

Productivity and costs of slash bundling in Nordic conditions

K. Kärhä*, T. Vartiamäki

Metsäteho Oy, P.O. Box 101, FI-00171 Helsinki, Finland

Received 29 October 2004; received in revised form 10 May 2005; accepted 12 December 2005

Available online 18 October 2006

Abstract

The number of slash bundlers and the volume of slash bundling have been rapidly increasing during the last few years in Finland. However, no comprehensive time or follow-up studies have been carried out on slash bundling technology in Finland or in any other country. Metsäteho Oy carried out studies on the productivity and costs of slash bundling in different Nordic recovering conditions. The study methods included both time and follow-up studies. Data were collected during the summer and winter period primarily in Norway spruce (*Picea abies* L. Karst.) dominated clear cutting sites. The bundling techniques performed by different types of bundler (Fiberpac 370, Timberjack 1490D, Pika RS 2000, Valmet WoodPac) were studied.

The average productivity of slash bundling was 18.1 bundles per operating (E_{15} , including delays shorter than 15 min) hour with the Timberjack 1490D and Fiberpac 370 bundlers in the follow-up study. The operator of the slash bundler had the greatest effect on the productivity of bundling. The prerequisite for increased bundling volumes is a reduction in the costs of the most expensive sub-stage of the bundling supply chain, i.e. bundling itself. This requires improved recovery conditions at bundling sites, increased bundling productivity, larger sized bundles, and the execution of bundling operations in two work shifts using an efficient bundler and effective operator working methods. Implementation of these development measures will bring the bundling supply chain up to a speed that makes it the most competitive supply chain for forest chips in terms of total supply costs for long-distance transportation distances of more than 60 km.

© 2006 Elsevier Ltd. All rights reserved.

Keywords: Forest chips; Logging residues; Bundling; Bundles; Slash bundlers; Productivity; Costs; Supply chains; Finland

1. Introduction

In the bundling system, the logging residues (or slash) left behind by a harvester are collected and fed into the bundler to produce logging residue bundles, i.e. compact residue logs (CRLs). Two new bundling system innovations (Fiberpac and Wood Pac) appeared in Sweden in the late 1990s. At the beginning of 2000, both bundling systems were introduced in Finland. The number of slash bundlers and the volume of slash bundling have been rapidly increasing during the last few years in Finland. At present (in spring 2005), there are nearly 30 slash bundlers in use in Finnish forests, and in 2003 more than 0.7 million slash bundles were produced.

A total of 2.1 million solid m^3 of forest chips were used in 2003 in Finland [1]. One sixth of the total amount of

forest chips used for energy production was produced by bundling supply chains. However, no comprehensive time or follow-up studies have been carried out on slash bundling systems in Finland or in any other country. Some minor slash bundling studies [2–14] have been carried out in Finland, Sweden, Norway, Ireland, France and the US.

Metsäteho Oy undertook a study on the recovering conditions at bundling sites, the productivity of the bundling of logging residues, and the effects of recovering conditions on productivity. In addition, the bundling supply chain costs were also estimated and compared with those of the other most commonly used logging residue chip supply chains.

2. Material and methods

2.1. Bundlers

The first slash bundlers (Fiberpac 370) to be used in Finland were manufactured by the Swedish company

*Corresponding author. Tel.: +358 20 765 8808.

E-mail address: kalle.karha@metsateho.fi (K. Kärhä).

Fiberpac AB. These bundlers were mounted on the load space of Timberjack forwarders. In autumn 2002, the Timberjack company purchased the product patents relating to the Fiberpac 370 bundler and introduced a new Timberjack 1490D slash bundler based on the Timberjack 1410D forwarder as the base machine (Fig. 1). Currently, there are about 25 Timberjack bundlers (including the Fiberpac 370 and Timberjack 1490D bundlers) bundling logging residues in Finland. In addition, there are about 10 Timberjack slash bundlers in use in Sweden, the Czech Republic, Switzerland, Italy, Spain and the US. In this article, the term Timberjack bundler is used to refer to both Fiberpac 370 and Timberjack 1490D slash bundlers, and the more precise term Timberjack 1490D bundler to refer to the new Timberjack 1490D bundlers. The Timberjack bundlers produce a “continuous”, 70–75 cm thick slash bundle that is cut by a chain saw into 3-m length bundles.

In the late 1990s, Wood Pac AB introduced its own Wood Pac slash bundler. The Partek Forest company bought the patents of the Wood Pac bundler and, in 2002, Partek Forest Oy Ab introduced the Valmet WoodPac bundler which produced one bundle, about 3.5 m long and 80 cm diameter thick, at a time. In spring 2004, Komatsu Forest Oy introduced the new Valmet WoodPac which is mounted on the load space of a Valmet 860.1 forwarder (Fig. 2). According to the specifications provided by the manufacturer, the bundles produced by the new Valmet WoodPac are slightly smaller than those made by the old model. At the present time there are three new Valmet WoodPac bundlers in use in Finnish forests.

S. Pinomäki Ky (currently Pinox Oy) introduced the Pika RS 2000 bundler in summer 2003. The Pika RS 2000 has been constructed on the load space of the Pika 828 Combi harvester-forwarder (harwarder) (Fig. 3). The bundling process in the Pika RS 2000 is continuous, like in the Timberjack bundlers. On the other hand, the bundling unit of the Pika RS 2000 bundler is detachable, as is the case in the Valmet WoodPac bundler. Consequently, the bundles can be forwarded by the base machine of the bundler. There are currently three Pika RS 2000 bundlers in use in Finland.

2.2. Time study

Two Timberjack 1490D, two Fiberpac 370, one Pika RS 2000, and one new Valmet WoodPac bundlers were tested in the bundling time study. Eight different bundler operators participated in the time study. The bundling experience of the operators varied from a few months to 3.5 years.

The time study was carried out on a total of 26 different bundling sites. There were 11 bundling sites in summer 2003 and 12 sites in winter 2004. The Timberjack bundlers were researched at 18 bundling sites and the Pika RS 2000 at five sites. In spring 2004, the brand-new Valmet WoodPac was also tested at three bundling sites. A total of 1971 bundles were produced in the time study. The material of the bundling time study primarily consisted of the bundles produced by the Timberjack bundlers. The numbers of bundles produced with the Pika RS 2000 and Valmet WoodPac were clearly smaller (Pika RS 2000: 352 bundles, and Valmet WoodPac: 209 bundles).



Fig. 1. The Timberjack 1490D slash bundler. Photos: Metsäteho Oy.

Download English Version:

<https://daneshyari.com/en/article/678909>

Download Persian Version:

<https://daneshyari.com/article/678909>

[Daneshyari.com](https://daneshyari.com)