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July 5, 2013

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Appendix

Improving the safety of milk powder packaging for the Asian market

What is inside?

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Appendix A

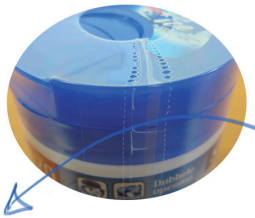
Brainstorm

A1 Supermarket products and inspiration

Mister Musle cleaner

Cannot accidentally open

User guide on cap

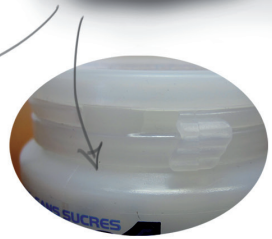


Stimorol Chewinggum jar

Completely wrapped in shrink foil with line of holes to make opening easier

Mentos Chewing-gum jar

Problem: when tearing the seal it may break. Then the jar cannot be opened.



Dishwasher tablet

You do not have to touch the product with your hands

Right dosage

Mayonnaise

Nossle enclosed - When holding the packaging upside down nothing detrimental can come/fall in. However when you squeeze it, it will come out. Therefore it will stay very clean.

Transparent so you can see the inside, and you can check the state of the product.

White seal that has to be removed before use

Cylinder packaging lightbulb

Smaller portions

With single serve sachet in it

Nestle Goeie Start Milkpowder

Tin with double layer

Tick wall feels protective (less dents)

Less effected by temperature

Could be more expensive

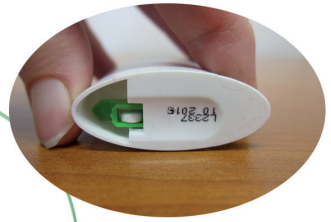
(ideas presented on next page)

Extra plastic seal (shrink foil) you have to remove before opening

Seal difficult to take off

Someone with a shrinking line could repackage it. Therefore only a part of the shrinkfoil would be removed, another part would stay on (sticker)

(ideas presented on next page)

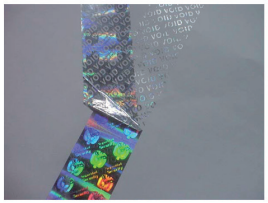


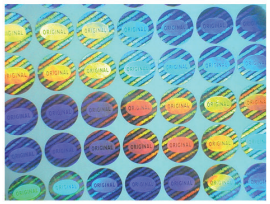
Sweetener dispenser

Exact dosing

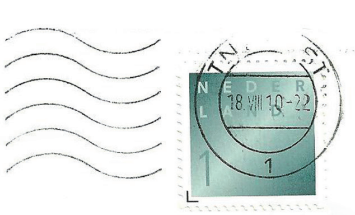
Ideas inspired and originated by the Nestle Packaging

Shrink foil
Part is ripped off, part stays on the packaging.
(not shown in the picture)



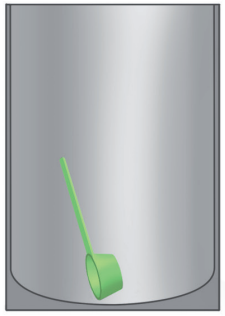


Hologram stickers can prevent alterations and can indicate tampering. Furthermore it is difficult to counterfeit.*
On the contrairy there are lots of internet companies that sell hologram stickers which could closely look like the origional hologram and therefore it could confuse the customer.



A **marking** impressed half on the seal and half on the tin might make re-sealing impossible.

This application is already seen in poststamps



1.

2.

Idea 1: Inside smooth, no ridges and easier to scoop all the product out.

Idea 2 : Multiple (smaller) compartments in a big pack, which would make it fresher (stacked in small portions)

Appendix A - Brainstorm

Soup in pouch

Label cannot be removed, becuase it has been printed on the package
Idea: Print on the bag in the bag-in-box

You can see it has not yet been opened

No wrinkels in the seal (now bag-in-box) has lots of wrinles

Coffee vacuum pack

Feels safe (when pack is blown up it does not feel safe)

Fresh AH juice

Part of cardboard stays on the glass

Hot Can -Self heating soup

Refill not possible because the first opening destroys the package (only a small part of the package needs to be permanently destoyed)

Right dosage

For child nutrition temperature must be set very precisely. In this case cannot be changed afterwards. Therefore this might be dangerous, as temperature cannot be varied.

Idea: combination with water and powder, push through and it is mixed in the packaging itself.

Whipped cream can

Inside is well preserved
Nothing can come in

Pressure difference vs small opening

You can clean the nossle yourself:
You can clean it as good as you want
Inconvenient and after cleaning still feels dirty

Soup in tin

Sterilized so it is safe

Beans in a glass jar (HAK)

Easy to be repacked/resealed

Push top to check if it's been opened (sound is heard when opened for the first time)

Breaker

Single use (so you do not forget when it is opened)

Formable (different to the yoghurts in a plastic cup)

Firm material/thick foil so it will not pierce

Small opening (little spillage, nothing can fall in)

Tamper evident seal (plastic ring around the lit) so you can see it has not een opened before. You cannot remove it without breaking it)

Chewing gum (single packed)

Singele portion

You do not have to touch the product with your hands

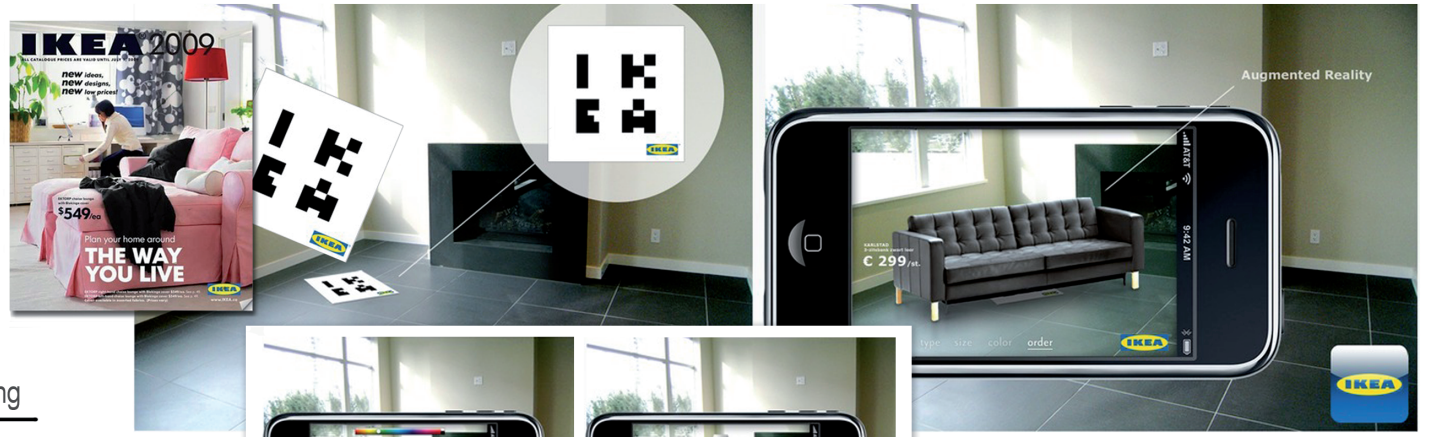
You can change the sleeve easily

Aliuminium foil can come with it when putting the chewing gum in your mouth

A2 Codes

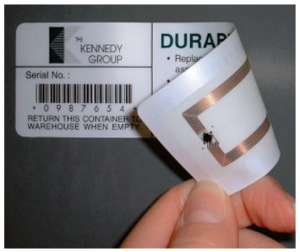
General encoding

QR code
Barcode



Augmented reality

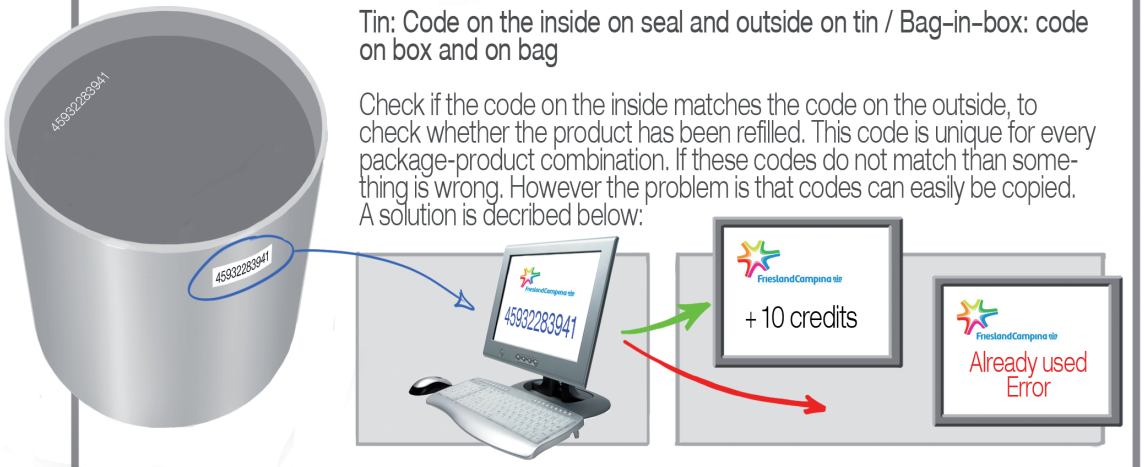
For example information can be shown about the product like the expiry date, but also a small movie about how to prepare the product might be shown.



RFID-tag (radio-frequency identification)

A RFID-tag contains electronically stored information which may be read from up to several meters away. The tag does not need to be in sight of the reader and may be embedded in the tracked object. (wikipedia)

For FrieslandCampina this tag might be used to track the location of each product. The route from the manufacturer to the distributer, to the shop and to the consumer can be tracked. The complete movement of the product can be followed including the time it stays in one place. FrieslandCampina can check whether something suspicious happens. (howstuffworks)



Tin: Code on the inside on seal and outside on tin / Bag-in-box: code on box and on bag

Check if the code on the inside matches the code on the outside, to check whether the product has been refilled. This code is unique for every package-product combination. If these codes do not match than something is wrong. However the problem is that codes can easily be copied. A solution is decribed below:

Code (on seal or outside) you should enter this code in the Friso-data-base. If you are the second person to fill in the code, the bottle has been refilled, and the costomer gets an error on his screen. To motivate customer to enter the code you can e.g. earn points every time you fill in a code, and after 20 codes you get a product for free or you can safe for Friso goodies.

Appendix A - Brainstorm

A3 Liquor and tobacco

Tamper evident seal

In paper in style of the product

Plastic seal below top

Cigars and Senseo pad

Single dose

Every dose is marked seperately with the brand. Gives the customer the feeling they have really bought the origional one and it costs more work to counterfeit

Dispenser

Exact dosing

Lock

Friso Random reader (in combination with entering the code you for example get by logging in on the website)

Lock like on suitcase (digit lock), but only to be used once

Wiskey

"Since 1780" gives a feel of quality. For IFT-nutrion mayby emphasize it is "Made in Holland" as the customer finds that very important.

Date indicator - Customer can manually put the opening date on the package

Like a parking disk: you turn it to the right date

A paper part on the package that stimulates the customer to write the date on it

A4 Freshness indicators

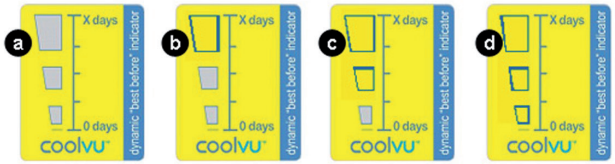
OnVu temperature monitoring

Temperature-senitive ink is used to print on the packaging. The indicator at the center of the thermometer is activited for use by means of UV light, which causes it to turn a dark blue color. This would be when opening the product. From this moment on, the indicator monitors the cold chain.

The outer portion of the thermometer is a lighter shade of blue. As long as the center is darker than as the reference color, then there has not been any significant interruption in the cold chain, and the best before date shown on the packaging remains valid. The colour also pales when time passes by, therefore it also indicates the time the packaging is open. (canadianmanufacturing.com)

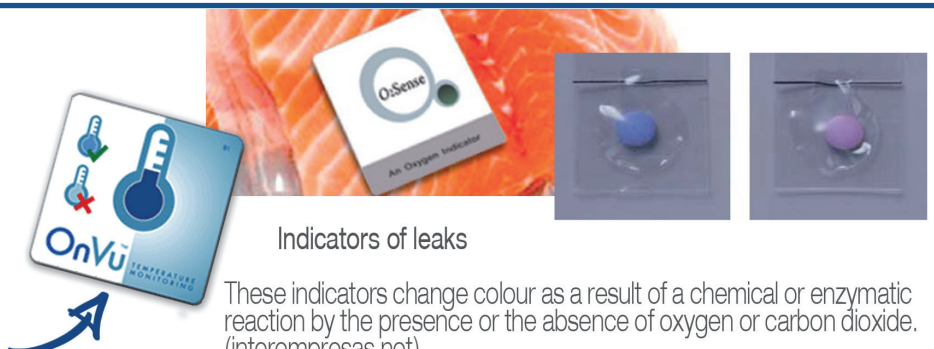
Freshness Indicator

The Freshness Indicator changes colour to remind users of the use-by date. It is made primarily of e-paper and is attached to a consumable product with a loop of elastic-like cord. The timer is pressed when the product is first bought, with the number of presses equalling how many days the product is expected to stay fresh. It changes from green to red. (Trendinsights)



UsebyMark

Indicates how long the package has been open.
Activation can be automated or manual when opening the package by aminating two layers together. (freshpoint-tti.com)



Indicators of leaks

These indicators change colour as a result of a chemical or enzymatic reaction by the presence or the absence of oxygen or carbon dioxide. (interempresas.net)

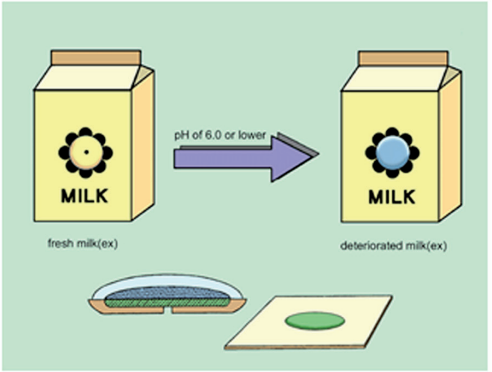
Indicator strip

Like a pH-measuring strip.

A strip of paper which reacts to one of the ingredients in the product that is unique for FrieslandCampina and can be measured with the strip. When the bottle is refilled or dilluted the strip scan show this, because than it will not discolour like it would normally do.

Colorimetric indicator label that indicates the food spoilage level

This on-package indicator contains mixed pH-sensitive dyes, bromothymol blue and methyl red, that respond through visible color change to carbon dioxide (CO2) as a spoilage metabolite. (sciencedirect.com)



Freshness indicator for milk

A patch covering a small hole on the side of the carton. The patch contains a pH sensitive transparent filling between a cover film and a semi-permeable membrane. The membrane allows pH containing ions and solvents of the milk to flow through the small hole into the filling. Any increase of the milk's pH value above 6 would turn it opaque and indicating that the milk is no longer fresh. (patentdata.com/)

Appendix A - Brainstorm

A5 Table with solutions found in brainstorm clustered per problem

All ideas that came up during the brainstorm are described in the first column. In the other columns it is given which problems every idea might solve. These problems include the four fraud risks of milk powder packaging. Besides, solutions for the problem with dosage and bottle preparation and general safety advantages are given. In the last column new ideas that have been derived from the original idea are included.
In the table, the bright yellow rows are the ideas that might be further used. In lighter yellow ideas are indicated that are less important or suitable but could be used as well.

This table clearly shows what ideas solve a lot of problems at the same time and what ideas do not really contribute to the original problem to be solved. For example, some of the indicators might help the customer to remember the date of opening, while that is not one of the main problems that needs to be solved for this assignment.

	General	Refill fraud	Fake copy fraud	Expiry date fraud	Dosage, preparation and hygiene	Idea which derive from this
User guide on top *Mister muscle*	Product opened in the correct way				Might give explanation about the preparation	
Completely wrapped in shrink foil *Chewing gum, wine bottle*		Foil breaks at first opening. When refilling a shrink foil machine would be needed to bring it to its original state	One more component to recreate (=extra difficulty to overcome)	Expiry date can only be changed once the shrink foil is removed, customer cannot remove it without damaging the packaging. Villain needs to reseal it		Part of the shrink foil stays on the package makes it harder to counterfeit (wine bottle or cardboard on fresh AH juice)
Tamper evident seal *Chewing gum, Breaker, Whisky bottle, cigar box, plastic drink bottle*		Seal is broken at first opening, needs to be recreated	One more component to recreate			Saying “Made in Holland” on a paper tamper evident seal might give the feeling that it is of good quality

	General	Refill fraud	Fake copy fraud	Expiry date fraud	Dosage, preparation and hygiene	Idea which derive from this
Small opening *Calve mayonnaise nossle even enclosed, Breaker, Whipped cream can*	Nothing detrimental can/will come/fall in				Little spillage	New kind of thickened liquid milk powder that is in a squeeze bottle
Transparent *Calve mayonnaise*	Consumer can check if the product looks good			Negative influence, because of UV light reaching product. However when date is changed you can still check the state of the product		
Seal removed before opening *Mayonnaisee*		Seal permanently removed, therefore needs to be recreated	One more component to recreate			
Double layered tin *Nestle Goeie start*	Less dents, more temperature stable, inside smooth for easier scoop		Might be more difficult to counterfeit that a one layered tin			
Single dose *Dish washer tablet, Breaker, Hot Can, single packed chewing gum, Cylinder packaging lightbulb Philips*	Consumer cannot forget when it is opened. For some options you do not have to touch the product with your hands	Much less attractive as it costs much more time to refill the same amount of product	Less attractive, as counterfeiting the same amount of product costs much more time		Dosage always correct	Mark every dose separately with the brand Senseo pads, cigars Multiple smaller compartments in a big pack, which would make it fresher Sell sachets in the cylinder

Appendix A - Brainstorm

	General	Refill fraud	Fake copy fraud	Expiry date fraud	Dosage, preparation and hygiene	Idea which derive from this
Hologram sticker		When placing the hologram sticker as a tamper evident seal, the hologram is broken and would need to be recreated	A hologram is difficult to copy exactly	When placing the expiry date in the hologram it is more difficult to change the date		Place a stamp over the hologram so it cannot be used again, or make breaking it necessary
Label printed directly on package with no wrinkles *Soup in pouch*	Label cannot be removed and changed for another label	Opening a pouch with the label printed on, would damage the complete product, makes reclosing more difficult	A package with no is more difficult to counterfeit than a bag with wrinkles			
Vacuum packed *Coffee pack*	Feels safer, like no 'dirty air' with bacteria could have gotten in. Completely closed	More difficult to have the safe airless result as the original	More difficult to pack the product airtight			New idea: place expiry date also on inside tin, than packaging needs to be damaged and it is more difficult to bring it back to its original state
Package completely damaged after use *Hot Can self-heating soup*		Packaging is significantly damaged, which makes it almost impossible to refill as a big part first needs to be repaired	Probably more difficult to counterfeit as the construction of the packaging is probably more complicated		Water-powder combination. Push through for mixing the product. Nothing can go wrong. However you cannot change temperature manually	
Firm, thick, formable (and heavy) material *Breaker*	Feels like product is well protected and will not pierce easily					

	General	Refill fraud	Fake copy fraud	Expiry date fraud	Dosage, preparation and hygiene	Idea which derive from this
Vacuum indicator/ push top *HAK beans in jar*		Sound is heard when opened the first time. After refilling and then opening it no sound is heard	More difficult to incorporate in the fake product			
Sterilized product *Soup in tin*	No bacteria can have come inside					
Self-cleanable part of package *Whipped cream can. Possible FC refill box*	The consumer can clean it very well, after it is used and before a future use					
Dispenser *For soap, liquor, M&M*	Right dosage, no touching with hands					
Lock *Random reader, digit lock*		The package can only be opened when the lock is opened. Once opened the lock does not work anymore. Makes refill very difficult	A lock on a package makes it a very complex system that is therefore much more difficult to counterfeit			
Date indicator Parking disc, strip of paper on packaging, freshness indicator	Opening date will not be forgotten, and product will not be used after the expiry date					
QR code	For consumer engagement and provides information		Can easily be copied	Giving information: products with production code 12-139 have expiry date x	It can provide information on bottle preparation	

Appendix A - Brainstorm

	General	Refill fraud	Fake copy fraud	Expriy date fraud	Dosage, preparation and hygiene	Idea which derive from this
Augmented reality *IKEA*	For consumer engagement and provides information		Can easily be copied		It can provide information on bottle preparation	
RFID-tag			Difficult to recreate and expensive	Info on the expiry date could be programmed and stored digitally		
Printed / inscripted code on the packaging as a reward code	Problem if not everyone fills in the code. Ask for consumer engagement	Refilling is not useful as the code will give an immediate error	Fake codes do not work. Copying a code from a (not used) Dutch pack onto a fake Asian pack does work so that needs to be solved	When entering the code, the expiry date of the product is given (as that is saved in the database). So even if it is changed the consumer will notice		Place code on tin as well as on seal/ place code on bag and on box, check if they match. (can however be copied) Use a silver scratch layer so codes are not yet visible in the store for copying or earning free credits
Temperature sensitive ink *OnVu temperature monitoring*	Indicates if there has been any interruption in the cold chain	After refill, the color might have paled as time passes by, so new indicator might be necessary. (It has also already turned dark blue because of the UV light, but the consumer will not know it was already blue before opening)	One more component to recreate	The color pales when time passes by, sold after expiry would be paler (even if it has not been opened?)		

	General	Refill fraud	Fake copy fraud	Expriy date fraud	Dosage, preparation and hygien	Ideas which derive from this
Indicator of leaks		If the indicator is visible from the outside and the inside is airtight it can be seen whether the packaging has been opened	One more component to recreate			
Indicator strip Ingredients		The strip will not correspond to the product used to refill, because the necessary ingredients would be missing	Much more difficult to counterfeit the product			
Freshness indicator for milk			One more component to recreate	The indicator turns opaque when it is no longer fresh. The expiry date can be changed but it is of no use because the customer can see the product is not right		
Colorimetric indicator				Indicates if the product is still fresh, so changing date does not do the trick (see 'freshness indicator for milk)		
Indicator how long product opened *UsebyMark*	Customer does not need to remember when the package is opened. He will see until when it is still good	Once refilled the indicator shows the product cannot be used anymore (expiry period after opening passed)	One more component to recreate			

Apppendix B

Technical information on brainstorm results and more

B1 Lids and closures of tin cans

At this moment, tin is the most important packaging material of milk powder of Friesland-Campina on the Asian market. To get to know more about lids and closures of tin cans, some information is collected from the “Zakboek Verpakkingen”-booklet (Ten Klooster et al. 2008).

B.1.1 Open top-lid

A can staked out with open top lid can be opened by the consumer with a can opener. In addition, paint cans often have a loose lid, which for example can be opened by laterally lighting it with a screwdriver or a coin. With the same cover, the can can be closed as the content is used only partly.

B.1.2 Fully opening easy open lid

This type of lid has an incision in the cover next to the outer edge an incision in the material, the score line. This score line is broken by the pull tab which is stapled to the cover panel. After this initial opening, the cover can be further torn along the score line with the same lever. Fully opening easy open lids are usually made from aluminum or tinplate.

B.1.3 Easy peel lid

To provide convenience to consumers of canned food, lids are developed of which the middle part is formed by an aluminum foil that very easily be ripped from the outer ring. These covers are made by heat-sealing aluminum foil on a tin or aluminum ring, which is then seamed on the can as a whole.

B.1.4 Easy open lid

The metal easy open lid is used in beverage cans. Through an incision in the cover it becomes possible to rip the central part of the lid from the top lid easily. With the stay-on-tab-lid the ring used for opening stays in place on the lid. The system works with the principle of the lever and a score line. By the lifting of the ring a small hole is created in the score. Because of this the pressure in the carbonated beverage can disappears. Then the score line is further torn and becomes the pouring hole. So far, only aluminum is used for this.

B2 Paper properties

Paper has some mechanical properties which distinguish it from other packaging materials. The “Zakboek Verpakkingen” gives some more information on the material properties of paper.
The advantage of paper is, that it is easy to cut, die cut, glue and fold. Beside, it can easily be ripped, which facilitates the opening of packages. The stiffness, the fact that is has no elasticity, the tear strength, puncture resistance and burst strength are the mechanical properties that make paper unique as a base material for packaging. Pure paper has almost no barrier-properties and it only provides a certain barrier against the influence of light. It is however possible to provide paper with excipients which do give it barrier properties. For example adding formaldehyde resins give paper wet-strength. This is important for labels on bottles of which the glass is reused. In that case the label needs to remain integral when it is removed to get it out of the rinse water. It is more difficult to reuse, which can be an advantage against counterfeiting. Another example is greaseproof paper that

has a grease barrier. Some greaseproof papers are also cooking and water resistant. These are used for the packaging of for example butter and microwave packaging. Because paper has no functional barrier it is possible the paper gets contaminated. For example in a moist environment (like in South East Asia) molds can develop. A solution for this is adding mold resistant additives.
It is possible to emboss paper and it is printable with all kinds of printing.

B3 Some terms and print finishing techniques

To get more awareness of printing techniques and possible options for applications for safer packaging, some information is collected on print finishing techniques. Some of the techniques explained were already thought of during the brainstorm, but are explained in more detail here. The information originates from the booklet “Zakboek Verpakkingen”.

B.3.1 Rotogravure

Intaglio printing can be applied to plastic film, paper and folding cartons. Examples that are seen in daily life are clusters for beer bottles, soup sachets, shrink sleeves or labels for bottles. In gravure deepened ‘pans’ are applied in a copper cylinder. The dots can not only vary in diameter but also in depth.

B.3.2 Labels

Labels serve to designate the content of the packaging. Labels for more expensive products (like liquor or wine bottles) will be more luxurious and equipped with gold edges and the like.

B.3.3 Shrink sleeves and shrink foil

Shrink sleeves are used to provide print on a product, mostly a plastic or glass bottle. The sleeve is affixed to the product and then shrunk tightly around the product by means of heat. Shrink sleeves are usually executed as a shell. They can also serve as protection (tamper evident of the product in the packaging). Consumers can see the product has been opened when the sleeve is ripped. Also, the sleeve can reinforce a container (for example a container made of glass) and protect it from abuse.

B.3.3 Embossing of paper

Embossing is a technique used to create a kind of relief by which it seems that the selected image or text lies on top or just engrossed in the printing. The technique exists of steel molds which are pressed on to the paper.

B4 Deformations of metal

In the “Zakboek Verpakkingen”- booklet some more information is given on printing and deformations of, in this case, metal.

B.4.1 Embossing of metal

The least extreme form changing that can be applied to cans is embossing of the hull of the can. A stamp deforms the sleeve body. The material can either be pushed in or pushed to the outside. With the just created relief of for example letters or figures, is achieved that parts of the hull, often in conjunction with the printing on the trunk, receive additional visual emphasis.

B.4.2 Can shaping

Can shaping is a form change that has significantly more impact than embossing. Aluminum and tin provide the possibility to give ready-to-drink bottles a totally different shape than the pure cylinder by means

Appendix B - Technical information on brainstorm results and more

of stretching, for example by constriction of the hull. Besides a clear underscore of the brand identity, like a beer can in the shape of a beer glass, the deformation may improve the ergonomics of a can.

B5 Glass

B.5.1 Decoration possibilities of glass jars

In order to gain more information on the possibilities of the use of glass and the ways it can be decorated, more information is extracted from the “Zakboek Verpakkingen”-booklet. This information can be used to think of ideas to use glass decoration to make the packaging safer.

A glass bottle can be provided with items that are mounted to the bottle in one of these ways:
- Paper label with wet glue is applied
- Paper or plastic label provided with adhesive glue
- Plastic sleeve which is applied as a wrapping
- Plastic shrink sleeve which is applied over the entire bottle
- Label affixed to the neck of the bottle through a hole in the label, a string or rubber band.

There are also techniques that have been linked to the production of the bottle. Here is a list of attributes.

Embossing or debossing
- The relief is machined in the mold (e.g., name or logo)
- Simple but also quite complex graphics are possible
- Debossing loses sharpness relatively quickly. The glass is difficult to form into a cavity of the mold.

Screen Printing
- Screen printing can be done directly on the glass
- It can be combined with embossing

Heat release ink transfer
- The ink is printed directly onto the packaging, and then baked on the package by means of heat.
- Images can be printed with high quality
- Ideal for large series

Etching
- Can be used to give the packaging for example a matt, satin, frosted appearance
- Is performed with aggressive substances and therefore subject to strict environmental regulations.

Coating
- Almost every color can be affixed to the packaging.
- The coating can then be printed with all possible techniques or labels

Twist-off caps for glass jars
The “Zakboek Verpakkingen”-booklet gives some more information about how to close glass jars. The information about the twist-off caps seemed the most relevant in this case and is therefore mentioned here.

Twist-off caps are produced by stamping blanks out of painted and/or decorated sheet metal. Immediately following, these blanks are deep drawn and double rolled (the edge is bent or a bulge is fitted in the metal plate). In the bead locking lugs are made that fit right on the mouth of glass bottles or jars. The steam in the head space of the bottle, which is used for closure, condenses and creates a vacuum. There are also designs of twist-off caps by which the center of the cap is repealed (hollow) by the vacuum. When the bottle is opened this flip button must rebound and become a bit bulb. If not, then the bottle may have been open before. This could be useful in the design for safe milk power packaging to counter refill.

Appendix C

Milk powder packaging in other continents

Appendix C1

Packages of top 10 American babyfood brands

1 Plum Organics

2 Enfamil

3 Gerber

4 Parents' choice

5 Spout

6 Happy Baby

7 Heinz

8 Similac

9 Beech-Nut

10 Earth's Best

Appendix C - Milk powder packages in other continents

Appendix C2

Overview of Asian Pacific milk powder products

These pictures were collected by FrieslandCampina for previous research

Apppendix D

Remarkable packaging

D1 Remarkable baby food packaging

All the information shown below is retrieved from the Mintel website

D1.1 Oat Milk Formula - Convenient click top carton for baby formula

Gotene Ingredients launched in Russia under the Semper brand an oat milk baby formula. It is sold in a carton box with a click top pacakgeing facility which is unusual for the Baby Formula market. The milk powder is contained in a multi-laminate pouch that is placed in a litho printed carton. The carton base is glued and the top is tamper glued on the sides. However once it is opened, it features the click top facility.
The GNPD website claims the following: “Whilst baby formula in pouches and within cartons are well established, most cartons simply comprise flat sealed tops, making the click top feature on this new Semper carton stand out. It lends a more convenient and fresh image to the brand given the resealability factor - making it especially appealing to parents looking to quickly prepare baby formula, limit mess and maintain product freshness. Moreover, according to the Mintel report, Food and Drink Packaging Trends - UK - January 2011, convenience is key when it comes to packaging attributes with over half of consumers wanting to be able to reseal their packaging or drawn towards easy to open packaging - both features seen in this new product.”

Image D1 Click top

Image D2 Cow & Gate

D1.2 Organic Baby Food Range

Hipp in Finland sells prepared meals in well-designed 230g, dual-compartment packs, which are vacuum-formed in polypropylene and heat-sealed with aluminium foil. A special card sleeve (printed litho on both sides) covers the forming and provides space for a specially moulded spoon in the top.

Image D3 Organic Baby food

D1.3 Step-Up Follow-On Milk

According to the GNPD website, this product of Cow and Gate (UK) is interesting because the “four different colour coded packs use the new litho printed composite drum made from paperboard, foil and polyethylene, with a similarly made base. The top is sealed with an aluminium foil with a tear-strip opening. This is protected by a hinged injection moulded polypropylene lid with a clipped in polypropylene scoop and a tamper-evident strip that is to be broken open. Part of the ‘push to open’ lid has

Appendix D - Remarkable packaging

an extra plastic strip in one corner that is used to smooth off the scoop of powder when mixing. The lid firmly clicks closed when finished."

D1.4 Little plates for toddlers - Olvarit Bordjes menu

In the Netherlands Nutricia has introduced a new line of shelf-stable meals for toddlers. What is special about the packaging of the meal, is that it is a plastic single-serve bowl in which the meal can be prepared and served. The packaging is a 230g bowl with a flexible cover. The bowl can be heated in the microwave and can then be presented to the toddler in the plastic holder with feet, to ensure stability. The holder also functions as a protective cover as it has a hinged lid with a tamper-evident strip. The meals retail at around €1,80.

Image D4 Self-stable meal Nutricia

D2 Special packaging of other product fields

D2.1 Syrup caps

Delo (in France) has designed a packaged line of beverage concentrate syrups. Each injection moulded HDPE cap is filled with syrup and the base if covered with a weakened seal. The cap is screwed onto a 500ml bottle of water and the seal on the base is broken whereby the content is released in the water. Each cap is placed in a colour coded reverse tuck carton printed litho. It exists in five different varieties. All five are put together and film over-wrapped for retail sale. It might be worth to look into this principle, and to investigate whether it is possible to fill it with milk powder as a single serve package.
The website drinkdelo has also written an article on this product. They explain the operation in more detail: "you simply screw onto any small bottle of water until you hear it click. Then the 100 % natural origin herbal extracts contained in the cap are released into the bottle below, you turn it upside down to mix it"

The article 'Single-serve cap – a new packaging format' on the best-in-packaging website shows a similar product. It claims that it is "one of the most intriguing features of the Single-Serve Cap is its configuration to automatically connect to bottle necks with a circumference between 26mm-32mm. That translates into all known water bottles and brands in the market worldwide."

D2.2 Recent developments in Beverage Cans

Facet Can

One of the most remarkable examples of the reshaping a beverage can is the Facet can designed by Dzmitry Samal from Belarus. It is a concept for an aluminium can be, as with lots of others who tried to reshape the beveragecan, it did not come off the drawing board.

Bowtie-Shaped Can

Is the Facet beverage can one of the many never-released shaped designs, the Budweiser BowTie was introduced on the market.

The bowtie-shaped aluminium can mirrors Budweiser's iconic bowtie logo. To make the new can possible a number of technical challenges needed to be solved and major equipment investments were required at Budweiser's can-making facility. Also, significant capital investments were required to upgrade packaging lines at the Budweiser breweries.

Reclosable Cans

In the article 'Reclosable Cans and the Can End as Marketing Tool' a device that not only prevents spills with its liquid tight seal, but also prevents gas from escaping the once opened is described.

"The ingenious "Soda Seal" can appears like a standard beverage can, until it is opened. When the tab is turned the can becomes re-sealed with a water-tight and gas-tight seal, but also revealing a full-colour, high-resolution advertising messaging."

Maggi "Moment Mahl"

In another article of Best-in-packainging, Steeman describes the Maggi 'Moment Mahl', a practical collapsible-cup packaging for instant soups, that could also be very well used as an inspiration for a redesign of the bag-in-box.

According to Steeman, "the packaging is remarkable due to the combination of a flexible pouch that contains the product and a folding paperboard part that turns into a convenient cup upon squeezing the bag."
"Special of the packaging is that the soup bowl is already integrated in the pouch. The consumer just has to tear off the top edge of the foil and squeeze the surrounding paperboard ring at the marked locations until the cup clicks, creating a stable soup terrine. Then he/she pours boiling water into the cup, stirs vigorously, waits three minutes, after which the soup can be enjoyed.
Compared to conventional solid-cup packaging solutions, this packaging, going from a flat-pouch to a soup bowl, scores points for excellent space-saving performance in transport and storage."

Velcro zip on stand-up pouch

The last example of special packaging is the Vecrop zip on the stand-up pouch produced by Lundberg Family Farms in Canada. The Global New Products Database explains on their website that it is a stand-up pouch with a novel closure. To make the pack resealable it has a Velcro seal. It is one of the first CPG products on the market to feature this unique pack closure. According to Mintel it is "intuitive to use as most consumers will be familiar with Vecro and how to use it. It also has the benefit of continuing to work even if it is contaminated slightly with product, unlike standard zip closures which can easily block.

Example of a dosing system - easy dose

As dosing and preparation is one of the important safety pillars, an example of a dosing system that is already on the market for all kinds of dry food products is described below to outline that for easy dosing it might be beneficial to further look into powder dispensing or dosing mechanisms.
The EasyDose is a plastic refill container. Once it is turned upside down a constant dose of powder comes out. Some of the key benefits of this EasyDose are: exact quantity, no over- or underdosing; Easy to use, refill and dose; One hand operation; Perfectly balanced, natural and ergonomic container
listed (by superfos.com).

Apppendix E

Inspiration from outside the packaging world

E1 Safety in non-packaging 'products'

E1.1 Safety of Barack Obama

Guards

Bodyguards. Why do they convey safety?

- o They are large, big and strong
- o Dressed in dark colours
- o Facial expression is surly (they do not look kind)

Packaging can be made heavy and of strong material. However that might not be beneficial in use. And when sold the packaging-product-combination is already heavy because of all the milk powder in it. These examples would imply that the packaging must scare the forgers. However a scary packaging does not really seem suitable for mothers and babies.

Surrounding security

Surrounded by security, streets are deposited so a 'sterile-zone' is created. There is a free space between Obama and that which can harm him.

Create an air barrier which protects the product against the environment. This can be done against the climate, but also to prevent the wrong people to get into the packaging.

Safety check before opening

Safety check before opening, for example letters, to intercept bullet/ powder letters. Someone else checks the letters first before they are delivered to Mr. Obama.

For milk powder packaging, it is impossible to check all products by someone before use, but maybe a mechanism can be created so the consumer can check the content (look inside if it is OK) before opening, like Mr. Obama.
For example provide a way for the customer to look inside or with an indicator that tells its the contents are alright.

Protocol

Protocol, which says what to do if something does go wrong, and how to recognize when to intervene when it is about to go wrong.

The packaging must clearly show what the design should look like and tell the customer that when it differs from the description, what they have to do, a safety protocol, with steps of how to handle.

E1.2 Aspects that make doors safe or convey a safe feeling

Material use

Heavy and massive feels safer than a light and thin door.

The use of heavy material and thick layers might make a packaging feel safer. However it is not beneficial for usage, it would only contribute to the appearance.

A steel door has a different appearance than a door made of multiplex. The purpose of a steel door is different than that of a wooden door.

For the packaging of the milk powder product it is equally important to choose a material that feels safe to the consumer, and that it suits the product. The Asian consumer feels that tin is the most hygienic and safest packaging material for milk powder.

Fire resistant

Making the door fire resistant makes it safer. A substance is added or applied to the wood which causes it to take longer to catch fire. Also a seal is placed to prevent oxygen from going in that would fuel the fire.

Add a matter to the material of the packaging that gives it special/better properties, that gives an advantage.

Make sure no air can get through gaps on the edge of the packaging, keep it air-tight. In that way the time the product comes in contact with oxygen is limited to the times the packaging is opened.

Visible lock

With a visible lock the occupant has visual confirmation that the house is secured.

Show clearly to the customer what is done to secure the product-packaging combination

Border

A steel border and a steel frame are placed along the door to prevent burglary. The borders are specially adapted against burglaries while the rest is not. The middle part is just to keep out cold, noise and keep the inside out of sight for the outside world. The burglary aspect is just put in the lock and the borders: only the most relevant part of the door that is involved with burglaries needs to be altered to make it safer.

For the packaging it needs to be looked at which part is the most relevant to alter to make it more secure against counterfeiting and refilling.

The part which brings into question the safety of infant nutrition packing is probably the opening part, especially when it comes to refill. This is the most important part to focus on when solving safety problems.

Besides the steel border and frame doors can also have a multi-point lock and a dead bolt to make it safer. The result is that the door and the frame are connected to each other on multiple points.

It would be a good idea that when the packaging is opened, multiple check points have to be broken. For example first a hologram tape has to be ripped, then […] and finally the aluminium sheet is removed. As long as the methods that seal the packaging are different, it is more time consuming to fix all the aspect when you want to refill it, and there are lots of aspects needed to counterfeit the packaging.

Peephole

A hole in the door the occupant can look through to see who is on the other side of the door and whether they feel safe to talk to them.

Peephole in the packaging so you can see the content of the product and whether it is still good. Also maybe the expiry date can be place behind the little window so it is harder to change it

E1.3 Debit card

Code

You need a pin code in order to use the card. If you do not have the code you cannot use the card. Therefore only the person that owns the card can use it.

Appendix E - Inspiration from outside the packaging world

Remove fraud sensitive part

The fraud sensitive magnetic strip is replaced by a chip. The magnetic strip was relatively easy to copy, while a chip is much harder to reproduce. This chip reduces skimming.

In packaging design it is also important to counter copying. Therefore it is important to replace the weak spot of the packaging ('the magnetic strip') by something that is more reliable and safe, and fulfils the same goal ('the chip').

Relief

The person's name and card number are placed in relief on the card, which makes it harder to counterfeit

Place important information or the name of the brand in relief on the packaging.

E1.4 Money bills

Safety tricks on paper money

There are several tricks that are applied in money bills in order to check they are real and not counterfeited. The website of the Chamber of Commerce (Kamer van Koophandel) gives some examples:

- Watermark: the watermark must be incorporated in the paper and should not be printed on. The figures in the watermark lights brighter than the other parts of the watermark.
- Security thread: the security thread is dark in color and runs through the middle of the note. On the security thread is the value of the note is printed, and contains the letters 'EURO'
- Silver hologram. If the note is moved, either the value or the euro symbol is visible (€ 5, € 10, € 20), or the value and architectural image (€ 50, € 100, € 200, € 500);

  In packaging for every different kind of product (Friso 1, Friso 2, Friso 3 etc) different holograms. That will take more effort to counterfeit as different holograms need to be reproduced.
- Feel with your finger or nail whether you feel the relief of the ink in different places, for example the imprint of the letters BCE, ECB, EZB, EKT, EKP, on the top front of the note.

All these examples to prevent money from being counterfeited could be used in the milk powder packaging as well. It must be clear to the customer what different features they must check to know whether it is the real product.

Ink bomb

Also, in money transport some safety measures are taken. For example when the money suitcase in the van is stolen en broken, a sort of ink-bomb explodes; ruining the money bills and spraying ink on the thieves.

E1.5 Dosage of medicine

The number of subjects that carefully need to be handled when it comes to medicine are enormous: dosage; combination with other drugs; preparation method; administration form. A lot of small errors can be made which can have major consequences. Therefore safety measures are taken to reduce the risks as much as possible. (Source: Red Cross Hospital)

Indication for quantity

The syringe has dashes on it that indicate how many milligrams of liquid it contains. Therefore the doctor can dose it easily and can check whether he really put the correct amount in the syringe.

Place dashes on the inside of the tin, to see how much powder is removed. Or place dashes in the bottle in which the milk is produced. Maybe place an indication on the spoon.

Check if doses is correct
When a patient comes to pick up his medication at the pharmacy and the dose of his medication changed, the person behind the desk always asks if it is correct that the dose has changed, in case it might be accidentally incorrectly communicated.

For milk powder preparation there is no one that can ask the parent whether she dosed it right, therefore this function must be fulfilled by the packaging. In some way the packaging must force the mother to check whether she dosed it right.

Individually wrapped and coded
Today in some hospitals each pill is individually wrapped and the package gets a barcode. So the pills are always recognizable until just before administering and there is no risk of confusion

Single dosage for milk powder

In packaging every dose could be marked as well. This can be done either with a code to check if the product is real, or mark it in a different way to make counterfeiting more difficult.

Double check
When the medication is distributed to the patients, it is checked whether the information on the wristband of the patient and on the label of the pill match the medication list of the patient.
Before the patient is given the drug, his wristband with barcode and drug packaging is scanned to verify that the correct patient gets the right pills. When something threatens to go wrong, the computer immediately gives a signal. The nurse can then avoid the error.

To make sure preparation of the bottle always goes right a signal might be given by the packaging when something tends to go wrong. So in some way the packaging must be able to check the prepared milk. Maybe by putting a drop of prepared milk on an indicator that checks if it is correct (like an insulin injection)

Color marking
Some medicines that are available in a number of different pills that all have a different amount of working substance, have covering foils of different colours. Every colour corresponds to a certain dose.

Dosing mechanism
Special IVF dosing systems for accurate dosing

E1.6 Safety examples from the wildlife

In nature a lot of ideas and inspiration of safe packaging can be found in the ways animals ensure their safety. They have different methods to stay alive. Below some examples are given from the way a butterfly ensures to stay alive. These examples might be used as inspiration and can be transformed to incorporate into the milk powder packaging to enhance the safety.

Camouflage
Butterflies make sure everything is well camouflaged: the eggs are well hidden on the underside of leaves. Eggs have a camouflage so they do not stand out: the green eggs on a green leaf can hardly be seen. Also, the pupa has a good camouflage and is hidden well from enemies. Many caterpillars look like twigs or leaves or the same colour as the plant they are sitting on.

Warning to fraudsters
A lot of butterflies are strikingly coloured. A lot of caterpillars that look very bright are toxic. The bright colour warns: “Do not eat me, I’m poisonous!”. The peacock butterfly has another mechanism to scare the enemy: If this butterfly is chased by an enemy, he can suddenly show his eyespots which scares the enemy and the butterfly can get away.

Appendix E - Inspiration from outside the packaging world

Warn the fraudsters on the packaging for the dangers, scare them in some way.

Butterfly wings hard to counterfeit

Some scientist from Cambridge have already gotten inspiration from butterflies. The article “15 Incredible Applications of Biomimicry” gives an explanation on the so called ‘Butterlfy Bank Notes’:
Scientists from Cambridge have developed a technology that has application for optical signatures on banknotes or passports that would make it nearly impossible for forger to duplicate. It would increase the security of important documents and currency. By using biomimicry they fabricated nanostructures structurally identical to the scales on butterfly wings. They got the idea from the study of Indonesian Peacock butterflies, which can be seen as either bright blue or leaf green depending on whether it are members or their own species seeing them, or predators in the jungle.

This technology with reproducing the scales on butterfly wings to make it impossible or forgers to duplicate banknotes and passports could also be applied to make it impossible to duplicate and counterfeit milk powder packaging.

E2 Biomimicry

Because biomimicry seems so useful, some more examples are given in this paragraph.

E2.1 Silk protects from flooding: Barking spider

As the climate in South East Asia is very moist, and the consumer is afraid of the impact of the moist on the product. An example can be applied to keep water out, and therefore making the influence of the climate on the product smaller is silk that protects the barking spider from rain. The website AskNature.org has written an article on this. They say “the burrow of the barking spider captures water and protects from flooding via silk mounds or nets at the entrance. The applications they name are flood protection, water collection and in packaging to keep water out.

E2.2 Dragline silk

The website Journal of the Royal Society tells about dragline silk that contracts significantly when unrestrained and wetted. “The wetting causes the length to shrink by more than half, while its diameter more than doubles.” As the scenarios have shown, the apartments of a lot of Asian families are very small.

The use of dragline silk might help to shrink the packaging with the help of water after it is used. Then the packaging will take in much less space than the original packaging. Even though this might be useful to apply, it does not directly solve any of the main safety risks.

E2.3 Skin aids movement - worms

Another way that biomimicry might help for changing shape is given on the website of AskNature.org: Skin aids movement: worms. “The skin of a worm allows it to move and change shape by having fibers wound in a cross-helical form around and along its body. These fibers in the skin allow the worm to go from short and fat to long and thin.”

Image E1 Worms

This principle might be useful to change the shape of the packaging, and make it smaller as a part of the milk powder is being used, and part of it is still left. In the example the content stays the same, but for packaging the contents becomes smaller if it gets emptier (linear relationship). Even though this might be useful to apply, it does not solve any of the main safety risks, it is more of an additional handy feature.

E2.4 Leave fold in response to touch: sensitive plant

There are also some plants that can change shape: Leaves of the sensitive plant protect themselves from predators and environmental conditions by folding in response to touch.

Image E2
Sensitive plant

The response of this flower may be a defense against threats. For the packaging this principle might also be used against the threat of refill. If you make sure the packaging is folded into a small shape and cannot be folded out back to its original shape, than the packaging cannot be refilled. As a bonus it has become small as well.

E2.5 Color changing packaging

It is generally known that the skin of the chameleon can change colour. This is due to contraction and distention of pigmented granules in superimposed cell layers.

Image E3 Cameleon

According to the paper "Color Changing Plastics for Food Packaging" by Lizanel Feliciano from the Ohio State University one method of communicating that seems to work well with consumers is a change in color in response to a change within the product itself. The incorporation of color changing plastics into food packaging materials is a method to alert consumers to the conditions inside a food package. These plastics can facilitate the identification of products that are progressing towards spoilage, or that have lost their quality and wholesomeness. "Chromogenic" materials are those that change their optical properties in response to an external stimulus." Examples are given by Feliciano:

Polymer Opal films

Assume that a flexible package made with this material is used to package a shelf-stable food. If this food becomes contaminated with gas forming bacteria, the sealed package will become bloated and pressure will build against the material. This could cause a stretching of the film and result in it changing its color. This would thus alert a customer to an unsafe packaged product.

Spoilage detectors/freshness indicators

These indicators are placed inside sealed package and are designed to alert consumers to chemical changes occurring within the product. They are sensitive to specific by-products that originate from deterioration reactions in the food.3This pH sensitive dye was entrapped within a polymeric matrix, and when the spoilage volatile compounds were released, visible color changes were observed as a response

E2.6 Special liquid softens hard cocoon: puss moth

The last example of biomimicry is a hard material that could be used for helmets, buildings and packaging. This hard material however can be self-dissolved over time by adding dissolving fluid. It is inspired by the mouth of puss moth larvae helps them escape their hard cocoon casing by exuding a softening liquid. (AskNature)

Appendix E - Inspiration from outside the packaging world

The packaging material for the milk powder needs to be hard when it is used at home. However when the packaging is empty it needs to be easily destroyed to prevent refill fraud. This looks quite contradicting. However, the use of this special liquid in combination with the cocoon material as packaging material, makes it very easy to destroy the packaging. No hammers are necessary any more (as were mentioned at the part about use scenarios), because the packaging can just be dissolved (with a biological liquid) very easily.

E2.7 Optimizing size aids survival: Sessile barnacles

Another example AskNature gives are opulations of sessile barnacles that optimize space where the physical habitat is limited by decreasing the average mass of an individual barnacle as population density increases. As the application for this method can be optimizing warehouse space, it can also be used to optimize the space of milk powder product-packaging combinations in the house. Even though this might be useful to apply, it does not solve any of the main safety risks.

Image E4
Sessile barnacle

E2.8 Portable cases protect from predators: Caddiflies

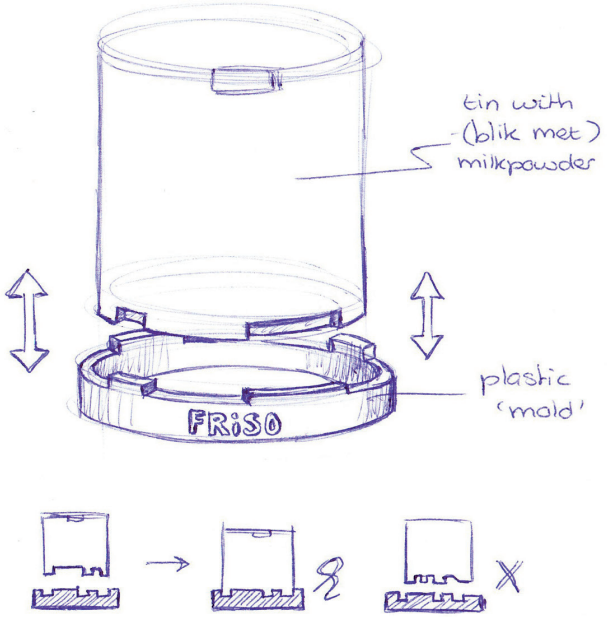
Another new form of packaging material is inspired by caddisflies. Some caddisflies protect themselves from predators by building portable cases out of local materials - such as pebbles, sand, and aquatic plants - that are cemented together with silk or mucus. It could be applied as durable but ultimately biodegradable packaging materials that utilize local materials, for example protective car seats that “grow” with the size of a child or size-flexible seating for vehicles (AskNature).

Image E5
Portable case of the caddiflies

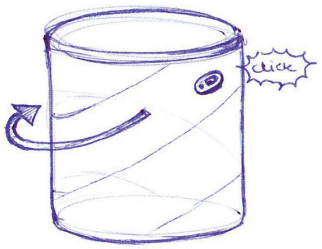
The fact that it is biodegradable might make it possible to think of a way of destroying the packaging easily, and therefore making refilling impossible. The fact that it is size-flexible might be used to for the design of a refill box that does not take in more space than it actually needs.

Apppendix F

Sketches

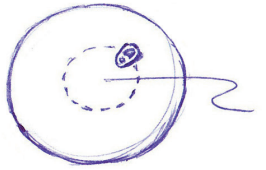


Easy peel / open lids (tin)



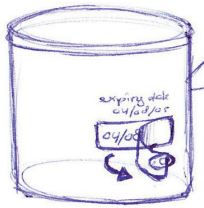
when the tin is empty open the lid like a coke can. A score-line is placed along which consumer can rip apart packaging like a croissant tin.

other option for destroying pack after use with tin lid:



underside is broken so cannot be refilled "like hotsoup"

expiry date

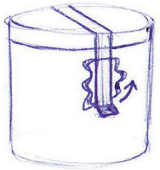


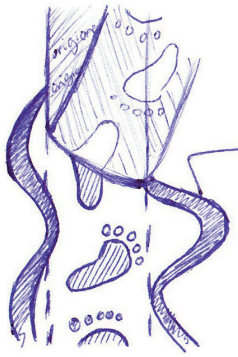
could also be behind scratchpad

expiry date also behind peel, more difficult to fraud

Multiple check points

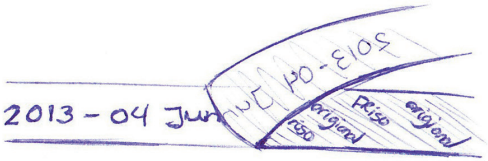
Hologram tape that leaves pattern when removed





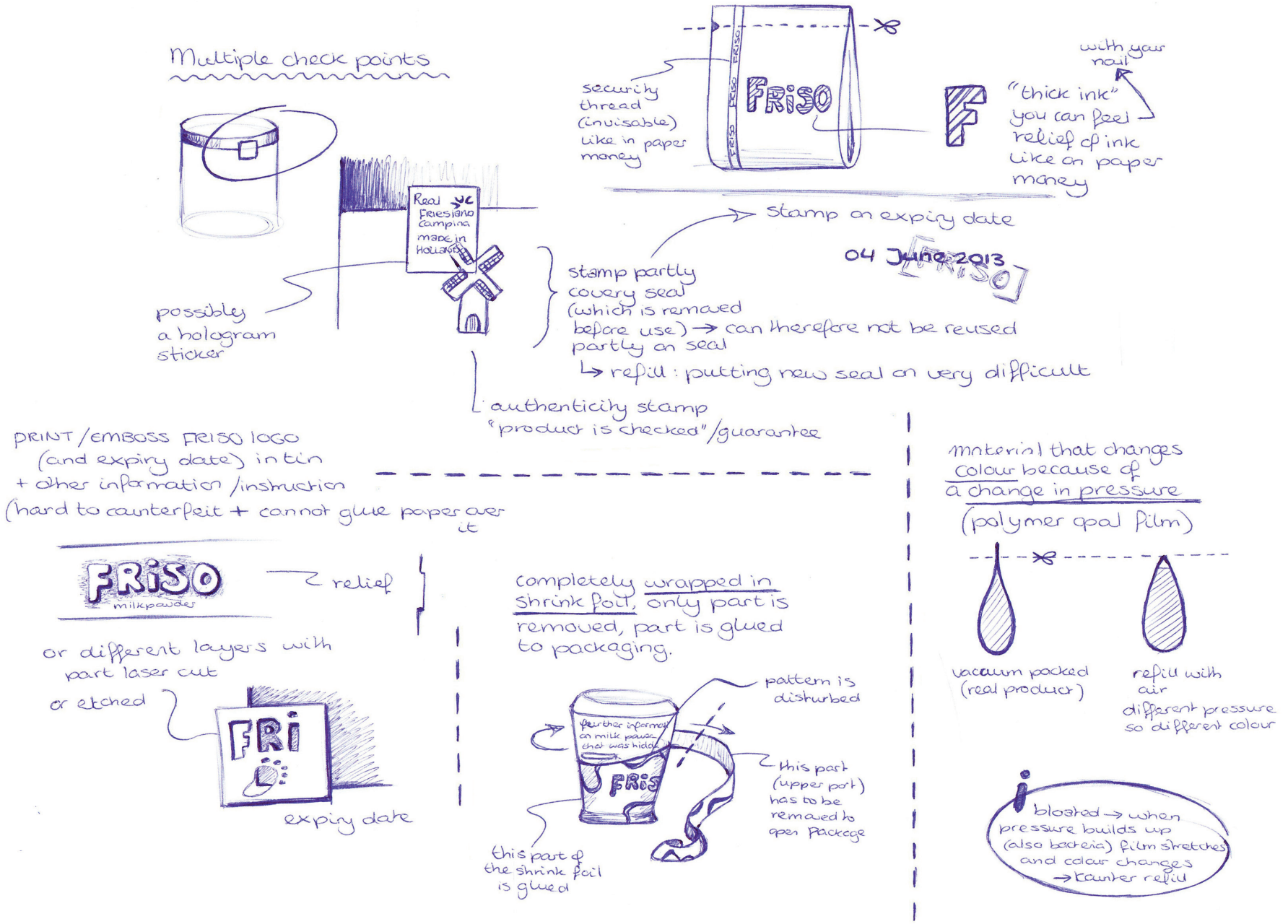
graphical design, in which the left print fits perfectly

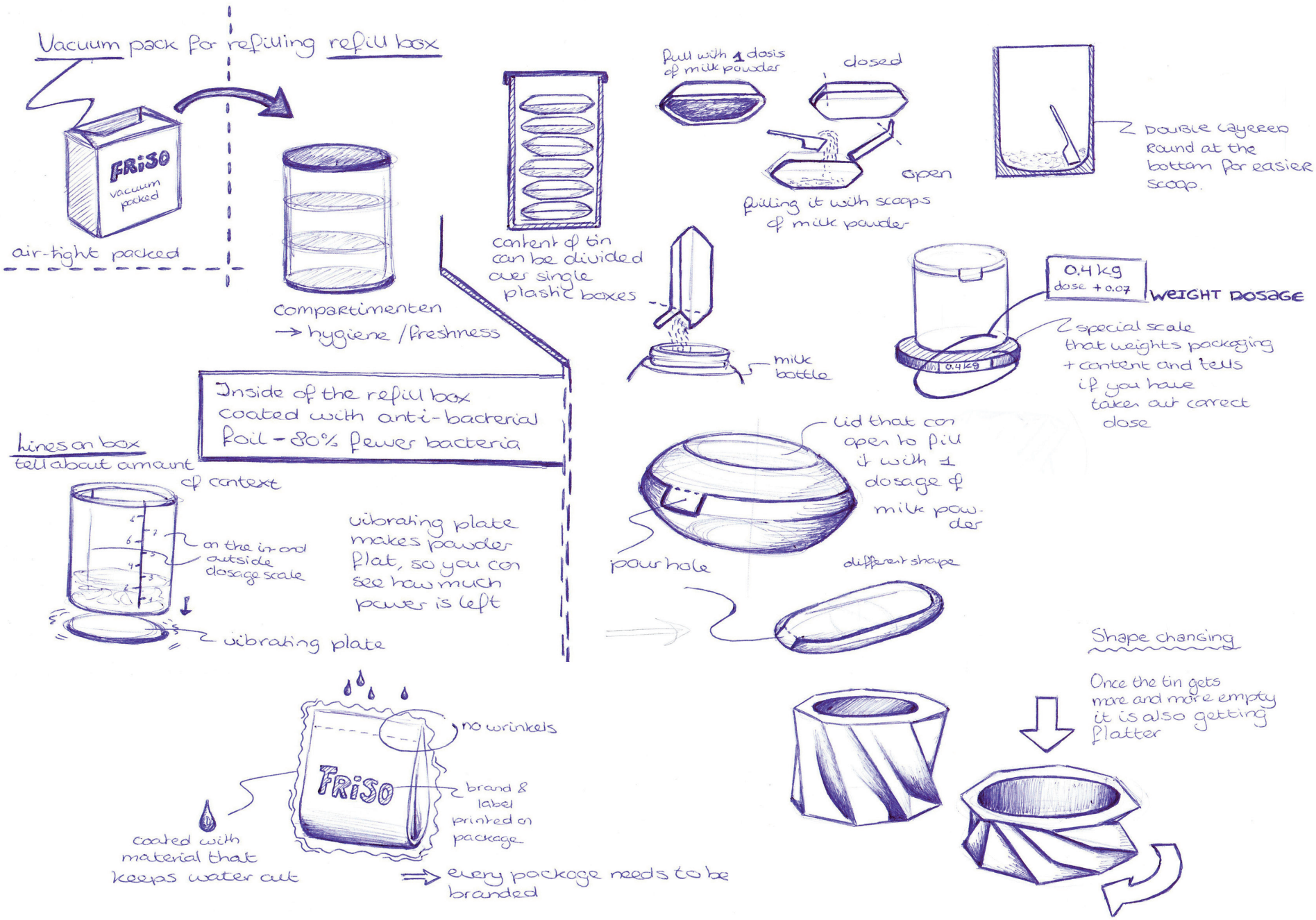
or



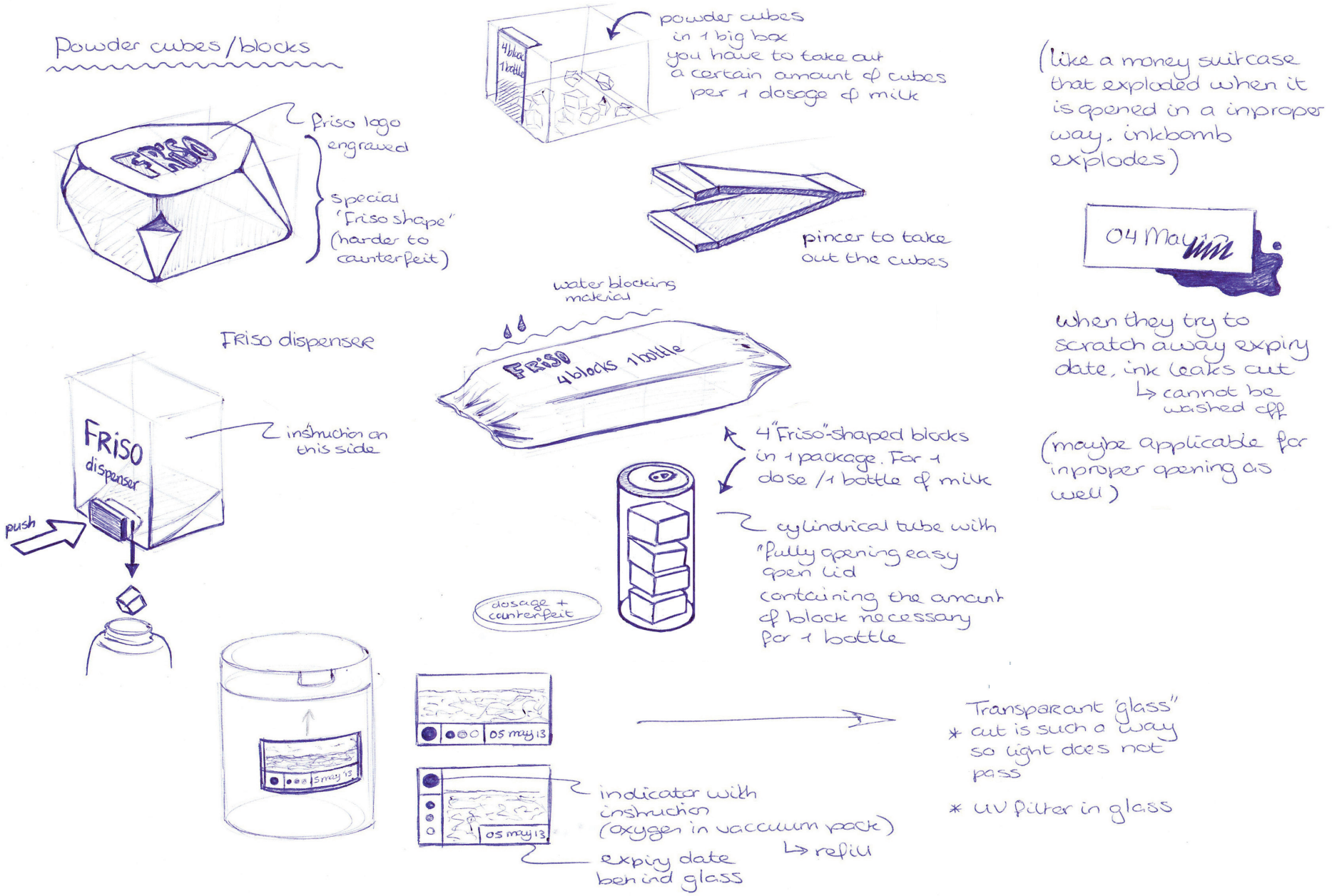
rip of hologram tape, expiry date is left to counter exiry date fraud

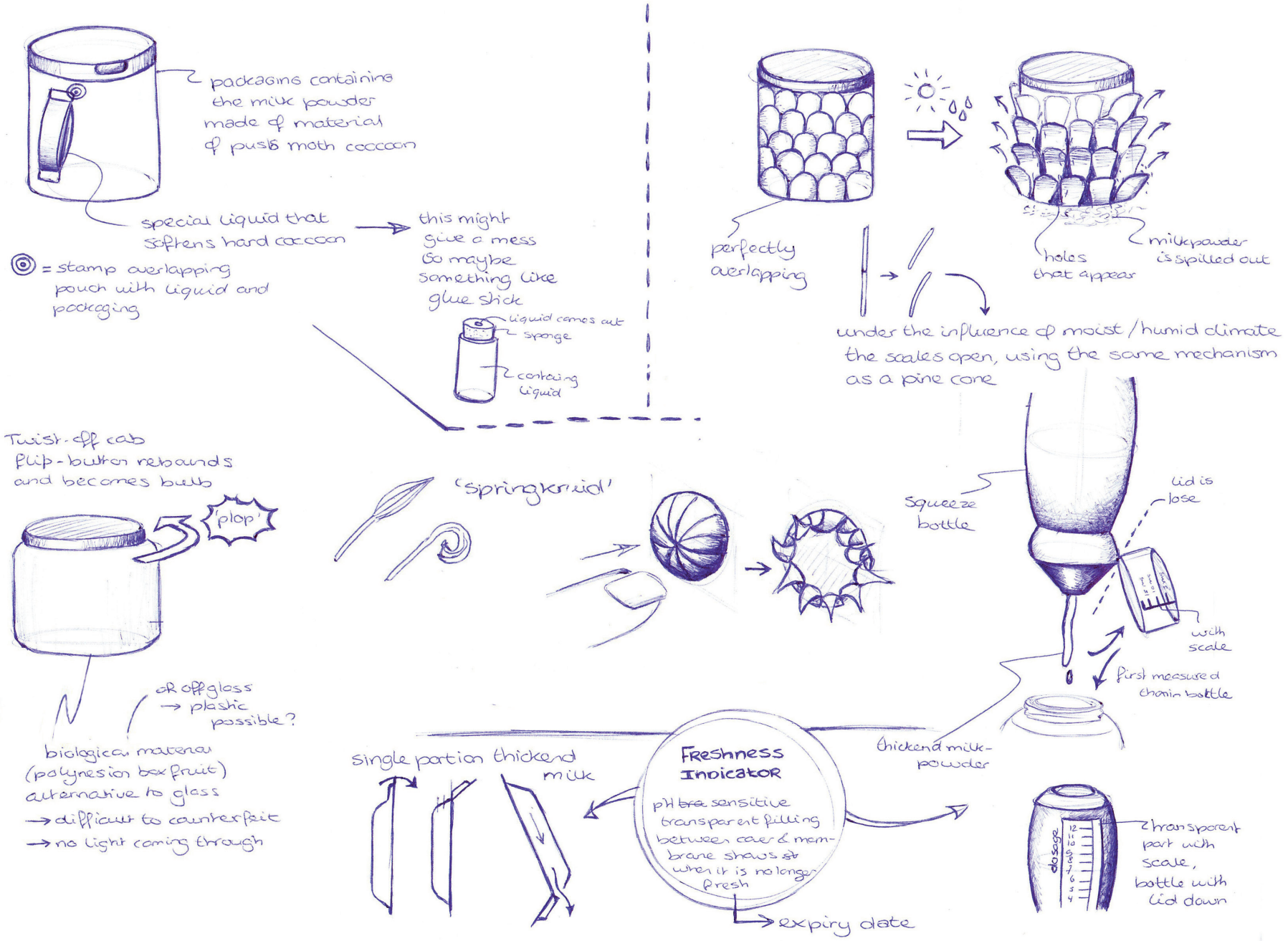
Appendix F - Sketches



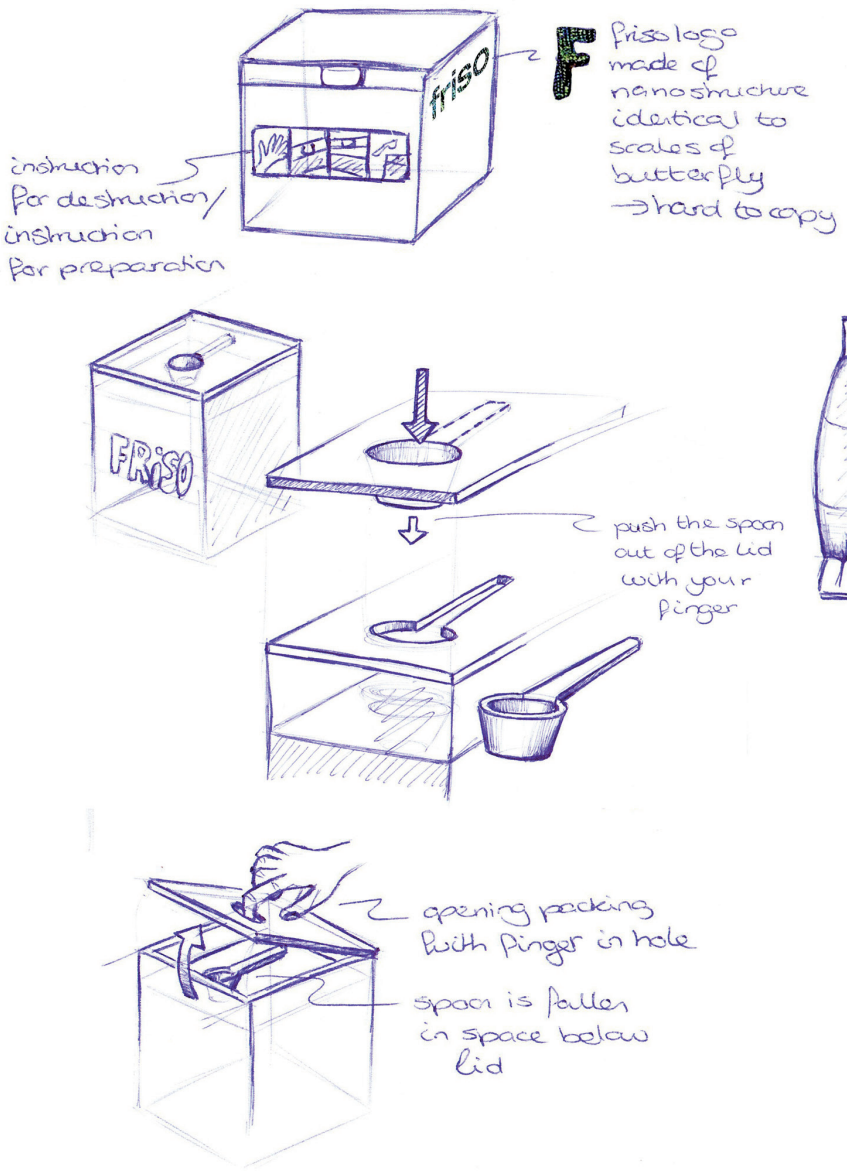

Vacuum pack for refilling refill box
FRISO
vacuum packed
air-tight packed
compartimenten
→ hygiene / freshness
content of tin can be divided over single plastic boxes
Inside of the refill box coated with anti-bacterial foil - 80% fewer bacteria
lines on box tell about amount of content
on the in- and outside dosage scale
vibrating plate
vibrating plate makes powder flat, so you can see how much power is left
milk bottle
Full with 1 dosis of milk powder
closed
open
filling it with scoops of milk powder
double layered round at the bottom for easier scoop.
0.4 kg
dose + 0.07
WEIGHT DOSAGE
special scale that weights packaging + content and tells if you have taken out correct dose
0.4 kg
lid that can open to fill it with 1 dosage of milk powder
pour hole
different shape
Shape changing
Once the tin gets more and more empty it is also getting flatter
FRISO
no wrinkels
brand & label printed on package
coated with material that keeps water out
every package needs to be branded

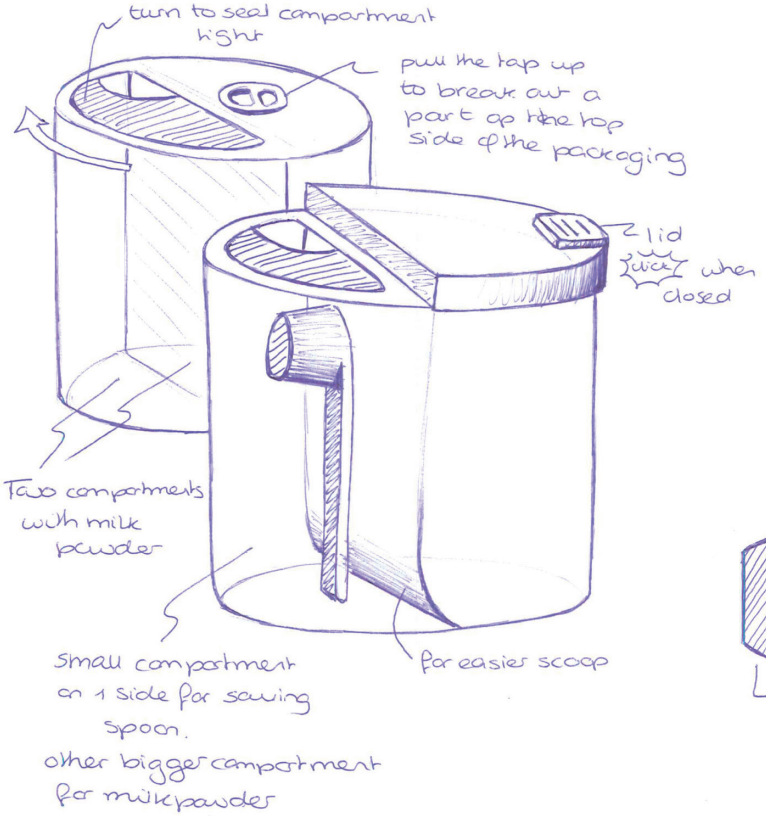
Appendix F - Sketches



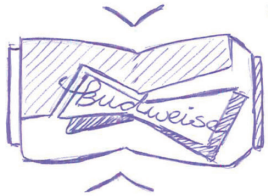

packaging containing the milk powder made of material of push moth coccoon
special liquid that softens hard coccoon
= stamp overlapping pouch with liquid and packaging
this might give a mess so maybe something like glue stick
liquid comes out sponge
containg liquid
perfectly overlapping
holes that appear
milkpowder is spilled out
under the influence of moist / humid climate the scales open, using the same mechanism as a pine cone
Twist-off cap flip-button rebounds and becomes bulb
'plop'
'springkraid'
Squeeze bottle
Lid is lose
with scale
first measured then in bottle
OR off glass → plastic possible?
biological material (polynesian box fruit) alternative to glass
→ difficult to counterfeit
→ no light coming through
single portion thickend milk
Freshness Indicator
pH bre sensitive transparent filling between coer & membrane shows st when it is no longer fresh
expiry date
thickend milk-powder
dosage
transparent part with scale, bottle with lid down

Appendix F - Sketches

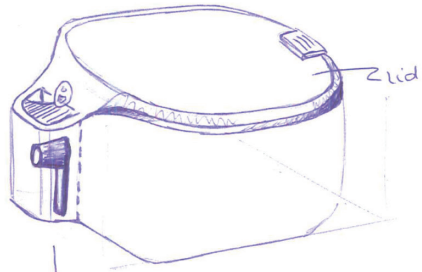




Regular rectangular shape of plastic milk-powder packaging. With plastic lid

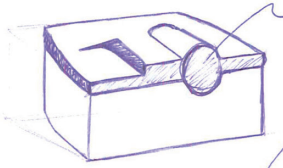


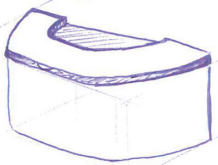
shape of packaging (tin or plastic) corresponding to brand logo

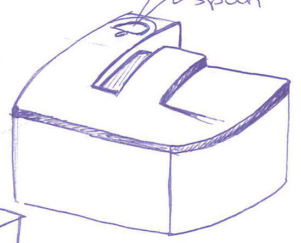


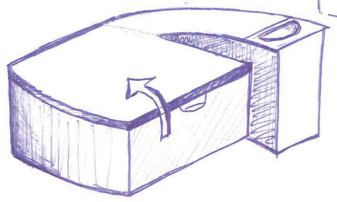
Friso

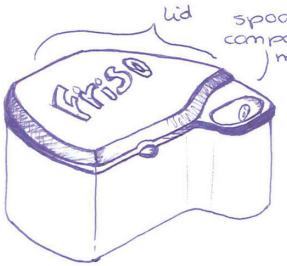
↳ Especialy the Friso F is very characteristic Same curves as packaging



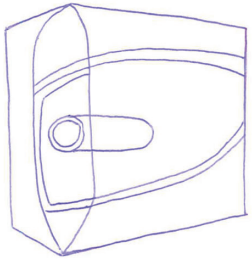








plastic box with special / unique shape → Friso inspiration ↳ special mold necessary to counterfeit



Dutch lady, shapes in BiB

curved shapes in Friso BiB

Appendix G - Concept choice

Apppendix G

Concept choice

The table below gives an overview of all the ideas (first column). On the right side of the idea the following is explained: some information on the content, the safety measures that are taken in the idea against respectivily refill fraud, fake copy fraud, expiry date fraud, dosing & preparation and hygiene and the expected period till introduction is given.
At the end all ideas are given an amount of safety points. These are calculated as followed:
All the problems are ranked according to importance, with fake copy fraud as the most important (5 points) and hygiene as the least important (1 point)
The safety measures are graded as well between 1 and 5 points, with 5 points for very good safety measures and 1 point if safety measures are taken that are not very strong.
A - is given when no safety measure is taken against that problem.

Safety points = 5 x no. of safety points for fake copy fraud + 4 x no. of safety points for refill fraud + [...]
+ 1 x no. of safety points for hygiene

Idea	Product	Dose	Fake copy fraud		Refill fraud		Expiry date fraud		Dosing & preparation		Hygiene		Short	Mid	Long	Very long	Safety points
Display box	Same powder	Single	1. Logo in thick money ink or butterfly wing scales, 2. every single dose branded, 3.hologram band	3	1.Hologram band is cut, 2. single packaging is cut, 3.shrinkfoil	4	-	0	1. Every dose single packed, so no scooping and counting necessary. 2. Small pouring hole possible.	4	1. Less contact with air	1		X			40
Folded-bag	Same powder	Big container	1. Hologram tape, 2. no standard shape	2	1. Packaging cut open through print, 2. hologram tape cut	2	1. Expiry date written on inside	1	1. Smooth inside for easy scooping, 2. No extra action for opening bag (like with BiB)	2	1. BiB no refill in tin packaging	1		X			26
Simpler version folded-bag	Same powder	Big container	1. Hologram tape, 2. Unique box	2	1.Hologram tape is broken, 2. Packaging cut through marking	2	1. Expiry date written on inside	1	1. No extra action for opening bag	2	1. BiB no refill in tin packaging	1		X			26
Bag-with-velcro-in-box	Same powder	Big container	1. Unique box, 2. Velcro in bag, 3. Hologram tape	2	1.Bag cut open, 2. Hologram sticker cut, 3. Part of carton ripped, 4. marking broken, 5. Spoon compartment broken,	4	-	0	1. Bag stays open during preparation	1	1. Hear click when closed, 2. Resealable, 3. BiB no refill in tin	2	X				30
Turning tube	Thickened liquid	Big container	1. Complicated system, 2.Unique shape, 3.relief	5	1. Break of plastic for opening date, 2.tamper evident seal	3	-	0	1. Exact dosing by turning no measuring	4	1. Special clean nossle	2				X	47
Bag-in-plastic-turning-box	(Different) powder	Big container	1. Hologram tape, 2. relief, 3. complicated system, 4. Unique shape, 5. a. Bag is cut, b. brand logo on it, c. vaccum packed, d. no wrinkels	5	1. Removed hologram tape leaving marking, 2. plastic tamper evident seal, 3. Remove plastic sticker for opening date, 4. marking covering this plastic sticker, 5. Remove inner circle	5	1. Hologram tape ripped of leaving expiry date	2	1. Turning for dosing, no scooping.	4	1. Product safed in vacuum pack, 2. 1x contact with air, 3. click when closed	3			X		62

As mentioned in paragraph 3.3 'Solutions found in brainstorm clusered per problem' The appalation of long-term and short-term are relative her. None of the ideas is really short-teerm. All ideas need more than 3 years to be implemented.
Short-term in this case means that the implementation can be done in a shorter period than the concepts that are named min-or long term.

Idea	Product	Dose	Fake copy fraud		Refill fraud		Expiry date fraud		Dosing & preparation		Hygiene		Short	Mid	Long	Very long	Safety points
Bag-in-plastic-box	Same powder	Big container	1. Hologram tape, 2. Unique shape, 3. Relief of logo	3	1. Hologram tape broken, 2. Tamper evident seal	2	-	0	1. In comparison to BiB no extra action to open pouch	1	1. Click when closed	1		X			26
Thickened liquid in cups	Thickened liquid	Single	1. Relief, 2. Outer packaging special shape, so special mold necessary, 3. special complicated single dose packaging,	5	1. Aluminium foil broken, 2. part of plastic broken, 3. single packed dose which is broken after use	5	1. Expiry date printed on aluminium foil	3	1. Fixed, single dose, 2. little actions necessary for preparing the milk	4	1. Product not in contact with air until put in bottle	3			X		65
Slimpler version cup-box	Thickened liquid/powder blocks	Single	1. Unique aluminium foil, 2.special complicated single dose packaging	3	1. Aluminium foil broken, 2. single packed dose which is broken after use	4	1. Expiry date printed on aluminium foil	3	Fixed, single dose, little actions necessary for preparing the milk	4	1. Product not in contact with air until put in bottle	3		X			51
Overturning dosing box	Same powder	Big container	1. Relief, 2.Unique shape, 3. Window*	3	1. Aluminium seal, 2. Tamper evident seal, 3. Window for looking inside	3	1. Expiry date on tear strip on foil inside, 2. Window*	4	1. every overturning is one fixed dose, no scooping necessary, 2. Handle for easy turning	3	1. No scoop necessary, 2. hear click when closed	3		X			48
Plastic box with spoon compartment	Same powder	Big container	1. Relief, 2. Hologram tape, 3. Special shape, 4. Spoon compartment	4	1. Spoon compartment broken open, 2. Hologram tape removed leaving mark	3	1. Hologram tape leaving expiry date	2	-	0	1. Click when closed	1		X			39
Tin with new features	Same powder	Big container	1. Unique shape, 2. Friso logo embossed	2	1. Spoon compartment broken open, 2. Shrink foil partly removed, 3. Seal on inside	4	-	0	-	0	1. Click when closed	1		X			27
Tin diamond box	Blocks of powder	Big container, in small doses	1. Unique box, 2. Even product as a unique shape, 3. Relief in product, 4. spoon compartment	4	1. Broken hologram tape, 2. Tweezer compartment broken, 3. Seal needs to be removed,	3	1. Special ink mechanism	5	1. Precise dosing, 2. Smaller spilling risk	3	1. Thoroughly closably 2. click when closed 3. Get product out with stelised tweezers	3		X			56
Luxe single serve	Same powder	Single dose (sachets)	1. Brand logo cut out, 2. hologram tape	1	1. Hologram tape broken, 2. Marking destroyed, 3. Carton destroyed	2	-	0	-	0	-	0	X				13

Apppendix H

Powder dispensers

H1 EasyGo dispenser

Image H1 EasyGo dispenser
Portable case of the caddiflies

The EasyGo pro consists of 3 parts: the powder compartment, the dosing part and the funnel.

1. All compartments are attached to each other.
2. The cylindrical part necessary for dosing is placed in the dosing part
3. The cylindrical part is turned so the milk powder compartment is closed and no powder can fall out, when the complete package is turned
4. The complete package is turned upside down and placed on the bottle
5. The cylindrical part is turned 90 degrees and the powder falls into the bottle.

The pictures are taken from a short demo of the Easy Go pro on youtube. To get an even better impression of how it worked, you can find it on:
http://www.youtube.com/watch?v=uYAa2_aSenI

Image H2 Storyboard EasyGO

The website easygodispenser.com, which is the official website of the EasyGo, states that “the EGD PRO™ will carry a full day’s worth of protein or drink powder and will easily dispense a 15 gram serving into any water bottle or shaker cup with the twist of the knob”. They say that the storage compartment keeps the powder fresh and no unwanted moisture or contamination can get in. The metering unit in the middle dispenses a precise amount of powder to the funnel section. The easygodispenser.com claims the EGD Pro™ is the only product on the market which combines storage and dispensing functionality, with superior design and portability.

Currently they are working on the EasyGo Baby™, which is meant for dispensing milk powder, but it is not yet on the market. They say the EasyGo Baby™ dispensers are currently designed for use with Similac and Enfamil baby formulas, however this would not be much different from Friso or Dutch Lady milk powder. EGD PRO™ further state that “the EasyGo Baby™ will carry a full day’s worth of infant formula, and is designed to easily fit into any diaper or tote bag. It is narrower in diameter than the EasyGo Pro™ for easy handling, and has a wider opening to quickly dispense milk powder into any baby bottle.” For the FrieslandCampina infant nutrition packaging, a bigger compartment would be needed to fit a week’s worth of milk powder, as it should substitute the big tin cans, which are not designed for travelling.

H2 Pro Portion Protein and Powder dispenser

The second powder dispenser is the Pro Portion - Protein & Powder dispenser, designed by IDM. This is however still a concept. On their website, idm-dispenser.com, they claim it is “a protein & powder dispenser designed to dispense precise recommended dosage amounts of your favourite proteins, powdered supplements and drink mix powders”. On the website is also described how the system works: “Simply fill your Pro Portion - Protein & Powder dispenser with your desired filling (consult with IDM). At the front part of the dispenser, you will see the dispenser handle. This handle is what activates the portion control mechanism and allows you to dispense your desired amount of powder. Different powders require different portions. That is why our special mechanism is custom fitted to work in the correct intervals of hundreds of different powders.”

Image H2
Pro Portion Powder Dispenser

Apppendix I

Pouches

Two stand-up pouch formats that are very popular are the Doy-pack and the S-Pouch. On December 31, 2009, the website “Best in Packaging” has provided some information about these pouches in their article “The 12 most impressive packaging innovations in 2009” by Anton Steeman. This information is given below.

I1 Doy-pack

First the basic Doyen design, which is the dominant style of the stand-up pouch. It consists of two flat sheets sealed together along their sides, with a “W” fold running along the bottom. This W opens when the pouch is filled and provides a base on which the pouch can stand. The pouch can be re-closed after opening due to the fitments on top.

I2 S-pouch

The S-Pouch Company in Taiwan went a step further. They made a tube which functions as body and the bottom en top are sealed with a gusset. On the top a spout is attached. Therefore the pouch looks a bit like a bottle and stands quite perfect and stable and does not tip over when half emptied as most of the tri-angular tapered stand-up pouches do.
According to Taiwanese engineer Wayne Chang, the designer, this pack can be filled up to 90%-97% of the pack size. So a material reduction of about 15-20% can be achieved, in comparison to a standard stand-up pouch.

Image I1 S-Pouch

I3 Milk in a bag

Steeman, also gives another example of a special pouch: the milk in a bag.
The organic UK dairy producer Daylesford, made this milk pouch. It is made of calcium carbonate, which makes it a biodegradable plastic pack. Even though the material is flexible, the pouch stands up steadily, due to the flat-bottom design. The air-filled handle makes it easy to get a grip and the spout makes it easy to pour.

Image I2
Milk pouch

Apppendix J

Japanese developments in metal printing

J1 Introduction

The information provided on the printing techniques on tin is from the article 'Japan's developments in metal packaging printing' by Anton Steeman.

According to Steeman, the attractive aspect of the Japanese beverage market is the obvious willingness of the consumer goods companies to engage in sophisticated printing techniques.

Firstly, some general printing technologies for cans are shown, and then some examples of Japanese applications are given.

Depending on the structure of the can, the printing methods can mainly be classified into two types: sheet printing and curved surface printing.

J2 Sheet printing

Sheet printing uses lithographic plates. The production process consists of coating and printing, which is done on the interior and exterior surface of the sheet. On a pre-processed metal sheet multiple of the same images are coated, and then the sheet is transferred to the sheet printing machine. After printing, varnish is applied by coating to protect the surfaces and to provide gloss and smoothness.

Image J1 Asahi Sky Tree Tower Cans (standard dry lager)

J3 Curved surface printing

Alternatively, for curved surfaces plastic letterpress plates are used. After forming the can-body, the exterior surface is printed using a curved surface printing machine. After printing and just before the ink curing process, an over varnish is applied.

Image J2 Kirin beer cans designed by Bravis

J4 Gravure printing

Another way of placing print on tin is gravure printing lamination. With this technology pre-printed PET film is laminated onto formed cans using a gravure roll. Special effects can be achieved such as photograph quality resolutions, metallic, mirror-like effects, and pearl tone effects.

Appendix J - Japanese developments in metal printing

J5 Samples

The samples that are shown below are printed according to the laminated pre-printed PET-film process.

Image J3 Roots Coffee by Tobacco Inc

"Japan Tobacco Inc designed a specially shaped can for coffee. The can suits perfectly the exclusive manufacturing method where the bottles/cans are sterilized at a higher temperature than normal. Its height and smooth contour are unique and enhance visibility at the point of sale."

Image J4
Kirin espresso Tea, and Wonda Coffee cans.

Image J5
190ml can of Go-go No Kocha

Image J6
Asahi super dry slim, designed by Nippon Design

Apppendix K

Aspin - Dispensing cap

As Anton Steeman states in his article “24 remarkable packaging innovations of 2012 – part 02”, to gain the maximum benefit of aspirin, it must remain in a dry form immediately prior to ingestion. Steeman states that in response some manufacturers provide analgesics in a powder form packaged in a tear-open packet, but that it is inconvenient for many active people.

According to Steeman, the Aspin is in line with almost all other known dispensing caps. He says that the additive is retained in an isolated condition within a sealed chamber inside the bottle cap, but in fluid communication with the liquid, such as water, within the bottle. The cap has a downward extending protrusion to breach the seal of the chamber, thereby releasing the additive, which then mixes with the water.

Image K1 Aspin dispenser