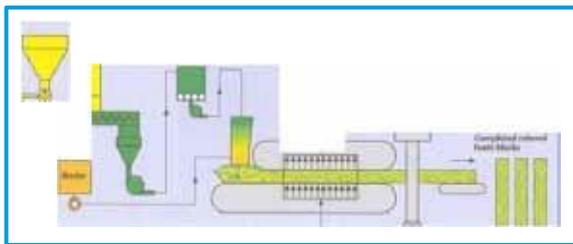


RECYCLING AND RECOVERY

POLYURETHANES

Rebonded Flexible Foam

Bonded foam, or rebond, is a moulded polyurethane product made from pieces of shredded flexible polyurethane foam, held together with a binder. Its relative high density and excellent resilience make it suitable for applications including vibration sound dampening, flooring, sport mats, cushioning, packaging and carpet underlay. In fact, rebond has been in use for decades. Up to 50,000 tonnes of rebonded foam are processed each year in Western Europe and new applications are constantly being developed.



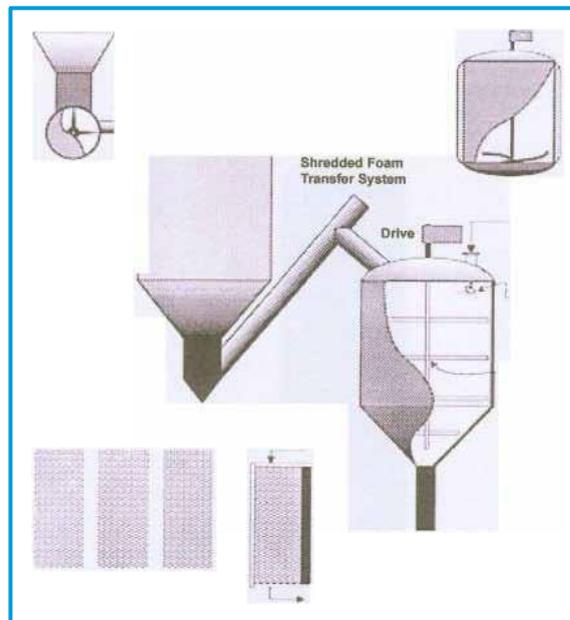
Typical bonded foam equipment using continuous moulding process

Bonded foam properties can be varied over a wide range by careful selection of base material, particle size, compression ratio, type and quantity of the binder. As a consequence, rebonded flexible foam is gaining acceptance in applications which so far could not be satisfied by virgin foam material.

The Process

- o foam collection and sorting
- o shredding
- o coating with adhesive binder
- o compression to desired density and shape
- o activation of adhesive binder
- o curing of adhesive binder
- o converting of rebonded foam parts

Typical bonded foam equipment using batch moulding process



Foam pieces from various sources - production trim and post-consumer waste - can be suitable for rebonding, although in practice production trim and cuttings are by far the most commonly processed. Granulators and flock-mills are normally used to shred the foam into pieces approximately one centimeter in diameter. There are other technologies available to handle large foam pieces by cutting them into very thin strips, which can then be reduced into smaller pieces.

The ISOPA Fact Sheet "Options in Practice" lists companies which are practicing foam rebonding. The technologies used vary according to the market requirements and the final use of the rebond articles.

Rebonding of polyurethane foam can be carried out through batch or continuous moulding. The foam blocks are further processed to fabricate parts and articles, resulting in trim which in turn can be reused in the process. Rebonding is also applied in the moulding--to-final-shape technology which allows processors to optimise material use and cost.

From a storage hopper, the small foam pieces are fed into a blend tank by means of an Archimedean screw. In the tank, the foam is sprayed/mixed with a polyurethane binder. Once coated with the binder, the foam is fed into a mould. In the batch process, a rectangular or cylindrical mould is used. A piston compresses the foam in the mould to the desired density. Steam is then introduced to activate and cure the binder. After curing, the mould can be opened, the rebond removed from it and allowed to dry.



Where a continuous moulding process is used, the foam binder mixture is deposited from the blend tank onto a moving conveyor. Another conveyor is positioned above this so that the mixture is compressed as it passes between them.

Conventional cutting and peeling processes are used to turn the rebond into finished products.

Rebond characteristics

The quality of rebond depends on several factors like:

- o the types and grades of the foams used
- o the particle size and uniformity of the shredded foam pieces
- o the density required of the end product
- o the quality of the binder
- o the binder / foam ratio

Typical physical properties of rebonded foam

Density kg/m ³	60 - 300
Tensile strength kPa	40 - 150
Elongation at break %	40 - 90
CLD hardness at 10% compression	4 - 20
at 25%	5 - 50
at 50%	15 - 150

SUGGESTED READING

'Rebonded Foam on the Basis of an NCO Prepolymer', Bayer; March 1987

'Basics of Bonded Foam', Dow Plastics, 1991 (Form No. 109-01506-591 SMG)

'Remotec Product Information', Hennecke Polyurethan -Anlagetechnik, October 1995

Recycling companies are kindly invited to submit to ISOPA their references in case they are active in practicing PU recycling and recovery.

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ISOPA - the European Isocyanates Producers' Association - is an International Non-Profit Organisation under Belgian law (AISBL).

Since the original polyurethane material has not been designed for use in articles in contact with food, relevant EU (such as Directive 90/128/EEC) and national legislations need to be consulted, if and when recycled materials are used to manufacture articles and goods for possible direct and indirect food contact.

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