The LEGO® Factory

The place where the parts, our dreams are made of, are manufactured.

Text by lluisgib

Pictures © The LEGO® Company

Moulding - Kornmarken

I find myself at the gate of a factory. It could be any factory anywhere in the world. There is nothing (or almost nothing) to indicate that inside these walls there are some people and machines that make the dreams of thousands of children come true… and not only those of children.

I came here with Jan Beyer, LEGO® Community Development Manager, who offered to guide me on this particular trip. The first step is to put on the reflective vests, which indicate that we are visitors. Yellow for me, orange for Jan.

We start in a hallway. There's an old manual plastic-injector machine, used to show visitors the process of creating a LEGO brick. Although the machine is more than 50 years old, the method is basically the same. Below it is a container where the plastic grain used for injection is stored, which is milky white. Formerly, coloured grain was used to cast the parts, having as many kinds of grain as there were colours in the elements palette. But due to the ever growing amount of colours it was difficult to maintain this production system, so they opted for a neutral grain colour, to which colour is given during injection. Another advantage of this system is that the company can receive raw materials from different suppliers, maintaining quality and final product properties (no matter how carefully it is done, plastic from different suppliers could have different tones for the same colour).

Before entering the rooms where the injection machines are, we must bear in mind some warnings:

- Wear suitable footwear.
- Always follow the marked paths.
- Do not touch anything without permission.
- Do not touch items in boxes or equipment.
- Do not pick up anything from the floor.
- Do not take photographs of the production area.

In the factory there are about 800 injection machines working 24 hours a day. A total of 800 pieces are produced every second, 48,000 per minute, 2,880,000 per hour. Today, about 80% of the total amount of bricks is produced in Billund. The rest is manufactured in the Czech Republic and Mexico,

and only special elements such as electrical elements or fabrics are made in China.

The plastic grain arrives at the factory and is stored in silos of 24 tons each. Some pipes come out of these silos that go directly into the rooms where the injection machines are placed. Once the plastic is inside the machine, it is heated to about 220 º C, and mixed with the dye that will give colour to the piece. The mould is closed and the plastic injected. After 10 seconds, the mould is opened and the bricks come out as we know them. Although the most widely used plastic is ABS, about 27 different types of plastic are used, each one with its features and uses. For example, there is a room where only transparent parts are moulded.

Once the brick is shaped, it is dropped to a bucket in the same machine and then the bucket is weighed. Once the pre established weight is reached, the machine stops and calls some electric carts, which replace the filled bucket with an empty one. Then the machine is ready to continue producing bricks.

The spare plastic from moulding is turned to grain and reintroduced into the production process. In this way only 0,4% of plastic waste is generated, which is incinerated.

The cart carries the bucket to a chaotic warehouse, that is to say, a warehouse where only a computer knows where each piece is stored. The warehouse has about 170km of linear storage capacity, with room for about 400,000 boxes, at a rate of 660 entries and departures per hour. When parts are needed for packing, printing or just sending to another store, the request is made and the system automatically collects and prepares the boxes for shipment.

It is a fully automatic system which requires a small number of employees to operate. The total number of workers is 450, working 24 hours in 3 shifts, 50 weeks a year. As a curiosity, the factory is built on a foundation made partly of old moulds. This is standard practice in some companies and is done to prevent such moulds from falling into the hands of other companies, which may copy or use these moulds.

After watching the whole manufacturing system of our beloved bricks, and impressed by everything I've seen, we leave the manufacturing building and head for processing and packaging.

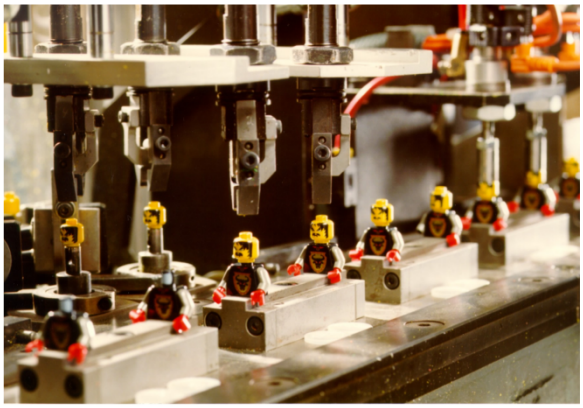
Processing and packaging – Højmarksvej

We repeat the procedure: we put on the vest and again are reminded of the rules to be followed within the factory.

The building is divided into two parts, the processing area, where the pieces from the manufacturing process are assembled and decorated, and the final packaging area, where all the pieces are packed, placed in their corresponding box (with instructions and stickers), and closed for shipment to the warehouse.

The visit begins in the processing zone. There are 35 machines dedicated to assembling different parts and decorating bricks by pad printing.

Parts that need to be decorated pass through these machines to get the picture that will define them. A pad printing machine is able to apply up to 12 different colours on the same piece, which actually lets you print really complex designs. The machine performs as many operations as different colours are applied, plus the placement and removal of the piece. For example, 4.2 million minifig torsos are printed per week, to reach 200 million of these little people a year. At the time of the visit, they were decorating the CITY minifig heads, at the same time as torsos and helmets for Star Wars ™ clones. Although I was tempted to stretch my arm to grab a few parts, the rules were very strict and I respected them 100%.



The clearest example of the assembly process is the minifig body or legs assembly. Each minifig body is made up of 5 parts that must be assembled: 1 torso, 2 arms and 2 hands. The process is very laborious in machine time terms as it requires several steps:

We begin by putting the torso in the machine. In case it is decorated, the machine has to place it correctly to avoid attaching the arms backwards. To do so, it uses a small ink mark that is in the head´s stud: this is the answer for many of us who have wondered what that little mark is for. Once oriented, one arm is inserted and then the other, arms are rotated so that they point upwards. The hands are inserted and the arms are rotated downwards again to reach the position we see when we open a box.

Once our tour through the assembly and decoration area is finished, Jan tells me to go to a kind of tray where I find a bunch of minifig parts. It's a small detail given to you when you visit the factory, and it consists in mounting a minifig-souvenir of the visit. A great little souvenir!

We cross a hallway and enter into the area of box packaging. There are two main tasks performed in this section: one is to put the bricks in bags and the other is to put all bags together in their respective boxes. Every day, 645,000 bags are packed to fill 89,000 boxes. 330 employees take part in this operation.

In the packing section there are three different types of machines:

- Single-string: 18 different elements packaging capacity.
- Double-string: 38 different elements packaging capacity.
- PP99: 42 different elements packaging capacity.

In each machine there are some conveyor belts that collect the pieces (one by one) from the different boxes that come from the manufacturing or decoration process. On the conveyor, the pieces are counted to put the exact number in the bag, and the volume of each piece is controlled to determine if it is correct or not. If not, that piece is rejected from the production chain.

There is another big conveyor belt that collects all the parts that go in each bag in a bucket. Once the bucket reaches the end of the machine, it dumps the pieces in the bag and the bag is sealed.

The bags are weighed to control that they contain the correct number of pieces. Many of the bags contain a small extra piece, this is intentionally done to avoid packing less than required which could pass undetected due to heir light weight.

At the box packaging section, we start with completely disassembled boxes. The packaging machine folds the box, applies glue where necessary, puts the bags into the boxes, adds any large pieces, the instructions manual and decal sheet (if applicable) and finally closes it.

There are 4 packaging lines:

- Combi line: up to 1600 units / hour
- Small Multibox: up to 1300 units / hour
- Large Multibox: up to 1450 units / hour
- Top Box: up to 700 units / hour

Once the boxes are closed, they are piled and packed into larger boxes that contain a specific number of units of this model (packing unit) and sent to the central warehouse in the Czech Republic.

During the visit, models of Star Wars ™ and Technic for the last quarter of 2009 were being packed.

And here ends the visit to the The LEGO® Group, Billund plant, which has been a beautiful experience for me. After so many years acquiring and opening LEGO sets I have seen how, starting from some small grains of plastic, the final product is made. I hope that from now on, you will have a clear vision of how a box is born and how it will end up being bought in a store.

I would like to express my most sincere gratitude and thanks to Jan Beyer for offering me the opportunity and all the help to write this article.■