TransBale – The World’s First Automated Distribution Centre For Pulp

By Kaj Fahlund, VP Paper and Converting, Pesmel Oy

Metsä Fibre, part of Metsä Group, is currently in the process of commissioning a new, next-generation bio product mill in Äänekoski (Central Finland). It is the largest industrial investment so far for the Finnish forest industry and is expected to produce 1.3 million tons of pulp annually. The mill will begin operations by the third quarter of 2017.

There will be new technology in every department, but one of the true world premieres will be seen at the end of the production line in the form of an Automated Distribution Centre (ADC) – a world’s first for pulp bale units, because this plant will not feature a warehouse in the traditional sense at all. The production of the plant will be shipped twice a day by train to Helsinki harbor, along with domestic truck shipments by road each day. To enable this, a whole new way of thinking about the finishing logistics was needed.

Matti Alamä, Vice President of Logistics, Metsä Group comments: “The selection process was not just choosing between different system suppliers, but also a selection between various technical and functionally quite different storage and handling solutions. The further the preliminary survey progressed, the more the benefits of TransBale became clear.

He continues: “TransBale provides an excellent chance to develop the product delivery pipeline as a whole, not just the dispatch operations at the mill. During the preliminary planning stage, the entire product delivery chain was modelled and the share of cost elements created during the different stages identified. After this, we sought a solution that would enable us to manage these material flows of 1.3 million tons in total, in the most cost-efficient and reliable manner. TransBale will also provide us with better tools for planning and grouping deliveries in a proactive manner, further benefiting the logistics pipeline outside the mill.

“Before the selection was made, the solution was carefully investigated from the perspective of usability, among other considerations. We studied other solutions of the similar type already in use, with the primary intention of gathering other users’ experiences of the operational reliability of high-bale storages. The distribution centre to be
delivered to the bio product mill will be a seamless part of the mill’s production machinery, and its reliability must be top class.”

AN INNOVATIVE APPROACH TO FILL THE NEED
The core of the TransBale automated distribution centre features high-bay storage with two fully automated stacker cranes. The system can buffer and sort both hard and softwood pulp bale units by product type and customer order, as well as controlling all dispatch operations. Compared with a typical high-bay storage facility using a pallet racking system with several stacker crane aisles – where only two pallets can be stored in each – TransBale provides a deep-lane storage system where six pulp bale units can be stored in each storage channel – and without any need for slave pallets. Thus, larger amounts of material can be stored in a smaller space. The pulp bale units are

Figure 2.1, 2.2 & 2.3. These three images show the erection of the rack on site from different angles.
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Delivery includes the following:
- In-feed conveyor
- RFID code system for identifying incoming products
- Construction of the shelving according to the EN 1090 standard
- Two stacker cranes
- Out-feed conveyor
- Roof and wall elements
- Sprinkler system
- Pesmel Warehouse Management System (WMS) for automated inventory connected to the mill’s SAP system.

Figure 3. This diagram features a cut-away view of the rack to show the stacker crane aisle. Fully automated railroad car loading can be seen happening to the right of the rack storage, with truck loading taking place under cover on the left-hand side.

Figure 4.1 & 4.2 The cut-aways in the above two diagrams help to illustrate the TransBale structure. In the left-hand diagram, the foreground shows the fully automated railroad car loading: 22 cars carrying 1,400 tons can be loaded in three hours. Meanwhile, the right-hand image shows operations on the opposite side of the building, where each road haulage truck can be loaded within five minutes. All of this can occur whilst full production is simultaneously being taken in.

Horizontal storage on steel C profiles; the shuttle car moves the bales from the bottom – a far gentler way of moving them than the more usual method: by the steel wire that holds the bale units together.
**WMS PLAYS A SIGNIFICANT ROLE**

With the distribution centre equipped with the Pesmel warehouse management system (WMS), the warehouse inventory is available in real-time and is fully automatic. The WMS plays a big role in the operations of the distribution centre as it is connected to both the production automation system and the mill’s SAP system. Based upon the product and dispatch information obtained from these systems, the WMS controls the automated train and truck dispatch and loading operations. With automatic loading, trucks are loaded in five minutes, and a train with 22 cars carrying 1,400 tons can be loaded in three hours. In addition to loading efficiency, automation minimises work safety risks and damage to the equipment and products.

**THE BENEFITS OF THE TRANSBALE CONCEPT**

There are several benefits to be derived from utilising the TransBale concept; together they can create a compelling case for its installation in many situations.

1. **Cost efficiency**
   The automation of the distribution centre lowers operating costs significantly through a reduction in manpower required: forklift drivers and supervisors in loading are no longer required. All functionality can be supervised by the operator at the mill. The high-bay construction enables increased production capacity without the need for any additional investment in the distribution centre. The high-bay concept requires less space upon which to be built and, if future needs so dictate, the shelving can easily be expanded upwards without any major disturbance to the operation of the facility.

**Figure 5. Stacker crane installed**

**Figure 6. An animation of a fully operating system can be seen at https://www.youtube.com/watch?v=H293MXkEETs**
The Pesmel WMS allows adjustable sorting capacity, which means that there is no longer any need for preliminary sorting: the stacker crane and WMS keep track of the storage location of each pulp bale unit. This enables the optimal use of space, regardless of how many different grades of pulp are produced.

2. Reliability
The construction is a rack-supported building, which means that instead of being located inside another building, the roof and wall elements are attached to the frame of the shelving itself. The building construction has been designed so that it functions flawlessly even in winter conditions: it is unheated and fully unmanned, with the exception of any essential maintenance requirements.

The simple construction ensures reliable operation between the integral shelving, two cranes and chain conveyors. Thanks to the real-time inventory enabled by Pesmel WMS, the delivery process is also very reliable. The orders are delivered on time and to the correct place as human errors in stock bookkeeping and dispatch have been eliminated. Reliability is further enhanced by the availability of the 24/7 HelpDesk.

3. Safety
The fully automated dispatch centre functions without forklifts; they are only needed for loading the cargo. The elimination of busy traffic inside the facility is a major safety factor. Also, the pulp bales are handled extremely carefully as the shuttle car moves the bales from the bottom.

Fire safety in the TransBale distribution centre is exceptional compared to typical storage facilities. In a typical storage building, the sprinklers are located in the ceiling; if a pulp bale that is located lower down in the shelving starts to smolder, it is difficult to extinguish it. In TransBale, there are thousands of sprinklers integrated into the shelving at different heights, thus enabling effective extinguishing.

4. Environmental friendliness
The TransBale concept supports environmentally friendly principles. No fossil fuels are used as the system is sustained entirely by the energy produced by the Metsä Group mills. In addition, the stacker cranes feature an energy storage capability which deploys every time the cranes lowers. This energy is then fed back into the mill’s own electricity network. It should also be noted that the use of fewer forklifts on site leads to a reduction in fuel consumption. TransBale’s optimised, efficient use of space minimises the need for storage space.