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CO₂ Tax – How it Effects Gravure Printing

NIR is a trademark of adphos.
adphos owns more than 200 patents- or patent applications on the NIR-technology

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Introduction



CO₂-emissions show highest effect for earth warming!

Source: google/pictures



Thermal processing
becomes a
(the mostly) driving
process in printing!



Source: google/pictures



Gas Fired Ovens/Driers

- $C + O_2 \rightarrow CO_2 \uparrow + \text{thermal energy}$
- 1 kg gas \triangleq 8 - 10 kWh thermal energy



1 kWh thermal energy by natural gas generates

- 0.40 kg CO₂ with standard burners
- 0.25 kg CO₂ with highest efficient burners (including thermal heat recovery)

Remark: Germany emits \approx 800 Mio. t/a CO₂!



CO₂-Taxes (Present and Future) (1)



Germany:

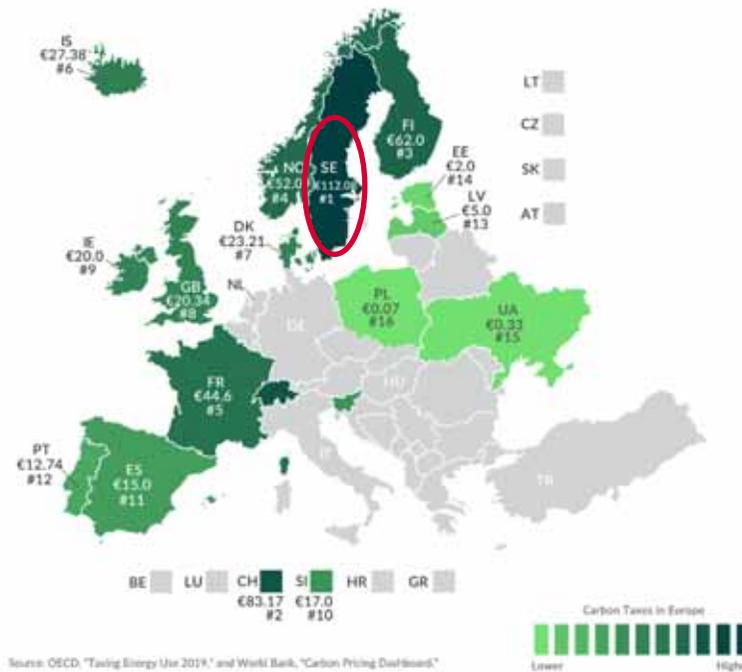
- January 1st, 2021 (?)
25 €/t CO₂ (≈ 28 US \$/t CO₂)
- 2025: up to 55 €/t CO₂
- ≥ 2026: 55 € - 65 €/t CO₂

Source: VDI Nachrichten August 23rd, 2019 – No. 34

CO₂-Taxes (Present and Future) (2)

Carbon Taxes in Europe

Carbon Tax Rates per Ton of CO₂e, as of 2019



TAX FOUNDATION @TaxFoundation

Source: google/pictures



CO₂-Taxes (Present and Future) (3)

Present

short term

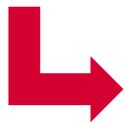
≥ 2030

≥ 25 €/t CO₂

≥ 50 €/t CO₂

≥ 100 €/t CO₂

**Today's waste treatment costs are estimated to 180 €/t CO₂!
(Reference "Bundesumweltamt")**



Question is not if, but only where,
how much and when!



Alternative Thermal Processing (1)

- Alternative burning fuels
 - Ammonia (NH_3) \Rightarrow high No_x generation
 - Hydrogen (H_2) \Rightarrow
 - lack of capacity
 - high price 3.5 – 5 €/kg
 - safety aspects
- Radiation curing systems
 - UV-curing
 - Electro-beam-curing \Rightarrow
 - require special new inks/coating recipes
 - limited to thin film printing/coating



Alternative Thermal Processing (2)

- Electro-thermal processing
 - Electrical heated hot air ⇒
(resistant, induction heated)
 - Infrared based driers ⇒
 - Advanced NIR driers ⇒
- low efficiency, high energy costs
- only applicable to non-temperature sensitive substrates and thin film printing/coating
- extreme compact
- extreme energy efficient
- applicable also for
 - temperature sensitive films
 - solvent based inks/coatings
- extreme improved productivity and enhanced quality



Typical Today`s Energy Consumption for Decoration Printing Presses (1)



These data are referred from a study

“Energie- und ressourceneffizientes digitales Druckverfahren in der Dekorindustrie” (2017)

As well based on printer provided data analyzing its presses (8).



Typical Today`s Energy Consumption for Decoration Printing Presses (2)

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- Gas consumption: 24.9 kWh up to 62.9 kWh based on 10 presses
- Average electrical consumption: 4.6 kWh up to 15.5 kWh

Resulting CO₂-emissions per 1,000 m²

↳ 6.2 kg up to 25 kg



280 g/km
22 km – 89 km



150 g/km
41 – 167 km

“average car”

Source: google/pictures



Application Example



Dryer energy requirements ¹⁾	Hot air (today's Standard)	adphoS NIR - Technology	
		Best case	Worst case
Electrical:	2 -3 kWh/1,000 m ²	8 kWh/1,000 m ²	12.5 kWh/1,000 m ²
Gas supplied:	22 - 44 kWh/ 1,000 m ² ²⁾	----	----
Total costs at energy ratio 5:	10 + 22 = 32 /15 + 44 = 59	40	62.5
energy ratio 4:	8 + 22 = 30 /12 + 44 = 56	32	50
energy ratio 3:	6 + 22 = 28 /9 + 44 = 53	24	37.5

1) 7.5 g/m² water based ink coverage, full width 2,250 mm.

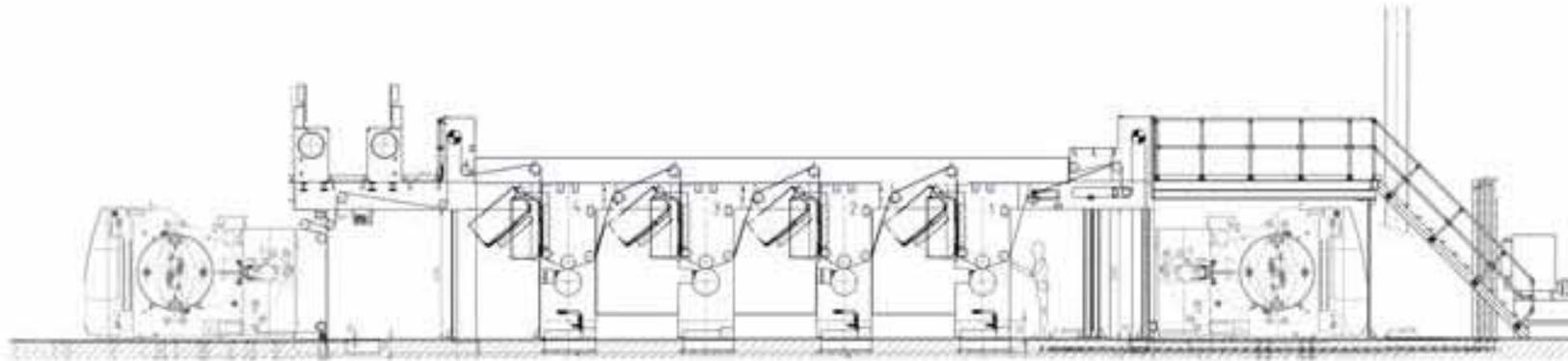
2) Energy consumption for hot air dryer remains constant even for reduced width (so proportional higher energy consumption, according to width/reduction) adphoS NIR[®] dryer requirements remain constant (due to power adaptation to width adjustment). In addition, hot air dryer presses up to **10,000 t/a CO₂!**



Application Example

Water based Inks on Paper (1)

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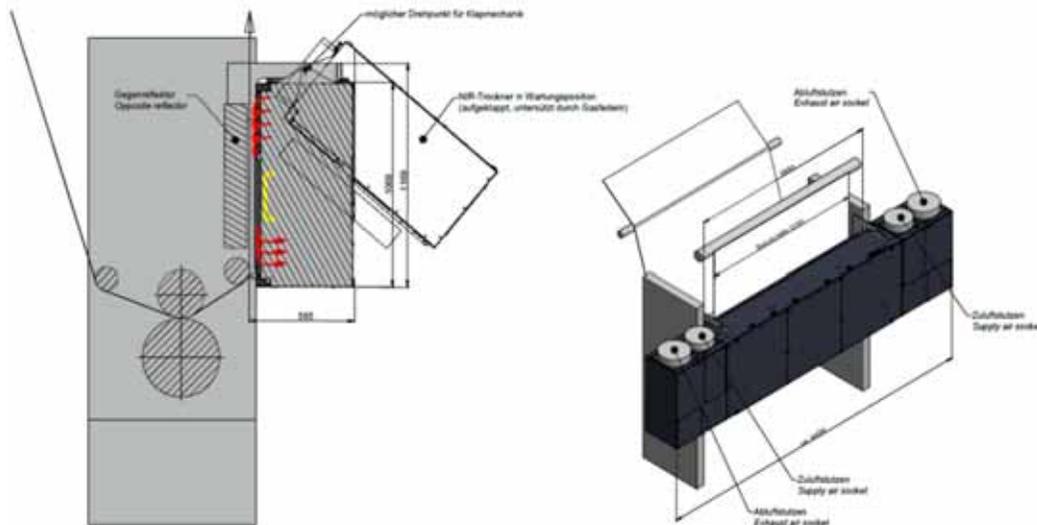


- Substrates: Different paper qualities (e.g. decor relevant)
- Speed: Up to 300 m/min
- Width: Up to 2,250 mm
- Inks: Water based inks (up to 0 gsm)
- 4 print station



Application Example

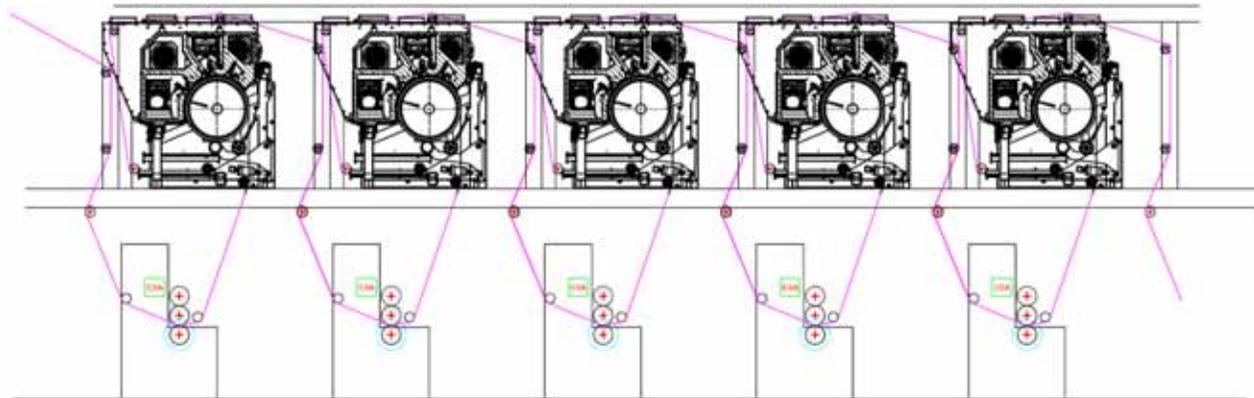
Water based Inks on Paper (2)



Application Example

Water based Inks on Film (1)

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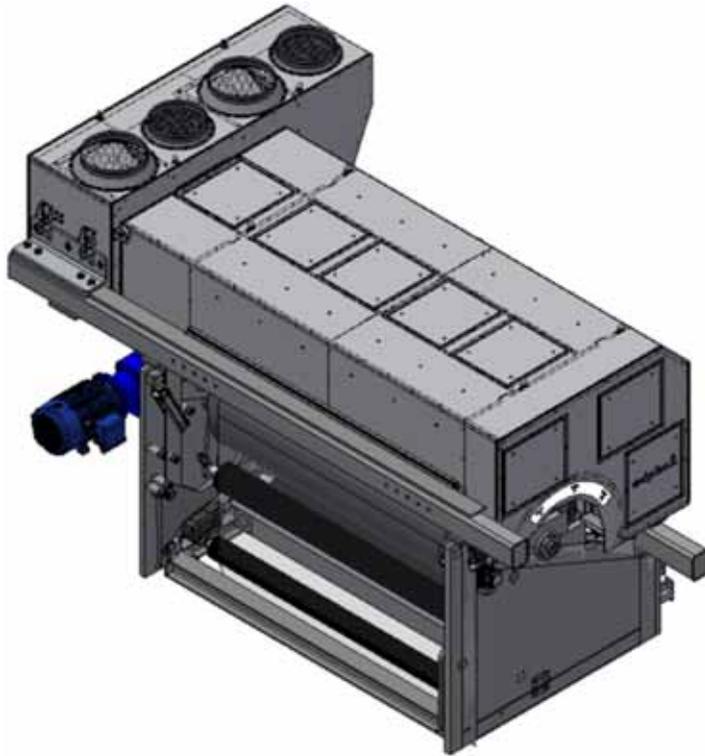


Substrates: PP, PVC, Acrylics, ...
Speed: Up to 250 m/min
Width: Up to 2,250 mm
Tinte: Water based inks (up to 10 gsm)
5 print stations



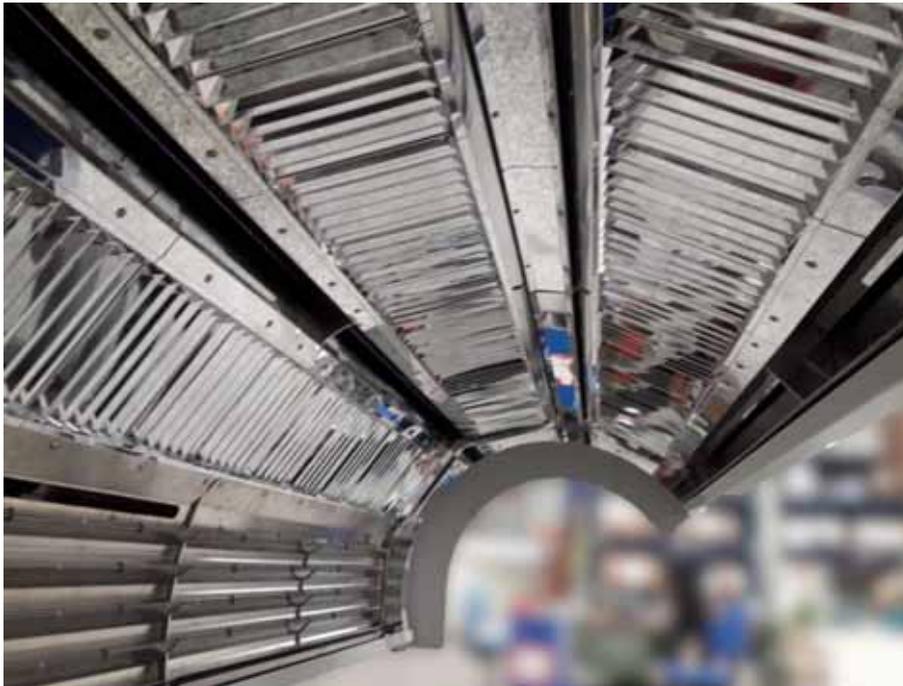
Application Example

Water based Inks on Film (2)



Application Example

Water based Inks on Film (3)



Application Example

Water based Inks on Film (4)

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Conclusions

- Germany, EU and worldwide “banning/taxation” for CO₂-emissions will come.
- Today's driers (mostly natural gas) in gravure printing business will be effected strongly, based on decided penalties
e.g. up to 40 €/h in Germany (\triangleq 1,000 m²/min and 25 kg/1,000 m²)
or \triangleq 0.62 €/1,000 m².
- Today's available advanced NIR-drying technology generates **no** CO₂-emissions as fully electro-thermal system technology and enhances print quality and productivity.
- Can be installed as replacement/upgrade in existing presses as well as for greenfield installations (new).





90 minutes ride:
gas consumption
0.5 t CO₂ emissions



Equivalent: Decoration print production of
25,000 m² - 40,000 m² with today's gas burners
or "O"-CO₂-emissions with advanced NIR
(but ≥ 250,000 m² up to 500,000 m²).

Source: google pictures





Thank you!

Drying at the speed of light!

Thank you!



Drying at the speed of light!

Source movie: ww.youtube.com