Naming problems

UV curing still bears potential for improvement

Naming problems is often a promising starting point for development. Although UV curing is often used for the coating of two-dimensional and plane objects, there are still some drawbacks which need to be solved. We asked Jørgen Ulrik Hansen, Teknos and Ines Marquard, Synthopol Chemie in how far UV curing techniques are still disadvantageous and if UV/LED curing could be an efficient alternative.

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"The market requires more and more faster curing and environmentally friendly systems."

1 UV/EB curable promises: increasing efficiency, lower storage costs and delivery of a constant product quality. If so, why does not everyone use this technique?

People are still afraid of the capital costs. Beside the investment in radiation lamps, the production and storage of UV/EB coatings should take place in "dark conditions" and there are special safety standards for working with EB lamps. Furthermore, the curing of pigmented coatings or thick layers is still a challenge for this market. But I am optimistic for the future that research and development will go further to overcome these problems, because the market requires more and more faster curing and environmentally friendly systems. These two arguments are the big strengths of this technique.

2 UV/LED curing – a promising curing technique for the future? Where is research effort still necessary?

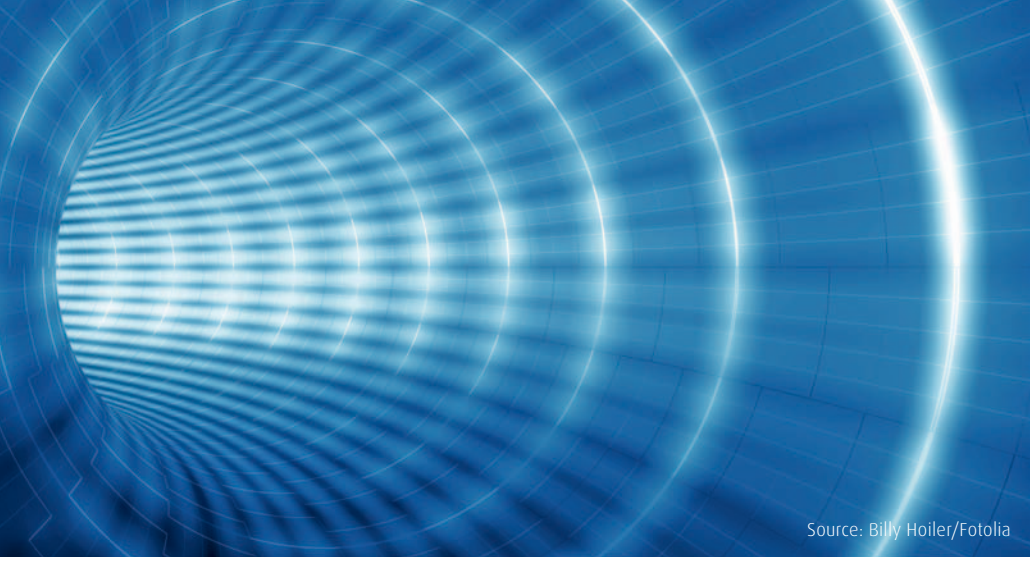
In an environmentally aspect, yes, because UV/LED lamps produce no ozone, that means no special exhaust air cleaning is required. The lamps develop less heat during the process, which makes them attractive for curing thermal sensitive substrates, like several plastics or thin layer foils. The next advantage is the long durability of UV/LEDs of approximately more than 10,000 hours compared to 1,000-5,000 hours for UV-lamps. Finally, the property to be "ready-to-use" without warm-up completes the demand of the market for faster processing. On the other hand, more efficiency is required at a shorter wavelength and higher distance to the object. Nowadays, customers often combine UV/LED with UV lamps in their process to get the surface sufficiently cured. Although UV/LED curing is currently used in the field of adhesives and printing inks, there is only a slow growth in other segments like the furniture coatings market. One reason could also be the limited choice of special raw materials for the formulation of UV/LED coatings.
Unfortunately, higher capital costs for the lamps and for the special coatings let people hesitate to invest in this future technique. These coatings have to be more reactive, due to the longer wavelength of the lamps. This can cause stability problems while storing or shipping. Changing the spectra from one wavelength to another is complicated and not even faster than changing a UV lamp. In case of a breakdown of several diodes, which can be caused by a mechanical damage, the whole block has to be replaced.

Book tip

RADIATION CURING
Patrick Glöckner et al.
www.european-coatings.com/books

Event tip

PRA Congress
"9TH INTERNATIONAL WOODCOATINGS CONGRESS"
14-15 October, Amsterdam
www.european-coatings.com/events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"Not every UV curing coating is suitable for LED lamps."

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1 UV/EB curing promises: increasing efficiency, lower storage costs and delivery of a constant product quality. If so, why does not everyone use this technique?

The advantages of radiation curing are obvious and already have had a major impact on industrial processes. But of course there are also drawbacks that have to be considered. Oxygen inhibits the polymerisation process, so depending on the process environment there might be difficulties to exploit the full efficiency potential of radiation curing. Volume shrinking sometimes is also seen as a drawback. Depending on material and application, this typical effect of UV or EB curing might lead to lower adhesion and tension in the surface layer. Such issues might have kept manufacturers from changing to UV or EB curing. Though in many applications there are good arguments for UV curing, such as high through-put rates and very high surface quality, manufacturers tend to be hesitant to change proven processes and conventional production lines. Depending on production volume and products, they may also run UV curing and traditional lines in parallel. And finally there are requirements where conventional drying with a state-of-the-art waterborne system can be the better alternative.

2 Is UV/LED curing a promising curing technique for the future? Where is research effort still necessary?

LED lamp technology in general is widely accepted as an energy-efficient, cost-reducing alternative to conventional lamps. Cost-efficiency is also the major reason why LED lamps are on the rise in UV curing, though this effect should not be overestimated. In addition, the fact that LED lamps do not emit active oxygen, ozone, and do not develop higher temperatures are also regarded as advantages. The latter is a benefit when curing highly resinous woods such as pine where the significant heat of gallium or mercury lamps can cause problems.
But on the other hand there also drawbacks. Even after full drying, LED-cured surfaces have a soft consistence, because oxygen inhibition still takes place. In most applications, however, very hard and firm surfaces are required, for example for furniture. In such cases, you cannot change the whole curing process to LED but need conventional lamps at the end of the line to get the final surface consistence required. This is a major drawback which certainly requires R&D effort on the application side.
Manufacturers should also be aware that not every UV curing coating is suitable for LED lamps. The coating therefore has to be specifically formulated for drying at this wavelength. We at Teknos have been working on reformulating our UV coatings for this purpose. So if a manufacturer is planning to change to LED, they should do that in close cooperation with their paint supplier.

R&D News

PREPARING UV-THERMAL DUAL-CURED COATINGS WITH MICROCAPSULES
www.european-coatings.com

Editor's Blog

UV CURING WITHOUT PHOTOINITIATORS
www.european-coatings.com/blog