TECHNICAL DOCUMENT

HOW TO CUT MELAMINE-COATED PARTICLEBOARDS | MFC

SONAE ARAUCO

Taking wood further

INTRODUCTION

The four main factors involved in the process of cutting melamine-coated particleboards and which must be kept under control in order to obtain a good cut finish are:

- The machine;
- The cutting tool;
- The operator;
- The product.

There are several work options or variables for each one of these factors that should be assessed and if a problem arises during cutting, the following options/variables guide can help the operator or the technician responsible for production to gauge which of them are more likely to cause the failure.

FACTORS TO BE CONSIDERED IN THE PROCESS OF CUTTING MELAMINE-COATED PANELS

MACHINE

- Vertical or horizontal cutting position;
- Manual or automatic machine;
- Condition of guides and bearings;
- Angular velocity selection (rpm);
- Feed, saw and scoring blade speeds;
- Saw shaft, motor and drive shaft vibrations;
- Alignment of the parallels (important for squareness);
- Alignment of the saw;
- Condition and size of the panel holders;
- Pressure and condition of the fences;
- Saw and scoring blade height adjustment.

CUTTING TOOL

- Profile, condition and design;
- Suitability of scoring blade to the machine;
- Quality of blades;
- Thickness and quality of the bodies;
- Planeness of bodies;
- Sharpness of blades;
- Geometry of blades;
- Ratio of thickness of the saw and the scoring blade;
- Angular and feed speed;
- Attack, free and tangential angle.

PRODUCT

- Planeness of the panels;
- Mechanical consistency of the panel;
- Thickness of the outer layer of the panel;
- Abrasiveness of the panel.

OPERATOR

- Training/experience in the operation of the machine;
- Expertise in saw and scoring blade height adjustment;
- Assembly of the saw and scoring blade;
- Recognition of cutting defects;
- Cleaning of the machine and the workplace.

GENERAL RECOMMENDATIONS

The use of tungsten-carbide or diamond blades is recommended, with which better cutting quality is achieved. Although this means a higher initial cost, it is offset by higher productivity over its lifetime (between sharpening).

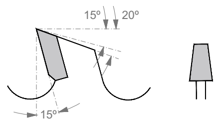
Cleaner edges are obtained when the cuts are made using a beam saw or sliding table panel saw (fitted with a scoring blade). Hand-held circular saws or jigsaws should only be used for parts whose edges are not visible or which are subsequently rectified.

The cutting saws must have a minimum of 60 teeth and minimum thickness of 2.2 mm.

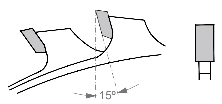
The periodic cleaning of the saws is recommended, especially the sides of the blades and their insertion areas. After a certain period of use it is common for a brownish deposit to form on the blades and body of the saw. This is due to the poor selection of the cutting and/or feed speeds and the abrasiveness of the material. This deposit thickens the blades, widening them beyond the area covered by the cutting edges, resulting in the chipping off of the melamine and aesthetically undesirable irregular cuts. This deposit on the diamond saws requires the use of a cleaning fluid. The saw blade should then be immersed in this fluid for at least 12 hours, to avoid it having to be sharpened again.

The use of saw blades with a spline not matching the diameter of the machine shaft should be avoided. Some users use adapters for these cases. This is, however, counterproductive as it generates vibrations and the locking nuts can become loose and may even make the machine unsafe to operate.

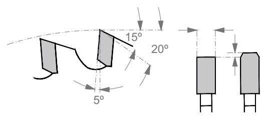
The sharpening of the tools must be done by a professional using automatic equipment. Manual sharpening of the blades is not recommended since very precise angles and geometries must be complied with, as shown in the following illustration:



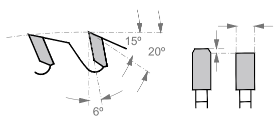
Scoring blades: conical profile positive angle



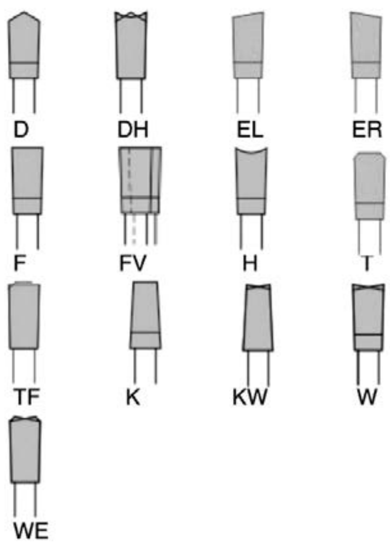
Adjustable scoring blades: flat profile positive angle



Trapezoidal flat profile: negative angle



Trapezoidal flat profile: positive angle



GEOMETRY OF BLADES:

D - Convex or diamond tipped tooth
DH - Hollow tooth with diamond tip
EL - Left bevel tooth
ER - Right bevel tooth
F - Flat tooth
FV - Extendable saw - flat tooth
H - Hollow tooth
T - Trapezoidal tooth
TF - Trapezoidal flat tooth
K - Conical tooth
KW - Conical alternate top bevel tooth
W - Alternate top bevel tooth
WE - Alternate top bevel with chamfer tooth

The most suitable saw blade profile for cutting melamine is the trapezoidal flat tooth.

It is the most resistant and it divides the chips into three particles during cutting, which results in less effort compared to the other profiles. The choice for the scoring blade is the conical type (for better adjustment between saw and scoring blade), or the flat type.

Cutting machines are generally characterised by having high speed motors (up to 7.000 rpm). This requires that a good balance is maintained between the shaft and the rotating elements (chariot and motors), thus avoiding any vibration that would ruin the cut or cause the melamine to chip.

Regular thorough inspections and maintenance of cutting machines and equipment are essential:

• Check the perfect alignment of the saw with the scoring blade. They must operate on the same cutting plane.

• The teeth of the saw and scoring blade must be of the same width or thickness.

• Check the height of the fixed cutting table and the sliding table. They must be level.

• Check the panel is adequately supported in the cutting area. The lack of support, even partial, causes vibration during the cutting process.

• Verify the good condition of the sliding table guides and that they are easy to slide.

• Check the parallelism between the direction in which the sliding table moves and the saw blade disk plane.

• Ensure the equipment is firmly attached to the ground. The levelling of the equipment is very important.

CUTTING TOOLS

	SAW	**SCORING BLADE**
GEOMETRY OF BLADES	**TRAPEZOIDAL FLAT (ALTERNATE)**	**FLAT**
Number of teeth	96	24
Distance between saw teeth	9.82 mm	19.63 mm
Teeth width	3.2 mm	3.2 mm
Thickness	2.2 mm	2.5 mm
Inner diameter	30 mm	20 mm
Outer diameter	300 mm	150 mm
Maximum angular rotation (rotations per minute)	7.600 rpm	15.200 rpm

CUTTING SPEEDS

Peripheral speeds between 60 and 80 m/s are recommended for cutting melamine. The following table shows the rpm at which the saw should be operated, according to the diameter of the saw and the different peripheral cutting speeds (at the blades).

ANGULAR VELOCITY (RPM)

SAW DIAMETER	60 M/S	70 M/S	80 M/S	90 M/S
100 mm	11.460	13.360	15.260	17.170
125 mm	9.180	10.700	12.220	13.750
150 mm	7.640	8.900	10.160	11.440
180 mm	6.360	7.420	8.440	9.540
200 mm	5.740	6.700	7.660	8.610
220 mm	5.200	6.080	6.960	7.820
250 mm	4.580	5.340	6.100	6.870
300 mm	3.820	4.460	5.100	5.740
350 mm	3.260	3.800	4.340	4.890
400 mm	2.860	3.340	3.820	4.290
450 mm	2.540	2.960	3.380	3.800
500 mm	2.280	2.660	3.040	3.420

FEED SPEEDS

It is important to understand that the feed speed of the saw and scoring blade carriage, together with the rpm of the cutting tools, have a direct influence on the quality of the cut.

A very slow feed heats up the cutting area, causing the saw to burn the panel and a dark colour and possibly smoke is observed at the cutting surface. In extreme cases, a fast feed can cause particles to be ripped from the panel. It is recommended that once the rpm is selected according to the diameter of the saw, the feed speed is at the point at which the cutting surface is clean or the colour of the natural wood and is free of roughness and irregularities.

The feed speed must be constant, i.e. it must not vary during the cutting process. Therefore, it is important to check the lubrication of the guide, bearings, chain tension, etc. Between cuts, the feed speed must be adjusted to reduce the negative impact due to the progressive wear of the tool.

QUALITY OF THE MELAMINE PANELS

The material to be cut may also have characteristics that negatively influence the quality of the cut.

Cutting panels that are too warped or with significant undulations (flections over 2 cm) often results in imperfect cutting surfaces. This is due to the lack of panel support in the bending areas, since the pressure of the panel holders or the fences is not sufficient to completely flatten the panel. It is therefore necessary to check whether the cutting machine has the capacity to negate the imperfect condition of the panel. If there is no such guarantee, it is best to separate out the panels, check the causes of their warping and, in the meantime, place them on a flat surface to aid them to recover flatness.

Panels with poor strength, that is with poorly agglomerated wood particles, are also more likely to have melamine chipping off at the edges of the cutting surface. In these cases, the shear stress exerted by the saw causes the particles to break loose (they are not cut but torn off). This will subsequently exert pressure on the upper layer (melamine) and cause it to break.

The thickness and compactness of the outer layer of the panel are perhaps the characteristics associated with the panel that can have the greatest impact on the quality of the cutting edge. The cutting of melamine panels with a very thin and/or poorly compacted outer layer of particles is usually problematic. In this case it is especially important to ensure optimum machine conditions, with tools in very good condition, presenting little wear, and an experienced operator to obtain a satisfactory cutting result.

Another factor that impacts on the performance of the cutting equipment, and therefore the quality of the cut items, is the abrasiveness of the panel. The effect is not immediate, but high melamine coated particleboard abrasiveness causes excessive wear of the blades (saw teeth) during the cutting process. In these cases, the cut will gradually worsen, reaching an unsatisfactory level of quality much earlier than expected if the operator is not attentive, resulting in a large number of rejected items. Cutting such panels means that the saws have to be replaced and sharpened more frequently. The abrasiveness of the panels can be influenced by the presence of contaminants in the wood used in the production, basically inert materials (sand, stones, etc.) and metals, which have not been removed by the separation and cleaning systems during the manufacturing process, or by the incorporation of additives which give the panel additional specific properties, e.g. certain flame retardants.

STORING CUT ITEMS

The storage of the cut items must be done to protect them from moisture and adverse weather conditions. They must also be kept away from doors and gates leading outdoors.

The edges of all wood-based panels are the most sensitive to impact and moisture, so if the cut items are to be stored for more than 3 or 4 days, it is best to do so with the edges protected.