TRAY FORMING: OUTSOURCING OR DIY?

Whitepaper including a calculation tool and a FAQ

www.boix.com

Table of Contents

The importance of a good tray

On the shelves in stores there are numerous trays in different sizes and colours to display fruit, vegetables, meat, cheese and other food. An outer tray is often an open, well stackable tray. Made of corrugated or solid cardboard, it is a strong, recyclable and environmentally very friendly packaging.

More and more food manufacturers see the benefits of using cardboard outer trays for presenting their products on the shelves. This white paper discusses best practices about forming cardboard retail ready trays.

Figure 1: the corrugated fruit tray is widely used in supermarkets.

The trays are provided by the food producers and their resellers, as part of the goods sold. The trays are for single use, there is no complicated return system as required by plastic crates. Good corrugated packaging is extremely important to increase the value and distinctiveness of fresh products. Packaging must protect the goods during transport. But in addition, a good cardboard tray has unique properties to increase the attractiveness of the product.

Forming trays: Outsourcing or Doing it Yourself?

Cardboard trays are made by tray forming machines. These tray formers form automatically sheets to cardboard trays, using hot melt and sophisticated folding movements.

Manually forming trays (without machines) is only considered for small quantities or very specific orders. When using the same amount of cardboard, automatically formed trays are always stronger than manually formed trays. About 95% of the trays in supermarkets are formed automatically.

Figure 2: tray forming machines in a tray erecting centre.

The process of making a tray out of a sheet, is called tray erecting. This process can be outsourced to the cardboard suppliers. Most cardboard suppliers offer the service of automatically tray erecting to their customers. The place where they perform this process is referred to as a tray erecting centre.

In a tray erecting centre, trays are formed automatically and stacked on a pallet. An example of a tray erecting machine and the process of tray erecting is shown in figure 2.

The process of tray erecting by a machine

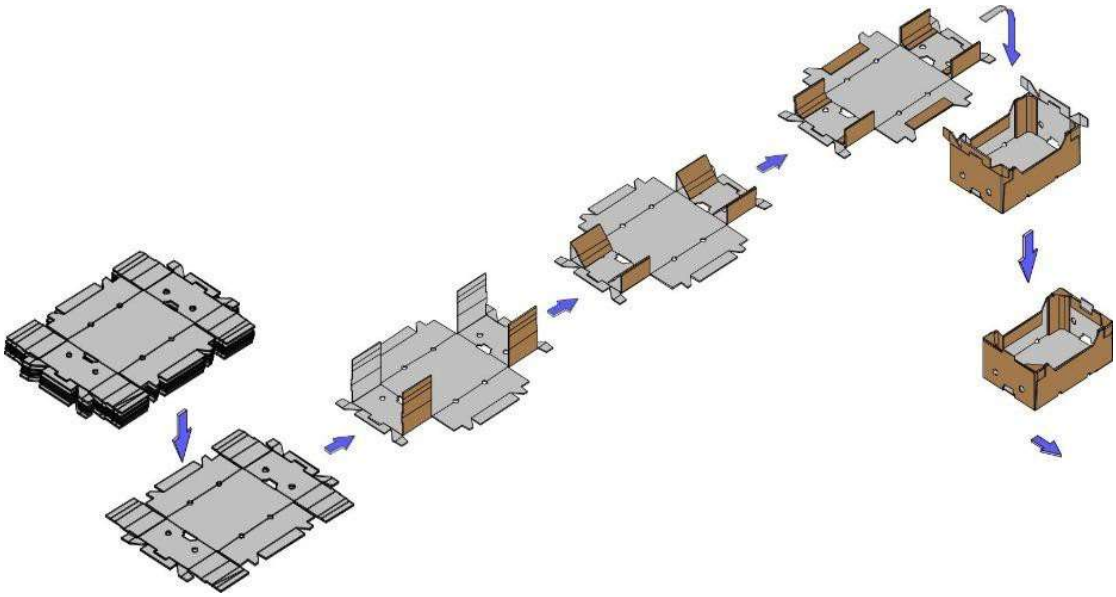


Figure 3: The process of tray erecting by a tray forming machine

After the tray forming and stacking, trucks transport the empty trays from the tray erecting centre to the food producers. The food producer unstacks the trays by hand and fills the trays with the products. The food producer pays the cardboard manufacturer per delivered tray.

The great advantage of outsourcing to tray erecting centres is that food manufacturers meet the requirements of their customers regarding retail- ready trays, without having to invest in a tray forming machine. It is obvious that cardboard suppliers will invest in a tray former if they have more customers with a demand for erected trays. In this way, the cardboard supplier can maximise the use of the tray forming machine's capacity.

For the food producer, there is a disadvantage of working with a tray erecting centre: the costs of transporting empty trays can be high.
Especially when there is a considerable distance between the customer and the tray erecting centre, moving empty trays can be notably expensive.

Whether there is a need for a fruit tray, meat tray, vegetable tray or bread tray, the tray must be formed by machine. A food producer could consider the use of an own tray forming machine. In particular when it needs significant amount of trays a year, it can be profitable to do the tray erecting in-house: do it yourself!

"There is a disadvantage of working with a tray erecting centre: the costs of transporting empty trays can be high".

How can you determine if it is profitable to have your own tray former instead of purchasing trays from the tray erecting centre? Moreover, which factors play a role? In the following business case this is described in more detail with the help of a Calculation Tool, see appendix I.

Business case: Best-Bread Bakeries

Best-Bread Bakeries is an industrial bakery that is specialised in pre-packed bake- off bread. Best-Bread has their retail ready bread trays formed at a local tray erecting centre. Best-Bread is satisfied with the offered trays and service by their cardboard supplier. Best-Bread is growing and wants to extend their production capacity. They expect that they will need approximately 500,000 corrugated outer trays per year.

TRAY CHARACTERISTICS

Size tray (mm)	400 x 300 x160
Size blank	820 x 620
Cardboard type	EB standard
Quantity per year	500,000 pcs
Price per tray1	€ 0.54

Figure 4: Tray characteristics

Best-Bread notes that due to their growth they must take an increasing number of trays in stock, which takes a considerable space in their warehouse. Having an own tray former, they will save valuable space in the warehouse and will give the opportunity to manufacture corrugated trays more efficient ('on demand').

The idea of their own tray forming machine sounds appealing: instead of having empty trays delivered, the cardboard supplier will deliver (pre-printed and die- cut) blanks to Best-Bread. With their own tray former, Best-Bread forms the blank to a tray 'Just in Time'.

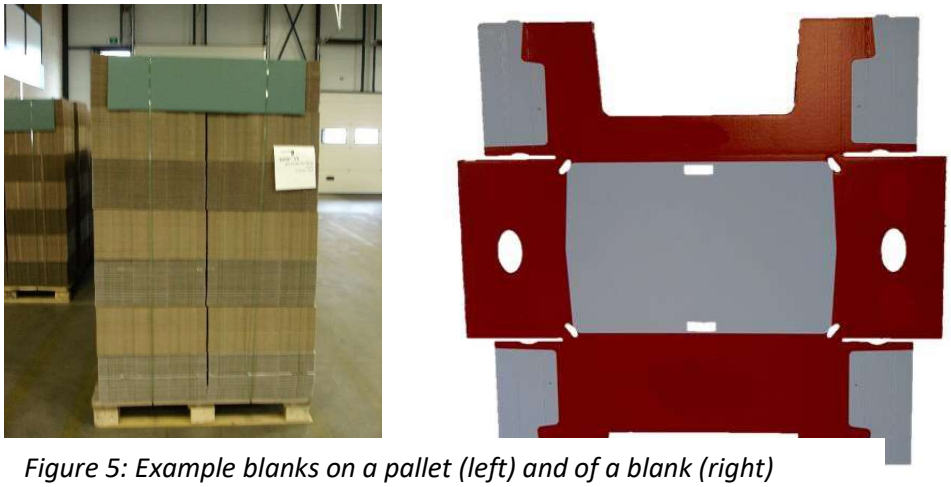


Figure 5: Example blanks on a pallet (left) and of a blank (right)

This means that Bestbread directly starts saving money on transport costs: no more trucks driving around with empty trays, but a significantly more efficient logistics process.

"No more trucks driving around with empty trays, but a significantly more efficient logistics process".

Frequently Asked Questions

To take a final, well informed decision about purchasing trays from third parties or doing it yourself with your own tray forming machine, Best-Bread asked the following questions:

- From which number of trays is it profitable to form trays by yourself?
- What are the annual savings if we purchase a tray forming machine?
- What is the payback period of the machine?

These questions are answered below by Job Schmidt, based on a custom-made Calculation Tool for Best-Bread. The output of the Calculation Tool is displayed on page 8. How the Calculation Tool exactly works, is explained on page 10.

1. **From which number of trays is it profitable to form trays by yourself?**

'This is a recognisable question. An investment in a tray forming machine only justifies itself if a substantial number of trays is required annually. Together with Best-Bread, we analysed their situation with our Calculation Tool. This shows that the breakeven point is around 178,000 trays per year. With 500,000 trays per year, a tray former for Best-Bread is certainly worthwhile.

"An investment in a tray forming machine only justifies itself if a substantial number of trays is required yearly." – Job Schmidt, Managing Director

2. **What are the annual savings if we purchase a tray former?**

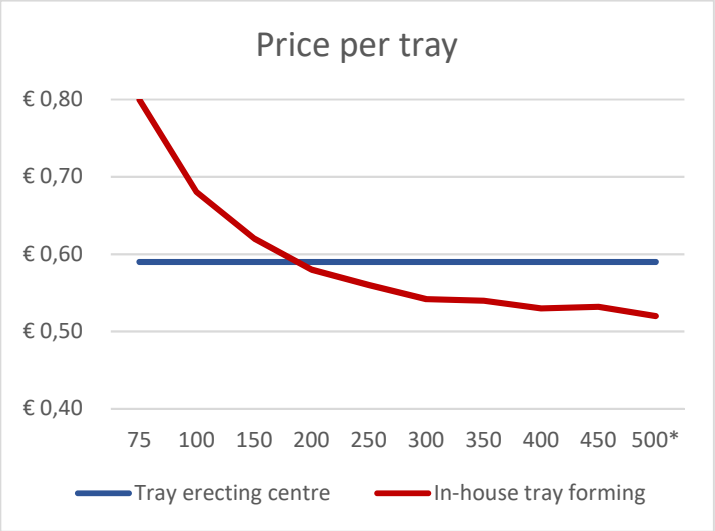
In the first year, savings will be € 34,800 if Best-Bread forms 500,000 trays, considering a depreciation period of 5 years. A Boix tray forming machine will last for 10 years without significant problems, under the condition that the machine receives regular maintenance. The cumulative savings over 10 years will be substantially.

3. What is the payback period of the machine?

The Calculation Tool shows that the investment's payback period is 1.6 years.

Best-Bread – Boix FP4-2M tray forming machine		
Investment	80,000	€
Depreciation period	5.0	per year
Rate	5.0	%
Maintenance costs (% of investment)	1.50	%
Energy costs	0.10	€ ct per tray
Glue consumption per tray	6.0	gram
Costs of glue per Kilo	3.50	€ per Kilo
Machine capacity per hour	2,100	trays per hour
Estimated trays needed per year	500,000	trays per year
Saving labor costs per year	0	€ per year
Price per tray (tray erecting centre, ex works)	53.0	€ ct per tray
Transport costs per tray (from tray erecting centre to customer)	6.0	€ ct per tray
Price per blank (tray erecting centre, ex works)	40.0	€ ct per blank
Transport costs per blank (from tray erecting centre to customer)	0.75	€ ct per blank
ANALYSIS		
Break-even point year 1	177,778	trays
Estimated trays per year	500,000	trays
Based on the estimate:		
Costs of outsourcing tray-erecting station (tray forming & transport)	59.0	€ ct per tray
Costs of in-house (blank, depreciation, rent, energy, glue)	52.0	€ ct per tray
Annual savings (year 1-5)	34,800	€ per year
Annual savings after depreciation (year 6-10)	50,800	€ per year
Total savings in 10 years	428,000	€ in 10 years
Payback period (years)	1.6	year

See appendix for the calculation tool



**Number of trays per year (1000x)*

Thoughtful decisions

Best-Bread spoke with their cardboard supplier about the advantages of purchasing their own tray former, and the calculations they made. This led to a thoughtful outcome: The cardboard supplier offered to invest in a new tray former, placed in-house at Best-bread, with the commitment of Best-Bread that they would purchase a minimum amount of blanks over a period of 2 years.

This was the ideal solution for both parties: Best-Bread benefits from lower transport costs per tray and uses valuable space in their bakery more efficient. The cardboard supplier assures himself of a good customer for a long period. The calculated costs of the tray forming machine, borne by the cardboard supplier, resulted in a slightly higher price for the blanks.

Besides space and cost savings by forming trays in-house, the tray former brought another advantage for Best-Bread: Having their own tray forming machine, it sparkled the interest to develop new, distinctive corrugated cardboard packaging for Best-Bread. This led to a new, more distinctive bread tray with a new shape, print and colours. The cardboard supplier supported Best-Bread intensively in this development process. A real partnership was born!

APPENDIX I: The Calculation Tool explained

The Calculation Tool works as follows:

1. Determine the right tray and the right machine

   The 'product selector' at www.boixeurope.com is an easy tool to find out which machine you need for your tray or which tray you need for your product. It is also possible to upload a drawing/picture of your tray. Boix Europe will review it and advices within 48 hours which machine is best suited for you. This can be done via this link. For BestBread, we advised a FP-4/2M2, a machine with a capacity of 2,100 trays an hour.

2. Set the height of the investment

   The height of the investment will mostly be determined by the costs of the machine, but there can also be additional investment costs (for example a compressor for air pressure). The depreciation costs are determined over a period of 5 years (standard) and 10 years. A Boix machine will easily last for 10 years, if maintained well. Even after 10 years and millions of trays made, a Boix machine will still have a substantial residual value!

3. Determine the annual maintenance costs

   Just like a car, a machine needs periodical maintenance. Moving parts must be inspected and replaced if needed. Boix Europe has a 24/7 service availability spread over Europe and offers free telephonic support to their customers. More and more customers choose a maintenance contract. Due to this yearly maintenance costs could drop below 1.5% of the initial investment.

4. Estimation of glue and energy usage

   A tray forming machine works with hotmelt-glue, glue that quickly dries after cooling down. Glue arrives into the machine as granulates. Normally glue costs between €3.00 - € 4.00 per kilogram. In general, a tray filled with bread is not heavy, and needs less glue than a meat tray or a fruit tray.

   The amount of glue needed by the machine to form a tray can be determined by weighing the blank and the formed tray. The difference in weight is the amount of glue needed for a tray. Depending on the type of tray, this will be between 3 grams and 11 grams of glue per tray (the tray in this example needs 6-gram glue). This means that the glue costs are between 1-cent and 4-cents per tray.

   The height of the tray is also a good indicator for the amount of glue that's needed. Lower trays need les glue then higher trays.

Tray forming machines are very energy efficient. At a speed of 2,100 trays per hour, a machine uses 7.5kW. At a price of 20ct per kWh, the energy costs are less than 0.1ct per tray.

5. Compare the transport costs of empty trays with blanks

   Look at figure 4 & 5 and imagine how little space is needed to transport 100 blanks. Compare this with transporting 100 empty trays. This is mostly transporting air! Forming trays on the spot will always result in transport cost savings.

   For example: in a standard truck trailer fits 33 pallets. A full trailer can transport 3,700 trays (tray size 30x40x16 cm). A trip from the tray erecting centre to the customer costs e.g. € 200, - which is 5.4ct per tray.

   In general, you get at least 8 times more blanks on a pallet then trays. The costs of transporting a blank compared with a tray are 8 times lower, this means 0.7ct per blank. A cost reduction of 4.7ct per tray is possible with a tray former on the spot. Especially when there is a considerable distance between the tray-erecting centre and the customer, significant costs reductions are possible.

   "If we compare this with transporting blanks, we can put at least 8 times more blanks on a pallet then formed trays."

6. Estimate savings in labour costs
   When you start forming trays in-house, the labour costs normally decrease. Labour-intensive handlings such as unstacking trays by hand will be significantly lower. In the Calculation Tool, the savings on labour are put to zero to come to a conservative conclusion.