Envalior
Imagine the Future

Arnitel® Blow Molding Grades

TPC-ET

Print date: 2024-03-12

Grade coding
Arnitel® P and Arnitel® E, non-reinforced and non-flame retardant blow molding grades.
Typical Arnitel® blow molding grades are:
Arnitel® EB464 and EB463
Arnitel® PB420 and PB420-B
Arnitel® PB500-H and PB582-H

MATERIAL HANDLING

Storage
In order to prevent moisture pick up and contamination, supplied packaging should be kept closed and undamaged. For the same reason, partial bags should be sealed before re-storage. Allow the material that has been stored elsewhere to adapt to the temperature in the processing room while keeping the bag closed.

Packaging
Arnitel® grades are supplied in airtight, moisture-proof packaging.

Moisture content as delivered
Arnitel® grades are packaged at a moisture level ≤ 0.05 w%.

Conditioning before molding
To prevent moisture condensing on granules, bring cold granules up to ambient temperature in the molding shop while keeping the packaging closed.

Moisture content before molding
Since Arnitel® is delivered at molding moisture specification (≤ 0.05 w%), the resin can be blow molded without pre-drying. However, to overcome the fluctuation from package to package we advise to pre-dry (see drying section below). Furthermore, pre-drying is required in case the material is exposed to moisture before blow molding (package damage or open for longer period of time). Moisture content can be checked by water evaporation methods or manometric methods (ISO 15512).

Moisture and influence on sagging
Arnitel® blow molding grades should be handled in the same way as other TPC materials, used in (extrusion) blow molding. Especially drying of the material prior to processing is very important. Having too high moisture content in the material will give rise to a lowering of the viscosity and, consequently, increase the sagging. This might result in varying molecular weights, and to a decrease in mechanical performance.

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Drying

Arnitel® grades are hygroscopic and absorb moisture from the air relatively quickly. Preferred driers are de-humidified driers with dew points maintained between -30 and -40°C / -22 and -40°F. Vacuum driers with N2 purge can also be used. Hot air ovens or hopper driers are not suitable for pre-drying Arnitel® grades; the use of such driers may result in non-optimum performance.

Moisture content	Time	Temperature	
[%]	[h]	[°C]	*[°F]*
< 0.05 and as delivered	3 – 4	110	*230*
> 0.05 – 0.2	8	110	*230*

Regrind

Regrind can be used taking into account that this regrind must be clean/low dust content/not thermally degraded/dry, of same composition and similar particle size as the original material. The acceptable level of regrind depends on the application requirements (e.g. UL Yellow Card). Be aware that regrind can cause some small color deviations.

MACHINERY

Arnitel® grades can be processed on general blow molding machines. Conventional single screw extruders can be used for plasticizing of Arnitel® blow molding grades. Barrels with axial grooves and cooling of the intake zone as well as barrier screws are used to build up some pressure in the accumulator. This requires adaptation of the temperature settings, if you have any doubts, please consult a DSM specialist in such cases.

Screw geometry

A good melt quality can be obtained by a standard 3-zone screw with a minimal length of 24 L/D and a volumetric compression ratio of approximately 2.8 – 3.0 work fine. However a well-designed barrier screw achieves the best result in terms of melt quality and absence of un-molten polymer. An optional additional mixing element at the end of the metering section enforces a homogeneous melt temperature.

Steel type

Abrasive resistant tool steels which are normally used for glass and/or mineral reinforced materials are also to be used for Arnitel® polymers in tools, nozzles and screws.

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TEMPERATURE SETTINGS

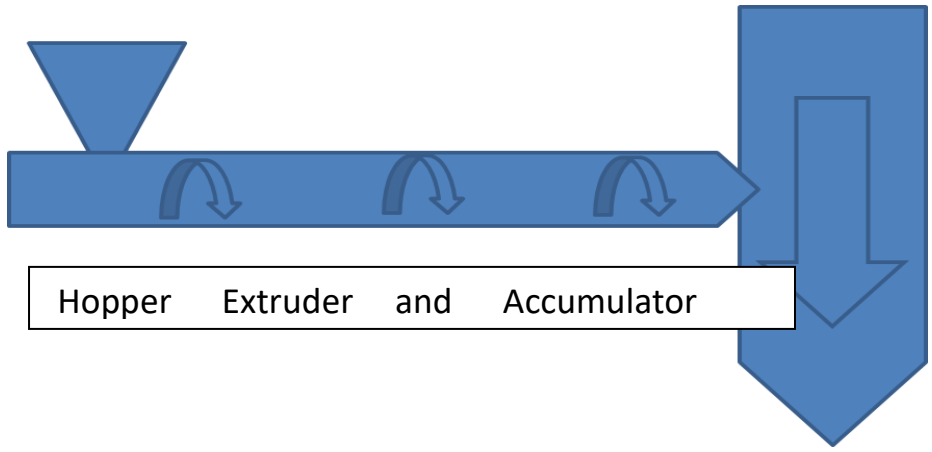
Mold temperature

Arnitel® can be used with a wide range of tool temperatures (15 - 50°C / 59 - 122°F). When wall thickness distribution is critical , it is recommended to apply a tooling temperature at the higher side (50°C / 122°F). In case the molded part tends to stick to the mold, a lower mold temperature can contribute to a better part release.

Barrel temperature

The given temperature settings are general for Arnitel®. Optimal settings are governed by barrel size and residence time. Additionally, a higher hardness and higher melting point of the Arnitel®, requires a barrel temperature at the higher side.
For the EB types, meant for Ossberger process, start at lower side of the temp range (210°C at the feeding zone).
For The P- types + 5°C will help to get started.
For PB500-H and PB 582-H the melting points are different (see Envalior Datasheet) a higher temperature for PB582-H at the hopper can help to start the process.

	Extrusion Zones			Accumulator	Resin	Mold
	Feed	Compression	Metering	Storage	Melt	Temperature
[°C]	220 – 220	210 – 230	220 – 240	220 – 240	230 – 250	15 – 50
[°F]	*392 – 428*	*410 - 446*	*428 - 464*	*428 - 464*	*446 - 482*	*59 – 122*



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Melt temperature

To generate a good and homogeneous melt, the melt temperature should always be above 230°C / 446°F. Optimal mechanical properties will be achieved at melt temperatures between 230-250°C / 446-482°F.
It is advised to frequently measure the melt temperature by pouring the melt in a Teflon cup and inserting a thermo probe into the melt.

GENERAL PROCESSING SETTINGS

Screw rotation speed

To realize a good and homogeneous melt, it is advised to set a screw rotation speed resulting in a plasticizing time that is just within the cooling time.
Please realize that a high rotation speed can generate slippage and in homogeneous melt.

Injection speed

Moderate to high injection speeds are required in order to prevent premature crystallization in the mold during injection phase and to obtain a good wall thickness distribution and a good surface finish.

Blow up pressure

To get optimal part it is preferred to blow up quick, with minimal 8 bar air pressure, via big hole. 10 bar is even better to have the best copy of the mold print /profiles

Cooling Time

Actual cooling time will depend on part geometry and dimensional quality requirements

Ejection of the part

In view of Arnitel® 's flexibility (particularly the softer types) specific attention has to be given to the mold release. Furthermore the surface of the ejection pins should be large enough to prevent damage or deformation of the part.

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RESIDENCE TIME

Melt residence time (MRT) for Arnitel® in general should not exceed 6 minutes with preferably at least 50% of the maximal shot volume used. A formula to estimate this MRT is described below

$$MRT = \frac{\pi D^3 \rho}{m} * \frac{t}{60}$$

Whereas:

MRT	= Melt Residence Time	[minutes]
D	= Screw Diameter	[cm]
ρ	= Melt Density	[g/cm³]
m	= Shot Weight	[g]
t	= Cycle Time	[s]

Optimal melt residence time for Arnitel® is < 5 minutes.

Remark:
According to the head design, most of the heads work according the principle first in first out, but cushion should remain as small as possible.

SAFETY

For the safety properties of the material, we refer to our MSDS which can be ordered at our sales offices. During practical operation we advise to wear personal safety protections for hand/eye/body.

STARTUP/SHUT DOWN/CLEANING

Production has to be started and stopped with a clean machine. Cleaning can be done with material itself, applicable cleaning agents or HDPE. Hot runners can also be cleaned and put out of production cleaning them with material itself.

PRODUCTION BREAKS

During production breaks longer than a few minutes, we advise emptying the barrel. The temperature of the barrel should be reduced to a level far enough below the melting point of the compound in order to stop decomposition of the compound. Always wear personal safety protections for eye/hand/body.

TROUBLESHOOTING

See our trouble shooting guidelines on the internet.
Contact Envalior in case more information is required from the aspect of material or processing.