UV-INERT-TECHNOLOGY

UV CURING
IN A NITROGEN
ATMOSPHERE

www.hoenle.com

UV DRYING UNDER **INERT CONDITIONS**

The Hoenle Group is known for its long-standing expertise and technological know-how in the field of inerting. Building on this foundation, we develop customized solutions that are precisely tailored to your processes, materials, and quality requirements.

Your benefit: Maximum process reliability and consistently high product quality, combined with optimized investment and operating costs. Our proven UV curing systems offer you the highest degree of flexibility: arc lengths ranging from 60 mm to 2,600 mm, precise power control from 20% to 100% at specific lamp powers of up to 240 W/cm, and a wide selection of standard and custom spectra enable ideal adaptation to your application.

PRINCIPLE OF **INERT TECHNOLOGY**

UV curing is based on the targeted activation of photoinitiators by UV radiation, which generates reactive radicals that trigger rapid and efficient polymerization. This process enables the formation of stable, highly cross-linked coatings with outstanding material properties. A key factor for optimal curing is controlling the influence of oxygen, as oxygen inhibits the radical reaction and thus impairs complete cross-linking. Nitrogen inerting can be used to specifically minimize this effect—ensuring maximum reaction speed, consistently high quality, and reliable production results.

UV radiation

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Dissociation of photoinitiators into free radicals R•

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Atmospheric air

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Radicals R• react preferentially with oxygen (O_2)

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Premature termination of surface connectivity

Inert atmosphere

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Radicals R• break the double bonds n the binders

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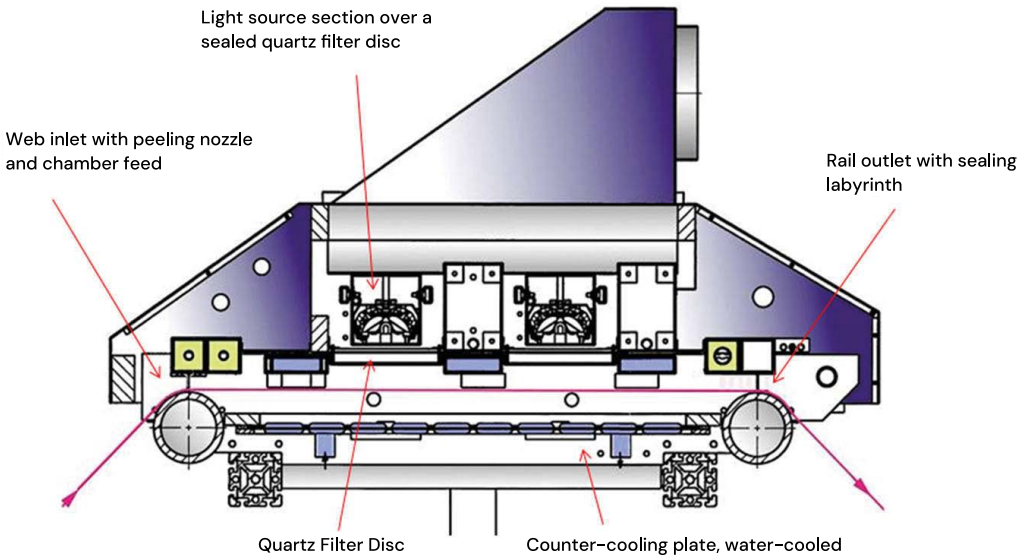
Polymerization

During inerting, the oxygen (O_2) in the UV irradiation zone is specifically replaced by a stable inert gas such as nitrogen (N_2). This creates optimal process conditions that ensure consistently high quality and efficiency in UV applications.

Positive Effects

- Improved surface quality with excellent optical, mechanical, and chemical properties
- Reduction of potential migration due to lower photoinitiator content. This also helps reduce odor and minimizes the risk of yellowing
- Curing of difficult-to-cure inks (full-surface opaque white) is possible
- Reduction in production costs due to lower UV output (intensity/dose) while maintaining higher press speeds
- Environmentally friendly by preventing ozone formation

PRINCIPLE STRUCTURE OF INERTED UV SYSTEMS



MONITORING OF THE **OXYGEN PROPORTION**

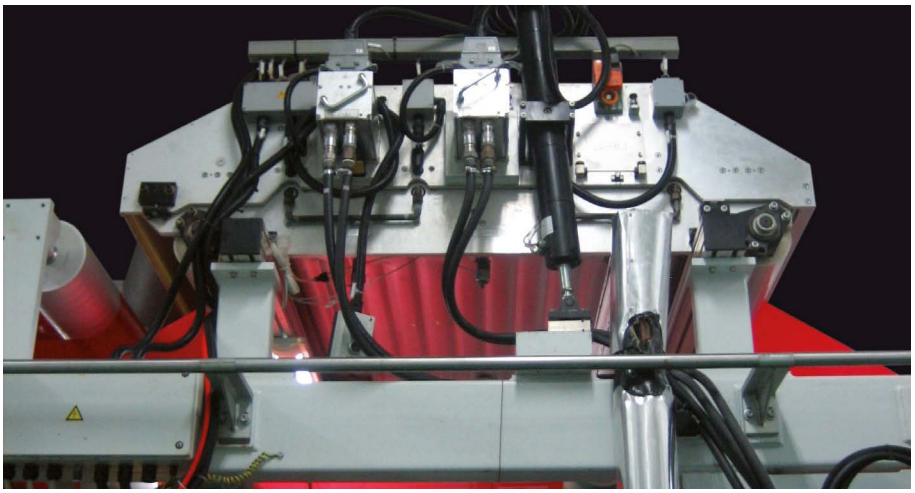
Usually Nitrogen (N_2) is used as the inert gas, which is fed by pipes from a tank directly into the inert chamber of the UV facility. To ensure constant process conditions and a continuous quality level, monitoring of the remaining oxygen within the inert chamber is recommended. In this case the gas filling of the inert chamber is controlled and optimized by constant gas regulation. Automatic regulation takes into consideration the adherence of the remaining oxygen limits as well as economic optimization.

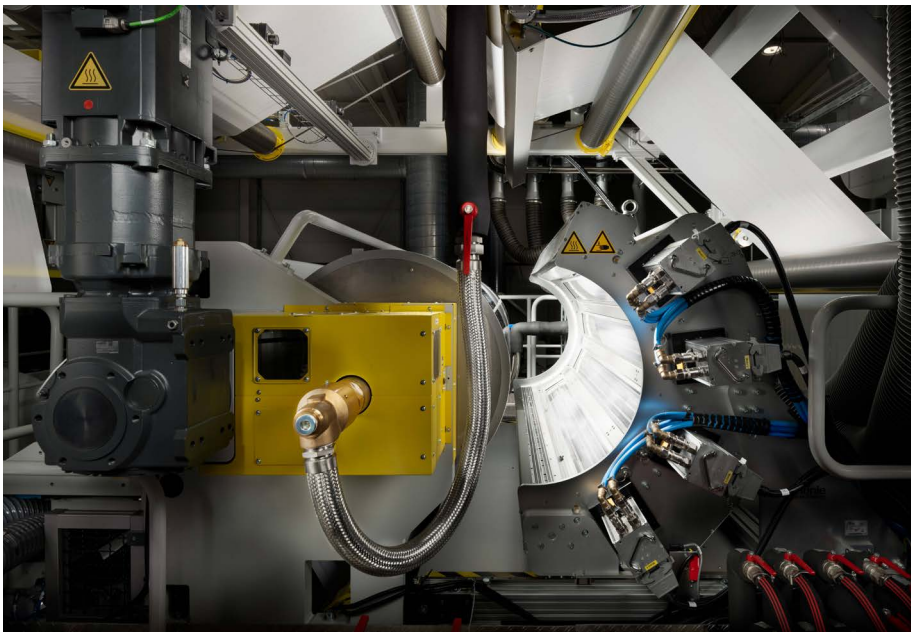
The maximum remaining amount of oxygen depends therefore on the requirements of the chemistry and can be different depending on the application. For example, radical curing silicones for release coatings require an oxygen maximum of < 30 ppm and make high demands on the system and also because of the extremely high process speed.

With other applications the inerting level can be within a %-range, which keeps investment costs and N_2 consumption costs under control and leads to an economic inertization process.

HOENLE **SOLUTIONS**

- Application Examples: Silicone Coating, Coating, Painting, Printing
- Residual Oxygen Content: up to < 30 ppm (depending on the application)
- UV Lamps: Number, width, and power depending on the application
- UV Monitoring: Optional online monitoring
- Optimized gas supply with residual oxygen content measurement and automated control





Hoenle AG
Nicolaus-Otto-Str. 2
82205 Gilching
Germany

Phone: +49 8105 2083-0
equipment@hoenle.com

www.hoenle.com