

# EXECUTIVE SUMMARY

## 0.1 INTRODUCTION

- 0.1.1 Development of particle and fibre board has been consequential to man's quest for optimum utilisation of timber and wood wastes which earlier were used mainly as fuel.

Initial development of particle board took place in Germany during the second world war when its timber supplies were practically cut-off from the supplying countries. Particle board plants were set up in post war West Germany to meet the demand for reconstruction. In the fifties particle board manufacturing plants were set up in Europe and USA. The industry has now developed throughout the world.

The origin of fibre board can be traced back to the beginning of 20th century in England and USA. It received a fillip in 1934 as a Swedish engineer developed the defibrator process or thermo mechanical pulping process. This led to the development of modern medium density fibre board industry. First MDF plant was set up in USA in 1966. Other products in the category of reconstituted panel are insulation board, wafer board, oriented strand board etc.

- 0.1.2 Particle board is made from small pieces of wood chips and other ligno-cellulosic materials, bonded with resins under pressure. Fibre board and medium density fibre board are manufactured by defibrizing the ligno-cellulosic raw material and bonding it with resins under pressure. Hard board or High density fibre board requires little or no resins for bonding when manufactured by the wet process.

- 0.1.3 The reconstituted panel boards substitute natural wood in many applications such as furniture and house building. There have been some constraints for using them for structural applications. Several new products, such as long strand lumber, have been introduced recently having the desired strength characteristic of wood but without its drawbacks for structural applications.

- 0.1.4 The reconstituted panel board industry was primarily based upon soft woods. In the recent years, there has been a major thrust to modify the manufacturing processes for conversion of non-conventional woods and other ligno-cellulosic materials into reconstituted

panels. Plants have been set up for manufacturing particle board and medium density fibre board from raw materials such as bagasse, hemp, rubber wood, cotton stalks etc.

## 0.2 STRUCTURE AND STATUS OF INDIAN INDUSTRY

0.2.1 The resin bonded fibre and particle board industry is of recent origin in India. Two hard board manufacturing units were set up in 1959-1960. The first particle board unit came up in early sixties. Medium density fibre board industry is of very recent origin, with only two units in operation, one of them commissioned only recently. A summary of the number of units engaged in the manufacture of reconstituted panels and their installed capacity is given below in Table 0.1.

**TABLE - 0.1**

### RECONSTITUTED PANEL UNITS AND INSTALLED CAPACITY

Sr. No.	Product	No. of Units	Installed Capacity (TPA)
1.	Hard Board (including insulation board)	3	53,000
2.	Particle Board	11	81,100
3.	Medium Density Fibre Board	2	65,400

A number of project proposals have been approved for setting up particle board and MDF board units. The additional approved capacity for particle board is 282,500 TPA and for MDF is 350,000 TPA. There are no proposals for setting up additional hard board and insulation board manufacturing units.

0.2.2 In the initial years the reconstituted panel board products have met with poor acceptance from the users due to a number of reasons. Most importantly, the use of such product requires joinery techniques and hardware with which the carpenters and small scale furniture manufacturer are unfamiliar. Hence, the capacity utilisation has been unsatisfactory and many units fell sick due to inadequate off-take.

- 0.2.3 In the recent past the production of hard board had been around 45000 TPA and the capacity utilisation was around 90%.
- 0.2.4 In addition to the Indian units, Bhutan Boards is also selling its products (particle board) in the Indian Market. The plant was set up by G. Siempelkamp GmbH and Co., Germany. The plant is operating at its full capacity of 30,000 Cu.M. or 21000 TPA. Thus the total off-take of particle board in India was more than 65000 tonnes in 1990-91 as against 30000-35000 tonnes few years back. The increasing trend of demand for particle board indicates better product acceptance and awareness.
- 0.2.5 Till recently, MDF was being produced by only one organisation namely Mangalam Timber, which initially faced technological problems in achieving product quality. The production process has now been stabilised with consequent improvement in capacity utilisation. The second unit for MDF based on cotton stalks started production in March-April 1992.

### 0.3 INTERNATIONAL SCENARIO

- 0.3.1 The world production of reconstituted panels is given below in Table 0.2.

**TABLE - 0.2**

#### **WORLD PRODUCTION OF RECONSTITUTED PANEL PRODUCTS**

(Million M<sup>3</sup>)

<b>Product</b>	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1986</b>	<b>1987</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>
Particle Board	33.0	44.0	44.5	47.3	49.5	51.3	50.0	50.0
Fibre Board (Hardboard or Insulation Board)	17.0	19.0	17.0	17.6	17.9	18.2	19.0	19.5
MDF	3.5	4.0	4.5	5.0	6.0	6.5	7.0	8.0

**Source :** FAO Year Book and Sunds MDF Directory.

The production of hard board and insulation board has been stagnant during the period 1975 to 1990. Particle board registered a growth of 51.5% whereas production of MDF increased by 128% in the same period.

According to data compiled by The National Particle Board Association (USA), world wide capacity had grown to 61.9 million m<sup>3</sup> for particle board and 9.4 million m<sup>3</sup> for MDF by 1991. All the segments of the panel industry are poised for strong growth, with the possible exception of hard board which appears to have reached a saturation stage.

- 0.3.2 In the industrialised countries, the average plant size for particle, fibre and MDF board units is between 100,000 to 150,000 Cu.M. per year. However, there are instances of lower capacity plants of 10,000 Cu.M. - 50,000 Cu.M. per year. Low capacity plants have the disadvantage of high production costs but at a very low initial investment. Very high capacity plants, for economic viability, need to be operated at a high production efficiency.
- 0.3.3 Until recently prescription standards were in use which were based on the control of inputs and process. Now the performance standards are being used universally to specify the product quality.
- 0.3.4 The production technology has improved tremendously in each stage of manufacture viz. particle production, defibration, drying, mat forming, pressing, finishing and over laying. Different equipment configurations are available from international suppliers having special process features suiting the production requirements and characteristics of input raw material at each process stage. Latest projects being set up have fully automatic plants with computerised monitoring, control and software backup.
- 0.3.5 The latest trend in product development are water proof exterior grade board, flame retardant board, low density board with similar properties as normal density board (700 kg./Cu.M.), cut to size panels, veneered and other overlaid boards, textured and embossed board. High density boards are also being marketed in considerable quantities to facilitate a wider choice and to minimise further processing at the end-use stage.
- 0.3.6 There are a number of international technology and equipment suppliers for reconstituted panels based on wood and other ligno-cellulosic materials. The names and addresses of the three organisations which

have been associated with a majority of the recent projects are as follows:

- (i) Bison Systems  
Bison Werke  
D 3257 Springe  
Germany
- (ii) G. Siempelkamp GmbH.  
Siempelkamp Strabe 75  
D 4150 Krefeld  
Germany
- (iii) Sunds Defibrator AB  
S-85194 Sunds Vau  
Sweden

#### **0.4 R & D EFFORTS, TECHNOLOGY ABSORPTION AND GAPS**

- 0.4.1 There have been marginal R&D efforts both in industry and at institutional level. However, planned R&D thrust has been lacking and entrepreneurs still have to depend on foreign collaborations for the future projects.
- 0.4.2 Particle board manufacturing technology based on wood and wood wastes is well absorbed in the country. Most of the existing plants have developed the necessary expertise to utilise conventional wood species for production of particle board. However, major items of plant and machinery are being imported for plants of capacities higher than 20 TPD. Indigenisation to the extent of 20-25% has been achieved for the latest plants being set up. Major items indigenised are dryers, material handling equipment, instrumentation, electricals etc.
- 0.4.3 Enormous difficulties were experienced in technology adaptation in the case of two recent projects which were based on non-conventional raw materials. In the case of Best Boards Ltd., project for the manufacture of particle board from bagasse in collaboration with KMW, Sweden., the process details provided were inadequate to handle Indian bagasse and hence there were frequent breakdowns, rapid wear of depithing blades and screens. The process could not be stabilised for more than two years.

Similarly, Mangalam Timber Products Ltd., collaborated with three companies, two from USA and one from Germany for setting up a MDF plant based on Eucalyptus and Acacia wood chips. G. Siempelkamp supplied the imported plant, process and indigenous plant details. Although foreign technicians came for erection and commissioning, the process and quality could not be stabilised. It took the organisation more than two years of trial and error for establishing the process parameters and synchronise the operation of plant.

- 0.4.4 IPIRI developed technology for manufacture of particle board from rice husk. The technology was transferred through NRDC for setting up a small scale unit in Bangalore. Padmavathy Panel Boards Pvt. Ltd., Bangalore, has successfully adapted indigenous technology for making particle board from rice husk. There is scope for setting up similar small scale units in different regions of the country. The institute now has become a central Autonomous Body under the Ministry of Environment & Forests.
- 0.4.5 MDF technology has been recently inducted into the country. Mangalam timber plant is in regular production after overcoming numerous problems in technology adaptation. The recently commissioned Nuchem Plastics' MDF plant, based on cotton stalks, has commenced operation recently. Cotton stalk is a standard agro-based raw material being offered by M/s. Sunds Defibrators for manufacture of MDF.
- 0.4.6 In general, technology for using agro wastes, annuals and non-conventional wood species is not available within the country. For long range technological self-sufficiency and to avoid technology adaptation problems faced earlier in respect of imported technology, the process know-how and engineering expertise is desired to be developed in the country.
- 0.4.7 There is also a need to diversify the reconstituted panel industry further by introduction of Oriented Strand Board and Wafer Board as they can substitute plywood and can be manufactured from small diameter plantation timbers. This will reduce the dependence of the country on imported round wood. The import of such wood in any case will have to be stopped as the environmental concern will compel various exporting countries to stop such exports. Development of products such as parallel strand lumber, which can substitute natural wood in structural applications is also vital.

- 0.4.8 In order to exploit full potential of reconstituted panels, down stream furniture making industry needs to be promoted in a planned manner alongwith development of skills specially in the area of joinery techniques and development of specialised hardware suitable for use in conjunction with reconstituted panels.

## **0.5 CONCLUSIONS**

- 0.5.1 The applications of particle board for furniture and house furnishing/ wood work are still not popular and hence the demand has been low. Consumers, due to lack of awareness, still prefer timber, plywood and block board. Although some individual efforts have been made by the industry to popularise the products but concrete efforts to increase awareness and hence demand have not been made. Hardboard industry has stable demand but prospectus for further growth are limited. MDF is a new product and its acceptability will be known after some time. Particle board industry on the other hand feels that the major reason for slow growth is the high cost of production that makes the product uninteresting and at the same time furniture industry is reserved for small scale sector which is unorganised and is by and large engaged in mannual processes using predominantly commercial plywood and blockboard. MDF and particle boards are predominatly designed for mechanised production of standard furniture system.
- 0.5.2 Due to poor marketing environment, the industry has had a anemic existence for two decades. This is in sharp contrast to experience in Europe, America and elsewhere, where the particle board and MDF industries have expanded at a very quick pace. This indicates that, the potential demand is there but because of lack of market development efforts,potential has not been translated into actual realisation. This aspect needs urgent attention of all concerned.
- 0.5.3 Given the acute shortage of round wood and total ban on cutting of forests, there is a need to develop the raw material base of all the wood based industries including reconstituted panels. For this purpose, a long term viable solution can be provided by development of new products which can utilise small plantation woods. The development of products like OSB, Scrimber and engineered timber products, is therefore of great importance and immediate concern. These products can do away with the dependence upon imported round wood, which may not be available in years to come as the shortage of timber is a world wide phenomena.

- 0.5.4 The Forest Research Institute and its regional centres should undertake surveys and studies to identify quick growing species of plantation trees which can be utilised for manufacturing various panel products. The techno-economic viability of such plantation in different agro-climatic zones need to be studied.
- 0.5.5 As another prong of the strategy to expand the raw material base of the industry, the availability of different ligno-cellulose material including non-conventional woods such as rubber trees coconut tree wood and agro-wastes such as bagasse, cotton stalks etc. may be undertaken. Such studies should cover the existing pattern of usage of such products and evolve the optimum pattern of usage keeping in view the adverse consequence of such use on local population and ecological considerations.
- 0.5.6 In technology adaptation one of the gray area was the raw material. Sufficient data and indepth process details for the raw material and correlation to end product quality were not available from the collaborators. The raw materials specifications and process parameters provided by them (which should be based on local samples or their earlier experience) have been found not conforming to those under actual commercial production conditions. Consequently the difficulties have been experienced in production efficiency and quality. This is the area in which technology need to be developed.
- 0.5.7 Indigenisation of equipment for MDF industry has been done for motors, dryers, electrical installations, boilers using factory wastes, generator turbines, weighing machines, water treatment system, material handling equipments, piping, structures etc. Large size chippers are also being produced in the country.
- 0.5.8 The country has been depending on imports of capital equipment for larger capacity plants because of inbuilt features like precise control of production and process parameters, equipment reliability, operational safety, pollution control and quality assurance features, apart from these there has been considerable progress in the indigenisation of equipment for the particle board industry. The items that can be manufactured indigenously are chipper, knife ring flakers, screens, sifters, glue mixers, spreading machine and hydraulic process. Technology gaps exist in a number of areas in respect of process technology and equipment and techniques.



0.5.9 R&D in industry is practically non existent. IPIRI which is the only national level research institution related to the area has been devoted to developing plywood technology. The only exception in its activities has been the development of particle board manufacturing process based on rice husk. At the same time the basic know-how on various binders is already available in the Indian industry. Resins work on formaldehyde board adhesives and binders for this industry is widely acknowledged.

## **0.6 RECOMMENDATIONS**

### **0.6.1 R&D Infrastructure**

R&D infrastructure has to be laid on a strong footing in a planned manner. Facilities are being upgraded at IPIRI, Bangalore which could be further expanded to take care of the long term R&D requirements of the reconstituted panels industry and its role redefined. Alternately setting up of a national R&D institute may be considered with enhanced scope of activities encompassing R&D and technology trading. The proposed institutes operations may be managed in a manner so that it becomes self sufficient by ploughing back profits and royalty accruals to support its research programs.

### **0.6.2 Support for Training**

The following initiatives may be considered to improve the functioning of the industry :

- Supports to be provided for training in designing and joinery techniques for making furniture from reconstituted panels to personnel from down stream units.
- The training courses in industrial training institutes may incorporate, in their curriculum, joinery and handling techniques for reconstituted panel products supplemented with practical training.
- Involvement of HUDCO, CPWD and others can be considered for imparting training to the carpenters in the building centres.

### **0.6.3 Technology Acquisition**

Foreign collaboration for technology acquisition in specialised areas may continue. Once the requisite technologies have been developed, the need for technology collaborations may cease and only specific components of technology may need to be imported. The factors influencing the choice of technology, equipment and collaborator are :

- Experience in the line.
- Cost of equipment and services.
- Energy, utilities, resins and other inputs per tonne of end products.
- Feed back on the experiences in similar projects from the entrepreneurs elsewhere in the world.

### **0.6.4 Process Development**

R&D projects may be taken up for the raw materials identified through studies for exploitation of their potential to substitute timber. Complete process technology for collection, transportation and storage of materials and product manufacture should be developed alongwith basic engineering data. The successful laboratory projects should be further tried out on pilot scale for incorporating the technology developments in equipment and their application to actual projects.

### **0.6.5 Applications**

New application development projects may be taken up. One of the areas could be developing of ligno cellulosic fibre and engineering plastic composites for use in consumer durables and industrial goods. Such R&D projects may open up new areas providing substitutes of petrochemicals for which considerable quantities of crude oil and petroleum products imports are being made.

### **0.6.6 Down Stream Industry**

Down stream integration of furniture industry based on the reconstituted panels may help in popularising the timber substitutes and development of industry. The industry feels that such units may be dereserved from small scale sector and allowed to be put up in the organised

sector. Only the timber/plywood based furniture units may continue to be reserved for cottage and small scale units. Thus the operations of the traditional furniture industry and working force employed there in would not get disturbed.

#### **0.6.7 Export of Knocked-down Furniture**

So far this has been an unexplored potential export area. Export potential for knocked down furniture and houses need to be studied simultaneously so that the down stream furniture industry can target its operations for export of furniture in addition to meeting the domestic demand.

#### **0.6.8 Marketing**

The industry need to make a joint effort for popularising its product acceptance through demonstration centres, short films in media and advertising in professional journals. So far the sporadic individual efforts by the industry have been inadequate to create sufficient demand growth.

#### **0.6.9 Indigenisation of Capital Equipment**

Few of the major equipments have already been indigenised. Equipment which are common to other industries such as presses, defibrator etc., can be taken up for indigenisation. Existing manufacturers may tie up with foreign manufacturers for know-how and international marketing.