Life Cycle Assessment

Flexographic Printing and Platemaking Update

Life Cycle Assessment performed by:
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Executive Summary

The original DuPont life cycle assessment (LCA)[1] has been updated using the Ecoinvent 3[2] database for relevant inputs and the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment[3] values for the global warming potential impact method. The impacts studied remained the same as the original study (global warming potential (GWP) and non-renewable energy (NRE) consumption).

Digital thermal processing is shown to have a 38% lower GWP impact and a 56% lower NRE consumption compared to digital solvent processing, without including the raw plate manufacturing. When including the plate manufacturing, digital thermal has a 17% lower GWP impact and a 20% lower NRE consumption compared to digital solvent processing.

Flexographic printing remains advantaged over gravure printing with a 46% lower NRE consumption and 51% lower GWP with the updated information.

The updated results validated the findings of the original study. **Thermal plate processing is shown to have a lower environmental footprint than solvent processing.**

Reason for Update

The original study was completed in 2008, with an update to the digital solvent information in 2010. The Ecoinvent databases have had significant updates with more current data. The IPCC also released its 5th assessment values for GWP. With this updated information for the input data and impact assessment calculations, it was time to update the study to see if the conclusions had changed over the past decade.

Life Cycle Impact Assessments

The environmental impacts considered in this study are primary non-renewable energy consumption (fossil and nuclear) and global warming potential.

An update from the original study is the use of the latest GWP impact assessment methodology. A period of 100 years is customary and the Intergovernmental Panel on Climate Change (IPCC) (100 yr) methodology is applied in this study using the values from the 5th Assessment.

Results

Flexography vs Gravure

Figure 1 shows the non-renewable energy consumption and GWP for printing using flexographic and gravure processes using the updated information.

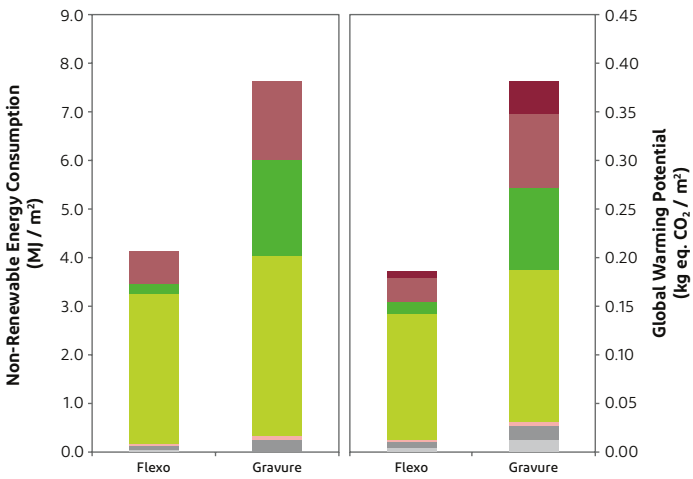

Figure 1: Average Flexo and Rotogravure impact

Flexographic printing has 46% lower NRE consumption and 51% lower GWP than gravure printing. The reason for the difference remains the high mixed ink, cleaning solvent, and electricity consumption in gravure printing. This result is nearly identical to the comparison in the original study.

Flexographic printing leads to **46% lower** NRE consumption and **51% lower** GWP than gravure printing

Flexographic Platemaking

Figure 2 shows the non-renewable energy consumption and GWP for platemaking at the tradeshops or converters using the updated average data.

As seen in Figure 2, the updated Cyrel® FAST System (with PET developer material) platemaking impact has a 56% lower non-renewable energy consumption and 38% lower global warming potential compared to the updated average digital solvent platemaking processes for a 0.067"/1,7 mm plate.

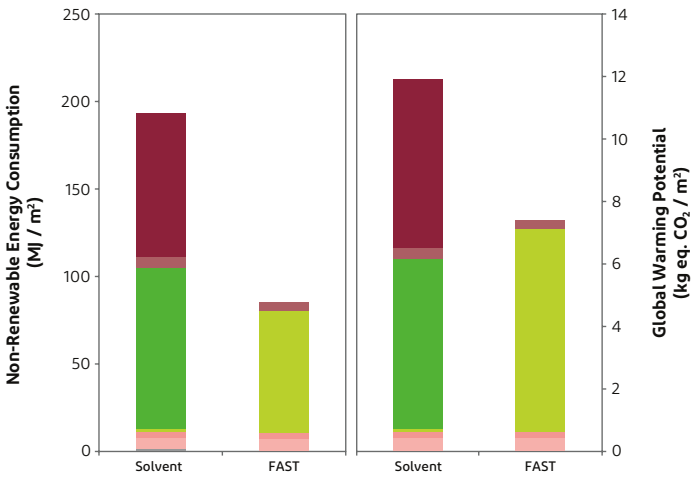

Figure 2: Average digital flexographic platemaking

The most significant change in the results was due to the lower NRE and GWP impact of the evolving electrical grid. Over the past decade, electricity generation from renewable sources and natural gas has increased, while generation from coal has decreased. This has decreased the GWP more than the change in NRE compared to the original study.

Platemaking with Cyrel® FAST leads to **56% lower** non-renewable energy consumption and **38% lower** global warming potential

Flexographic Plate Manufacture and Platemaking

Figure 3 combines the information presented in the previous graph with the environmental footprint of plate manufacturing. The plate manufacturing footprint (grey) is presented as an aggregated number.

It can be seen that there is no difference in plate manufacturing between the different processes. The differences are all in the platemaking process.

Digital thermal has 20% lower non-renewable energy consumption and 17% lower global warming potential compared to the updated average digital solvent plate manufacturing and platemaking processes for a 0.067 plate.

Overall plate production with Cyrel® FAST results in **20% lower** non-renewable energy consumption and **17% lower** global warming potential

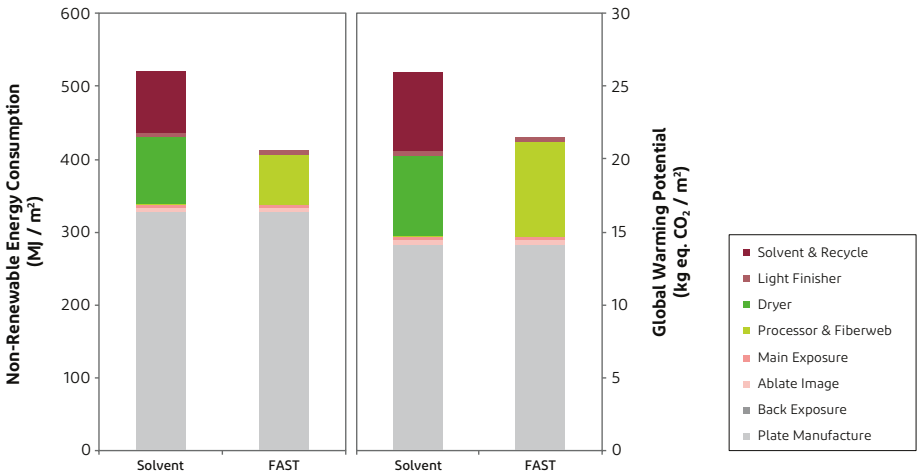

Figure 3: Average digital flexographic plate manufacturing and platemaking impact

References

(1) S. Veith, S. Barr, DuPont, "Life Cycle Assessment: Flexographic and Rotogravure Printing Comparison & Flexographic Plate Imaging Technologies", 2008,

(2) ecoinvent Version 3: Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, [online] 21(9), pp.1218–1230. Available at: (http://link.springer.com/10.1007/s11367-016-1087-8)

(3) Intergovernmental Panel on Climate Change (IPCC): Fifth Assessment Report (https://www.ipcc.ch/report/ar5/syr/)

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