

## SUMMARY

### EQUIPMENT AND TECHNOLOGIES OF COMBINED PROCUREMENT OF MERCHANTABLE WOOD WITH CUTTING WASTES UTILIZATION FOR ENERGY PRODUCTION IN BELARUS

**FYEDORENCHIK ALEKSANDR SEMYONOVICH, LEDNITSKY ANDREY VIKENTIEVICH**

Department of Forestry Machinery and Logging Technology,  
Department of Economics and Management on Enterprises of Forestry-Chemical Complex  
Belarusian State Technological University

Sverdlova Str., 13a, 220050 Minsk, Republic of Belarus  
Tel. +375 17/226-10-75, Fax 227-62-17, Mob. tel. +375 29/706-11-04

[www.bstu.unibel.by](http://www.bstu.unibel.by)

[fedor@bstu.unibel.by](mailto:fedor@bstu.unibel.by), [ledniz@inbox.ru](mailto:ledniz@inbox.ru)

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The energy consumption in the Republic of Belarus is about 33 million tons of standard fuel<sup>1</sup> annually, and only 15 per cent of this amount is covered by the own resources. The costs of purchasing the required energy resources and electric energy are about 2 billion € annually, that is equal to more than 30 per cent of the total amount of import of the Republic of Belarus, resulting in dependence of its economy on external factors. The total volume of forest stands in Belarus is about 1414 million m<sup>3</sup>, that is about 243 m<sup>3</sup> per hectare. The average annual increment is slightly less than 30 million m<sup>3</sup>, and the total volume of cuttings of all types is about 14 million m<sup>3</sup>. In this respect, the matters of both logging volume increase and wood waste utilization for energy production, including utilization of logging, sawmilling, wood processing wastes and low-quality fuel timber, become especially important.

To determine the potential of wood fuel resources in Belarus, the procedure was developed by the authors of this paper. On the basis of this procedure, the *potential, technically available and economically available* volumes of wood fuel were determined for the period up to 2015. At present the annual economically available wood fuel potential for the enterprises of forestry complex is about 6.8 million m<sup>3</sup>, and in 2015 it will increase by 55 per cent. Sixteen small combined heat and power plants (CHP plants) with about 1.2 million m<sup>3</sup> annual consumption of wood fuel are under construction in Belarus. For procurement of large volumes of wood and production of chip fuel, several technologies and a series of domestically produced machines were developed in the University.

The multiple technical and economical investigations, carried out by the authors with regard to the conditions existing in Belarus, give an opportunity to make the following conclusions.

1. The technological processes, providing procurement and hauling of wood on cuttings of principal and intermediate harvesting as assortments, will become predominant, because of their better economic effectiveness indicators and maximum compliance with the requirements of forest certification.

2. Within the combined process of wood raw materials procurement, it is most reasonable to use mobile machine systems for chip fuel production. This machine system shall include: load-haul-dump machines; mobile barrel-type chippers, driven by a stand-alone motor, having the capacity at least 40 m<sup>3</sup> loose per hour; chip trucks, having turn volume more than 35 m<sup>3</sup> loose, or road trains, having turn volume about 70...80 m<sup>3</sup> loose; a bucket front loader, with bucket volume at least 5 m<sup>3</sup> loose. As a rule, for fuel timber, comminution at interseasonal storages is most reasonable. For logging wastes, comminution at intermediate storages, located near all-weather roads, with the delivery distance not exceeding 5 km, and for sawmilling and wood processing wastes, comminution at the source is most reasonable.

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<sup>1</sup> 1 ton of standard fuel is equivalent to 29300 MJ

3. As a whole, for production and delivery of wood fuel in Belarus, about 228 logging tractors, 762 load-haul-dump machines, 167 chippers and tractors for their transportation, 620 chip trucks, 74 chip loaders are required.