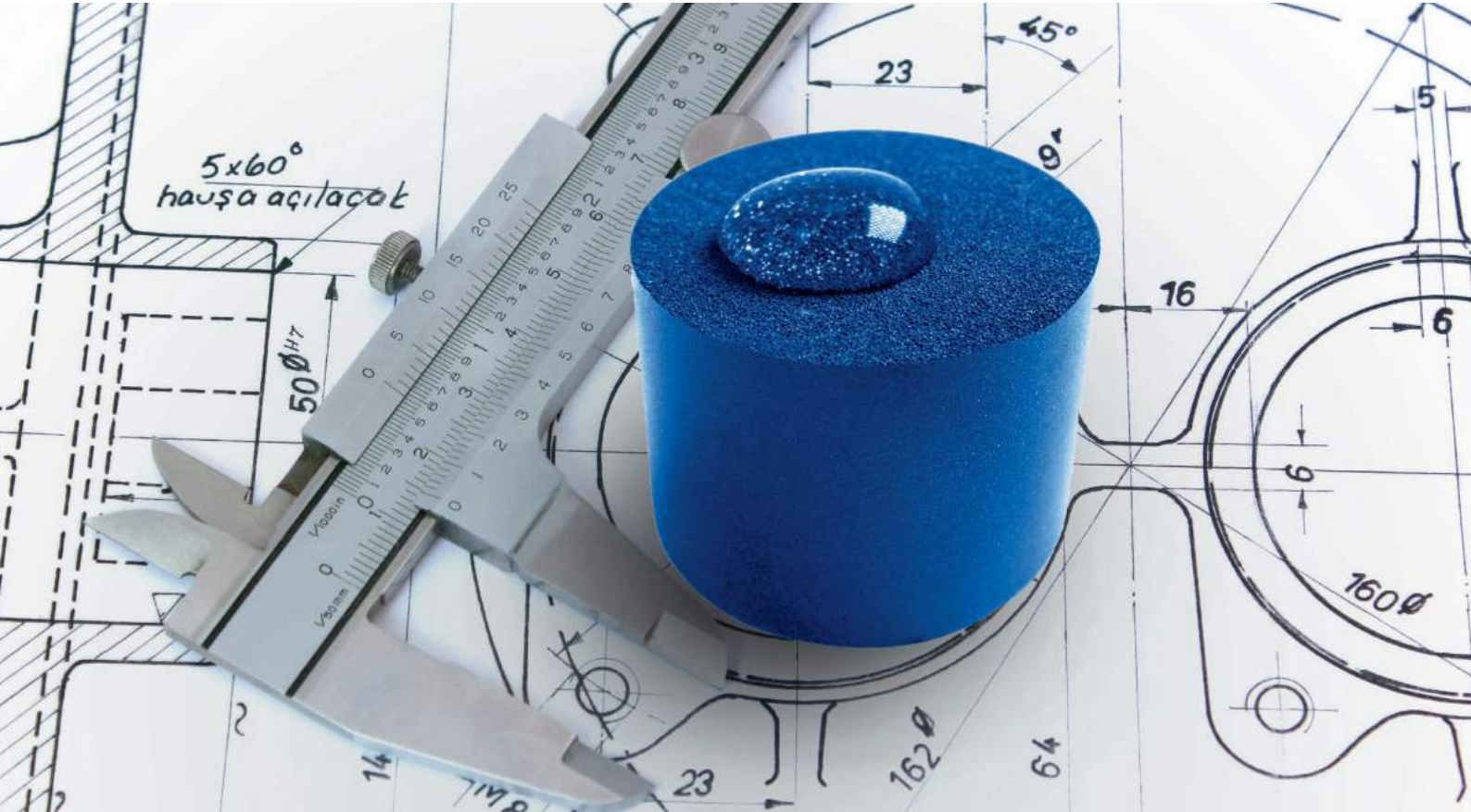
Robafoam

Robotically-applied, foam seal specialists

Design Guide



Robafoam Design Guide

Robafoam Ltd is a specialist foam sealing company based in Leamington Spa. Since our opening in 2013, Robafoam have been providing high performance IP rated seals to our customers from a range of different industries, including automotive, lighting, electronics and marine to name a few. By using 6-axis robots to directly apply foam to customers' parts, we are able to produce high performance foam gaskets on any substrate. The bespoke foam seal then cures in seconds on the part, ready to be dispatched back to the customer.

Suppliers of unique Single Component foam creation equipment and materials to make foam seals.

This Design Guide has been put together to assist designers working in any industry on how best to incorporate a foam seal into their design. By considering the seal requirements at the beginning of the design process, taking into account the impact of joint design, bolt location and the part material, it will save a huge amount of stress and money later on during the process. We hope you find this Design Guide useful and feel free to get in touch if you have any further questions.

Cell structure

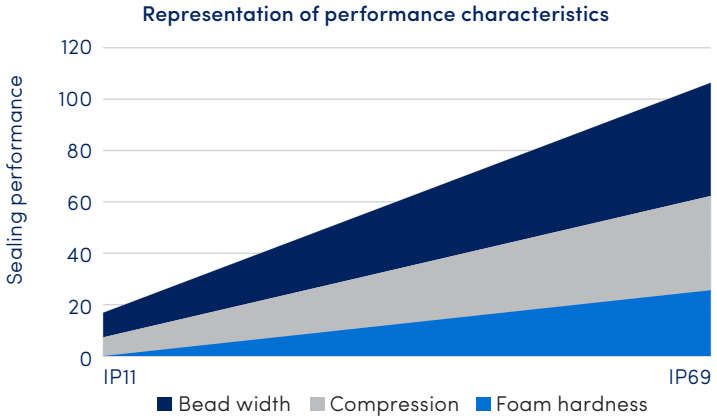
Open cell structure

Closed cell structure

Our Single Component (1K) foam is a predominantly closed cell structure. Therefore its sealing performance is not reliant on surface skin integrity. Closed cell structures perform well with high performance water tight seal requirements. They are suitable for both multiple opening / closing applications, or fit and forget joints.

Note: closed cell foam structure exhibit slower height recovery when decompressed.

Sealing performance



There are a range of performance requirements demanded from compression foam seals. These include differing "Ingress Protection" levels (IP ratings), customer specific demands, fluid resistance and thermal demands. So the Component Designer looks to take these factors into account at the concept stage

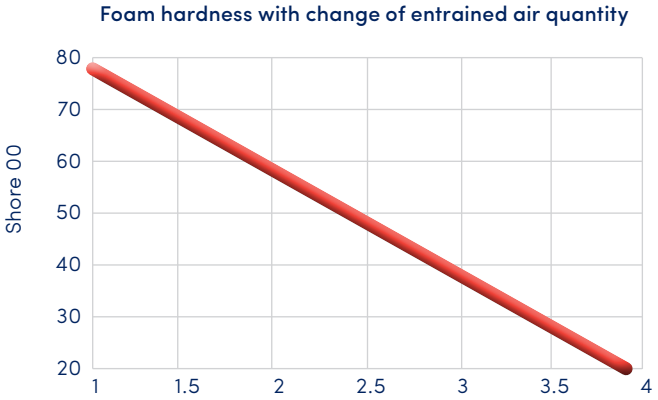
Our technology allows fine adjustment of height and width to foam beads as they are applied. Hardness can also be selected, from one base material. This gives increased flexibility, in achieving the part's functionality.

The adjustable parameters to achieve increased sealing performance are logical.

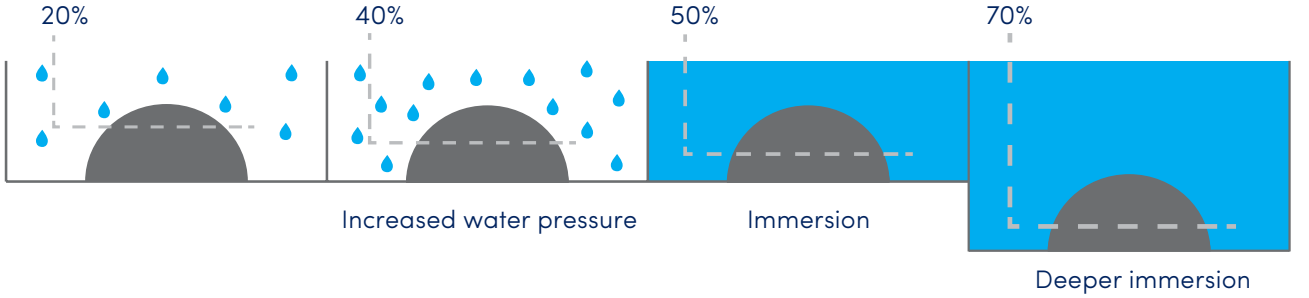
If a designer can keep 3 key points in mind, it will benefit the sealing performance of the part:-

- Wider bead widths generally have higher sealing performance – larger sealing faces.
- Higher compression levels increase seal performance.
  eg: 20% water spray / 50% water immersion / 70% max compression
- Harder foam generally improves sealing performance.

However the constraints of the part design; ie part flexibility, span and size of fixing points, wall thickness etc. all play a contributing factor.

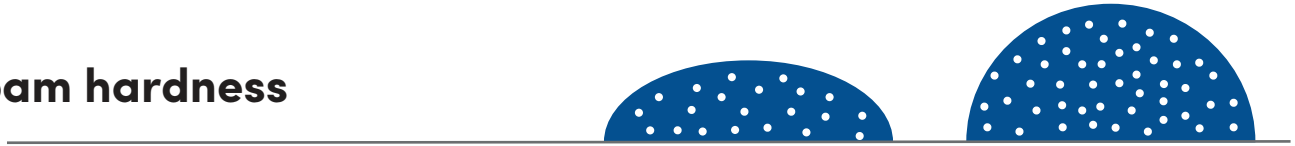


Compression effect



IP11 IP63 IP63 IP65 IP66 IP67 IP68 IP69

Foam hardness



Foam height to width ratio increases with high level of entrained air (softer foam)

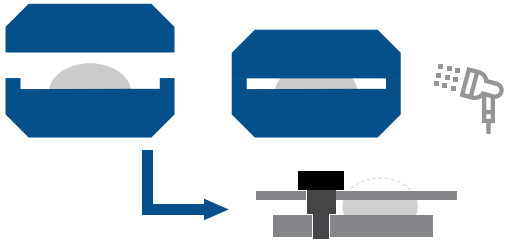
Bead size

Increasing the bead width = higher seal performance. Larger foam beads are more elliptical in cross section.

Joint design

Overlap joint

A physical compression limiter is required. This gives improved protection to higher power jet penetration.



Butt joint

A standard joint needs a compression limiter of some form to control foam compression level.

Standard joint

Allows joint face contact. Cellular foam compresses into groove section. Radius to base of groove is better for foam application.

Tongue and groove

Upper tongue increases contact face with foam. Again radiuses are the preferred option, creating less stress to the foam surface.

Adhesion

The adhesion of our 1K material to a component's surface depends on the surface energy of the material or surface treatment in question. Also the potential contamination of the surface. Therefore different material surfaces exhibit different levels of "natural" adhesion.

Surface energy can be changed by the prior application of "atmospheric plasma" to the material surface, where the foam bead is to be applied. It is also possible to use liquid surface primers, to promote adhesion. The increased "wetting" of the foam to the surface of the part can lead to the foam bead being reduced slightly in height.

Having adhesion to the material surface with naturally enhance the sealing performance at this specific joint interface.

It is important to note that Single Component foam can be used as a very effective bonding agent / adhesive, where good surface adhesion exists.

Applied either as a liquid foam or in its unfoamed state. In a foamed condition, it has good gap filling properties. Naturally, both mating surfaces must have this high adhesion level.

It is therefore possible to combine bonding and foam sealing processes within the one workstation, saving time, space and investment with separate applications. Whether bonding or foam sealing, our 1K material cures rapidly at 80°C.

Adhesion on plastic parts		
Material	**With plasma pre-treatment**	**Without plasma pre-treatment**
ABS	✓	✓
PA	✓	✓
PBT	✓	✗
PC	✓	✓
PE	✓	✗
PMMA	✓	✓
POM	✓	✗
PP	✓	✗
PS	✓	✗
PTFE	✗	✗
PUR	✓	✓

Adhesion on metal parts		
Material	**With plasma pre-treatment**	**Without plasma pre-treatment**
Aluminium raw	✓	✗
Aluminium anodised	✓	✓
Oiled steel sheet	✓	✗
Satin stainless steel	✓	✗
Chrome (High gloss)	✓	✗

*Adhesion can additonally be built up on raw aluminium with primer

✓ = Cohesive fracture ✗ = Adhesive fracture

Heat curing

Single Component foam rapidly cures at temperatures on or above 80°C. The foam itself will cure in a few seconds. It is the heat sink property of the part material that determines the length of time the foam takes to cure on the component. In most cases 2 to 7 minutes.

Generally conventional oven systems are used to cure the 1K material, but it will also cure in microwave ovens.

The temperature of the part at time of application, can also impact on the cure time of the foam. So a plastic part taken directly from an injection mould machine (say at 60°C) at time of foam application, will require significantly less time in the oven, compared to apart being processed at an ambient temperature of 20°C.

For further information or more detailed design guidance, please get in touch

+44(0) 1926 336 231

uk@robafoam.com

Robafoam Ltd
Unit 1, Berrington Road
Sydenham Ind. Estate
Leamington Spa
CV31 1NB
Great Britain

+44(0)1926 336 231

uk@robafoam.com

www.robafoam.com