

Ink Properties to maximise production potential!

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Good morning/afternoon Ladies and Gentlemen.

Thank you Pira for the invitation to present at this conference.

My name is: Wilbert Streefland, I'm the owner/director of Technology Coaching BvbA. I have been involved in the printing industry for the last 20 years starting with textile screen printing, flexo printing and later printing on packaging specifically corrugated board.

I would like to present to you today about "Ink Properties to maximise production potential" The content of the presentation will go a bit further then that!

Ink Properties to maximise production potential

- Print quality and inks
- Exploring the effects of ink properties on the production process as a whole
- Reducing the negative environmental impact of inks

Wilbert Streefland

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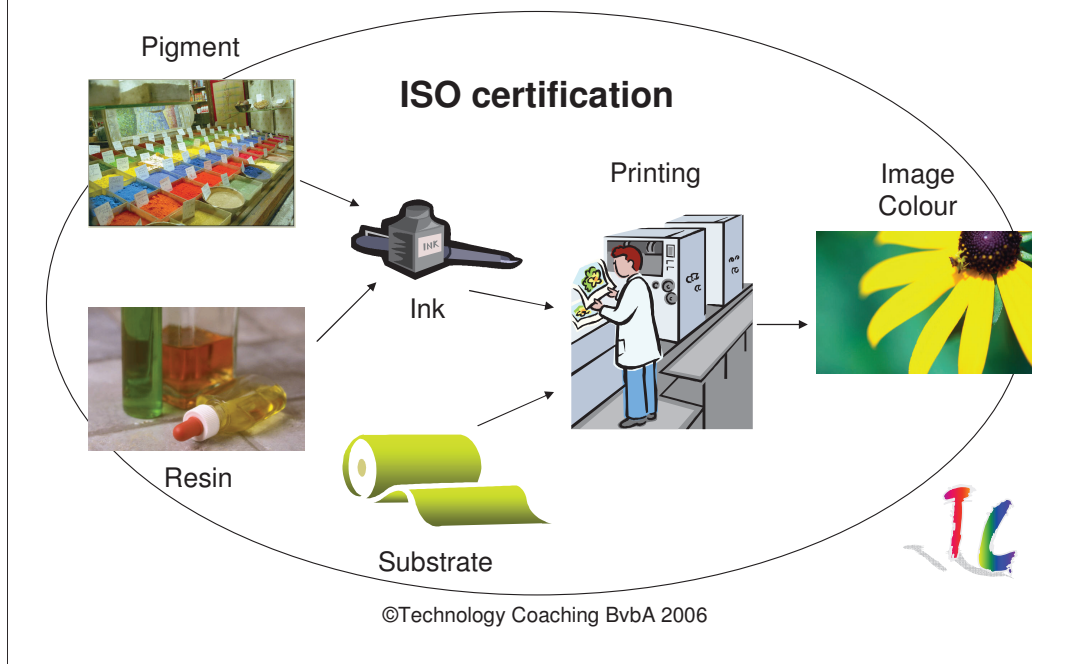


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The 3 main topics of my presentation are:

- 1) Print quality and inks;
- 2) The effect of ink properties on the production process;
- 3) Reducing the negative environmental impact of inks.

The Process



This is the simplest representation of the process. It involves 4 main parties:

- 1) The ink (Ink, pigment and resin supplier);
- 2) The substrate;
- 3) The print supplier;
- 4) The print customer.

They all want to be ISO certified to show their focus on Quality, Environment and Risk reduction.

Print quality and inks

- What is print quality and what is expected from ink and coatings in relation to print quality?
 - Colour consistency;
 - Edge sharpness between printed and un-printed area;
 - Mottling (Uniformity);
 - Probably not affected by ink:
 - Defects (Dust);
 - Register consistency
- Taking a closer look at colour consistency over time for:
 - Printed Colour;
 - Substrate Colour.



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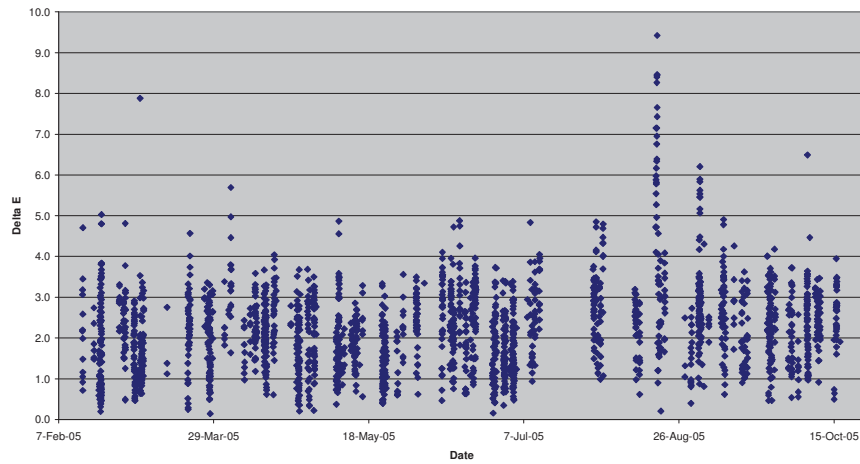
When talking about quality we need to be sure that we can measure it in a quantitative way.

Print Quality can be expressed in 5 elements:

- Colour Consistency;
- Edge sharpness between printed and un-printed area;
- Mottling (non-uniformity in a full tone area)
- Defects (dust). (Probably not affected by ink);
- Register. Colour to colour and print to structure. (Probably not effected by ink.)

Let us take a closer look toward printed colour consistency over time and substrate colour consistency.

Printed Colour Variation



2,384 measurements in 10 Months

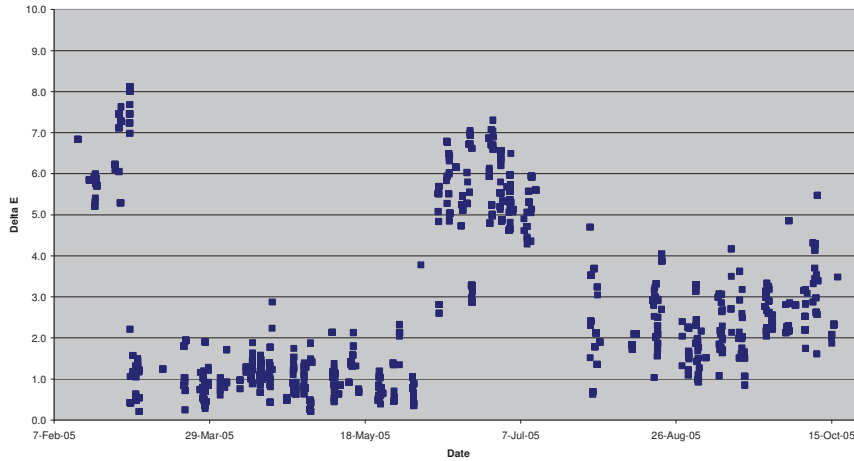


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This graph shows the colour difference over time between a digital colour standard (The spectral data of the perceptual agreed colour swatch, this data will not change over time the colour swatch will!) and the printed colour measured with a spectrophotometer. It is a Brand colour. The time period is about 10 months.

The spread of the colour printed around the 26 Aug 2005 was large.

Substrate Colour Variation



926 measurements in 10 Months



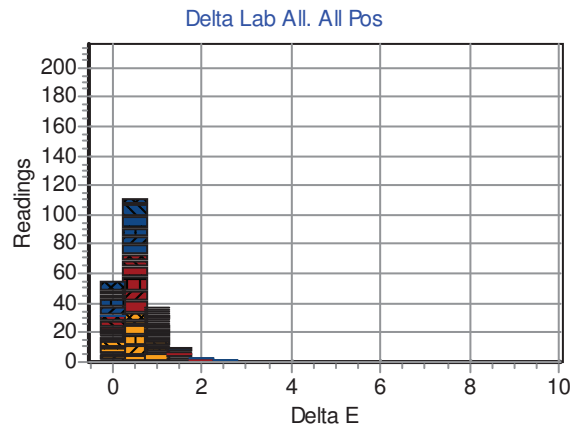
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This graph shows the colour difference over time between a digital colour standard and the substrate colour measured with a spectrophotometer. The colour of the previous slide was printed over the same time period of about 10 months.

We see clearly that some periods the colour difference is larger between the measured paper colour and the standard than other periods.

Printing Equipment Colour Consistency

- Measuring 3 colours on 12 consecutive printed sheets in 6 positions:



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We have looked at long term colour data. But what if we would look at a printing machine only printing 12 consecutive prints in 3 colours and measure colour variation in 6 positions for each of the 3 colours on the 12 prints. The colour variation is shown in this graph. It shows that the maximum deviation between the measured colours and the average colour calculated of all measurements is CieLab DE 2. This is what we call a snapshot.

Comments on Colour Consistency

- Can printers really guarantee the long term colour consistency for brand colours within the today's Brand Owners demand?
- Would it not be better to select brand colours that can be printed with “safe” pigments setting a realistic tolerance in function of the print process and raw material capabilities used?
- It all looks like that perceptual evaluation/judging of colour has driven us to not achievable numerical targets for the current print processes, equipment and raw materials.



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We need to ask our self if the printer using the current equipment really can print within the targets set by the brand owners/print buyers.

Would it also not be better to select brand colours using “safe” pigments and set realistic numerical tolerances based on the capabilities of equipment and materials used?

It all looks as if perceptual evaluation/judging of colour has driven us to not achievable numerical targets for the current print processes, equipment and raw materials.

Effects of ink properties on the production process as a whole

The Printer wants **Press Ready Ink.**

This delivers:

- **First print the right colour;**
- **No ink related production limitations;**
- **After last product, no press return.**



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Let us look at the effects of water based ink properties on the production as a whole.

The key for the printer is to have press ready inks allowing him to produce the first print the right colour. At the same time he wants no ink related production limitations and no press return.

Ink Stability on Press

How stable is ink throughout a production run.

A graphical simulation of water based ink behaviour over time at 2 temperature levels for:

- Temperature;
- Colour;
- pH;
- Viscosity.

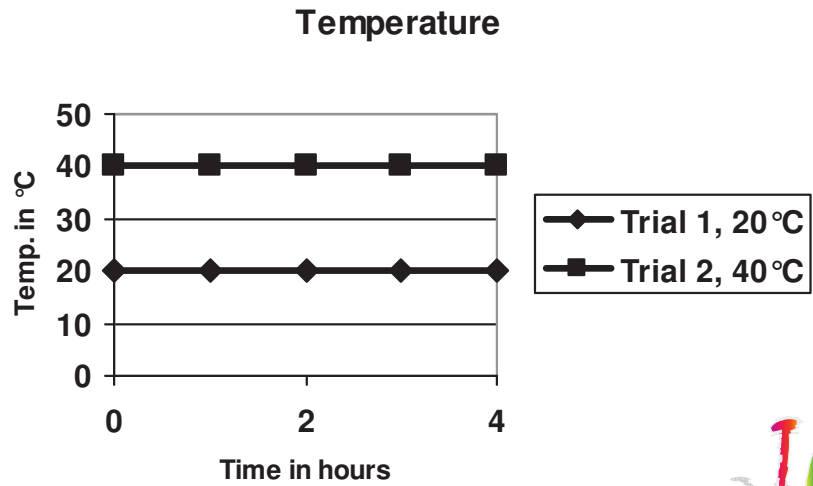


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To achieve this we need to look at the stability of ink during production. Lets have a look at a graphical simulation of 4 measurable water based ink properties:

- 1) Temperature (We assume 2 levels);
- 2) Printed Colour;
- 3) pH;
- 4) Viscosity

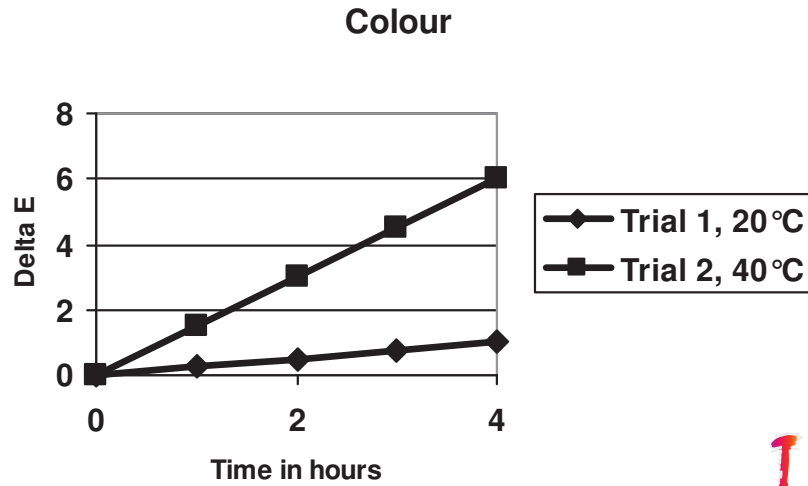
Temperature over Time



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This is the graph simulating the temperature for the 2 tests. One at an ambient temperature of 20°C and one at 40°C.

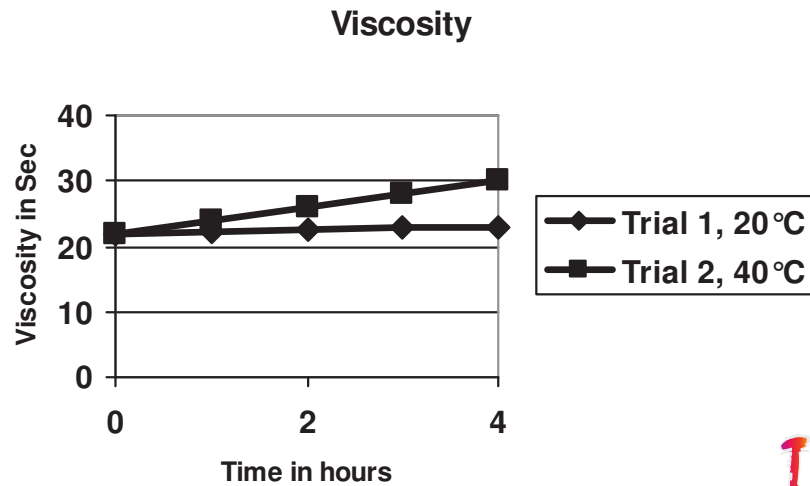
Colour variation over time



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This is the graph simulating how the colour would change for the 2 tests using the measured colour at the start as the standard. This for the tests at an ambient temperature of 20°C and one at 40°C. We see that at a higher temperature the colour change over time will be bigger than at a low temperature.

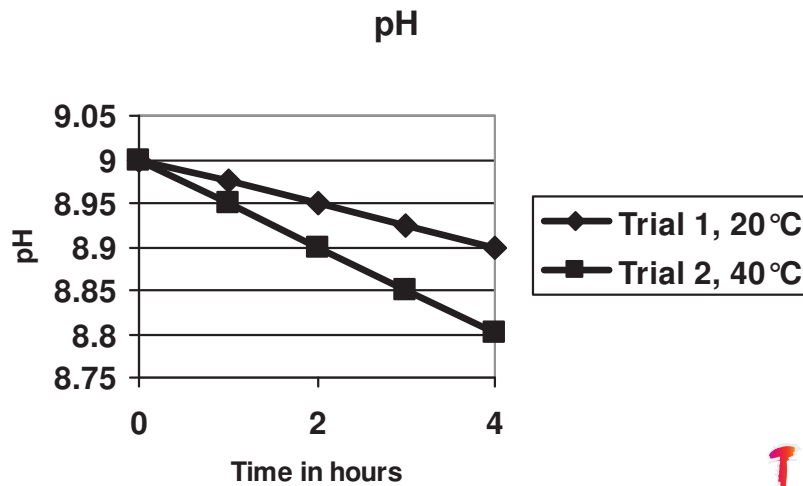
Viscosity over Time



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This is the graph simulating how the viscosity would change for the 2 tests. This for the tests at an ambient temperature of 20 °C and one at 40 °C. We see that at a higher temperature the viscosity change over time will be bigger than at a low temperature. Note also that the ink viscosity goes up over time also at high temperature. You might have expected first a drop in ink viscosity due to the temperature increase. The viscosity goes up due to the evaporation of the “amines” in the ink. Thus for the same ink I would expect the viscosity at 40 °C to be less than at 20 °C initially (Before any amine evaporation).

pH over Time



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This is the graph simulating how the pH would change for the 2 tests. This for the tests at an ambient temperature of 20°C and one at 40°C. We see that at a higher temperature the pH change over time will be bigger than at a low temperature. The pH drops but it is fractional and one can question if it is reliably measurable. A water based ink is after all a chemical buffer. This means that only small pH changes are measured when larger amounts of the amine in the ink evaporate.

Ink Properties Questions & Comments

- **Understanding the impact of controlling pH and viscosity towards colour consistency might help to make the correct investment decisions;**
- **Is measuring colour not the first step before deciding on changing ink properties during production?**
- **Water based ink temperature has the largest impact on the colour change during a production run!!**

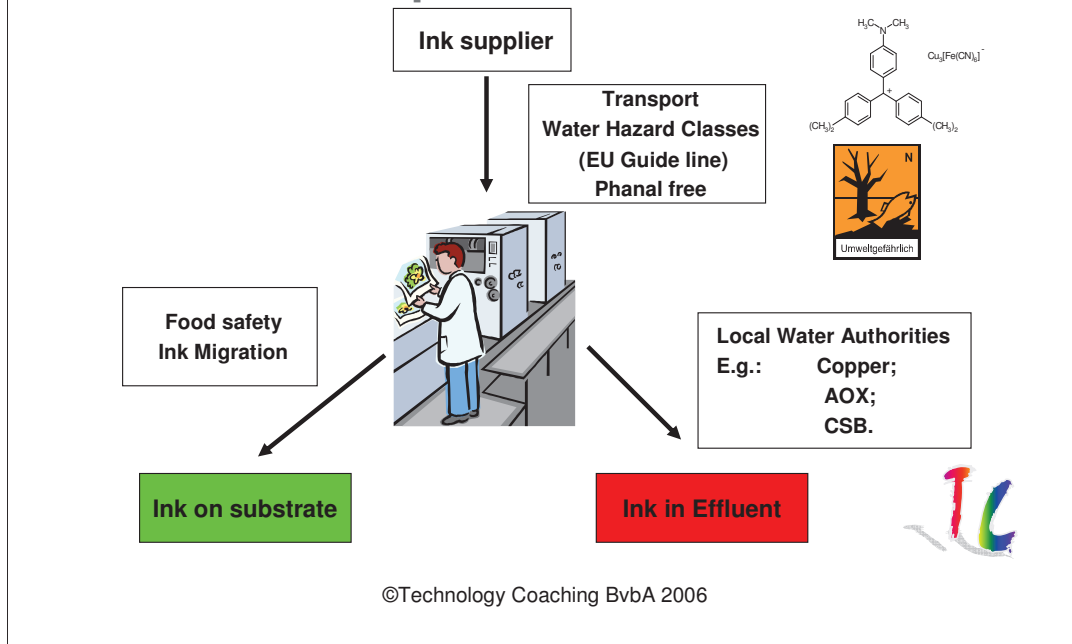


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The results of this simulation is pointing towards the following regarding water based ink properties:

- Understanding the impact of controlling pH and viscosity towards colour consistency might help to make the correct investment decisions;
- Is measuring colour not the first step before deciding on changing ink properties during production?
- Ink temperature has the largest impact on the colour change during a production run!!

Reducing the negative environmental impact of inks



What about “Reducing the negative environmental impact of inks”. We can talk for hours about legislation that is depending on local authorities. We also have EU guide lines. It often looks as if the ball is passed on but really it is part of all parties involved from pigment supplier to print customer. At least if we are eager to get ISO certification.

The legislation is focussing on 3 areas:

- The transport and storage. The liquids protection level during transport and storage are depending on the “Water Hazard Classes”. It is a European guideline not every where in Europe implemented although it should have been according to the by EU set time table;
- Food safety if the ink is in direct food contact or can migrate thru the packing material;
- Effluent contamination

Ink and the environment

What can we do!

- **Stop putting ink in the drain. What is not in does not need taking out;**
- **Ink supply road transport storage: Do not except tubs, barrels and containers having this label →**
- **Food safety: Adopt colours so the use of hazardous inks can be avoided;**
- **“Effluent” treatment:**
 - **Invest in an effluent treatment plant;**
 - **Use inks that are minimized in their effect on the environment.**



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But what can we do for the environment in relation to inks and resins?

- First stop putting ink in the drain. What is not in does not need taking out. This might require redesigning the metering system to minimize ink losses during colour change;
- Ink supply road transport storage: Do not except tubs, barrels and containers having this label;
- Food Safety. Adopt colours in order to avoid hazardous inks/pigments;
- “Effluent” treatment:
 - Invest in an effluent treatment plant;
 - Use inks that are minimized in their effect on the environment.

We want to be certified!

ISO 9001:

- What is print quality and what is expected from ink and coatings in relation to print quality;

ISO 14001:

- How does it impact on the environment and what can we do about it;

ISO 18001:

- The personal risk involved using the current and new technologies and materials.



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Today it is important to take notice of the ISO certification. I do not claim that having them is a must but they are a good guidance to achieve “Good Manufacturing Practices”. How do they link to what I have presented until now:

ISO 9001:

I spoke about: “What is print quality and what is expected from ink and coatings in relation to print quality” these ideas can be implemented in your ISO 9001 procedures;

ISO 14001:

I spoke about inks and “How does it impact on the environment and what can we do about it”;

ISO 18001:

This is all about the self assessment for the risks involved using our processes, equipment and materials. It is about “The personal risk involved using the current and new technologies materials”. For ink this really starts with specifying the pigments used to print colour.

Remember

- ISO certifications was intended to show ones responsibility in the supply chain;
- Often it looks that we pass the responsibility on to the suppliers not adjusting our demands in order to allow them to meet their ISO target.



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We have to remember that:

- ISO certifications was intended to show ones responsibility in the supply chain;
- Often it looks that we pass the responsibility on to the suppliers not adjusting our demands in order to allow the supplier to meet their ISO target.

Summary

- All participants will benefit from a better utilization of Material, Equipment and People (Less is Better);
- Print customers need to set “Quantitative” and “Achievable” objectives using standards that are in line with factual common knowledge not a perceptual opinion;
- Only then we will know if we benefit of the new developments in relation to inks and coatings.



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Let me summarize the presentation:

- All participants will benefit from a better utilization of Material, Equipment and People (Less is Better);
- Print customers need to set “Quantitative” and “Achievable” objectives using standards that are in line with factual common knowledge not a perceptual opinion;
- Only then we will know if we benefit of the new developments in relation to inks and coatings.

Time for your Questions.
Thank you for your attention.

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Thank you for your attention. I hope you enjoyed listening. You can find more information about the topics discussed in the articles I have published in various magazines. You can find them on my website: www.tcbvba.be

Time for your Questions?