Moulding Compounds Limited
West Side Industrial Estate, Jackson Street
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VAT NUMBER: GB128445312

PROCESSING OF BONDDISC PHENOLIC MOULDING MATERIALS

Moulded components can be produced from **BONDDISC** grades by 'compression', 'transfer' and 'injection' moulding techniques.

Prior to moulding, we recommend that the bag be inverted several times to ensure that the material is well mixed as contents can sometimes settle in transit.

Pre-pelletising (cold) of the powder is possible in automatic or manual machines.

Preheating by radio frequency, infra red, drying ovens, etc., can be employed immediately prior to moulding; or extrusion/preplasticisation can be used.

The nature of the fillers incorporated can have some effect on the above processes. For example, long fibres, bulky materials may not automatically feed; conducting fillers such as graphite or aluminium powder may create preheating problems. Individual data sheets for each **Bonddisc** grade should indicate this.

The selection of the best processing procedures is very important in producing economic, quality mouldings and these should be established for each component. However, the table below gives some guidance to general conditions.

Compression Moulding

Mould Temperature	-	150 - 180°C
Compression Mould Pressure (min)	-	150 bar
Curing Time (4mm section)	-	40 - 60 secs

Transfer Moulding

Mould Temperature	-	150 - 180°C
Compression Mould Pressure (min)	-	400 bar
Curing Time (4mm section)	-	40 - 100 secs

Injection Moulding

Barrel Temperature	-	70 - 90°C
Screw Temperature	-	60 - 80°C
Nozzle Temperature	-	85 - 110°C
Mould Temperature	-	150 - 180°C
Injection Pressure	-	800 - 2500 bar
Screw Back Pressure	-	50 - 300 bar
Injection Speed	-	5 - 10 secs
Curing Time (4mm section)	-	20 - 40 secs

Jigging of the hot moulding when ejected from the tool, can be employed to achieve improved dimensional stability or accuracy.

Post stoving of mouldings is occasionally employed where exposure to high temperature is envisaged. Temperature and temperature gradients employed depend on the type of material, the thickness of section and the ultimate exposure required. This should be found by trials. Temperatures ranging from 130°C to 220°C are involved.

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BONDDISC PHENOLIC MOULDING MATERIALS CHARACTERISTICS

A full range of Bonddisc Phenolic Moulding Materials are manufactured by compounding phenolic resin with various fillers such as cellulose, organic and mineral fibres or powders.

Phenolic moulding materials are thermosetting in nature – once moulded, they cannot be re-softened. They are characterised by a permanent hard, tough, rigid nature. Several particular properties of Bonddisc Phenolics make them a good choice of material for many applications where they score over alternative plastics, both thermoset and thermoplastics.

1. Flame and Fire resistance

An important requirement for plastic materials is to resist burning and have low smoke emission with low toxicity combustion products. This is important for public safety, particularly where escape from fire could be restricted, for example as in aircraft, underground and public buildings and also in automotive applications.

Phenolic based materials in general show advantages in these areas. They do not rapidly melt, but retain their form even in high temperature burning situautions. Thermal attack results in a protective surface ‘charring’ which acts as a thermally insulating layer so retarding the spread of thermal degradation. Bonddisc grades can be manufactured to give a UL94 V-0 or V-1 rating with little difficulty and do not require halogenated flame retardants which create their own hazards on combustion when added to other polymers. In general, the greater the percentage of mineral filler present in the phenolic compound, the greater the natural flame resistance.

An oxygen index value of 30 – 40% for phenolics also indicates their resistance to burning and smoke emission and toxicity of combustion products is low.

2. Heat resistance

The cross-linked phenolic resin component of Bondddisc grades ensures long term stability over a continuous temperature ranging from 140 – 180^{o}C (increasing where all mineral fillers are incorporated) and intermittent exposure up to 250^{o}C (as in oven ware handles) is possible.

Retention of physical properties at high temperatures over long periods is excellent compared to other plastics. Heat resistance is often improved by short term ‘tempering’ prior to exposure to higher temperatures.

Phenolic compounds find uses where thermal insulation is required to protect more heat sensitive mechanisms. Heat shield on automobile braking and exhaust systems represent this type of application giving relatively low heat conductivity and stability of form in abnormal heat generating situations. The exposure temperatures and general working conditions have some bearing on the best filler system to incorporate with phenolics to obtain best results.

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3. Chemical resistance

Resistance to solvents, oils, fuels, greases and weak acids is high for cross-linked phenolics. Successful use over many years in applications such as carburettor gaskets, water pump housings, exhaust gaskets and in chemical plant are evidence of this.

4. Bearing and Wear resistance

A further important property of phenolic materials particularly with cotton fabric filled types is on running surfaces where good resistance to wear is obtained from the hard bearing like surfaces, for example, pulley wheels, escalator wheels.

Further improvements in PV and wear resistance are possible by inclusion of small amounts of internal lubricant such as graphite and PTFE, or alternatively, running surfaces can be grease treated without detriment to the moulding. Dimensional stability and creep resistance under pressure running is exceptionally good compared to thermoplastics.

5. Electrical Insulation

Electrical insulation properties of phenolics are good. Mica filled and glass filled phenolics are used in commutators for example, where good electrical insulation combined with strength, dimensional stability and heat resistance are relevant.

Incorporation of organic (nylon) fillers giving retention of insulating properties under long term hot/humid conditions and use of one stage phenolic resins guarantees no corrosion of attached brass electrodes under similar conditions.

Track resistance and resistance to arcing can also be improved by judicious selection of resin/filler systems.