

Introduction to UV and Hybrid UV Printing

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Introduction to UV & Hybrid UV Printing

Presented by
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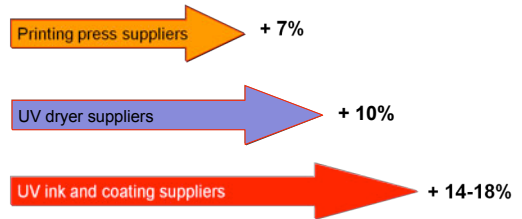
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General Market Trend in UV Printing

Growth Prognosis per Annum approx. 14%



Source: Specialized magazines, printing press, dryer, and UV ink suppliers

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Why the Trend for More UV Applications?

- Increased product range
- Differentiation towards competition
- Sometimes simply keeping up with the competition
- Ability to secure specialized niches
- Higher added value to your customers
- Demand for more and high-quality surface finishing
- Cost reduction through in-line production
- Shorter delivery times
- Less production risks on non traditional speciality substrates
- Full utilization of all plant capacities
- Driven by:



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UV Applications in the Graphic Arts Industry



UV packaging



UV labels



UV commercial



UV speciality

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UV Packaging Applications

- High End Packaging
- Cosmetics
- Personal care
- Luxury goods
- Food and non-food
- Distilled Spirits Packaging
- Blister packaging
- Specialty applications such as rub-off lottery tickets



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UV Applications in Sheet Fed Printing



Applications:

- Folding boxes, business reports, labels, in-mould-labels
- Blister packaging, plastic cards (identity, credit and phone cards)
- Banknotes

Benefits:

- Immediate curing of inks varnishes, immediate processing
- No powder spraying required
- Solvent-free ink and varnish systems
- Printing of non-absorbent materials

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Special Effects via a Combination of Printing / Coating Applications

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Metallic effects



Pearlescent effects



Gold gloss



Matt gloss contrasts



Silver effects



Opaque white

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Advantages of UV Technology

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- No solvents, 100 % solid-system, zero VOC
- Constant color-quality
- Immediate curing (with pure UV ink and or UV coating)
- Less wasted sheets during make-ready
- Immediate processing of the printed sheets
- High abrasive resistance
- Highest gloss-quality
- No powder-spraying
- Dry trap printing with full interstation UV
- Successful printing on non-absorbent substrates
- Spot and overall coating



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Commercial Printing Applications

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- Annual reports
- Automobile brochures
- Posters
- Presentation folders
- Calendars
- Fashion and jewelry catalogues



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UV Curing System Considerations

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Quality factors of a UV unit

High performance UV printing presses only work as efficiently if an equally efficient UV curing system is also installed.

It is very important that all installed systems work in perfect co-ordination:

- UV-Lamp, Power supply device, Power control
- Reflector
- Heat management
- UV-Measurement
- Integration of the system into the press via OEM co design and factory approval status
- User and maintenance friendly systems
- North America and Global Service and support organization

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Available UV References

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- **Optimized Sheetfed UV Guide**
 - Best Practice Guide Publication
 - Good tool for basic information
 - Based on one group's opinions (Printcity)
 - Not the final word
 - Based on European view
- **There is a significant difference between US view and European view on UV**

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Number of Lamps and Position and Application Techniques

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- Euro Pure UV format one interdeck lamp after every other print unit, three lamp end of press running Pure UV (non Hybrid) inks and UV coating
- Euro still loves in line multiple coating, inline water based primer wet trap over conventional ink, dry the first down coating then apply UV coating via a second coater, three lamp end of press UV curing system for the coating

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Number of Lamps and Position and Application Techniques

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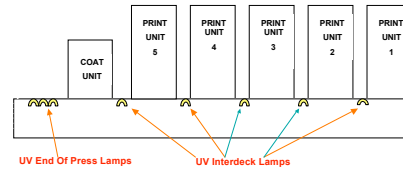
- US Pure UV format one interdeck lamp after every print unit (fully interdecked), three lamp end of press running Pure UV (non Hybrid) inks and UV coating
- US has accepted Hybrid UV inks over inline multiple coating for all but special applications, one interdeck lamp after every other print unit, three lamp end of press running Hybrid UV inks and UV coating three lamp end of press UV curing system

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Basic UV Lamp Configuration for Pure UV by U.S Standards

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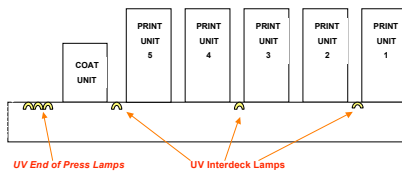


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Basic UV Lamp Configuration for Hybrid UV by U.S Standards Or Pure UV by European Standards

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Plan / Configuration Depends on What Results you Wish

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- In Line Multiple Coating: Challenges with the two coatings, gloss back a potential issue. Lead to the development of Hybrid UV in the US.
- Pure UV inks and UV coatings: The proven standard for difficult non porous substrates
- Hybrid inks and UV coatings: With the correct planning can offer good flexibility and some success on specialty substrates

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Plan / Configuration Depends on What Results you Wish

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- UV system should include prep kits or docking stations to allow movement of interdeck lamps to each print unit position
- Place interdeck UV lamp after opaque white; pink, pastels, metallic colors; high ink film thickness inks opaque and dark heavy coverage colors
- Always remove UV lamps from the delivery when using conventional inks and spray powder. A dummy unit or connection plug is installed.

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Plan / Configuration Depends on What Results you Wish

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- Most blanket and roller problems are caused by incompatible washing agents or poor procedures.
- Always test roller and blanket compounds for compatibility with inks and solvents / washes prior to running hybrid or Pure UV
- It is important that the ink supplier know which inks will wet trap to ensure that the tacks are correctly set.

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Plan / Configuration Depends on What Results you Wish

- UV and UV compatible Rollers and blankets – everything is changing – old rules do not apply, but some have not changed
- Blanket choice is determined by the type of ink and coating to be used. Print vs. Swell, Solvents and washes are a big issue
- Pre testing is the best practice
- UCR (Under Color Removal) should be used

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Plan / Configuration Depends on What Results you Wish

- Baked positive plates for really long runs
- Some plate images can 'simply disappear'
- Polymer (smooth or 'cyrel like') plates give a higher gloss than blankets for coating
- Optimize the coating and film weight for each substrate
- Analox roller cell configurations for UV are not the same as for water based coatings

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Plan / Configuration Depends on What Results you Wish

- Color can change with HKS 13, 25, 33, 43, PMS warm red, Rhodamine red, purple, blue 072, reflex blue with exposure to UV light. Need to use specially adapted inks.
- What GOE means to you.
- Too much dampening causes many print related problems including ink misting. Mist collectors are available.

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Plan / Configuration Depends on What Results you Wish

- Maintaining (or not) UV lamps and reflectors can have a giant effect on the ability to cure inks and coatings
- All UV lamp suppliers are not the same, power outputs, heat generated by the lamp and lamp life vary greatly.
- Use a radiometer to measure light output
- You can pump UV and Hybrid inks
 - special black plastic or rubber must be used

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Plan / Configuration Depends on What Results you Wish

- Do not trap over wet white ink
- Overhead lights around press should have no UV output, use UV filters over fluorescent tubes
- Good housekeeping is a must
- Use separate coating pumps, lines, pans and or chambers for UV and water based coatings

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Plan / Configuration Depends on What Results you Wish

- UV Lamp spectral output and UV photo initiators should match for best results
- Special lamp doping including, Iron, Gallium and Metal Halide is available for opaque colors, white can be challenging
- Mercury is the most common lamp doping
- Use cotton gloves when handling lamp to avoid finger printing, clean lamp with IPA 99%

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Plan / Configuration Depends on What Results you Wish

- Measure roller temperature on a chilled ink vibrator roller not simply any ink roller
- Mix coating continuously at press side
- Do not use PVC rollers release quality is poor
- Ink agitators are recommended for UV inks

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UV/Hybrid Mindset

- Pressroom Benefits:
 - no drying back – color stays the same
 - instant curing
 - work and turn
 - environmental- no VOC's, very low vapor pressures
 - no spray powder
 - short or long runs

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UV/Hybrid Mindset

- Management Benefits:
 - cost savings – in line processing, film lamination replacement
 - recyclable
 - environmental
 - quality-high gloss & durability
 - printing on wide gamut of substrates
 - special effects
 - diversify printing
 - **Differentiate**

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Hybrid UV Technology

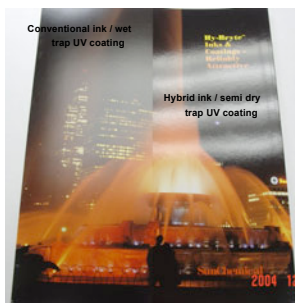
An ink/coating system that allows in-line UV coating at production speeds without gloss-back thereby increasing productivity and profitability.

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An Example of Wet Trap UV Coating Over Conventional Ink Glossback



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Hybrid UV Ink and Coating Systems

- Originally filled the need to in-line UV coat on presses with conventional rollers
- Designed to work with minimal lamps
- Improved litho performance
- Not designed for plastic substrates

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Think About Your Ink

- There is a tremendous difference in Hybrid UV inks from suppliers. Each can potentially react different on press resulting in plate, blanket, roller and printability issues.
- Some of the latest Hybrid UV inks are closer than ever to actual full UV ink.

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Newer Hybrid UV Systems

- Advanced roller chemistry has increased the flexibility of running hybrid chemistry
- Can easily switch between hybrid inks and conventional inks
- Newer UV chemistry offers similar or better lithographic performance
- Hybrids are now being designed to run on paper and some synthetics

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Hybrid UV Inks with In-Line UV Coating

- Provides gloss similar to off-line
- Eliminates the need for a primer
- Allows higher productions speeds
- One pass productivity
- Runs on conventional presses
- Runs on a variety of substrates
- Requires UV lamps

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Newer UV Chemistry

- Offers broader water window
- Provides lower odor
- Yields dot gain similar to conventional
- Cures at higher speeds or at same speeds with lower lamp power (partially due to lamp/reflector enhancements)
- The preference for non porous substrates
- Sustainability printing

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Newer UV Chemistry for Food Packaging

- Through the RadTech Alliance, FCN 772 has been issued by the FDA that allows specific materials to be used in a variety of food contact applications
- The limited material list does not allow formulators to manufacture inks or coatings with the broad range of specifications needed for most applications

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Newer UV Chemistry for Food Packaging

- Although the materials specified in FCN 772 can be used in food contact applications, several of the items are known to cause off-taste in various products and are therefore not acceptable
- Most food packaging is NOT direct contact
- For these applications, low migration formulations are available that satisfy FDA regulations as well as end product needs

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UV Ink/Coating for the Future

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- UV curing is most successful when the “package” is put together properly
 - chemistry of the ink/coating
 - lamp system
 - press (rollers, blankets, procedures)
 - fountain solution chemistry
- This should be done **PRIOR** to the installation and as a team
- Everyone in one room at the same time to discuss the needs for success

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UV Ink/Coating for the Future

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- Discuss capital costs and price of all consumables
- UV and hybrid inks print differently than conventional
- Develop curves for different ink systems and substrates

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Industry Related Websites

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- www.radtech.org
- www.packageprinting.com
 - Reference article: GOEX recycle ability of inks on plastics
- www.napim.org
- www.cfsan.fda.gov
- www.pcimag.com

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Rubber Compounds

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- Most printing rollers are a combination of NBR with a small percentage of PVC filler.**
- Nitrile part of compound is responsible for chemical resistance-mostly oil**
- Butadiene part of compound is responsible for dynamic behavior**
- PVC filler helps with UV ink resistance but reduces dynamic behavior**
- Most NBR “type” rollers have SOME UV resistance**

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Dynamic Running Conditions

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Press	Sheetfed
Copies/h	13,000
Paper speed	2.7 m/s
Diameter	80 mm
Rev./s	14.4
No. nips	2
Nips/s	28.8

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Comparison of Compounds with Different Hysteresis Characteristics

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	Comp. 1	Comp. 2
Static hardness (Shore A)	25	25
Speed (m/s)	15	15
Setting (depth in mm)	0.30	0.30
Static pressure (N/mm)*	0.15	0.15
Dynamic Pressure (N/mm)*	0.68	0.40
Dynamic Hardness (Shore A)	43	31
Dissipation Factor	0.17	0.05
Torque (Nm/mm)*	1.20	0.15
Temp. Increase (K)	8	3

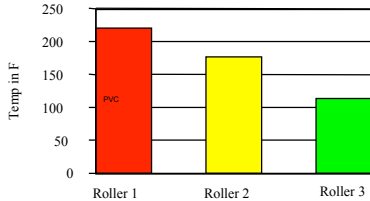
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Comparison of Heat Build-Up

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Nip Width: 4mm
Speed: 1500 rpm
Cooling: none
Time: 90 min



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Roller Compounds for Full UV Ink

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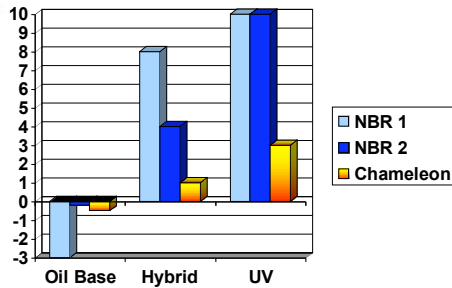
- EPDM is normally used for running full UV ink and or UV Coating
- EPDM is resistant against UV ink
- EPDM has no resistance for oil
- EPDM cannot accommodate conventional inks

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Swell/Shrink Data

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Swelling

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Nip changes due to swelling
(example: inker roller 25 Shore A compound)

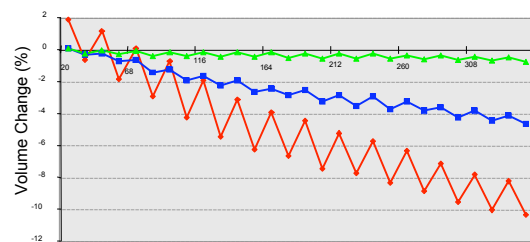
Diameter of printing plate [mm]	Diameter of inker roller [mm]*	Nip width a [mm]*	Line force = force in nip [N/mm]
254	80	5	0.049
254	80.09	6	0.085
254	80.19	7	0.135
254	80.32	8	0.201
254	80.62	10	0.392

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Wash Swell

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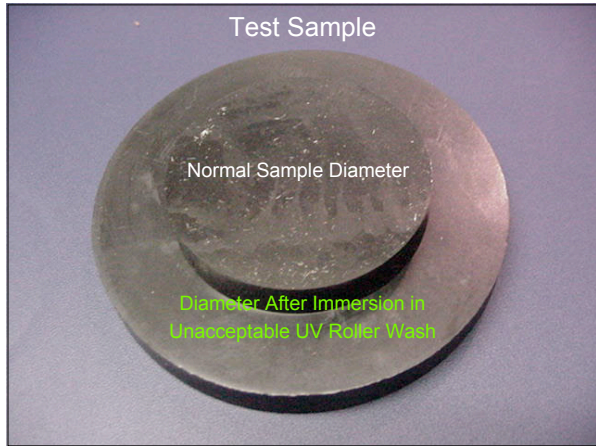


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We do not recommend running Hybrid, UV ink or UV wash on press without securing approval from your roller supplier.

The same holds true for your blanket supplier.

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Non Anilox Coaters

- Use EPDM compound for coater rollers
- EPDM is resistant against UV and Aqueous coatings

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Remember –
It Is Always Best To Test!

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