

# MARCHING TOWARD “GREEN”

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Nearly 1,000 attendees at the 2008 World Adhesives Conference in Miami, Florida, listened intently to global industry leaders discuss challenges and trends within the adhesives industry. The common theme was “Reducing Environmental Impact.” Alan Bate, formerly executive vice president of National Starch and Chemical Ltd., focused his message on reducing environmental impact through innovation. His presentation highlighted efforts in reducing the carbon footprint, increased recycling content in materials, use of renewable resources and enhancing biodegradability. Bate also emphasized sustainability through energy-reduction innovation.

Likewise, Alois Linder, executive vice president-Adhesives Technologies at Henkel KGaA, emphasized sustainability. He stated that sustainability is an opportunity for the adhesives industry. In the words of Dr. Ulrich Lehner, former chairman of the Management Board of Henkel KGaA, “sustainability equals future viability.” Therefore, sustainability is part of Henkel’s DNA, according to Linder.

While sustainability is not a new theme, greater emphasis is put on it based on the peril our planet and future generations face. Linder shared the Brundtland Commission 1987 report summary that stated “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” He identified five driving forces for sustainability in our industry.

1. **Public Awareness.** The possibility of raising the industry’s reputation through proactive engagement.
2. **Legal Requirements.** The increasing number of regulations impacting the adhesives industry, such as REACH, RoHS, TSCA, and “Green Building.”
3. **Customer Standards.** Increased focus on “Green” solutions and banning of chemical substances from product and production processes.
4. **Economical Benefits.** Assigning “carbon ratings” and reduction of emissions throughout the supply chain.
5. **Need for Sustainable Solutions.** Innovative solutions enabling adhesive customers to reduce wastewater costs, cleaning steps, operating temperatures, thereby saving energy costs.

Andre Ladurelli, worldwide CEO of Bostik, characterized the need for global energy conservation. His message to the future of the adhesives industry was that of “Social Responsibility... to become a lead



industry in sustainable development.” He said the success of the industry relies on our ability to anticipate social expectations. Ladurelli highlighted four areas for sustainable requirements:

1. **Non-hazardous Materials.** Using reactive and waterborne vs. solvent-based materials, isocyanate-free and/ or silane-modified polymers vs. isocyanates, etc.
2. **Renewable Materials.** Developing renewable polymers and re-visiting natural materials such as rosin, starch, fatty acid dimers, etc.
3. **Recyclability.** Developing biodegradable/ compostable adhesives, adhesives that are recycling compatible and “de-bonding on command” systems.
4. **Low Carbon Footprint.** Conducting lifecycle analysis and approaches, such as the “Green Building” standard.

No doubt these leaders see a future vastly different from today – one where our reliance on fossil fuels is significantly reduced. But how far along are we? Dr. Jürgen Wegner, managing director, ChemQuest Europe, summarized the global adhesives industry status relative to renewable raw materials. Wegner posed a challenging question: “Does the rapid speed of progress in adhesives correspond to the rate of innovations on bio-based polymers?”

His analysis shows that we have a long ways to go. He said that, presently, adhesives based on renewable technology have the following pro and con characteristics.

#### **Pro**

- Favorable bio-compatibility
- Positive GHG balance
- Good price/performance ratio
- Availability
- Low-to-no toxicity

#### **Con**

- Suitable for low to medium modulus adhesives only
- Often denaturation through chemical modification
- Often requires biocides to prevent microbial decay
- Quality consistency
- Limited thermal stability



Wegner forecasts global demand for adhesives based on renewable sources to grow at 3 % through 2010 (see Table).

**Table. Adhesives Based on Renewable Sources - Global Status 2006 and Outlook for 2010**  
(data in 1000 metric tons wet formulated adhesives)

| <b>Natural Resin Base</b>                     | <b>2006</b>  | <b>2010</b>  | <b>AGR (%)</b> |
|---|--------------|--------------|----------------|
| Natural Rubber                                | 455          | 502          | 2.5            |
| Starch/Dextrin                                | 1668         | 1892         | 3.2            |
| Natural Tree Resins                           | 17           | 16           | -0.1           |
| Resin Emulsions                               | 15           | 15           | 1.1            |
| Cellulose Ethers                              | 40           | 44           | 2.4            |
| <b>TOTAL NATURAL BASED ADHESIVES</b>          | <b>2195</b>  | <b>2469</b>  | <b>3.0</b>     |
| <b>TOTAL ALL ADHESIVES</b>                    | <b>14120</b> | <b>16608</b> | <b>4.1</b>     |
| <b>TOTAL SHARE of NATURAL BASED ADHESIVES</b> | <b>15.5%</b> | <b>15%</b>   |                |

Source: The ChemQuest Group, Inc.

Not included in these figures of 15+% share are those areas where the polymer molecule is at least in part formed on natural building blocks (i.e., polyurethanes based on oleochemical-based polyols, polyesters and polyamides based on dimeric fatty acids).

While we have much work to do yet, “natural” -based materials will now and in the future play an important performance-governing role as binders and additives in adhesives, particularly in the B2C area. With further progress in biopolymers, it cannot be excluded mid-to long-term that this will reverse the trend towards focusing on renewable rather than depletable sources.



## About the Author



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Dan joined The ChemQuest Group, Inc. in 1996 from the Rohm & Haas Company where he was most recently European Director, Industrial Coatings. Prior to R&H, he spent thirteen years with Unocal Polymers where his career took him from technical service positions to Director of Marketing. He directed the sale of the Unocal Polymers Business to Rohm & Haas, working closely with Morgan Stanley, numerous attorneys, as well as the FTC. His entire career has been dedicated to the Coatings and Adhesives Industries. His particular strengths lie in strategic assessment and value creation on behalf of clients. He holds degrees from Wabash College (BS Chemistry) and William & Mary (MBA).

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