

## **Introduction**

The challenge facing the world economy today is to provide sustainable approaches to economic growth. Industrial processes have the potential to provide better living standards, improved education and health care. However, careless industrialisation can lead to negative development, such as pollution - a difficult and expensive problem to solve, which can often lead to the quality of living standards falling. One drawback of industrial processes is the creation of waste products. These waste products enter a 'sink' which can sometimes 'overflow', harming the environment so that the wider resource base may be depleted.

It is, therefore, vitally important for industry and the community to develop methods of limiting the harmful effects of the 'waste sink' and, wherever possible of converting 'waste' into productive outputs. This study provides such an example showing how ICI Polyurethanes recycles agricultural by-products, such as straw, rice husks or sugar cane bagasse, for markets of global proportions. It shows how forward-thinking organisations can meet the challenge set out by Gro Harlem Brundtland (Prime Minister of Norway who chaired the Rio Conference in 1992), defining the need for:

'Development which meets the needs of the present, without compromising the ability of future generations to meet their own needs.'

The case study shows how new technology, developed by ICI, enabled the conversion of agricultural waste by-products into high value materials for building and other industrial uses.

### **Problem 1 - agricultural by-products**

Current trends in world population growth indicate that the demand for food will steadily increase, creating greater amounts of agricultural by-products. Each year, approximately one billion tonnes of these by-products are created through the production of food worldwide. These by-products are unavoidable and were originally considered to be largely unusable. Finding ways to dispose of the waste with minimal impact on the environment is one of today's greatest challenges. Until recently, these by-products were disposed of by methods such as field burning, which caused increased concerns over public health and environmental problems such as the greenhouse effect and ozone layer depletion.

### **Problem 2 - declining availability of wood products**

Wood products are a major component of everyday life. Their supply, however, becomes more limited (and more expensive) each day. In addition, concern about deforestation and the subsequent restrictions on timber harvesting have led to a world-wide search for alternative fibre sources. One of the alternative sources is agricultural by-products, resulting in a new superior building product, and also bringing tremendous environmental and economic benefits.

## **Research**

For more than a decade, ICI Polyurethanes researched methods to recover and re-use agricultural byproducts, by exploring and creating new international markets. This resulted in the development of a new process that uses RUBINATE and SUPRASEC Binders to transform these fibres within the products into a highquality performance board. This manufacturing process, (known as ECO-Binding Technology) produces an environmentally sound board which allows particle board and medium density fibreboard (MDF) to replace wood for construction and furniture. The process uses agricultural byproducts created by the production of wheat, sugar cane and rice.

The use of RUBINATE and SUPRASEC Binders, instead of traditional urea formaldehyde (UF) - based binders, gave the finished products a superior performance and other environmental economic benefits when compared to traditional woodfibre materials. The unique properties of these binders produce a board which is highly resistant to moisture and provides stronger bonding that is superior to current wood-based panel boards. The construction and furniture industries therefore now have an alternative to traditional particle boards which is stronger, more durable, lighter and easier to transport, as well as moisture-resistant, non-toxic and formaldehyde-free.

## **New products**

Until the arrival of ECO-Binding Technology, it was often felt that boards made from agricultural by-products - such as sugar cane bagasse, wheat straw and rice hulls - would be substandard. However, ICI has put an end to such concerns by using RUBINATE and SUPRASEC Binders as the resin. These binders result in strong physical and chemical bonds (previous resins had only been able to create a physical surface bond with other materials).

Another benefit of ICI's RUBINATE and SUPRASEC Binders is that the boards do not give off formaldehyde gas, making them ideal for use where indoor air quality is a concern. Furthermore, the use of the binder produces boards which are ideal for many outdoor applications because they can be coated with fungicides and other wood treatments. The new products can be produced in bulk and therefore also offer economies in terms of production costs.

The new boards are strong, impact resistant and are less likely to warp than previous materials. They have smooth surfaces, are stiff, flat and have good screw-holding power and workability. They are easy to cut, can be nailed, stapled or glued and can be installed with ordinary hand power tools.

The new boards are ideal for furniture and ready-to-assemble (RTA) applications:

- end panels, drawer fronts
- frames for upholstered furniture
- seats
- cabinets
- shelving
- mirror frames
- doors
- floor underlayment
- countertops
- numerous other applications.

The new materials are particularly suitable for the building and manufacturing industries where controlled performance and precise physical qualities are essential.

## **Global perspectives**

Having researched and developed a superior product, it was important for ICI to ensure it was well placed to beat its global competitors in the ECO Binding Technology industry. ICI knew the strength of its product. The company knows that, compared to standard particle board, ECO-Binding Technology based products have a number of benefits, not least of which is a reduction in emissions and gases given off during the manufacturing process. The challenge facing ICI Polyurethanes was to ensure potential purchasers understood these competitive advantages. ICI also needed to make its suppliers of agricultural by-products aware of the benefits resulting from the new technology. Benefits include:

- an opportunity for people to harness and profit from by-product resources
- expansion of second crop profitability
- a safe and effective way to use and preserve natural resources
- a safe and effective way to fill the increasing need for 'greener' products.

On a global scale, this gave ICI Polyurethanes an opportunity to create viable and profitable international markets, whilst contributing to conservation.

## **The challenge**

It is not enough to have the technology and knowledge to create sustainable solutions. The company had to be able to translate these opportunities into a successful business. ICI, therefore decided to let a number of pioneer organisations use the new technology in North America and other key locations. It was essential to build up outstanding relationships with these pioneer organisations. After identifying the key organisations, objectives for the partnership were established and relationships built to lead to future sales.

The first North American ECO-Binding Technology customers were all innovators in various phases of production:

- PrimeBoard of Wahpeton, North Dakota
- Phenix COMPOSITES of Mankato, Minnesota
- Agrifibre Industries Inc. in the Canadian province of Alberta
- Naturall Fibre Board, Minneapolis, Kansas
- Environmental Agriculture Technologies, New Iberia, Louisiana.

ICI worked with plants in Thailand and China and additional market exploration visits are continuing in Asia with new ventures developing in South and Central America. To win the confidence of these customers, ICI needed to:

1. Demonstrate the successful industrial application of the new technology i.e. the creation of high value building products. For example, a Canadian customer is building a new plant in the province of Alberta which will make fibreboard from locally produced straw. The product looks like granite and can be used as hardwood.
2. Encourage accelerated replication of the technology. Once the pioneers establish the benefits of the new processes, then others will follow very quickly.
3. Promote customer loyalty by building strong relationships with customers.
4. Promote value added selling strategies i.e. by creating the benefits which are most appropriate to meet customer requirements in terms of product development.
5. Understand the complexities of the global market and the impact of local political, business and social philosophies. ICI recognises that quite different market expectations and values operate in different regions.

Expanding a current market is a science, creating a new market is an art. ICI sets out to create and develop its markets by a number of key measures:

1. Building an appropriate marketing mix i.e. creating products which customers want, at a price which best meets their needs, in the right place at the right time, using the best possible promotional mix.
2. Targeting marketing at the appropriate group of customers and using market research to find out how to meet customer requirements.
3. Learning the rules of the international marketplace and identifying world markets.
4. Building awareness through carefully organised sales and marketing activities.
5. Launching new products successfully by taking advantage of market research techniques.
6. Learning how best to use research information.

A seven-step approach to market leadership ICI has created a seven-step approach to market leadership in the agricultural by-products industry. These steps are:

1. Consultation. ICI sets out to understand its customer's business through a consultative focus process.
2. Relationship selling. This involves establishing shared interest with its customers.
3. Solution selling. The selling organisation develops products which meet customers' needs. If a customer wants a strong and flexible building material then the only solution is the product which meets those criteria.
4. Team selling. ICI recognises that its product meets a global need. It has, therefore, created an international team to meet customers' requirements.
5. Creating customer satisfaction. ICI competes on non-price factors. In particular, the company pinpoints the value added to individual products to meet customer requirements.
6. Positioning. ICI has adopted the position in the market as a 'can't do it without us' company. In other words, organisations wishing to develop ECO-Binding Technology feel that they cannot use and develop the technology without the support and partnership of ICI.
7. Communication. ICI ensures potential customers are aware of what it has to offer through creative and up-front communication.

## **'Green' marketing**

'Green' products are no longer a new trend or concept for the future. A recent Gallup Poll, covering 24 countries, showed that the majority of the people surveyed think environmental protection is more important than economic growth. Consumers will continue to support companies that produce 'green' products. From the building materials in the homes where they live, to the furniture they buy, informed consumers are choosing 'green' products.

Recycled and 'green' furniture manufacturers and retailers are emerging around the world. One furniture manufacturer stated, 'More and more often, we are being asked to fill out surveys about what we're doing environmentally, before customers will buy our furniture.'

From farmers to builders to end-users, boards made with agricultural by-products benefit everyone by:

- extending the world's forest lands and the wider ecosystems they protect
- creating a use for agricultural by-products previously considered unusable
- reducing the impact of burning fields as a means of waste disposal
- leaving more trees to contribute to the oxygen supply
- providing a formaldehyde-free alternative to UF-based resins
- reducing the amount of energy required in the production of board products
- promoting sustainable development
- meeting consumer demand for environmentally responsible products.

In addition to converting low value by-products into performance boards and potentially increasing crop profits, this technology may also have an important role in reducing global warming. ECO-Binding Technology offers a tremendous opportunity for ICI to dominate a new market, whilst promoting sustainable development. For customers, this will provide a unique chance to make use of superior products, enhancing their reputations for quality and for contributing to sustainable growth.

## **Conclusion**

These by-products can now benefit sustainable development in their countries of origin and create significant world-wide economic opportunities. In the future, the agricultural belts of Europe, the Americas and Asia will show increased economic prosperity, job opportunities and the expansion of the farmer's one harvest economy into two.

Today, demand for ECO-Binding Technology products outstrips production - some production plants have back-orders of up to five years. In order to meet existing market demands and continue expanding the market, ICI is now shifting its focus from proving the viability of these new products to serving the needs of the pioneering companies that helped build this success. In the coming years, efforts will be made to expand the use of ECO-Binding Technology products in the kitchen and bathroom markets, to serve the needs of existing customers by increasing the number of production plants.