Processing Guidelines Badamid A80 and LA80 Grades

General Information

This information brochure is intended to give hints and advices to skilled processor about the processing of the Badamid A80 and Badamid LA80 product lines. Due to the huge variety of articles and in the configuration of machine and tooling, this information brochure can only give general advice.

In case of more specific questions, Bada's Application Technicians remain at your disposal:

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Advice for the safe handling and processing of Badamid Compounds can be found in the appropriate material safety data sheet.

Process Support on site – our special service

We would be pleased to support you on site if you have any questions or problems with the processing of new sample materials or in ongoing series applications. We offer our processing support service for this purpose. Together with you we look for the cause to find a solution for you. If you would like to find out more, just contact us at ProcessSupport@bada.de.

Nomenclature

Badamid A80 and Badamid LA80 grades are compounds on the basis of Polyamide 66. These grades are easily flowing and suitable for injection moulding.

The product lines Badamid A80 and Badamid LA80 consist on a large variety of different grades and versions. The nomenclature is as follows:

Fillers / reinforcement:

GF	glass fibres
CF	carbon fibres
GK	glass beads
M	minerals

Tough modification:

L	dry impact resistant
TM-Z…	tough modified
SM-Z…	tough modified at low temperatures

Heat stabilisation:

K, H,	different heat stabilisers
HH, HHC	against thermal ageing

Flame retardant grades:

FR	flame retardant
FR HF	flame retardant, without halogens

Special grades:

LB	laser printable
LT	transparent for laser (welding)
TF	lubricated with PTFE
MoS2	lubricated with Molybdenum Disulfide
EL	improved electrical conductivity
UV	stabilisation against harmful ultraviolet irradiation

Processing:

S	nucleated, for fast production cycles

Besides the abbreviations given above, there are some more nomenclatures in use for special applications. Please refer to the technical datasheet of a specific grade where a description of the material is provided.

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Basically, all Badamid A80 and Badamid LA80 grades have additives incorporeted to improve flowability and mould release.

In impact modified Grades, the numbers from 1 to 3 indicate the grade of modification.

Colours are identified by an internal colour reference number. They are assigned in ascending order by Bada's colour lab. There is no correlation to RAL colours or other colour systems.

Special grades are denominated with an S, followed by a number.

Storage

Badamid A80 and LA80 grades are delivered in different packagings.
For material in original factory packaging, the following reference values fort the storage times are given;

Bags: Under normal circumstances, material can be stored significantly longer than one year. However, there is a small risk that the bags become intight.

Octabins: The recommended storage time for Octabins in original packaging is maximum 6 months.

Big Bags: Material in big bags is intended for the immediate use.

Once being opened, the content of the packaging should be processed directly.

Storage under dry conditions, if possible at modest temperatures and in closer rooms, is advisable.

Although there is no acute hazardous potential, sources of ignition and open flames should be kept away from Badamid A80 and Badamid LA80 grades for safety reasons.

Pre-drying

Badamid A80 and Badamid LA80 grades are delivered with a residual moisture content less than 0.15% by weight.
Predrying is absolutely recommended. If the packaging had already been opened before, if the bags have become intight or when processing material out of big bags or actabins, predrying is essential and inevitable.

Predrying parameteres:

- When processing Badamid A80 S natural S1, Badamid A80 S natural S4, Badamid A80 S natural S5 or Badamid A80 S natural 28, *the maximum predrying temperature must be set to 65 °C*.
- For all other Badamid A80 and Badamid LA80 Grades, the predrying temperature using a dry air dryer is 80 °C.
- The recommended drying time is 2 to 4 hours.

The predrying conditions can also be found on the technical datasheet of the respective grade.

Too high moisture contents result in hydrolytic material degradation with a significant loss in the mechanical performance of the parts, especially in terms of toughness.

As a rule, predrying might be insufficient when the melt forms bubbles (foaming), the melt drips out of the nozzle, the part surface is very uneven, or there are silver streaks / flowmarks on the part surface. Eventually, a longer predrying time can resolve this.

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But it should be kept in mind that it is possible to overdry the material. The lubricants and processing aids can be roasted out of the material. Yellowing is an indication for drying too long or too hot.

Flowlines / streaks are not always an indication for too high moisture contents. Overheating of the melt and / or too long residual times in the machine cylinder can generate similar surface aspects.

Injection Moulding Machine Configuration

Badamid A80 and Badamid LA80 grades can be processed on modern standard injection moulding machines. The machines should be equipped with at least three cylinder heating zones, flange temperature control and nozzle heater.

Single-flighted, three-zone screws (universal screws) with a length of 18 D to 22 D (D = Diameter) and a compression ratio from 1.5 to 3, preferably in the range from 2.5 to 3, shall be used. The use of a non-return valve is mandatory.

Both, open nozzles or needle-valve nozzles, can be used. The advantages of open nozzles are robustness and favourable flow conditions, whereas needle-valve nozzles prevent the suction of air while decompression of the melt is performed.

A well balanced relation between cylinder / screw configuration and the shot weight / shot volume has to be maintained. In case of screws / cylinders being too large, there is a risk of long residual times of the material in the cylinder which can cause thermal degradation of the material.

Tool and Gating Configuration

With respect to the large variety in tool design and gating technologies, it is not possible to give some general advice in this guideline.

Basis for good material processing is the well balanced relation between machine capacity and shot weight.

It is under all circumstances good practice to incorporate knowledge and experience in processing Polyamide of mould makers, processors, and production staff into the tool setup. Furthermore, the widely known and accepted general state of the art in designing the plastic parts and the mould should be applied.

Individual means of tempering, especially –if applicable- for slides and cores, are recommended, particularly when the part geometries are complex.

Concerning sprue and gating, all common types of gatings and sprues for technical thermoplastic materials are suitable.

Hot runner systems have, one the one hand, some significant andvantages for the processor. But on the other hand, hot runners mean a lot of thermal stress to the material. The risk of a thermal decomposition of the material is always present. Especially long residual times, for example if the production is interrupted, have to be avoided.

Sufficient venting has to be provided. This is especially important when flame retardant and / or tough modified grades are pricessed. Ejectors with increased clearance are a good means to improve venting locally. Venting is of very high efficiency at the ends of the flow lines or in the area of welding lines.

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Processing – General Information on Processing Parameters

The metering should be performed at the lowest rotation speed of the screw which is possible. Less important is the back pressure. But as a rule, the back pressure should also be as low as possible.
The general idea is not to bring too much friction to the material. The cooling time should be used completely for metering the material. The lowest volume which allows to work process-sure with a small, but sufficient melt cushion should be metered. Long residual times of the melt in the machine cylinder must be avoided.

Experience shows that the injection speed should be set to low to moderate values. In order to avoid burns at the end of the injection, the injection should be performed in several steps with decreasing values of the speed to the end of the injection. A general increase of injection speed can improve the surface and the stability of welding lines.

Clamping forces shall be set to the least value possible for process- sure production. This is not only good for machine durability, but improves also venting by the parting lines.

The following typical values are guidelines for processing Badamid A80 and Badamid LA80 grades:

Badamid grades A80, LA80	**not reinforced**	**reinforced (GF, CF, GK, M)**	**flame retardant (FR, FR HF)**
Heating zones	240 – 300 °C	240 – 305 °C	240 – 300 °C
Nozzle	280 – 300 °C	285 – 305 °C	280 – 300 °C
Melt temperature	280 – 300 °C	285 – 305 °C	280 – 300 °C
Tool surface temperature	60 – 80 °C	80 – 110 °C	60 – 80 °C
Holding pressure	ca. 85 MPa	ca. 85 MPa	ca. 85 MPa

The typical values given above are guidance values. The actual values are depending on machine and tool configuration, part geometry and so on and can vary in a broad range.

Specific Processing Guidelines

Flame retardant grades (FR, FR HF):
When processing flame retardant grades, it is recommended to use the lowest temperatures and pressures given above, if possible. If the melt tends to build foam, carefully check whether moisture can be excluded as a reason. If the moisture is ok, foaming material indicates in many cases the decomposition of the flame retardant,. In this case, the cylinder should be emptied and purged with a material without flame retardants. The processing temperatures shall be lowered, if possible.
Furthermore, it may be helpful to reduce shear stress by lowering the injetion speed. Perhaps, this may require higher cylinder temperature settings in contrast to what was said above.
Good venting has to be ensured. Nevertheless, cleaning of the moluld regularly in the venting areas has to be considered.

Tough modified grades (TM-Z… , SM-Z …) :
It can be possible that the temperatures have to be lowered by up to 20 °C compared to the guidance values given in the paragraph above. Good venting has to be ensured. Nevertheless, cleaning of the moluld regularly in the venting areas has to be considered.

Grades with improves electrical conductivity (EL):

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Set temperartures to the upper limits of the range given in the paragraph before. The injection speed should be as low as possible.

Application-specific processing instructions to reduce carbon emissions

When testing the carbon emissions according to VW PV 3341, for example, the carbon emissions from components can be minimized during processing by adhering to the following parameters.

Mechanical load:
• Minimize shear during melt preparation, i.e., screw speed and Dynamic pressure as low as possible (use cooling time)
• Keep injection shear low, i.e., injection speed as low as possible, nozzle and gate cross-sections as large as possible, sharp-edged transitions avoid

Thermal stress:
• Keep cylinder and, if applicable, hot runner temperatures as low as possible but still high enough that the mechanical shear is as low as possible.
• Residence time of the melt in the overall system of cylinder, nozzle and, if applicable, hot runner as short as hold possible.

Processing of Milled Material (Regrind)

In general, the use of regrind is possible. It has to be considered that moisture, dust and other impurities as well as the repeated thermal stress may have a negative influance on the mechanical properties.

In coloured grades, the colour can change (yellowing).

Processing regrind with flame retardant grades (FR, FR HF) is not recommended. The flame retardant properties can be massively deteriorated by the use of regrind.

As a rule, there content of regrind shall be significantly below 20%.

It is the duty of the processor to verify wheter the processing of regrind is in accordance with the requirements and the specification, or not.

Conditioning

Parts directly after production (dry as moulded) made out of Polyamide 66 are sometimes totally different in their properties from parts which have already been able to take up moisture. E.g., the brittleness is much higher when the parts are dry as moulded.
From time to time, this can lead to defective parts in the assembly, for example at snap-fits. Eventually, by checking and adjusting storage conditions (temperature, moisture, duration), this can be resolved.

The moisture uptake (conditioning) can take up to several months, depending on the environment’s conditions, but also on part thickness. In conjunction with this, there might be a change in the part volume and the dimensional stability.

If the specifications allow this, it may be possible to accelerate conditioning by elevating temperature ans moisture.

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The information given herein represent the state of Bada's knowledge at issue date. The information is intended to give advice to a skilled and trained staff how to process Badamid A70 and LA70 grades. The parameters given herein are typical values. Based on the experience, it should be possible to obtain a basic parameter setup. The optimum parameters are depending on a large variety of influences; the optimum parameters have to be determined by the processor individually. The information is not transferable to other products. They must neither be construed as confirmation of specific properties nor as specification limits.