

Lost Foam – What is it?

Lost Foam is a unique casting process which is ideally suited to the manufacturing of geometrically complex parts with one cast. The main characteristic of the process – as already stated in the name "Lost Foam" – is the use of "lost" patterns made of organic foam materials. The patterns are inserted into a mould material that is free of bonding agents by using vibration compression. During casting, the pattern is then pyrolysed by the molten steel, thereby creating a hollow space which the molten steel fills up. In this way, an exact metallic cast copy of the pattern is created. In addition to the possible geometric complexity, Lost Foam cast parts distinguish themselves through their excellent surface qualities and dimensional accuracy.

Advantages of Lost Foam

- Without limits Lost Foam enables geometrically complex cast parts to be created with the highest quality
- Dimensionally exact High dimensional accuracy and low tolerances
- Weight reducing Lost Foam enables the creation of thin-walled, filigree cast parts
- Without subsequent machining Lost Foam is done without a core and without burrs so that there is almost no subsequent fettling work
- Optically "1a" Superior surface quality
- Environmentally friendly Energy efficient casting process with low emissions and closed mould material circulation
- Cost efficient Economically efficient casting process for prototypes and series casted parts



Product example

As an example please look at the patterns and associated cast steel parts for a grate plate (above), a drill clamp (middle) and a component for printing machines (below).



Lost Foam – an advantageous process

Areas of application

Application areas for Lost Foam at GSL:

- For geometrically complex parts
- Component dimensions up to 600 x 600 x 600 mm
- Component weight 1 100 kg
- Made of low alloyed up to high alloyed cast steel
- Series cast parts from 500 to 10,000 pieces/year with foam patterns
- Single casting or small series with machined or constructed patterns

Application limitations:

- Cast steel with less than 0.1% carbon, e.g. many stainless steels are not able to be casted
- The component must be technically suited to feeding this can be checked with a simulation
- The interior of the component must be suitable for moulding with bonding agent free sand
- The foam pattern must be sufficiently stable for all of the process steps

Product characteristics

- Wall thicknesses able to be cast from 3 mm
- Dimensional tolerances according to ISO 8062 CT07 CT09
- Surface quality Ra 6.3 and better
- Holes and slots are able to be cast
- Geometrically complex cast parts can be created by assembling pattern segments together
- Steel casting materials according to DIN, EN, ISO or customer specifications

Service spectrum GSL

- Cast part development for Lost Foam and sand casting
- Casting simulation of mould filling and solidification
- Material consulting for the choice of application suitable materials
- Pattern and tool construction for sand casting and Lost Foam
- Cast part manufacturing of single parts up to series in 150 types of steel
- · Heat treatment and mechanical machining of the cast parts
- · Component assembly, cast welding constructions
- Material inspection and non-destructive component testing
- QM system according to ISO 9000:2000
- Accreditation from Deutsche Bahn AG





Product example

As examples, take a look at the patterns and associated cast steel parts for a spinner wheel (above), a grate plate (middle) and an aircooled grate bar (below).

> modern, environmentally friendly, flexible

Procedure

Foam tools and pattern creation

A pattern made out of organic foam, e.g. polystyrol, is needed for each Lost Foam casting. The manufacturing of the patterns is carried out in series production using foam tools. For individual parts and small series, patterns could also be created by milling a foam block or using classical pattern construction.

The foams of serial parts in the foam tools create patterns with extremely high quality and repetitive accuracy. Geometrically complex patterns can be created by assembling individually manufactured pattern segments together. The use of movable cores enables the creation of undercuts and holes.

Cast part production

The previously construction foam patterns are put together into a pattern cluster for the casting process. The pattern cluster is made up of multiple patterns and the associated pouring system of downsprue, runners and ingates for the patterns to be supplied with molten steel at a later point in time.

In the next process step, the pattern cluster is coated with a thin refractory coating. Following this the pattern is encased in moulding sand using vibration compression in a special casting container.

During the casting, the molten steel is applied to the patterns that are embedded in the mould sand via the pouring system. The foam patterns are pyrolysed by the high temperature of the liquid steel melt. At the same time, the molten steel moves into the corresponding space until the pattern is completely dispersed. The gaseous products of the decomposition of the foam patterns are completely captured and postprocessed.

After a suitable cooling period, the cast parts can be simply removed from the unbound and thereby free flowing moulding material. Timeconsuming demoulding and gutting are not necessary.

Further processing

Following a brief stop in the fettling shop, the Lost Foam cast parts head off to further processing steps depending on material and delivery conditions:

- Heat treatment for the precise calibration of the material characteristics
- Mechanical machining lathing, milling, drilling until a ready-to-install part is produced
- Installation and assembly Welding and assembly of component groups
- Inspection of material characteristics and non-destructive component inspection carried out by qualified inspection personnel.



Lost Foam procedure principles







 Construction welding with Lost Foam components

> secure, high-quality, economical

Economic efficiency

Lost Foam is an especially economic production process. Partially highly geometrically complex cast parts can be created in a single production step. The amount of fettling needed is usually very low. The following mechanical machining can often be reduced as holes can be inserted during the casting and low dimensional tolerances can be kept to. Also the possibility of joining together multiple individual components into one cast part can lead to significant cost advantages. The process's economic use of energy and resources and the closed moulding material cycle are further cost advantages.

Ecology

Lost Foam is also an especially environmentally friendly casting process. The moulding sand is free of chemical bonding agents and is completely kept in circulation. In comparison to other casting processes, there are no emissions of organic moulding components in the casting hall. All the decomposition products of the foam patterns are completely caught by the vacuum system and treated in catalysing emission control equipment. Due to the low post-processing efforts needed, the amount of associated noise pollution and particle emissions are clearly reduced.

Experiences

Our Lost Foam production line for cast steel and meanwhile 20 years experience in this high-performance casting process are unique in Europe. More than 80 series products have been successfully realised in this time, not to mention numerous individual components and prototypes. We aren't going to relax on the experience we've gained however. The further development of the Lost Foam casting process has the highest priority within the framework of customer projects and basic research.



Product examples

As examples, take a look at the patterns and associated cast steel parts for a console for guiding tracks in the food industry (above) and a water cooled grate bar that would be utilised in waste incineration (below).







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