FINAL REPORT

FEBRUARY 2005

Icelandic Fisheries Laboratories
REPORT 01-05

IceTec
TECHNOLOGICAL INSTITUTE OF ICELAND
ITI 0502/EUT01
8UE2118

OPTI-PACK

Optimising Packaging at SÍF Group, Iceland

- Overview of the Project Work -

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Titill / Title	*OPTI-PACK lágmörkun umbúða hjá SÍF, yfirlit yfir verkefnavinnu / OPTI-PACK Optimising Packaging at SÍF Group, Iclenad- Overview of the project Work*		
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Skýrsla ITÍ /IceTec report	0502/EUT01	*Útgáfudagur / Date:*	February 2005
Skýrsla Rf /IFL report	01-05	*Útgáfudagur / Date:*	February 2005
*Verknr.ITÍ / project no.*IceTec	8UE2118		
*Verknr.Rf / project no.*IFL	1556		
Styrktaraðilar / funding:	*Nordic Industrial Fund and SIF group.*		

Ágrip á íslensku:

Markmið verkefnisins eru:

- Að útbúa gagnleg verkfæri fyrir atvinnurekendur til að lágmarka umbúðanotkun sína og uppfylla þannig kröfur í umbúðatilskipunum Evrópusambandsins (94/62/EC och 2004/12/EC) og tilheyrandi stöðlum (EN 13427-13432).
- Að stuðla að bættri innleiðingu og auðveldara eftirliti með umbúðareglunum.
- Að þróa aðferðir til að meta umbúðir samkvæmt staðli EN13428, um lágmörkun umbúða.

Niðurstöður verkefnisins er OPTI-PACK kerfið sem samastendur af:

- Kerfislýsingu, með almennri lýsingu á OPTI-PACK kerfinu og uppbyggingu þess.
- Verkfærakassa (Toolbox), sem inniheldur ýmsar gagnlegar aðferðir til að meta hvort of mikið sé notað af umbúðum og hvernig megi lágmarka þær.

Unnið var náið með SÍF og Kassagerðinni við að þróa OPTI-PACK kerfið og lýsir skýrslan þeirri vinnu.

Lykilorð á íslensku: *Lágmarka umbúði, OPTI-PACK, umjbúðatilskipun Evrópusambandsins 94/62/EG*

Summary in English:

The aims of the project are to:

- Support companies in order to be in accordance with the European Packaging and Packaging Waste Directive (EU/94/62) and the 6 harmonised CEN Standards (EN 13427-13432)
- Support to national authorities to implement and audit of the above mentioned Directive and Standards
- Develop industrial methods for the assessment of EN13428 (packaging optimization to 10 performance criteria's)

The elements in OPTI-PACK are developed by Scandinavian companies, business associations, and institutes in a number of national projects from Denmark, Finland, Iceland, Norway and Sweden. OPTI-PACK has integrated these elements into a general Scandinavian project.

In areas where a company does not have optimisation and documentation methods for the optimisation of a packaging-product-design, OPTI-PACK has several proposals. OPTI-PACK is designed in several reports in following structure:

- The **System** which gives the background of the EU Directive and the standards and overall introduction of how to work with the assessment of the essential requirements.
- **A Toolbox** with a number of different assessment methods including theory and science.

This report describes the use of the OPTI-PACK system in the Icelandic company, SÍF Group and Kassagerdin – Central Packaging.

English keywords: *Optimising packaging ,OPTI-PACK, EU Directive 94/62/EG*

Table of Content

OPTI-PACK is a Scandinavian project financed by Nordisk Industrifond (Nordic Innovation) with the aim of giving:

- Support companies in order to be in accordance with the European Packaging and Packaging Waste
- Directive (EU/94/62) and the 6 harmonised CEN Standards (EN 13427-13432)
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The Packaging and Packaging Waste Directive (94/62/EU) and the 6 standards EN13427-13432 are the setting requirements for all who are marketing a packed product on the EU Market. But the standards do not in all cases give companies precise instruction in optimising the packaging. And OPTI-PACK is a Scandinavian project trying to give practical methods to industry. In areas where a company does not have optimisation and documentation methods for the optimisation of a packaging-product-design, OPTI-PACK has several proposals. OPTI-PACK is designed in several reports published on the OPTI-PACK website, www.opti-pack.org.

An optimisation method is a prediction into the future. Simple methods can maybe be done with few resources but can also at the same time be un-precise. A wrong prediction can result in either to weak packaging (= damaged products = failure cost and lost goodwill) or to strong packaging (= cost to packaging and transportation). Each product or company is special and no report can develop a general optimisation method for all. OPTI-PACK is only offering the companies a list of usable methods and companies must choose from the list or develop other methods. Please also be aware that the list of methods in OPTI-PACK is not complete.

Participants in Iceland are *SIF group*, *Technological Institute of Iceland* (IceTec) and *Icelandic Fisheries Laboratories* (IFL). The worked is performed in co-operation with *Kassagerdin – Central Packaging*, which supported the packaging optimization work and modeling in the computer program CAPE PACK. The authors give special thanks to *Kassagerdin – Central Packaging* for there support.

Introduction SIF Group

SIF Group is a leading company in sales and marketing of seafood internationally. Around 1800 employees in 15 countries currently work for the *SIF Group*, in value-added production, marketing and sales of seafood products to more than 60 countries around the globe.

SIF Iceland's operations play a key role in the development and management of the Group. The company also coordinates the Group's sourcing and sales of seafood from Iceland.

The structure and organization of the *SIF Group* is based on its member companies working closely together as a team, sharing information, experience and know-how, and collaborating in solving major tasks. *SIF* has defined France, the USA, the UK and Spain as its core markets, while each subsidiary within the Group occupies a distinctive place within its extensive sales network. As the company has a worldwide sales system the product chain is long and varying from one product to another and even from one buyer to another. The picture emphasis the long journey the goods travel and the stress on the packaging.

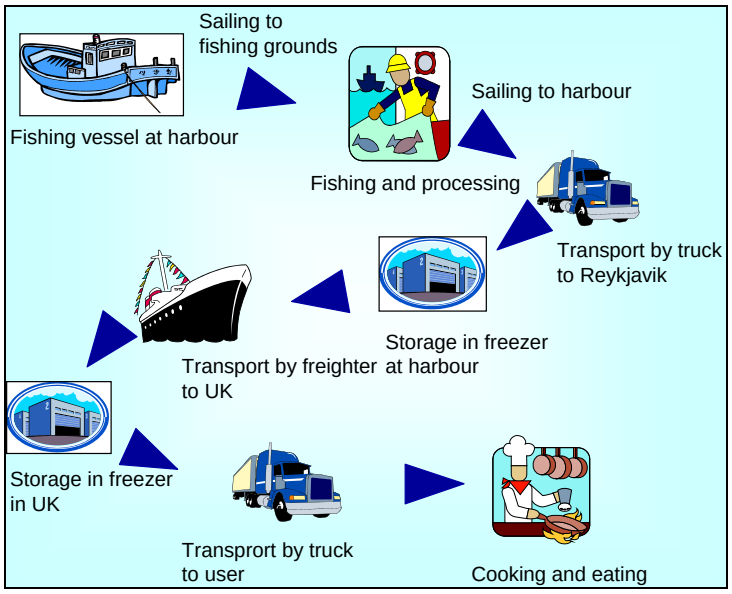


Figure 1. Example showing transport of packed fish product from Iceland to UK

The OptiPack system

The work is performed in accordance with the OptiPack system (Process oriented Environmental Assessment of Packaging, Ann Lorentzon). Information on the Opti-Pack system is available on the project website, www.opti-pack.org. The work was performed in the following order:

Step 1. Description of current management system in the company
Step 2. Description of current methods for optimising
Step 3. Grouping of packaging
Step 4. Calculation of key figures
Step 5. Critical factor for optimizing
Step 6. Optimising
Step 7. Assessment of Heavy metals and material recovery
Step 8. Documentation

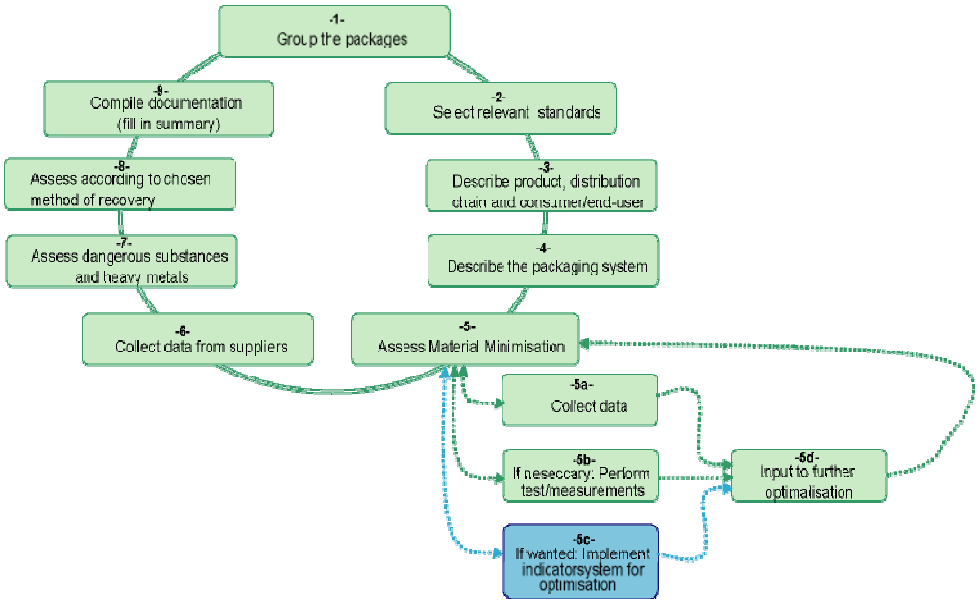


Figure 2. OptiPack system.

Step 1. Description of current management system

- The company has a quality system or rather a management system. Until recently the company had ISO certification but decided not to keep it. There are procedures available for purchasing new packaging and they are under revision. Some key words in the description of work are; responsible persons/divisions, labelling, information text, technical barriers for use, logistic, necessary testing for new design, accordance with regulations, amount ordered. A form for "work request" (verkbeiðni) for new packaging is available. The form is used in communication with packaging supplier. Description of the product and packaging is given with a print out of layout or graphics.

- The daughter firm *Saltkaup*, has the responsibility of packaging purchasing and distribution to producers/packers. Before *Saltkaup* entered the *SIF group*, there was a well defined work procedure for managing packaging with detailed information in a database. Detailed description of all packaging systems was entered into the database including product description, size of packaging, type, amount and prize of material, label, pallet and all auxiliary material such as strapping plastic and corners. In addition figures are given such as boxes/pallet, pallet/box, kr/kg, Kr/box, kr/pallet. After entering the *SIF group* this working method has not been prioritised and the information has not been updated.

- Producers/packers follow HACCP system as food producers.

Step 2. Description of current methods for optimising

- The practical method for choosing new packaging is by using experience. Similar products are found and the criteria for the new packaging is based on this. Both packaging suppliers and the company it self have a good feeling for the needs and the tolerance limit for packaging. Sometimes the packaging does not meet the criteria because the product does not behave as expected e.g. regarding filling which can be dependent on size of packaging and pieces of product. Packaging design often comes at the end of the Product development process and time is often lacking for testing.

- Documentation on how a decision is taken regarding packaging is not available.

Step 3. Grouping of packaging

An approach was taken to group packaging by products. This way 14 classes were defined:

Table 1. Grouping of packaging, 14 groups were defined.

Group	**Group**
Frozen ground fish / light salted	Frozen ground fish / cello packaging
Frozen ground fish / shatter packed	Frozen ground fish / block / mince
Frozen ground fish / portions / fillets / fresh formed	Frozen ground fish / frozen at sea
Shrimp / frozen at sea	Shrimp / cooked / peeled
Fresh fish	Lobster
Herring and Capelin / land- or frozen at sea	Herring / "matjes sild"
Scallop	Salt fish /split / fillet

The composition of packaging for the distribution chain was listed for all sizes of packaging for these classes. This resulted in 43 sub classes, see annex 1. Out of these four representative packaging chain were chosen for further description.

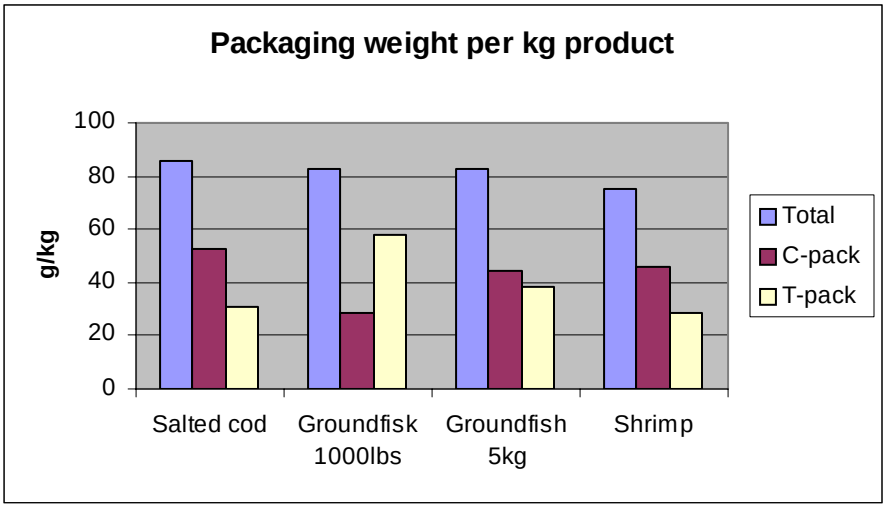
Table 2. Products chosen for case study.

Product name	**Product description**
Salted cod	Salt fish Packed 25kg, Bottom and cover / corner support / inter layers / strapping / wrap / pallet
Shrimp	Shrimp/ cooked/ peeled, Packed 4*2,5kg, Plastic bag / box / tape / wrap / pallet
Ground fish 100 lbs	Frozen ground fish / portions / fillets / fresh formed, Packed 1000 lbs, box / plastic bag / corner support / strapping / wrap / pallet
Ground fish 5 kg	Frozen ground fish / portions / fillets / fresh formed, Packed 5 kg, Inner plastic bag / box / tape / wrap / pallet

Step 4. Calculation of key figures

1. Indicator for amount used

Indicators for amount of packaging /kg product were calculated for the chosen products (see table 2). It turned out to be easy to gather the information. The data enables the group to trace high use of material, see figure 3.



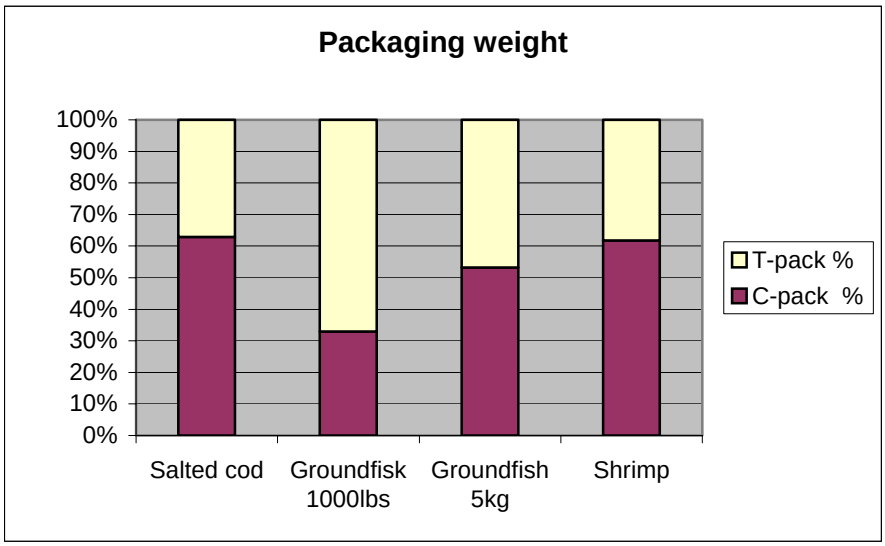


Figure 3. Indicators for packaging optimization

2. Indicator for damage statistisc

Damage Statistics for the chosen product is such that out of 60 complains for packaging of these products in year 2002 only one complain can be traced to packaging quality.

Step 5. Critical factors for optimising

Based on the Damage statistics there seems to be room for optimising regarding to strength. The following form, table 3, was filled out in order to identify the critical factor for the chosen packaging.

Table 3. Identification of critical factors for packaging optimisation.

Company: SÍF **Product: Salt fish** **Date: 19/05/03** **Done by: ÁG, BS and EY**					
	Performance criteria	**Relevant requirements**	**Critical areas**	**Ref.**	**Points**
1	Product protection	Keep moist inside for freshness, Mechanical protection	Yes	Quality control	
2	Packaging manufacturing process	Type of material and design of packaging	No	Packaging producer	
3	Packaging/filling process	Easy closure,	No		
4	Logistics (including transport, warehousing and handling)	Stacking strength, Vibration Handling Shock Heat variations Moist environment Filling degree (e.g. Boxes / pallet and pallet/container)	Yes	Stability strength indicator	
5	Product presentation and marketing		No	Consumer specification	
6	User/Consumer acceptance	Undamaged packaging, "Size sells" concept	Yes	Consumers specification	
7	Information	Printability Moist resistance	No		
8	Safety	Food grade material	No	Regulations	
9	Legislation	Food contact approval	No	Regulations	
10	Other issues				

Forms for the other products are in Annex II. The group agreed that product protection and logistic was the critical factor in product design. The packaging must withstand e.g. stacking, handling and long storage time in moist environment. The search for a critical factor led to various considerations on stacking strength and logistic, see next chapter.

Checklist for evaluating packaging

- General guidance for minimising packaging packaging design, redesign and for evaluation of packaging and transport chain.

	Yes/ No/ Check	Comment
Can packaging be standardised in order to reduce packaging lager. (Same packaging used for several products)		Labelling in house or printed on packaging by packaging producer?
Can some layers of packaging be removed ?		
Is the best material used for the packaging and the best combination for composite materials ?		
Can less material be used ?		
Is the filling optimal ? Can the product be packed in a different way ? Can the packaging be resized or redesigned ?		
Can secondary packaging be removed ? Is e.g. wrapping sufficient ?		
Can more primary packs be inserted into secondary packaging ?		
If filler material used ? Is it minimised ? Can it be removed ?		
Can glue or staples be removed ?		
Is the thickness of wrap optimised ? Can it go down to 20-30mikron ?		
Is wrap, tape or straps the best option to stabilise packaging on a pallet ?		
Type of pallet. Are there lighter pallets that can be used ?		
Can the space in transport be utilised in a better way with different arrangement or different combination of packaging/pallet ? Or with small adjustments of packaging size or design ?		
Can corners and interlayer be used to strengthen stacks ?		
Can the packaging treatment be gentler in order to minimise transport loss ?		
Can better treatment during packaging increase utilisation of space ?		
Can the packaging be reused, especially tertiary and secondary packaging ?		
Can employee training and awareness increase quality and efficiency in packaging chain ?		
Can some packaging from suppliers be reused?		
Just-in-time delivery often requires less quality packaging (e.g. shorter storing time)		

Step 6. Optimising

The search for optimization led to following work:

- Checklist for packaging design.
- Optimising stacking strength
- Optimising logistics in three case studies

1. Checklist

A simple one page checklist was made for the company to use as a working document in future packaging design, see checklist.

2. Stacking strength

Information regarding stacking strength is not included in standard information from paper and cardboard producers. They are reluctant to give such information based on the fact that such values are not stable for the products. It is too much dependent on the situation the packaging goes through. Factors affecting Stacking strength are e.g. :

1. Packaging design
2. Product stacking strength in those cases where the product can withhold some of the weight put on the packaging, example frozen fish blocks.
3. Humidity /Moisture and time in storage
4. Irregularities in stacking
5. Vibration
6. Shocks and sudden impacts due to e.g. braking / acceleration of transport vehicles.

There are several methods available for testing stacking strength and it can be done for

1. Testing the fragility of the product
2. Packaging material (small sample of the material is tested)
3. Packed product

The group tried to get closer to this figure by asking for ECT values in order to compare different product but no values where obtained. ECT values are even harder to interpret as ECT only gives information on the cardboard material where as the packaging design is also of importance. The measured strength applies to the material at the time of the testing but as soon as the product leaves the factory moist, small fractures and other effects start to change the property of the packaging. The same packaging would therefore give different results in tests performed with several weeks interval. The practical way to deal with this is to have security limit. The thumb rule is that the real weight should not be less that twice the measured strength. In other words the ratio measured value over real value should not be less than two:

$$\text{Measured value} / \text{real value} > 2$$

where; Measured value = Measured stacking strength of packaging at delivery
Real value = Real weight put on packaging placed in bottom row in stacks

For the purpose of this project detailed information on specific packaging was sought to estimate this ratio. The group wanted to know how far from theoretical packaging strength the products were actually put through. Supplier *Kassagerdin – Central Packaging* agreed to participate in the work of this project and was willing to give information on selected packaging. Based on this the values in table 4 where calculated.

Table 4. The ratio for measured value for stacking strength over real value weight put on packaging.

Product	Measured value/real value
Ground fish 100 lbs	2,9
Ground fish 5 kg	2,6

3. Logistics

It was decided to investigate the logistics for selected products. For this supplier *Kassagerdin – Central Packaging* was involved in the work with the use of software to simulate the optimised stacking in packaging, warehouses and container.

Case study #1 - Box 400gr

This product is packed in Iceland in pre-designed packaging and transported to UK. For many bulk packed fish products the restraining factor in logistics is maximum weight allowed in containers. As this product has light weight this is not the case. For this packaging two approaches were taken:

1) Comparing three different modes of ordering in stack
2) Modelling the same product with small changes in packaging size

1) Three different modes of ordering in stack

The current stacking was modelled in computer software CAPE PACK. Two other ways of stacking were suggested by the software as optimal stacking, see annex III. Comparison was then made between them to identify logistical improvement, see table 5.

Table 5. Comparison of the three different modes (called A, B and C) of stacking the product.

	A	B	C	A-B	A-C
Nr. of primary pack on pallet	1512	1584	1530	72	18
Product / pallet (kg)	605	634	612	28,8	7,2
Boxes / pallet (kg)	63,5	66,5	64,3	3,0	0,8
Pallet (kg)	25	25	25		
Plastics (kg) / pallet					
Total packaging (kg)	88,5	91,5	89,3	3,024	0,8
Material Intensity	146,3	144,5	145,8	-1,9	-0,5
g packaging / kg product					
Nr. Boxes / container (20 pallets)	30240	31680	30600	1440	360
Products (kg) / container	12096	12672	12240	576	144

Both the material intensity (g packaging/ kg product) and the amount of products that can fit into one container indicate that method B is more effective, see figure 4. Still the difference is only 1% in material intensity and 4,5% for products (kg) per container. It must though be noted that method B requires more handling than method A does. The secondary packaging is smaller, containing only 4 boxes where as method A has 7 boxes in each secondary packaging. Reducing the number of primary packaging in a bundle from 7 to 4 and rearranging the stacking, increases the amount of products placed on the pallet. For a whole container, or 20 pallets, 1440 more boxes can be placed in the container with method B, which is almost the amount placed on one pallet. Looking at the secondary packaging the amount goes to 44 bundles per pallet with B instead of 24 with method A. Other effects are:

- Higher handling cost
- More secondary packaging needed (plastic wrap)
- More time consuming wrapping

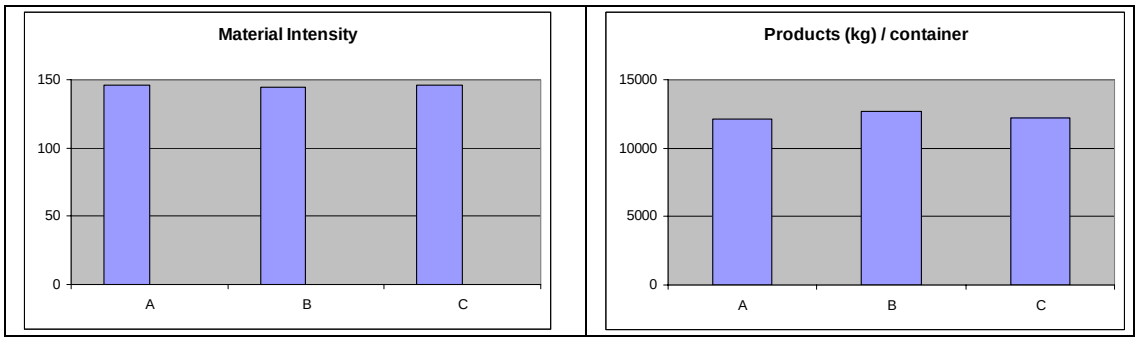


Figure 4. Material Intensity (g packaging / kg product) and amount of product in one container for three different modes of stacking.

2) Small changes made in packaging size

This example is meant to give an indication of how this kind of modelling can assist in future design projects. The outcome of the modelling is not an option for this particular packaging as the design has been implemented.

Boundary conditions for the modelling are set to be:

Length-height-depth increased or decreased by max 15 mm from current size.

The software searches for optimised size of packaging in order to gain optimised stacking on pallets.

A) Packaging redesigned #1

Current size in mm: 145 - 045 - 220
Recommendation in mm: 141 - 044 - 231

This way 1642 pcs. primary packaging can be put on the pallet but the secondary packaging is not realistic, the packaging line can not handle this geometry.
Material Intensity is 143,5 g packaging / kg product compared to 146,5 for the current stacking method.

B) Packaging redesigned #2

Current size in mm: 145 - 045 - 220
Recommendation in mm: 131 - 050 - 219

This way 1.620 pcs. primary packaging can be put on the pallet. Compared to current packaging, 1.512 pcs. per pallet, the difference is 108 pcs.
Material Intensity is 143,6 g packaging / kg product compared to 146,5 for the current stacking method.

Case study #2 - Gjögur – Tube

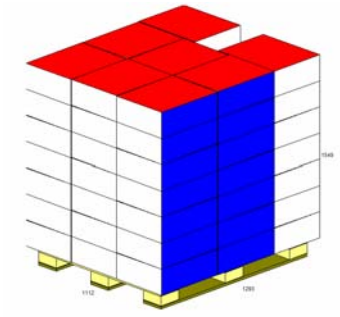
In this case the same product is packed in three different ways. The product is fish blocks, a bulk product that is packed either in

1) 3 x 8kg boxes called Gjögur
2) 20 kg boxes
3) Tube – One box per container filled with 8 kg blocks

In annex IV detailed information on the stacking is shown.

1) Gjögur

This case is on a 3 x 8kg fish blocks packed in the box shown to the left. Two examples are shown below. Gjögur A is the current mode of stacking and Gjögur B is a suggestion for changing the stacking.



Gjögur A

Current packaging is shown to the left. The stack is 7 layers high with 56 boxes altogether on the pallet or 168 blocks weighing 1344 kg. The product is overhanging from the pallet 47mm longways and 56mm breadthways. The stacking height is not utilising all the room available in the container. But the pallet should not exceed 1300 kg and as this is a heavy bulk product this limits the stacking height.

Gjögur B

The only option for optimisation is to change the stacking allowing no overhang and that way more pallets might fit into the container.

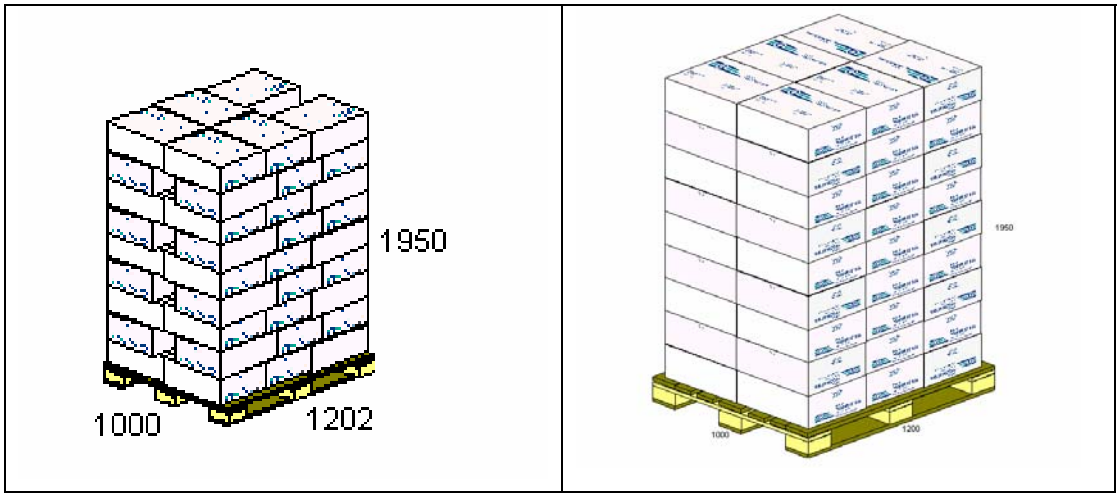


Figure 5. Alternative stacking for packaging Gjögur

In the example to the left in figure 5 the stacking has been reorganised without overhang but higher load. This way 54 boxes are on the pallet or 162 blocks which is 6 blocks less than for Gjögur A. One more layer would exceed the maximum height allowed. The stacking is similar to current stacking and can be rotated between layers. The same outcome is gained with the stacking shown to the right in figure x, by not turning the last row, but this gives not a possibility of rotating between layers.

2) 20 kg boxes

Current stacking is 4 boxes in 16 layers on each pallet with overhang, total 64 boxes per pallet or 1280 kg. The limiting factor is weight allowed on each pallet. No optimisations is needed here.

3) Tube

The box is designed to fit four layers of 9 x 8kg blocks. The bottom half is placed on a pallet, blocks are stacked up to 1m high and the upper half is put on as a lid, see figure 6. Altogether 144 blocks are inserted or 1152 kg.

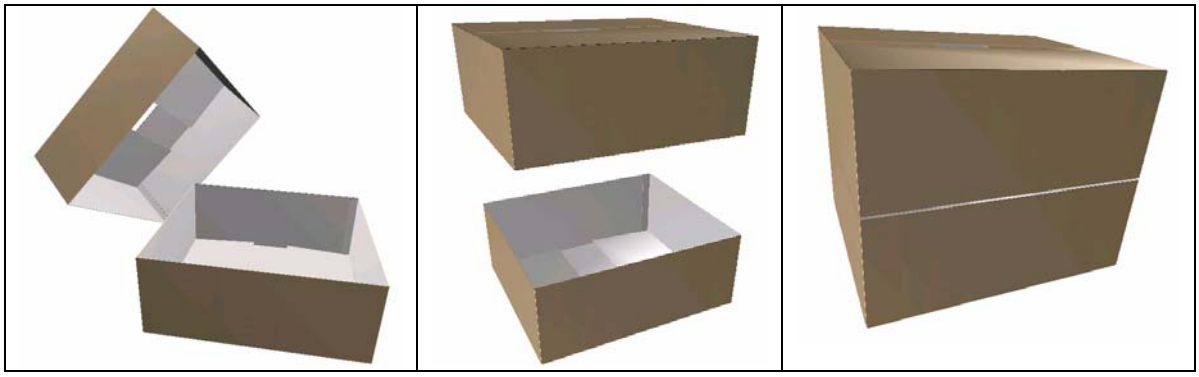


Figure 6. Tube

Comparison

Comparison between the methods is shown in table 6 and figure 7. The best option, both in regard to product per container and with regard to the amount of packaging used per kg product is the Tube.

As the packaging are very different other aspects than material intensity need to be considered as well, in order to choose the most appropriate packaging. These include:

- customer acceptance
- handling time and cost
- work load and settings

All methods seem to be optimised in logistics terms, although a small adjustment is suggested for Gjögur which leads to better use of container space.

Table 6. Comparison of the three different modes of packing the product.

	Gjögur A	Gjögur B	20 kg Box	Tube
Weight of box kg	0,36	0,36	0,392	10,86
Product in box kg	24	24	20	1152
Nr. of boxes on pallet	56	54	64	1
Product (kg) / pallet (kg)	1344	1296	1280	1152
Boxes (kg) / pallet (kg)	20,2	19,4	25,1	10,9
Pallet (kg)	25	25	25	25
Plastics (kg) / pallet (kg)	3,54	3,42	4,48	3,04
Wrap and top (kg)	0,57	0,57	0,57	0,57
Total packaging (kg)	49,3	48,4	55,1	39,5
Material Intensity packaging / product (g/kg)	36,7	37,4	43,1	34,3
Material Intensity Cardboard / product (g/kg)	15,0	15,0	19,6	9,4
Pallets per container	18	20	20	24
Boxes / container (20 pallets)	1008	1080	1280	24
Products net. / container (kg)	*24.192*	*25.920*	*25.600*	*27.648*
Product brutto/ container (kg)	*25.079*	*26.667*	*26.703*	*28.595*

In table 6 net. product refers to the weight of product only but brutto product refers to weight of product and packaging.

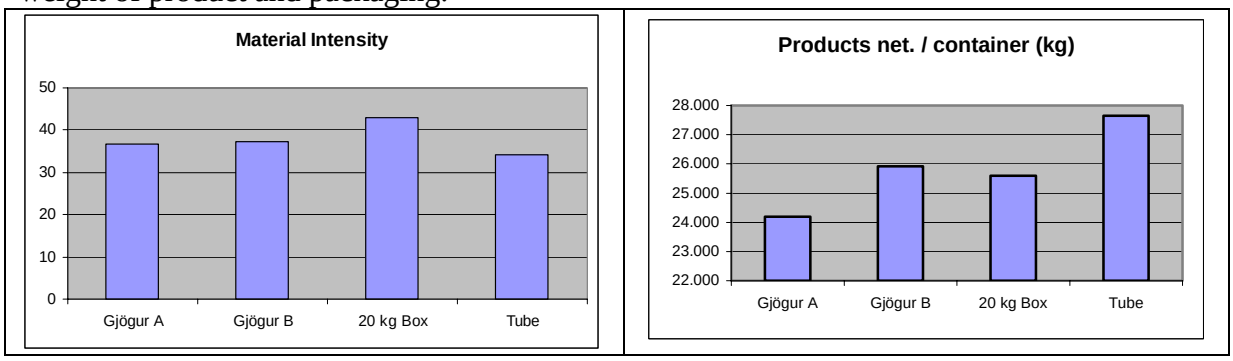


Figure 7. Material Intensity (g packaging / kg product) and amount of product in one container for three different modes of stacking.

Empty packaging logistic

Another aspect to be taken into consideration is the empty packaging logistics. The stacking was modelled for the three types of packaging, see figure 8 and annex IV.

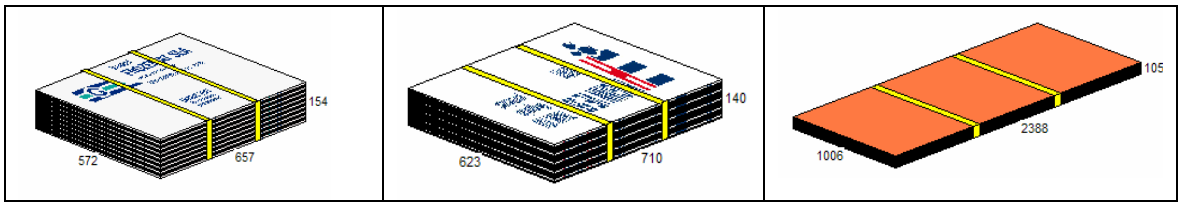


Figure 8. Empty packaging for 20 kg boxes, Gjögur and Tube.

Comparison for the amount of empty packaging transported is such:

Gjögur: 1.400 boxes /pallet whish is sufficient to pack 37.800 kg of product
20 kg: 1.400 boxes /pallet whish is sufficient to pack 28.000 kg of product
Tube: 150 boxes /pallet whish is sufficient to pack 172.800 kg of product

Again the Tube shows the greatest potential and handling and logistic for the packaging itself is less than for the others.

Case study #3 – High Cube Container

Two types of packaging were considered:
Box nr. 26 containing 2 x 6kg of shrimp
Box nr. 160 containing 4 x 2,5kg of shrimp

For both types three different modes of stabling are modeled; Euro pallet (800x1200), standard pallet (1000x1200) and no pallet. In the table the results are summariesed, see annex V for detail.

Nr.	Box nr.	Primary packaging	Weight incl. pack. (kg)	Pallet	Container max height	Box / Layer	Layer	Box / Pallet	Box / Container	Pallet / Container	Weight / Pallet (kg)	Weight / Container (kg)	Cube used
1	86	6 x 2kg	12,5	800x1200	2420	10	7	70	1610	23	878	20.196	88,00%
2	86	6 x 2kg	12,5	1000x1200	2420	13	7	91	1820	20	1.142	22.830	91,50%
3	86	6 x 2kg	12,5	no pallet	2420	260	8		2080			26.092	86,60%
4	160	4 x 2,5kg	10,5	800x1200	2420	10	9	90	2070	23	947	21.781	95,70%
5	160	4 x 2,5kg	10,5	1000x1200	2420	13	9	117	2340	20	1.231	24.621	99,50%
6	160	4 x 2,5kg	10,5	no pallet	2420	275	9		2470			25.989	87,20%

The highest number of packaging can be stabled into the container when not using a pallet. This is not surprising as the pallet takes some room. Still this is not practical in terms of work load during loading of the product into container.

Today standard containers are used for this product and for box nr. 86 the load is 20.069 kg/container. For box nr. 160 the load is 22.386 kg/container.

The benefits of High cube containers is first and foremost that more weight can be put in each container which is more cost effective and gives better utilization of the space. The draw backs are that higher stacks are unstable and care must be taken when doors are to low for such high stack. In those places the top layer has to be removed at harbor with extra handling and time. High cube containers are not suitable for bulk products as full loaded containers are to heavy. Each transport chain has to be evaluated separately.

Step 7. Assessment of Heavy metals and Material revorery

Documentation from suppliers Plastprent and Kassagerð confirm that packaging chemical content is in consistence with standards and regulations.

Step 8. Documentation

Testing of the Optipack documentation:
In annex VI are samples of the Optipack documentation which SÍF performed for there products.

SIF filled out the OptiPack document for selected product type with no difficulties but it was time consuming. All the information needed is available within the company. On the other hand SIF wondered if it is enough to fill out these forms only for one item per product group instead of doing this for each product.
SIF had some comments regarding this documentation:

- This documentation needs a lot of work and time to be maintained properly due to frequent changes in the packaging system chain.
- To fill out the questionnaire 4, critical area, a good experience is needed. It is good to have the score and figures to point out the critical area. What is missing in the Optipac system is to allow for documentation that confirms that this is really the critical are e.g. calculation of the stacking strength etc.
- To fill out questionnaire 5, packaging components, energy content is needed. It would be good to have a small table with energy content on this page.
- SIF missed documentation about the product key figures as was done in step 4 in this report. Those key figures describe clearly the packaging system ups and downs.
- SIF is not certain that they will use the Optipack documentation as it is to day. They think it is too much work to maintain it as mentioned earlier. The documentation needs to be simplified and developed further preferably into an intelligent computer model.

Annex I. Grouping of packaging

Saltfiskur: Flattur/flök	
25kg:	Kassi/styrktarhorn/miði/bindiborði/wrap
400kg:	Kassi/styrktarhorn/miði/bindiborði/wrap
800kg/1000kg:	Hólkur/miði/bindiborði/wrap
Frosið léttsaltað.	
1x10kg:	Kassi/poki/tape/wrap
Frosið/cello pakkningar:	
12x1kg	Kassi/askja/plast umslög/tape/wrap
10x1,5kg/6x2kg:	Kassi/askja/plast umslög/spjald/tape/wrap
10x5 lbs:	Kassi/askja/plast umslög/spjald/tape/wrap
30x2lbs:	Kassi/plast umslag/poki/tape/wrap
Frosið/millilagt:	
4x6kg:	Kassi/askja/plast/tape/wrap
3x15lbs	Kassi/askja/plast/tape/wrap
Frosið/blokk/marningur:	
4x16,5lbs:	Kassi/askja/tape/wrap
160x16,5lbs	2Hólkar/askja/bindiborði/wrap
Frosið/bitar/formflök:	
1x10lbs:	Kassi//poki/wrap
100x10lbs:	Magna kassi/stór poki/10lbs poki/bindiborði/wrap
1x1000lbs:	Magna kassi/stór poki/bindiborði/wrap
20x18kg	Magna kassi/stór poki/18kg poki/bindiborði/wrap
20x20kg	Magna kassi/stór poki/20kg poki/bindiborði/wrap
20x23kg	Magna kassi/stór poki/23kg poki/bindiborði/wrap
Sjófryst:	
3x20lbs (almennt)	Kassi/askja/plast/bindiborði/wrap
3x7kg (karfi)	Kassi/askja/plast/bindiborði/wrap
2x13kg (Grálúða)	Kassi/askja/plast/bindiborði/wrap
Sjófryst rækja:	
Iðnaður ca, 25-30kg	(Striga)poki
Iðnaður ca, 20-25kg	3. aðferðir. 1. 2öskjur í kassa. 2. plain blokkir í kassa. 3. Blokkir í poka.
Evrópa, 1x5kg	botn+lok/plast/wrap
Japan, 12x1kg	kassi/poki/askja(vax)/tape/wrap
Soðin&pilluð rækja.	
6x2kg, 1x12kg	Kassi/poki/tape/wrap
4x2,5kg, 1x10kg, 5x2kg	Kassi/poki/tape/wrap
40x12kg,	Magna kassi/stór poki/12 poki/bindiborði/wrap
Ferskur fiskur:	
1x5kg	Frauðkassi/poki/bleia/tape/wrap
1x7kg (tvær stærðir)	Frauðkassi/poki/bleia/tape/wrap
1x13kg(algengast)	Frauðkassi/poki/bleia/tape/wrap
1x25kg (laxakassi)	Frauðkassi/poki/bleia/tape/wrap

ATH. Notaður er ytri poki (utan um frauðkassann) þegar að varan er flutt með farþegavélum en ekki þegar að flutt er með fraktvélum.

Humar:	
12x1kg, Ítalía.	Kassi/asja(botn og lok)/tape/wrap
12x1,5kg, Spánn	Frauðkassi/tape/bindiborði á 4. kassa/wrap
6x5lbs	Kassi/askja/plastörk/tape/wrap
5x5lbs	Kassi/askja/plastörk/tape/wrap
5x5lbs, IQF	Kassi/poki/tape/wrap
3x11lbs	Kass/askja/poki/tape/wrap
Landfryst/sjófryst:	**Síld/loðna**
3x8kg	Poki/kassi/bindiborði
3x9kg	Poki/kassi/bindiborði
1x20kg	Poki/kassi/bindiborði
Síld: söltuð/edik/krydd	
120L	Plast tunna.
Hörpudiskur:	
5x5lbs, 6x5lbs	Kassi/poki/tape/wrap
6x2kg, 1x12kg	Kassi/poki/tape/wrap

Annex II Performance Criteria

Company: SÍF **Product: Cod 1000lbs** **Date: 19/05/03** **Done by:**					
	Performance criteria	**Relevant requirements**	**Critical areas**	**Ref.**	**Points**
1	Product protection	Keep moist inside for freshness, Mechanical protection	Yes	Quality control	
2	Packaging manufacturing process	Type of material and design of packaging	No	Packaging producer	
3	Packaging/filling process	Easy closure, Filling degree (e.g. increased by shaking)	Yes		
4	Logistics (including transport, warehousing and handling)	Stabling strength, Vibration Handling Shock Heat variations Moist environment Filling degree (e.g. Boxes / pallet and pallet/container)	Yes	Stability strength indicator	
5	Product presentation and marketing		No	Consumer specification	
6	User/Consumer acceptance	Undamaged packaging	No	Consumers specification	
7	Information	Printability Moist resistance	No		
8	Safety	Food grade material	No	Regulations	
9	Legislation	Food contact approval	No	Regulations	
10	Other issues				

Company: SÍF **Product: Cod 10lbs** **Date: 19/05/03** **Done by:**					
	Performance criteria	**Relevant requirements**	**Critical areas**	**Ref.**	**Points**
1	Product protection	Keep moist inside for freshness, Mechanical protection	Yes	Quality control	
2	Packaging manufacturing process	Type of material and design of packaging	No	Packaging producer	
3	Packaging/filling process	Easy closure, Filling degree (e.g. increased by shaking)	No		
4	Logistics (including transport, warehousing and handling)	Stabling strength, Vibration Handling Shock Heat variations Moist environment Filling degree (e.g. Boxes / pallet and pallet/container)	Yes	Stability strength indicator	
5	Product presentation and marketing		No	Consumer specification	
6	User/Consumer acceptance	Undamaged packaging, "Size sells" concept	Yes	Consumers specification	
7	Information	Printability Moist resistance	No		
8	Safety	Food grade material	No	Regulations	
9	Legislation	Food contact approval	No	Regulations	
10	Other issues				

Company: SÍF **Product: Shrimp**		**Date: 19/05/03**	**Done by:**		
	Performance criteria	**Relevant requirements**	**Critical areas**	**Ref.**	**Points**
1	Product protection	Keep moist inside for freshness, Mechanical protection	Yes	Quality control	
2	Packaging manufacturing process	Type of material and design of packaging	No	Packaging producer	
3	Packaging/filling process	Easy closure, Filling degree (e.g. increased by shaking)	No		
4	Logistics (including transport, warehousing and handling)	Stabling strength, Vibration Handling Shock Heat variations Moist environment Filling degree (e.g. Boxes / pallet and pallet/container)	Yes	Stability strength indicator	
5	Product presentation and marketing		No	Consumer specification	
6	User/Consumer acceptance		No	Consumers specification	
7	Information	Printability Moist resistance	No		
8	Safety	Food grade material	No	Regulations	
9	Legislation	Food contact approval	No	Regulations	
10	Other issues				

Annex III Case study #1 - Box 400gr

1) Three different modes of ordering in stack

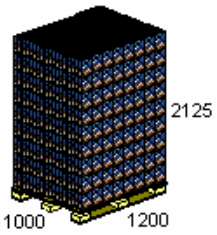
The current stacking was modelled in computer software CAPE PACK. Two other ways of stacking were suggested by the software as optimal stacking. Comparison was then made between them to identify logistical improvement.

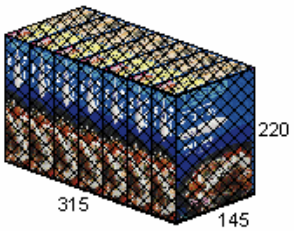
A) Current loading

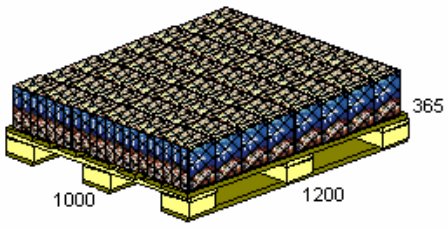
Primary packaging are put 7 in a secondary plastic wrapping and placed on a standard pallet. Results of database calculation are:

Product Name	V291344 400gr					
Product Code	Öskjur búntaðar saman 7stk					
Kassagerðin hf				7		Askja / Kassi
Formhönnun				1512		Askja / Load
Tillaga v/nýtt form				24		Kassi / Layer
				9		Layer / Load
Pallet type	euro2			216		Kassi / Load

		Length	Width	Height		Net	Gross		Volume	
Askja	(OD)	145,0	45,0	220,0	mm	0,400	0,400	Kg	1435	cm^3
Kassi	(ID)	315,0	145,0	220,0	mm	2,800	2,962	Kg	10048	cm^3
Kassi	(OD)	315,0	145,0	220,0	mm	2,800	2,962	Kg	10048	cm^3
Product		1160,0	945,0	1980,0	mm	604,800	639,792	Kg	2,17	m^3
Load		1200,0	1000,0	2125,0	mm	604,800	669,792	Kg	2,55	m^3
Overhang		-20,0	-27,5		mm					







B) Suggestion B

The database searches for optimised loading based on the set boundaries conditions :

- 4 – 7 primary packaging in secondary packaging
- Standard pallet
- Height at Container size

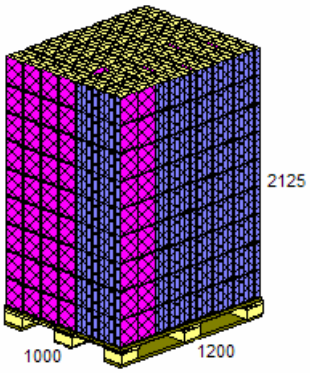
Best case is given with 4 primary packaging in secondary and the following arrangement.

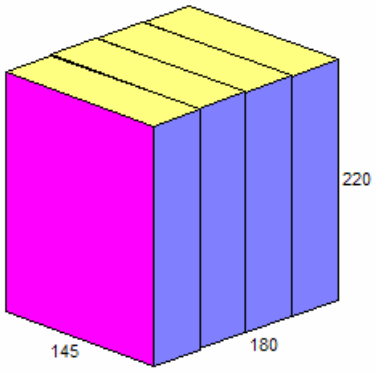
Results are :

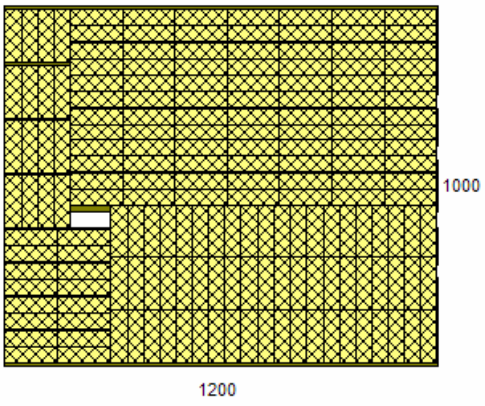
3. febrúar 2004

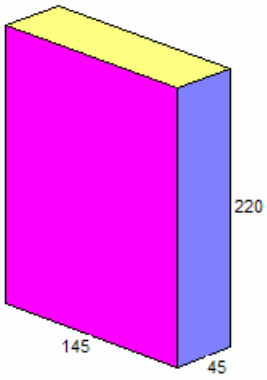
Product Name	V291344 400gr					
Product Code	Öskjur búntaðar saman 7stk					
Datafile Name	(19.10.2003)					
Solution Ref.	1 S			4		Askja / Kassi
Cube Used	95,5 %			1584		Askja / Load
Area Used	95,7 %			44		Kassi / Layer
Pallet type	euro2			9		Layer / Load
				396		Kassi / Load
				4		Askja / fjórar
				396		fjórar / Load
				1		fjórar / Kassi

		Length	Width	Height		Net	Gross		Volume	
Askja	(OD)	145,0	45,0	220,0	mm	0,400	0,400	Kg	1435	cm^3
fjórar	(ID)	180,0	145,0	220,0	mm	1,600	1,600	Kg	5742	cm^3
fjórar	(OD)	180,0	145,0	220,0	mm	1,600	1,600	Kg	5742	cm^3
Kassi	(ID)	180,0	145,0	220,0	mm	1,600	1,715	Kg	5742	cm^3
Kassi	(OD)	180,0	145,0	220,0	mm	1,600	1,715	Kg	5742	cm^3
Product		1195,0	975,0	1980,0	mm	633,600	679,140	Kg	2,31	m^3
Load		1200,0	1000,0	2125,0	mm	633,600	709,140	Kg	2,55	m^3
Overhang		-2,5	-12,5		mm					







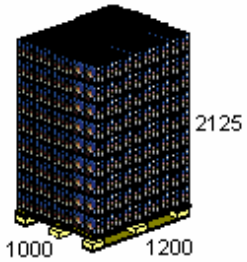


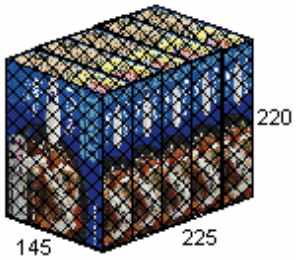
C) Suggestion C

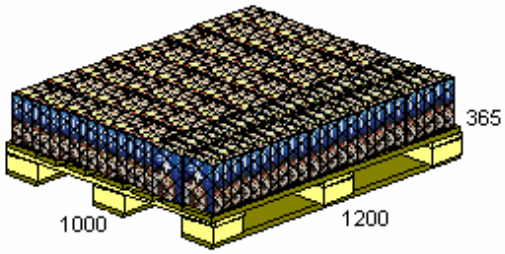
Another suggestion based on the same boundary conditions as below includes 5 primary packaging in secondary packaging.

Product Name	V291344 400gr		
Product Code	Öskjur búntaðar saman 7stk		
Kassagerðin hf		5	Askja / Kassi
Formhönnun		1530	Askja / Load
Tillaga v/nýtt form		34	Kassi / Layer
		9	Layer / Load
Pallet type	euro2	306	Kassi / Load

	Length	Width	Height		Net	Gross		Volume	
Askja (OD)	145,0	45,0	220,0	mm	0,400	0,400	Kg	1435	cm^3
Kassi (ID)	225,0	145,0	220,0	mm	2,000	2,131	Kg	7177	cm^3
Kassi (OD)	225,0	145,0	220,0	mm	2,000	2,131	Kg	7177	cm^3
Product	1160,0	965,0	1980,0	mm	612,000	652,086	Kg	2,22	m^3
Load	1200,0	1000,0	2125,0	mm	612,000	682,086	Kg	2,55	m^3
Overhang	-20,0	-17,5		mm					







2) Small changes made in packaging size

Boundary conditions for the redesigned modelling are set to be:

Length-height-depth increased or decreased by max 15 mm from current size.

The software searches for optimised size of packaging in order to gain optimised stacking on pallets.

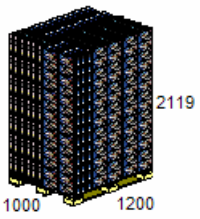
A) Packaging redesigned #1

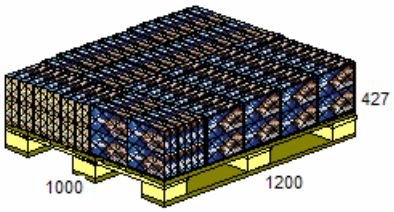
Current size in mm: 145 - 045 - 220

Recommendation in mm: 141 – 044 - 231

```
Product Name   V291344 400gr
Product Code   Öskjur búntaðar saman 7stk
Kassagerðin hf                                    4          Askja / Kassi
Formhönnun                                     1624          Askja / Load
Tillaga v/nýtt form                              58          Kassi / Layer
                                                  7          Layer / Load
Pallet type    euro2                            406          Kassi / Load


               Length     Width    Height          Net     Gross       Volume
Askja    (OD)   141,0      44,0     231,4 mm     0,400     0,400 Kg       1435 cm^3
Kassi    (ID)   282,0      88,0     231,4 mm     1,600     1,714 Kg       5742 cm^3
Kassi    (OD)   282,0      88,0     231,4 mm     1,600     1,714 Kg       5742 cm^3
Product        1199,4     990,8    1974,0 mm   649,600   695,884 Kg       2,35  m^3
Load           1200,0    1000,0    2119,0 mm   649,600   725,884 Kg       2,54  m^3
Overhang         -0,3      -4,6          mm
```





B) Packaging redesigned #2

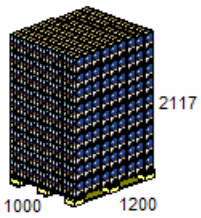
Current size in mm: 145 - 045 - 220

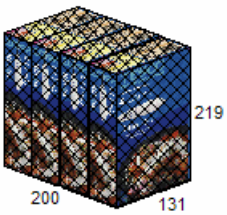
Recommendation in mm: 131 - 050 - 219

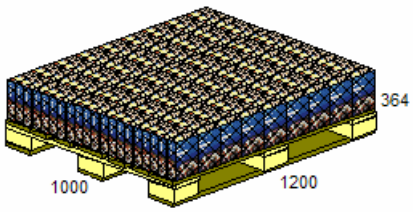
Product Name V291344 400gr
Product Code Öskjur búntaðar saman 7stk

Kassagerðin hf	4	Askja / Kassi	
Formhönnun	1620	Askja / Load	
Tillaga v/nýtt form	45	Kassi / Layer	
	9	Layer / Load	
Pallet type euro2	405	Kassi / Load	

		Length	Width	Height		Net	Gross		Volume	
Askja	(OD)	131,0	50,0	219,2	mm	0,400	0,400	Kg	1435	cm^3
Kassi	(ID)	200,0	131,0	219,2	mm	1,600	1,712	Kg	5743	cm^3
Kassi	(OD)	200,0	131,0	219,2	mm	1,600	1,712	Kg	5743	cm^3
Product		1179,0	1000,0	1972,4	mm	648,000	693,360	Kg	2,33	m^3
Load		1200,0	1000,0	2117,4	mm	648,000	723,360	Kg	2,54	m^3
Overhang		-10,5	0,0		mm					







Comparison is shown in the table below.

	A	R1	R2	A - R1	A-R2
Nr. of primary pack on pallet	1512	1624	1620	112	108
Product / pallet (kg)	605	650	648	44,8	43,2
Boxes / pallet (kg)	63,5	68,2	68,0	4,7	4,5
Pallet (kg)	25	25	25		
Plastics (kg) / pallet					
Total packaging (kg) / pallet	88,5	93,2	93,0	4,704	4,5
Material Intensity	6,8	7,0	7,0	0,14	0,1
g packaging / kg product					
Nr. Boxes / container (20 pallets)	30240	32480	32400	2240	2160
Products (kg) / container	12096	12992	12960	896	864

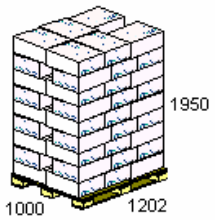
Annex IV Case study #2 – Gjögur – Tube

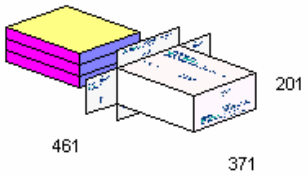
1) Gjögur B

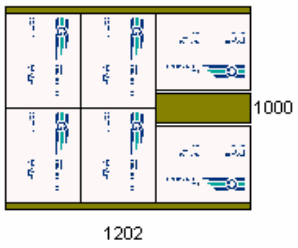
The only option for optimisation is to change the stacking allowing no overhang and that way more pallets might fit into the container. In the example below the stacking has been reorganised without overhang but higher load. This way 54 boxes are on the pallet or 162 blocks which is 6 blocks less than above. One more layer would exceed the maximum height allowed.

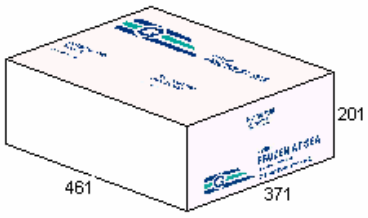
Product Name 3 x 8,0 kg í V272419
Product Code 10064Gjögur V272419

Kassagerðin hf				3		Carton / Kassi	
Formhönnun				162		Carton / Load	
Tillaga v/nýtt form				6		Kassi / Layer	
				9		Layer / Load	
Pallet type euro2				54		Kassi / Load	
	Length	Width	Height	Net	Gross	Volume	
Carton (OD)	445,0	360,0	63,0 mm	9,000	9,800 Kg	10092	cm^3
Kassi (ID)	365,0	195,0	450,0 mm	27,000	29,765 Kg	32028	cm^3
Kassi (OD)	370,6	200,6	461,2 mm	27,000	29,765 Kg	34286	cm^3
Product	1202,4	923,3	1805,4 mm	1,588	1,607 t	2,00	m^3
Load	1202,4	1000,0	1950,4 mm	1,458	1,637 t	2,35	m^3
Overhang	1,2	-38,4	mm				









The stacking is similar to current stacking and can be rotated between layers. The same outcome is gained with the stacking shown to the left, by not turning the last row, but this gives not a possibility of rotating between layers.

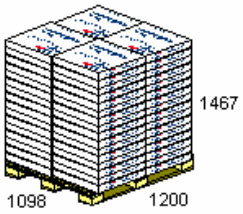
2) 20 kg boxes

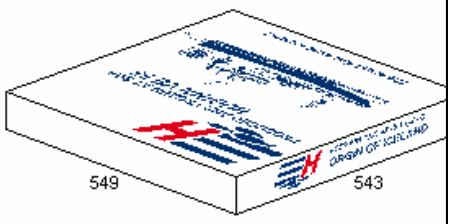
Current stacking is 4 boxes in 16 layers on each pallet with overhang, total 64 boxes per pallet or 1280 kg. The limiting factor is weight allowed on each pallet. No optimisations is needed here.

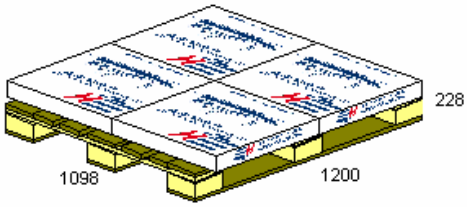
Product Name 1 x 20 kg í V279299
Product Code 10069 1X20kg Huginn

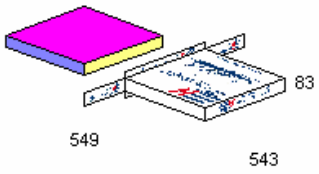
Kassagerðin hf					1		Carton / Kassi	
Formhönnun					64		Carton / Load	
Tillaga v/nýtt form					4		Kassi / Layer	
					16		Layer / Load	
Pallet type	euro2				64		Kassi / Load	

		Length	Width	Height		Net	Gross		Volume	
Carton	(OD)	532,0	72,0	530,0	mm	20,000	20,000	Kg	20301	cm^3
Kassi	(ID)	537,0	77,0	538,0	mm	20,000	20,382	Kg	22245	cm^3
Kassi	(OD)	542,6	82,6	549,2	mm	20,000	20,382	Kg	24614	cm^3
Product		1085,2	1098,4	1321,6	mm	1,280	1,304	t	1,58	m^3
Load		1200,0	1098,4	1466,6	mm	1,280	1,334	t	1,93	m^3
Overhang		-57,4	49,2		mm					







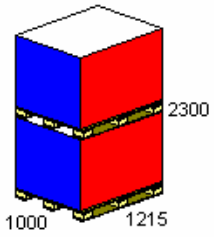


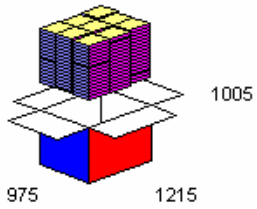
3) Tube

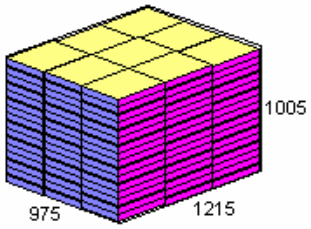
The box is designed to fit for layers of 9 x 8kg blocks. The bottom half is placed on a pallet, blocks are stacked up to 1m high and the upper half is put on as a lid. Altogether 144 blocks are inserted or 1152 kg.

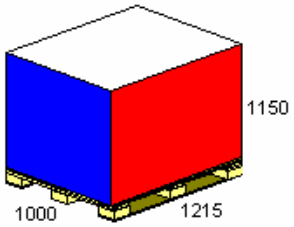
Product Name 120 x 8kg í V237248
Product Code Loðnuhólkur
Kassagerðin hf 144 Carton / Kassi
Formhönnun 144 Carton / Load
Tillaga v/nýtt form 1 Kassi / Layer
1 Layer / Load
Pallet type euro2 1 Kassi / Load

		Length	Width	Height		Net	Gross		Volume	
Carton	(OD)	400,0	320,0	62,0	mm	8,000	8,000	Kg	7936	cm^3
Kassi	(ID)	1209,0	969,0	994,0	mm	1,152	1,156	t	1,16	m^3
Kassi	(OD)	1214,6	974,6	1005,2	mm	1,152	1,156	t	1,19	m^3
Product		1214,6	974,6	1005,2	mm	1,152	1,156	t	1,19	m^3
Load		1214,6	1000,0	1150,2	mm	1,152	1,186	t	1,40	m^3
Overhang		7,3	-12,7		mm					









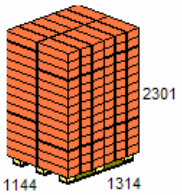
Empty Packaging logistics

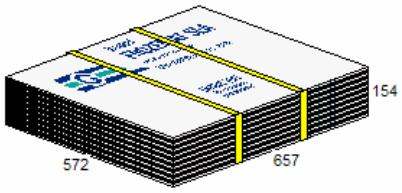
Gjögur:

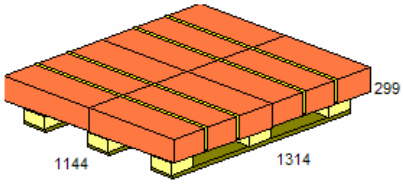
Product Name
Product Code

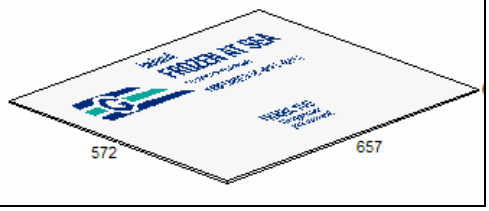
Kassagerðin hf	25	KDF / KDF
Formhönnun	1400	KDF / Load
Tillaga v/nýtt form	4	KDF / Layer
Skv.ebl.323	14	Layer / Load
Pallet type euro2	56	KDF / Load

		Length	Width	Height		Net	Gross		Volume	
KDF	(OD)	657,0	572,0	6,2	mm	0,000	0,360	Kg	2329	cm^3
KDF	(OD)	657,0	572,0	154,0	mm	9,000	9,000	Kg	57873	cm^3
Product		1314,0	1144,0	2156,0	mm	504,000	504,000	Kg	3,24	m^3
Load		1314,0	1144,0	2301,0	mm	504,000	534,000	Kg	3,46	m^3
Overhang		57,0	72,0		mm					





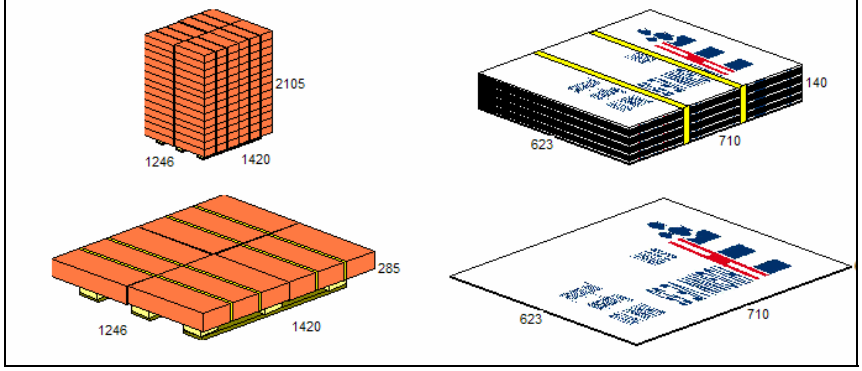




20 kg boxes:

Product Name
Product Code
Kassagerðin hf 25 KDF / KDF
Formhönnun 1400 KDF / Load
Tillaga v/nýtt form 4 KDF / Layer
Skv.ebl.323 14 Layer / Load
Pallet type euro2 56 KDF / Load

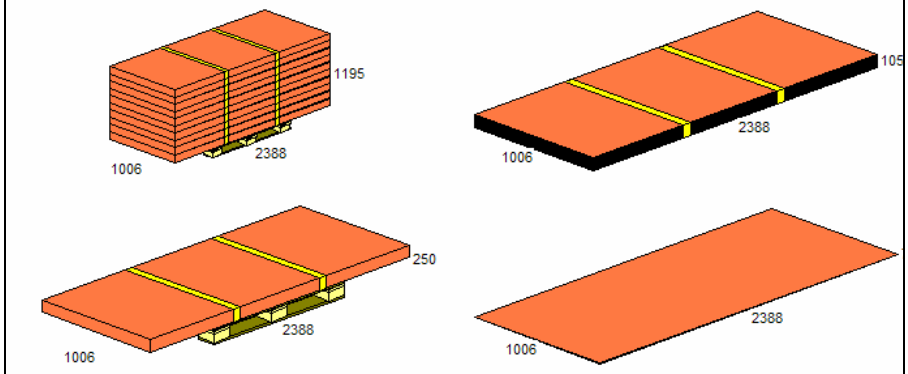
		Length	Width	Height		Net	Gross	Volume
KDF	(OD)	710,0	623,0	5,6	mm	0,000	0,392 Kg	2477 cm^3
KDF	(OD)	710,0	623,0	140,0	mm	9,800	9,800 Kg	61926 cm^3
Product		1420,0	1246,0	1960,0	mm	548,800	548,800 Kg	3,47 m^3
Load		1420,0	1246,0	2105,0	mm	548,800	578,800 Kg	3,72 m^3
Overhang		110,0	123,0		mm			



Tube:

Product Name KDF Group
Product Code Flatblank
Kassagerðin hf 15 KDF / Bundle
Formhönnun 150 KDF / Load
Tillaga v/nýtt form 1 Bundle / Layer
Skv.ebl.323 10 Layer / Load
Pallet type euro2 10 Bundle / Load

		Length	Width	Height		Net	Gross	Volume
KDF	(OD)	2388,0	1006,0	7,0	mm	0,000	2,950 Kg	16816 cm^3
Bundle	(OD)	2388,0	1006,0	105,0	mm	44,250	44,250 Kg	0,25 m^3
Product		2388,0	1006,0	1050,0	mm	442,500	442,500 Kg	2,52 m^3
Load		2388,0	1006,0	1195,0	mm	442,500	472,500 Kg	2,87 m^3
Overhang		594,0	3,0		mm			



Annex V Case study #3 – High Cube Container

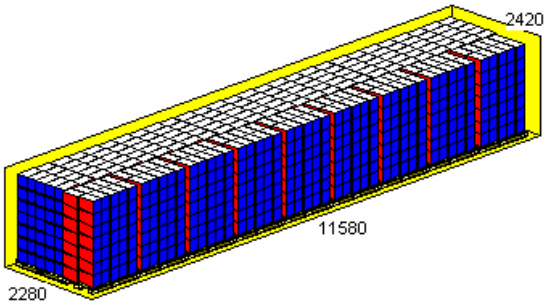
Box #86 Pallet 800 x 1200

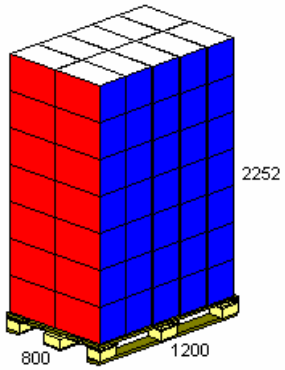
Container 1158-228-242 (load line)

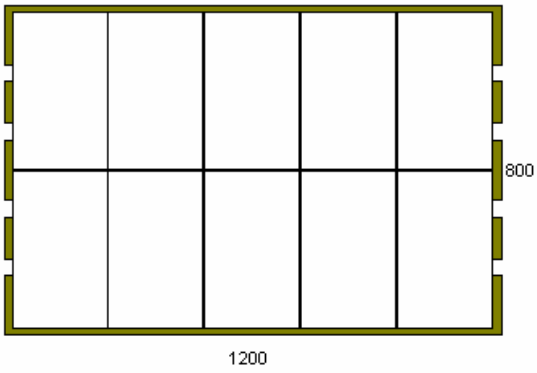
24.september 2004

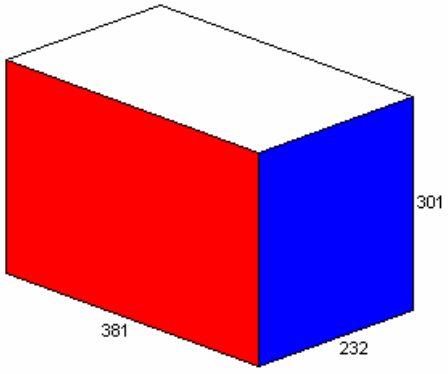
Product Name	Kassi # 86						
Product Code	Kassi/bretti/gámur						
Datafile Name	(2.10.2004)						
Solution Ref.	1 C						
Cube Used	88,0 %				10		Case / Layer
Area Used	92,1 %				7		Layer / Load
Pallet type	euro1				70		Case / Load
Truck Solution Ref.	1	I			1610		Case / sam 40ft
Truck Area Used	83,6 %				23		Load / sam 40ft

	Length	Width	Height		Net	Gross		Volume	
Case (ID)	381,0	232,0	301,0	mm	12,000	12,500	Kg	26605	cm^3
Case (OD)	381,0	232,0	301,0	mm	12,000	12,500	Kg	26605	cm^3
Product	1160,0	762,0	2107,0	mm	840,000	875,000	Kg	1,86	m^3
Load	1200,0	800,0	2252,0	mm	875,000	900,000	Kg	2,16	m^3
Overhang	-20,0	-19,0		mm					
Product	11200,0	2000,0	2252,0	mm	20,125	20,700	t	50,44	m^3
sam 40ft	11580,0	2280,0	2420,0	mm	20,700	21,700	t	63,89	m^3









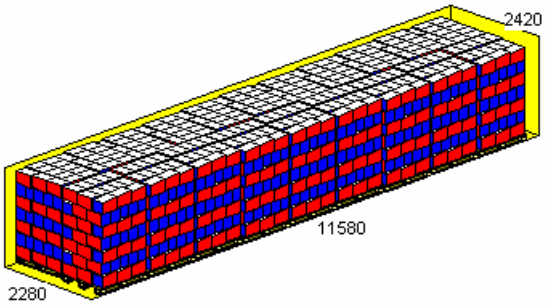
Box #86 Paller 1000 x 1200

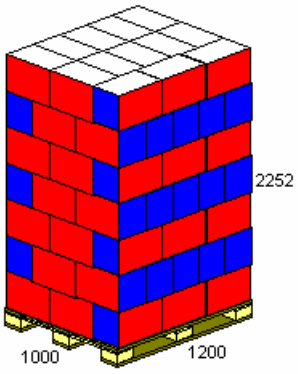
Container 1158-228-242 (load line)

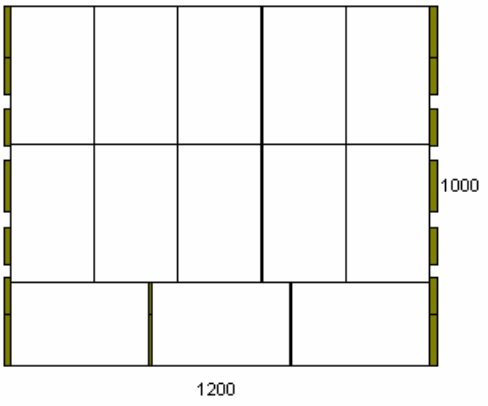
24.september 2004

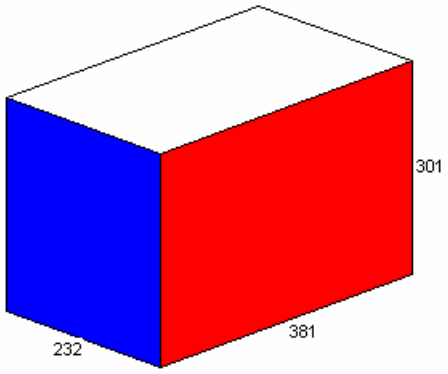
```
Product Name    Kassi # 86
Product Code    Kassi/bretti/gámur
Datafile Name            (2.10.2004)
Solution Ref.     1 I
Cube Used        91,5 %                          13          Case / Layer
Area Used        95,8 %                           7         Layer / Load
Pallet type     euro2                            91          Case / Load
Truck Solution Ref.  1  I                      1820          Case / sam 40ft
Truck Area Used  90,9 %                          20          Load / sam 40ft

                Length     Width    Height          Net     Gross       Volume
Case     (ID)    381,0     232,0     301,0 mm    12,000    12,500 Kg     26605 cm^3
Case     (OD)    381,0     232,0     301,0 mm    12,000    12,500 Kg     26605 cm^3
Product         1160,0     994,0    2107,0 mm     1,092     1,138  t       2,43  m^3
Load            1200,0    1000,0    2252,0 mm     1,138     1,168  t       2,70  m^3
Overhang         -20,0      -3,0          mm
Product        11000,0    2200,0    2252,0 mm    22,750    23,350  t      54,50  m^3
sam 40ft       11580,0    2280,0    2420,0 mm    23,350    24,350  t      63,89  m^3
```









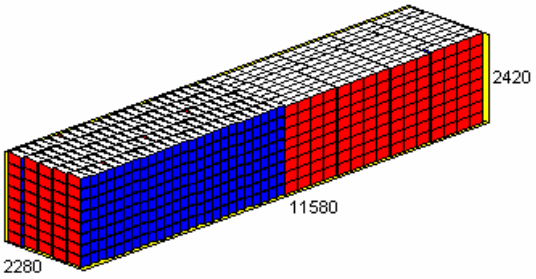
Box #86 no pallet

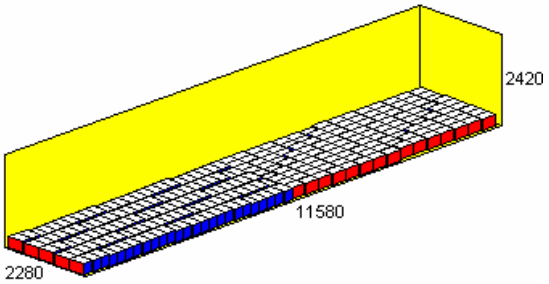
Container 1158-228-242 (load line)

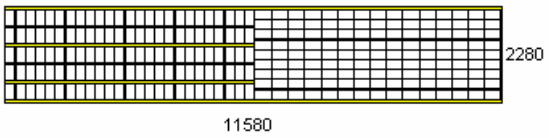
24.september 2004

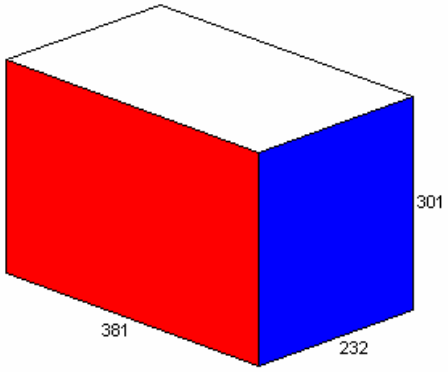
Product Name	Kassi # 86						
Product Code	Kassi/bretti/gámur						
Datafile Name	(2.10.2004)						
Solution Ref.	1 I						
Cube Used	86,6 %				260		Case / Layer
Area Used	87,0 %				8		Layer / Load
Pallet type	sam 40ft				2080		Case / Load

		Length	Width	Height		Net	Gross		Volume	
Case	(ID)	381,0	232,0	301,0	mm	12,000	12,500	Kg	26605	cm^3
Case	(OD)	381,0	232,0	301,0	mm	12,000	12,500	Kg	26605	cm^3
Product		11515,0	2088,0	2408,0	mm	24,960	26,000	t	57,90	m^3
Load		11580,0	2280,0	2420,0	mm	26,000	26,000	t	63,89	m^3
Overhang		-32,5	-96,0		mm					









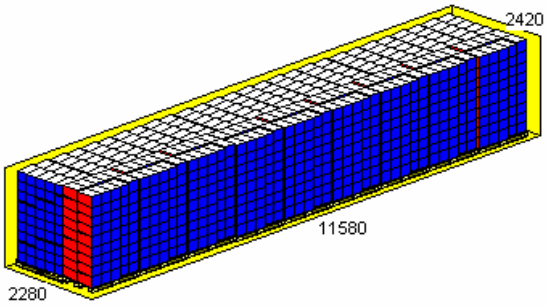
Box #160 Pallet 800 x 1200

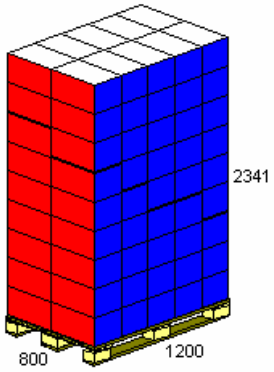
Container 40’ 1158-228-242 (load line)

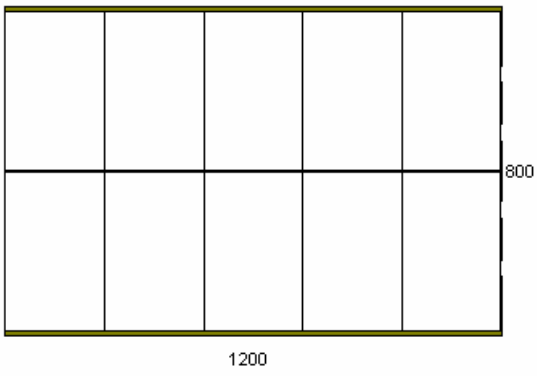
24.september 2004

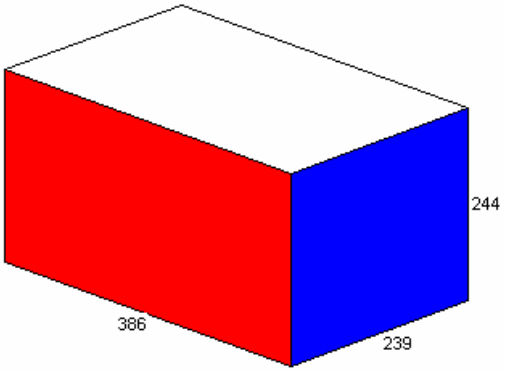
Product Name	Kassi #160			
Product Code	Kassi/bretti/gámur			
Datafile Name	(2.10.2004)			
Solution Ref.	1 C			
Cube Used	95,7 %	10	Case / Layer	
Area Used	96,1 %	9	Layer / Load	
Pallet type	euro1	90	Case / Load	
Truck Solution Ref.	1 I	2070	Case / sam 40ft	
Truck Area Used	83,6 %	23	Load / sam 40ft	

	Length	Width	Height		Net	Gross		Volume	
Case (ID)	386,0	239,0	244,0	mm	10,000	10,500	Kg	22509	cm^3
Case (OD)	386,0	239,0	244,0	mm	10,000	10,500	Kg	22509	cm^3
Product	1195,0	772,0	2196,0	mm	900,000	945,000	Kg	2,03	m^3
Load	1200,0	800,0	2341,0	mm	945,000	970,000	Kg	2,25	m^3
Overhang	-2,5	-14,0		mm					
Product	11200,0	2000,0	2341,0	mm	21,735	22,310	t	52,44	m^3
sam 40ft	11580,0	2280,0	2420,0	mm	22,310	23,310	t	63,89	m^3









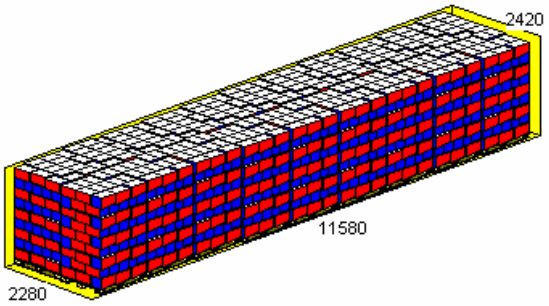
Box #160 Pallet 1000 x 1200

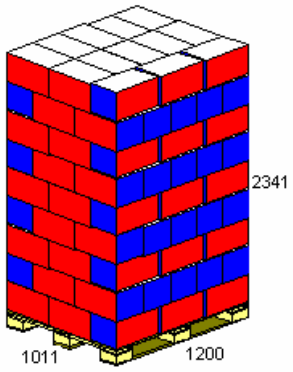
Container 40’ 1158-228-242 (load line)

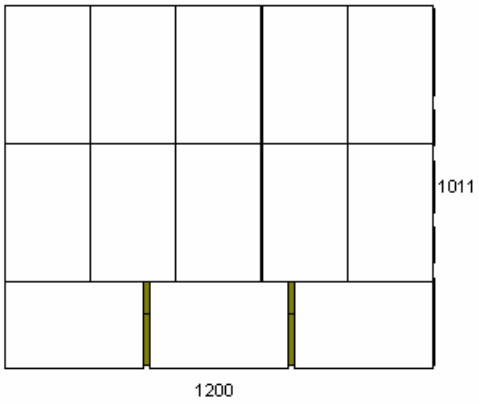
24.september 2004

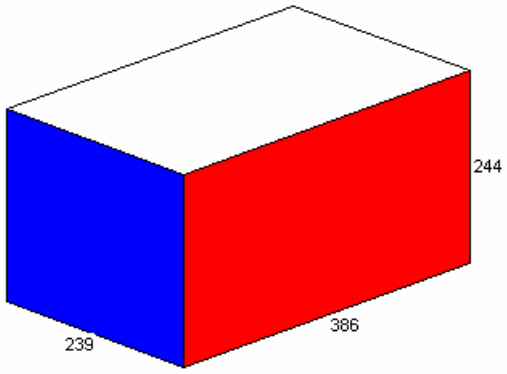
```
Product Name    Kassi #160
Product Code    Kassi/bretti/gámur
Datafile Name             (2.10.2004)
Solution Ref.     1  I
Cube Used        99,5 %                          13          Case / Layer
Area Used        99,9 %                           9         Layer / Load
Pallet type     euro2                           117          Case / Load
Truck Solution Ref.  1   I                     2340          Case / sam 40ft
Truck Area Used  91,9 %                          20          Load / sam 40ft

                Length     Width    Height          Net     Gross       Volume
Case     (ID)    386,0     239,0     244,0 mm    10,000    10,500 Kg     22509 cm^3
Case     (OD)    386,0     239,0     244,0 mm    10,000    10,500 Kg     22509 cm^3
Product         1195,0    1011,0    2196,0 mm     1,170     1,229  t       2,65  m^3
Load            1200,0    1011,0    2341,0 mm     1,229     1,259  t       2,84  m^3
Overhang          -2,5       5,5          mm
Product        11121,0    2211,0    2341,0 mm    24,570    25,170  t      57,56  m^3
sam 40ft       11580,0    2280,0    2420,0 mm    25,170    26,170  t      63,89  m^3
```









Box #160 No Pallet

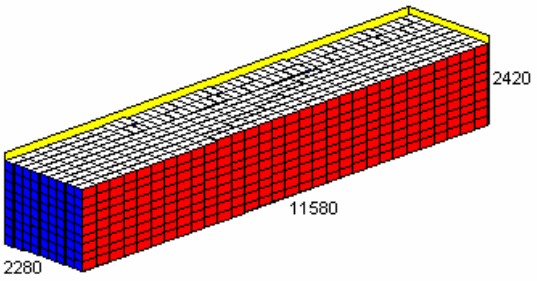
Container 40’ 1158-228-242 (load line)

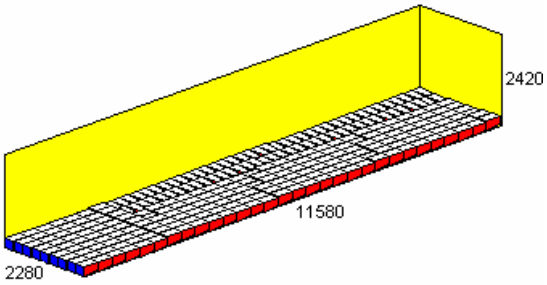
24.september 2004

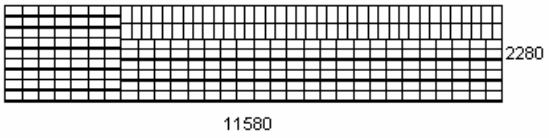
Product Name	Kassi #160
Product Code	Kassi/bretti/gámur
Datafile Name	(2.10.2004)
Solution Ref.	1 T
Cube Used	87,2 %
Area Used	96,1 %
Pallet type	sam 40ft

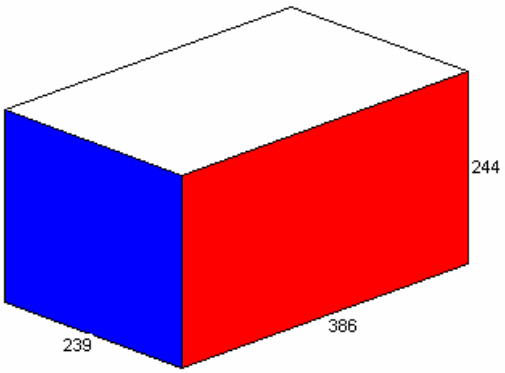
		Length	Width	Height		Net	Gross		Volume
Case	(ID)	386,0	239,0	244,0	mm	10,000	10,500	Kg	22509 cm^3
Case	(OD)	386,0	239,0	244,0	mm	10,000	10,500	Kg	22509 cm^3
Product		11580,0	2206,0	2196,0	mm	24,750	25,988	t	56,10 m^3
Load		11580,0	2280,0	2420,0	mm	25,988	26,988	t	63,89 m^3
Overhang		0,0	-37,0		mm				

Case / Layer	275
Layer / Load	9
Case / Load	2475









Annex VI Opti-Pack documentation

The intention of this questionnaire is to describe the product and the distribution chain. It is important to describe conditions which might have influence on the dimension of one or more parts of the packaging system.

Please fill in the white cells where possible and use the cells "Other" to describe relevant aspects not covered by the questionnaire.

Product name and description	Various I.Q.F. products, packed 20x23 kg in tote. The tote is wrapped and put on pallet.	
Relevant technical problems that might occur during the filling process		
Relevant geographic market areas for the product	The product is transported to Reykjavik in containers (18°C or below) by truck and then shipped to Europe, US, Asia	
Temperature demands during distribution		Uninterrupted temperature conditions
	Yes	Uninterrupted frozen temperature conditions
		No demands
		Other Describe

Description of the distribution (if information is available)	
Normal way	Type of transport
From filler to wholesaler	By a truck and a freighter
From filler to retailer	
From wholesaler to retailer	By a truck
Important conditions for storage	
Number of pallets in height	2
Storage time	12 to 24 months, different between i.g. Glazed and ungl. Prod
Customer	Varies
Relevant technical problems/ sources to losses in the distribution	
Important to keep the product frozen at all time. Handling needs to be minimized	
Other relevant data	

Description of the packaging system. It is important that all components and conditions that are dimensional for the packaging system are included. Components means items such as cover, bag, box, pallet, elastic films and so on.

Primary/Sales packaging					
Type of packaging	23 kg various I.Q.F. products in a plastic bag				
Dimensions	height	90	cm	226800	Volume cm^3
	width	40	cm		
	length	63	cm		
Filling weight	23000	gram			

	Description	Material	Weight [g/unit]	Supplier	
Component 1	Plastic bag (20 bags	MD/PE	156	Plastprent	
Component 2					
Component 3					
Component 4					
Component 5					
Description					

Secondary/Grouping packaging			
Number of primary/sales packages per secondary/grouping package	1	units	
Number of layers of primary/sales packages per secondary/grouping package	1	layers in height	

	Description	Material	Weight [g/unit]	Supplier	
Component 1	Card board	fiber	11000	Norampac	
Component 2	Plastic bag	LD/PE	600	Plastprent	
Component 3	Corners/extra strengt	PE	1600	Plastmótun	
Component 4	Plastic strap	PP	500	Icedan	
Component 5					

Tertiary/Transport packaging			
Number of secondary/grouping packages per pallet/transport package	1	units	
Number of layers of secondary/grouping packages per	2	layers of secondary/grouping packages	

	Description	Material	Weight [g/unit]	Supplier	
Component 1	Plastic wrap	PE	600	Various	
Component 2	Pallet	wood	25000	Various	
Component 3					
Component 4					
Component 5					

Which standards are relevant for this product and packaging system?

Prevention by source reduction and minimisation of heavy metals and noxious and other dangerous substances must be assessed for all packaging.

If one or more parts of the packaging system can be reused, the Reuse standard must be assessed.

The packaging shall meet at least one of the standards for recoverability; this also applies to packaging which can be reused.

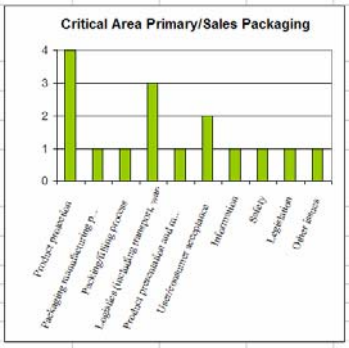
		Relevant = Yes Not relevant = No/Not applicable	If relevant: State which part of the system
Prevention by source reduction	**EN 13428**	Yes	The whole packaging system
Minimisation of heavy metals	**CR 13695-1/2**	Yes	The whole packaging system
Minimisation of noxious and other dangerous substances	**EN 13428**	Yes	The whole packaging system
Reuse	**EN 13429**	No	
Material recovery	**EN 13430**	Yes	The whole packaging system
Energy recovery	**EN 13431**	Yes	The whole packaging system
Composting recovery	**EN 13432**	No	

This questionnaire is a checklist for assessment of the minimum adequate weight/volume of packaging. For each part of the packaging system, assess the specific performance criteria which prevents further reduction of weight and/or volume of the packaging without endangering functional performance, safety and user/consumer acceptability. Evaluate the performance criteria by giving them scores from 1 to 3, where 3 is most important. One of the performance criteria should be given the score 4 (this is the critical area). For this performance criteria "Yes" will appear under "critical area" on the right side of the evaluation.

The critical area has to be documented. The documentation must be given in the "References" section of the tables below.

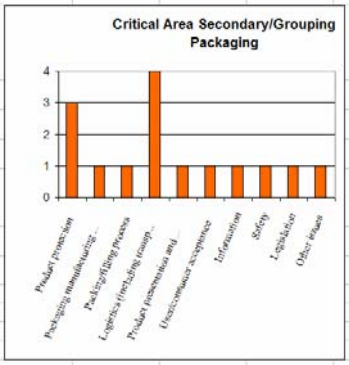
Primary/Sales Packaging

Performance criteria	Most important/relevant requirements	References	Score Primary packaging	Critical area
Product protection	Keep moist inside for freshness, Mechanical protection	Quality control	4	Yes
Packaging manufacturing process	Type of material and design of packaging	Packaging producer	1	No
Packing/filling process	Easy closure, filling degree (e.g. increased by shaking)		1	No
Logistics (including transport, warehousing and handling)	Stacking strength, Vibration, Handling, Shock, Heat variations, Moist environment, Filling degree (e.g. Boxes / pallet and pallet/container)	Stability strength indicator	3	Yes
Product presentation and marketing		Consumer specification	1	No
User/consumer acceptance	Undamaged packaging, "Size sells" conc	Consumer specification	2	No
Information	Printability, Moist resistance		1	No
Safety	Food grade material	Regulations	1	No
Legislation	Food contact approval	Regulations	1	No
Other issues			1	No



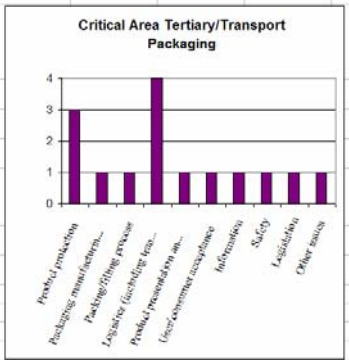
Secondary/Grouping Packaging

Performance criteria	Most important requirements	References	Score Secondary/ grouping packaging	Critical area
Product protection	Keep moist inside for freshness, Mechanical protection	Quality control	3	Yes
Packaging manufacturing process	Type of material and design of packaging	Packaging producer	1	No
Packing/filling process	Easy closure, filling degree (e.g. increased by shaking)		1	No
Logistics (including transport, warehousing and handling)	Stacking strength, Vibration, Handling, Shock, Heat variations, Moist environment, Filling degree (e.g. Boxes / pallet and pallet/container)	Stability strength indicator	4	Yes
Product presentation and marketing		Consumer specification	1	No
User/consumer acceptance	Undamaged packaging, "Size sells" conc	Consumer specification	1	No
Information	Printability, Moist resistance		1	No
Safety	Food grade material	Regulations	1	No
Legislation	Food contact approval	Regulations	1	No
Other issues			1	No



Tertiary/Transport packaging

Performance criteria	Most important requirements	References	Score Tertiary/Transport packaging	Critical area
Product protection	Keep moist inside for freshness, Mechanical protection	Quality control	3	Yes
Packaging manufacturing process	Type of material and design of packaging	Packaging producer	1	No
Packing/filling process	Easy closure, filling degree (e.g. increased by shaking)		1	No
Logistics (including transport, warehousing and handling)	Stacking strength, Vibration, Handling, Shock, Heat variations, Moist environment, Filling degree (e.g. Boxes / pallet and pallet/container)	Stability strength indicator	4	Yes
Product presentation and marketing		Consumer specification	1	No
User/consumer acceptance	Undamaged packaging, "Size sells" conc	Consumer specification	1	No
Information	Printability, Moist resistance		1	No
Safety	Food grade material	Regulations	1	No
Legislation	Food contact approval	Regulations	1	No
Other issues			1	No



This questionnaire is to be filled out using data from suppliers.

Primary/Sales packaging

	Component Type	Weight g / packaging unit	Organic (O) / Inorganic (U) % ref I.2.1 O %	U %	Supplier	Energy content, (If: % organic < 50%) ref I.3.1		Total, heavy metals ref I.2.1		Other environmental hazardous substances?		Reference
Component 1	Plastic bag (20	156	100	0	Plastprent	22	MJ/kg		ppm			supplier
Component 2	0	0		100	0		MJ/kg		ppm			
Component 3	0	0		100	0		MJ/kg		ppm			
Component 4	0	0		100	0		MJ/kg		ppm			
Component 5	0	0		100	0		MJ/kg		ppm			
	Total	156	g									

Secondary/Grouping packaging

	Component Type	Weight g / packaging unit	Organic (O) / Inorganic (U) % ref I.2.1 O %	U %	Supplier	Energy content, (If: % organic < 50%) ref I.3.1		Total, heavy metals ref I.2.1		Other environmental hazardous substances?		Reference
Component 1	Card board	11000	100	0	Norampac	8			ppm			Supplier
Component 2	Plastic bag	600	100	0	Plastprent				ppm			
Component 3	Corners/extra str	1600		100	Plastmótun				ppm			
Component 4	Plastic strap	500		100	Icedan				ppm			
Component 5	0	0		100	0				ppm			
	Total	13700	g									

Tertiary/Transport packaging

	Component Type	Weight g / packaging unit	Organic (O) / Inorganic (U) % ref I.2.1 O %	U %	Supplier	Energy content, (If: % organic < 50%) ref I.3.1		Total, heavy metals ref I.2.1		Other environmental hazardous substances?		Reference
Component 1	Plastic wrap	600	100	0	Various	22			ppm		ppm	
Component 2	Pallet	25000	100	0	Various	8			ppm		ppm	
Component 3	0	0		100	0				ppm		ppm	
Component 4	0	0		100	0				ppm		ppm	
Component 5	0	0		100	0				ppm		ppm	
	Total	25600	g									

	Reuse **Packaging unit**		**Primary/Sales Packaging**		**Secondary/Grouping Packaging**		**Tertiary/Transport Packaging**	
	Is the packaging meant to be reused? (If no; please move on to the next questionnaire)			Yes x No		Yes x No		Yes x No
	Can the packaging easily be emptied/unloaded without significant damage, beyond that which can be viably repaired?			Yes No		Yes No		Yes No
	without significant reduction in its ability to perform its intended function?			Yes No		Yes No		Yes No
	Does any reconditioning operation under the control of the packer/filler minimise its impact on the environment?			Yes No		Yes No		Yes No
	Can the packaging be refilled/reloaded without risk to the integrity of the product?			Yes No		Yes No		Yes No
	Are organisational, technical and financial arrangements in place in the circumstances and location of intended use, and available so as to make reuse possible?			Yes No		Yes No		Yes No
	Which of the following types of reuse is the most relevant for the packaging?	Closed loop		Choose one category		Choose one category		Choose one category
		Open loop						
		Hybrid system						

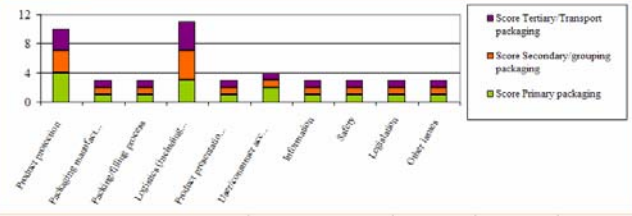
	Definitions	
	Closed loop	Reusable packaging is circulated by a company or a group of companies (e.g.: soft drink bottles owned by and returned to the original supplier).
	Open loop	Reusable packaging is circulated among unspecified companies (e.g.: pallets which are returned to a pool system for use by any subsequent operator).
	Hybrid system	Consists of two parts; one reusable packaging and one one-way packaging, used as auxiliary to transport the content to the reusable packaging (e.g.: a box for washing powder for dish washers with bags for refilling the boxes).

	Recovery by material recycling						
	Packaging unit	**Primary/Sales Packaging**		**Secondary/ Grouping Packaging**		**Tertiary/ Transport Packaging**	
	Is material recycling claimed for the component/functional unit						
	No (If no; please move on to the next questionnaire)		No		No		No
	Yes	x	Yes	x	Yes	x	Yes
	Criteria for assessment of the production phase						
	Is the design of the component/functional unit, combination of raw material and components - including additives - suitable for the known and relevant recycling systems?	x	Yes	x	Yes	x	Yes
			No		No		No
*	Is there a control procedure for the production system(s) that ensures suitability for the collection/sorting and recycling system?	x	Yes	x	Yes	x	Yes
		x	No	x	No	x	No
	Does the design enable the packaging to be emptied of its contents in order to maintain compatibility with the recycling process and minimise additional environmental impacts from emissions/residues?	x	Yes	x	Yes	x	Yes
			No		No		No
	Does the design of the packaging construction and components facilitate any necessary separation of the components by the user before collection for recycling?		Yes		Yes		Yes
		x	No	x	No	x	No
	Does the design including materials, separability and emptying minimise releases to the environment during the recycling system?	x	Yes	x	Yes	x	Yes
			No		No		No
* This is an export product that is sold to many countries with various recycling systems.							
The producer participates in the green dot system in Europe							

Packaging identification		Document identification	

The most important materials in the packaging	
Plastic bag (20 bags)	MD/PE
Card board	fiber
Plastic wrap	PE
Pallet	wood
0	0

Critical areas:



Part I Summary of assessment

Standard		Assessment requirement	Claim	Note
1.1	Prevention by source reduction	Ensure only minimum adequate amount of material in the packaging system (EN 13428:2000)	Yes	
1.2	Heavy metals and	Ensure below maximum permitted levels for components (CR 13695-1:2000)	Yes	
1.3	other noxious/hazardous substances	Ensure in compliance with (EN 12328:2000)	Yes	
2	Reuse	ensure reusability in all terms of the standard for the functional packaging unit (pr EN 13429)	No	
3.1	Recovery by material recycling	Ensure recyclability in all terms of the standard for the functional packaging unit (EN 13430-2000)	Yes	
3.2	Recovery in the form of energy	Ensure that calorific gain is achievable for the functional packaging unit (EN 13431:2000)	Yes	
3.3	Recovery by composting	Ensure compostability in all terms of the standard for the functional packaging unit (EN 13432:2000)	No	

Note: Conformity with EN 13427 requires affirmative responses to sections 1.1, 1.2, 1.3 and to at least one of sections 3.1; 3.2; 3.3. In addition, where a claim of reuse is made, section 2 should also record affirmative responses.

Part II Statement of conformity

In light of the assessment results recorded in part I above, this package is claimed to comply with the requirements of EN 13427:2000

Signed on behalf of (Name and address of supplier, supplier as defined in EN 13427)

Signature:

Position

Date: