BIG SIDE CABINET 5268 5269

Environmental impact assessment

1. Description and assessment of the Materials used in the Product
2. Description and assessment of the Production process
3. Description and assessment of the Surface Treatment Methods
4. Description and assessment of the Packing practices
5. The Products structure

1 Description and assessment of the Materials used in the Product

Materials are assessed according to energy consumption and burdening of the environment when the Product reaches the end of its life cycle, their physical characteristics and feasibility for recycling.

- **Steel**

Energy contents: 23.4 MJ/kg *recycled: 10 MJ/kg*

Steel is a commonly used and economical construction material. Due to good mechanical properties, it can be used in wide variety applications. Further it is suitable for many different processing and fabrication methods.

The waste generated by steel (→ rust) has hardly any impact on the environment. Moreover, the material is very suitable for recycling and the infrastructure for recycling steel is well established.

- **Aluminium**

Energy contents: 198.2 MJ/kg *recycled: 8.1 MJ/kg*

Aluminium is an extremely energy-intensive material. On the other hand, it is very easy to recycle with an extremely low energy consumption level. Recycling does not change its mechanical characteristics, so that it can be recycled a limitless number of times. Infrastructure for recycling aluminium is well established.

In case of die cast aluminium items, the raw material consists typically for more than 50 % of recycled aluminium (or up to 100 % depending on the supply of recycled aluminium). However, if aluminium is processed in extrusion the content of primary aluminium is higher; the content of recycled raw material is approximately 35%.

- **Zinc**

Energy contents: 51 MJ/kg *recycled: - MJ/kg*

Most often zinc is used in either producing die cast items or in galvanising process (steel). Due to excellent mechanical values, it is suitable for numerous applications. Zinc is suitable for following surface coatings: chemical coating (chrome, phosphate, anodising), electrolytic coating (Ag, Au, Cu-Ni, Cu, Cr, etc.), organic coating (liquid paints, powder based paints), and plastic coating. Further zinc has very good anticorrosive properties and when die cast due to excellent surface quality, it is possible to avoid supplementary surface treatment. Material is suitable for recycling.

- **Plastic**

Energy contents: 70 MJ/kg *recycled: 10 MJ/kg*

Plastic takes little energy to produce. Most synthetics are suitable for recycling, although their mechanical characteristics deteriorate each time. Because of its relatively low price, the demand for recycled plastics is minnow, and further the infrastructure for recycling plastics is not well organized. Due to these factors, plastics are burned most of the time → energy production.

- **Particle board**

Energy contents: 8.0 MJ/kg

Particle board is one of most common construction material in Scandinavian furniture industry. Board is produced from small wood particles and glue under high pressure and heat. Used glue is usually urea-formaldehyde resin. The amount of glue is less than 10% percentages (by weight). Raw material is origin from renewable natural recourses. Particle board's basic properties are comparable to wood. It may be covered in a melamine or plastic foil, natural veneer (+ staining and lacquering) or painted. Regarding recycle ability, particle board is used for energy production.

- **MDF board**

Energy contents: 11.9 MJ/kg

MDF is a type of fibreboard made from wood or other lignocelluloses materials, refined into fibres and reconstituted with a resin binder (glue) carried out at elevated temperatures. The recovery rate of the raw material is almost 100%. It is easy to machine and can be laminated and painted to produce almost any board finish. MDF can be sawed and shaped very evenly and smoothly. MDF can be nailed, stapled, routed, sanded and screwed just like any natural wood product

- **Veneers**

Veneer, in woodworking, refers to thin slices of wood, usually 0.6-1.2 mm. Veneer layers are usually glued and pressed onto core panels of different materials such as particle board or MDF. The two main types of veneer slicing is rotary cut and knife cut veneer. The rotary lathe in which the wood is turned against a very sharp blade and peeled off in one continuous or semi-continuous roll. Knife cut veneer is made in a slicing machine in which the flitch or piece of log is raised and lowered against the blade and slices of the log are made. Each slicing processes gives a very distinctive type of grain, depending upon the tree species.

2 Description and assessment of the Production process

The production processes are assessed according to energy consumption, emissions during the process and residual waste.

- **Die-casting and plastic injection-moulding**

During die-casting and injection-moulding, the processed material is heated to melting-point and pressed into a die cavity or mould impression. As the mould is cold, the material solidifies. When the mould is opened, the product is ready. Depending of the component, some additional fabrication or surface treatment may be needed.

Heating and pressing of materials takes place electrically. In case of aluminium die-casting, waste and rejects are re-melted and used again. Depending on the plastic type used in injection-moulding waste and rejects are reused or alternatively used in energy production. During the process, no substances that burden the environment are released.

- **Aluminium extrusion**

The manufacture of aluminium profiles requires relatively little energy. Extrusion starts with aluminium alloy logs. These are cut into billets, which are heated in induction furnace to the right extrusion temperature of 450-500 C. Next applying considerable pressure, each heated billet is forced through a die, the profile emerging rather like toothpaste from a tube. Cooling in air or water commences immediately the profile leaves the die. After cooling, the profile is stretched. The final strength of the material is controlled through natural or artificial ageing.

- **Steel punching, forming and cutting**

Steel is punched, formed and cut by electrically driven hydraulic machines which form and cut the steel with knife-like tools. No substances that burden the environment are released in this process. Cutting waste is removed as scrap metal and delivered to recycling.

- **Machining techniques**

Metal axles and pipes are produced by means of machining techniques such as turning, milling and sawing. Cutting oil is used in the machining process. This is a mixture of water and a very small quantity of soluble oil. The chips are collected, while the oil residues are removed by means of centrifugation. The oil is processed as chemical waste. The chips are removed as scrap metal and recycled.

- **Fabrication of wood based materials**

Veneer and laminated components are made by gluing veneer/ laminate to base panel, usually MDF or particle board. Semi-fabricants are machined to final sizes in machining line. At the same phase the panel can be edge-banded and machined. Machining line can make holes and grooving to the components. Complicated shapes can be produced with CNC-routers.

3 Description and assessment of the Surface Treatment Methods

Surface treatment techniques are assessed for emissions and residual waste.

- **Painting/lacquering chip board based items**

Planar components are lacquered in roller coating line. Lacquer is spread with rollers and hardening is made by UV-lamps. Edges are threaded by spraying and hardening is made by dispersed the solvent. UV-hardened and solvent based lacquers are quite often water based liquids.

- **Powder coating**

Coating
The coated parts are covered in powder in an electrostatic process (i.e. coating) and powder polymerizes when the part is placed in a heated furnace (approx. 200 ºC). Any powder that is lost is collected and reused or cured in the furnace. Cured powder results in a ‘block’ of plastic which has no impact on the environment and disposal is permitted.

Degreasing
Before the powder is applied, the parts must be degreased. This takes place in hot alkaline water. Apart from the water vapours, no vapours that burden the environment are released. When the water is saturated, the dissolved greases are separated by a water treatment plant. The water is discharged, whilst the greases are removed as chemical waste.

This makes powder coating one of the most environmentally friendly surface treatment techniques.

- **Electro-zincing**

In the electro-zincing process, a very thin layer of zinc is added to, for example, steel. This thin coating provides excellent protection against rust.

The process takes place in a container with water and a dissolved zinc compound. Subsequently, the products are rinsed in the water, during which a small part of the zinc comes into the water.

The rinse water is purified in a treatment plant and discharged. What is left is chemical waste and must be processed.

- **Chromium-plating**

The chromium-plating process is similar to the electro-zincing process. In many cases, several layers are applied underneath the chromium, such as copper and nickel. Since chromium, copper and nickel form part of the group of "heavy metals", they are hazardous to the environment. The heavy metals are recovered from the residues of the water treatment plant. They can then be re-used.

- **Anodising**

There are normally four stages in anodising process: pre-treatment, anodising, colouring (if needed) and sealing. The most common type of anodising is natural anodising. The electrolytic process takes place once the metal surface has received the appropriate mechanical or chemical pre-treatment and has been thoroughly cleaned. The profile is connected to a direct current source and becomes the anode. An electrolytic cell is formed. Dilute sulphuric acid at room temperature is normally used as the electrolyte. During electrolysis, the surface of the metal is oxidised. The process continues until the desired layer thickness (usually 5-25 µm) is reached. To obtain an impermeable surface, the pores on the surface have to be sealed. Sealing is achieved by treating the surface in de-ionised water at 95-98ºC. This changes the aluminium oxide into bohemite, the attendant increase in volume closing the pores. The anodic oxide layer has good corrosion resistance in most environments and further it is virtually maintenance free. An anodised profile can be recycled with no pre-treatment.

4 Description and assessment of the Packing practices

Packing operations are assessed for burdening of the environment and recycle ability.
There are two packing operations involved in production:

- packing of parts
- packing of finished product

Parts
For the packing of large parts, pallets and wire-mesh trolleys are used, which are recycled.
For smaller parts, cardboard boxes and plastic bags (LDPE) are used, which are recycled several times.

Finished product
For the packing of finished product, cardboard boxes and plastic bags (LDPE) are used. Since Martela takes care of its own transport, we are able to take back our packing material and have it recycled or disposed of in a responsible manner.

Cardboard
In cardboard production main raw materials are recycled paper and virgin fibre. As a waste product, it can be used again as a raw material for cardboard. This makes cardboard the most environmentally friendly packing material. Only white (bleached) cardboard is an extra burden on the environment and is therefore not used as a packing material. On average the raw material mixture in our cardboard packages is: 40% recycled and 60% virgin fibre.

Plastic bags (PE)
A plastic bag is often needed for proper scratch-resistant and dust-proof packing. Natural PE is the most environmentally friendly plastic for this. Since the bags are very thin (=0.05mm), they require only very little material. Moreover, the plastic bags can be used several times. Hardly any hazardous substances are released when processed in a waste incinerator.

5 The product structure, Big side cabinets;

5268PL/C1/C2/C3 Veneered
*particle board includes veneer

	kg	MJ	% kg
Particle board	44,0	351,7	**69,2 %**
MDF	7,1	84,9	**11,2 %**
Steel	11,4	266,6	**17,9 %**
Aluminium	0,8	158,6	**1,3 %**
Plastic	0,2	14,0	**0,3 %**
	63,5	**875,8**	

5268PL/C1/C2/C3 Painted

	kg	MJ	% kg
Particle board	14,2	113,3	**20,7 %**
MDF	41,9	470,8	**61,2 %**
Steel	11,4	266,6	**16,6 %**
Aluminium	0,8	158,6	**1,2 %**
Plastic	0,2	14,0	**0,3 %**
	68,5	**1023,3**	

5269PL/C1/C2/C3 Veneered
*particle board includes veneer

	kg	MJ	% kg
Particle board	47,4	379,1	**70,8 %**
MDF	7,1	84,9	**10,7 %**
Steel	11,4	266,6	**17,0 %**
Aluminium	0,8	158,6	**1,2 %**
Plastic	0,2	14,0	**0,3 %**
	66,9	**903,2**	

5269PL/C1/C2/C3 Painted

	kg	MJ	% kg
Particle board	14,2	113,3	**19,5 %**
MDF	45,9	546,2	**63,3 %**
Steel	11,4	266,6	**15,7 %**
Aluminium	0,8	158,6	**1,1 %**
Plastic	0,2	14,0	**0,3 %**
	72,5	**1098,7**	