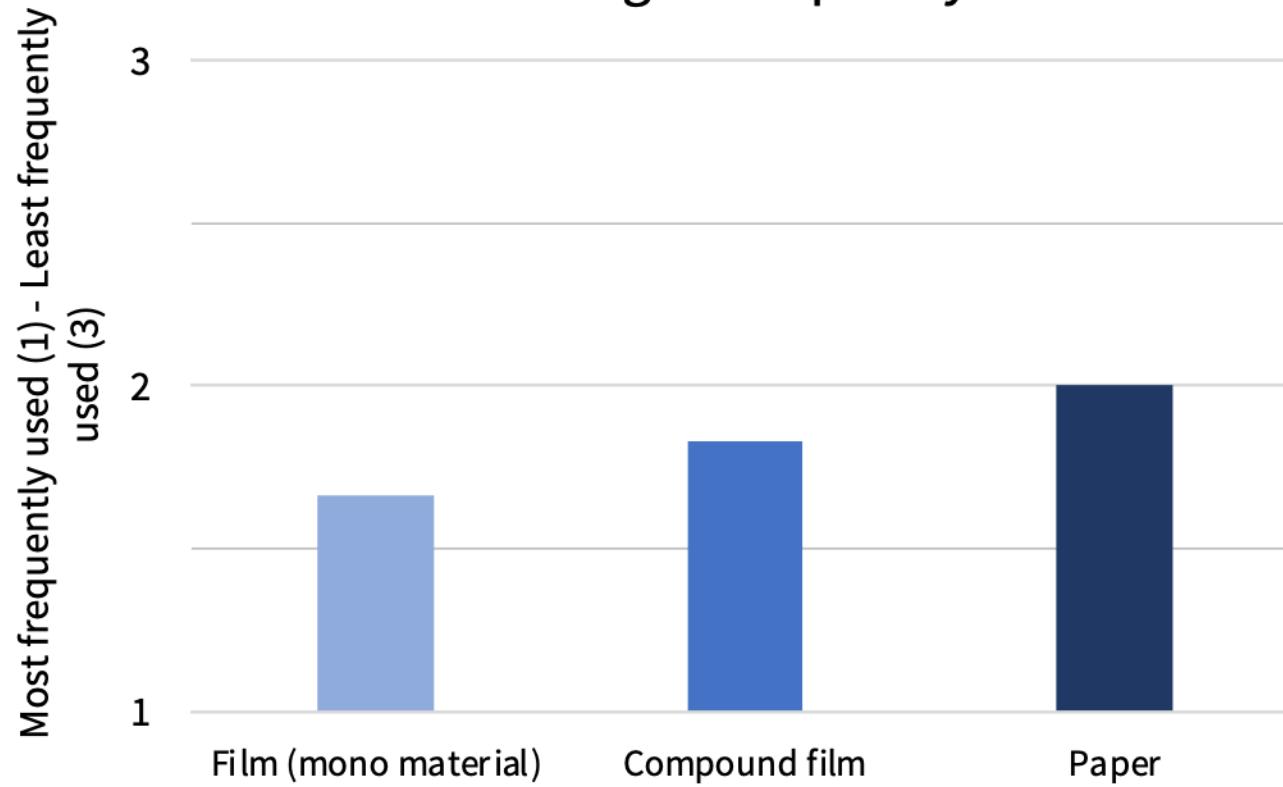
Cylinder data

What were the 5 largest run lengths per imaged gravure printing form ordered in 2019? (in m)



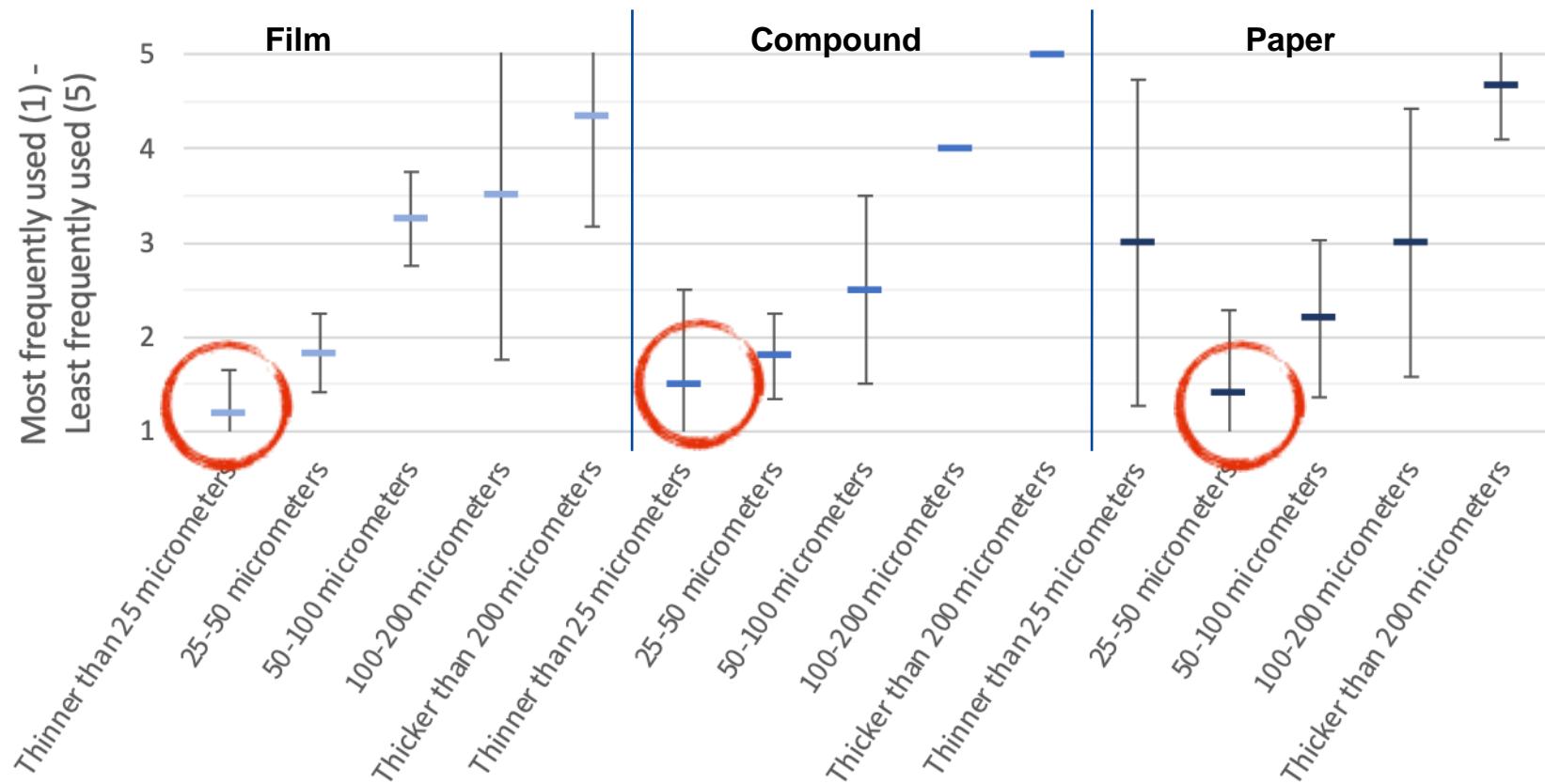
Substrate

What type of substrate is mainly used in gravure printing? Please rank the following substrates according to frequency of use.



Substrate

What is the thickness of substrate used in gravure printing?
Please rank the following paper thicknesses according to frequency of use.



What other beneficial aspects of gravure printing are there in terms of ecological sustainability?

Interchangeability between printing sites
reuse of entire print form

cylinder materials

one print form is sufficient
100% circular economy

Reusability of cylinder

mass production
100% recyclable water based inks components

Material composition of cylinder

Recyclability

Longevity of printing machines

What other disadvantageous aspects of gravure printing are there in terms of ecological sustainability?

non-local suppliers
Printing on blown PE film high weights
warehouse costs
printng on super-thin films

Transport costs long distances

logistics
non-local markets Cylinder storage
printing on recyclable materials

What other approaches to improve sustainability of gravure printing should be pursued?

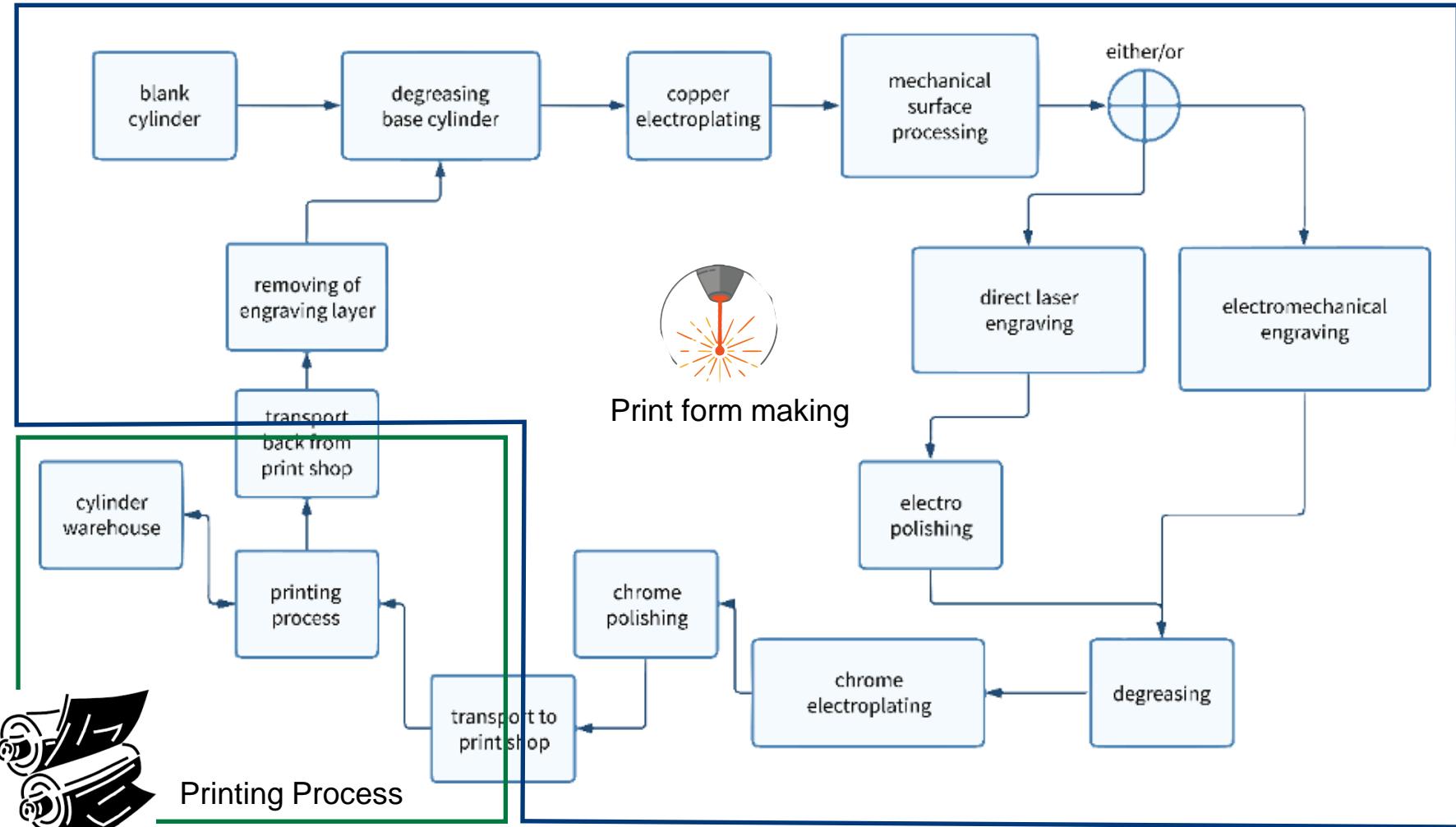
increasing period of cylinder using
faster processing

saving ink reduce make-ready waste
substitute Cr(VI)

automation
less colors less production steps
renewable energy

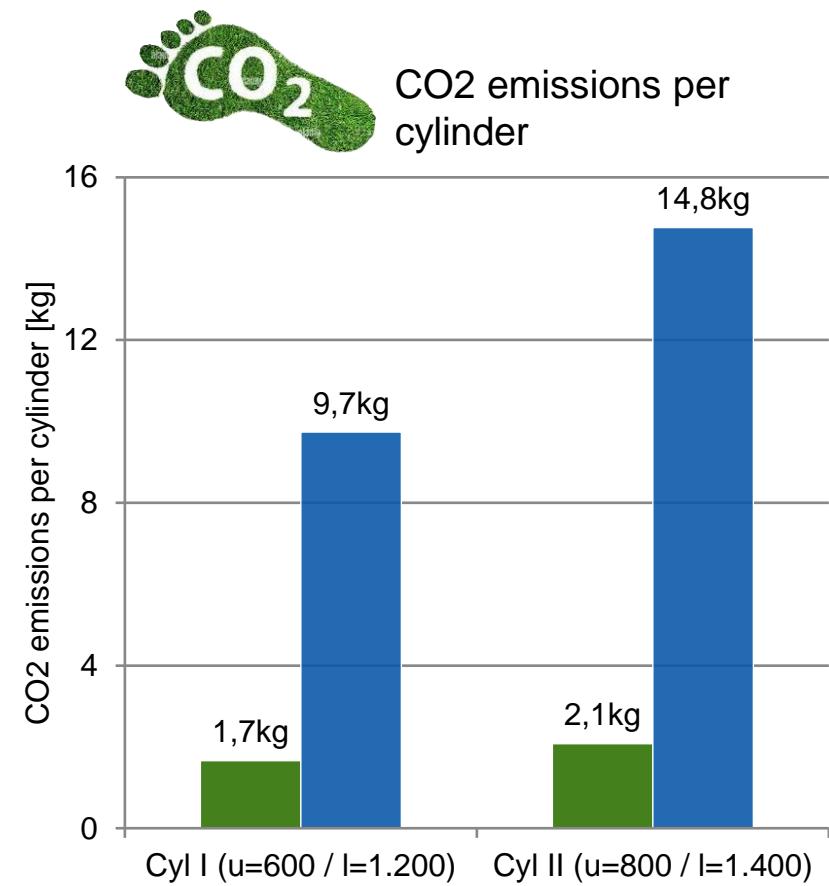
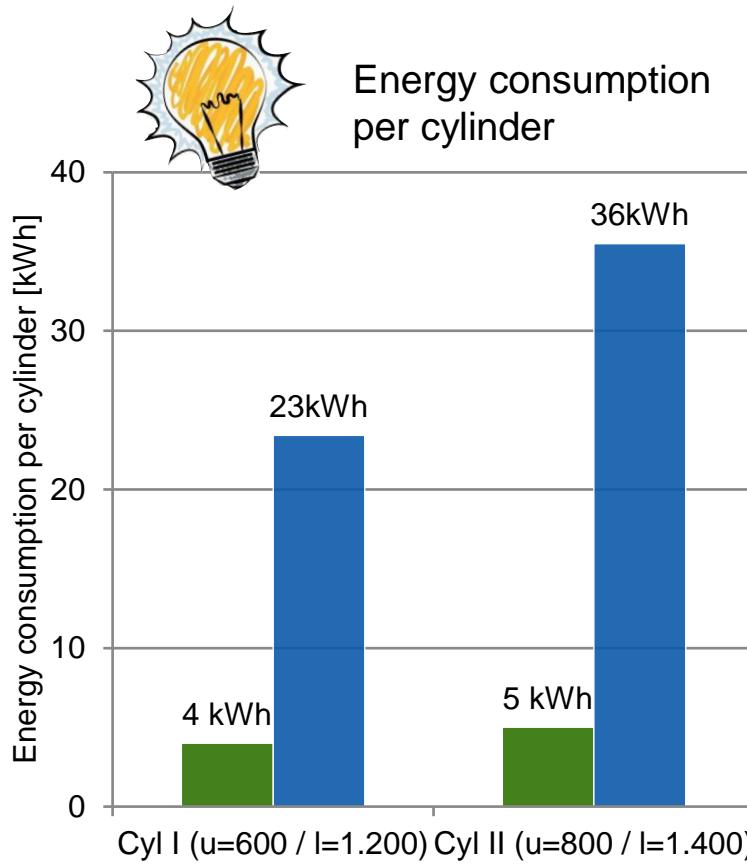
lower ink film

Energy Consumption and CO₂ Emissions



Very first approaches to LCA analysis

Process analysis - Printing form production - Greatly simplified



- Stylus Engraving
- Laser Direkt Engraving

What have we learned?

- **No general statements possible**
 - Case-by-case consideration for every current and future packaging application is required
 - Has to be communicated
- **Long run jobs are still important**
- **Gravure printing has ecological advantages**
 - *Potential for a circular economy*
 - Printing forms are recycled
 - Closed material cycle
- **Current innovations aims main problem (Cr^{VI})**

...ONE MORE THING

- Better communication and coordination within the entire supply chain was often desired
- Includes all players from ink manufacturers, machine builders, design agencies to recycling companies.
- This could drive the coordination and prioritization of developments

What we will do in Leipzig next

- Development of a new research focus for the Institute at the University of Applied Science in Leipzig
- Topic is introduced in depth into the BA and MA courses
- Starting an doctoral Projekt (Kilian Menzel) with the focus of „LCA in the packaging sector“

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