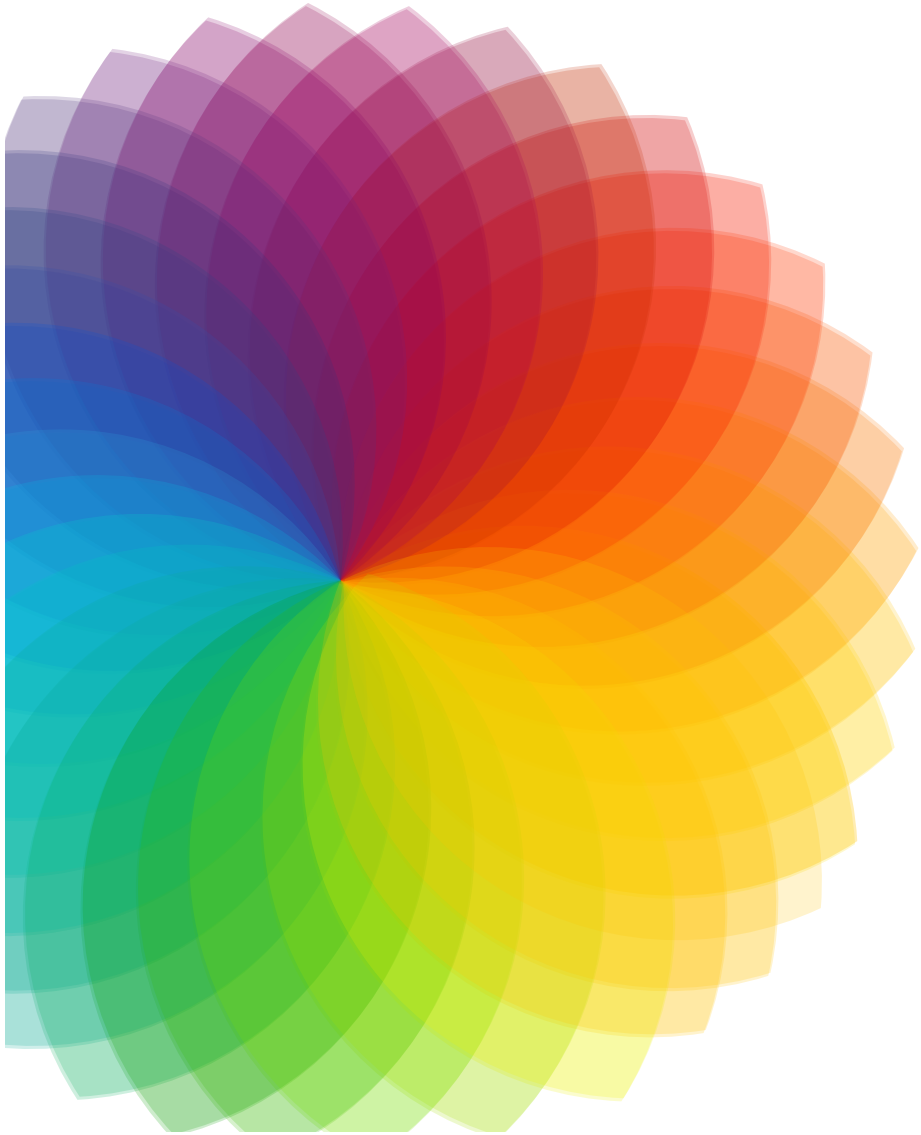


COOLUV

total solutions for UV LED curing

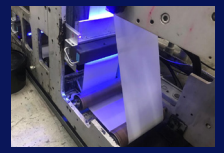
Advanced UV LED Curing System on Sheet-Fed Offset Press

Green technology helps user cut 60% curing cost!

In partnership with:

Litho Sales & Label (Pty) Ltd

COOLUV
total solutions for UV LED curing



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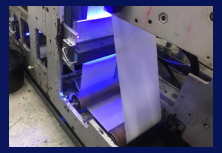
ADVANCE WITH THE TIMES



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Mercury Arc Lamp Was The Standard UV Curing Solution since 1960s

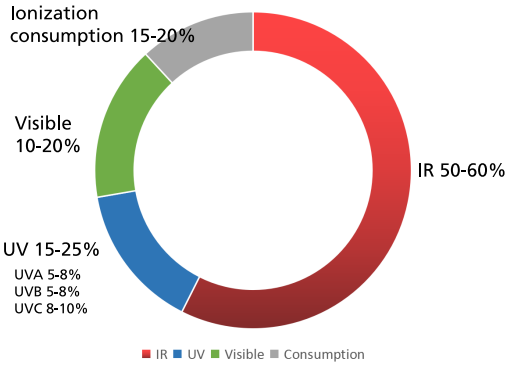
Produce wide range UV and IR light at high energy consumption

Advantages

- Produce vast amount of UV photons
- Generat full range UV light (100-400nm)

Disdvantages

- High energy consumption
- High maintaining cost
- No flexible arrangement
- Environmental concern of mercury and ozone
- Long time to warm up and cool down
- Shutter normally required
- Limited use to heat-sentitive material



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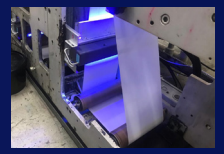


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UV LED Is New Solid State Light UV Curing Solution Since 2014

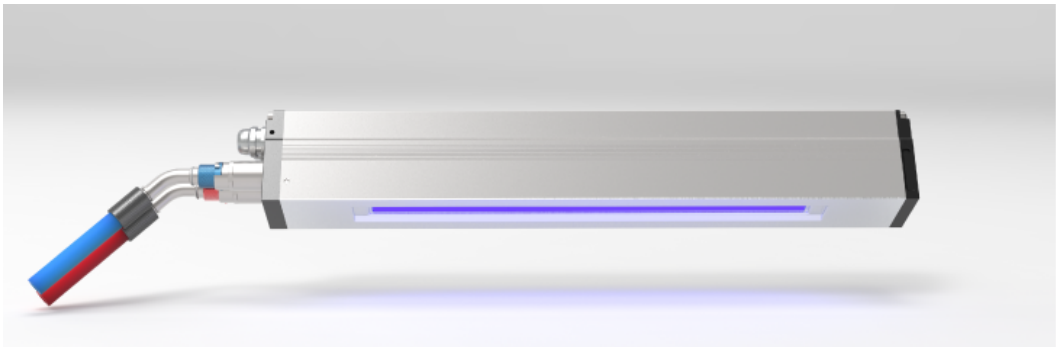
High intensity light at UVA range with many benefits.

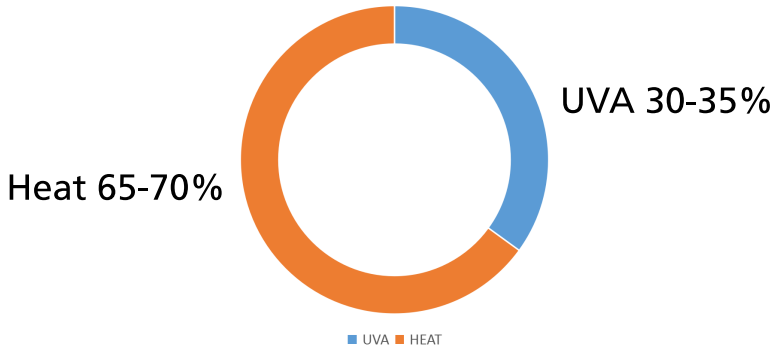
Advantages

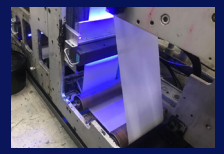
- Saving up to 70% energy cost
- Longer life time up to 25,000 hours
- Saving 90% maintaining cost
- No IR radiation, suitable for heat-sensitive material
- Compact and resistant to vibration
- Instant on/off
- Uniform radiation across the exposure area
- No ozone produced, no mercury containing

Disdvantages

- Limited spectrum range
- Need more complicated control system
- Ink or coating fomula need to be adjusted to match LED spectrum







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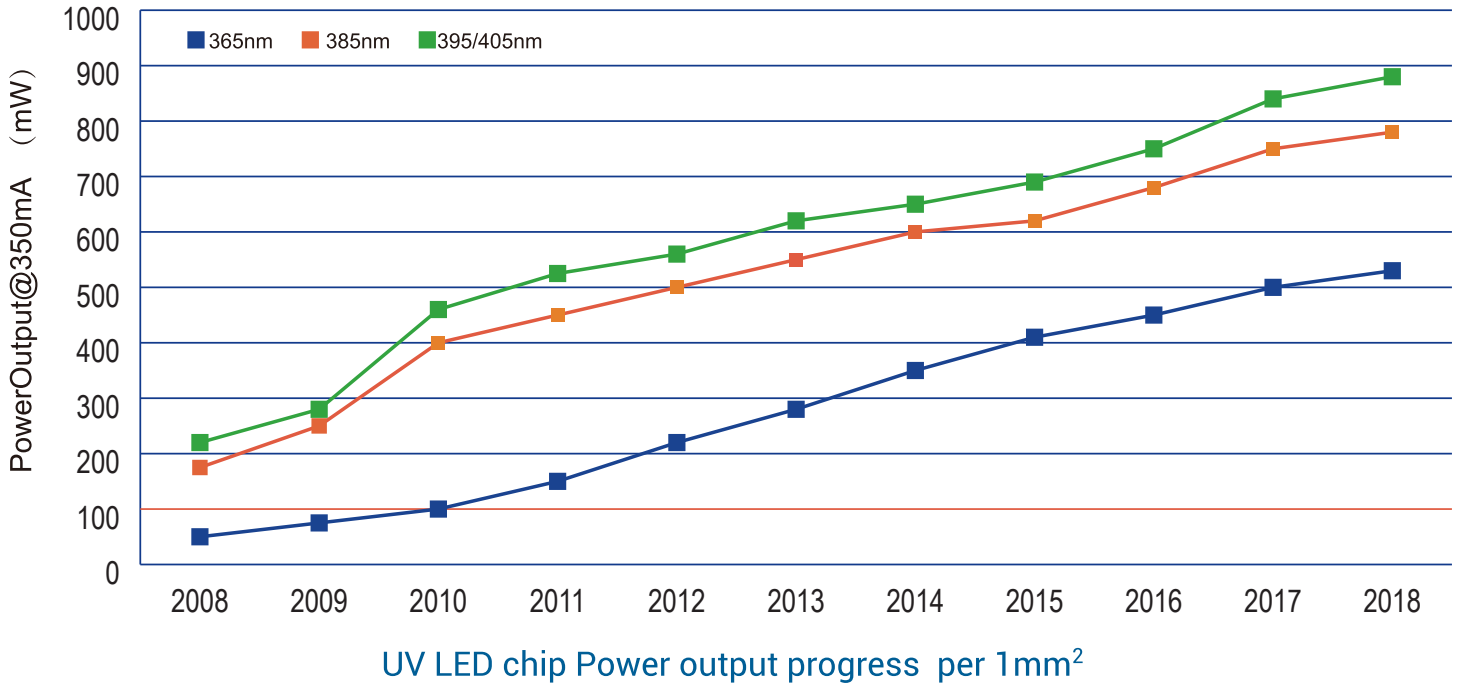
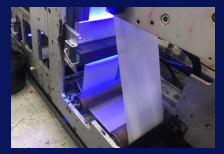
Why UV LED Is Now Qualified to Printing Industry-1

UV LED single die power output has increased over 4X since 2008, also price has reduced around 90-95% from year 2008, that makes the posibility for wide industrial application.



UV LED chip Power output progress per 1mm^2



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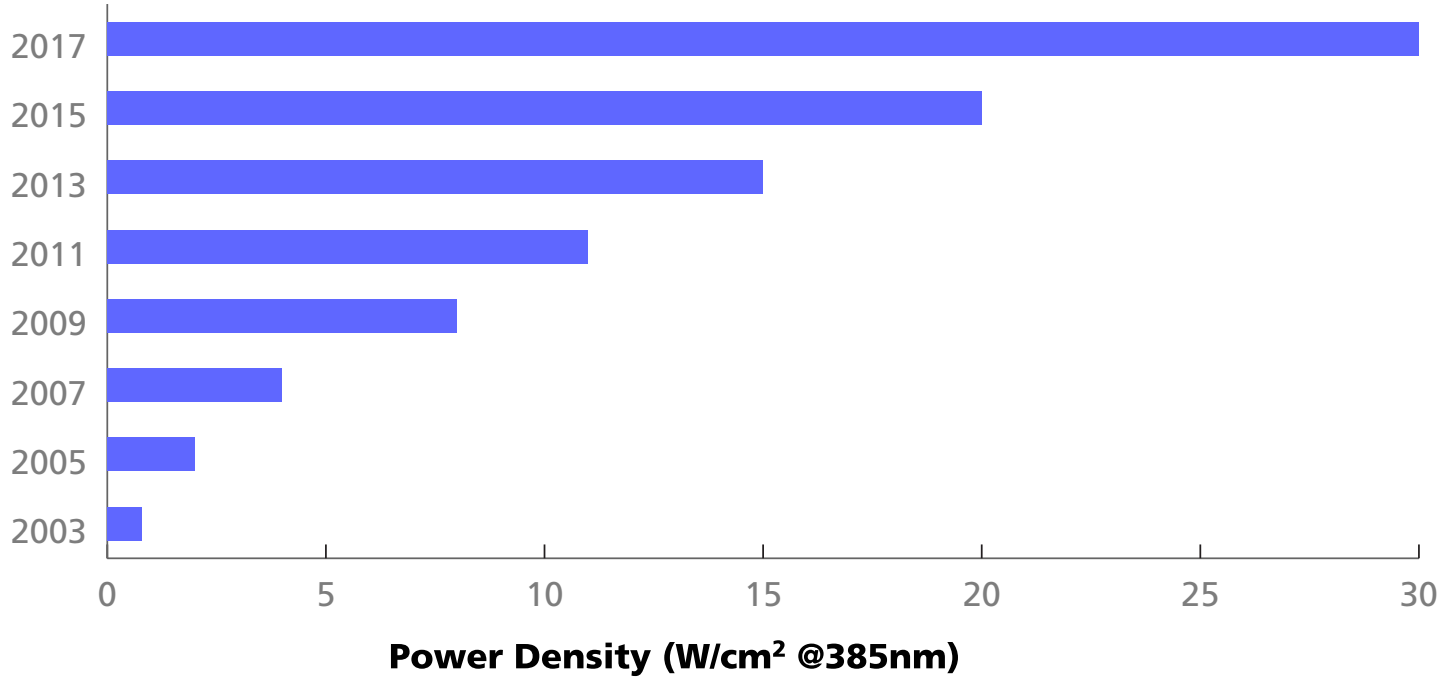
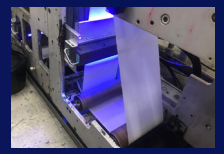
Why UV LED Is Now Qualified to Printing Industry -2

New developed packing technology now can reach over 30W/cm^2 on receiving surface, which satisfy most of the industrial applications.





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Brief Introduction of CoolUV

ESTABLISHED
2001

2006

2009

2014

OPTICAL STORAGE PRODUCT | DIGITAL PRINTING | UV LED R&D | UV LED PRODUCT

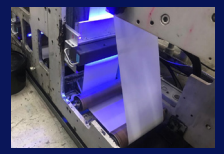
We do the die packing by ourselves.

- year 2009
  the thousand grade level clean room was built
- year 2010
  the package manufacturing line was formed
- year 2010-2012
  the complete testing line was formed

Our R&D team including experts of:

- Die packing engineer
- Die-level micro-optical designer
- Heat and mass transfer engineer
- Power electronics engineer
- Software engineer
- Structural engineer

COOLUV
total solutions for UV LED curing



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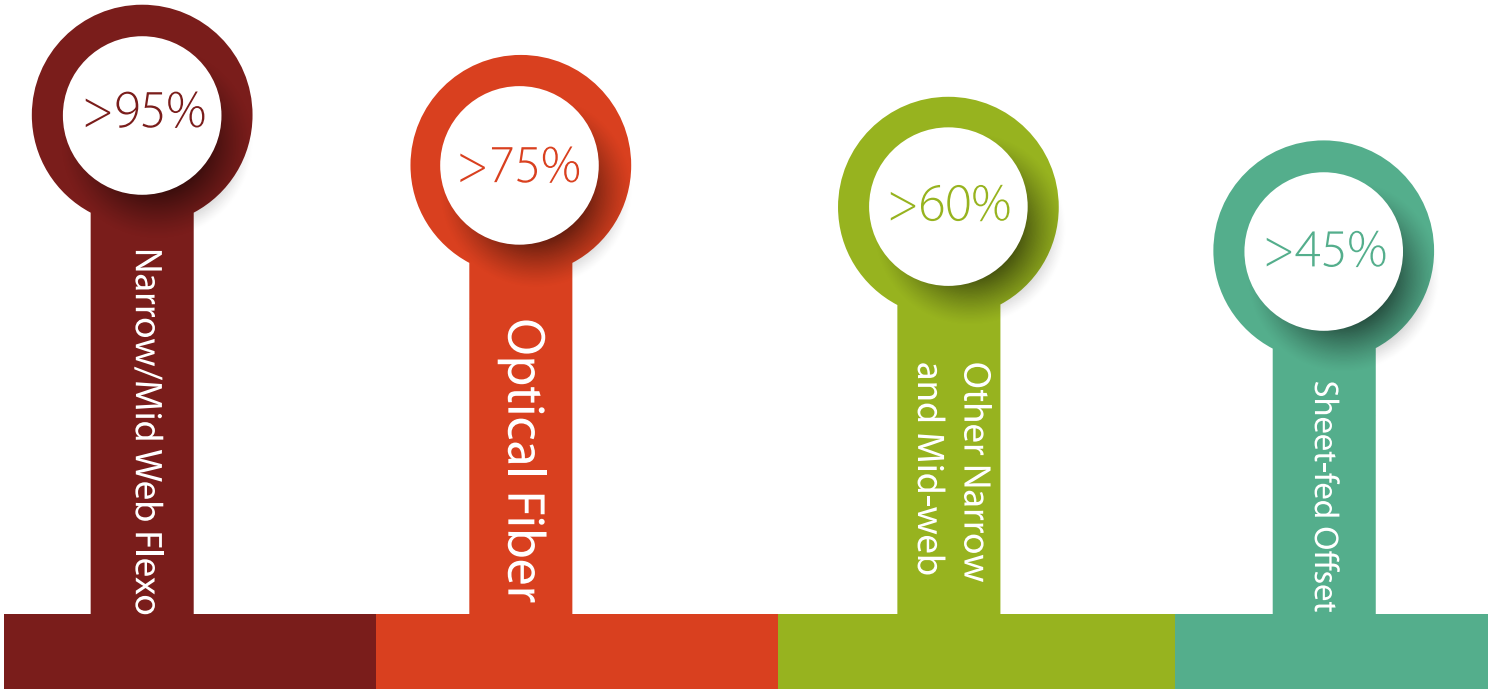
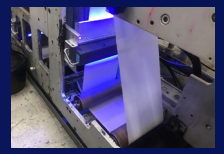
CoolUV, No.1 Brand of China on UV LED Curing System Market

For 10 years continue Research on UV LED curing technology, we've built our own knowledge system on how to produce a powerful and stable curing system. And CoolUV now is the most successful brand on UV LED curing system in China.



Market Share Till End of 2018



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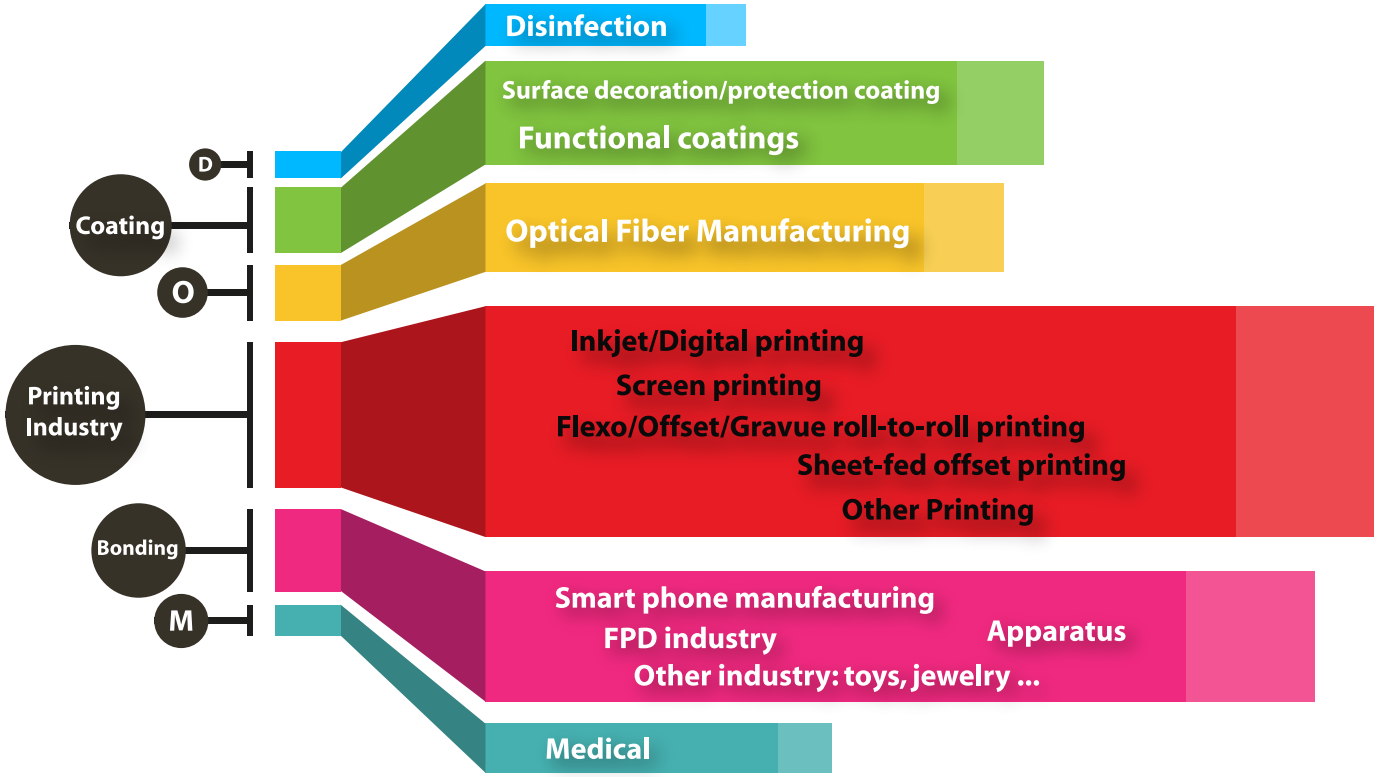
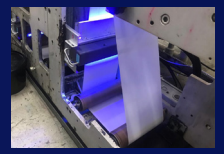
CoolUV Products For Different Application

CoolUV has developed various products for printing, coating, adhesive and specific industry customization.



COOLUV
total solutions for UV LED curing



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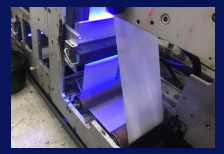
CoolUV Products Lines for Printing Industry

CoolUV has developed full range of products lines for printing industry, they can satisfy almost all printing segments demanding. SuperCure series are most popular and recommended for narrow web printing.

M	SmartCure	6-8W/cm^2	DISTANCE 3-20mm	Air/Water cooling — for inkjet / coating / glue / low speed application
Q	QuickCure	8-12W/cm^2	DISTANCE 3-10mm	Air/Water cooling — for inkjet / coating / glue
P	PowerCure	14-18W/cm^2	DISTANCE 3-10mm	Water cooling — for medium-low speed offset / flexo / silkscreen / high speed inkjet
S	SuperCure	20-25W/cm^2	DISTANCE 3-10mm	Water cooling — for mid-high speed roll-to -roll press
U	UltraCure	20-25W/cm^2	DISTANCE 10-100mm	Water cooling — for high speed or sheet fed offset press
U+	UltraCure+	30-35W/cm^2	DISTANCE 10-100mm	Water cooling — for high speed or sheet fed offset press

COOLUV
total solutions for UV LED curing



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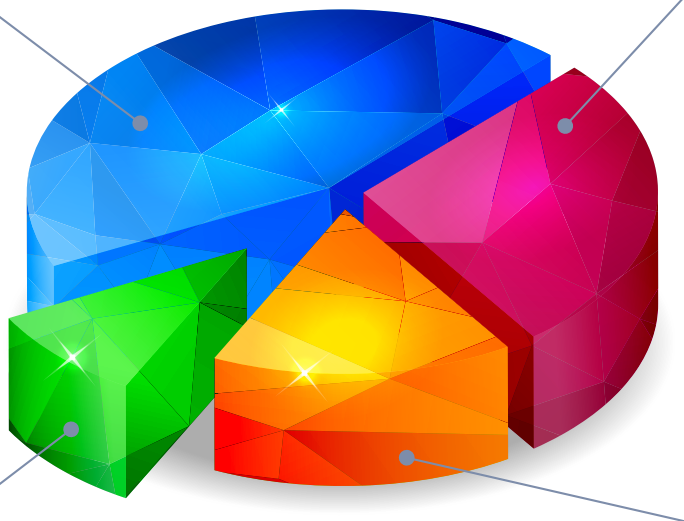
CoolUV Technology Started the R&D on UV LED Curing Since 2009

For 10 years continue Research on UV LED curing, we've built our own knowledge system on the 4 key-technology: dies packing and optical design, driving design, thermal management, and friendly integration and application support.

01 High density dies packing and die-level optical design make the high radiant intensity available.

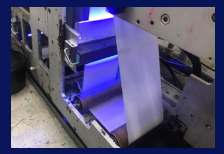
02 Excellent thermal management guarantees the curing lamps' long life time and work stably under full load situation.



04 We provide complete control system to ensure the application or system integration easy and quick.

03 Advanced LED modules controller(driver) gives the lamp and system best performance.

COOLUV
total solutions for UV LED curing



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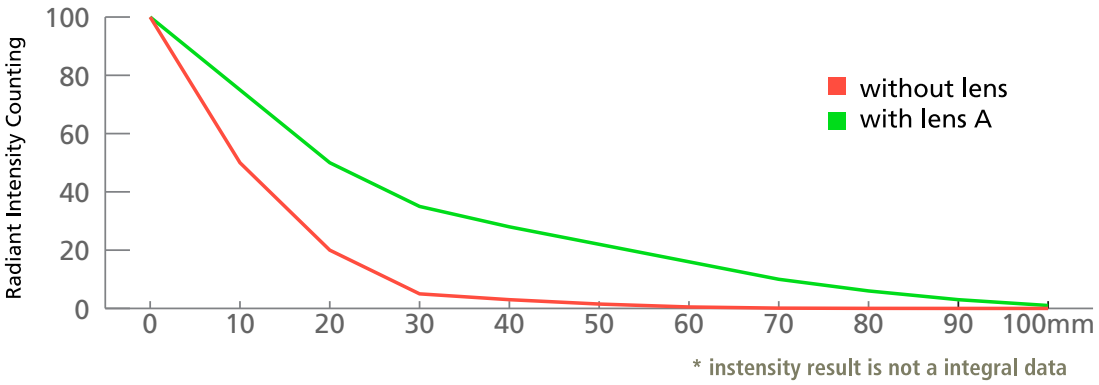
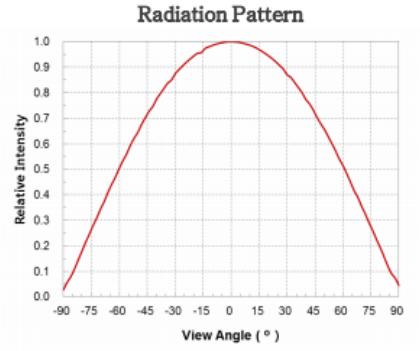
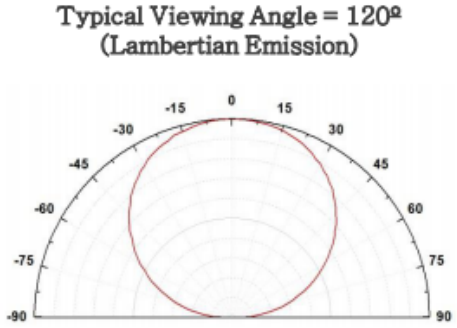
Challenges of Curing Lamps for Sheet-fed Offset Printing -1

Challenge 1, optical design for the target of the highest radiant intensity on the curing distance of 40-100mm.



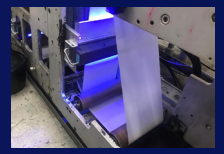




UV light radiant intensity get very quick reduction in air without lens, reflector or proper optical design.

For most of Sheet-fed press, the distance from printed material to the bottom of lamp normally between 40-100mm, and the minimal required UV intensity is 4-5 W/cm^2.

LED chips are solid-state semiconductor parts which emit light from a flat surface, also it need a heat sink big enough to transfer the heat as quick as possible.
Unlike the arc lamp is transparent and not so hot sensitive, optical design is much simple for arc lamp but much difficult for LED matrix with very limited optical parts could be adopted.



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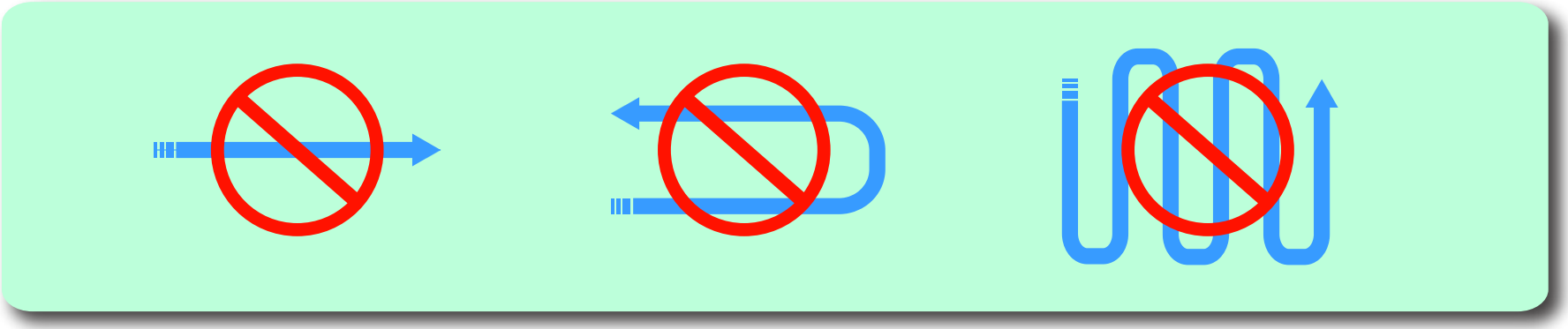
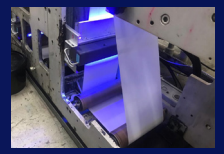
2 Challenges of Curing Lamps for Sheet-fed Offset Printing -2

Challenge 2, lamp length for sheet-fed press normallly between 700-1800mm, power consumption from 6Kw-25Kw. Such length and high power make great challenge for heat dissipation and tempreture uniform on whole lamp.



Traditional heat sink design of water cooling for long cooling plate over 1 meter may cause:
1) tempreture difference for one lamp over 15-20 degrees;
2) max. tempreture over 15-20 degrees than common usage;

Which may cause the lamp working at a high tempreture that may be not ideal for the lamp.



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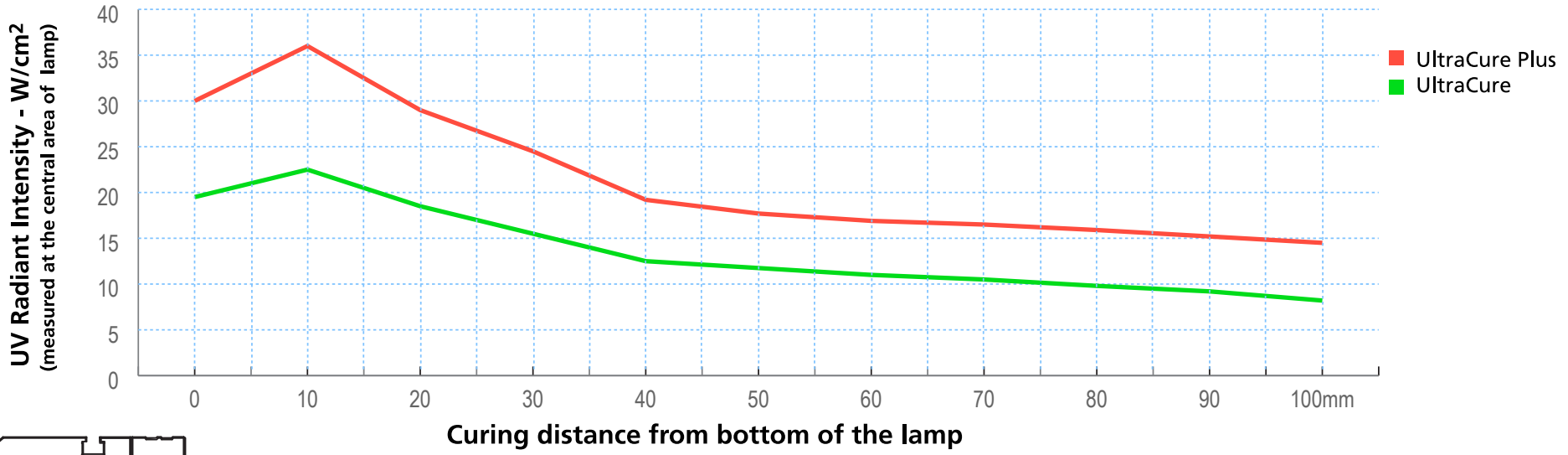
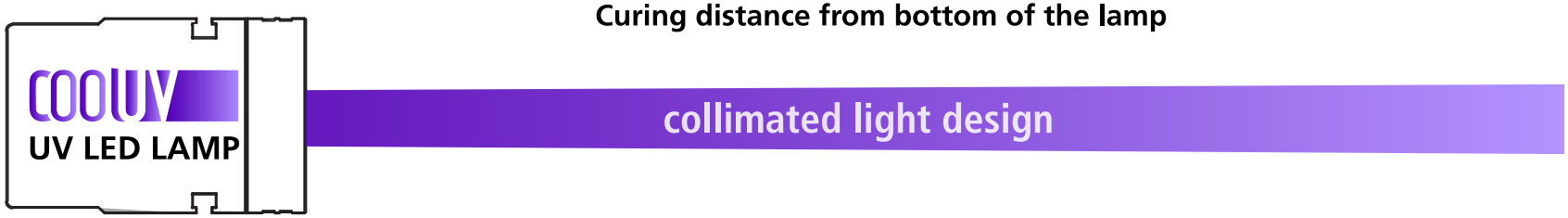
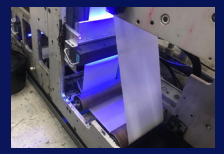
CoolUV's Excellent Optical Design for Sheet-fed Offset Printing -1

Two models were developed: UltraCure and UltraCure***plus***, for common and high power demanding.

- UltraCure, applied for cure distance 5-45mm, UV intensity 20-25W/cm² max.(10-12W/cm²@45mm, 8-9W/cm²@100mm)
- UltraCure***plus***, applied for cure distance 5-100mm, UV intensity 30-35W/cm² max.(12-15W/cm²@100mm).







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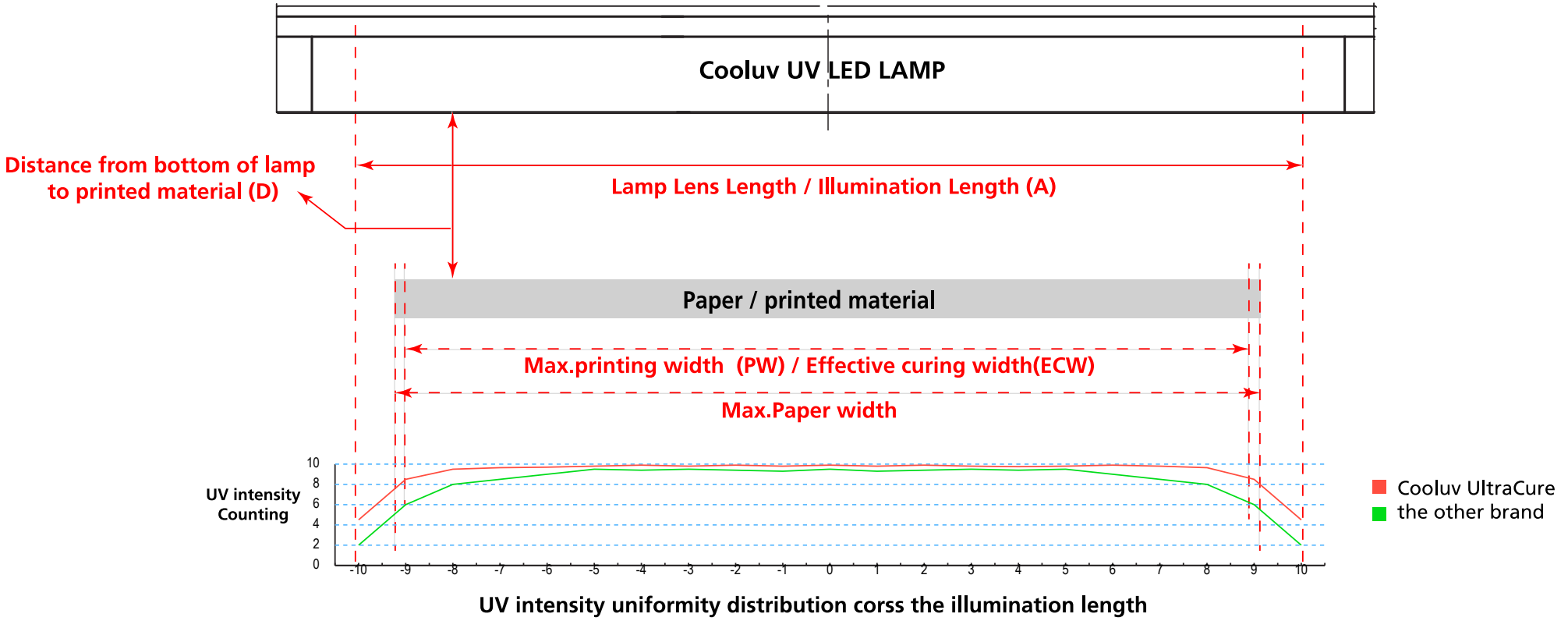
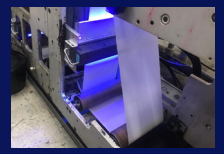
CoolUV's Excellent Optical Design for Sheet-fed Offset Printing -2

ECW/PW = A - 1.25*D



UV intensity uniformity distribution corss the illumination length

COOLUV
total solutions for UV LED curing



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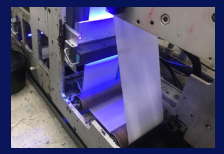
CoolUV's Excellent Optical Design for Sheet-fed Offset Printing -3

Excellent optical design offers more advantages than the other brands products.

CoolUV UltraCure and plus	The other brands products
• No reflectors used • No strict focuse distance required, wide range usage • Same installation manner for interdeck and delivery • Uniformity length for effective curing >85% • UV chips power output usage efficiency >60% • Less power consumption for same uv intensity • Compact size for any models of machine	• Some with reflector • Some requires certain focuse distance • Some with different installation for interdeck and delivery • Uniformity length for effective curing <75% • UV chips power output usage efficiency <50% • High power consumption • Large dimension not suitable for some machine modles

- For low-energy required LED formula offset ink, UltraCure is enough for the full speed ptinting (max. 16,000-17,000 sheets/hour) even at distance of 100mm;
- UltraCure is fully workable with conventional ink at distance of 40-50mm for full speed printing;
- UltraCure plus is one option for varnish printing and for conventional inks at 100mm distance.



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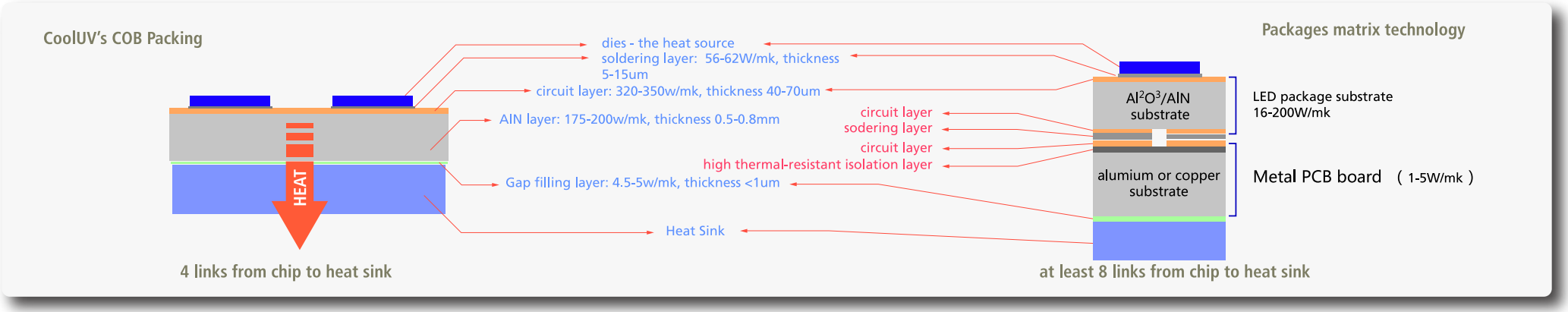
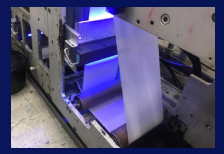
CoolUV's Excellent Thermal Management - Dies Packing

LEDs produce vast heat during working, dies work at high tempreture will cause the great life reduction, so to run at a working tempreture as lower as possible is very important. Transfer and dissipate the heat quickly and efficiently is a very challenging work, CoolUV start the work from dies packing.

COB (chip on board) packing: Allign the dies(chips) directly on the circuits board is still the best packing method so far which can minimize the heat transfer link.
By adopting very high thermal conductivity materials at every layer, CoolUV lamp provide a very ideal working tempreture for the dies: 15-25℃ higher above the room tempreture.



Packing manners and Heat Transfer Link



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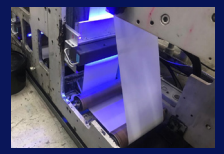
CoolUV's Excellent Thermal Management - Heat Sink Design

Inventive heat sink design can make sure the uniformity of the lamp tempreture and also keep lamp working at very low tempreture.

Because of commercial secrets, this part temporarily not available.



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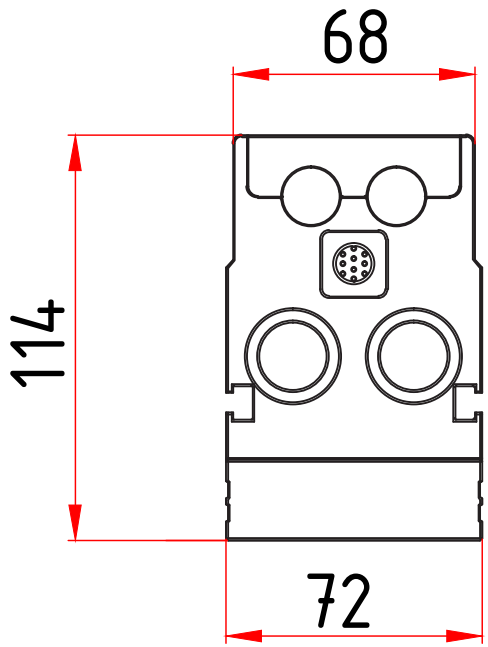
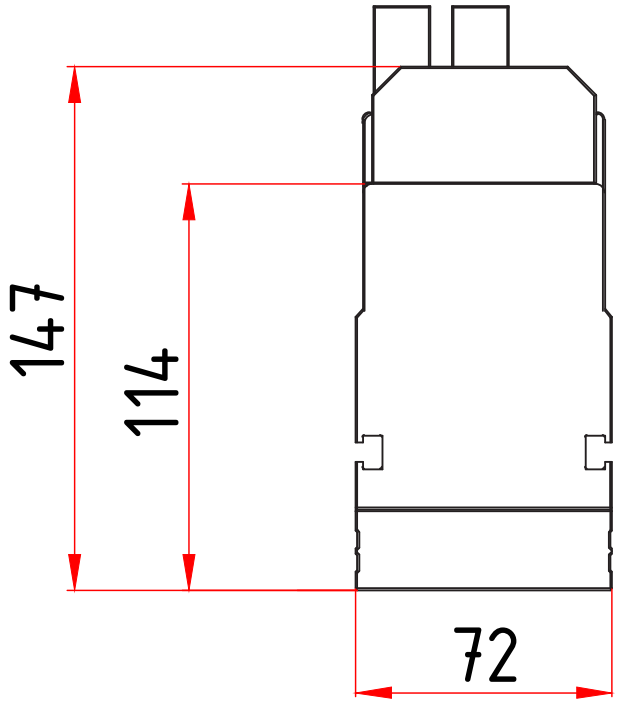
Compact Dimension

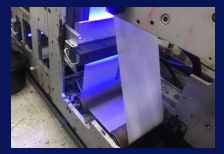
Unit: mm



Lamp with cables and pipes from side



Lamp with cables and pipes from top



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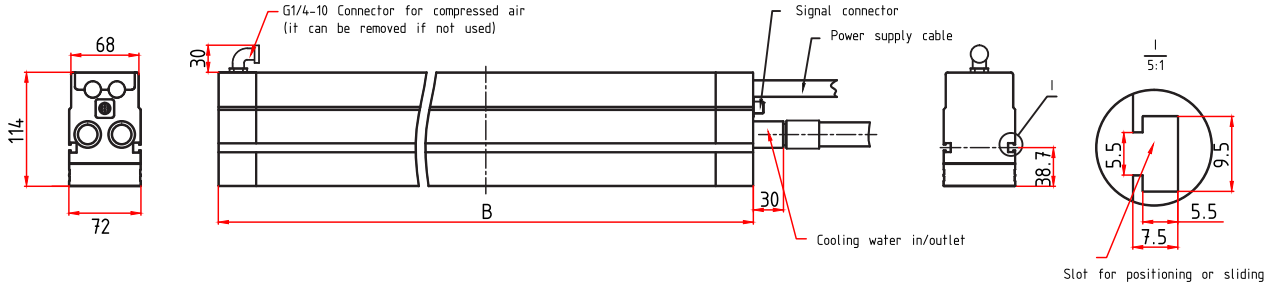
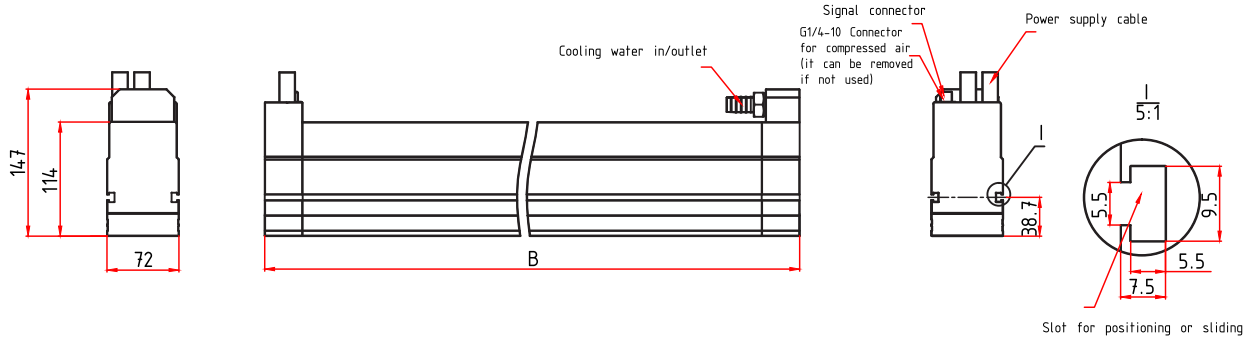
Flexible Installation Model

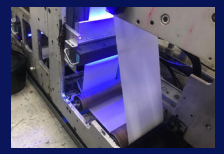
More cables and pipes leading-out combination are available to match different press modles.

Lamp with cables and pipes from side



Lamp with cables and pipes from top





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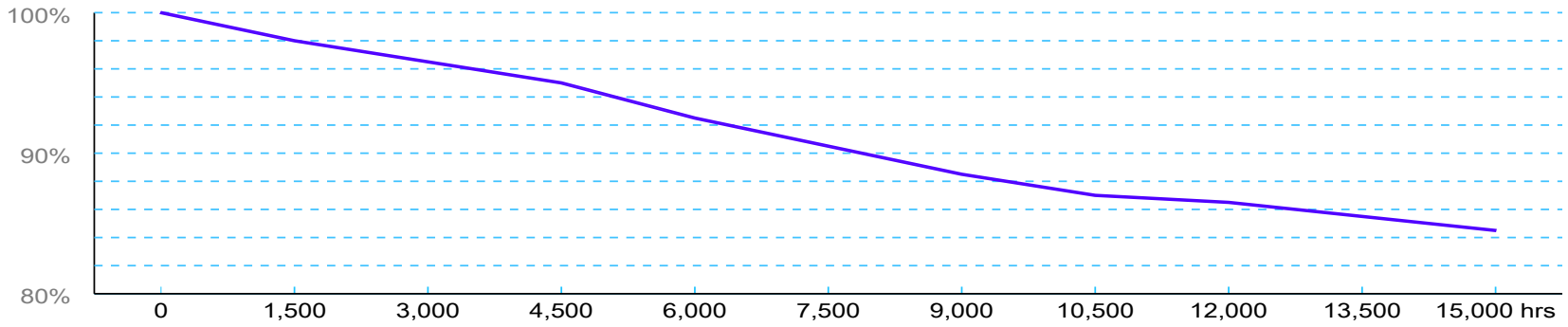
CoolUV Lamp Has Excellent Life Time

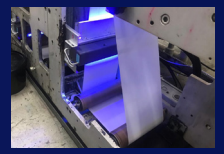
By excellent thermal management, packing technology and driving technology, CoolUV lamp's life time extends to over 15,000 hours.

Tips:

Dies life time theoretically can reach over 100,000 hours (when reaching 30% light reduction), but after packing, there're a lot of factors may cause the lamps failure, so dies life time can not be considered as lamps life time; almost all the lamps failures during the actural usage are not related with dies natural life ending.



Lamp UV Radiant Intensity Reduction @385nm die working tempreture 55-65 degree



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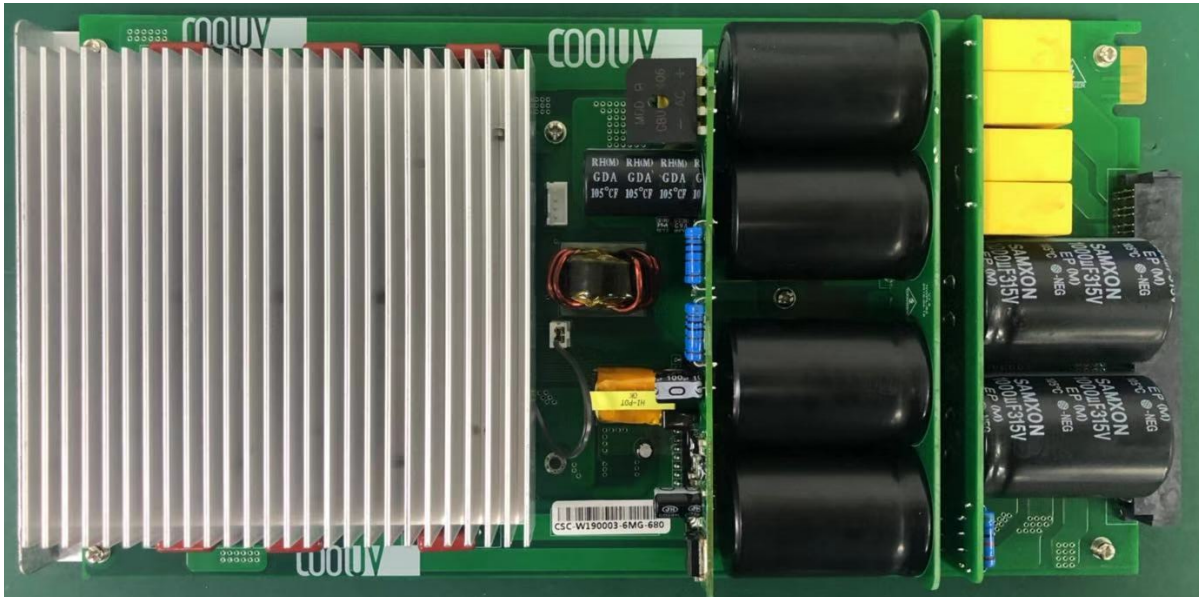
CoolUV's Advanced Controller And Control System -1

CoolUV developed advanced control technology which is proved very stable and robust, and also can meet various requirements of most applications.

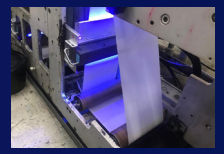
Advanced Features

- 10-100% automatic power regulation in 1% resolution;
- Real fast on-off switching within 2-3 milliseconds no hurting lamp's life;
- All running factors real time monitoring, alarm fatal and modules failure immediately;
- Advanced AD-DC power supply, efficency >94.5%, life >100K hours;
- Curing length optional for less size material printing;
- Standard interfaces with PLC, ARM and X86 system, easy to expand or integrated with other intelligent/managing system;

...



Advanced controller: plug-in and play, communication, running current regulation, parameters setting, status monitoring .....



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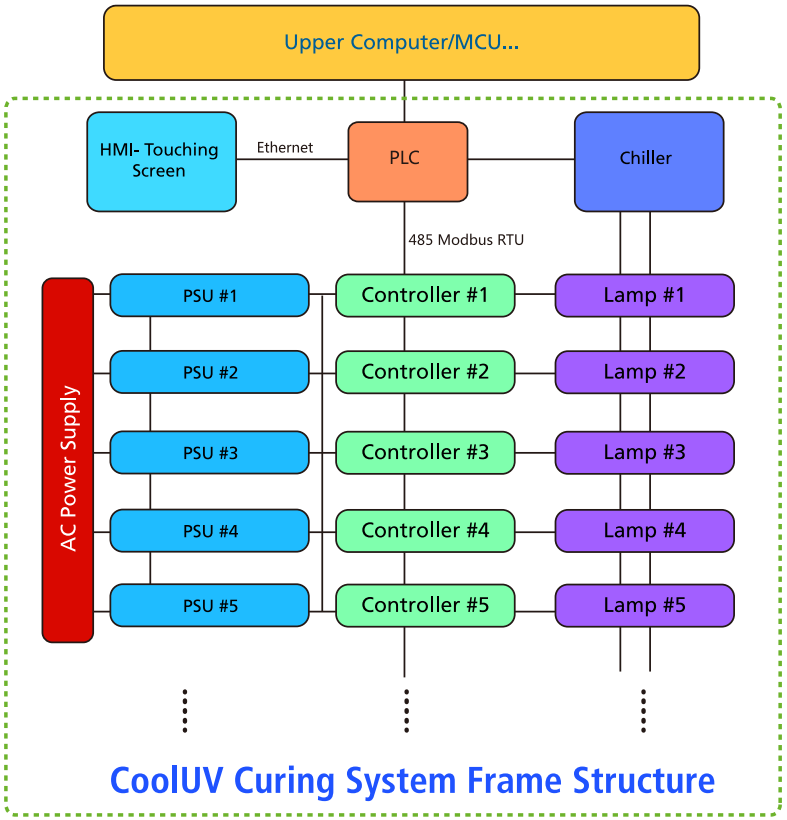
CoolUV's Advanced Controller And Control System -2



CoolUV Curing System Frame Structure

*pictures only for reference.

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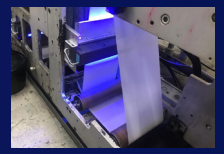
total solutions for UV LED curing



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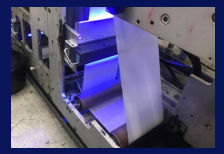
UltraCure and UltraCure plus Technical Specifications

Technical Specification

	UltraCure	UltraCure plus
Linear Power (at max. output)	100-120W/cm	160-180W/cm
Default Spectrum	385 +/-5nm (365/395 available)	385 +/-5nm (365/395 available)
Radiant Intensity	25W/cm² @10mm /9W/cm² @100mm distance	35W/cm² @10mm /14W/cm² @100mm distance
Power Output Resolution	20-100% @1%	20-100% @1%
Normal Running Output	60-90%	50-80%
Cooling Manner	Water Chiller	Water Chiller
Max. Speed Supported		
conventional ink <45mm	16,000 sheets/hour	16,000 sheets/hour
conventional ink @100mm	10,000 sheets/hour	16,000 sheets/hour
led ink <45mm	16,000 sheets/hour	16,000 sheets/hour
led ink @100mm	16,000 sheets/hour	16,000 sheets/hour
UV LED Varnish Support	Good	Excellent
UV LED Metal Ink Support	Good	Excellent

* 1) Curing speed depends on ink formula and thickness; 2) Specifications may be changed and are different with actural products.



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Inks: A Very Important Factor

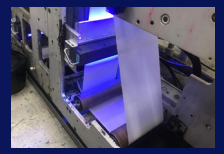
Does the UV LED lamp request special formulation ink?

Basically yes, UV LED lamp is working at UVA (315-400nm) range, so the relative photo-initiator is requested for UV LED ink.

All main brands of LED formula inks in the market are approved matching very well with CoolUV lamps, including offset ink, flexo ink, silkscreen ink, inkjet ink and so on.

However, depending on the ink fomula, more than 70% offset inks used with arc lamp could be used directly under COOLUV LED lamps.

Approved SIEGWERK TOYOINK T&K TOKA DIC FlintGroup



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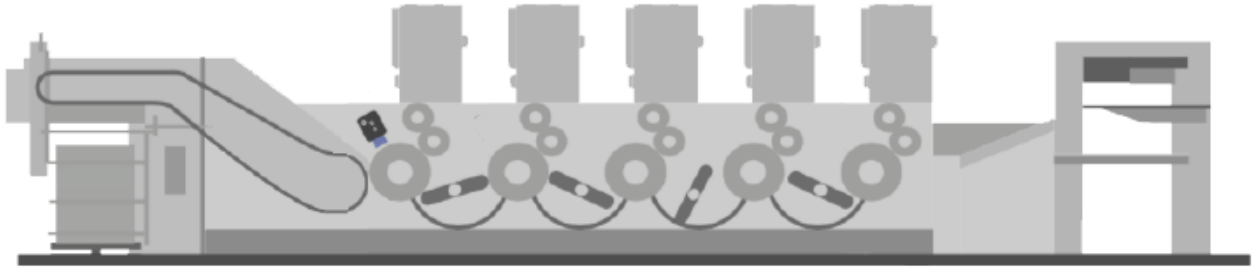
Installation Variety -1

Samples of various installation situation, much more variety is available depending different printing jobs.

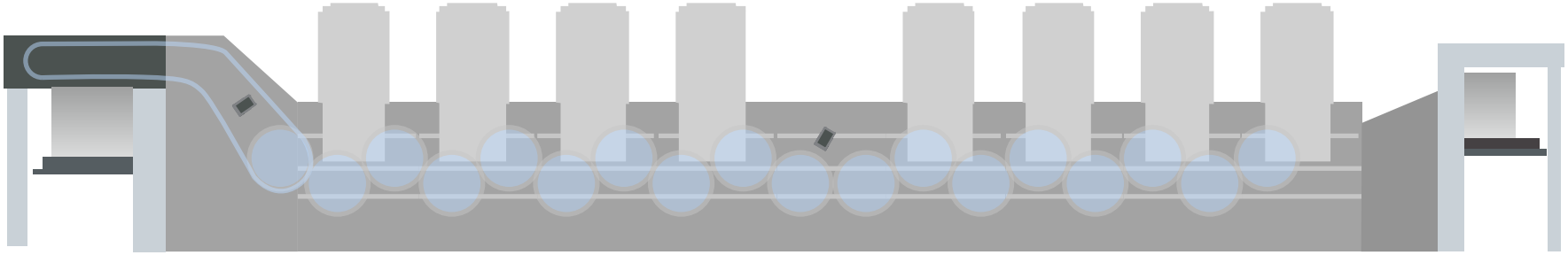
Sample-1

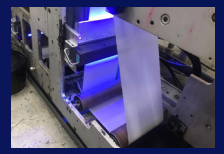
4 or 5 colors
with 1 LED lamp
normally for
paper printing



Sample-2

8 colors
with 2 LED lamp
normally for
paper printing





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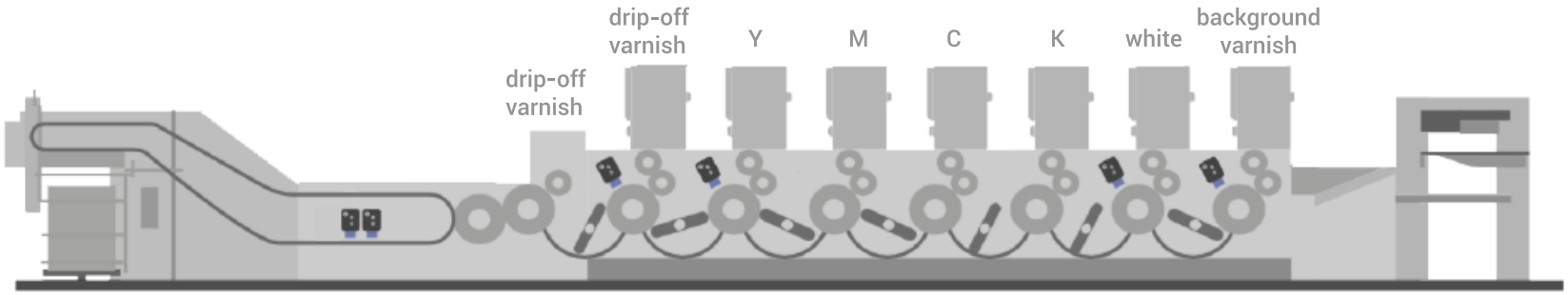
Installation Variety -2

Samples of various installation situation, much more variety is available depending different printing jobs.

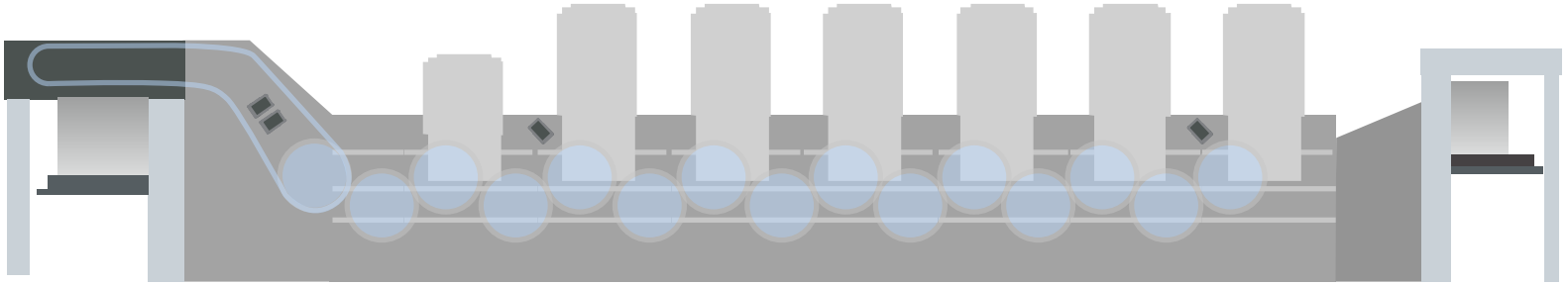
Sample-3

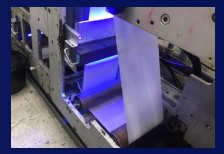
7 + 1 colors
with 5-6 LED lamp
normally for
packages printing



Sample-4

6+1 colors
with 3-4 LED lamp
normally for
packages printing





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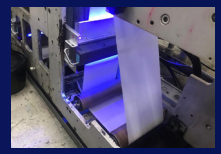
Using Cost Comparision Items Between Arc Lamp and Led Lamp

	Arc Lamp System	UV LED System
First time purchasing cost	-	same or less
Workshop support cost	air exhausting	water cooling pipes, cost less
Electricity cost		
Running time	full power	save at least 60%
Standby time	half power or 1/4 power	lamps off, keep very low standby power
Cooling	motor fans	water Chiller
Power supply efficiency	60-70% or 80-90%	> 95%
Maintaining cost		
Tubes	changed every 1-1.8k hrs	-
Reflectors or filter glass	changed every 4-6 months	-
Repair	expensive	full modulized, cost less
Workshop air conditioning cost	high	less
Inks	-	same or less higher



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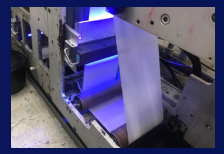
Case Study 1: Using cost for 1 lamps length 1100mm (sample-1)

Press Model: Roland700 or Heidelberg CD102/CX102

	Arc Lamp System	CoolUV UltraCure	CoolUV UltraCure plus
Total electricity consumption each lamp (	including cooling and power supply consumtion)		
Running time	25kW·h	14kW·h	20kW·h
Standby time	6kW·h	0.5kW·h	0.5kW·h
Daily working time	16 hours	16 hours	16 hours
Running time (full power)	10 hours	10 hours	10 hours
Standby time	6 hours	6 hours	6 hours
1lamp daily electricity consumption	25x10+6x6=286kW·h	14x10+0.5x6=143kW·h	20x10+0.5x6=203kW·h
Anual working days	320 days	320 days	320 days
Anual electricity consumption	286x320=91,520kW·h	143x320=45,760kW·h	203x320=64,960kW·h
Anual maintaining cost	Around USD3,000	Almost 0	Almost 0
Anual total using cost	USD3,000+91,520kW·h	45,760kW·h	64,960kW·h



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Case Study 1: Using cost for 6 lamps length 1100mm (sample-3)

Press Model: Roland700 or Heidelberg CD102/CX102

	Arc Lamp System	CoolUV UltraCure	CoolUV UltraCure plus
Total electricity consumption each lamp (including cooling and power supply consumtion)			(4 Ultracure+1UltraCure plus)
Running time	160kW·h(7 lamps)	72kW·h(6 lamps)	66kW·h(5lamps)
Standby time	6kW·h	1.2kW·h	1.2kW·h
Daily working time	40 hours	16 hours	16 hours
Running time (full power)	10 hours	10 hours	10 hours
Standby time	6 hours	6 hours	6 hours
dystem daily electricity consumption	160x10+40x6=1,840kW·h	72x10+1.2x6=727.2kW·h	66x10+1.2x6=667.2kW·h
Anual working days	320 days	320 days	320 days
Anual electricity consumption	1,840x320=588,800kW·h	727.2x320=232,704kW·h	667.2x320=213,504kW·h
Anual maintaining cost	Around USD15,000	Almost 0	Almost 0
Anual total using cost	USD15,000+588,800kW·h	232,704kW·h	213,504kW·h

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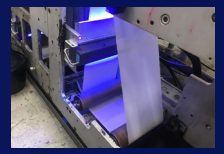
total solutions for UV LED curing



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Benifits By Using UV LED Curing System

UV LED curing is really a green environmental friendly technology. By cutting significant carbon emission, zero-mercury to handling, no changing parts, long using life, the users and our planet benefit very much from this technology.

Saving at leaset 90% curing system maintanence cost!

Saving at least 60% electricity!

Increasing at least 20-30% daily production!

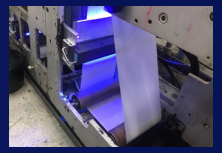
More heat sensitive materials available!

Immediate on-off operation without waiting!

Zero ozone produced!
Zero Mercury containing!
Low noise during running!
Better curing uniformity!
Less heat produced in the workshop!

COOLUV

total solutions for UV LED curing



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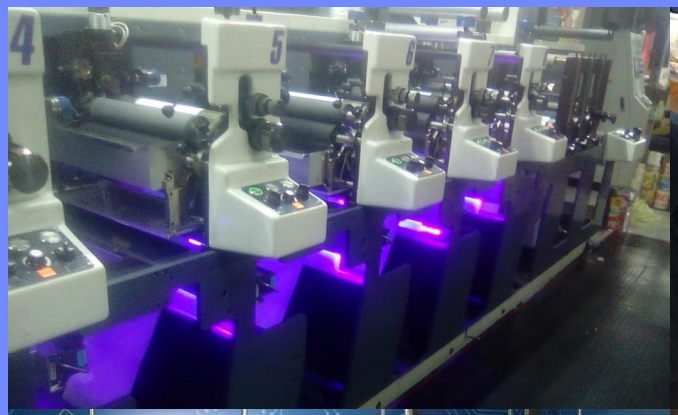

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