Operational efficiency and cost savings with Pesmel TransRoll Storing

Kaj Fahllund
Dear Reader,

Automated high-bay storages (ASRS) have been used long time in the converting industry with great success as an intermediate production buffers and finished products shipping storages. There, they offer great cost savings with simplified and automated material handling around and between the main processes.

Properly integrated storages enable the main processes optimisation and broke minimisation in a way that is hard to believe to be true. That's why these automated high-bay storages, both for rolls and pallets, have became the best-kept secret in business what the companies with repeat orders guard jealously.

Now these rack storages have slowly but surely started to spread into the paper mills too, and with good reasons as explained in this article.

There is more information of storages and material handling concept in www.pesmel.com.

Author:
Kaj Fahllund,
General Manager, Paper Industry
Pesmel Oy
Tel. +358 207 009 626
email: kaj.fahllund@pesmel.com
Fresh thoughts needed for cost cutting

In paper mills, the challenge has been how to connect the paper machines, converting and shipping in a way that each of these main processes can be freely and individually optimised and maintained so that rolls sorting and moving can be done in a most simple and cost effective way with minimal or zero broke from reeler to shipping dock. With broke, we mean both production trimming and damages caused by rough roll handling.

Traditionally the answer has been roll handling system to move and up-end rolls for needed number of clamp trucks with enough floor space to pile up rolls to designated areas. With bigger producers and those with need for more streamlined and automated operations, the storing efficiency has been increased with automated overhead crane storages.

These traditional concepts have served well enough so far, but with multi-grade swing machines and high production multi-machine mills, these traditional conveyor and storing systems have swollen to big, complicated and space-requiring system behemoths. Here, the limited handling and sorting capacity especially is causing problems, which have been solved by adding more conveyors, overhead cranes, clamp trucks and quality floor space to tackle the increased sorting and volume needs.

**Fire safety has always been the limiting factor with piled rolls, which form chimney like conditions for air streams.**

The help of standard water sprinklers in storage hall ceilings is limited to certain roll pile heights, which can be improved with new, much higher cost nitrogen solutions and airtight storage spaces to make the oxygen reduction possible. But nevertheless the fire code has became one extra limiting factor for storages with piled rolls, which also can be helped with enlarged and advanced building technology. With rack storages, where rolls are laying on their bellies, fire extinction can be arranged with precision accuracy, where the standard sprinkler system can be integrated in to the rack.

*Figure 1 TransRoll stacker cranes between rack structure and the channel vehicle at the first level ready to deliver roll set on the cut take conveyor*
But there is a limit with the spending in these times, when all the old 'cost cutting' ways have already been fully utilised. The fact is that as a producer, your success formula has six ingredients - cost of raw materials, energy, transportation, labour force, internal operations and of course, the selling price. Five of these, you can affect very little. The only thing you can do is to be smarter with the internal tasks. And therefore, the question is: How to arrange the entire production layout by minimising equipment and at the same time avoiding the production line bottlenecks?

**Pesmel TransRoll® high-bay storage’s base elements**

To start with, it needs to be noticed, that there have been several different types of high-bay storing, some with a not particularly successful base idea. In this article, we present the unique Pesmel TransRoll high-bay storing concept, the success of which is based on its horizontal deep lane roll storing. It is easy to integrate this type of storage both to new and existing mills, as well as to big or small storage volume needs, because the rack structure itself can be stretched according the needs with all three axes (width, length and height). Also, the rack can be located in the building, or the rack can support by itself the attached wall and roof elements (Figure 2).

*If in the future storage volume needs are increased, expanding the system is easy by expanding the rack and guiding rails for the stacker.*

The base elements with high-bay, deep lane, TransRoll technology (Figure 3) are:

- Rack storage with channel profiles, which stores the rolls on laying horizontal position.
- Stacker crane, normally one or two units.
- Channel vehicles to move rolls or roll sets.
- Computer controlled Warehouse Management System (WMS) to manage the inventory.

There are motors only in the channel vehicle and stacker crane, the technology of which resembles a roughly vertically turned overhead crane. The rest can be calculated in like structural building elements. Stacker cranes' horizontal speeds are twice that of overhead cranes with gripper (240 m/min vs 120 m/min), and with equal lifting and lowering speeds.
Unmatched capacity with smallest footprint

With storage building volume comparison between different storage types, the rack storage’s space utilisation efficiency and footprint need is clearly the best compared to other storing modes based on studies done. The rack structure enables two to three times higher storages, and therefore the floor space need is 50-70% smaller.

The flexibility to fit the rack in almost anywhere, its almost limitless handling and sorting capacity separates TransRoll storages from the other alternatives. With a stacker crane’s normal 40-50 cycles per hour handling capacity and six to eight rolls per set handled by the channel vehicle, the roll stream in and out together can be up to 400 rolls per hour per stacker crane. This equals also plenty of sorting capacity within the storage as well during off-peak hours. (Figs 4, 5).

The TransRoll storage works like a giant sieve, by being able to take rolls in and move them out from multiple points at the same time. The AGV (Automatic Guided Vehicle) robot truck type channel vehicle lifts rolls or roll sets straight from plain standard conveyors. It can handle roll sets without limitations related to roll dimensions or packing variants. Rolls can be unwrapped, partially wrapped or fully wrapped. Also, it is possible to store both rolls and pallets in the same shared rack structure. There is no need to up-end or pre-pile rolls with precision positioning or palletising as is needed with other systems.

---

Figure 4 Multiroll handling is the key for high handling capacity. This combined to the high-bay storage’s sorting capacities means practically limitless automatically controlled material stream.

Figure 5 The incoming roll stream is sorted by the channel vehicle in the storage.
According the well-known rule of thumb, the horizontal handling is not only 25% more efficient than handling rolls vertically up-ended, but it is clearly gentler for the roll ends and corners (Figures 6, 7).

Figure 6 The TransRoll channel vehicle lifts rolls or roll sets straight form plain standard conveyors.

Figure 7 TransRoll channel vehicle delivering roll from rack storage to the out take slat conveyor
TransRoll Deep Line technology what is it all about?

In the rack, the incoming roll stream is sorted by the channel vehicle on profile channels, which are formed optimally to support horizontally lying rolls from their belly. The needed storing volume is arranged by sizing enough channel meters to accumulate the needed number of rolls lying with 100mm spacing on the channel profiles.

The channel vehicle's home base is on the stacker crane's lifting platform, from where it makes the fetching or delivering strokes. The incoming roll stream is sorted according the given parameters (e.g. customer orders, paper grades, etc.) set in the WMS (Warehouse Management System).

WMS combined with the channel vehicle's handling capabilities enables full freedom to store rolls according the needs either with FIFO (First In First Out) or LIFO (Last In First Out) or any possible mode combination needed, without any effects to set handling capacity needs (Fig. 8).

Figure 8 Secret for the high sorting and handling capacities is multi-roll handling without limitations related to roll dimensions or packing variants.
Proper integration needed to reap the benefits

The old thinking goes that storing or buffering means something that is sidelined or located off the main production process; something that needs to be moved away to minimize disturbance to the main processes. And that is exactly what clamp truck operated and overhead crane storages are, because of their limited capacity and requirements for floor space.

But with automatic high-bay storages, the idea is the opposite - to move the storage in the centre between the main processes to enable the production lines' optimisation and to minimise the handling equipment needed. Smartly integrated storages break a rigid production line down into smaller, individually more manageable processes with minimal amount of connecting conveyors.

Let's take one concrete example with paper machine line, which produces few different grades with few different sorts of paper. With proper storage buffering, the paper machine's production cycle (the grade or sort change cycle) can be extended from a few days to a few weeks. This means more optimization possibilities for the paper production itself, at the same time, when the same is done for the sheeting and shipping operations. Similarly in converting big and fast enough Transroll or TransPallet storage means broke optimisation with a production window of several weeks instead of several days, which enables better trimming optimisation.

So, we should not push storage back to the sidelines. Instead integrate it between the main processes, and simplify the process by driving the whole production through the storage. This way, we are able to reap the full benefits from your systems. At the end, even the finest machines fail to deliver at their fullest performance, if they are not connected properly.

Warehouse Management System

TransRoll and TransPallet systems are controlled automatically and unmanned by Pesmel's own server PC-based WMS system with the necessary number of client PCs for operator terminals.

The base module controls the storage inventory according the production and customer order information downloaded from the Mill Information System (MIS), and includes all modern real-time process view, management, diagnostic and reporting features.

In cases where the MIS capabilities are limited, this system can be enlarged by production planning system. Also, add-on modules can be offered to mills' rolls or pallets tracking and shipping control needs.

We should not push storage back to the sidelines but instead integrate it into the main processes.

Outsmart your competitors

Paper mills and converters success requires elimination of large scale manual and semi manual work. With storing and material handling systems this is not purely related to bloated operational costs with old and outdated systems, but also a logistical issue that unnecessarily chokes production plants' main operations. As we know, the investment costs to mills' material handling are marginal compared to total investments in the mill.

So why bottleneck your production and shipping operations, when there are alternatives with proven payback?
Summary of the benefits

- Simplified layout with minimal number of integrated conveyor.
- Smallest storage footprint compared to other alternatives.
- Minimised storage building costs by rack supported walls and roof elements.
- Fire safety with zone divided standard sprinkler system.