OAKDENE HOLLINS
RESEARCH & CONSULTING

# REPORT SUMMARY

May 2006

Sustainable Innovation, Waste Economics, Low Carbon Technologies

## Technical and Economic Evaluation

**Oakdene Hollins assisted Keele University in investigating the potential of rapeseed oil as a source of bio-resin, replacing mineral oils. We were asked to assess the viability of bio-resins in the primary application of formaldehyde resins, to research the likely production costs of a large-scale resin plant; to identify agents who might be willing to test resin manufacture at one tonne scale, and to assess the prospects for a variety of market applications of bio-resin, and to make introductions to representatives acting in those markets.**

Our research suggested that the initial target market (fibreboard) was unattractive. Resins costs were high compared to formaldehyde and, while board processors continue to drive down residual formaldehyde levels, issues of health and safety were insufficient to drive a change for the foreseeable future

There are more attractive markets in the specialty area, particularly paints and coatings. Future possible markets include military, but a clear functional advantage will need to be demonstrated.

We calculated cost of manufacture at the 100, 1,000 and 10,000 tonne scale (based on materials cost and estimates of waste water treatment). We also costed a process with 90% recovery of key reagents and water. We estimated the cost of full scale plant to produce commercial quantities of material, and concluded that purpose-built plant at less than 1000 tonnes per year scale is unlikely to be attractive in accessing commodity markets.

Finally, we recommended undertaking a full life-cycle comparison of the production of resin against alternatives. The synthesis involves reagents of similar hazard to those it is trying to replace and, potentially, market-shifting quantities of some chemicals. In addition, rapeseed oil is rising in price as producers see its value as a fuel replacement, and this could impact permanently on the business case for large scale applications.

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**Background to this report:**

Keele University was engaged in a Defra-funded project to determine the potential of a rapeseed resin as a replacement for oil-based equivalents.

The primary driver for investigating an alternative resin system was the perceived toxicity concerns of formaldehyde as used in conventional systems. Residual methanal emissions have been the subject of some investigation over at least the last three decades, and whilst not yet being on a 'red list', recommended exposure limits have been progressively reduced.

One of the major product groups affected by this drive has been oriented strand board (OSB), particle-board and fibre-board (MDF). Keele's bio-resin has been put forward as a replacement system for the formaldehyde component. This work therefore sought to test the strength of health concerns in this area as a driver for a move to alternative systems. In addition, exploring a wider range of alternative applications where health may be a concern, Oakdene Hollins attempted to identify alternative markets and product applications.

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**About Oakdene Hollins Ltd:**

*Oakdene Hollins is a research and consulting company working to support change toward more sustainable and less carbon-intensive products, processes, services and supply chains. The business sectors we work with include Food & Drink, Textiles & Clothing, Metals & Mining, Wastes Management, Chemicals & Materials, Sustainable Innovation and European & UK Policy. We have built a strong reputation for integrity, reliability and excellence with public sector and private industry clients alike. We operate at a European scale and manage the Ecolabel scheme in the UK in collaboration with TUV/NEL.*

*Oakdene Hollins employs people with science, economics, business administration and manufacturing disciplines, so that within each industry sector we can offer the following core services:*

- *Market Appraisal*
- *Technology Appraisal*
- *Protocol and Standards Development*
- *Economic Modelling*
- *Lean Manufacturing Projects*
- *Financial Impact Assessment*
- *Management of Research Projects*
- *Ecolabelling Advice*
- *Carbon Footprinting*
- *Critical Review of Life Cycle Assessments.*