



NATIONAL AGENCY  
OF INVESTMENT  
AND PRIVATIZATION  
REPUBLIC OF BELARUS

# PRODUCTION SETUP OF BLEACHED CHEMICAL-THERMOMECHANICAL PULP

Bleached chemical-thermomechanical pulp (hereinafter – BCTMP) is used in the production of paper and paperboard as a cheaper alternative to bleached hardwood pulp.

Unlike traditional technologies for the production of pulp, the production of BCTMM practically does not pollute environment and consumes less water and chemicals.



# ABOUT PROJECT

**BCTMP** IS A FIBROUS SEMI-FINISHED PRODUCT OBTAINED FROM **VEGETABLE RAW MATERIALS**, SUBJECTED TO MILD CHEMICAL AND HEAT TREATMENT, FOLLOWED BY GRINDING IN DISK MILLS UNDER PRESSURE.

## PROJECT GOALS

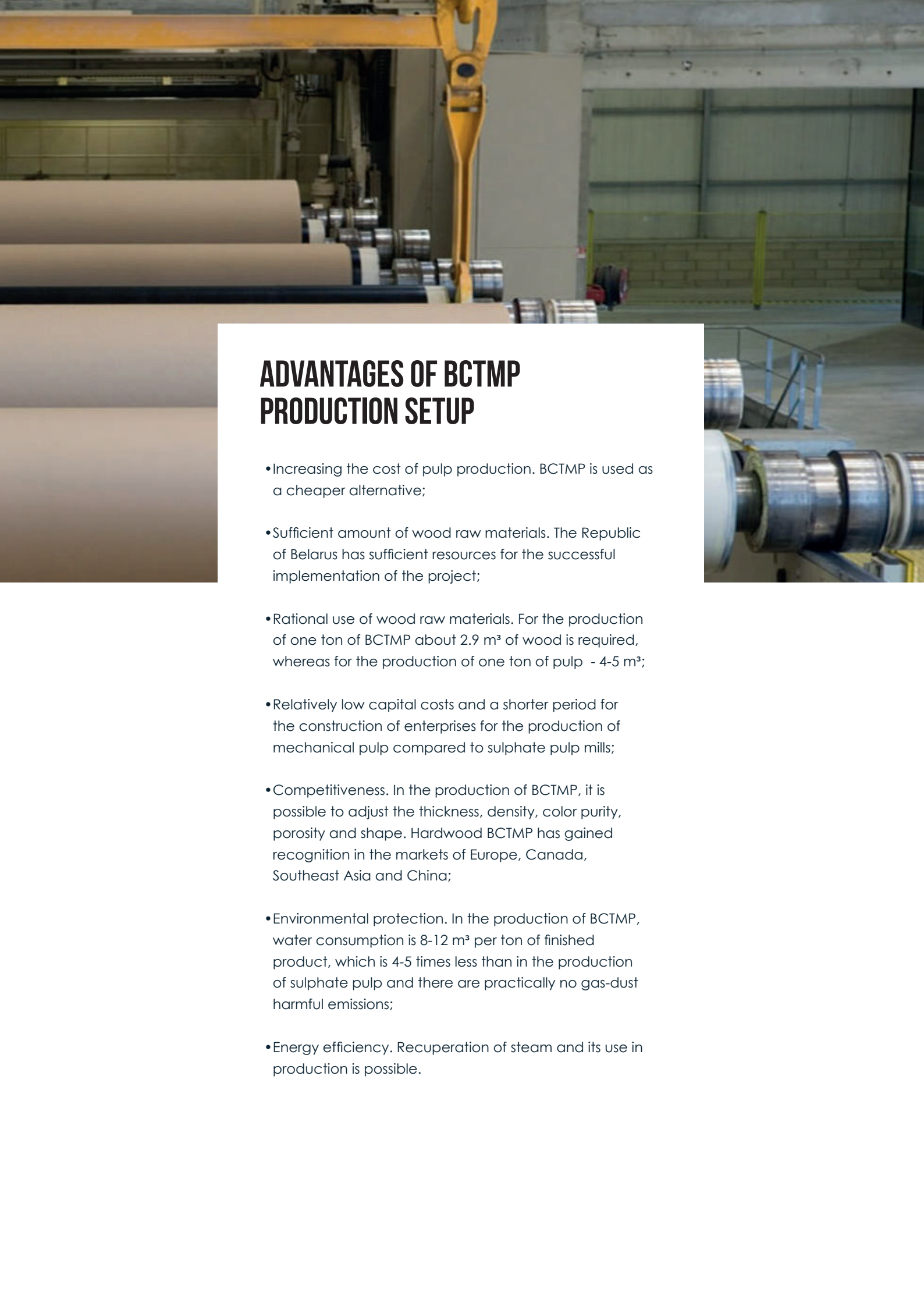
Creation of an enterprise for the production of bleached chemical-thermomechanical pulp.

## SCOPE

- import substituting production;
- high value added production
- increase in tax revenues;
- deep processing of wood.

## APPLICATION OF BCTMP

- production of high quality paper for printing;
- manufacture of food packaging materials;
- production of cardboard for various purposes;
- production of sanitary paper.



## ADVANTAGES OF BCTMP PRODUCTION SETUP

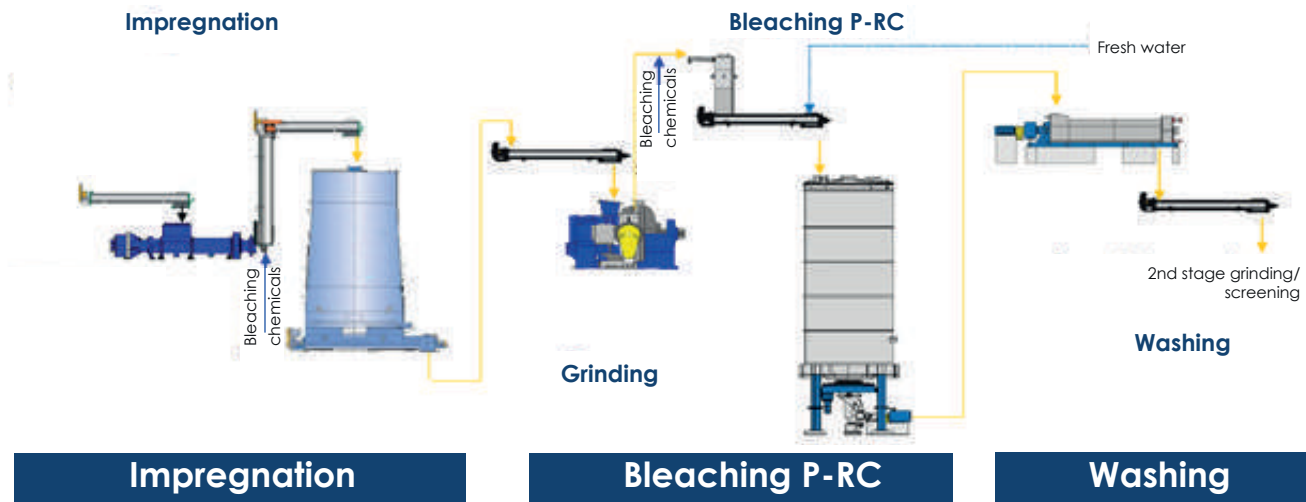
- Increasing the cost of pulp production. BCTMP is used as a cheaper alternative;
- Sufficient amount of wood raw materials. The Republic of Belarus has sufficient resources for the successful implementation of the project;
- Rational use of wood raw materials. For the production of one ton of BCTMP about 2.9 m<sup>3</sup> of wood is required, whereas for the production of one ton of pulp - 4-5 m<sup>3</sup>;
- Relatively low capital costs and a shorter period for the construction of enterprises for the production of mechanical pulp compared to sulphate pulp mills;
- Competitiveness. In the production of BCTMP, it is possible to adjust the thickness, density, color purity, porosity and shape. Hardwood BCTMP has gained recognition in the markets of Europe, Canada, Southeast Asia and China;
- Environmental protection. In the production of BCTMP, water consumption is 8-12 m<sup>3</sup> per ton of finished product, which is 4-5 times less than in the production of sulphate pulp and there are practically no gas-dust harmful emissions;
- Energy efficiency. Recuperation of steam and its use in production is possible.



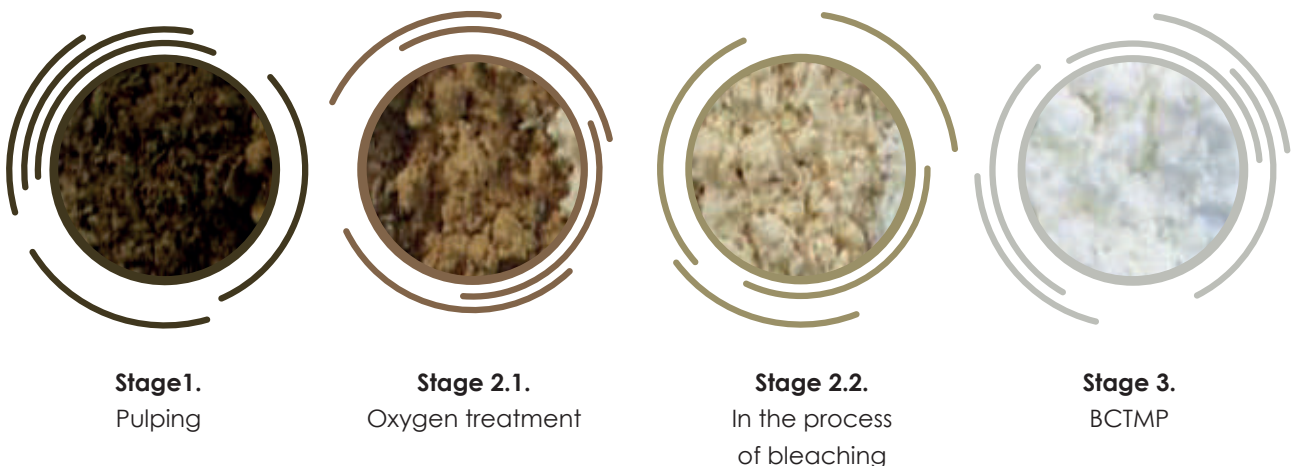
# INVESTMENT PROPOSAL

|                                                       |                                                                                                                                           |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Production capacity</b>                            | 140 000-300 000 tons/year                                                                                                                 |
| <b>Required raw materials volume</b>                  | 2.9 m³ of pulp wood per 1 tonne of BCTMP<br>(870 thousand m³ when reaching full capacity<br>of 300 thousand tons / year)                  |
| <b>Concept</b>                                        | A stand-alone plant with its own energy block<br>operating on wood waste. Suitable for areas with<br>limited access to forest resources.  |
| <b>Product</b>                                        | Hardwood BCTMP, various types. BCTMP is<br>produced in the form of commercial products,<br>which is packed in bales weighing 250 kg each. |
| <b>Plant area<br/>(without auxiliary premisses)</b>   | 50-100 ha                                                                                                                                 |
| <b>Personnel</b>                                      | 85 people                                                                                                                                 |
| <b>Power requirement</b>                              | 55 megawatt                                                                                                                               |
| <b>Cost of a set of main<br/>production equipment</b> | 395 mln BYN (160 mln EUR, 187 mln USD) - without<br>the cost of sewage treatment plants and energy<br>boiler                              |
| <b>CAPEX</b>                                          | 640 mln BYN (260 mln EUR, 305 mln USD)                                                                                                    |
| <b>OPEX</b>                                           | 565-590 BYN /t (230-240 EUR/t, 270-280 USD/t)                                                                                             |

# BCTMP PRODUCTION PROCESS



## BCTMP BLEACHING STAGES



Getting bleached chemi-thermomechanical pulp includes steaming chips, grinding in two stages with its chemical treatment and bleaching.

The dark color of the pulp is mainly due to residual lignin, which must be removed during bleaching.

In modern bleaching processes BCTMP molecular chlorine is not used - it is replaced by oxygen, hydrogen peroxide and chlorine dioxide.

The byproducts of such bleaching are harmless.



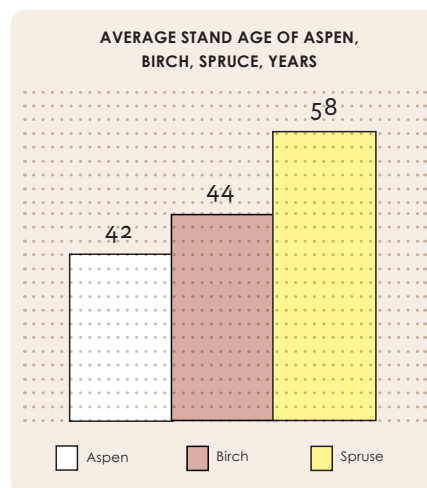
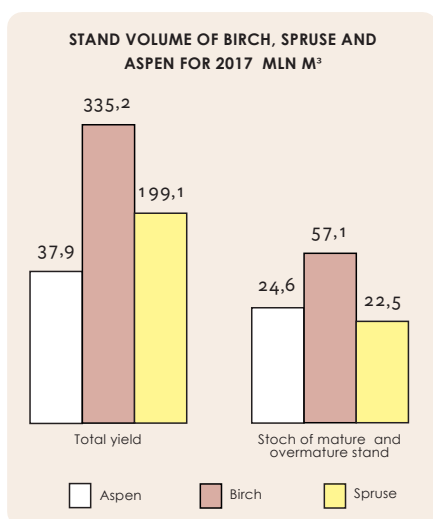
# RESOURCE BASE

The self-sufficiency in raw materials of the investment project for obtaining BCTMP directly depends on the state of the forest funds of Belarus, which has been steadily improving over the past years.

The main raw materials used to obtain BCTMP are hardwood pulp bolts - aspen and birch; it can be also produced from spruce and pine.

Pulp bolts are the logs harvested mainly from the top of a tree trunk of a certain species or logs with such natural curvature that cannot be used in wood processing for the manufacture of sawn timber in the future.

The supply of wood raw materials for the production of BCTMP is supposed to be carried out from the enterprises of the system of the Ministry of Forestry of the Republic of Belarus.



The market has developed the following prices for the necessary paper wood:

- Aspen – 26 BYN/m<sup>3</sup>  
(12,3 USD/m<sup>3</sup>, 10,6 EUR/m<sup>3</sup>);
- Birch – 30 BYN/m<sup>3</sup>  
(14,2 USD/m<sup>3</sup>, 12,2 EUR/m<sup>3</sup>);
- Spruce – 31 BYN/m<sup>3</sup>  
(14,7 USD/m<sup>3</sup>, 12,6 EUR/m<sup>3</sup>).

Processing technology should take into account the characteristics of the morphological structure of the cell wall of each wood species. It is important that such fast-growing deciduous species of wood such as aspen and birch which are widely distributed in the Republic of Belarus can be used to obtain BCTMP.

The essential factor that constrains the use of pine wood in thermo-mechanical wood pulp production is higher content of fats and resin compared to the wood of spruce. As a rule, pine wood can not be used in quantities of more than 10% of the total volume of raw wood.



The necessary raw materials volume is 2.9 m<sup>3</sup> paper wood per 1 ton of BCTMP (870 ths m<sup>3</sup> when at full capacity of 300 ths tons per year). For the BCTMP production the following volumes of energy resources are required:

| Resource name      | Resource consumption per ton of the product | Cost                                                                               | Annual demand           |
|--------------------|---------------------------------------------|------------------------------------------------------------------------------------|-------------------------|
| Gas supply         | 95 m <sup>3</sup>                           | 550,49 BYN/m <sup>3</sup><br>(262 USD/m <sup>3</sup> ,<br>224 EUR/m <sup>3</sup> ) | 28,5 mln m <sup>3</sup> |
| Electricity supply | 1 000 kW                                    | 0,18 BYN/kWh<br>(0,09 USD/ kWh,<br>0,07 EUR/ kWh)                                  | 300 000 000 kWh         |
| Water supply       | 6 m <sup>3</sup> /day                       | 1 BYN/m <sup>3</sup><br>(0,5 USD/m <sup>3</sup> ,<br>0,41 EUR/m <sup>3</sup> )     | 1,8 mln m <sup>3</sup>  |
| Water discharge    | 10 m <sup>3</sup> /day                      | 0,7 BYN/m <sup>3</sup><br>(0,34 USD/m <sup>3</sup> ,<br>0,29 EUR/m <sup>3</sup> )  | 3 mln m <sup>3</sup>    |
| Heat supply        | 0,4 Gcal                                    | 95 BYN/Gcal<br>(45 USD/ Gcal,<br>39 EUR/ Gcal)                                     | 120 ths Gcal            |



# HUMAN RESOURCES

The need for personnel is approximately **85 people**. Training of the personnel with higher education in the field of forest-processing industry is carried out by the **Belarusian State Technological University** with the following departments:

- **Faculty of Forestry**, the main focus of which in recent years is the creation and improvement of: multi-level systems of training specialists in forestry, landscape design, landscape gardening, tourism and environmental management that meet international standards.
- **Faculty of Technology and Equipment of the Forest Industry**, which is engaged in the training of highly qualified personnel in the field of resource-saving and environmentally friendly

technologies, transport systems and equipment for the processing of raw wood for innovative and export-oriented production that ensure efficient rational use of raw, energy and human resources.

- Training of the personnel with **specialized secondary education** in the field of forest-processing industry is carried out by:
  - Vitebsk State Technological College
  - Bobruisk State Forestry College
  - Gomel State Polytechnic College
  - Polotsk State Forestry College





Implementation of the project is recommended in the Vitebsk, Minsk and Mogilev regions of the Republic of Belarus.

On the territory of these areas there are the largest **unclaimed** volumes of softwood timber. This makes them the most attractive because of the availability of raw materials.

# BCTMP MARKET REVIEW

The need for a continuous increase in the production of BCTMP is due to the increased consumer demand on the world market and the expansion of the field of application of this type of wood raw material. In addition, BCTMP can be considered as a cheap alternative to bleached pulp. At the same time, the operating BCTMP production plants, located mainly in Canada and Scandinavia and producing from 100 to 620 thousand tons per year, are not capable of meeting the ever-growing demand for BCTMP.

Compared with other pulp classes, it is relatively cheaper and easier to produce BCTMP, the equipment for its production is not so expensive. However, the price of BHTMP is quite unstable and much lower than the cost of cellulose produced by chemical means. Currently, the price of BHTMP in China is 590-610 USD per 1 ton of coniferous BHTMP, and the price of hardwood BHTMP is 770-780 USD per 1 ton, while the net price of bleached pulp is 865-890 USD per 1 ton.

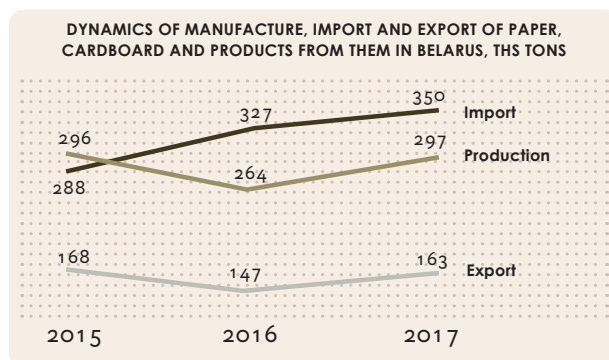
BCTMP from hardwood is successfully used in the composition of high-quality printing paper, food packaging materials, in the manufacture of cardboard and sanitary paper.

The forecast of the BCTMP market development can be estimated on the basis of the dynamics of production and consumption of cardboard and paper, in the manufacture of which this semi-finished product is used.

Over the past twenty years, global consumption of paper and paperboard has quadrupled, and by 2030 it will be 482 million tons. On average, demand will grow by 1.1% per year. These are the results of the market research (World Paper Markets up to 2030) prepared by Poyry Management Consulting. The study covers the markets of 80 countries in 10 product areas, including printing paper, packaging varieties, etc. At the same time, by 2030 the consumption volumes of sanitary paper, container and packaging cardboard will increase.

The main growth drivers are the demand for packaging in emerging economies, the boom of e-commerce, as well as the growth in consumption of convenience foods and branded consumer goods. Annual growth in consumption of packaging materials is projected at around 2.9%. China and India are the key countries that provides for the consumption growth of paper and are characterized by population growth, urbanization and the formation of a new middle class.

In the pulp and paper industry of the Russian Federation, the growth trend continues for the main types of products. Paper and paper products production index in 2017 was 104.7% compared to the previous year.



The pulp and paper industry of Belarus annually produces about 250 million tons of paper and about 60 million tons of cardboard, some of the products are exported. Despite the growing production volumes of Belarusian enterprises, the level of paper imports to the country remains high. In 2018, 1,208.5 t of BCTMP were imported to the Republic of Belarus at a price of \$ 486/t.

In Belarus, there is no existing production of BCTMP. The organization of such a production will not only reduce the overall volume of imports, but also reduce the cost of the goods themselves, and support domestic producers.



## BCTMP PRODUCTION AND CONSUMPTION RATIO IN THE WORLD MARKET



Production

Consumption

# BCTMP WORLD MAIN PRODUSERS

| Country                        | Plant                             | Raw material  | Company                                                         | Capacity<br>ths tonnes |
|--------------------------------|-----------------------------------|---------------|-----------------------------------------------------------------|------------------------|
| Canada                         | Tembec                            | aspen/ maple  | Tembec                                                          | 620                    |
|                                | Ranger                            | aspen         | West Fraser                                                     | 220                    |
|                                | Quenscel River                    | spruce        | West Fraser                                                     | 350                    |
|                                | Miller Western                    | aspen/spruce  | Miller Western                                                  | 590                    |
|                                | Fibreco                           | aspen/spruce  | Fibreco                                                         | 200                    |
| Sweden                         | SCA                               | aspen/birch   | SCA                                                             | 100                    |
|                                | Waggeryd                          | spruce        | Waggeryd                                                        | 140                    |
|                                | Rottneros                         | aspen         | Rottneros                                                       | 85                     |
| Finland                        | UPM                               | aspen         | UPM                                                             | 170                    |
| Norway                         | Folla                             | spruce        | Mayr-Melnhof Karton                                             | 100                    |
| Estonia                        | Estonian Cell                     | aspen         | AS ESTONIAN CELL                                                | 450                    |
| New Zeland                     | Winstone                          | insignis pine | Winstone                                                        | 190                    |
|                                | Pan Pac                           | insignis pine | Oji                                                             | 200                    |
| Russia<br>(Kaliningrad region) | International<br>Paper            | aspen/pine    | International Paper                                             | 200                    |
| Russia<br>(Irkursk region)     | Pulp-and-paper<br>plant in Bratsk | spruce        | parity joint venture<br>International Paper<br>and Ilim Holding | 300                    |
| Russia<br>(Irkursk region)     | Ust-Ilim                          | aspen         | parity joint venture<br>International Paper<br>and Ilim Holding | 120                    |



# REPUBLIC OF BELARUS

## Business Environment

### EURASIAN ECONOMIC UNIT



512 mln  
consumers

EAEU



183 mln consumers in the EEU

10 mln consumers in Belarus

### INVESTMENT LEGISLATION

**70** agreements on  
avoidance of double  
taxation

**The Republic of Belarus is a member of  
the Multilateral Agency for Guarantees  
and Investments**

**66** agreements on assistance  
in the mutual protection of  
investments

#### Law on investment

- 1.** Protection against nationalization
- 2.** Unhindered transfer of profit (income) abroad
- 3.** Equality and non-discrimination of investors

### VISA REGIME

In 2018, Belarus extended the visa-free stay for foreigners to 30 days. Visa-free visits are provided on condition of the entrance through the National Airport Minsk for citizens of 74 countries, including European countries, as well as Brazil, Indonesia, the United States, Japan and other countries.



# FORESTRY OF THE REPUBLIC OF BELARUS

In the Republic of Belarus forests are one of the main renewable natural resources. Forests and forest resources are of great importance for the sustainable socio-economic development of the country, ensuring its economic, energy, environmental and food security.

According to a number of key indicators characterizing the forest fund (the forest cover of the territory, the forest area and the growing stock of timber per inhabitant), Belarus is among the top ten forest countries in Europe (the share of forests in the country is 39.8%).

As a result of purposeful work on forest reproduction and forest cultivation, positive dynamics of the forest fund were achieved. The main indicators of the forest fund as of January 1, 2018:

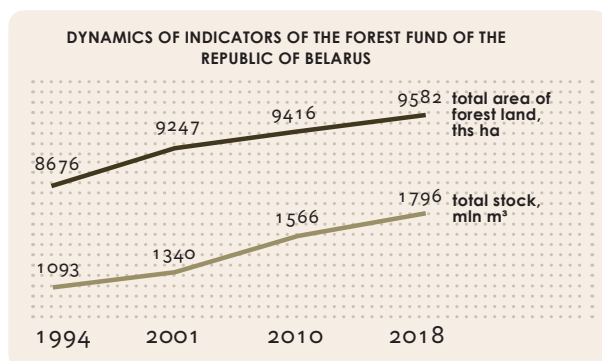
- forest area - 8260.9 thousand hectares;
- forest cover of the territory - 39.8%;
- total stock of standing timber - amounted to 1796.0 million m<sup>3</sup>;
- reserve for 1 ha of forest land - 217 m<sup>3</sup> per 1 ha;
- average stand age is 56 years.

In Belarus, along with the increase in the total forest area, a steady increase in the area of ripening, ripe and overmature stands is observed.

During the twenty-year period, the area of ripe and overmature stands was significantly increased and amounted to 14.7% of the total forest area.

The forestry of Belarus is owned by the state.

In accordance with the Decree of the President of the Republic of Belarus of May 7, 2007 № 214 "On some measures to improve activities in the field of forestry" harvested industrial wood is sold at the stock exchange of the OJSC Belarusian Universal Commodity Exchange. Pulp bolts are sold at the stock exchange weekly, quarterly and annually.

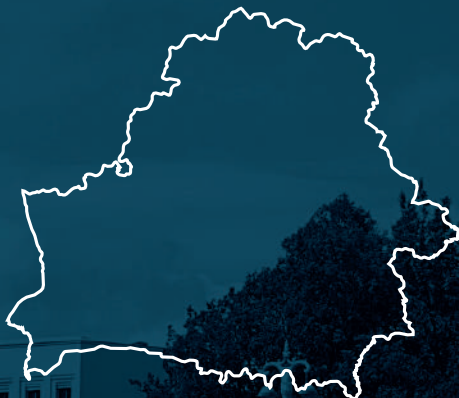




# NATIONAL AGENCY OF INVESTMENT AND PRIVATIZATION

The Agency is ready to help foreign investors interested in doing business in Belarus:

- Presentation of information on investment opportunities, preferential regimes and benefits, industries, legislation
- Provision of current information on investment projects
- Selection and provision of information on options for land and premises
- Search for potential partners for the implementation of the investment project; organization of meetings, negotiations with potential partners to establish cooperation
- Providing a platform for negotiations and support for the investor during the negotiations — Organization of visits to the Republic of Belarus (development of a program of stay, assistance in obtaining a visa)
- Representing the interests of the investor in negotiations with government officials on the implementation of investment projects, as well as on improving business practices in the Republic of Belarus
- Post investment support



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