DELTA THREE OSCAR

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Virginia Tech Corporate Research Center
1750 Kraft Drive, Suite 1275
Blacksburg, VA 24060

Fabrication guidance for Delta Three Oscar Ballistic™

1. Cutting, Sawing, Routing etc.

Standard hand and powered tools can be used to cut Delta Three Oscar Ballistic™ foam. All tools should be sharp to ensure clean cutting and minimise swarf generation. The wearing of suitable eye protection and a dust mask is recommended when using power sanders, routers, etc.

2. Splitting

Delta Three Oscar Ballistic™ foam can be split using a standard roller splitting machine. We recommend using the lowest roller speed. A sharp blade running at a high speed should be used. This avoids excessive drag on the blade which can cause surface melting.

Difficulties can arise when splitting “dry” material. We recommend the material is first environmentally conditioned. Guidance on this is outlined below.

Static electricity build-up can occur causing operator discomfort. This can be eliminated using HT antistatic ioniser bars positioned across the full width of the machine both above and below the material on the take-off side.

3. Thermoforming

Delta Three Oscar Ballistic™ can be thermoformed through vacuum forming; compression moulding; flat platen moulding. Delta Three Oscar Ballistic™ requires a processing temperature of around 220°C. For this reason oil or electrically heated equipment is required. The temperature differential (the relatively high temperature of moulding to ambient) during moulding leads to rapid freeze-off. Consideration should be given to moulding equipment including the type of tool used: female vacuum forming tools give better definition to male tools; reducing the proximity of the oven to the tool helps prevent premature freeze-off; heated tools help with surface definition.

As higher temperatures are typically employed for thermoforming it is essential to have adequate ventilation in the area and local exhaust extraction is recommended.

Vacuum moulding equipment starting point recommendation (although will depend on equipment type): central zone + overhead heater temperature = 280 C; under head heater temperature = 250C; cycle time = 95 secs.

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4. Butt Welding

A good weld can be produced using a travelling blade welding machine with the following conditions:

For “dry” sheets:

- blade temperate of 465°C to 475°C (869°F to 887°F)
- speed of 0.18 m/s [speed setting 70 on the P&P butt-welding machine]
- heating dwell time of 5 seconds

For “conditioned” sheets:

- blade temperature of 480°C to 500°C (896°F to 932°F)
- speed of 0.14 m/s [speed setting 50 on the P&P butt-welding machine]
- heating dwell time of 5 seconds

A weld as strong under tension as the base material can be achieved for sheet thicknesses up to 15mm. Care should be taken when rolling sheets immediately after butt-welding. The new join is brittle and can fracture, particularly for sheet thicknesses greater than 15 mm.

As the temperature of the blade is above the decomposition temperature of the material it is essential that adequate exhaust extraction is fitted and the exhaust gases directed to a safe place.

4. Lamination

A weld as strong under tension as the base material can be achieved for sheet thicknesses up to 15mm. Care should be taken when rolling sheets immediately after butt-welding. The new join is brittle and can fracture, particularly for sheet thicknesses greater than 15 mm.

Sheets can be laminated using a proprietary heated blade laminating machine. Recommended conditions are:

- Blade temperature: 380°C (716°F)
- Roller Speed: 8.4 m/min (27.6 ft/min)
- Maximum thickness: 300 mm
- Maximum width: 1300 mm

A minimum roller pressure consistent with producing a good weld should be used.

As the temperature of the blade is above the decomposition temperature of the material it is essential that adequate exhaust extraction is fitted and the exhaust gases directed to a safe place.

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6. Waste Disposal

Scrap arising from fabrication should be disposed of in accordance with local regulations. The foam can be incinerated in accordance with local regulations. Recycling is possible.

7. Environmental Conditioning

The Delta Three Oscar Ballistic™ foam absorbs small amounts of moisture from the surrounding atmosphere. In cold dry conditions the material can be brittle: referred to as “dry” in this document. In warmer more humid environments it is more flexible and ductile: referred to as “conditioned” in this document.

To condition Delta Three Oscar Ballistic™ the foam sheets should be stored in a typical working environment (20°C & 50% relative humidity) prior to processing. The conditioning time can be reduced by any of the following: removing the process skins; increasing the storage temperature; spraying a small quantity of water over the sheets.

In all operations, special attention should be paid to prevent overheating of the material. Local exhaust extraction is recommended for butt welding, thermoforming and lamination operations where higher temperatures are typically employed. For further details on safety precautions the user should refer to the relevant Material Safety Data Sheet