

Component Analysis

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Word Count: 1515

Steel Pc Case



How Steel Cases are Made

Several properties are taken into consideration when looking at material for a computer case. Examples of these important qualities are cost, durability, their ability to keep a computer cool, weight, ease of manufacture and aesthetic qualities. The first part of this paper will look at the manufacturing of a steel case and why steel is used. Aluminium has a higher thermal conductivity, meaning more heat will be allowed to pass into and out of the computer. Therefore, steel should be better as it can keep hot air out while the fans keep the interior cool.

The first stage of a steel case are sheets of rolled metal that will be cut and fed into punch presses with toolings that will shape the metal. A tooling is a type of die that is used to shape, cut and bend materials i.e. steel. There are specific toolings made for each individual press to create the desired component. These toolings will also be manual and automated, depending on what is cheaper and more convenient for the manufacturing process. The life expectancy of toolings varies on several factors. For example, how many times the tooling is used in a day, the material it is made from, the material it is striking, the shape of the tooling etc. These toolings will be used to create the side panels of the computer case. This method is used because it allows quick production of many metal plates with an accurate and repeatable result. Several toolings will be used on a single panel as only one form can be changed at a time, for example a tooling made to cut will only be able to cut one shape. The amount of toolings required will increase with how complex the shape of the panel becomes, so more cuts and bends will be needed.



Example of a steel tooling. (Sourced from PCGamer)

The steel used for steel computer cases is SECC (Meaning "Steel, Electrogalvanized, cold rolled, coil") which, for computer cases, will be in sizes of 0.6mm to 1.0mm. SECC is a thin zinc layer that has been electrolytically bonded to the steel. This is used because it helps to protect the steel from corroding.

A steel case will be created in four different parts. However, the order of creation of the parts does not matter as the manufacture of each piece is mutually exclusive apart from the material. In the factories of NZXT, a Chinese case manufacturer, they run the chassis along hooks which are then taken down manually by workers. These workers will then put the side and back panels onto the case. To put the parts together they will use screws with standardized thread types between all computer cases. However, some companies may ship their screws with different head shapes. To fix on the side and back panels #6-32 screws are used. These will often be made with larger heads, so they can be removed without the use of a screwdriver if they are intended for the access panels. Thus, this type of screw is also used to fasten disk drives, hard drives and other components to the case. The other common type of screw is the M3 screw. The M3 screw has a smaller

thread pitch than the #6-32 and is used for components that load into the front bays of computers.



The back of a common computer case with components fitted. (Sourced Dreams Time.)

The image to the left displays four #6-32 screws holding on both side panels to the chassis of the case. The chassis and panels are different in this case as the panels have a dark coating. Also visible are eight internal threads to hold the rear fan to the case. Also visible in this image is how the side panels are bent to a 90° at the rear so that it allows the screws to enter from the back, stopping the panels from sliding from their locks and coming off.

Looking at the cost of steel, it is easy to see why it is such a common choice for manufacturers. Electrogalvanized steel as used by NZXT average cost was £641.41 -£294.24 per tonne in December 2017. It is difficult to say how much material is used for each computer case as every design will require a different amount.

Alternative Material: Brushed Aluminium

The other material that has been chosen for this model of case is brushed aluminium. Brushed aluminium differs from normal aluminium because of its finish. This finish is applied by a two-step process: Polishing the surface with a harsh belt and then using a softer belt or pad to smoothen out the surface. The exact finish of the aluminium is defined by factors such as the type and texture of grit used on the belts, the aluminium used and the process by which the material is brushed. This means that extra care must be taken if a consistent finish is to be desired.



Example of brushed aluminium finish. (Sourced from Online Worktops.)

If the case is to be made at the same rate as its steel counterpart it can still be machined just as well.

However, some changes to the toolings and machines will have to be made because of aluminium's different properties from steel. The amount that aluminium can bend is different from steel. With 2.31mm 5052 aluminium having a maximum bending radius of 0.04" and a galvanized steel of the same thickness being 0.05". Therefore, design considerations will be slightly different than steel on the bending front. Since aluminium is so flexible in its forming and cutting options, the equipment that is used for industrial cutting varies. One of these types is using a water jet cutter. This type is great for cutting aluminium because it

produces no heat when cutting, meaning that the properties of the metal will not be changed during the process. Using a water jet allows for an accurate cut even into thick metals at very high speeds. This process would be used for intricate side panels on more expensive cases. For mass production, aluminium can be shaped just like steel cases through punch presses. These machines can be automated or operated manually and can make cuts and impressions that water jets cannot. They are usually cheaper in larger scale productions with mainly the tooling maintenance creating the most cost.

Brushed aluminium can be bought in coils just like steel, costing around £735.60 - £2206.80 per tonne depending on the quality of the aluminium. Because it is more expensive it is deemed as a more premium material than steel.

Because aluminium is softer than steel, the case will have to be thicker to help strengthen the case from small bumps and bangs which could occur when installing parts. Additionally, the fan netting will have to be wider to compensate for its lower strength. Thus, the netting pattern or scale may have to be changed. This will increase the cost as thicker aluminium coils will have to be purchased. Additionally, it is also much easier to scratch than steel, but the brushed finish will aid in hiding some of the finer, less deep scratches.

Having a brushed surface on metals will affect the environmental performance of the metal. However, some of these factors are less of an issue for usage in a pc case since they are situated inside and out of the way of rain.

Thermal regulation is an important factor when creating a computer. One way, on top of the fans and design of the interior of the case, to keep the computer cool is by choosing the right material for the outer panels. Aluminium has heat conductivity rate of 205.0 W/mK whereas steel's is a quarter of that at 50.2. This will allow aluminium to dissipate heat better than steel because more heat can travel through the material. Whereas a steel case will contain more hot air.

Sound insulation is another key factor in computer cases. While the sound generated is not because of the case, it can be reduced by the type of case and material used. Steel is better at blocking sound than aluminium because of its density. This extra density also increases the weight, reducing shaking and rattling in the case that would create extra noise.

The price increase in aluminium cases also comes from the other additions that manufacturers tend to add when designing an aluminium case. Such as titanium front panels and hot swappable drives. This is because aluminium is treated as the premium material, therefore will come with other premium features.

When building a computer, being able to access the entirety of the shell is important. Which is why almost all sides of computers can be removed without fuss if the case is of decent quality. The sides of the case are opened and closed by a slide lock that allows the entire side panels to come off. Once slid in place, the screws that are fitted into the back hold them securely in place. Both panels are made independently from the main body with only the top and bottom being removable like the side panels.

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