An Interface between Packaging and Logistics systems
A case study performed in DeLaval

Sri Hari Gunasekaran

Master of Science Thesis
Stockholm, Sweden 2012
An Interface between Packaging and Logistics systems
A case study performed in DeLaval

By

Sri Hari Gunasekaran

Master of Science Thesis INDEK 2012:160
KTH Industrial Engineering and Management
Industrial Management
SE-100 44 STOCKHOLM
Master Thesis ME200X 2012
An Interface between Packaging and Logistics systems
A case study performed in DeLaval

Sri Hari Gunasekaran

<table>
<thead>
<tr>
<th>Approved</th>
<th>Examiner</th>
<th>Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-12-14</td>
<td>Mats Engwall</td>
<td>Mandar Dabhilkar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Registration No</th>
<th>Commissioner</th>
<th>Contact person</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012:160</td>
<td>DeLaval International AB</td>
<td>Thomas Tschee</td>
</tr>
</tbody>
</table>
STRUCTURED ABSTRACT

Purpose:
As a result of globalization competition in every business has raised. This makes it imperative to show at most attention towards every part of the business process in a detailed manner. The ratio between the cost of the industrial equipment and the cost expended in packaging and repairing the damages incurred in the logistics of the equipment is very little. As a result, in current practice packaging design is not given substantial attention it deserves. Because of this several manufacturing industries incur expensive losses and degradation of their brand value primarily due of inferior packaging practices. Therefore this thesis focuses on importance of packaging in the industries and its relationship with logistics system.

Problem:
This thesis have answered following research questions
1. How does the interaction happen between the packaging system and other systems in a manufacturing industry?
2. What are the steps that can be taken to establish an effective relationship between packaging and logistics?
3. What are the relevant key performance indicators (KPI) which affects the company’s logistics costs in context with packaging?

Methodology:
Facts and data for this paper were gathered from literature reviews of various articles found in international journals and case studies. In addition semi-structured interviews were conducted with representatives at manufacturing industries. Basically systematic approach and qualitative research are the main two methodology followed. The course of this thesis project was executed during the period of five months at M/s. Delaval International AB, an attempt was made to investigate the effectiveness of different types of packaging solutions that can be adopted to improve the current packaging process.

Discussions:
Below four sections where mainly discussed in this thesis

1. Optimizing logistics by better packaging
2. Increase of packaging logistics knowledge and importance in the entire organization
3. Influence of packaging
4. Information flow and exchange between packaging and logistics systems

The basic values of the packaging logistics and the interactions between packaging and logistics where also discussed.

Keywords: Packaging, Logistics, Total cost, Tertiary Packaging, DeLaval
Acknowledgements

I would like to thank everyone who helped me during my thesis work. First my sincerely thanks to DeLaval International AB for granting me this opportunity to carry the research work in their space for around five months. It was an amazing experience for me to spend time with them working freely and interact with all the managers. Thomas Tschee Manager of Production engineering DeLaval was my supervisor who never said no to any of my initiatives and this let me to carry out many experiments liberally. I also would like to thank other employees in DeLaval who where in constant support for my work.

This thesis would not have been completed without the help from Mandar Dabhilkar my thesis supervisor at Royal Institute of Technology, Industrial Engineering and Management department. I had constant feedback from him throughout the thesis work. This helped me to conclude the research work within the specified time period.
# Table of Contents

1. **INTRODUCTION** .................................................................................................................................................. 1
   1.1 Thesis Objectives .............................................................................................................................................. 1
   1.2 Research questions ............................................................................................................................................ 2
   1.3 Delimitations ..................................................................................................................................................... 2
   1.4 Outline of the thesis .......................................................................................................................................... 2

2. **METHODOLOGY** .................................................................................................................................................. 4
   2.1 Systematic Approach and Qualitative Research ............................................................................................... 4
   2.2 Project diary ...................................................................................................................................................... 4
   2.3 Weekly update ................................................................................................................................................... 4
   2.4 Mid-term Presentation ...................................................................................................................................... 4
   2.5 Thesis seminars ................................................................................................................................................. 5
   2.6 Case Studies ..................................................................................................................................................... 5
   2.7 Interviews .......................................................................................................................................................... 5
   2.8 Time line chart ................................................................................................................................................. 6
   2.9 Benchmarking ................................................................................................................................................... 6

3. **THEORY** ............................................................................................................................................................ 8
   3.1 Key items in the literature ............................................................................................................................... 8
   3.2 Packaging a general overview .......................................................................................................................... 8
   3.3 Packaging Logistics ......................................................................................................................................... 8
   3.4 Cost involved in packaging Logistics ............................................................................................................. 9
   3.5 Efficient packaging design in logistics ........................................................................................................... 11
   3.6 Logistics Improvement through Packaging Rationalization (Case Study) .................................................... 11
   3.7 Packaging and Physical Distribution ............................................................................................................... 12
   3.8 Packaging and logistics decision .................................................................................................................... 13

4. **EMPIRICAL EVIDENCE** .................................................................................................................................... 17
   4.1 About DeLaval and Voluntary Milking System (VMS) .................................................................................... 17
   4.2 Current packaging process and issues found in it ............................................................................................. 17
   4.3 Benchmarking studies ..................................................................................................................................... 19
   4.4 Optimizing logistics by better packaging: ....................................................................................................... 21
4.5 Cost comparison:........................................................................................................... 22

5 ANALYSIS AND DISCUSSION .......................................................................................... 24
5.1 Increase of packaging logistics knowledge and importance in the entire organization ..... 24
5.2 Information flow and exchange ....................................................................................... 25
5.3 Influence of packaging ................................................................................................. 26
5.4 Discussion ...................................................................................................................... 27
   5.4.1 Packaging Logistics in Supply Chain ........................................................................ 27
   5.4.2 Impact of Packaging on Supply Chain ...................................................................... 28

6 CONCLUSION ..................................................................................................................... 30
6.1 Further Research ............................................................................................................ 31

7 REFERENCES .................................................................................................................... 32
   7.1 Literature & Articles ..................................................................................................... 32
   7.3 Websites ...................................................................................................................... 34
   7.2 List of Interviews ........................................................................................................ 34

List of Figures

Figure 1: Cost of optimum packaging .................................................................................... 10
Figure 2: Cost and product damage ....................................................................................... 10
Figure 3: Relationship between packaging and logistics systems ...................................... 14
Figure 4: Shipment process of VMS at DeLaval ................................................................. 18
Figure 5: Transportation network ........................................................................................ 21
Figure 6: Cost comparison .................................................................................................... 22
Figure 5: The parameters involved in tertiary packaging and logistics process ............... 25
Figure 6: Simple supply chain model .................................................................................. 27
Figure 7: Packaging cost Vs Logistics cost ......................................................................... 28
1. INTRODUCTION

This chapter gives the reader a brief introduction of the thesis along with the objective and research questions.

In the process of globalization manufacturing industries are competing with each other vigorously. Because of this it becomes vital to maintain customer’s service level on top of the scale. Quality of the product effectively distinguishes companies with their competitors. When it comes to the quality of the product packaging communicates a clear message to the customer about the product. Of course packaging does not only represent the product but in-turn it should be part of the product. According to Lancioni & Chandran (1990) the cost of package accounts for 8% of logistics cost align with Bjöörn (1990) statement which is about 5 – 10% of the logistics cost.

Packaging represents the important interface between the logistics system and the end product and as well as converse the customer end-value to maximize the business. Normally packaging is not included as a static element in product life cycle so it leads to bad packaging, but rather it has to be considered in a dynamic way in order to achieve a continuous improvement packaging (García & Carlos, 2008).

In manufacturing industries where large equipments are produced in one place and delivered across the globe tertiary packaging plays a vital. Tertiary packaging also called as transportation packaging is designed only for the purpose of protection to the product during shipment. Since the cost of the equipments is high in this case it is important to safely deliver the product to the customer and that can be achieved by better packaging.

DeLaval is one among those manufacturing industries where they produce milking robots and it is taken as a case study in this thesis. DeLaval is the company which is following the same type of packaging for more years.

1.1 Thesis Objectives

The main purpose of this thesis is to elaborate the conscious of packaging technologies and analyzing its impact in different section of an organization through theoretical concepts and case studies. The objective focuses on enlightening the value of packaging on the product development in the manufacturing industries and shows how bad packaging affects the profitable growth of an organization. This thesis also investigates the relationship between packaging and logistics systems in an industry.

The objective of this thesis also include in finding healthier packaging solution that DeLaval should adopt in order to deliver the product to their customers more efficiently without losing the brand image. In the process of attaining better packaging set up, it should also help DeLaval to optimize their logistics system as well.
1.2 Research questions

As a result of the objective research questions are formulated below

1. How does the interaction happen between the packaging system and other systems in a manufacturing industry?
2. What are the steps that can be taken to establish an effective relationship between packaging and logistics?
3. What are the relevant key performance indicators (KPI) which affects the company’s logistics costs in context with packaging?

1.3 Delimitations

This research study is limited to the packaging solution of Voluntary Milking System (VMS) in DeLaval and not to any other products manufactured by them. The thesis does not focus on the freight cost and the modes of transportation.

1.4 Outline of the thesis

In order to help readers find their path from start till end below is the short description of every chapter used in this thesis.

**Chapter 1 – Introduction**
This is the first chapter which starts with a brief background of the thesis with description of major concepts followed by research questions, delimitations and thesis outline.

**Chapter 2 – Methodology**
This second chapter tells the reader about the approach of this thesis work. Since this research work was carried out in a company methodology includes more practical steps followed along with the time line chart used for this thesis.

**Chapter 3 – Theory**
This is the third chapter where theoretical concepts and frameworks are explained deeply. Brief definitions of terms such as packaging types, logistics, packaging logistics and cost involved in logistics were also included.

**Chapter 4 – Empirical evidence**
In chapter 4 all important data and information collected in DeLaval were formulated in a structured manner. This chapter also contains benchmarking studies collected from printing industry, Alfa Laval and Nefab.

**Chapter 5 – Analysis and Discussion**
This chapter relates the empirical evidence along with theory and analysis is made from those concepts. Along with this research questions are answered at a high level.
Chapter 6 – Conclusion
Conclusion chapter suggests steps which can be followed by manufacturing industries to improve their packaging logistics set-up.

Chapter 7 – References
The last chapter of this thesis represents the list of articles, journals, books and interviews made.
2. METHODOLOGY

Methodology chapter describes about the various methods followed during the thesis to collect facts and data.

This thesis work was carried out in DeLaval, Tumba production factory where I spent five days a week. This provided me with an opportunity to interact with all departments of the company as well as to see the actual progress of packaging carried out.

2.1 Systematic Approach and Qualitative Research

A methodology which grew strong during late 1960 is systematic approach. Systematic approach is a study which involves a system. Interaction between different components in that is analyzed and understood. Qualitative research is another methodology where a group of employees are enquired to understand the in-depth behavior of the systems involved. Normally qualitative research is carried out by conducting various interviews and observations are made. In this thesis both systematic approach and qualitative research where followed since it involves packaging system and logistics in the industries. Here the roles of different actors in both the systems are analyzed with facts and information collected from interviews, case studies and theories.

2.2 Project diary

Right from day one till the last day I scripted day today activities in the project diary. Different tasks such as observations, meetings, discussions and interpretations were documented in the project diary on daily basis. This helped to review my work by looking back of what I have done and what needs to be done.

2.3 Weekly update

I fixed weekly project meetings with the manager of production engineering in DeLaval. During this meeting I used to update my tasks performed every week and get constant feedback now and then. This weekly update helped me to proceed on the right track in a systematic way under the guidance of my manager.

2.4 Mid-term Presentation

During the half stage of thesis work a short presentation was made to the management team of DeLaval. In that presentation I presented various ideas and they were brought to the discussion table. After solid feedbacks I was asked to focus on the final two solutions which eased the further proceedings.
2.5 Thesis seminars

Thesis seminars were conducted in the university in which thesis works of other students are presented. This seminar was like a feedback session where I had a chance to read my peer groups work as well get feedback on my work.

2.6 Case Studies

Case studies may be positivist or interpretivist in nature, depending on the approach, the data collected and the analytical techniques employed. Reality can be captured in greater detail by an observer-researcher, with the analysis of more variables than is typically possible in experimental and survey research (Collins & Hussey 2009). In order to narrow down the solutions obtained from different companies through benchmarking, I used case studies from two companies that provided good results.

Literature studies are made from various numbers of scientific articles, journals, books and internet sources. I also collected diverse published thesis from Lund University and used them to support for my theoretical framework.

2.7 Interviews

Semi structured interviews are conducted within DeLaval which includes transportation managers, assortment manager, product construction engineers, design engineers, installation employees and logistics engineers. I conducted meetings with all representatives in the company to understand their work flow and to identify areas where possible changes need to be done. Three interviews were conducted with representatives at Alfa Laval, Nefab and Times of India. Each of those interviews was prepared extensively for 2 to 4 hours. Those interviews were recordings and transcripts were analyzed for the valuable information and possible hints for the solution.

Weekly update meetings were done with the production manager to analyze the activities carried out and formulate the future proceedings. Practical Project Steering (PPS) a tool used in DeLaval for “preparation and managing projects based on practical experience” was used as a guidance tool to carry out operations such planning, risk assessment, financial comparison and resource allocation.
2.8 Time line chart
The thesis work was carried in DeLaval and it was mandatory to finish the work on the scheduled time since this research was given highest priority in the company. In order to overcome this hurdle a time line chart was prepared at first and circulated to the managers in DeLaval to get the approval. This time line chart was used as a project plan and it helped a lot to complete the task on time.

<table>
<thead>
<tr>
<th>Approximate time</th>
<th>Goals to Meet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Week</td>
<td>Start up process, &quot;Kick off&quot;, Planning the upcoming work and finish Time line chart of this project.</td>
</tr>
<tr>
<td>2nd Week</td>
<td>Pre study on packing and handling of large equipments</td>
</tr>
<tr>
<td>4th Week</td>
<td>Analyze the main problematic areas in today's packaging process</td>
</tr>
<tr>
<td>6th Week</td>
<td>Collect ideas and opinion from the workers who do today's packaging process</td>
</tr>
<tr>
<td>10th Week</td>
<td>Visiting other companies and understands what is available on the market in packaging equipment and material.</td>
</tr>
<tr>
<td>12th Week</td>
<td>Base line for a project, project plan, risk assessment, resources needed. Use PPS as a project guidance tool at DeLaval.</td>
</tr>
<tr>
<td>16th Week</td>
<td>Mid-Term: Present several ideas, benefits and cost to Managers and get feedback.</td>
</tr>
<tr>
<td>18th Week</td>
<td>Finalize on one idea which satisfies the objectives.</td>
</tr>
<tr>
<td>20th Week</td>
<td>Presentation of the final idea to the Tumba factory manager team and product owner.</td>
</tr>
</tbody>
</table>

2.9 Benchmarking
I believe benchmarking enabled me to obtain the data about practices, situations or views at one point in time through questionnaires or interviews. Quantitative analytical techniques are then used to draw inferences from this data regarding existing relationships (Collins & Hussey, 2009). The use of benchmarking studies permitted me to study more variables at one time than is typically possible, whilst data are also collected about real problems. Both internal and external benchmarking was used with the help of semi structured interviews conducted from various department managers of DeLaval as well managers from other companies. I took the benchmarking in the beginning in order to get an overall picture of the various best practices that are currently followed in various industries.
3 Validity and Reliability

Validity is the degree of accuracy in data collected and reliability is the measure of precision of the same data. Both validity and reliability measure relevant facts and information gathered in order to maintain the trustworthiness.

In order to examine the research questions, I made references to a set of handouts, articles and authors which are mentioned in the following pages and believed to be authentic. I made an extensive search on journals and articles from Emerald insight, EBSO, Scopus reliable databases available through the KTH Library and Lund University Library. So far approximately 30 article/journal papers were retrieved, of which approximately 20 were thoroughly analyzed and the rest briefly scanned. Case studies where constructed in comparable manner for validation.

Reliability was considered during interviews where selective persons from both packaging and logistics departments were interviewed to obtain the best knowledge. Moreover articles and journals has been taken from well known publications especially most of them where published in Lund University as it has a specified department for packaging logistics.
3 THEORY

This chapter is a collection of all theoretical material from different articles. It begins with the definition of packaging, explains the total cost involved packaging, followed by logistics improvement through packaging designs and then finally summaries a case study.

3.1 Key items in the literature

As it is stated in the research question I am aiming to find a suitable packaging system which satisfies the company’s specification as well as optimize the current logistics strategy followed in the company. I made an extensive search in many databases and journals to find articles which suit my thesis and a small summary of an article and a case study are described below.

3.2 Packaging a general overview

In general packaging are classified under basic three types and they are below (Daniel & Mazen, 2007)

- **Primary packaging** – mostly used for consumer package.
- **Secondary packaging** – mostly used for outer/retail packaging.
- **Tertiary packaging** – mostly used for transportation package.

This thesis is about tertiary packaging where DeLaval packs the huge milking robot and it is shipped all around the world. Right now only two modes of transportations are followed and they are road ways and via sea. These milking robots are shipped to the farmer’s location along with other accessories which are manufactured from Sweden, Poland and Germany.

In the process of designing a package there are five important factors to be considered such as

- **Handling**: How the product is handled internally
- **Logistics**: How the product is shipped, modes of transport, whether corrosion could be an issue.
- **Product**: What type of product gives more ideas on how to design the package?
- **Constraints**: Budget, warehouse capabilities.
- **Specifications**: Product height, weight, truck and container size.

3.3 Packaging Logistics

According to Chan & Choy, 2006 “packaging logistics is defined as the interaction and relations between the logistics and the packaging system that improve “add on” values to the whole supply chain from raw material producer to end-user, and the disposal of the empty package”. So it is necessary to have a packaging system which improvise the packaging process in
DeLaval’s manufacturing unit as well invent performance efficiency in the complete supply chain i.e. from factory to the farmers. The selection of material in the packaging process also plays a vital role since the product is delivered to the farm where non-environmental product cannot be disposed off.

3.4 Cost involved in packaging Logistics

Robertson, (1993) argued that

“Packaging is a coordinated system of preparing goods for transport, distribution, storage, retailing and end-use.”

“Packaging is a means of ensuring safe and efficient delivery to the ultimate consumer in sound condition at minimum cost”

Packaging plays one of the important roles in all industries irrespective of their products produced. The cost involved in packaging contributes to the logistics cost of the company. Below are the major six factors which are involved in packaging logistics.

Material → Handling → Storage → Freight → Damage → Disposal

It starts from the selection of the material for packaging. Most of the industries opt for wooden pallets since they are the standardized one and environmental friendly. But again plastic and steel boxes are considered in case of reusable packaging. Handling cost largely involves repacking goods and handling those materials. In most of the companies packages of the spare parts occupies larger space in production line and disposal of those requires additional labor work. The storage varies depending on the type packaging process. If it’s one-way packaging only required quantity can be stored in the warehouse. In case of returnable pallets additional space is needed to store all the materials in one place. Depending on the size and weight of the container the freight cost fluctuates. So it is necessary to arrive at minimal packaging dimensions. Protection is the vital factor in tertiary packaging and any damage to the product will primarily affect the total cost which in-turn includes the loss in brand value. Cost which is involved in the disposing the packaging material is called disposal cost (Ballou & Ronald, 2004).
The graph below represents the optimum cost considering the improvement of the packaging and cost involved damages occurred in the product (Gourdin & Kent, 2001). Normally damages are caused by various factors such as underprovided packaging, unsecured products while loading, breakdowns and accidents of vehicles, collision of other goods with the product and sloppiness and careless handling by the respective carriers.

![Cost of optimum packaging](image1)

**Figure 1:** Cost of optimum packaging

According to Gourdin & Kent, (2001) the below graph illustrates the relationship between the cost and percentage of defects occurred in the products because of packaging damage during transportation. Here the rectifying costs is the amount spend in buying the damaged parts of the product as well labor cost involved in repairing those issues. Preventive cost is the financial value invested in improvement of packaging.

![Cost and product damage](image2)

**Figure 2:** Cost and product damage
3.5 Efficient packaging design in logistics

Possibilities of cost reduction in packaging logistics, starting from primary package, secondary package and transport module are analyzed in the article written by (Changfeng, 1996). Highlighting factor I found from this article is that the “fact about packaging optimization based on the total cost is found different”. Total packaging cost normally includes the cost of materials, equipment, operations and labor. Basically there are three approaches involved in developing an efficient packaging design in logistics.

1. Focus is on the primary package, glass products and other less weight commodities were packed in several layers to reduce damage, but now it is replaced by one metalizing layer which is called flexible packaging.
2. Reducing the amount of secondary packaging. New box pattern are evolved to minimize board area.
3. Optimize the space in the container in the transport section.

The above points are the main area of concern for many industries since most of them use containers in the shipping process. Inefficient packing leads to usage of larger container space. Strength planning is one on the arrangement of the container in one truck. This highly reduces cushioning material usage.

Relationship between space utilization and cost reduction are also needs to be measured in the logistics strategy. Normally space utilization is calculated in terms of total space occupied by the container divided by the volume of truck. In case of cost optimization, it is necessary to maximize the space available to minimize unit transportation cost. For an example if the number of products in a single truck is increased the transportation costs decreases since more items are shipped in one single run. Now the milking robot is placed on a wooden pallet which is 3.7 m in length and it can be reduced to 3.5 m through optimal new design in packaging. This reduces the logistics cost when one or two products are transported. More over the reduced in size means DeLaval can accommodate other articles in the same container of the milking robot.

3.6 Logistics Improvement through Packaging Rationalization (Case Study)

To illustrate packaging cost and design the below benchmarking case study was found. Nowadays industries try to minimize the cost by all possible means. This includes logistics costs which in-turn lead by packaging costs. (Arca et al, 2006) focuses on improvement in logistics through packaging rationalization with the help of case study at the Spanish frozen food company Pescanova. Different stages of activities were carried out in Pescanova.
During the first stage analysis and diagnosis was made on different products based on their size, storage, handling, transportation and commercial aspects. In the second stage various packaging solutions for different products where proposed to improve the current system.

In the end a summary report was created which describes the advantages of every proposal. Third step was called test running. Here feasibility tests were done for all the products with the variety of proposals in the summary. These tests were useful to get more corrections to the proposals made earlier.

Last stage was launching the new packaging system which all passed the previous stage. A descriptive report was created summarizing the main actions taken in the packaging of products and implements the actions in the company. Benchmarking evolved keeping this summary as basis for the improvement of logistics system.

Various packing techniques for different products are all now categorized in one single place. Pescanova Group gained annual savings of over €600000. Environmental aspects include 3.8% reduction in cardboard packaging waste, 1.8% in plastic waste and 2.9% in corrugated cardboard where are identified and removed.

The next part of the report deals with the improvement of packaging in Namibian products. Box type packages and shrink-wrap packaging are discussed in the earlier stages. Then different modes of transportation were explained and the focus was on sea transport since it was more dominant mode. During the sea transport from Africa to Europe cardboard box packing was vital to ensure the quality of product. So larger sized corrugated box was preferred rather than shrink-wrap, this reduced cost of material to a large extend. Maritime containers were also included in transportation from South Africa to Europe. By implementing this alternative the company was able to achieve 8% reduction in total logistics costs from the Namibia plant.

Finally the report was concluded which can be formulated in below three points
1. Importance of considering the different aspects in packaging which in-turn led to the development of a new product. Furthermore this incorporated various dimensions such as packaging suppliers, distributors, and third-party logistics all together.
2. Considering the necessity of various packaging systems in the supply chain network will result in quite marginal cost reduction.
3. Good designs in packaging can be formulated and added to best practices list of the company.

3.7 Packaging and Physical Distribution

Transportation is one of the major factors which are affected by packaging especially in case of tertiary packaging where the equipments are huge. According to Jahre & Hatteland, (2004) argue that it is always good for logistics if the packaging is standardized. Manufacturing industries use different distributors depending upon their customer location and therefore use of one standard can make things simpler. Since tertiary packaging always involves large machines
the packaging structure should be able to accommodate other integrated parts of the main product. By this separate transportation can be eliminated and also packaging time of those integrated products are also completely saved.

As environment is becoming one of the most important factors for all the business units, consumers demand greener packaging. European Community (EC) also insists the companies to rethink their packaging approach if it is not environmental friendly (Prendergast, 1995). Because of the pressure from both consumers and legislatives packaging, environment and logistics are the vital three areas highly interrelated. Therefore reusable components come into picture which in-turn affects distribution. So companies either invest more and produce returnable packaging or invest little and create larger biodegradable packages which can accommodate more products optimizing the distribution system.

**3.8 Packaging and logistics decision**

Bowersox (1978) defines logistics as “The process of strategically managing the movements and storage of materials, parts and finished inventory from suppliers, between enterprise facilities to customers.”

In manufacturing industries where tertiary packaging is carried out, one of the prerequisite in making packaging decision understands the packaging environment thoroughly. Both the issues in logistics and tangibility in packaging need to be analyzed and discussed since they will affect the entire supply chain. Traditionally logistics engineers often focus on transportation system and packaging engineers focus on packaging system alone. Though, majority of indirect and hidden cost, possibilities of profit improvements and many value-adding elements are put-forth only when both packaging system and logistics system interaction is made. Identifying the importance in these interactions redirects the focus on entire supply chain as a whole.

According to Twede (1992) below picture shows a systematic cyclic process of cause, impact and affect between packaging and logistics. This cycle can be viewed as two parts. The first part represents the impact where both packaging and logistics decision creates impact their systems. The second part shows the effects of packaging system on logistics process and vice versa. This cyclic effect creates a solid bridge between these two systems.
Packaging professionals often tend to focus on the packaging system alone and likewise logisticians focus only on their system. This creates a mismatch between the two interactions and leads to adverse effects on the overall performance and total cost. Therefore it is necessary to build a solid bridge to fulfill the gap between them by investigating how the packaging decision influences on logistics and vice versa. This bridge creates a platform where logisticians and packaging professionals can discuss about the total cost involved in both the processes as well as possible ways of eliminating all the hidden cost.

According to the above cycle whatever packaging decision be, it must always consider the impact of the packaging solution which is chosen. Likewise efforts also should be made in adopting the features of logistics process relevant to the packaging system used. Combined actions of these interrelated activities will help in achieving the desirable performance improvements in packaging logistics system as a whole.

2.8. Benchmarking

One exact scientific definition of the concept of benchmarking would be that “benchmarking is the search for the best industry practices which will lead to exceptional performance through the implementation of these best practices” (Camp, 1989). In short, the idea is to learn from “the best in the class” when it comes to a certain practice, process, or any other factor that needs to be improved within the own organization. Rather than being a simple matter of copying or plagiarism, benchmarking is a process of innovation, where the inputs of the analysis are adapted and applied to the own organization (Thompson & Cox, 1997). What others do may simply be impossible or ineffective when used in a different context (Dattakumar & Jagadeesh, 2003). Benchmarking can also be used to alert complacent managers about the fact that improvements
can be made and that competition may have a head-start in certain areas (Schonberger, 1994). Continuous benchmarking will increase the own organization’s awareness of the competitive environment and allow it to stay competitive in the same (Hyland & Beckett, 2002).

A learning firm is one which develops and maintains proficiency in both performing and to change the company in improving the performance. Improvement in organizational learning behavior and capability of individuals will effectively respond in the firm’s environmental growth. Individuals need to convert data into knowledge that should be encoded and put on air in ways that are useful to the company. This needs to easily retrievable and embedded in the vocabulary of the organization (Hyland & Beckett, 2002).

It’s not to be taken for granted that a competitor or other company will be the best performer, and thus benchmarking can be made externally (against another company of choice) or internally (against some part of the own organization which already performs better) (Anand & Kodali, 2008).

Many major companies have their own benchmarking model, but one that is highly cited and widely used is the Xerox model, which is a ten-step organization based model. The process is as follows:

1. Identify the factors to be benchmarked.
2. Identify the company/organization that you will benchmark against.
3. Decide how the relevant data is to be collected.
4. Determine how large the difference (“the gap”) in performance is and what changes would have to be made in the own organization to close it.
5. Attempt to predict the effects of these changes, besides the increase in performance.
6. Communicate the results to the right people in order to gain support.
7. Formulate the goals of how the own organization is to perform based on the findings of the benchmark.
8. Make plans on how these goals are to be achieved.
9. Implement the plan and make sure everything runs smoothly.
10. Refine the benchmarking process and start over in order to facilitate further improvements (Camp, 1989).

One obvious implication of benchmarking is that the company which has been used as the target may not be willing to reveal anything about its practices, especially if it’s a competitor or if the benchmark has revolved around factors related to e.g. a critical process within that company (Dattakumar & Jagadeesh, 2003).

Though it is a foregone conclusion that firms will not easily reveal their strategies that would give them a competitive advantage, few exceptions where found such as printing industries, packaging company and manufacturing units.
Nefab which was started in 1949 and for the past 63 years their main target is enhancing the entire logistics system by developing efficient packaging design with the help of qualified engineers. At the center of this approach were the concepts of packaging design and cost reduction.

Alfa Laval which was started in 1883 is the huge suppliers of heavy equipments such as heat exchangers, condensers and generators. They follow almost all kinds of tertiary packaging types available in the market in order to deliver the product at the best quality.

Times of India, one of the oldest news paper printing industry running India for the past 168 years. During these years they had purchased every kind of printing machines across globe. This made them to see the packaging types followed by wide variety of companies.

According to the Xerox model the above three organizations are chosen as benchmark studies. It was not possible to follow all the 10 steps in this benchmarking study, but the learning was done keeping Xerox model as the base. The complete findings from the above three industries are discussed in the next chapter.
4 EMPIRICAL EVIDENCE

In Empirical evidence chapter a short back ground about DeLaval was given. Investigation on current packaging system was described and then benchmarking studies from various other industries were also included in this chapter. In addition analysis of empirical evidence was also added.

“Packaging is a techno-economic function aimed at minimizing costs of delivery while maximizing sales (and hence profit)” (Robertson, 1993)

4.1 About DeLaval and Voluntary Milking System (VMS)

DeLaval is a company of the Tetra Laval Group has 125 years of innovating in the dairy industry. They also support dairy farmers in managing the farms their own way. In the process of building smart framing they developed automation technologies in milking process and in quality of milk.

In DeLaval the VMS was a radical innovation. The existing products involved the farmer during the milking process but the VMS is fully automatic. A lot of technology was combined in a new way and they had to offer new kinds of services. But after that successful innovation they could offer their customers a milking system that was fully automatic and alarmed the farmer if something was wrong.

When DeLaval launched the VMS they were convinced that just selling the machine itself wasn’t the right method. Instead DeLaval is providing the customers with a product that involves both the Voluntary Milking Machine, different kinds of service and optional equipment. These additional products are the key to get the farmers to feel safe when they invest in a VMS.

4.2 Current packaging process and issues found in it

Today the VMS milking robot is packaged on a wooden pallet and secured by nylon straps and wooden stops on the pallet. This keeps the robot from sliding on the pallet. The whole robot is then covered in a sheet of tarpaulin. Tarpaulin is a strong large sheet, flexible and water resistant material normally made up of plastics substance such as polyethylene. The tarpaulin is then nailed down to the wooden floor. Labels are then attached to the tarpaulin to show where to strap and to lift. Gross and net weight is also attached. Four holes are cut in the tarpaulin for the nylon straps. The whole VMS is then lifted with a fork lift and transported out of the factory. The pallet can be lifted from four different directions with a fork lift. The VMS is then placed in a specific space in the yard before transport to Customer. The nylon straps will then be used to tie down the robot when loaded on a truck or in a container. The wooden frames dimension is designed to fit on a standard European truck. The packaging is designed to handle a g-force of 6g in all direction. This is when a packaged VMS is transported on a container boat.
- VMS get damaged during the transportation because of vibration and improper secure in the trucks.
- No structured communication between the packaging and logistics departments.
- This process today is at a sound level of 82-85 dB and should be considered to be lowered if a new process will be introduced.
- This packing process takes a long time and it needs to be reduced.
- Since the VMS is covered by sheet of tarpaulin which is thin, the outer shield of the VMS and few of its parts are damaged during transportation.
- Current packing system does not give a good appearance considering the cost and value of the product.

In the below picture right hand side shows the instructions for securing the VMS in the trucks which was designed by the packaging engineers. But the activity of securing is done by the transportation employees who are always in contact with the logisticians. Since there is no communication between the packaging professionals and logisticians this method of securing is not informed properly to the transportation employees and therefore they secure on their own without following the standards. This non-communication between the packaging and logistics departments is one among the major issues identified.

Figure 4: Shipment process of VMS at DeLaval
4.3 Benchmarking studies

Interviews were conducted with the representatives from Alfa Laval, Times of India and Nefab. Printing industries and packaging solution provider industries. These interviews were used for analyzing the various packaging solution available in the market as well to get the cost of those packaging solutions as well.

It was tricky to find the companies who produced milking robots. Because they are the direct competitors to DeLaval so the decision was made to choose industries where heavy equipments are either produced or used. This decision paid out really well and provided lot more inputs for the research work to proceed. The three companies which were chosen for the benchmarking had faced similar kind of problems compared with that to DeLaval. It was interesting to know that all the three companies had their own approaches to solve those problems. This difference in approach made the task much tougher to choose the best one for DeLaval. So in the end few best practices were alone chosen from the three companies and it was applied in the case of DeLaval.

The first company is Times of India they produce Indiatimes newspaper throughout India. This comes under printing industry category. Printing industries were approached since they involve huge printing machines which are normally delivered from various countries. For an example in Times of India printing machines are bought from Germany, Norway, and U.S.A and installed in India. During the installation certain machines arrive damaged. It took such a long time to fix those issues, because all the damaged spare parts had to be ordered from the manufacturing company and delivered in India. So this shipping time of spare parts was the major concern rather than fixing the damages of the product. Since printing machines were delivered from companies in different countries I was able to find various packaging techniques adopted by those companies. Some companies gave more importance to packaging and their installation times of printing machines where considerably less compared to the others which were bad packaging. Normally those printing machines are delivered by the transportation companies such as DHL, Schenker etc. The installation employees come only after those machines are delivered. So it was two separate processes one is deliver of machines and other is installation of machines. During the interview from the production manager from Times of India I identified many key factors but one which was very useful was that printing machines which are not packed with appealing look are handled carelessly by the transportation companies. From it was inferred that good looking products get the treatment it worth.

The second company is Nefab, one of the largest packaging solution providers offers its service to different kind of industries. For the past 63 years packaging solutions are being provided various industries across the globe. With the help of qualified engineers they deliver well optimized packaging design which is not only cost effective but also mingles with the industry transportation set-up. An employee from Nefab said that packaging is like a hand glove and
logistics is the hand. The hand has five fingers all of different sizes so the glove has to fit properly to deliver the best outcome. Likewise in the products manufactured will be shipped in all modes of transportation under different environmental conditions packaging should be done in a way that it protects the product from all possible damages. Nefab is mostly famous for its returnable packaging solution. Returnable packaging is the type of packaging where packaging material will be returned back from the customer end to the manufacturing place from where the product is shipped. So this packaging material will be used again for another product. This kind of packaging is possible only if the customer location is fixed and it has to been on regular basis. From the pool of various ideas available from Nefab I took the option of cost comparison of different packaging types. This helped DeLaval to get an idea of how much has to be invested on the new packaging set-up.

The third company is Alfa Laval largest producer of heat exchangers, condensers, reactors and pumps. For the past 129 years they produce heat exchangers and deliver it world-wide. It is the core responsibility of Alfa Laval to deliver their products without any kind of damage for this they have to follow different packaging designs in specific for their varied goods. The products produced in Alfa Laval are huge in size which is called heavy equipments. So the type of packaging they follow is tertiary packaging which is the same in case of DeLaval. Unlike DeLaval Alfa Laval has a separate department for packaging with a designer engineer, quality tester and professionals from transportation companies. I had the opportunity to have discussion with one of their packaging designer. From that interview I was able to discover the decision making for the designs. It is understood that every packaging set-up which is designed will first go for the quality checkup, then goes to the transportation employees to see the feasibility of new set-up and then finally the decision is taken under the provision of both packaging engineer and logistics engineer. Through this process Alfa Laval makes sure that new packaging does not disturb the transportation set-up in anyway.

From the above three benchmarking studies below are the summary of findings which can be implemented in the case of DeLaval.

1. Times of India – Impact of good packaging on handling of the product.
3. Alfa Laval – Proper decision made on finalizing the new packaging set-up.
4.4 Optimizing logistics by better packaging:

Voluntary milking machines (VMS) are produced in Tumba and delivered globally. In this procedure DeLaval has five consolidated platforms where these VMS will be stored and then sent to the customer in their respective destinations. VMS is not the only product which is going to be used in the farms. There are many other products combines together and complete it has a project.

The current transportation system is parallel i.e. the VMS are transported in the separate trucks to the consolidated platforms. The other products which are produced in the same factory are shipped to Glinde on daily basis and from there they are transported to the customers. With the introduction of better packaging the other accessory products can be placed along with the VMS and shipped directly to the customer.

Figure 5: Transportation network
4.5 Cost comparison:

Cost estimation was one of the major parts of the thesis. Since every industries have their focus on cost reduction, as said in the introduction part manufacturing industries focus more on decreasing the packaging cost just because their thought process is such that package is not the part of product. Below is the chart showing the percentage of money spent for the packaging in during production with the money spent in repairing the product for the damages caused due to bad packaging. It clearly shows that damage repair cost is just 16% lesser than the production cost. So the money spent in fixing those problems in directly adds to the product cost.

The production cost includes both the material used for packaging and the labor time involved for packing one complete milking robot. It does not include the shipping cost of the milking robot. The damage repair cost includes the labor time costs spend in refurbishing the damaged milking robot. Money used for buying the spare parts which are broken is not included in this damage repair cost. It was difficult to calculate the spare parts cost since there is was no track on those items in the case of DeLaval. Normally the spare parts are ordered both the old product which needs regular service and for the new product the one which is damaged. The same installation employees take care of checking the old machine which is under regular maintenance cycle. This is the situation in most of the industries. Similar kind of situations happens even in case of automobile industries. The cars which are manufactured in one placed are transported to respective dealers located diversely. The customers come and visit new cars in the show room which is clean and perfect. In the backdoor the some cars gets damaged during shipment process and those are fixed before the car is exhibited to the customers. By evaluating this situation there is some considerable amount of work labor and spare parts purchased take place during the damage repair process.
The figure 7 shows the graphical representation of cost spent in packaging the product and money lost in repairing the damaged product due to bad packaging. This graph illustrates the same information as the chart in the above in the diagram but in the different format. For the reason confidentiality the values in y-axis is removed. In the below graph it is clearly evident that only small gap is between the production cost and damage repair cost. Both the costs are almost equal in this case. This is like that of the sea saw case if the budget allocated for packaging is increased the amount spent on repair cost is decreased. The sum of money spent is not severe but if this damage is going to bring the brand value then it becomes severe which is not possible to recover in short period of time. So finally the costs spend in restoring the issues happened in the product can be prevented if the money allocated for the packaging in the production is increased to a small percentage.

![Cost estimation](image)

**Figure 7:** Cost estimation
5 ANALYSIS AND DISCUSSION

This chapter starts with the analysis of results obtained from interviews, case studies, theories and benchmarking studies. A short discussion is also made by answering the research questions stated in the introduction. As stated in the abstract main context of the thesis was also explained.

Considering the concepts from theories and identified best practices from benchmarking industries certain changes which can be implemented in DeLaval were analyzed and explained below.

5.1 Increase of packaging logistics knowledge and importance in the entire organization

It would be valuable for DeLaval to increase and improve the packaging system. By increasing the packaging system towards all the customers DeLaval can mainly decrease paid out damage, increase customer satisfaction and above all improve their distribution efficiency.

Everyday numerous goods are handled by DeLaval and so if the packaging is designed to cope the handling operations and transportation difficulties it would in-turn increase the efficiency and productivity all together. Loads of work involved in the damage reporting and repairing them at the customer site would disappear. In order attain these advantages DeLaval has to establish a deeper relationship with the transporting companies and educate them about the packaging system followed. A well designed package transported in DeLaval will make handling of their goods safer and simpler. It would take lot more efforts for the management in achieving improvement in packaging but the results would ultimately make the company profitable.

Not many people think packaging as a valuable element of the entire supply chain. The figure 5 below shows the supply chain members and elements, which are common between packaging and logistics especially in case of tertiary packaging process. The main three sectors are manufacturing, distribution centre and retail outlet.

Manufacturing:

In the production layout packaging is placed in the end near the warehouse. So the first step in packaging process starts here. Filling process is the stage where the product is packed with all necessary vibration damping materials to make it safe during the transportation. Then during the warehouse process the product is placed according to delivery time and papers necessary for the shipment are attached to the pack. Now it is transported to the respective distribution centre.
Figure 5: The parameters involved in tertiary packaging and logistics process

**Distribution centre:**

In the distribution centre product is received and stored. From here the product is directly delivered to the customer. So the transportation company picks the exact details and ships to the customer on time.

**Retail outlet:**

The final stage where the product is received at the customer end unpacked and checks for any damages. Moreover the package is either reused are recycled i.e. sent back to the distribution centre.

### 5.2 Information flow and exchange

A good information flow is vital in a well-managed supply chain. In the process of creating better packaging DeLaval has to establish exchange of information between all parties, both inside and outside DeLaval.

A damage preventing section has to be created headed the product owner must involve employees from the design department, logistics department, financial department and installation/delivery department.

Several times the information regarding bad packaging which is identified the installation employees does not reach the main office. The installation employees are the people who see the product’s condition at the customer site. They can show other employees a complete understanding of damages happening in the product during transportation as well they can
illustrate the steps taken in repairing those damages. So with this information necessary changes can be implemented in the product development right from the design stage. The importance of the packaging in distribution is however realized by the employees who actually handle and transport the packages. These ideas must be recognized early in the future by the organizations to accomplish improvement in packaging. Alfa Laval packaging services is a good example for the DeLaval packaging work. At Alfa Laval the higher level management is well alerted of the packaging importance and product development department achieve the best output. To improve the package moving in DeLaval business, enlightening the customers regarding the distribution strains and packaging are crucial. Seeing everything now is online, providing the information regarding packing, sealing and labeling on the company's website which can be downloaded by the customer, or a "How to do video" upload will be more than sufficient.

5.3 Influence of packaging

The main element packaging is not recognized as the concerning element of the business by most of the people at Delaval. The influence of packaging in DeLaval has to be seen through economical figures. As discussed in the theory chapter cost involved in packaging logistics, DeLaval has to dedicate a proper budget especially for packaging system in the organization. During this budget allocation costs involved in damage repairing and loss of brand value both has to be considered.

To create a profitable growth it is necessary to identify bad packaging and see how this affects customer satisfaction. By understanding the importance of the package in a supply chain management we can obtain the most achievable advantages in a distribution center. In supply chain the role of a good package can provide much greater productivity and efficiency in handling. The improvement is both environmental and ergonomic which in turn informs the content of the package and product market. The concept of packaging activities that exists in DeLaval is not based on damage prevention.
5.4 Discussion
Along with high level discussions the research questions explained in the first chapter of the thesis are answered.

5.4.1 Packaging Logistics in Supply Chain
Below is the very basic model of supply chain which consists of packaging, logistics, distribution and consumption.

![Simple supply chain model](image)

**Figure 6:** Simple supply chain model

The above diagram shows the very basic model of Supply Chain which contains only four elements unlike SCOR or PORTER VALUE which contains more than six elements in their models.

**Packaging** can be described as a coordinated method of preparing the finished product for transport, warehousing, sales, logistics and end use by the customers.

In the other hand **logistics** deals with the methods to deliver, track and confirm the influx of the product i.e. the flow of services and goods from the point of origin to the final point of consumption so that the requirements of the customers where meet neatly.

**Distribution** decides the channel which has to be used to deliver the finished goods to the customer such as construction to distribution warehouse to the dealers and finally to the customers.

**Consumption** is when the finished goods are used by the customer. This is the place where the product is unpacked, installed and made ready for use. Thus it is inferred that packaging plays a
very vital role throughout the supply chain. If the packaging is not proper the other process followed are all getting disturbed and in the end it incurs a huge loss for the industry. Normally companies try and reduce the material cost involved in packaging but in-turn they spend a lot in restoring the issues created due to bad packaging. Here cost is not the only factor which gets affected but also the entire processes within the supply chain is getting affected.

5.4.2 Impact of Packaging on Supply Chain

The below diagram shows the comparison between the packaging material costs Vs Logistics costs. This is the continued discussion form the simple supply chain model where as we will discuss about the various elements which are all add in to the entire packaging logistics cost.

![Figure 7: Packaging cost Vs Logistics cost](image)

The packaging value chain is very deliberate in nature and hence optimizing the packaging system directly affects the logistics cost as well. Below is the small list includes  

1. Increased warehouse effectiveness  
2. Reduced labor costs  
3. Reduced freight costs  
4. Improved product handling
The above four points adds to the steps involved in optimizing the cost of packaging logistics. Consequently this optimization leads to more efficient performance of the entire supply chain as well. Freight, labor, warehousing and handling cost all together compound to one cost which is material cost as indicated in the above diagram. This is the situation which normally happens in most of the industries i.e. they always try to reduce the cost of material used in packaging their goods with an assumption that the total product cost has been reduced. But realistic is when the cost of packaging material reduced it leads to poor packaging and ultimately it affects entire supply chain elements. Gradually this extends to lots of indirect loss in costs. So simply having better packaging makes life easier for the other elements of supply chain.

Below are the research questions stated in the first chapter are answered

*How does the interaction happen between the packaging system and other systems in a manufacturing industry?*

This investigation was done in DeLaval and it was identified that no clear interaction was happening between packaging system and other systems. Because of this miscommunication many issues arise such the packed product were not secured properly according to the standards defined in the logistics system. Also all the decisions taken in any one of the system affects the other directly and indirectly.

*What are the steps that can be taken to establish an effective relationship between packaging and logistics?*

As explained in the discussion chapter a proper flow of information exchange has to be followed between packaging and logistics department. Weekly meetings have to be conducted between the managers from both of the departments. During these meetings the product owner also has to be included so that continuous improvement can be established in product life cycle. In the stage of packaging design approval logistics manager should also be involve in it.

*What are the relevant key performance indicators (KPI) which affects the company’s logistics costs in context with packaging?*

Foremost factor which disturbs logistics cost is the product damage due to improper packaging. The total cost analysis was made in this theory chapter. The rectifying cost involved in shipping the spare parts for repairing the damaged product also add to a large extend. Bad packaging also denies the insurance cost for the broken products during transportation.
6 CONCLUSION

Finally in this chapter conclusions were made based on the analysis made and research questions were also answered. The chapter ends with possible further studies.

By calculating the data obtained by using the frame of reference we find the importance of packaging in a product development.

The essential factor of a dynamic organization is communication. There is an abundance of conceived knowledge inside the DeLaval organization about packaging. Like discussed earlier the employees in the lower level of the management who handle the package is a best source to identify the problems faced during packaging which in turn provides an improvement in packaging. This can be achieved only if there is an effective communication between the upper and the lower level employees of the organization. A token of appreciation along with gifts can be provided to employees who provide information to improve the packaging process can bring out more ideas among the employees. A good communication between the employees of the damage preventing and the product design organization is vital. The information regarding with the problems faced in packaging should be provided by the installation employees on a daily basis to the employees at the product development system. They must have the knowledge about how the damage preventing work to solve the issue brought up.

Below is the list which should be implemented in DeLaval to create a better packaging organization and deliver their products in high quality.

1. Packaging needs to be considered during the design stage of the product.
2. Optimal cost should be allocated for packaging.
3. Good communication should be maintained between the various departments especially between packaging and logistics employees in the organization.
4. Providing information regarding packaging to the customers on the company's website.
5. Identify the activities which are a cause of a bad packaging. Provide the significance of having the best packaging unit in Delaval operations.
6. Last but not least DeLaval should consider packaging as a part of their product.

By introducing new concepts in packaging DeLaval can sustain their brand image always at a high node. Considering the theory development and benchmarking studies it is understood that all the manufacturing industries should consider packaging as a part of their product and deliver the packaging at high standards.
6.1 Further Research

1. In this thesis importance of packaging in DeLaval business unit was described and also it shows the ways for improvement of the current packaging system. Further research can be done in the subject of introducing new technological innovation in packaging. It would be helpful to further investigate on how this new technology impacts logistics system.

2. Since DeLaval is an international company they have customers in all 5 continents and because of this they use bigger number of transportation companies to ship their products. DeLaval is unaware of what happens to their product during transportation and where exactly the product gets damaged. For this many technologies such as (RFID) Radio frequency identification and (WSN) Wireless sensor network tags are available in the market to keep track of the product condition during shipment. DeLaval can use any of the technology and find more interesting facts.
7 REFERENCES

7.1 Literature & Articles


7.3 Websites

www.containerhandbuch.de/chb_e/index.html 2011-2012
www.tis-gdv.de/tis_e/inhalt.html 2011-2012
www.nefab.se 2011-2012
www.alfalaval.com 2011-2012

7.2 List of Interviews

<table>
<thead>
<tr>
<th>Date</th>
<th>Person</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011/12/12</td>
<td>Magnus Falkening Quality Manager VMS</td>
<td>DeLaval International AB</td>
</tr>
<tr>
<td>2011/12/15</td>
<td>Jouko Raninen Design Engineer</td>
<td>DeLaval International AB</td>
</tr>
<tr>
<td>2011/12/22</td>
<td>Jonas Klint Product Owner VMS</td>
<td>DeLaval International AB</td>
</tr>
<tr>
<td>2012/01/11</td>
<td>Pekka Puntila Transportation Solution Manager</td>
<td>DeLaval International AB</td>
</tr>
<tr>
<td>2012/01/27</td>
<td>Kenneth Gustafsson Sales Manager</td>
<td>Nefab</td>
</tr>
<tr>
<td>2012/01/30</td>
<td>Talon Gabriella Planning &amp; Distribution</td>
<td>DeLaval International AB</td>
</tr>
<tr>
<td>2012/02/09</td>
<td>Steffan Packaging Employee</td>
<td>DeLaval International AB</td>
</tr>
<tr>
<td>2012/02/27</td>
<td>Krestin Sundberg Ware House Manager, Stockholm</td>
<td>DeLaval International AB</td>
</tr>
<tr>
<td>2012/02/29</td>
<td>Ralf Sundaram Pillai Ware House Manager, Glinde</td>
<td>DeLaval International AB</td>
</tr>
<tr>
<td>2012/03/14</td>
<td>Tim Kastner Packaging Desinger</td>
<td>Alfa Laval</td>
</tr>
<tr>
<td>2012/03/19</td>
<td>Per Peterson Installation Manager</td>
<td>DeLaval International AB</td>
</tr>
<tr>
<td>2012/03/30</td>
<td>Srinivasan Subramaniam Production Manager</td>
<td>Times of India</td>
</tr>
<tr>
<td>2012/04/11</td>
<td>Naser Probic Production Leader</td>
<td>DeLaval International AB</td>
</tr>
<tr>
<td>2012/04/25</td>
<td>Frank Philip Logistics Manger, Glinde</td>
<td>DeLaval International AB</td>
</tr>
<tr>
<td>2012/04/27</td>
<td>Martina Niehaus Transportation Solution Analyst, Glinde</td>
<td>DeLaval International AB</td>
</tr>
</tbody>
</table>