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September 19th – 23rd

A study on the influence of calcium carbonate as a filler in bagasse based uncoated paper during perfecting in an offset printing machine and its impact in reducing carbon foot print

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Print Media Academy

“Land where you live is not gifted from your parents, but is borrowed from your grand children”

Engineering and technologies interacting

Materials

Printing technology

Thermodynamics

Pneumatics

Fluid mechanic

Cybernetics

Acoustics

Measurement technology

Design

Power electronics

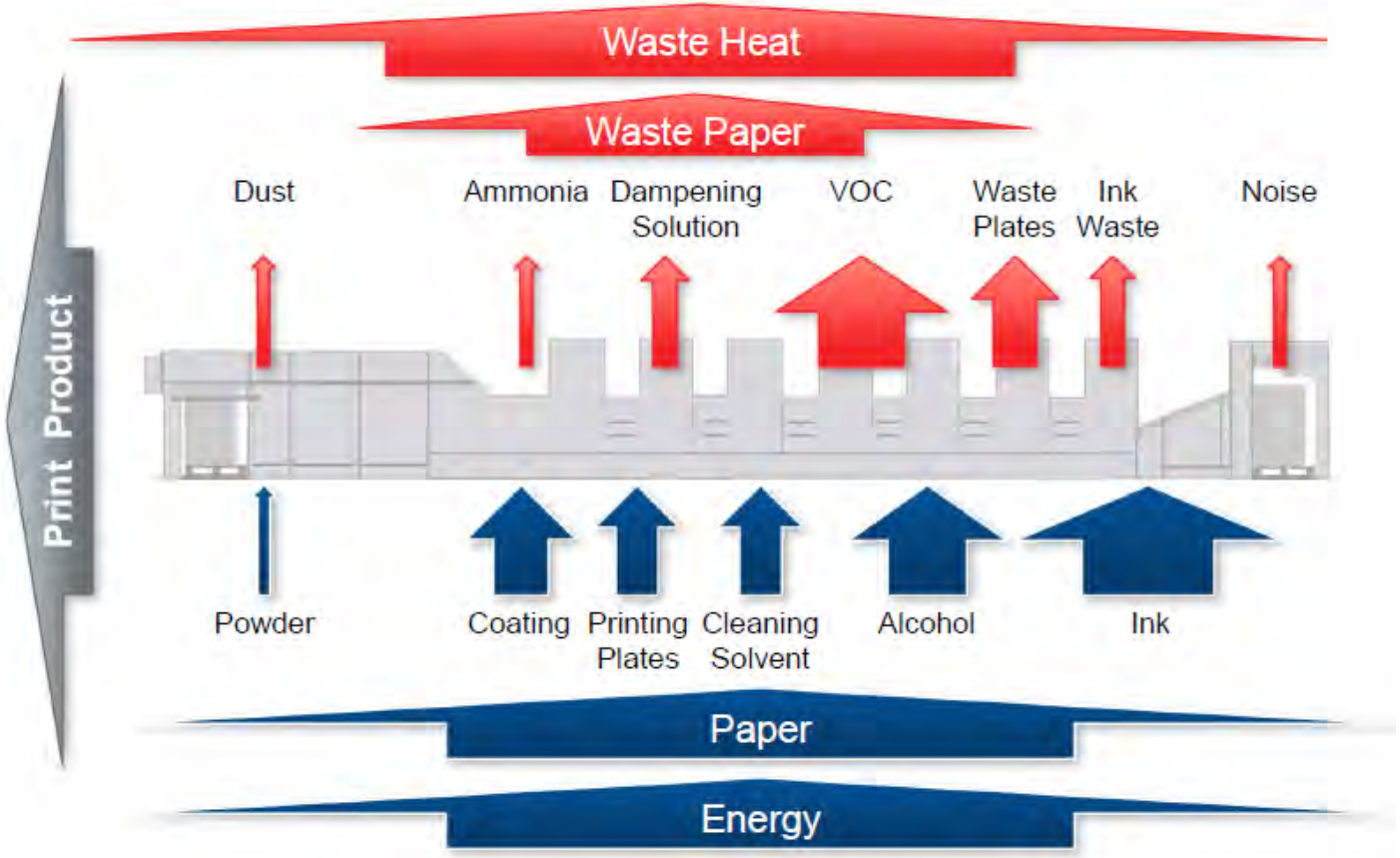
Technical mechanics

Gear technology

Ergonomics

Sensor technology

Environmental Facts at the shop floor



During the 1990s the damaging environmental impact of the printing industry was realized.

How is the environment polluted through printing?

- Press is not standardized
- When the compatibility of fountain and ink is not fine
- When eco friendly substrates and consumables are not used

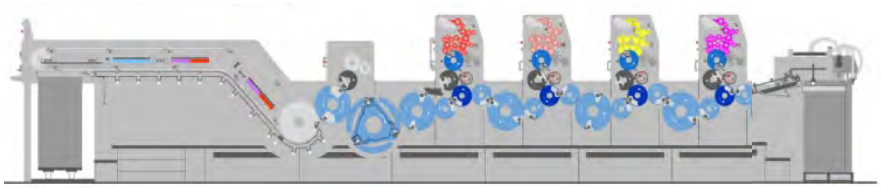
Why Environmental friendly substrates and consumables

The development toward sustainability and environmentally compatible solutions is the most important task of the 21st century

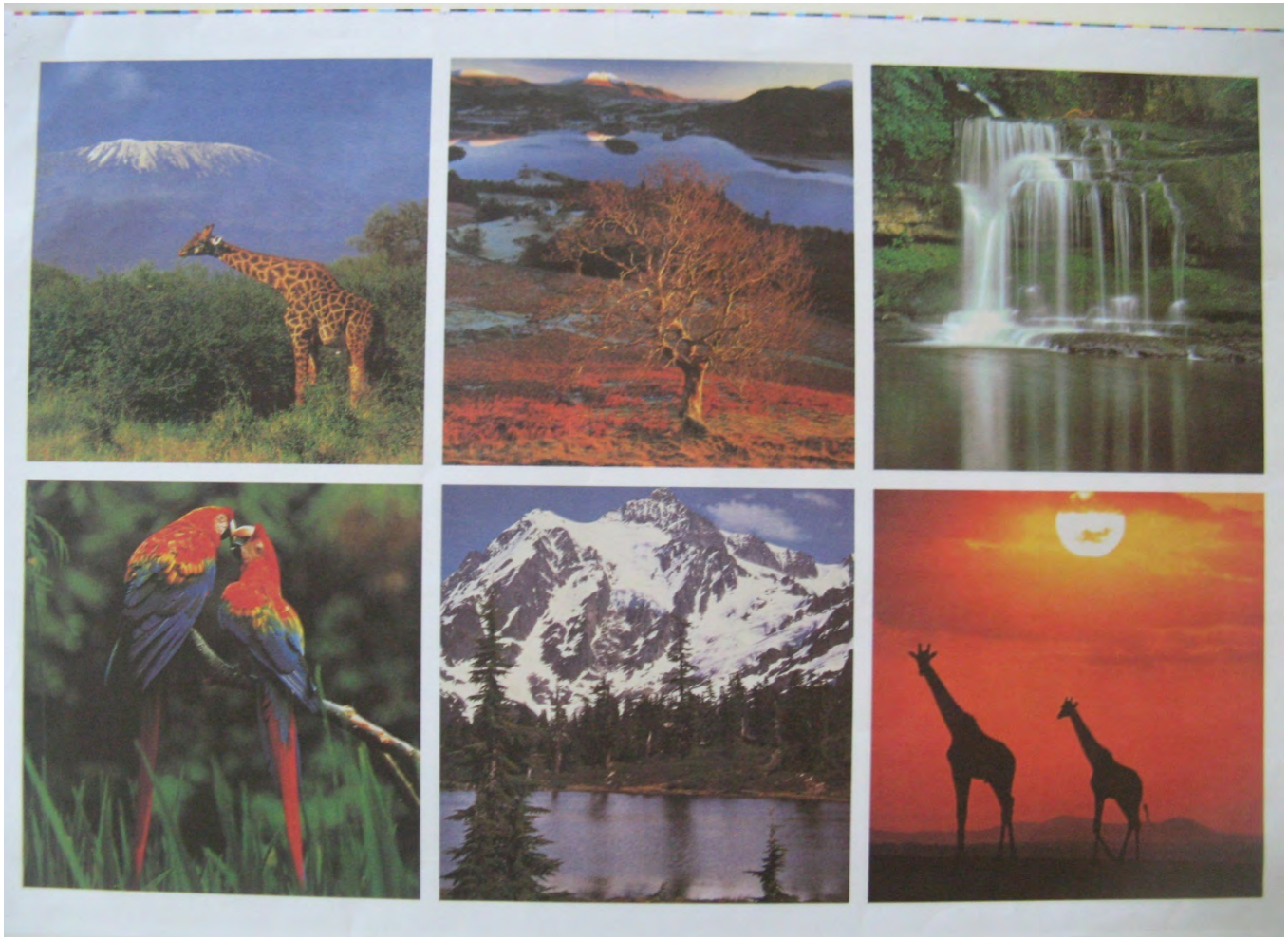
- Less waste
- Lower energy consumption
- Fewer emissions of volatile solvents
- Fewer ammonia, dust and noise emissions
- Less residual ink
- Less waste water

SM 74 – 4P – L at PMA Heidelberg, Chennai

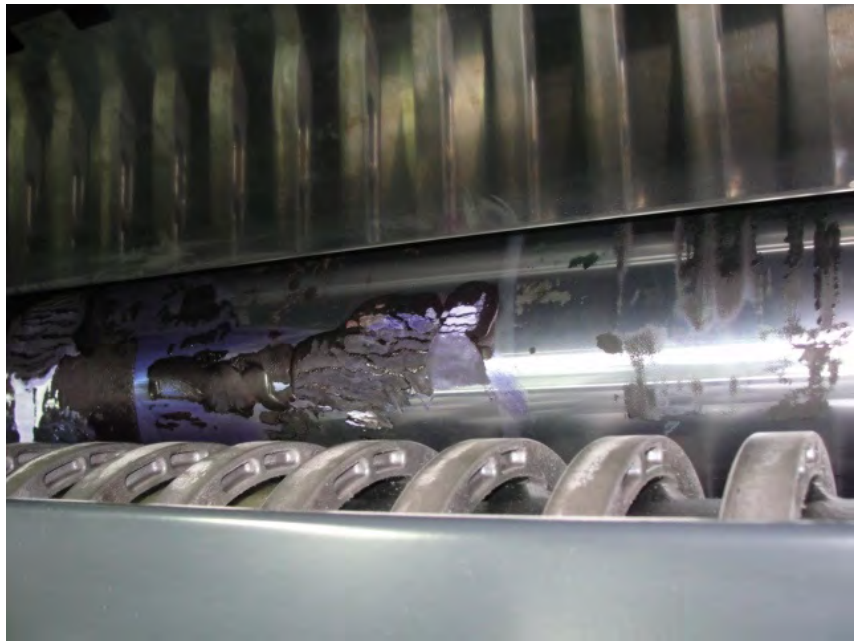
The case study at PMA-Chennai



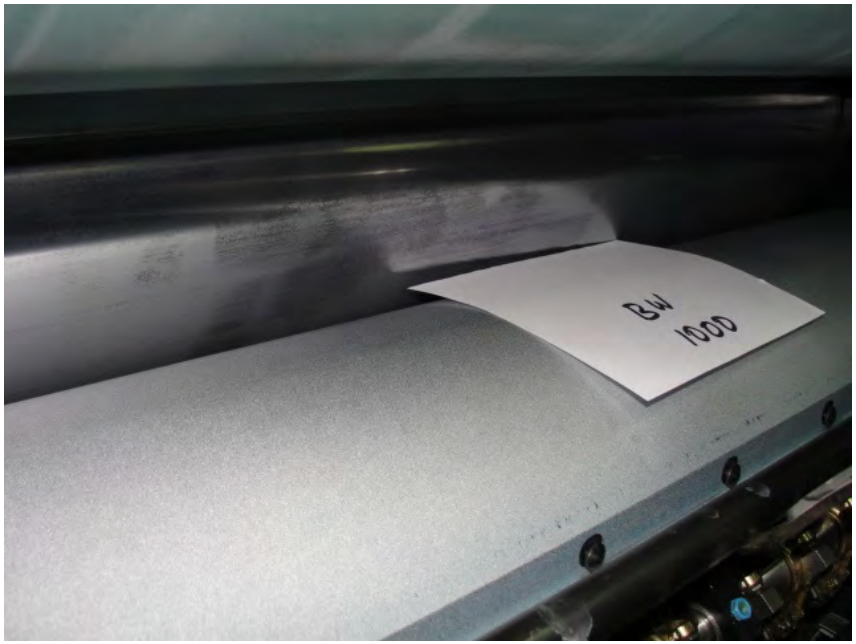
OK Print on Map litho paper (80 gsm Super Printing Map litho grade)

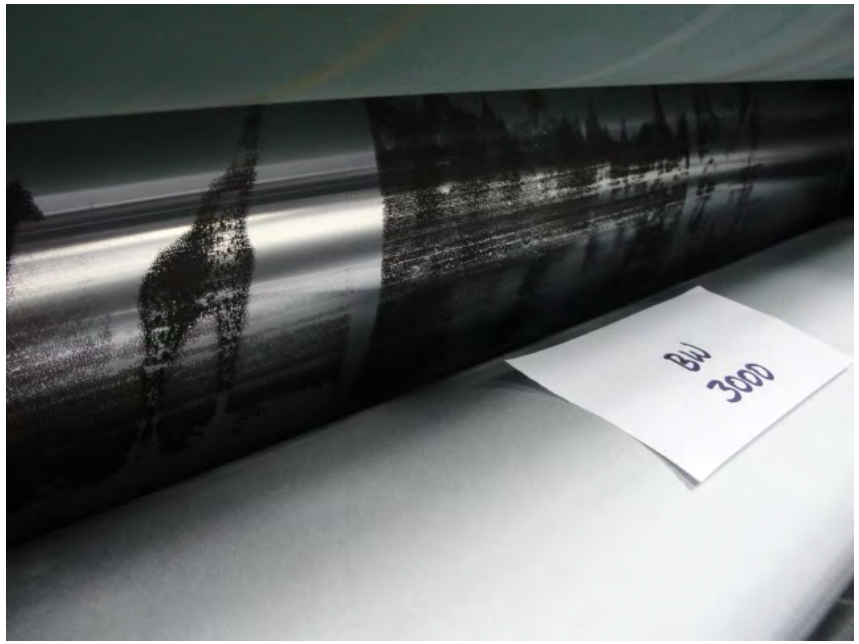


1st unit impression cylinder before and after printing



BW (Felt side) of paper printed first & its effect on the impression cylinder





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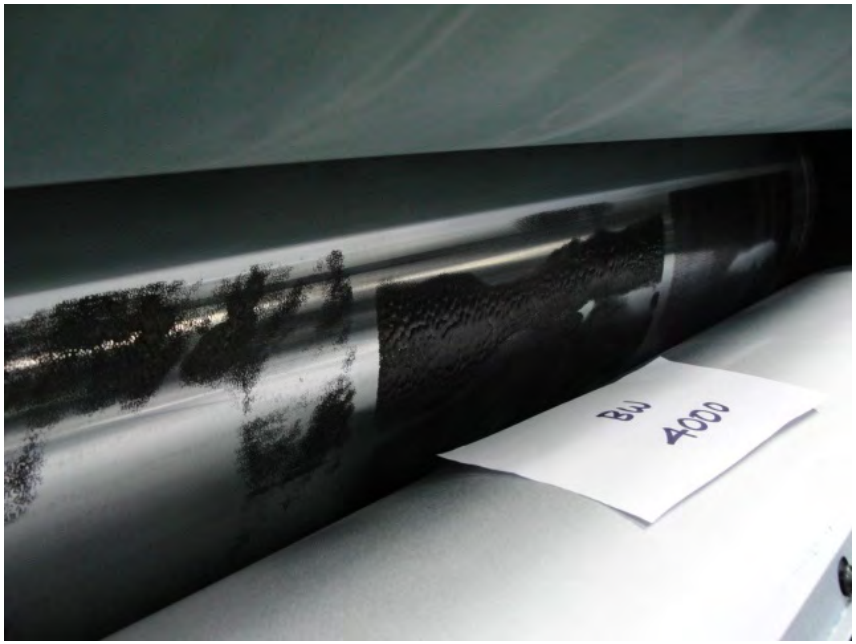
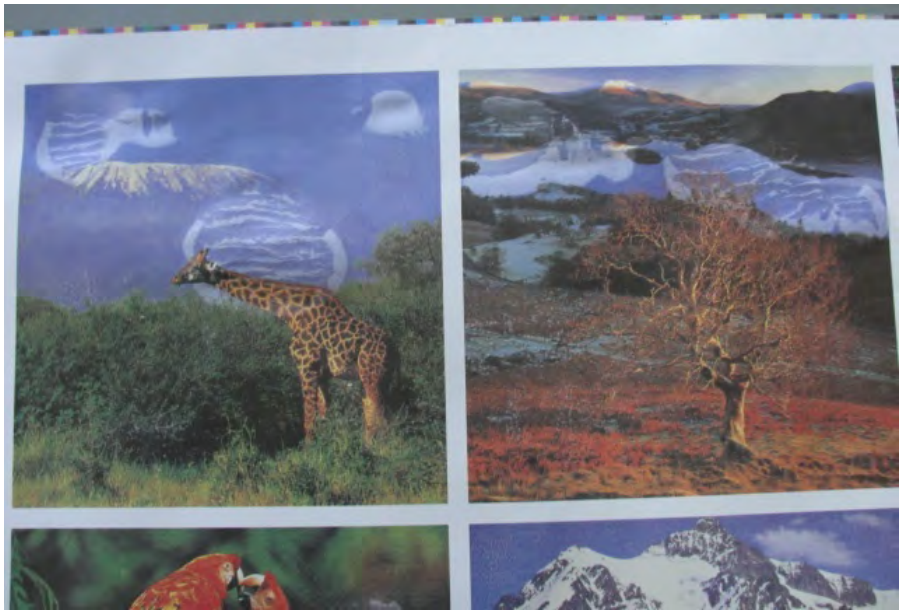
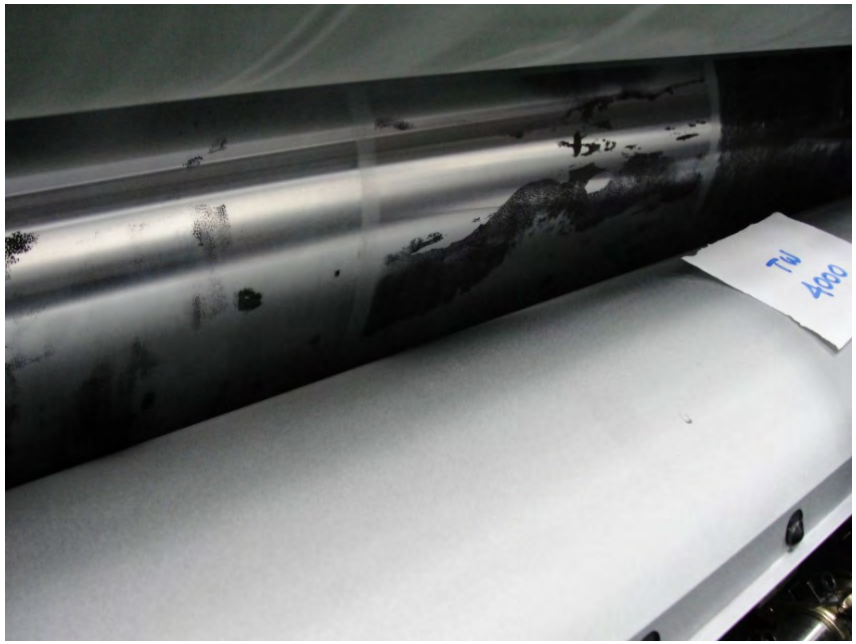
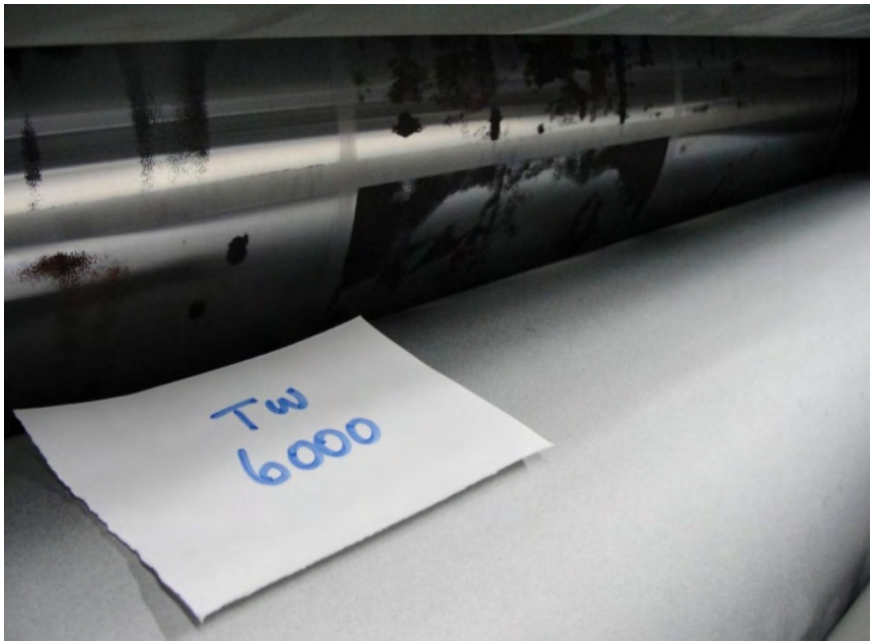


Damaged blanket in 1st unit



TW (Wire side) of paper printed first & its effect on the impression cylinder





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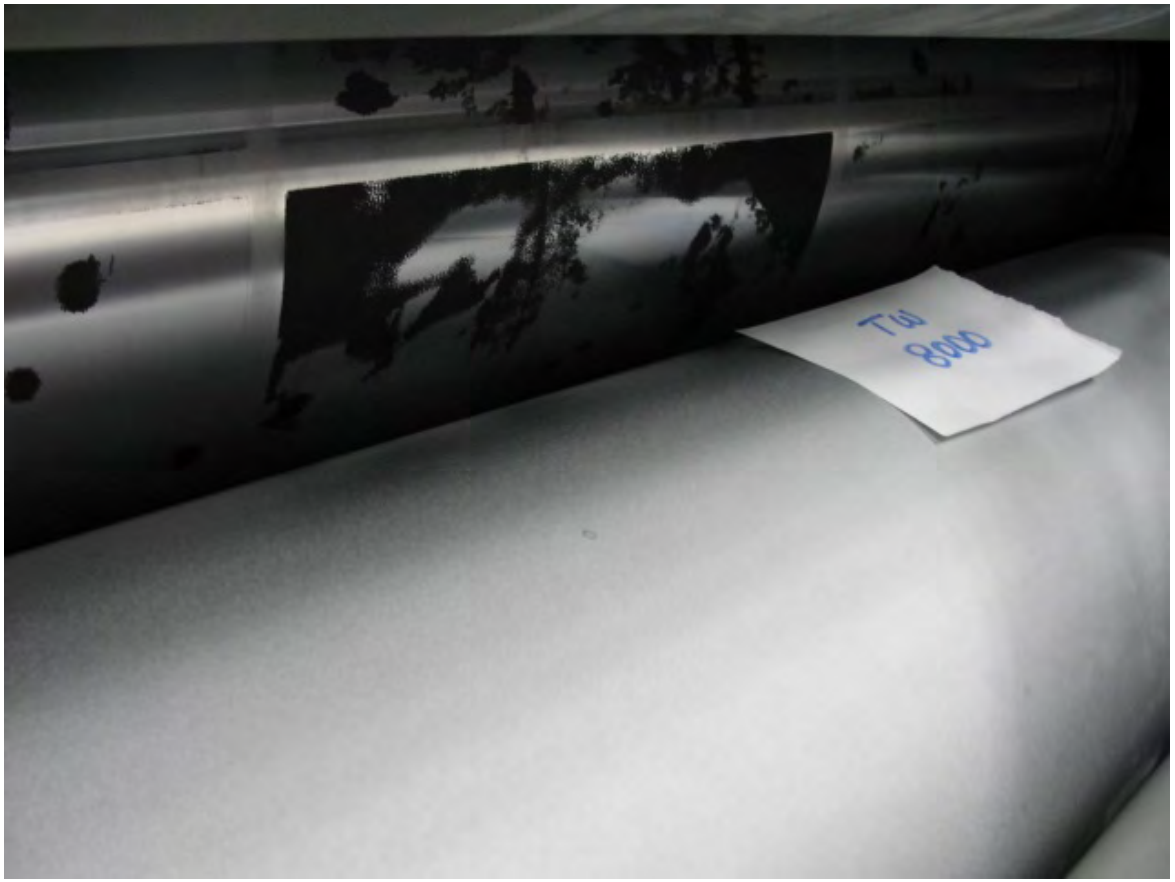
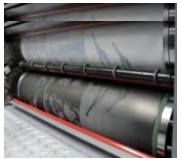


Exercise 1 - Calculating the CO_2 release

Energy

Energy consumption for 51 x 74 format	= 36kw
Average **CO_2** factor for electricity per kWh	= 0.514 kg **CO_2**
CO_2 for 36 kW for 8 hours	**= 148 kg CO_2**



Blanket

CO_2 factor for blanket	= 6.5 kg/m2
For blanket size .772 m x .627 m	= .484 m2 x 6.5 kg **CO_2** /m2 =3.146 kg **CO_2**
For 4 printing blankets	**= 12.6 kg CO_2**

Plate

CO_2 factor for plate	= 7.88kg/m2
For plate size .745 m x .605 m	= .450 m2 x 7.88 kg **CO_2** /m2 =3.551 kg **CO_2**
For 4 printing plates	**= 14.2 kg CO_2**

IPA

CO_2 in kg/kg material	= 3.8
IPA used	= 6.4 kg
CO_2 for 6.4 kg	**= 24.32 kg**

Wash up solvents

CO_2 in kg/kg material	= 2.3
Material used	= 2.5 kg
CO_2 for 2.5 kg	**= 5.7 kg**

Fount

CO_2 in kg/kg material	= 2.0
Fount used	= 1.28 kg
CO_2 for 1.28 kg	**= 2.56 kg**

Exercise 1 - Calculating the CO_2 release

Ink

CO_2 in kg/kg material	= 2.5
Ink used	= 2.0 kg
CO_2 for 2.0 kg	**= 5.0 kg**

Paper

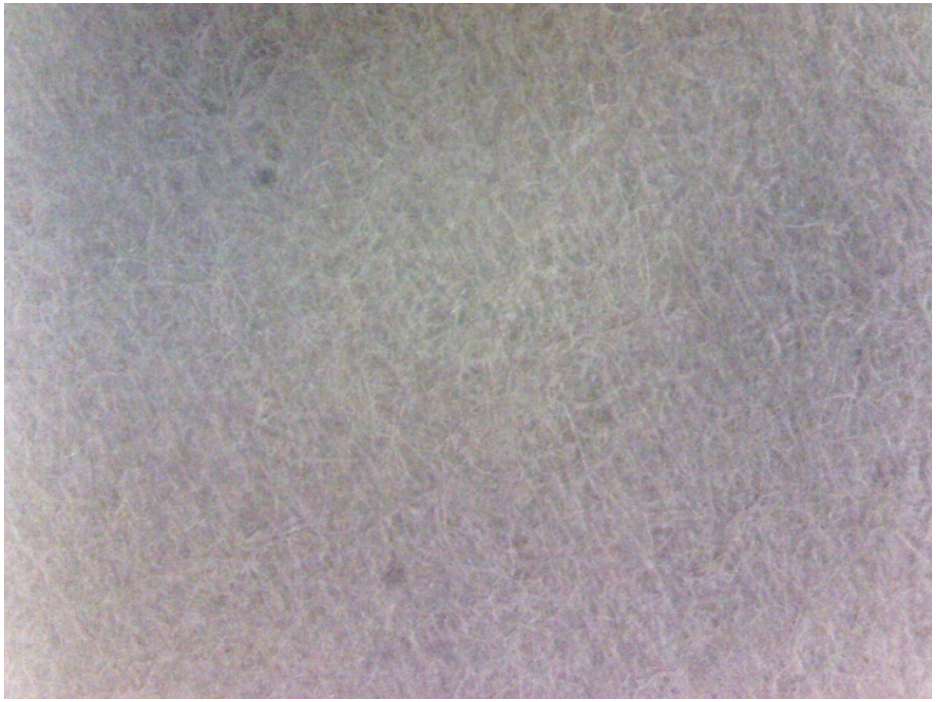
CO_2 in kg/kg material	= 1.27
Paper used	= 30 reams x 21.3/kg = 639 kg
CO_2 for 639 kg	**= 825 kg**

Total CO_2 release during this exercise was 1037.38 kg.

Observation and Recommendation

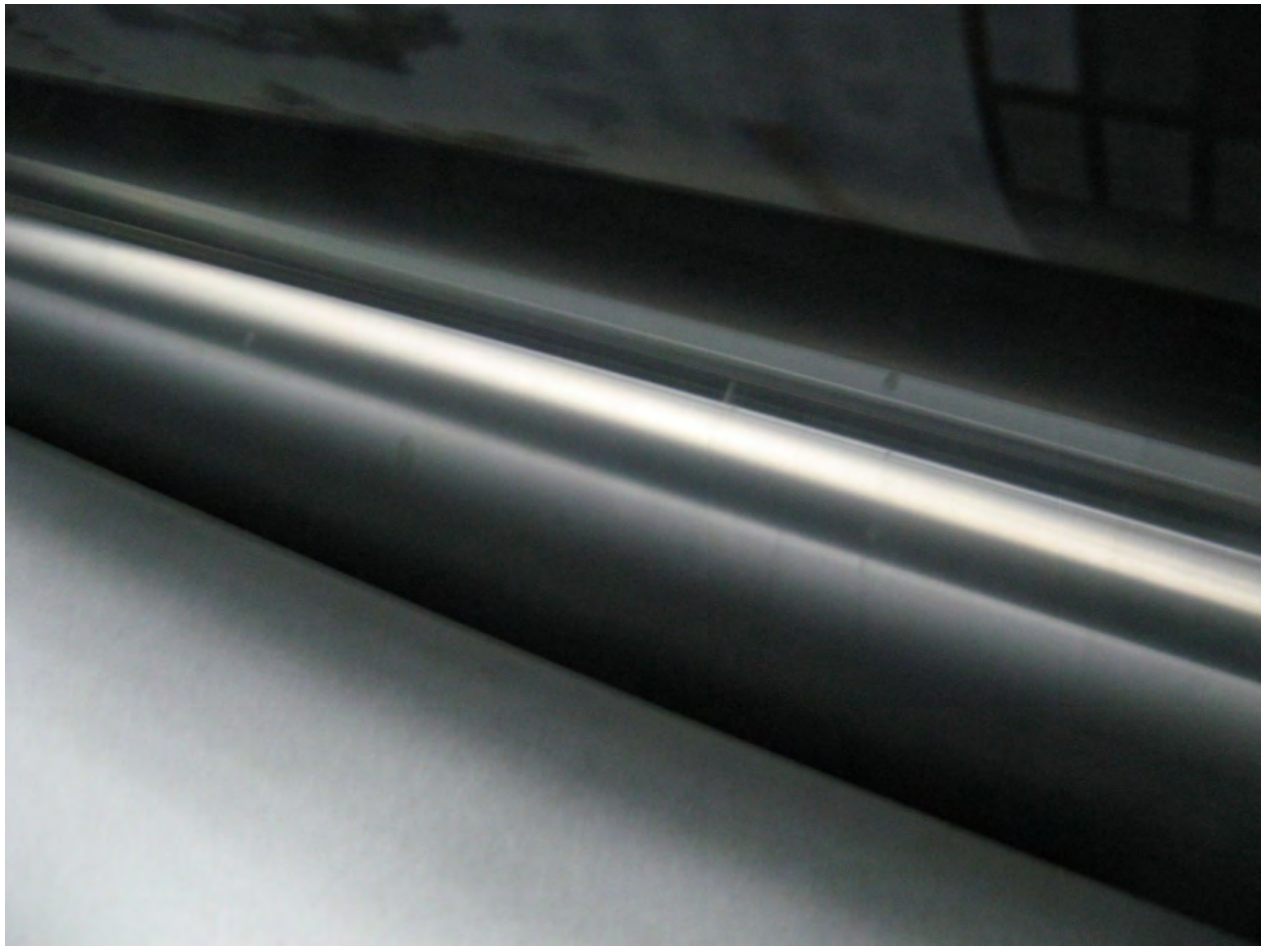
- Ink deposition was found high on the 1st unit impression cylinder
- Paper fluff is high
- Use of low tack ink
- To increase filler calcium carbonate to 12%
- Improve the filler content (Increase the ash (stone powder and china clay)) to 20%
- Print Rough side (TW) first instead of the normal practice of printing Smooth side (BW) first
- Advantages of printing TW (Rough side)
    - Higher surface strength : Reduced ink pick up on to the impression cylinder
    - Higher roughness - Less contact area thus less ink transfer to imp.cyl.
    - Lower filler orientation - Higher bonding of ink and thus reduced ink transfer
    - Lower oil absorption - Accelerated ink drying due to reduced ink up take

Comparison of paper surface structure between “exercise 1” and “exercise 2” (after implementing suggestions)



White patches are filled with calcium carbonate for quick ink drying and reduce picking of paper fibers

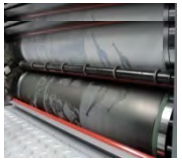
After the paper is improvement the condition of impression cylinder after 12,000 impressions



Exercise 2 - Calculating the CO_2 release

Energy

Energy consumption for 51 x 74 format	= 36kw
Average **CO_2** factor for electricity per kWh	= 0.514 kg **CO_2**
CO_2 for 36kW for 3 hours	**= 55.5 kg CO_2**



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IPA

CO_2 in kg/kg material	= 3.8
IPA used	= 6.4 kg
CO_2 for 6.4 kg	**= 24.3 kg**

Wash up solvents

CO_2 in kg/kg material	= 2.3
Material used	= 0.75 kg
CO_2 for 0.75 kg	**= 1.7 kg**

Fount

CO_2 in kg/kg material	= 2.0
Fount used	= 1.28 kg
CO_2 for 1.28 kg	**= 2.6 kg**

Exercise 2 - Calculating the CO_2 release

Ink

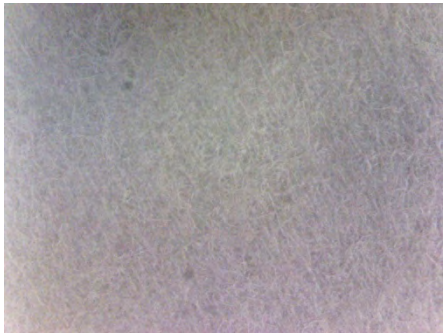
CO_2 in kg/kg material	= 2.5
Ink used	= 1.0 kg
CO_2 for 1.0 kg	**= 2.50 kg**

Paper

CO_2 in kg/kg material	= 1.27
Paper used	= 5 reams x 21.3/kg = 106.5 kg
CO_2 for 106.5 kg	**= 135.2 kg**

Total CO_2 release during this exercise is 246.35 kg.

Comparison of Carbon Foot Print savings



Total Carbon foot print for 1st exercise is 1037.38 kg.

Total Carbon foot print for 2nd exercise is 246.35 kg.

Potential savings of CO_2 release = 791.03 kg

Heidelberg activities for environmental protection

1996	First environmental management certification
1999	Be awarded the Eco Manager of the year (GER)
2001	“Emission tested” certification
2005	Opening of Environmental Information Center
2006	New energy concept for foundry in Amstetten
2008	Heidelberg announces ECO Printing Award
2008	FSC Certification for Print Media Center
2009	FSC certified paper for all Heidelberg print products

FSC

Print Media Academy

Conclusion

Paper, Ink, Printing plates, Cleaning agents and Energy has diverse impact on environment. There are multiple approaches for reducing or even eliminating these impacts. It is the paper that provides by far the biggest opportunity for shrinking a print job's carbon foot print. Depending on its properties and how it is made, paper accounts for between 60% to 80% of the total CO_2 emissions. Therefore printer has to be very meticulous in selecting an appropriate stock.

Thankyou for your attention

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