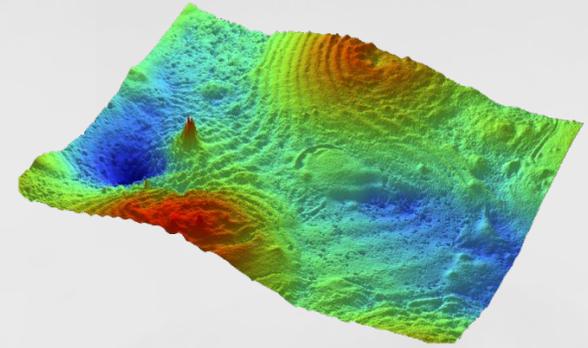


IdeOn LLC



Electron Beam in Packaging- Current and Future trends

Dr. Mikhail Laksin



Printing Today – just a couple of quotes...

As that great American scientist, Freeman Dyson, has said, the technological revolution is like an explosion, which is tearing apart the static world of our ancestors and replacing it with a new world that spins 1000 times faster.”

“Societies or companies that expect a glorious past to shield them from the forces of change driven by advancing technology will fail and fall.”

Rupert Murdoch presented in London in 2006 about the future of the newspaper industry

The trend that will continue to affect the media universe is the ongoing shift in advertising dollars from traditional media into nontraditional media, most notably the Internet,”

By Stuart Elliot

Published: December 5, 2006, New York Times



What is going on with printing industry today?

- Print has been the main communication media for several centuries since its invention by Guttenberg in 15th century
- It is not any more.
- Publication and commercial print markets on decline
- Home and office printing is a large market segment that will also be affected by new generation of electronic media

Packaging printing is the key sustainable market for printing technology



Challenges of Packaging printing

- 21st Century printing must address market and social needs:
 - Lower energy consumption
 - Increased sustainability – lower material consumption, lower carbon footprint
 - High productivity – press speeds up to 600 m/min
 - Regulatory compliance (FDA and EPA)

Are we up to the challenge?



Packaging Printing Today

- Dominated by solvent based ink and printing technology
- Highly ineffective in respect to energy consumption
- Environmental concerns
- Limited but improving print quality - Flexo
- Limited resistance properties of the ink layer required protection via lamination
- High material consumption:
 - Multilayer lamination structure
 - Low solids – high ink consumption



Ink Chemistry in Packaging

- Predominantly solvent based inks
- Drying and incinerating solvent with recently required oxidation step is a wasteful part of this technology
- Water based inks represents about 10% of the market
 - Still contain solvents
 - poor press stability especially at high speeds
 - Multiple performance issues associated with high surface energy

UV or EB Curing?



UV Curing in Packaging

- UV curing has been used in printing for over 30 years
- Offers enhanced productivity and product resistance
- Still represents around 4% of total market, less in flexible packaging
- Odor and photoinitiator migration are still big concerns for food packaging
- Adhesion on many films (PET, PETG, OPP, PA) is limited
- UV energy available for curing varies with press speed and ink colors

EB curing then?



EB Curing in Packaging

- EB Curing is accepted by food packaging – has been used for about 30 years
- Offers low odor and low migration systems
- Direct food contact is possible
- Potential for improved adhesion
- Excellent process control – the same EB dose is delivered in the broad range of press speeds
- Cure practically independent from the ink color
- Still EB curing represents a fraction of Packaging printing

Why?



EB Litho Offset Printing

- Almost 30 year old technology, used in folding carton business (frozen food, dairy and juice gable top packaging)
- Traditionally limited ability to print a broad range of package size – repeats on the same press.
- Recent advanced in variable sleeve press technology have not penetrated flexible packaging
- Registration and repeat are still issues for flexible substrates
- Lithography on non-absorbing substrates is challenging



EB Flexography

- Introduced around 10 years ago (US Patent 6,772,683)
- Water- or solvent based EB chemistry concept
- Wet color trapping due to water/solvent evaporation and viscosity gradient
- Offered improved graphic quality, good physical properties and broad regulatory acceptance
- Improved economics – cost of print vs. conventional Flexo printing
- Limited press stability at high speeds due to evaporation of water or solvent



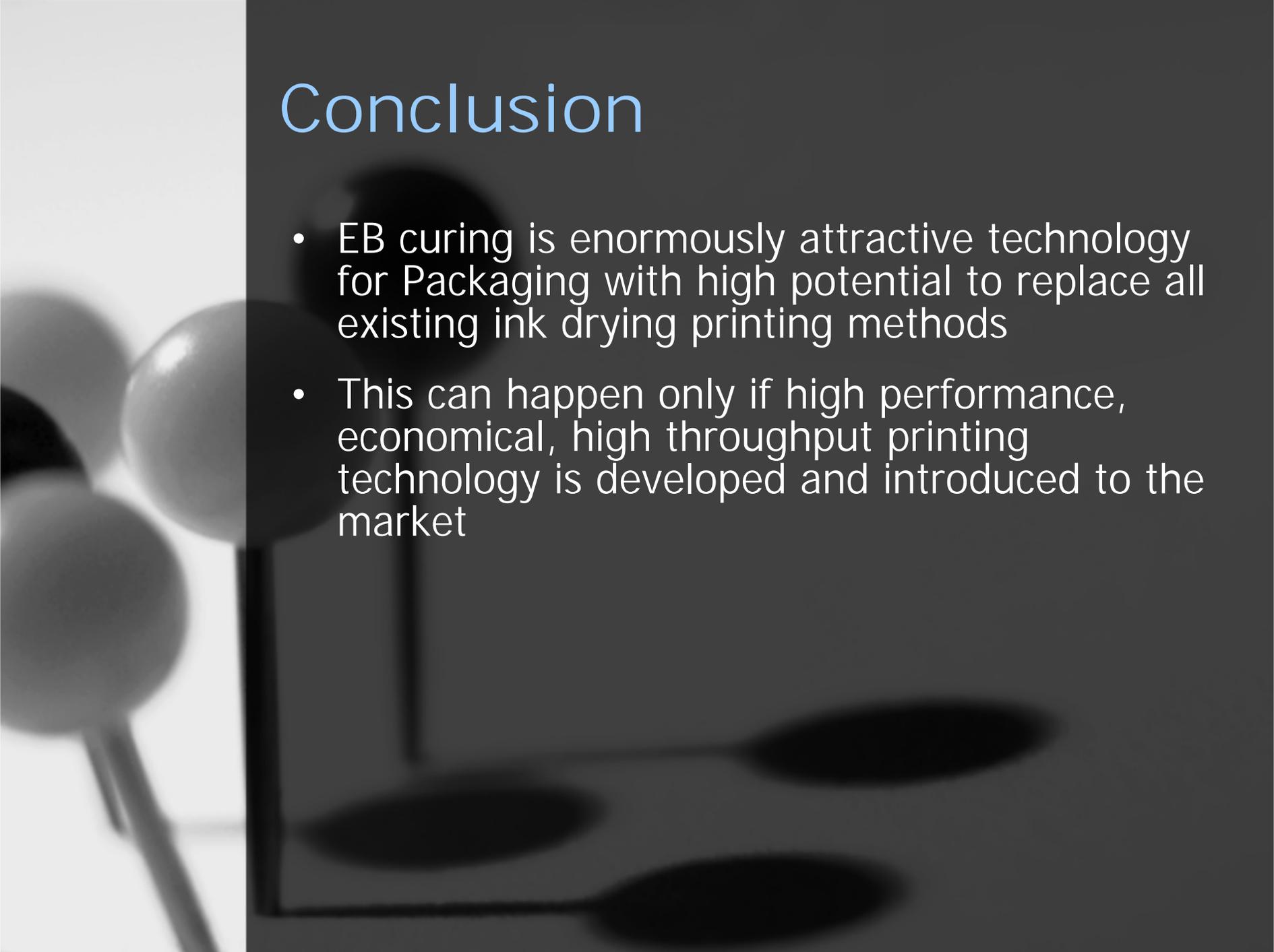
EB Gravure

- Introduced in 2009 – US Patent 8,109,211
- Also based on water based EB chemistry platform
- Offers improved physical properties over conventional Gravure inks
- Solvent free – significant VOC reduction
- The best application is in printing labels on absorbent substrates (paper)
- Economics of Gravure printing are poor due to high cost of cylinders and limited web width
- High water content is challenge for printing on non-absorbent substrates



Ideal EB Printing Concept to Win Over Packaging

- Electron beam curable, solvent and water free ink system
- Wet trapping
- High color strength ink, delivering target densities at very low film thickness for improved graphics
- High press speed, wide web for high productivity
- Surface printing as more sustainable alternative to lamination
- Low cost of print, energy and material consumption
- US Patent 7,997,194



Conclusion

- EB curing is enormously attractive technology for Packaging with high potential to replace all existing ink drying printing methods
- This can happen only if high performance, economical, high throughput printing technology is developed and introduced to the market