

Materials and Construction Methods:

Digital Camera

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1. Introduction

Everything that we capture through our own eyes can also be captured through the lens of cameras, which are “any equipment used to photographically record images.” (Chandler, 2011). In a matter of seconds we can capture a landscape that will end up as our laptop's wallpaper. This amazing invention has changed our lives and how we perceive things. But to achieve this, there is a complex construction method and design of high end technology that first needs to be done.

2. Historical Background

Digital cameras began in 1961 with Eugene F. Lally's idea, but it wasn't until 1975 when Steven Sasson, a Kodak engineer, first built a self-contained electronic camera. These cameras are technically described as "a form of camera in which film is replaced by a semiconductor CCD array, which records the picture and stores it within the camera in a (usually) replaceable memory module." (A dictionary of physics, 2009).

After a couple years and improvements in technology, the Japanese company, Nikon, first introduced the digital single-lens reflex, which by the 2000s was already widely expanded among population.

Nowadays since the beginning of the new century, we see digital cameras on our daily lives, without going any further, they're on every cell phone manufactured in the present.



Figure 1: Zhang, M. (2010). Eastman Kodak.

3. Type of product to be analysed

The product to be analysed in this case is a digital CANON IXUSi AiAF with 6.4mm 1:2.8 and 4.0 MEGA PIXELS. It consists of a simple and useful design which can be carried around quite easily.



Figure 2: Photo by the autor (Ordóñez, 2018)

4. Bill of materials, assembly and construction methods during this product's manufacturing.

	Material	Construction Method	Assembly Method	Utility
Case	Aluminium	Cut the desired shape and then stamp it in the hydraulic press.	Screws.	Protects the interior components of the camera and

				gives the camera a good looking exterior.
Edge Case	Stainless Steel	Laminated Steel takes the bending form in the hydraulic press.	Screws.	Assembles the whole body of the camera.
Screws	Stainless Steel	With a wire of the appropriate size and a spinning obtain the shape. Then put on hot and let cool down to gain strength.	(Assembly component)	Assembles nearly every part of the camera together. (Non-permanent assembly).
Card/Battery Case	Plastic	Injects melted plastic into a mold untill it cools down into the shape.	Screws.	Protects the battery and card space and allows an easy access.
Press Button Control	Plastic	Injects melted plastic into a mold untill it cools down into the shape.	Fits between the exterior case and the interior components.	Gives an easy control on camera settings.

Rope	Polyester Fibre	Filaments are first grouped together in a process called throwing or doubling. Then it's braided or twisted together.	Knot.	Allows the person holding the camera to have more security and control over it.
LCD Screen	Liquid Crystal Display (LCD)	Consists of: Mirror, 2 polarizing films, 2 glass filters, negative electrode, liquid crystal lawyer, positive electrode and a glass cover.	Snap Fitting.	Allows the digital display of the potos and the camera settings.

Table 1: Bill of materials.

5. Advantages of chosen methods and materials as applied to this product over other materials and methods

Each object that is manufactured is composed mainly of the best materials available and the best methods of production as possible, but also affordable. The materials used for this camera were probably considered the best options available for this product and its'

requirements when it was produced. Each material has advantages and disadvantages which we'll study now.

Aluminium (used for the case) is a light-weight material which makes the product easier to carry around. Also it's durable, so the product's lifetime will be longer, and It's maleable which will make the construction method easier. But, It has a couple of disadvantages, such as being easily scraped and soft, making it easily damaged by daily use.

Plastic is one of the most used materials around the world mainly because of its low costs and easy methods of manufacturing. On the one hand it has plenty of advantages such as being light-weight, durable, high impact resistance, scratch resistance, resistant to water and corrosion. Also, It has low conductivity, so it keeps parts such as the battery good isolated. But on the other hand, this might make the product less high-quality looking.

Fort the edge case using stainless Steel is a huge advantage because it's strong which means that it'll survive from any impacts, making the camera more resistant. Also as it's ductile which makes the manufacturing method easy.

An important part in digital cameras is the digital screen, which is made of Liquid Crystal Display (LCD). It consists of a merge of different materials sheets which all together achieve a product which is low cost and thinner and lighter than LED. But also it's low reliable and works within a limited range of temperature for operation. For the year this camera was released, this screen clearly is the best and most advanced one compared to the other options available.

Lastly, the rope used to hold the camera is made of polyester fibre. This material has high strength and resistance to load and degradation (high resistance towards chemicals, acids, water, sunlight). Even though it has low elasticity, it gives the consumer enough

security to hold the camera without the fear of breaking the rope and therefore breaking the camera.

6. Future development of these materials and methods (possible replacement with more advanced technology?)

Because of the age of this camera (possibly around 2010), there are a couple of parts which nowadays have been updated, such as the digital screen, the lens, the exterior body design, etc. Focusing on this particular product, there's always something to improve. For a lower cost manufacture overall but at the same time thinking about strength, durability and environment, I would introduce plastics developed from organic materials, such as hemp plastics, which "Currently, are starting to be integrated into our daily lives, with large automobile companies such as Ford, BMW and Mercedes using the strong plastic to make dashboards and sometimes door panels." (Milne, 2014). This biodegradable polymer is lightweight and strong so it would benefit the handy use of the camera. But for a better looking camera, aluminium never gets old as a quality material, and even better if this material keeps improving. As said in the journal: Aluminium international today, "Aluminium manufacturers are constantly looking to improve the efficiency of their production processes and are relying upon increasingly sophisticated digital technologies to streamline their operations." (Aluminium International Today, 2018, 31(5), pp. 6).



Figure 3: Walia, A. (2013). Kestrel.

7. Summary

Technology is one of humanity's best achievements. Constant improvements need to be made to keep up with demand. Materials and methods used in any product are overall one of the most important aspects to consider when developing the whole product. In this particular product, assembly methods are simple and materials used for the exterior components are resistant and good looking, to ensure that consumers get an easy and comfortable experience while using the camera.

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MATERIALS AND CONSTRUCTION METHODS: DIGITAL CAMERA



Assembly: Non - permanent. The main exterior parts of the camera are assembled with screws. Order of dissassembly: first tie off the rope, then un - screw all the visible screws. After that, start by sliding the edge case and the card/battery case. Continue by strongly pulling apart the front and back cases in order to get to the interior parts of the camera.

EXTERIOR PARTS



SCREWS
Material: Stainless Steel
Utility: Assemble parts together (non - permanent assembly)

STAINLESS STEEL:
Strong, Ductile, Hard, Resistant, etc.



EDGE CASE
Material: Stainless Steel
Construction Method: Bended
Assembly: Screws
Utility: Assemble the whole body of the camera.

ALUMINIUM:
Light - weight, Durable, Easily scraped, Soft, Ductile, Malleable, etc.

CASE:
Material: Aluminium
Construction Method: Stamped.
Assembly: Screws
Utility: Protects the interior components and gives the camera a good looking exterior.



POLYESTER FIBRE:
Strong, Resistant to load and degradation, low elasticity, etc.

ROPE:
Material: Polyester fibre
Construction Method: Filaments grouped together through throwing or doubling. Then it's braided or twisted together.
Assembly: Knot
Utility: Allows the person holding the camera to have more security and control over it.



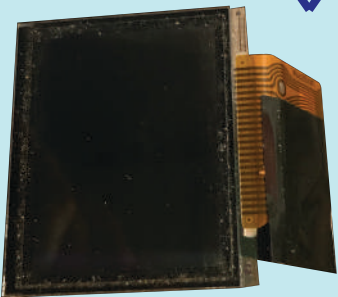
CARD/BATTERY CASE:
Material: Plastic
Construction Method: Injection
Assembly: Screws
Utility: Protects the battery and card space.

PLASTIC:
Light - weight, scratch resistance, high impact resistance, etc.



PRESS BUTTON CONTROL:
Material: Plastic
Construction Method: Injection.
Assembly: Fits between two parts (case and interior).
Utility: Allows the control of camera settings.

LCD SCREEN:
Material: Liquid Crystal Display (LCD)
Construction Method: Put together different material screens.
Assembly: Press Fitting
Utility: Digital display of camera settings.



LCD:
Low cost, Thin, Light - weight, limited temp. range, etc.

INTERIOR (FITTED) PARTS