



Polystyrene Beehives: **Design Concepts for British National Hives**

Summary

Polystyrene bee hives have long been popular on the continent and are becoming increasingly common in the UK. It is therefore inevitable that a number of different British National designs will be developed. When designing a polystyrene version of an existing beehive type, it is important to ensure compatibility with other hives of that type. The design and production possibilities when using polystyrene to manufacture beehives are such that each manufacturer could produce completely different polystyrene versions of British National hives. These designs could all be compatible with British National frames, but may not be compatible with each other or with parts of wooden hives. This would lead to a fragmented market and a lack of confidence by beekeepers that what they are buying will work with their existing equipment. This article sets out and discusses key concepts for British National polystyrene beehive design. The design principles discussed will allow freedom to design hives, which are sufficiently different from each other to differentiate between suppliers and manufacturers but are compatible with other polystyrene or wooden hives in order to maintain flexibility and consumer confidence.

Design Concepts

The most important consideration when designing a new polystyrene beehive is to ensure compatibility with existing wooden and polystyrene beehives. If every manufacturer designs their own beehives independently and without reference to the existing designs, they will probably not be compatible with each other. This would ultimately lead to a lack of consumer confidence whereby beekeepers would not know what was compatible with their existing beehives, both wooden and polystyrene. By manufacturers following a few common design principles they can ensure that all polystyrene British National beehives are compatible with each other and with existing wooden hives. These common design principles will still allow each manufacturer to have sufficient freedom of design to ensure that the designs can be differentiated from each other in both form and function, whilst allowing each manufacturer to have their own unique selling point.

The design of polystyrene beehives is not limited like wooden hives by commonly available sizes or cutting profiles, therefore the design options for a polystyrene version of an existing hive are numerous. The most important design concept is compatibility with existing beehive frames this ensures that the beekeeper can simply transfer their frames from their existing wooden hive or nucleus into the new hive. Frame size is fundamentally what differentiates beehive types from one another and therefore is what makes a particular beehive a British National or not.

An additional feature of the British National beehive design, not common in other beehives, is that it is square externally. This allows the beekeeper to align the frames with the entrance in either the warm way or cold way. Although there is little evidence to support any differences between the results obtained by aligning the frames either way, many beekeepers will not change their management practices. It is therefore important that the beehive is square and can be aligned in either orientation.

The density of the polystyrene used in the manufacture of the hives is important as this determines the balance between strength, insulation and cost. Higher density material is stronger but provides less insulation and is more expensive. Lower density polystyrene provides better insulation but is subject to damage during inspections and the bees are able to chew holes in the material. Recent attempts to produce cheap polystyrene beehives in the UK to British National designs were made using insulation grade polystyrene cut to size. These were initially popular but rarely lasted for more than one or two seasons and have now been withdrawn from sale. These low grade hives caused distrust within the beekeeping community towards polystyrene beehives and have severely damaged their reputation in Britain. It is essential that this error is not repeated. A minimum of 100 grammes per litre is recommended as giving the best balance between maintaining adequate insulation in the walls while delivering sufficient strength and damage resistance. It is the density of material used extensively in mainland Europe.

To achieve the same strength the walls of a polystyrene hive need to be thicker than a corresponding wooden hive. Also, if the walls of the hive are too thin, the bees may chew through a thinner section to create an additional entrance. This is of particular relevance in sections such handle rebates and the wall at the end of the top bar of the frames.

When designing a new polystyrene beehive the options are to keep the external dimensions the same as a wooden hive and to reduce the internal dimensions, or to keep the internal dimensions the same and increase the external dimensions. Keeping the external dimensions of the hive the same as a wooden hive imposes several significant problems. To achieve an adequate wall thickness in the side walls you need to reduce the number of frames from 11 to 10, given that many queen bees in the UK are so prolific they often need to be kept in brood and a half, double brood or 14x12 hives, reducing the number of brood frames compounds this problem. The most significant problem of keeping the external dimensions of the beehive the same, is that the walls in the area of the handle rebates and at the end of the frame top bars will remain the same thickness as those of a wooden hive. These areas are too thin and highly susceptible to damage during inspections, which may significantly reduce the overall life of the beehive.

Keeping the internal dimensions the same as a wooden hive has many important advantages. Most significantly, adequate wall thickness can be maintained in the areas of the handles and at the end of the frame top bars. Careful design should also ensure that sufficient wall thickness can be maintained if a hive is designed to take commercial frames. By removing the constraint of the external dimensions the walls can be made significantly thicker. This dramatically improves the insulation of the hive, keeping the bees cooler in summer and warmer in winter, which potentially increases honey yield and reduces the need for winter feeding. For the beekeeper they can move their colony from a wooden hive directly into the new polystyrene hive. They also do not have to alter any of their management practices or techniques. The only disadvantage of this design option is that the polystyrene supers or brood bodies may not fit under existing wooden roofs. However, the majority of beekeepers switching to polystyrene will buy complete hives including roofs and, considering the advantages that design option allows for both to beekeeping and longevity, this problem is not significant.

The exact external dimensions are not so critical but it is important that they provide a balance between wall thickness and practicality. To deliver this and to ensure compatibility with existing designs it is recommended that a standard external dimension of 500mm x 500mm be adopted while keeping the internal dimensions identical to those of a wooden British National beehive. This gives thick, highly insulating end and side walls and allows deep, easy to grip, handle recesses. It also allows adequate wall thickness to be maintained if a commercial framed hive is produced. The increase in size is not too large and is not noticeable when beekeeping or moving hives of these external dimensions.

To ensure compatibility with both wooden hives and other designs of British National polystyrene hives the top and bottom edge of each lift must be flat, although a small round on the external edge assists with separating the lifts. This means that the hives can be stacked and used in the normal way. There is a temptation to put lugs or locking sections on the edges of the lifts or the floor, such that the hives fit together and cannot be misaligned. These can cause significant problems when trying to prise the lifts apart and will also prevent compatibility with any other design of hive.

The majority of British National hives sold and used in the UK have bottom bee space. Regardless of the beekeeping justifications for either system, to ensure compatibility with the majority of the UK market, polystyrene beehives should use bottom bee space.

The design of the roof, floor and entrance block, inner cover or crown board and hive stand can all be unique to a particular manufacturer. Provided they have internal dimensions identical to the wooden British National hives and are compatible with lifts with a flat top and bottom edge in a hive with external dimensions of 500mm x 500mm. This allows each manufacturer to have a unique selling point. By ensuring that the designs of each new British National polystyrene beehive are different but remain compatible with each other, consumer confidence in polystyrene beehives in the UK should improve.

Recommended Design Standards

The key design standards to ensure compatibility and maintain consumer confidence are:

1. The density of the polystyrene should be a minimum of 100 grammes per litre.
2. The internal dimensions of the hive should be identical to a wooden British National hive allowing 11 standard or 12 hoffman self spacing frames.
3. The external dimensions of the hive should be 500mm x 500mm.
4. The top and bottom edge of each lift should be flat, possibly with a small round on the outside edge.
5. The hives should be bottom bee space.