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Labelexpo Global Series



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Introduction to inks, coatings and varnishes

Today's agenda:

- Understanding why different inks are used for different printing processes
- Exploring how inks are manufactured, handled, stored and used
- The impact on end use applications
- Security inks



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Security Inks

- Functions include authenticity, indicators of alteration and to conceal hidden information
- Either overt or covert (requiring knowledge of encryption format or special equipment)



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Security Inks - threats

- Threats range from unauthorized replication to detecting alteration and substitution attacks
- Printed codes can be erased or replaced to disguise an out of date product, or mislead consumers



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Security inks - converter side

- Converter procedures to safeguard supplies in stock and on print shop floor awaiting conversion
- Obligatory to deliver security ink using spot color
- For digital this means additional pass or in-line coating unit



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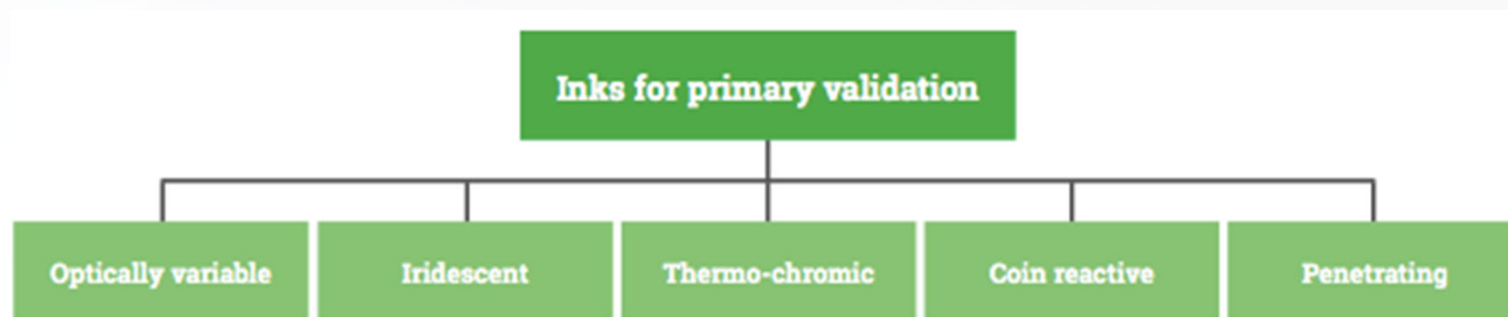
Security inks - specification

- Different levels – primary, secondary or forensic
- Is protection required only at POS or through supply chain?
- How does ink complement other security devices eg holograms, serialized numbers?



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Inks for primary validation



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Clear/OVD varnishes

- Matt/gloss effect provides resistance to scanning and 'home office' printer attacks
- Adding a color shifting pigment to varnish increases security
- Size of color shifting pigment particles may exclude litho and flexo



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Optically variable inks

- OVIs visibly change color when tilted
- Color change delivered by millions of small light reflecting platelets distributed in ink
- High pigmentation levels require print processes carrying heavy ink weights, eg silk screen



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Iridescent inks

- Deliver a multitude of colors - effect similar to bird's feathers/butterfly wings
- Usually only considered for decoration and very low level protection applications



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Thermo-chromic inks

- React to specific variations in heat
- Brief or permanent color change from clear to blue (chilling) and orange/red (heat warning)
- New tri-thermochromatic inks undergo range of color changes depending on temperature profile



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Coin reactive inks

- A very basic level of security
- Visible as a semi-gloss varnish after printing
- Oxidation on coin's surface causes minute amounts of material to be transferred to the clear ink when rubbed, creating a gray color.



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Penetrating inks

- Infiltrate paper substrates, bleed through and viewed from the reverse
- Inks appear black on the exterior and color on the opposite side
- Inks absorbed into the mat of the paper so very difficult to erase or alter.
- Secures product coding against alteration/erasure



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Covert authentication inks

- Provides secondary degree of confirmation
- Requires an instrument to confirm security feature present – or not



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Inks used for covert authentication



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UV responsive inks

- Authenticated with UV power cell/lamp ('black lights')
- Shorter wave more secure - inks 'tuned' for further security
- Phosphorescence - luminescence continues to fluoresce after UV light source extinguishes (decay can be measured accurately – good security device)



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Metameric inks

- Color changes when inks viewed under different light sources
- Under natural daylight a pair of color-matched inks will appear to be exactly the same. Different image observed under alternative light source
- Highly effective covert authentication feature



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Photochromic inks

- Chemicals respond to light and display as color change
- Drawback - when carried in inks, photochromic chemicals (spiropyrans) only react to high intensity light (eg camera flash)
- Also daylight causes loss of color fastness over time



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Conductive inks

- Interface with the screen of a smartphone.
- Invisible printed pattern on label acts in same way as a finger used to tap or navigate the system
- Different codes deliver the user to a webpage where product authentication takes place
- Works in combination with specialist app



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Machine readable inks

- Scanners recognize specific chemical signatures
- Unique chemical signatures formulated from 'rare earth' materials embedded within ink or varnish
- Doped crystals emit visible colors (eg in near-infrared light)
- Readers range from hand held devices to high-speed automated machinery



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Tamper evident inks

- Messages displayed such as 'opened' and 'void' reveal that a label has been removed/tampered
- Protects date/product coding, serialization and batch data from alteration and/or erasure assaults
- Screen of erasable ink under code - enhanced by chemically sensitive ink which warns of solvent/bleach attacks aimed at erasing code
- Codes protected by scratch-off ink removed during verification. Ink panel can itself be authenticated



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Forensic inks and taggants

- Highest level of security
- Microscopic particles embedded in material
)Validated by lab tests, specialist readers (DNA) or doped chemical test kits with color change
- Organic markers (eg synthetic DNA) are dissolvable and can be applied by inkjet
- Inorganic markers best carried in viscous inks or varnishes



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