

TNNOSFN



SPEAKER



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Nearly 40 years experience in the can industry in various fields (R&D, Support, Sales, etc.)



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OPTIMIZING THE UV DRYING PROCESS

Interpreting Logger Data

AGENDA

- Theory
- Obtaining and Interpreting
UV curing process data
- Conclusion
- Other products that help
the curing process

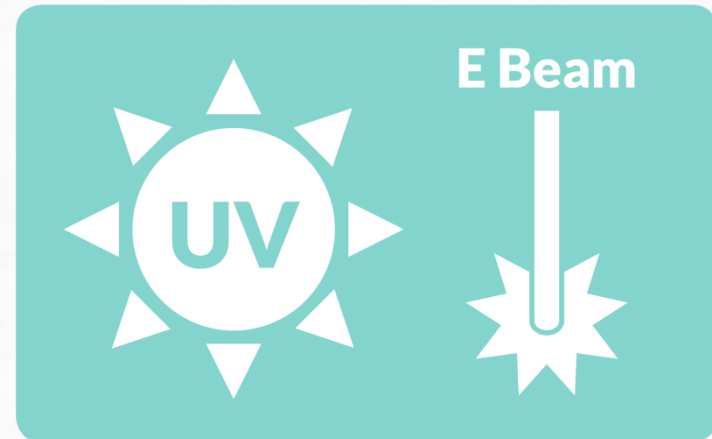


CURING

Thermal

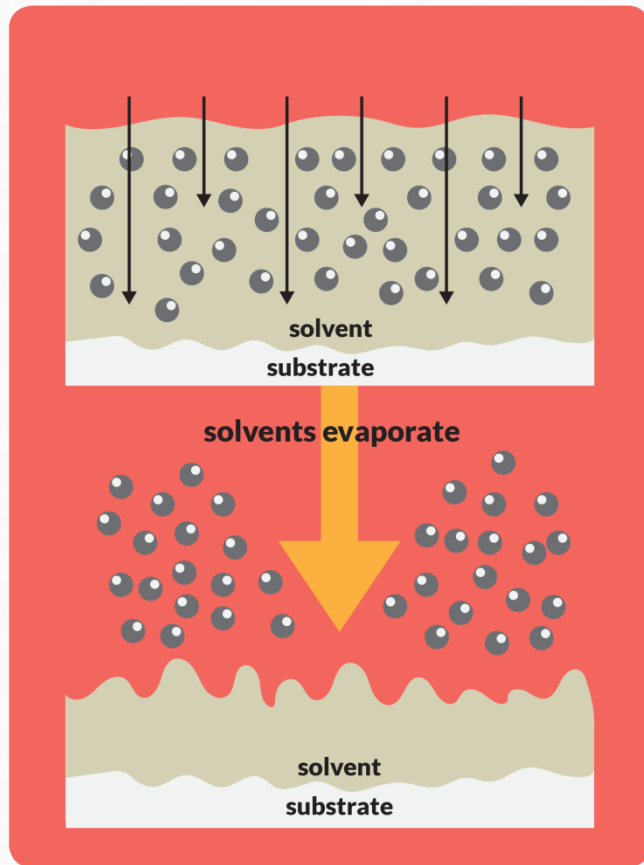


Radiation



Thermal vs. UV Curing

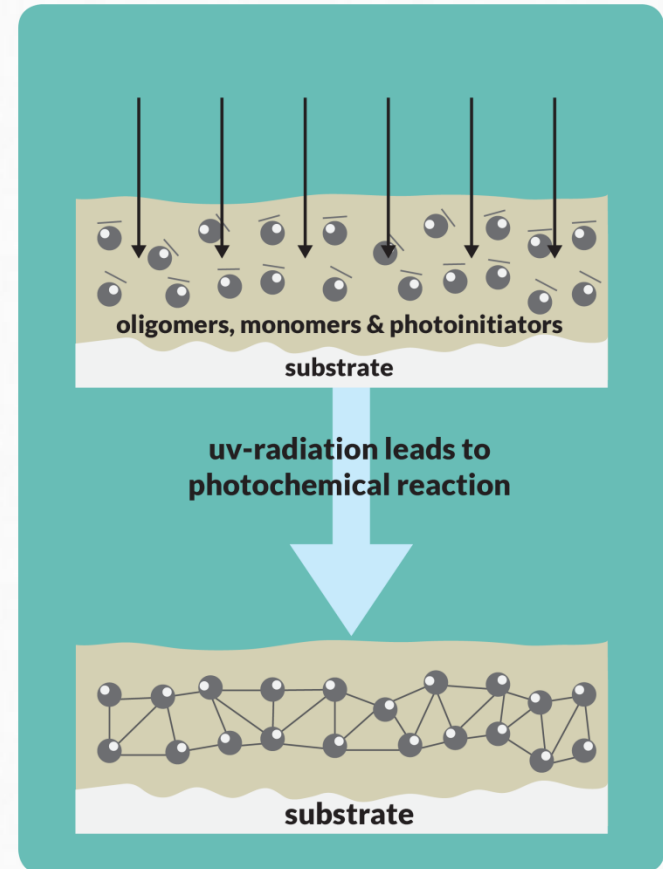
Thermal Curing



Liquid layer

Solid layer

UV Curing



UV Curing Advantages



Less Pollution



Energy efficient



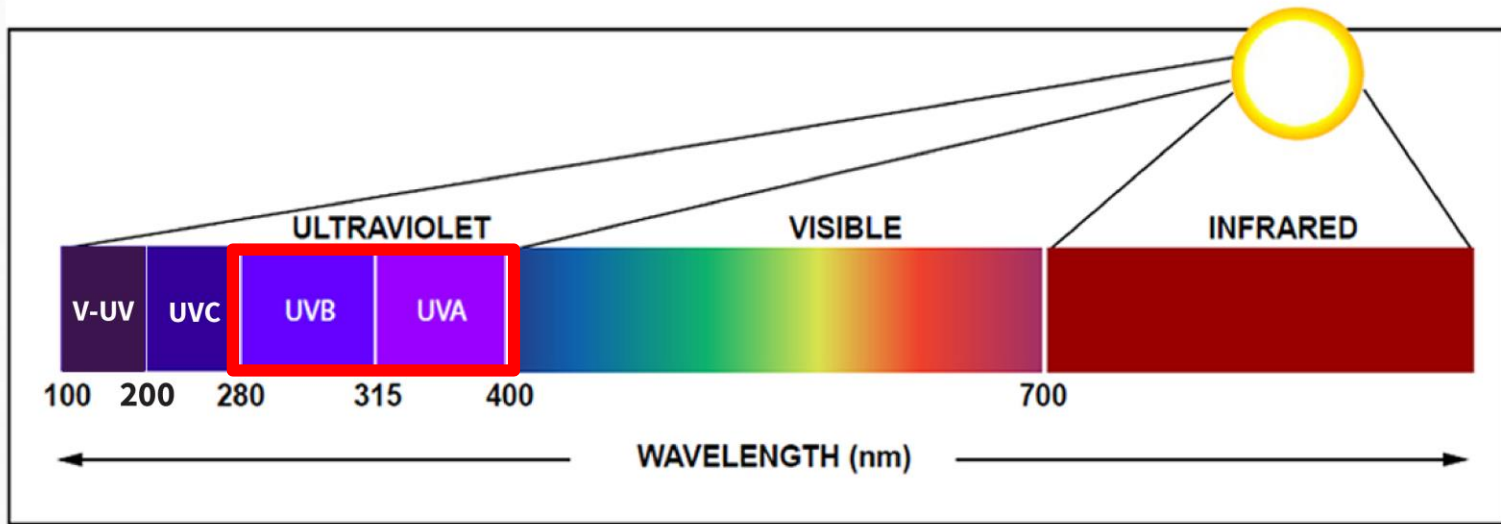
Very fast curing

Factors Affecting Curing

1. UV absorption vs. Wavelength
2. Penetration vs. Wavelength
3. Emission spectrum
4. Color / Pigments
5. Layer thickness
6. Substrate reflection

Factors Affecting Curing:

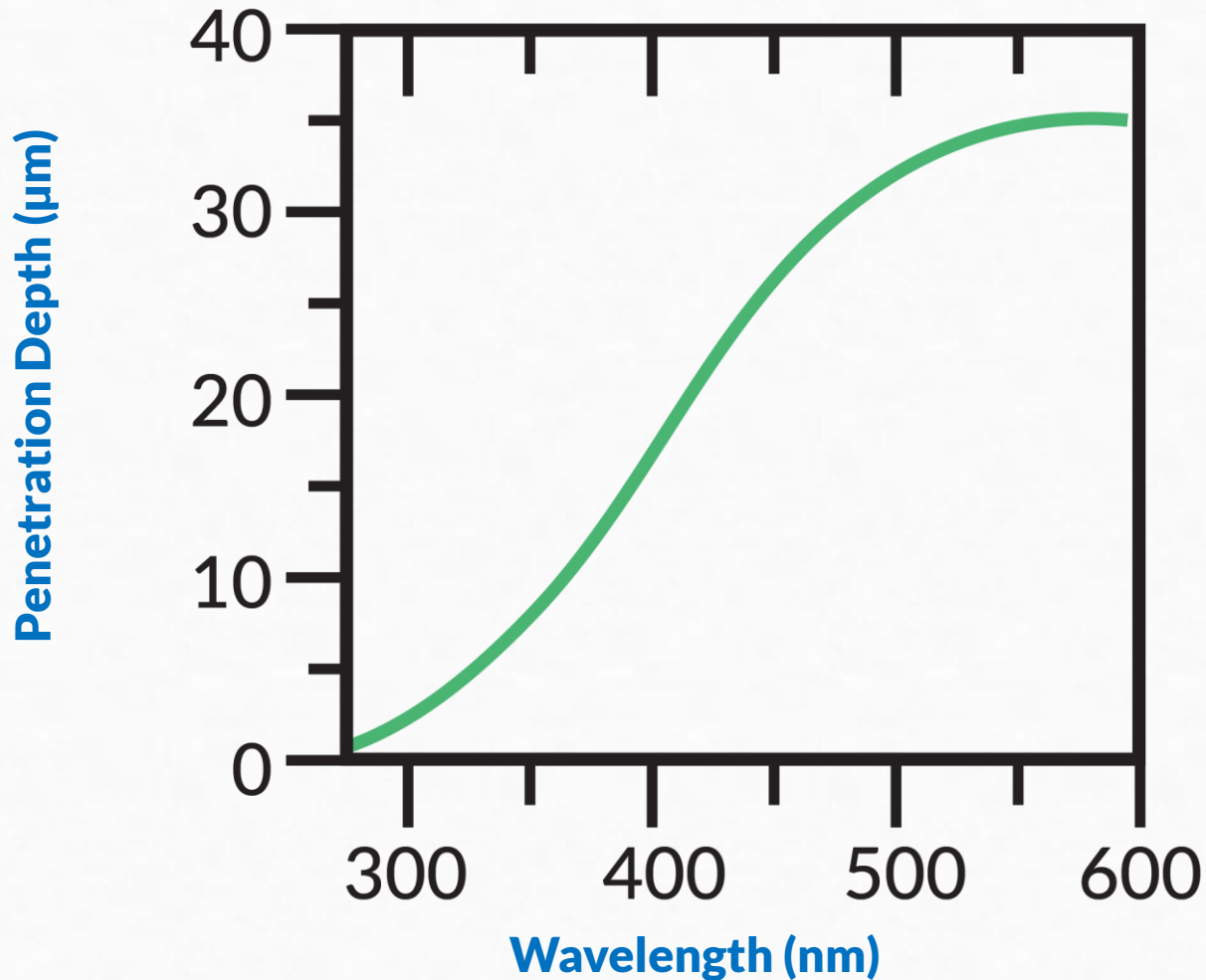
UV Absorption vs. Wavelength



UV Range	Wavelength (nm)	Photo energy [eV]	Characteristics	Field of Application
Visible Light	780 - 380	1,60 – 3,26		adhesives
UV-A	380 - 315	3,26 – 3,94	Deep curing	Inks or coatings
UV-B	315 - 280	3,94 – 4,43		varnishes
UV-C	280 - 200	4,43 – 6,20	Surface Curing	sterilization
V-UV	200 - 100	4,43 – 12,4	Absorption by O ₂	No application for UV Curing

Factors Affecting Curing:

Penetration Depth

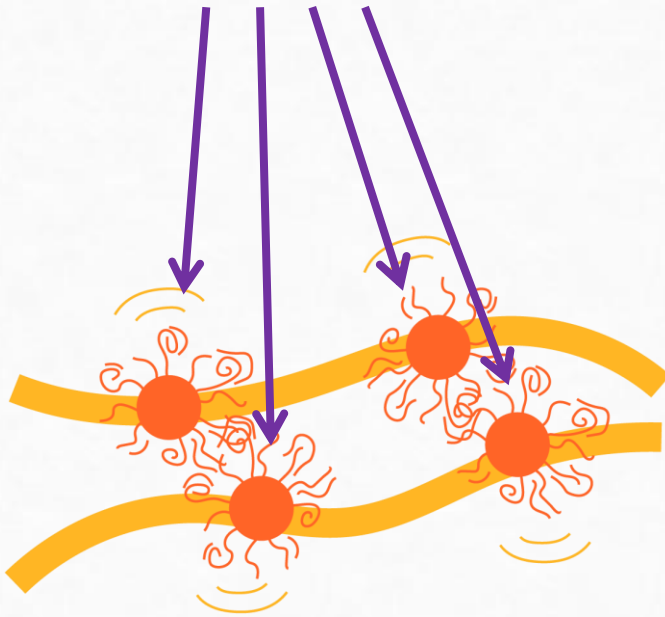


UV Curing Process



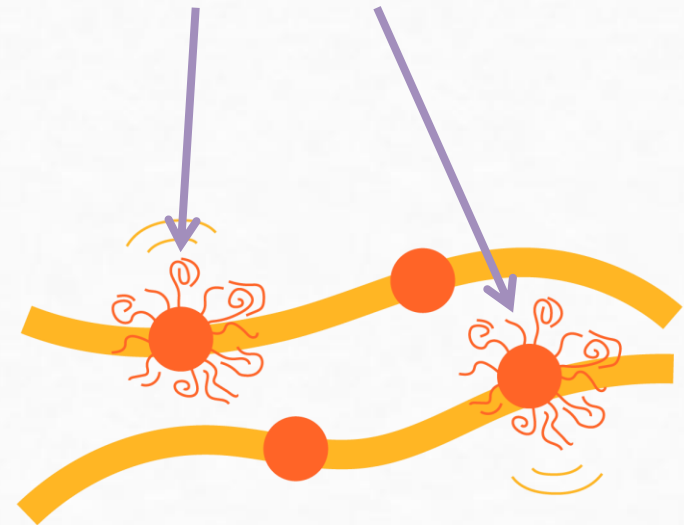
UV Curing Process

UV LIGHT



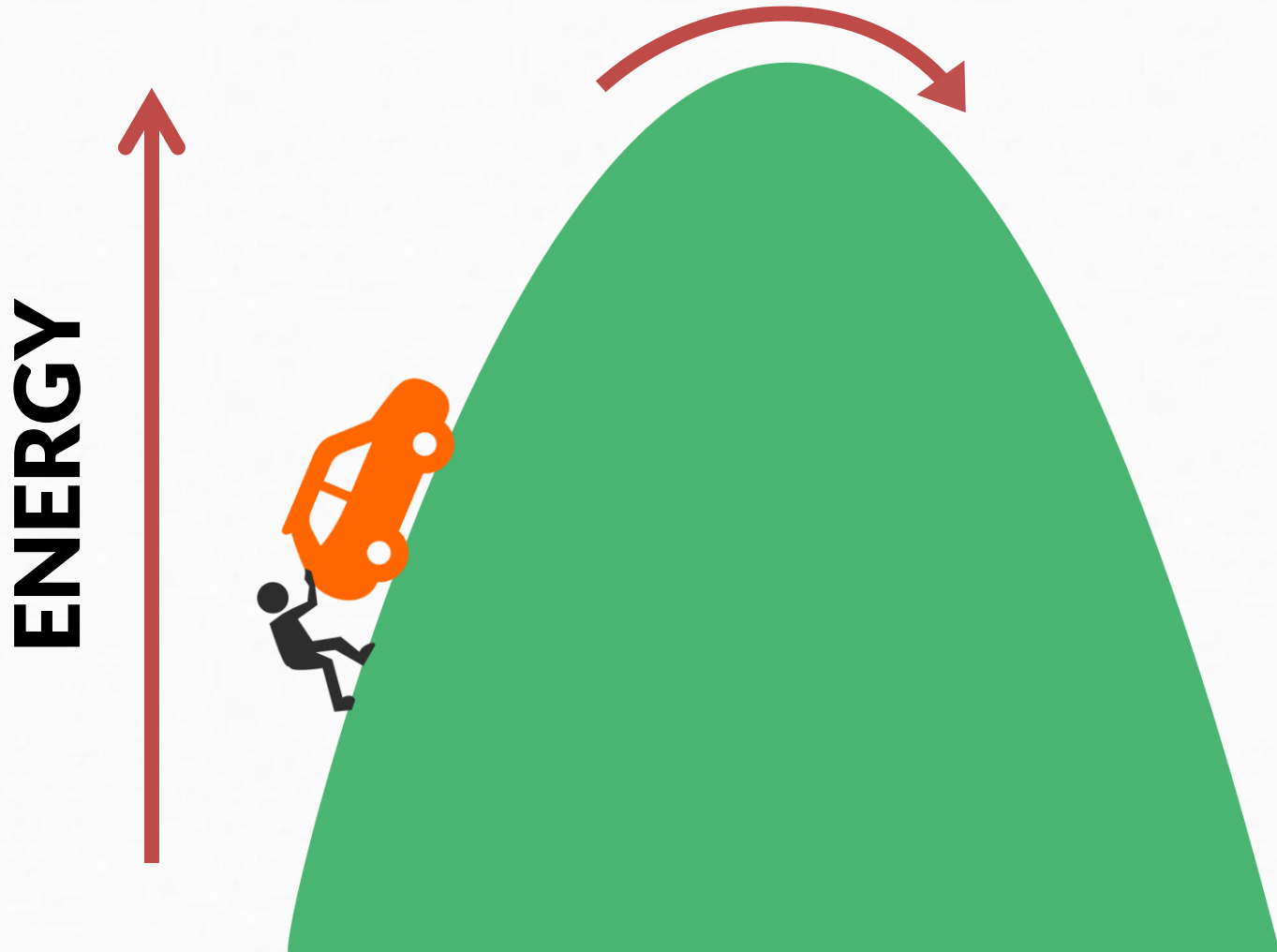
All lacquer needs to be excited at the same time

UV LIGHT

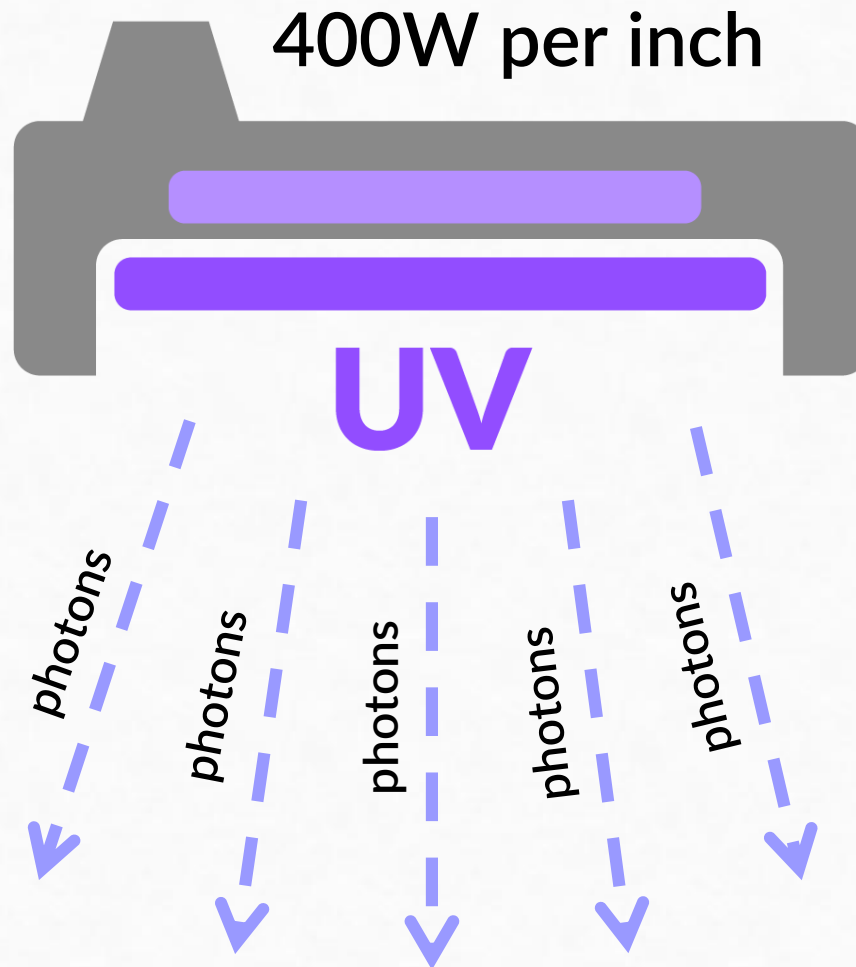


Not enough light...
Nothing will happen!

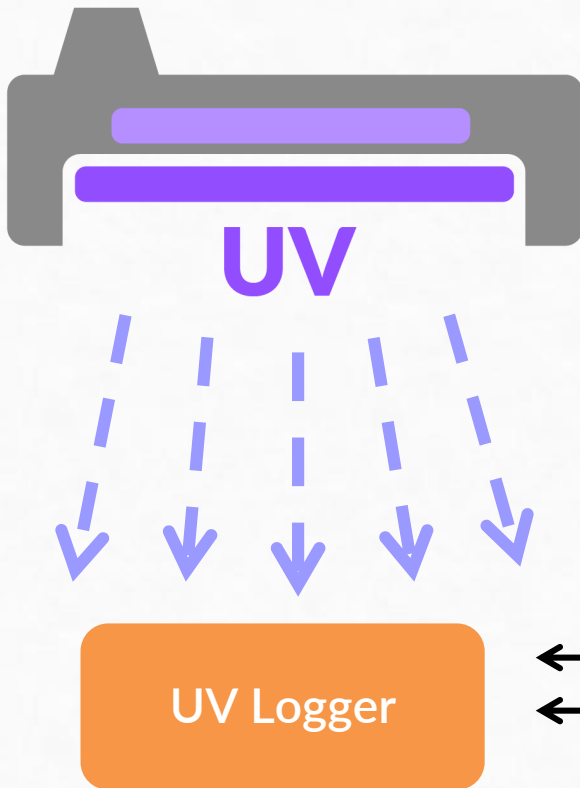
UV Curing Process



Light / Photons



Energy and Power



Energy [J] = [W] x sec

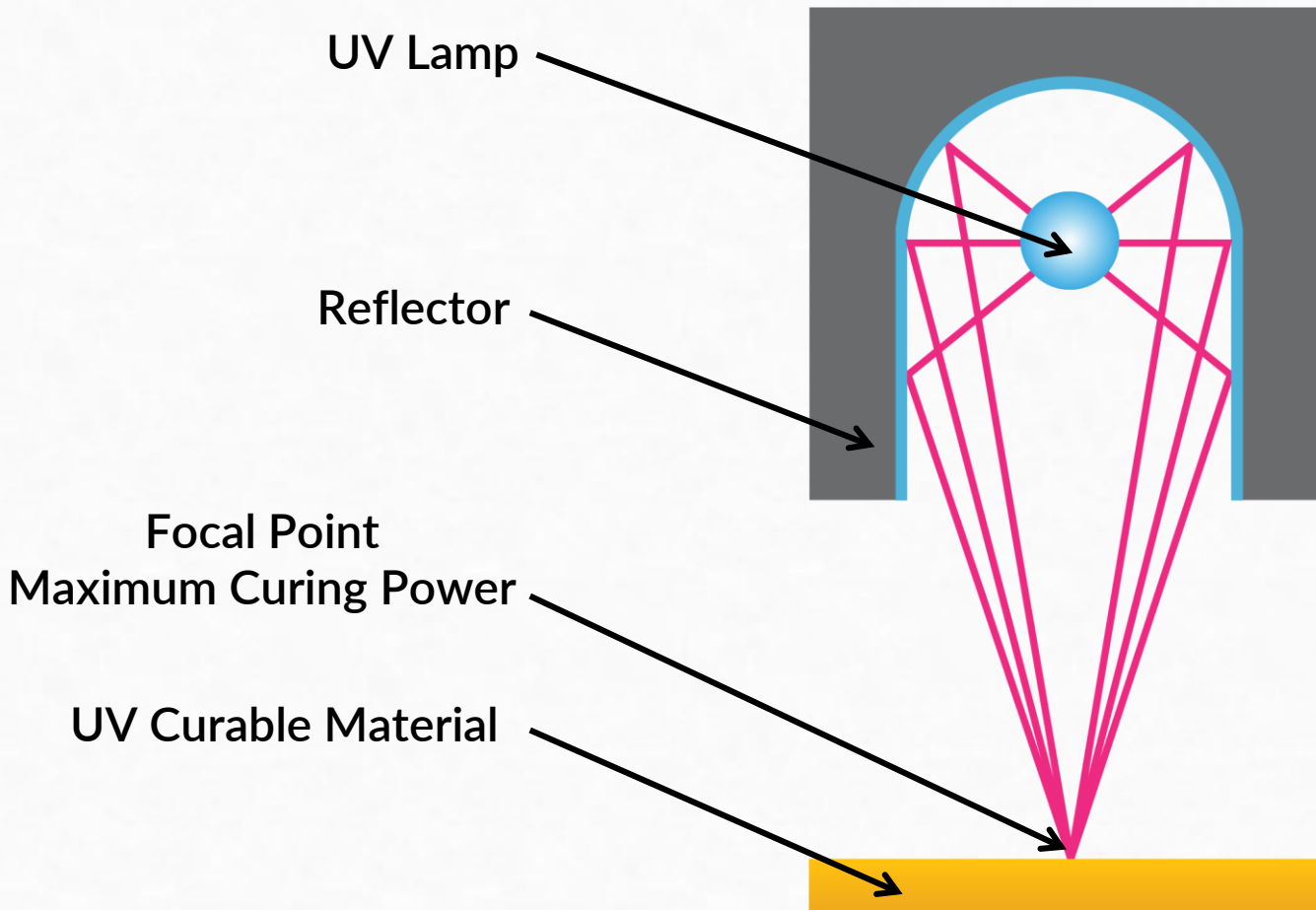
- Logger looks at total of photons
- Longer exposure -> higher count

Power [W]

- Logger looks at photons at any instance
- Number of photons per second per cm²

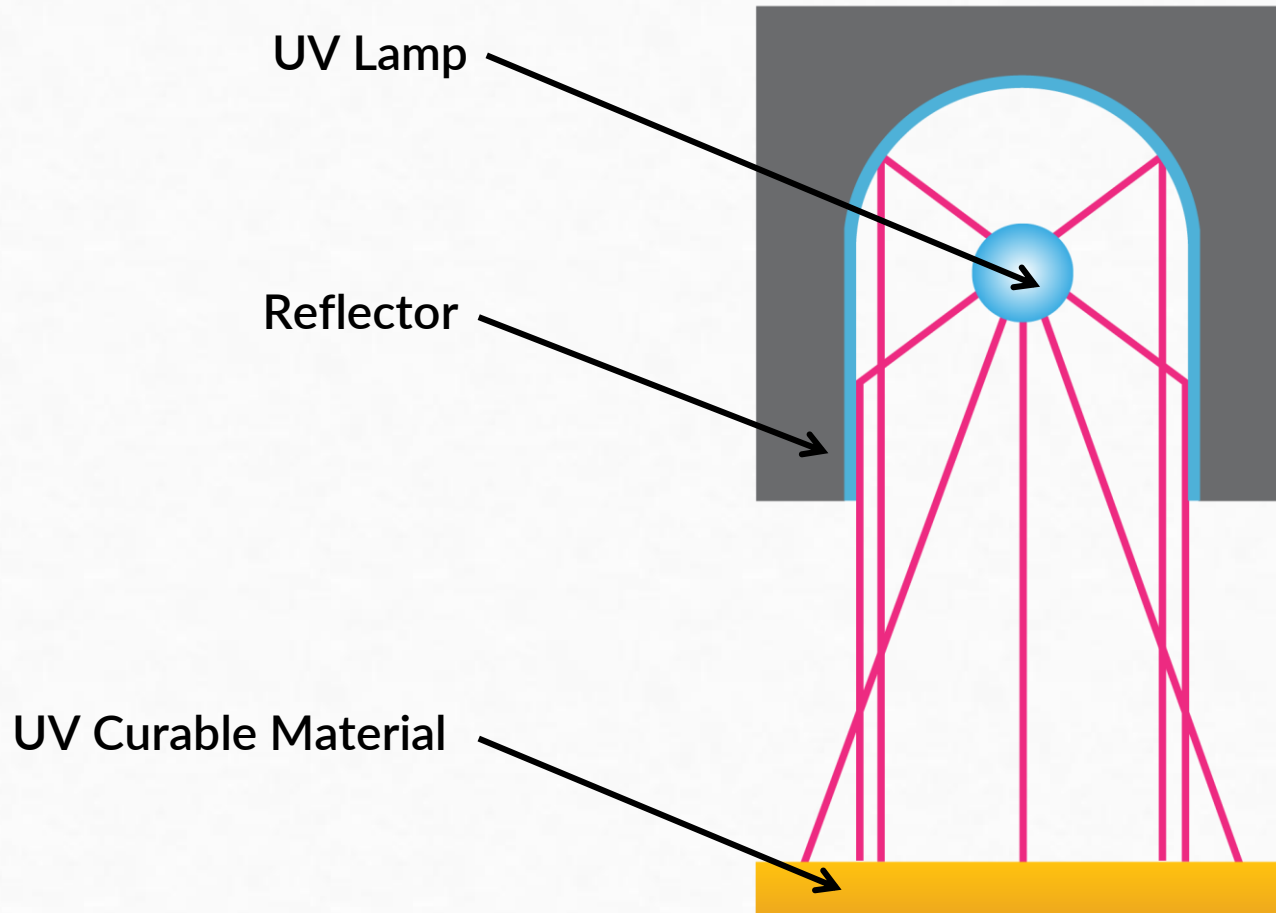
UV Ovens – Main Components

-FOCUSED LIGHT-



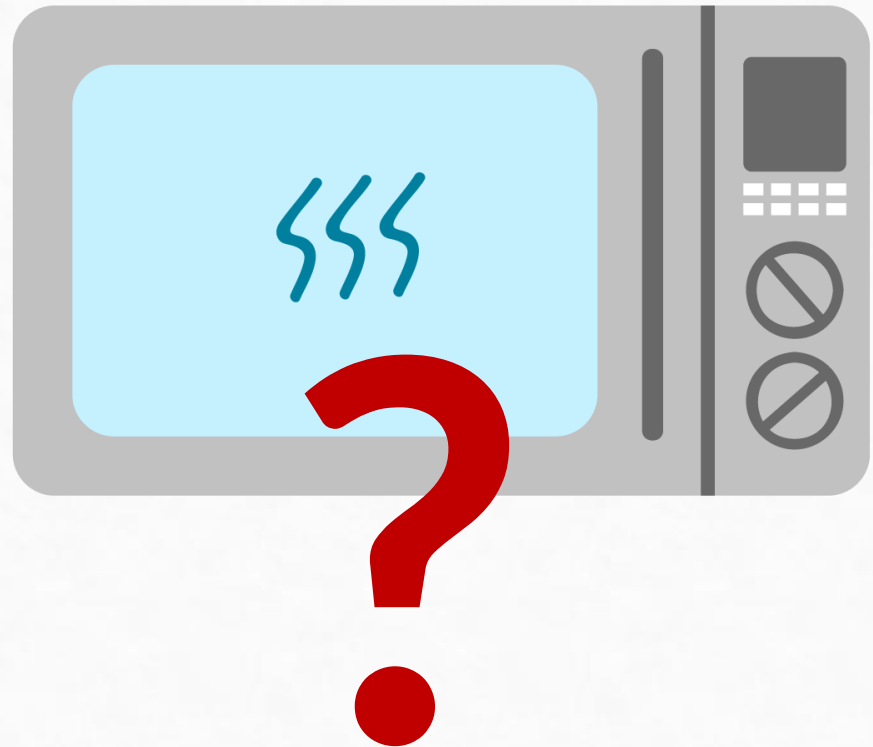
UV Ovens – Main Components

-OUT OF FOCUS-



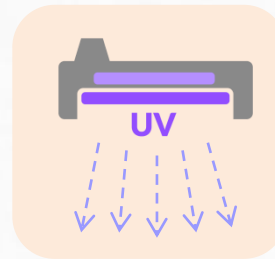
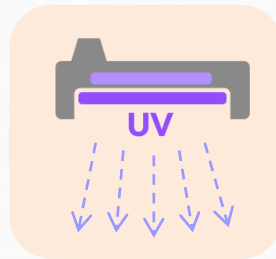
How to Improve your Curing Process?

You need a tool
to show you
what happens
inside your oven!



How to Improve your Curing Process?

You need information about:

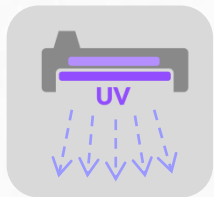


Power and Energy

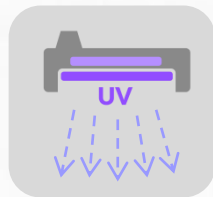
Individual Lamps

Graphical Data

Most loggers:



+



= X



Only give a total for the whole oven

No Graphical Data

Integrated UV meters

- Stationary
- No dynamic data
- Far from sheet

What does Innosen Offer?

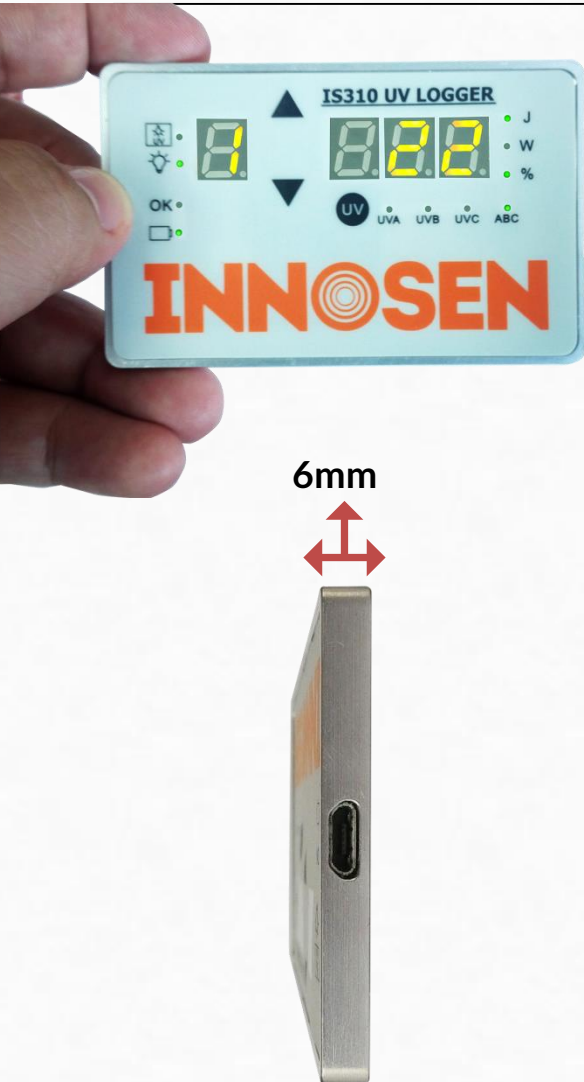


**UV Logger
IS310**



**Multiband UV Logger
IS315**

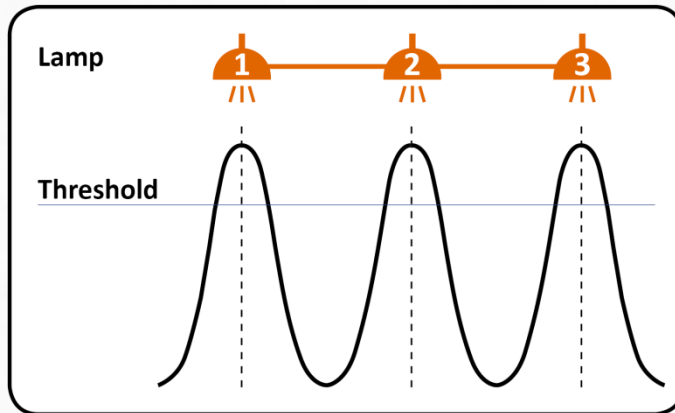
What does Innosen Offer?



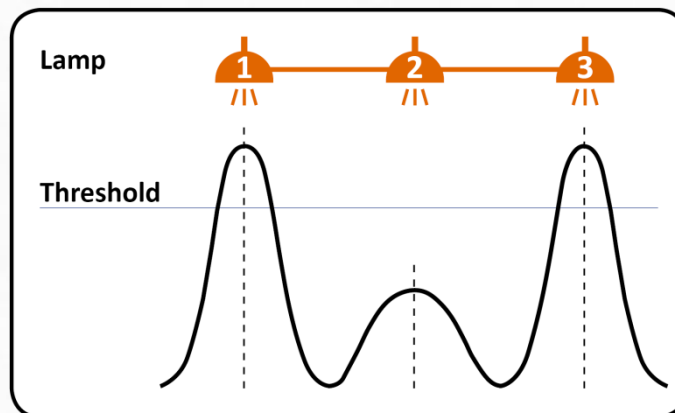
- Reading of Power in Watts [W] and Energy in Joules [J]
- Readings for each individual lamp in various ovens
- FREE data analysis software included
- IS310 measures combined UVA+B+C
- IS315 measures UVA, UVB and UVC separately
- Small as a credit card
- Approx. ¼" thick
- Fast logging
- Very low cost, yet with features similar to the most expensive loggers on the market
- Indication of percentage degradation per lamp

Readings for Individual Lamps

Why is this important?



=



Same Peak = Same Power

Same Area = Same Energy

True?

Graphical Data

Why is this important?

By analyzing graphs you can much easier optimize your curing process!

It gives you info on:

- Vertical and horizontal focus
- Reflector quality (dirty reflectors)
- Lamp current / aging

Graphical Data

Why is this important?



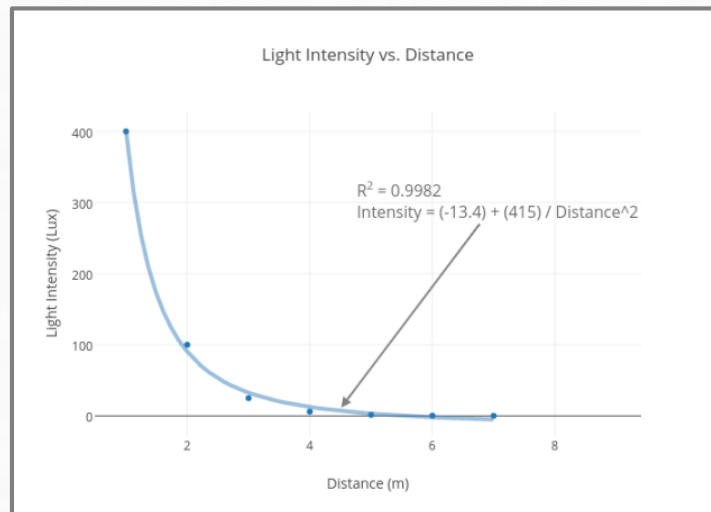
It will enter even the smallest opening,
i.e. you don't get toasted!

Logger X



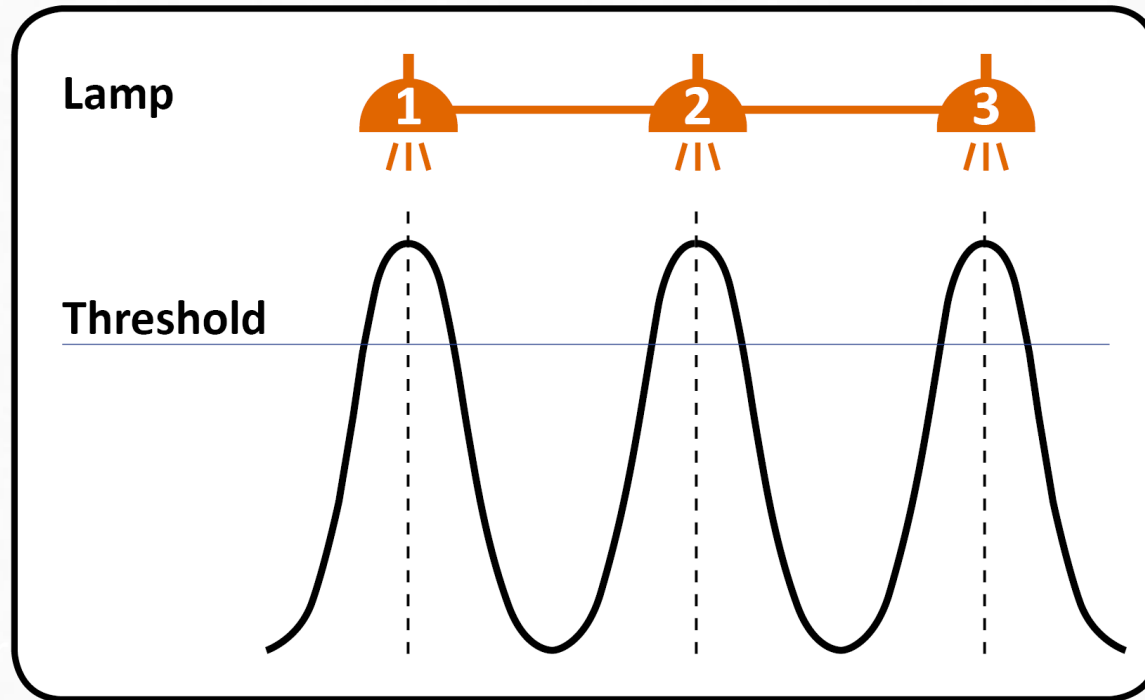
20mm

Other loggers 20mm
thick!



Light intensity
vs. Distance:
 $P = 1 / \text{distance}^2$
(very approximate)

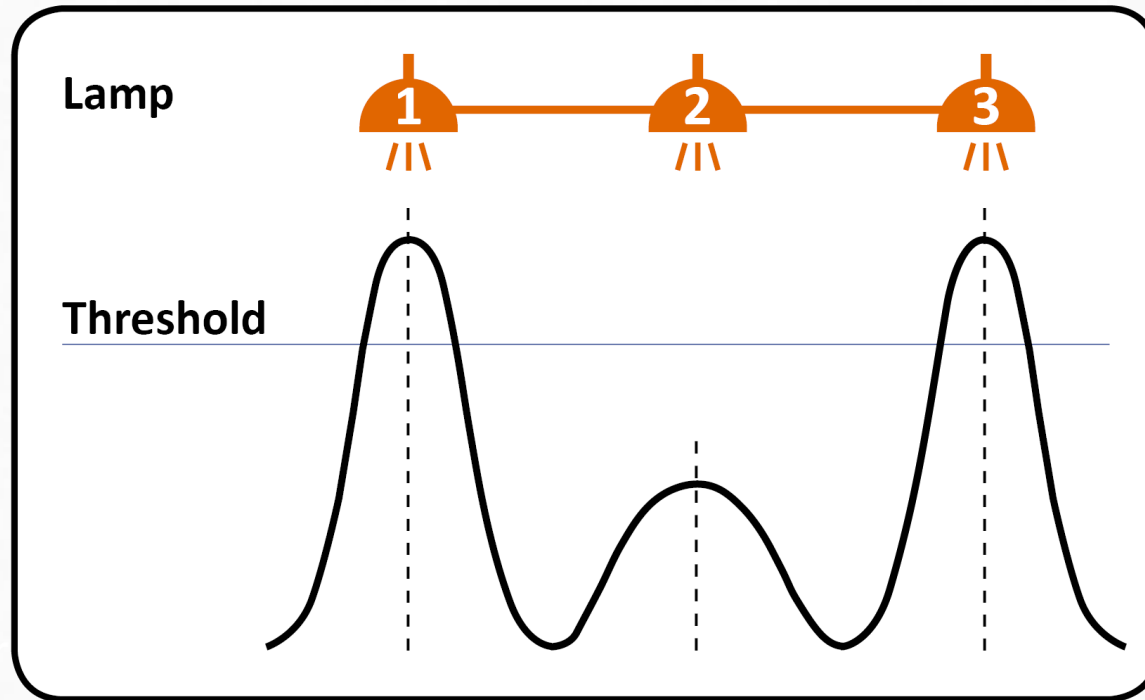
Data Analysis Examples



Three identical peaks

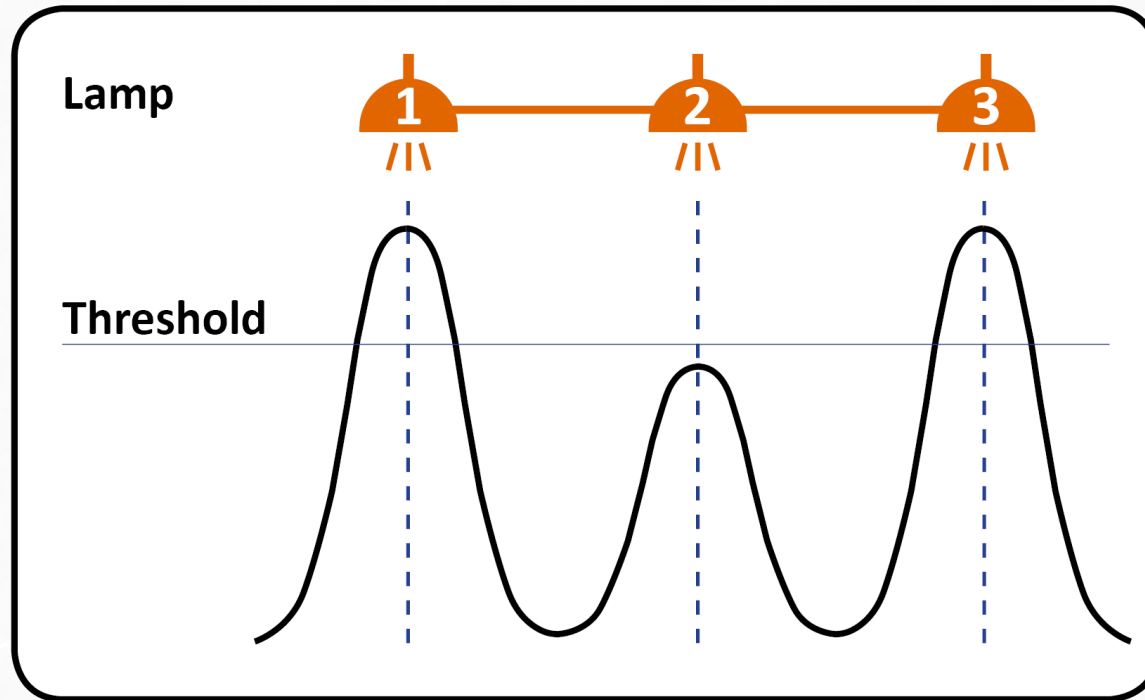
- Symmetrical
- Same height
- Narrow and steep

Data Analysis Examples



Vertical Focus Issue

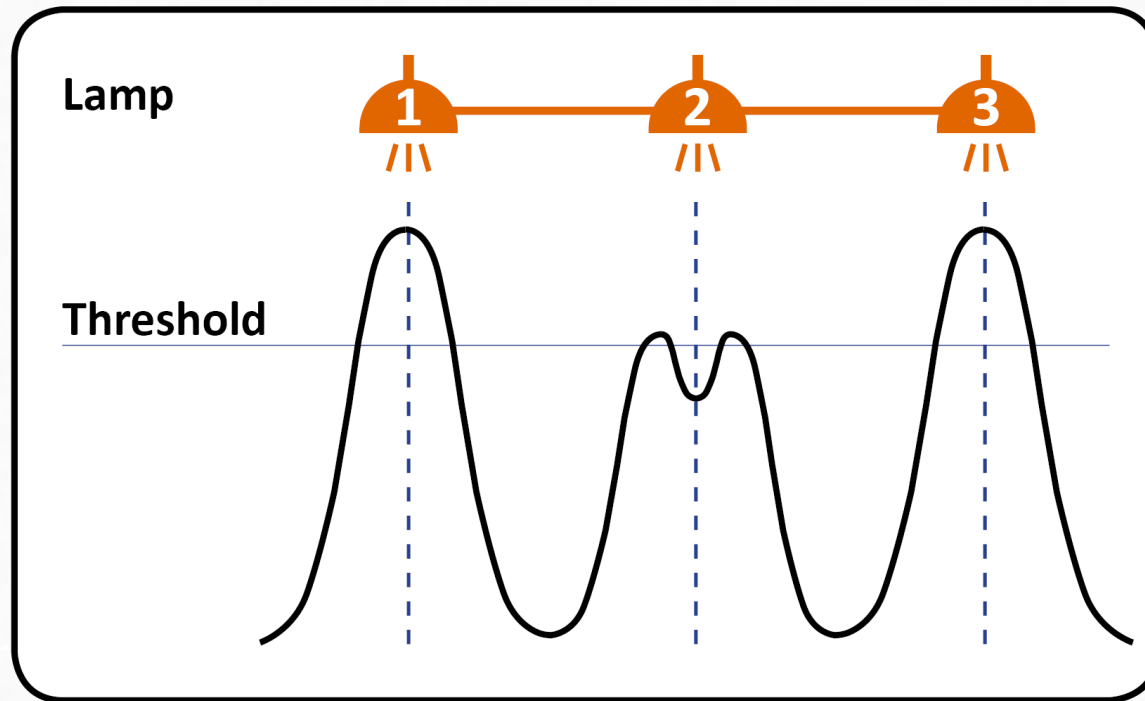
Data Analysis Examples



Logger

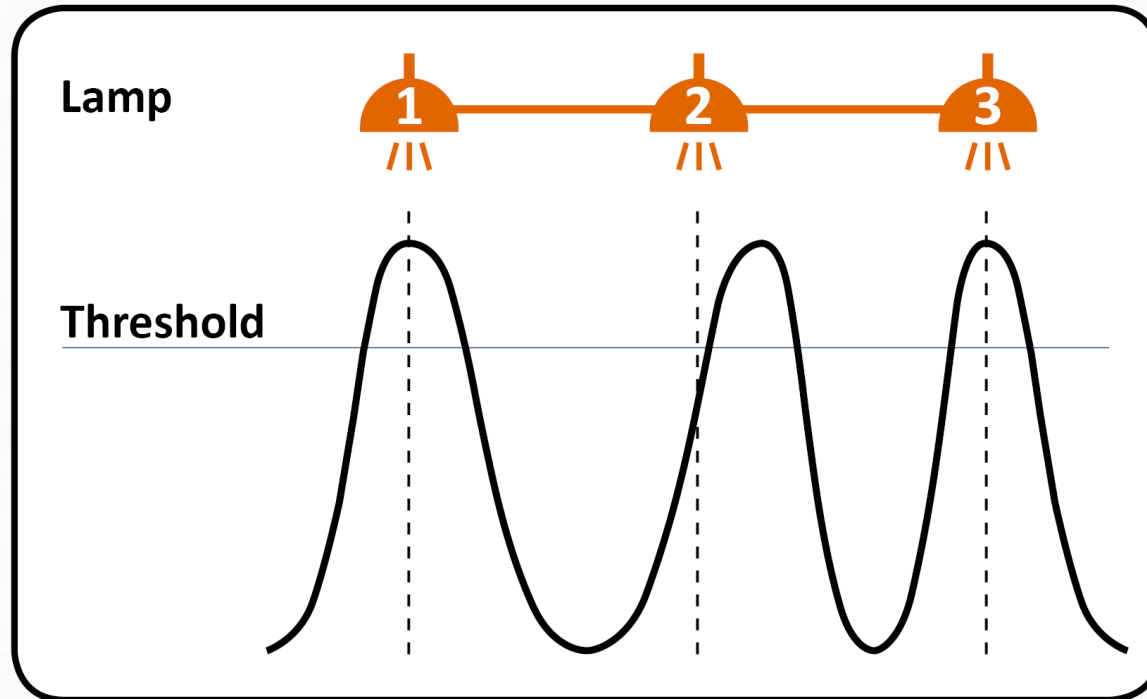
Dirty Reflector or Old Lamp

Data Analysis Examples



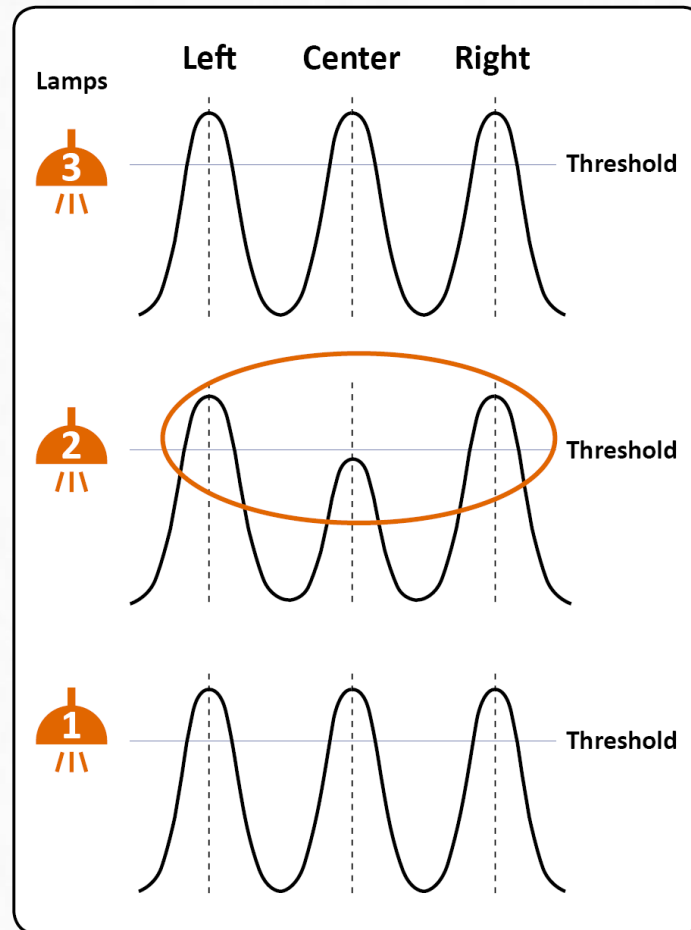
Wrong Reflector / Lamp Distance or Sagging Lamp

Data Analysis Examples



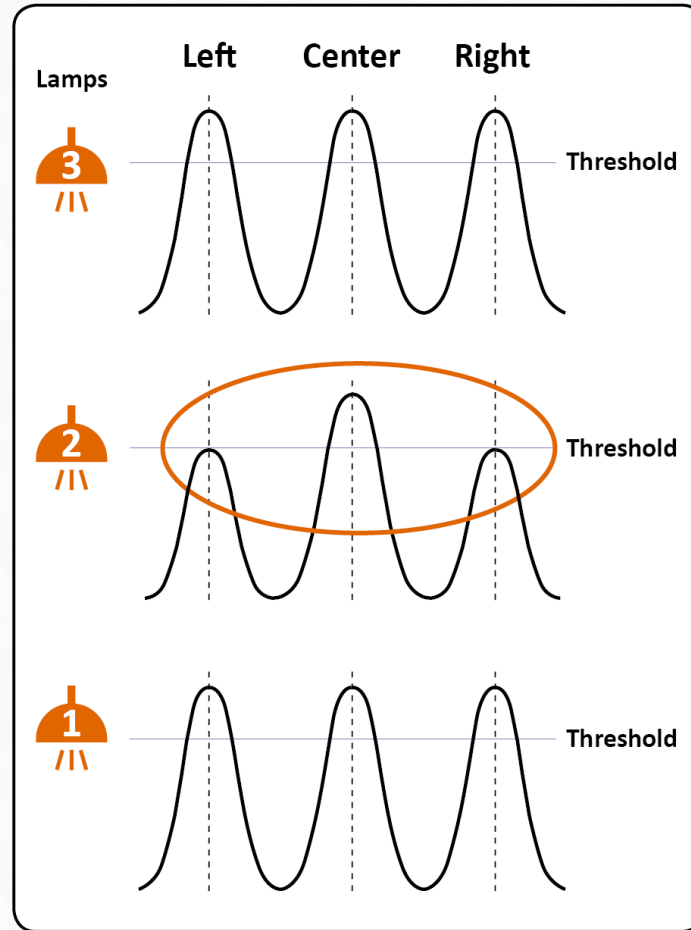
Wrong Reflector / Lamp Distance or Sagging Lamp

Data Analysis Examples



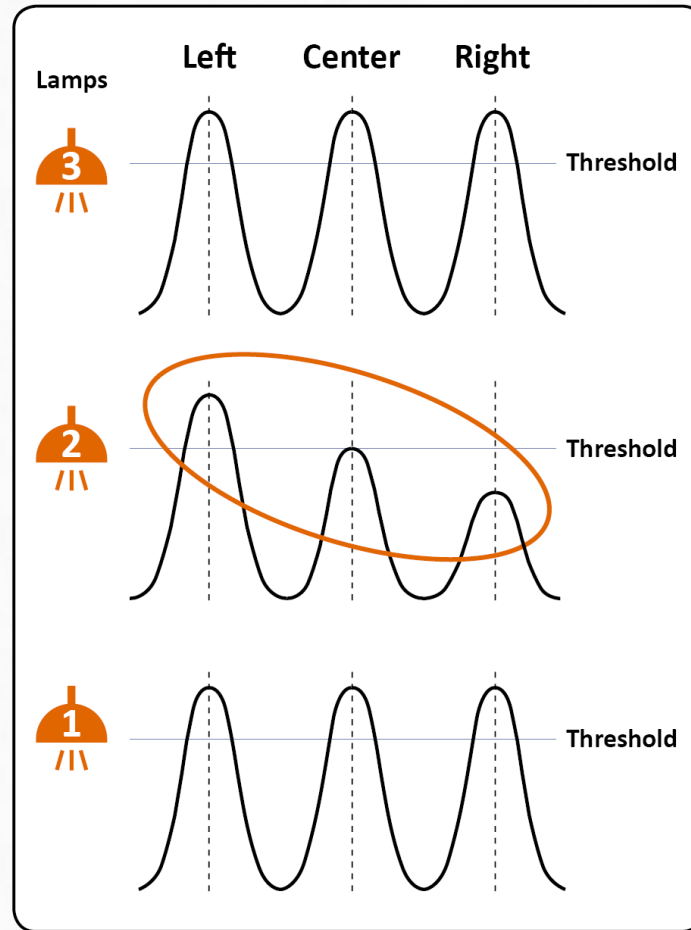
Sagging Lamp 2

Data Analysis Examples



Sides of Lamp 2 have gone black

Data Analysis Examples



Reflector / Lamp 2 not parallel to sheet

Conclusion

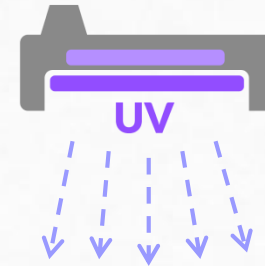
The ideal logger should have the following qualities



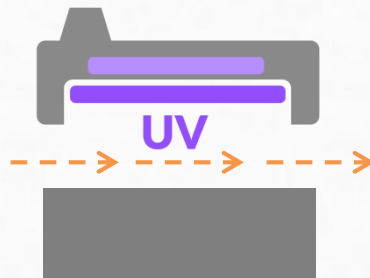
Help save energy -
environment-friendly



Fast enough to capture
the power peaks



Capable of providing
data for individual lamps

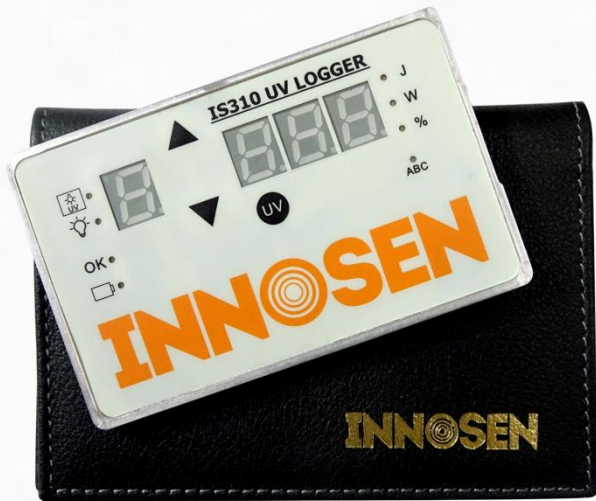


Able to pass through the
protection slots



Able to provide graphical data that
helps you identify what needs to be
corrected in your oven

Conclusion



**UV Logger
IS310**

Benefits of using Innosen' IS310 and IS315 UV Loggers

- Quick, accurate and reliable readings
- Improved efficiency of curing process
- Reduces lamp replacement costs
- Minimize (unplanned) production downtime
- Low-cost device
- Easy to use interface
- FREE data analysis software included

By using a Proper UV Logger, you can:



Save on electricity costs



Achieve longer lamp life



Improve production quality

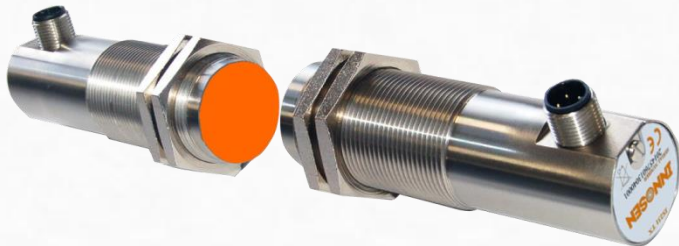


Help save the environment

OTHER PRODUCTS HELPING IN CURING PROCESS

IS231 Double Sheet Detector

*It doesn't help your oven cure well, **if sheets are uncoated!***



- Calibrates Automatically
- Fit and Forget
- No Operator Intervention, no risk of wrong adjustment
- Large thickness range
(0.08-1.6mm / 0.0031" – 0.063)
- Works on both aluminium and tinplate
- For coating, printing lines, slitters and presses

OTHER PRODUCTS HELPING IN CURING PROCESS

IS651 Missing Lacquer Detector

*It doesn't help your oven cure well, **if a part of a sheet was not coated***



Protects machinery and product against problems caused by missing lacquer on sheets

- No need for operator adjustment
- Self-adjusting and self-calibrating
- Works with all white, colored and clear transparent lacquers
- Protects your equipment and your reputation from expensive quality issues

OTHER PRODUCTS HELPING IN CURING PROCESS

IS415 Sheet Skew Measurement

*It doesn't help your oven cure well, **if a sheet is skewed and later welded where there is lacquer!***



- Full protection from skewed sheets even at high line speed
- Faster production rates
- Specification verification
- Adjustment of dogs on feed chain
- Gate Keeper
- Add on options from **Translation** (Lateral Displacement) and **Length Registration** (Sheet Feed-Roller Timing)

OTHER PRODUCTS HELPING IN CURING PROCESS

IS610 Plain Margin Inspector

*It doesn't help your oven cure well, **if margins are contaminated by lacquer!***



Reliably detects contaminants in the margin of coated/printed sheets

- Detects any type of lacquer, even small drops of clear transparent lacquer
- Detects presence of other contaminants (e.g. grease/oil, rust, water marks) in the margin



Your Partner in Quality.