

# Efficient handling of secondary packaging

Reducing handling costs for the dry foods assortment at Metro Cash & Carry



## **Abstract**

The master thesis project, as described in this paper, contains an analysis of the factors that influence the handling time in the retail store and is executed at Metro Cash & Carry Netherlands. Especially the reduction in handling costs that can be achieved with the implementation of Shelf Retail Ready Packaging is analyzed. Moreover, the implementation issues regarding a successful implementation of Shelf Retail Ready Packaging are discussed.

The most important handling activities in the retail store that are influenced by Shelf Retail Ready Packaging are 'opening of the secondary packaging' and 'filling of the new inventory'. These activities are executed for each secondary packaging that arrives in the retail store and determine 70% of the reduction in handling costs that can be achieved with SRRP. The potential reduction in handling costs for the Dry Food assortment of Metro Cash & Carry Netherlands is 7% of the total costs per year. The most ideal type of Shelf Retail Ready Packaging is a tray without a hood as this type of packaging requires no opening time and can be put on the shelf in one move.

## **1 Introduction**

Metro Cash & Carry Netherlands is a sales division of the Metro Group, which was founded in 1996 by merging several independent smaller commercial chains and is nowadays the third largest retailer in the world. Metro Cash & Carry is global market leader in self service wholesaling and sells high volumes in the business to business market, where their focus is on catering industry and traders.

Two parallel changes, an internal and an external one, have taken place at Metro Cash & Carry and have led to the problem situation that has resulted in the master thesis project.

### Increased handling cost at the retailer

Until 2004 Metro sold only case packs to their customers, but in order to increase the turnover of the Dry Foods (DF) assortment it is decided that the products will also be sold in small quantities to the customers. This resulted in a lot of additional handling activities for the shelf filler as typically 12 separate Selling Units (SUs) have to be stacked on the shelf instead of one case pack. The labour costs related to shelving of the products have risen with 63% and are currently 17% of the total costs. Further, those costs are expected to increase even more as the rotation speed of the DF assortment will increase due to the focus on catering industry and traders.

### The opportunity of Shelf Retail Ready Packaging

The definition of Shelf Retail Ready Packaging (SRRP) according to ECR Europe is; "the term used to refer to a product that comes in a ready merchandised unit which is easy to identify, easy to open, can easily be put onto the shelf and disposed of, allowing an optimisation of shelf replenishment and enhanced visibility". Besides, Van Zelst et al. (2006) state that SRRP will most likely result in labour efficiency for supermarkets; an efficiency gain of 12% can be realized if the stacking regime is changed from unit to tray. Moreover, Saghir and Jonson (2001), Dowlatshahi (1996) and Lee and Lye (2002) all emphasize the importance of packaging regarding handling costs. Concluded is that SRRP has many benefits for the retailer and consumer, but that it especially provides opportunities for reduced handling costs at the retailer. As SRRP is more or less pushed into the supply chain by major European retailers, Metro should take advantage of this opportunity.

Increased handling costs in the retail store, increasing competition and the upturn of SRRP have led to the following research question:

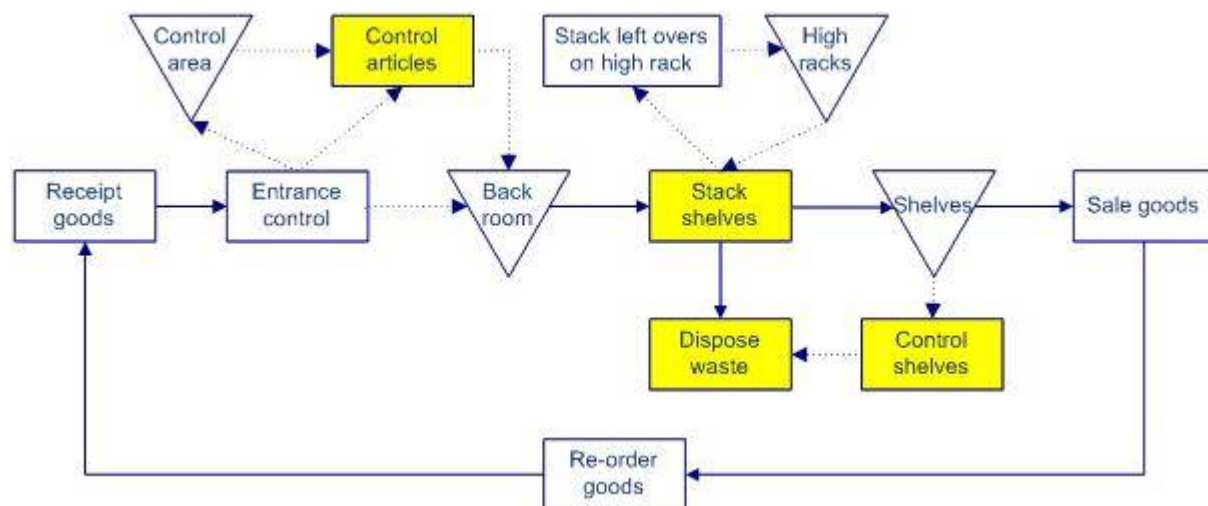
*Which products within the Dry Foods assortment of Metro Cash & Carry Netherlands are suitable for delivery in Shelf Retail Ready Packaging and what is the related reduction in handling costs that can be achieved at the retailer?*

## 2 Research design

The research was started with an extended literature review about handling costs in the retail store and the role of packaging regarding these handling costs. Based on this literature review the problem has been defined and analyzed. Separated analyses were made of the handling process, SRRP and the handling activity drivers. Then a time study has been carried out at the Metro retail store in order to quantify these handling activity drivers. Based on these results the Handling Efficient Secondary Packaging (HESP) Tool has been developed. With this MS Excel tool the potential reduction due to SRRP can be computed for each handling process. The HESP Tool has been applied on the DF assortment and finally an implementation plan, including the critical success factors of SRRP, has been written. Most of this is shortly discussed in this paper.

## 3 Problem Analysis

Handling activities in a retail store are described in scientific literature by Van Zelst et al. (2006) and by Kotzab and Teller (2005). Those activities were adapted based on experiences from within the Metro retail stores; the researcher has carried out the activities herself and has observed and talked with the retail staff. This has resulted in the final set of handling activities as graphically displayed in figure 1. Some activities are not carried out for every order or article, which is indicated by dotted lines.



**Figure 1; Handling activities in the retail store**

Special interest goes to the handling activities that are influenced by secondary packaging (2P), as the goal of this thesis is to determine the reduction in handling costs that can be achieved with SRRP (SRRP is a kind of 2P). The activities that are influenced by 2P are displayed in 'yellow' in figure 1.

Besides, the Shelf Ready Packaging Scoring Tool (SRP Scoring Tool), which has been developed by ECR NL, is analyzed. This scoring tool is based on the following five 'easies'; easy identification, easy open, easy shelf, easy dispose and easy shop. Every 'easy' is based on a few attributes and each attribute has impact on one or more of the following four areas; handling time, customer convenience, environment and/or safety. Special interest regarding this master thesis project goes to the attributes that have an influence on the handling time. Those attributes are translated into seven secondary packaging drivers which are assumed to affect the handling activities in the retail store. This is displayed in figure 2 on the next page. According to ECR Europe (2007), Van Zelst et al. (2006) and St-Vincent et al. (2005) there are other factors that affect the handling time in the retail store as well. Those factors are clustered into two types of drivers, product and other drivers, and are also displayed in figure 2.

The problem analysis has resulted in the Easy Handling Matrix (figure 2 on the next page). The rows represent the handling activities that are influenced by 2P and the columns represent the handling activity drivers. A 'cross' means that the handling activity is expected to be influenced by the indicated handling activity driver and a single line indicates that the handling activity might be influenced by the driver depending on the type of 2P.

The next question is how important each of those relations are, this in order to determine the main handling activity drivers. Especially the most important 2P drivers are of great interest regarding the goal of this project; negotiating with suppliers about 2P in order to reduce the handling costs at the retailer. A research method in order to determine the most important handling activity drivers is presented in the next chapter.

Easy Handling Matrix

		Handling activity drivers																		
		Secondary packaging drivers						Product drivers					Other drivers							
		1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2	2.1	2.2	2.3	2.4	2.5	3	3.1	3.2	3.3	3.4
<b>Handling activities in the retail store</b>																				
<b>A Control of incoming goods</b>			X								X		X			X				
1. Check differences			X								X		X			X				
<b>B Identification of goods</b>			X								X		X			X				
1. Identification of goods on high racks			X								X		X			X				
<b>C Open secondary packaging</b>				X	X		X			X				X		X				
1. Open secondary packaging				X	X		X			X				X		X				
<b>D Stacking of goods on shelves</b>			/								X		X			X	X	X		
1. Search for product location on the shelf			/								X		X			X	X	X		
2. Check best before dates and remove 'old' inventory					X	X				/	X	X		X		X	X	X	X	
or 3. Put 'old' inventory to the back					X	X				/	X	X		X		X	X	X	X	
4. Fill new inventory				/	X	X	X			/	X	X		X		X	X			
5. Fill 'old' inventory (if necessary)					X	X				/	X	X		X		X	X	X	X	
<b>E Disposal of waste</b>									X	X						X				
1. Separate cardboard and plastic									X	X						X				
2. Dispose waste									X	X						X				
<b>F Control of shelves (if necessary)</b>				/	X					X						X	X			
1. Removing of empty trays				/	X					X						X	X			

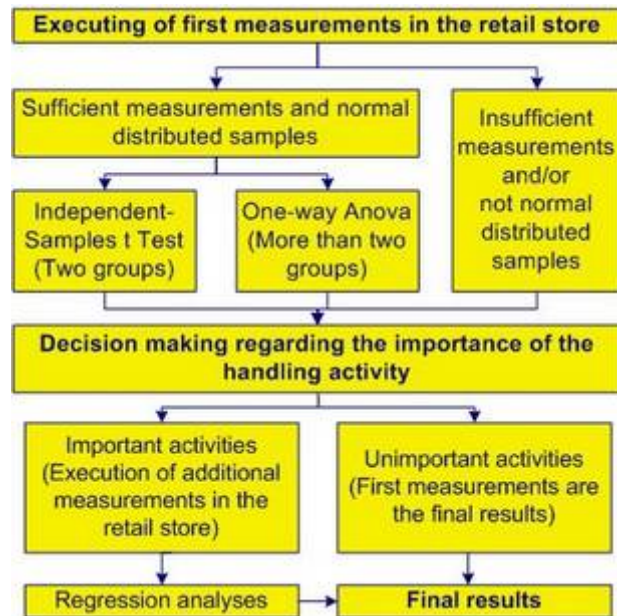
Figure 2; Easy Handling Matrix

#### 4 Measurement methodology

The relations as indicated in the Easy Handling Matrix need to be quantified in order to determine the most important relations. At first sight it was thought to use the orthogonal full factor experiment or the differential research method (Graziano and Raulin, 2004). But those experiments will lead to an enormous amount of samples that have to be gathered as the Easy Handling Matrix has many relations to be quantified. Apart from the preceding there is an extra difficulty; all handling activity drivers except for driver 3.1, 3.3 and 3.4 are extraneous (Graziano and Raulin, 2004). This means that the drivers are pre-determined and can not be manipulated by the researcher. For example the researcher can select 'easy' and 'difficult' to identify 2Ps from the existing population, but the researcher can not influence the recognizableness of a certain 2P. This nature of the drivers makes it difficult to gather a good sample that fulfils all the drivers in the required way. Especially as the researcher is dependent on the available population, which may be limited for a certain combination of drivers. Besides, it can be difficult to decide 'from the outside' whether a 2P fulfils a certain driver. An example of this is the stability of the tray, which will only be noticed during the shelving process.

In order to reduce this complexity, the measurement methodology, as displayed in figure 3 on the next page, has been used for the quantification of the relations of the Easy Handling Matrix.

First, some measurements were carried out in order to get some feeling for the most important handling activities and the associated drivers. The results of these first measurements have been analyzed with an Independent-Samples t Test or with an One-way Anova (Montgomery and Runger, 2003), but only if there were sufficient measurements and if the samples were normally distributed. Otherwise the measurements were analyzed with the box plot and the mean values. Based on the analysis of the first measurements and the frequencies with which a handling activity is carried out, a distinction has been



**Figure 3; Measurement methodology**

made regarding the importance of the handling activity. This distinction had to be made given the complexity of the measurements, as discussed on the previous page.

If needed, more measurements were carried out for the important handling activities. Those measurements have again been analyzed with an Independent-Samples t Test or an One-way Anova. Further, regression analyses have been carried out for those important activities. The results of these important activities have formed the final results together with the analyses from the first measurements for the less important activities.

The concerning measurements were carried out on random weekdays in one of the Metro stores. The handling activities have been carried out with the slightest interruption to the normal process and all activities were recorded with a video camera. The big advantage of

recording with a video camera is that the process can be reviewed. This is necessary regarding the short cycle times of the handling activities and the many different drivers that have to be registered as well. These can not be viewed and registered all at the same time.

During the measurements, the handling times for the various activities were the dependent variables and the handling activity drivers were the independent variables. Further, only the most important drivers have been controlled during the construction of the sample. This means that the sample for a certain handling activity contained a significant number of measurements for all values of the controlled driver. Regarding the final goal of the assignment, especially the 2P drivers are important and were therefore be controlled. This as Metro can influence the 2P, by negotiations with the supplier.

## 5 Results

In order to interpret the results in this paragraph correctly, please note that the absolute figures in this chapter are multiplied with a certain factor due to confidentiality of the data. The most important results from the time study that has been carried out are the following:

- Opening of a tray without a hood requires no opening time and is therefore the best opening method. The opening times for the various 'opening methods' is graphically displayed in figure 5 on page 6. Further, the more SUs in a 2P the better, as the opening time for a 2P will remain the same and the time per SU will decrease.
- Filling new inventory goes much faster with a tray, than filling without a tray; 14.3 versus 57.6 seconds.

Those results are the most important as the absolute time differences are quite big and as these activities are carried out for each 2P that arrives in the retail store. The remaining results are;

- It is easier to find an 'easy' to identify 2P in an order than a 'difficult' to identify 2P, the search time is respectively 26.9 versus 78.8 seconds. The search time for a 'difficult' to identify 2P on the high

racks can go to infinity as it is almost impossible to find the 2P, while the average search time for an 'easy' to identify 2P on the high racks is 37.9 seconds.

- It is faster to remove the old inventory with a tray than to remove it without a tray; 26.1 versus 44.8 seconds. It is also faster to fill the old inventory with a tray than to fill it without a tray; 20.8 versus 34.0 seconds.
- When the products are filled without a tray the main determining factor for the filling time is the number of SUs in a 2P, followed by the size of the SU.
- When the products are filled with a tray the main determinants for the filling time are stability of the tray and visibility of the SU. Further, the more SUs in a 2P the better, as the filling time for a tray will remain the same and the time per SU will decrease.
- It is more time consuming to separate a 2P which contains plastic than a 2P that consists of pure cardboard; 9.7 seconds versus 0 seconds. The time for throwing away a 2P in the plastic or cardboard container is very short; 2.5 seconds per 2P.
- The handling time for removing the empty trays is negligible if it is done before the activity 'stacking of new inventory' or during the daily 'product availability check'. When the activity is carried out separately, it will take 52.3 seconds to remove one empty tray, to move the 'full' tray behind the empty tray to the front and to travel in the aisle.

## 6 Handling Efficient Secondary Packaging Tool

Based on the results of the time study and some additional assumptions the HESP Tool has been developed in Ms Excel. Metro can use the 'input' sheet (figure 4) to fill in the 2P drivers and additional

The screenshot shows the input interface of the HESP Tool. It features a list of criteria for secondary packaging, each with a dropdown menu set to 'Not Scored'. The criteria include: Date (20 juni 2007), Name assessor, Article number, Identification of the secondary packaging, Opening method, Quality of the opening method, Availability of a display tray, Stability of the display tray, Visibility of the SU within the tray, Type of material(s), and Other remarks. At the bottom, there is an 'Output row' field containing the number '3' and a 'Submit' button.

Figure 4; Input screen of the HESP Tool

information. In this way the data is entered per article. In case several articles, with the same values of the 2P drivers, have to be added, this can easily be done as well in another part of the HESP Tool.

The article number is linked to the data in the Metro Business System and returns the article description, the supplier name, supplier number, the turnover in SUs a year and the number of SUs in a 2P.

When all 2P drivers are notated in the HESP Tool, the tool will compute the potential savings per 2P for each process. This will be translated to the total savings per year.

Besides, the total savings per supplier per year will also be computed if several articles are scored with the HESP Tool. In this way priorities can be made regarding the negotiations with the suppliers.

Together with the supply chain specialist of Metro 1148 articles have been scored on the 2P drivers. The scorings data for these articles were put in the HESP Tool and the potential reduction in handling costs for this part of the DF assortment was computed. This has been translated into a potential reduction of the handling costs for the total DF assortment; 7% of the total costs per year.

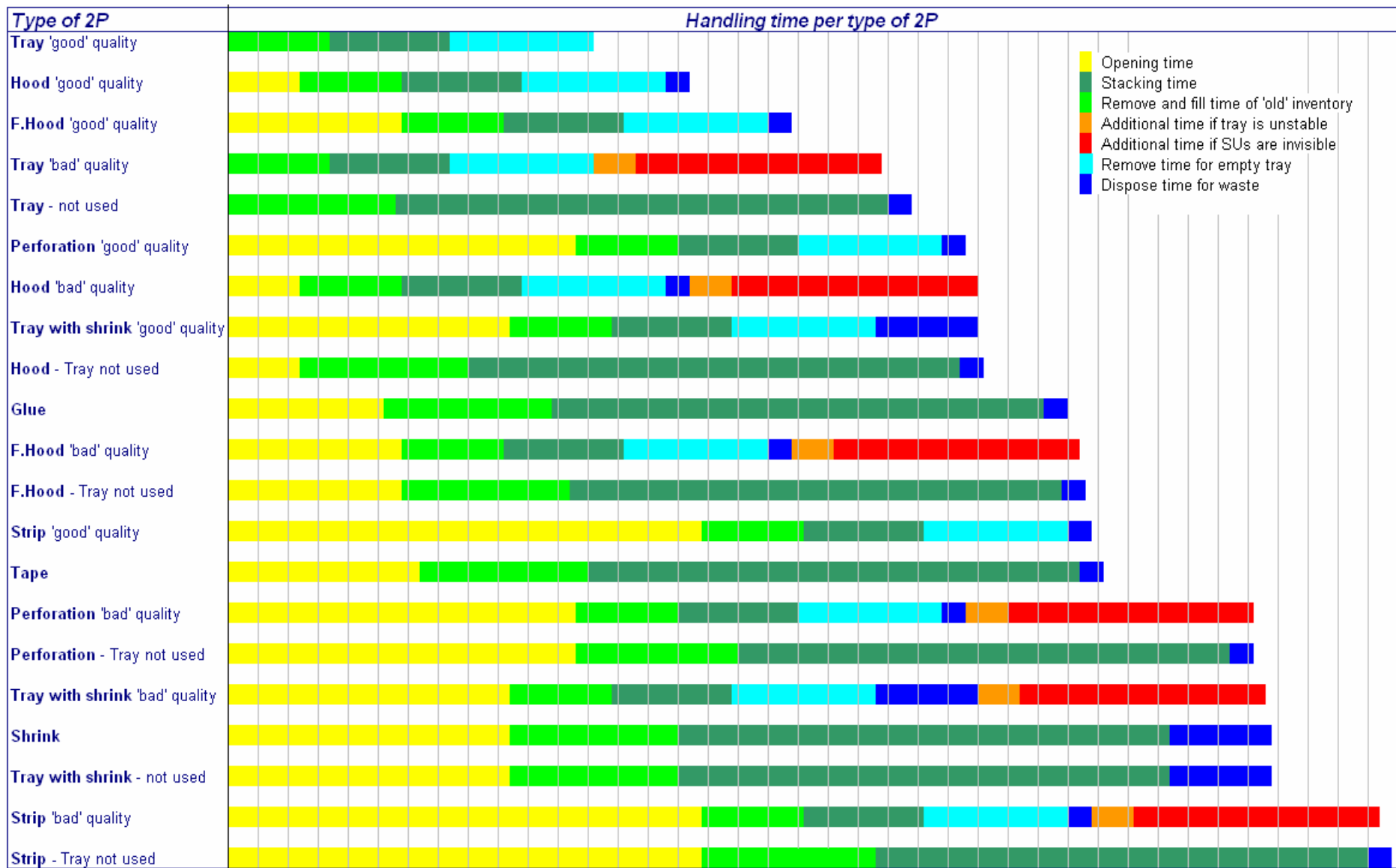


Figure 5; Handling times for the different types of secondary packaging

## 7 Conclusions

### Most important handling activities influenced by secondary packaging

From all the handling activities that are influenced by 2P, the activities ‘open secondary packaging’ and ‘fill new inventory’ are the most important ones. These activities are executed for each 2P that arrives in the retail store and together they determine 70% of the reduction that can be achieved for the handling cost.

### Ideal type of secondary packaging



The most ideal type of 2P is a tray without a hood (figure 6), at least when it is accomplished correctly. This opening method is the best as the time for opening of the 2P is zero seconds. Besides, the 2P contains a tray and filling the new inventory with a tray is faster than filling it without a tray. Furthermore, this type of 2P consists of solely cardboard, which is faster to dispose of than a 2P that contains plastic.

**Figure 6: Tray without hood**

The handling times for all types of 2P are displayed in figure 5 on the preceding page. For each opening method, three types are distinguished; ‘tray good quality’, ‘tray bad quality’ and ‘tray not used’. There can be concluded that the worst 2P takes three times longer than the best 2P.

A very important conclusion regarding the 2P with a tray is that the advantage of a tray is diminished when the tray is not or can not be used or if it is from a bad quality, e.g. the tray is unstable and/or the products in the tray are invisible, due to wrong orientation of the products or due to the fact that the tray is too high in the front.

Regarding the opening method it can be concluded that the opening methods ‘strip’ and ‘perforation’ are more time consuming than the other opening methods. This is as these opening times are heavily depending on the quality of the strip or perforation and this quality varies a lot.

### Ideal type of product

The most ideal type of product for SRRP is a product with a high sales volume; “products with a high sales volume require much handling time as those products have to be replenished more often than other products” (ECR Europe, 2007). Furthermore, small and light products are ideal regarding SRRP for the following reasons;

- It is easier to develop a stable tray for small and light SUs, than it is for big and heavy SUs.
- There fit more SUs in a 2P, when the SUs are small and light. And the more SUs in a 2P, the higher the efficiency gain is for the activities ‘open secondary packaging’, ‘remove and fill old inventory’, ‘fill new inventory’, ‘disposal of waste’ and ‘removing of empty trays’.
- Small and light SUs are often unstable and will therefore especially benefit from shelving in a tray, as the tray offers stability to the SUs.
- Small and light SUs are more difficult to grab, especially when shelved in the back of the shelf. The tray makes it easier to grab these products.

### Potential reduction in handling cost

SRRP can lead to a significant reduction in the handling cost at the retailer. The yearly reduction in handling cost that can be achieved at the DF department of Metro is 7% of the total costs. This reduction in handling cost will be achieved if all the products of the DF assortment will be delivered in a good quality tray without a hood. Two factors are crucial in order to achieve this reduction in handling cost;

- The use of the tray; if a 2P has a tray, it should always be used as the advantages of SRRP will otherwise be negligible.
- Collecting of the empty trays; this factor has a very important influence on the efficiency gain that will be derived by using of a tray. The benefits of shelving with a tray will be negligible if collecting of the empty trays can not be incorporated in the regular handling process, e.g. during filling of the new inventory or the product availability check in the morning.

Besides reduced handling cost, some other benefits are expected as well;

- Reduced cost for presentation materials, such as dividers and racks. These presentation materials will become unnecessary if the products are shelved on a tray.
- Higher sales volume, due to marketing opportunities of the tray.
- Enhanced customer satisfaction, as SRRP supports easy shopping.

## **8 Recommendations**

### Apply HESP Tool on fast movers

The supply chain specialists of Metro should start with scoring the articles that have the highest turnover on a yearly base. In a later stadium the other products of the DF assortment and even the non-food assortment should be scored and analyzed with the HESP Tool.

### Negotiate with suppliers

Key points in the negotiation will be the opening method and the availability of a tray. The objection from the supplier will probably be that these kinds of changes in the 2P will lead to additional cost for him, but in that case Metro can offer compensation to the supplier. The height of the compensation can be determined as the savings due to SRRP are known. Moreover, attention should be paid to the number of SUs in a 2P. More SUs in a 2P will lead to higher efficiency gains for many handling activities.

### Collaborate with other retailers

In order to convince the suppliers for delivery in SRRP, Metro should collaborate with the other retailers. This as the market position of Metro in the Dutch food market is small and it is more likely that the supplier will adjust the 2P if all retailers require SRRP. Agreement among the retailers should be achieved about the most optimal type of SRRP. An important aspect in this agreement is the number of the SUs in a tray and the number of facings of the tray. When a common implementation approach towards SRRP is derived, the retailers should negotiate with the suppliers collectively.

### Adjust internal organization

In order to achieve the reduction in handling costs, awareness of SRRP should be created in the internal organization; Spaceman, the system that develops the planograms, should adjust the planograms to the dimensions and number of facings of the tray, the purchasing department should incorporate SRRP in the negotiations with the suppliers and the shelf fillers should use SRRP if possible and they should use it in the right way.

### Execute store audits

In order to maximize the reduction in handling costs, two main issues should be checked by the supply chain specialist on a regular base in the retail store; are the trays used by the shelf fillers if possible and are the empty trays removed during the regular process if possible? The ideal situation is that all empty trays are removed during stacking of the new inventory or during the product availability in the morning. Besides, the employee should collect the empty trays on his way, whenever he goes to the backroom.

### Maintenance and further development of the HESP Tool

The supply chain specialist will become the owner of the HESP Tool and should regularly update the HESP Tool. For example if the frequencies, with which the handling activities are carried out, change. Besides, small adjustments should be made in the HESP Tool, so it can also be used for the non-food assortment.

## References

- Dowlatshahi, S., "The role of logistics in concurrent engineering", *International Journal of Production Economics* 1996; 44, p. 189-199
- ECR Europe, *SRP case studies*, 2006, last accessed 20 February 2007  
[http://www.ecrnet.org/04-publications/blue\\_books/srp/Blue%20Book%20Case%20Studies\\_final.ppt](http://www.ecrnet.org/04-publications/blue_books/srp/Blue%20Book%20Case%20Studies_final.ppt)
- ECR Europe, *SRP blue book*, 2006, last accessed 20 February 2007  
[http://www.ecrnet.org/04-publications/blue\\_books/srp/ECR%20Europe%20SRP%20Blue%20Book\\_final.pdf](http://www.ecrnet.org/04-publications/blue_books/srp/ECR%20Europe%20SRP%20Blue%20Book_final.pdf)
- ECR Europe, *Business case assessment tool*, 2007, last accessed 20 February 2007  
[http://www.ecrnet.org/04-publications/blue\\_books/srp/ECR%20Europe%20SRP%20Business%20Case%20Assessment%20Tool\\_final.xls](http://www.ecrnet.org/04-publications/blue_books/srp/ECR%20Europe%20SRP%20Business%20Case%20Assessment%20Tool_final.xls)
- ECR UK, *Retail Ready Packaging Functional Guidelines*, 2007, last accessed 20 February 2007  
<http://www.igd.com/cir.asp?menuid=84&cirid=2171>
- Graziano AM, Raulin ML. *Research methods: a process of inquiry*. 5th edition. London: Pearson; 2004.
- Kotzab, H., Teller, C., "Development and empirical test of a grocery retail instore logistics model", *British Food Journal* 2005, 107 (8), p. 594-605
- Lee, S.G., Lye, S.W., "Design for manual packaging", *International Journal of Physical Distribution & Logistics Management* 2002, 33 (1/2), p. 163-189
- Montgomery DC, Runger GC. *Applied statistics and probability for engineers*. 3rd edition. London: John Wiley & Sons, Inc.; 2003
- Saghir, M., Jonson, G., "Packaging handling evaluation methods in the grocery retail industry", *Packaging Technology and Science* 2001, 14, p. 21-29
- St-Vincent, M., Denis, D., Imbeau, D., Laberge, M., "Work factors affecting manual materials handling in a warehouse superstore", *International Journal of Industrial Ergonomics* 2005, 35, p. 33-46
- Zelst, S. van, Donselaar, K. van, Woensel, T. van, Broekmeulen, R., Fransoo, J., "Logistics drivers for shelf stacking in grocery stores: Potential for efficiency improvement", *International Journal of Production Economics* 2006, xxx, p. xxx-xxx