

## Hybrid Cure Process

Innovative process for UV curing applications to improve scratch resistance of surfaces

Drying varnishes on metal plates. Curing coatings on lamp housings. In the industrial sector, there are numerous requirements for different coating processes. For the manufacturer, however, countless production steps can present real challenges as they often involve substantial energy consumption and costs.

Heraeus Noblelight provides customers with photon-based solutions, from UV to IR, for a wide range of production processes in industry. During polymerization in a UV curing process, photoinitiators are activated by intense UV light and cross-linked within seconds. This quickly cures the material, making the surface dry, abrasion-proof and immediately ready for further processing.

Infrared transfers energy to materials without contact, generates heat where it is required and consequently is particularly efficient in drying varnishes or melting powder coatings. For some applications, curing can be optimized by a combination of infrared heat with UV radiation – the Hybrid Cure Process. These applications include high quality surface coatings and surfaces that must be scratch resistant.

The Hybrid Cure Process can be tested in our Applications Competence Centers. Under laboratory conditions, your individual process can be simulated and specific applications can be examined. Benefit from our knowledge and experience – worldwide. Our Applications Competence Centers will help you master new challenges.

## Hybrid Cure Process adds higher value to the product

The Hybrid Cure Process solution is devised to solve the following types of issues in industry:

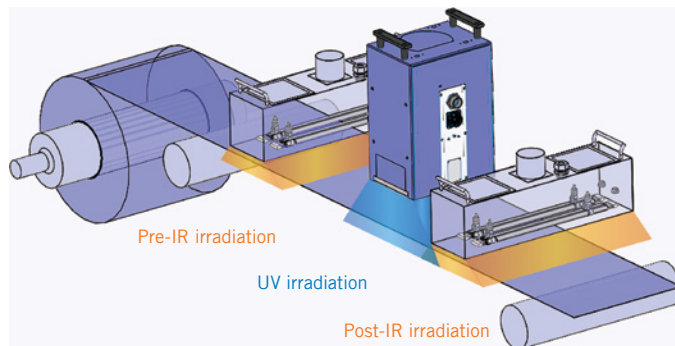
### With UV curing:

- Process development for new product
- Optimization of current UV curing process
- Optimization of curing speed

### With IR heating / drying:

- Efficient utilization of heating / drying process
- Optimization of overall cost of process

The Hybrid Cure Process is a solution for industrial challenges. It helps improve the physical properties of the cured product, adding to its overall quality and value.



### Effects of Pre-IR irradiation

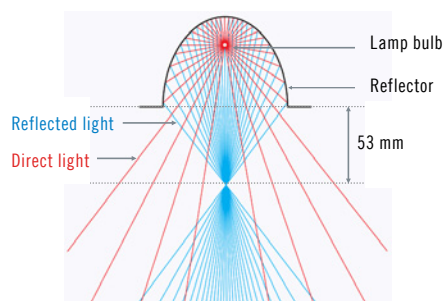
- Higher scratch resistance on the surface of cured film is observed
- Improvement of line speed by using IR and UV irradiation
- Reducing the concentration of photoinitiators by implementing the hybrid cure process
- Higher double bond conversion and higher surface reflectance are provided
- Growth of cross-link density and refractive index enhances surface reflectance of cured coating

### Effects of UV irradiation

- Hybrid Cure Process withstands the features of the UV lamp system, which transforms high UV efficiency against energy input
- It collects high power of light by reflector due to the small diameter characteristic of lamp bulb
- High reaction rate as well as high cross-linking density can be obtained, as the reactive species concentration is high in unit time.

### Effects of Post-IR irradiation

- Film curl generated by cross-linking reaction is relaxed
- Adhesion of coating, flexibility, and curling are improved
- Improvement of production efficiency and stability of process of cationic curing system are obtained
- Degradation odor of photoinitiator can be expected



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