BKG
UNDERWATER PELLETIZING SYSTEMS

Underwater-pelletizing systems

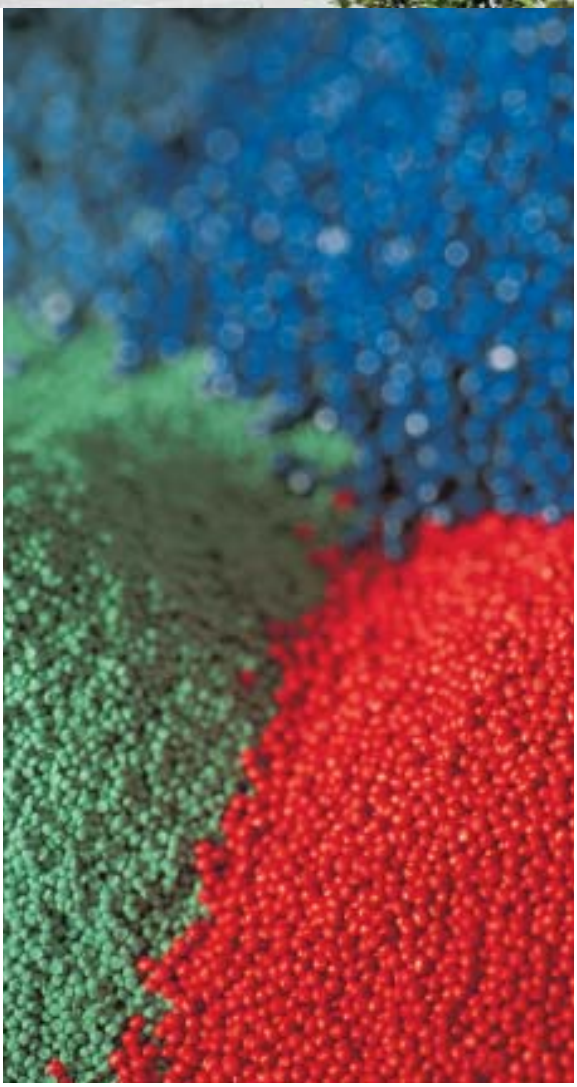
Our company

BKG was founded in 1994 with the aim of pelletizing under water, the new technical plastic materials such as PET, PA6 and PBT. Several hundreds of underwater-pelletizing machines have been supplied world-wide (with throughputs of 2–15.000 kg/h) witnessing our ambitious aim.

In addition to supplying parts for our own underwater-pelletizing and drying systems, we also offer die plates, blades and cutter hubs for other manufacturers pelletizers.

BKG underwater-pelletizing systems are not only suitable for thermoplastics but also for all materials, which behave like thermoplastics.

- **Polyolefine**
  e.g. LLDPE, LDPE, HDPE, PP, EPDM
- **Polyvinyl chloride**
  e.g. PVC-P (Soft-PVC)
- **Styrene Polymere**
  e.g. PS, SAN, ABS
- **Acrylic resins**
  e.g. PMMA
- **Polyacetals**
  e.g. POM
- **Polycarbonates**
  e.g. PC Polyester PET, PBT, PEN
- **Polyamide**
  e.g. PA 6, PA 6.6, PA 11, PA 12
- **Polymerblends**
- **Thermoplastic Elastomer**
  e.g. TPE-S, TPE-O, TPE-E, TPE-A
- **Polyurethane**
- **Hot Melt Adhesives**
  e.g. EVA-based, APAO-based, PA-based
- **Natural resins**
  e.g. Chewing gum
- **Synthetic resins**
  e.g. Epoxy resin



Our products

Customers' need for high quality throughout becomes more and more important. BKG's company strategy is focused consequently on two aims: to offer our customers first class products and service at favourable prices, while enabling our employees to be motivated, work successfully and be satisfied with their work.

The modern quality management system DIN EN ISO 9001: 2000 is an important part of our company concept. It confirms our quality and proves that we are mastering all internal processes.

Furthermore the desire for quality and the know how of all employees (made up by careful training and further education) play a central role in our company. The fulfilment of the customers' orders within our internal quality standards is of highest priority.

Our customers can rely on our quality, fast and punctual delivery, reliable operation, systems, machines and services and their long life-time even with intensive use.

This is made possible by precise work, from the construction of standard models through to individual special solutions. We are our customers' partner in every field of plastics processing.

And yet our principle is quite simple: solid practical solutions – simple in handling, precise and robust in use and at the same time economical in performance.

BKG Master pelletizers

The Master series covers a wide output range from 2 up to 2000 kg/h. Because of the integrated know-how the BKG system convinces by easy handling and compact design. A handwheel allows fine-adjustment of the contact pressure of the cutter head to give optimal product processing , whatever the requirement. The Master series can be installed in the minimum of space and easily relocated at any time.

Further advantages in particular for compound and master batch production:

- flexibility with respect to the granulated material
- flexibility with respect to new materials and colours
- flexibility with respect to the production of various pellet sizes, thanks to fast
- exchangeable perforated plates
- easy and fast cleaning of the system components
- production of micro granulates

A new design of perforated plates permits processing of not only all the customary plastics such as PE, PP, AB etc. but also products as PA 6, PA 6.6, PBT, PET and PPO. A further important step towards the processing of critical high-temperature products.

Total system Master 300

5 Agglomerate Ejection (optional)

Any agglomerates are automatically detected as they break the light beam of a “photo-eye”. When clumps of pellets are detected the agglomerate gate automatically opens and any oversized material is ejected before it enters the dryer.

1 Easy clean water tank

The master water tank (heating optional) provides the water flow of the pelletizing system, which cools down the pellets directly after leaving the perforated plates. Any fines are collected on a large woven wire mesh screen in the tank. The mesh screen and the tank can be cleaned within a very short time to avoid cross contamination between colour batches.

3 Easy clean centrifugal dryer

After being cut the pellets are separated from the transport water in the centrifugal dryer and dried in the counter-air flow. Residual moisture less than 0,05%, depending on the material type, can be realised. Thorough cleaning is made easy by two large doors and a removable one piece rotor screen – essential when producing colour compounds and master batch.

2 Pelletizer A 300 and A 2000

The micro-metric adjustment of the pelletizer guarantees precise control of the blades against the die plate. This ensures long blade and die plate life. The quick exchange die plate can be exchanged within only 10 minutes. Various hole diameters can be used (Ø 0,3 mm – Ø 4,2 mm).

4 Control panel

The master system is delivered with a compact control panel. The operator friendly panel shows all process data as well as graphs. The on-screen help function assures easy handling.

The BKG Pelletizing Systems are consisting mainly of the following three mechanical aggregates:

Polymer Diverter Valve – Pelletizer – Tempered Watersystem

Polymer Diverter Valve

The polymer diverter valve consists of a heated housing and hydraulically movable piston. By hydraulic actuation of the piston the melt flow can be diverted e. g. towards the floor or directed towards the die plate.

The diversion is necessary because the desired optimal melt flow per die plate hole can not be generated instantaneously, by the preceding equipment (e. g. extruder), at start-up.

The polymer diverter valve also separates the pelletizing process from the preceding process (i.e. extruder) so that both of them can be shut down separately in case of minor faults or changes made at the pelletizing side. Polymer diverter valve before the screen changer and the extruder connection.

Diverter valve in front of the screen changer and the extruder connection

Bypass piping

The bypass means the piping around the cutting chamber. The process water entry into the cutting chamber can be exactly timed by this bypass piping and the two 2/2 way valves, the 3/2 way valve (all valves incl. final position indicator) and the related SPS programming.

This avoids a freeze-off (blocking) of the die plate holes if the process water enters too early and, furthermore, agglomeration of the pellets if the process water enters the cutting chamber too late. Also a high loss of process water is avoided when the pelletizer is uncoupled.

All electrical equipment is pre-wired on a bigger terminal box where the plugs for the polymer diverter valve, the die plate heating and the pelletizer are connected for easy and quick electrical and mechanical disassembling of these units, e. g. if extraction of the extruder screws is necessary.

Pelletizer AH 2000 with direct connection to the continuous screen changer and bypass piping

Pelletizers for 2–15.000 kg/h

The pelletizer cuts the polymer strands into pellets in the cutting chamber, which is completely filled with water, immediately after they have passed the die plate.

Because of the high temperature difference between melt and water, the cut polymer drops solidify immediately into the characteristic spherical form of underwater-cut pellets (spherical form depends on the product viscosity).

The different types of BKG pelletizers work with a throughput of 2 - 15.000 kg/h. The "small" Master covers the output range from 2 - 500 kg/h, the A and AH types with the "big" AH D250 reach throughputs of up to 15 t/h which are mainly demanded by the polymer industry in the continuous polymerisation and polycondensation lines in the field of PA, PET, PBT as well as SAN and PS.

Cutting chamber with die plate

The die plate consists of the die plate collar with cartridge heaters and die plate insert with die holes. The nose cone mounted on the die plate insert avoids dead space and directs the polymer flow to the radially arranged die holes. In the cutting chamber filled with process water the strands leaving the die holes are cut directly into pellets. The die plate collar and cutting chamber are bolted directly onto the preceding equipment (Polymer diverter valve or adapter). The two-piece design of the die plate enables a quick change of the die plate insert within 10 minutes.

Automatic connection of the pelletizer to the cutting chamber

Hydraulic control fully automates the forward feed of the cutter shaft (higher force during start-up and step-by-step reduction down to minimum force during regular production). This assures a constant production because the optimum application pressure is reproducible.

Also the blades at the die plate can be re-ground to predefined values to level the blade wear occurring during production, thus ensuring contact between blades and tungsten-carbide cutting face of the die plate.

Pelletizer AH D250 for throughputs of up to 15.000 kg/h

The flexible head of the cutter shaft, on which the cutter hub is mounted, gives the tolerances of the axial alignment between cutter hub and die plate are compensated.

Tempered water system in modular design

To meet customers' requirements, BKG is now delivering their systems in modular format. The customer can buy what he needs, not more and not less. If he wants to change his line due to product changes, this will be possible, in the future, quickly without great expenses. The basic version of the new system contains the dryer and water tank with accessories for simple processes in the field of non-filled polyolefin's.

Water system in modular design

Process water unit

After the separation of process water and pellets the water is filtered in the water tank by passing a screen package. A water heating device is mounted at the water tank to heat up the process water before production start as well as the piping for over-flow and refilling incl. valve. The water level inside the water tank is controlled by a measuring transducer and can be set independently to minimize the amount of refilled water or to avoid higher water losses.

The process water is primed by the water pump through the tubular or plate-in-frame heat exchanger to ensure the possibly necessary cooling. The regulation of the cooling water refill is done by a steadily working valve.

Integrated Filter system in the water tank

BKG Lab line

Agglomerate catcher (optional)

At the first production step upstream of the pellet dryer, this agglomerate catcher prevents pellet clusters (agglomerates) entering the rotor area of the dryer.

Inside of the agglomerate catcher housing the pellet/water mixture passes inclined angled bars which are filtering bigger agglomerates. These are leaving the system via a flapper gate actuated by a photo-electric eye.

Centrifugal pellet dryer incl. exhaust blower

The centrifugal pellet dryer separates process water and pellets which move helically, because of the fast rotation of the dryer and the angled rotor blades, upwards to the top of the dryer and are leaving the dryer continuously through the pellet outlet.

Because of the rebound effect and the counter current airflow generated by the exhaust blower the pellet outlet moisture is designed for less than 0.05 % depending on the type of polymer and hygroscopy.

Pellet diverter valve (optional)

This pneumatic operated pellet diverter valve is mounted at the dryer outlet and allows for example the elimination of low quality pellets during start-up or sampling of pellets during production.

Pellet diverter valve at the dryer outlet

Combi-Line: modular water- and drying system for throughputs of up to 2.000 kg/h

The Combi-Line type is used for applications with medium throughputs, especially for compounding lines. The round centrifugal dryer is easily accessible by two big doors. The one-piece sieve of the dryer can therefore be exchanged quickly.

The basic version of the Combi-line is equipped with a sieve for very fine particles integrated in the tank, which can be cleaned or exchanged during production.

As an option the customer can choose a curved screen directly or install it later on to have a further continuous filtration step.

Easily accessible screens

Combi-Line 2A with curved screen

Opti-Line for throughputs up to 15.000 kg/h

The Opti-Line type is a modular system like the Combi-Line. This type is used for all applications of extrusion and polymerisation lines. With Opti-Line the customers have a system, which offers the optimum of equipment, as the name already implies.

- noise reduction of the dryer ≤ 80 dBA
- filter system for the air inlet of the centrifuge
- pre-dewatering to be integrated into the dryer (installation possible at any time)
- centrifugal dryer can be designed with window and lights
- self-cleaning system for centrifuge and screen can be integrated

Even at high water temperatures no steam escapes in the environment.

Opti-Line for outputs up to 2.500 kg/h

Curved screen (optional)

As some plastic pellets tend to have a higher abrasion, and therefore also a higher development of finest particles, and the filter element in the water tank might no be sufficient, the curved screen serves as an additional continuous filtration device of the process water.

Dryer with self cleaning system

The process water coming out of the centrifugal dryer is taken in by a pump and pumped into the housing of the curved screen. Because of the special construction of the housing the water flow is calmed down and the process water is guided by overflow principle continuously over the curved screen. The filtered process water then flows into the water tank. The standard curved screen has got a pneumatic cover with window. The filtered particles are collected in a filter case and can be taken out easily.

Opti-Line with curved screen and self-cleaning device

The Underwater-pelletizing for glass-fibre filled products

It is much more difficult to meet the requirements concerning the wear of this material during manufacturing with the pelletizing system compared to standard products. The problem is in this case not the cutting of the product but the enormous wear occurring during transport as well as drying of the pellets.

In detail, especially

- the water box (cutting chamber), the cutter head and the cap peace of the bearing in the cutting section have to be protected.
- Also in the water- and drying system the centrifugal dryer has to be developed in a completely wear protected version.

It is necessary to adapt the pelletizing system to the special coating procedure first. Resulting from this adaptation are good screen life cycles and the components can also be easily exchanged and therefore can be replaced at a favourable price.

Advantages for the customer

- Due to the cut of the product within the liquid phase, the glass fibres are well included in the pellets.
- Furthermore, the development of dust is clearly reduced. The starting of the pelletizing is fully automatic, fluctuations in the extrusion process do not lead to a stop in production due to intermittent strands.
- The products can normally be manufactured at high water temperatures, which leads to costs savings in the cooling energy.

The system has already proved its advantages several times for products as PP, PBT, PC, PA with up to 66 % glass fibre content.

Wear-protected design of the cutting chamber and the pelletizing system

Glass-fibre filled pellets

Underwater-pelletizing for special applications

Besides the standard types as Master-, Combi- and Opti-Line there are of course special constructions available for our customers – the individual solution for their unique application.

In this case, especially the water systems as for example a separate centrifugal dryer or a central water system for as many pelletizers as necessary are specially designed. You often find this in the field of polymerisation where the underwater-pelletizing is following directly after the reactor.

Central water system for feeding of 9 pelletizer systems in a PA6 polymerisation

UWG AH 4000 in explosion-proof version (picture taken during inspection for ex-proof certificate)

Complete systems for the world of plastics

BKG and BSG Bruckmann Steuerungstechnik, and KREYENBORG GmbH are part of the Group. These 3 partners are able to offer not only single components such as

- melt pumps
- continuous and discontinuous filtration systems
- control systems
- mixers
- special silos
- recycling technology

but also complete turn-key and system solutions.

Our Group philosophy is:

- easy integration of all components into the customers' complex line
- minimisation of all process relevant interfaces
- process guarantees for our customers' success
- synergy for the supply of complete lines

Type sizes of pelletizers per throughput*

	max. 500 kg/h	max. 2.500 kg/h	max. 2.500 kg/h	max. 7.500 kg/h	max. 15.000 kg/h
Pelletizer type	A 300	A 2000	AH 2000	AH 4000	AH D250
Motor	4,4 KW	5,5 KW	5,5 KW	15 KW	37 KW
RPM	500–5.000	500–3.600	500–3.600	500–2.500	500–2.000
Die plate heating	electrically / oil / steam				

*throughput depending on product and die plate

Type sizes of water systems in modular design

System	Master 300	Master 1000	Master 2000	Combi-Line 1	Combi-Line 2
Throughput kg/h	2–500	300–1.200	1.200–2.000	500–1.200	1.200–2.000
Dryer types	TVE1001ED	TVE1001ED	TVE2000ED	TVE1001ED	TVE2000ED
optional	TVE2000ED	TVE2000ED		TVE2000ED	
Dryer motor	4 KW	4 KW	4 KW	4 KW	4 KW
Dryer Self-cleaning	no	no	no	no	no
Water tank volume	200 l	350 l	350 l	500 l	700 l
Heating capacity	9 KW	2 x 9 KW	2 x 9 KW	24 KW	40 KW
Volume flow m^3/h max.	15–15	25–30	30–30	30–30	40–40
Curved screens	no	no	no	BS 700	BS 700
Curved screen motor	no	no	no	4 KW	4 KW
Cleaning system	no	no	no	optional	optional

System	Opti-Line 1	Opti-Line 2	Opti-Line 3	Opti-Line 4	Opti-Line 5
Throughput kg/h	500–1.200	1.200–2.500	2.500–5.000	5.000–7.500	7.500–15.000
Dryer types	TVE2004SR	TVE2004SR	TVE6002SR	TVE6002SR	TVE12000SR
optional	TVE6002SR	TVE6002SR			
Dryer motor	5,5 KW	5,5 KW	5,5 KW	5,5 KW	7,5 KW
Dryer Self-cleaning	Option	Option	Option	Option	Option
Water tank volume	500 l	700 l	1.000 l	1.000 l	2.000 l
Heating capacity	24 KW	40 KW	75 KW	75 KW	100 KW
Volume flow m^3/h max.	30–30	40–40	60–60	80–80	120–120
Curved screens	BS 700	BS 700	BS 1000	BS 1000	BS 1200
Curved screen motor	4 KW	4 KW	5,5 KW	5,5 KW	7,5 KW
Cleaning system	optional	optional	optional	optional	optional

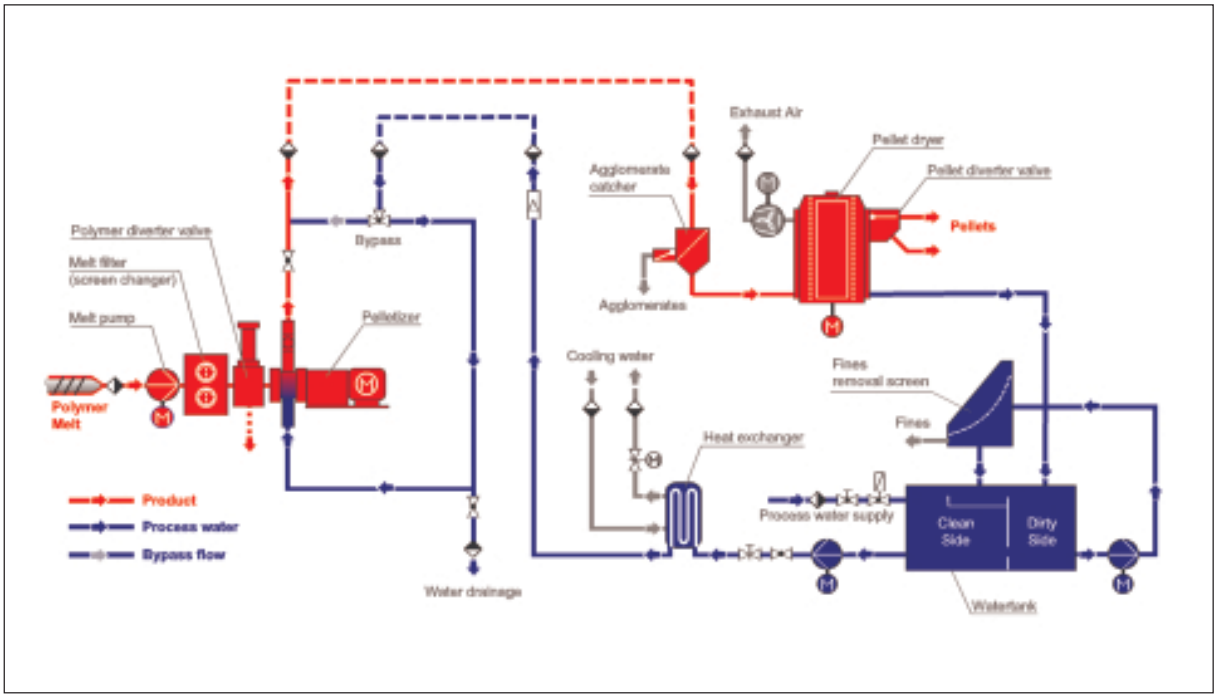
Accessories

Crystallisation tower

The pellets of some polymer types are very sticky and tend to agglomerate when too warm, or they need certain reaction times for crystallisation. Heat transmission from the pellets to the much cooler process water is relatively slow whereas transport of pellets in the process water pipe can be very fast (a few seconds depending on the pipe length. The dwell time of the pellets in the process water can be increased significantly, up to several minutes, by using this crystallisation tower. As a result, very cold and/or crystallised pellets enter the dryer. The dwell time of the pellets in the water depends on the size of water pump and the length and diameter of the pipe of the crystallisation tower. Our crystallisation tower consists mainly of a plastics-steel, 120 meter long, helical tube, which is coiled round a steel frame.

Pressure de-watering device

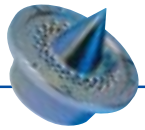
In some cases the length of the crystallisation tower pipe is not enough for cooling and/or crystallisation of the pellets, and the dwell time needs to be extended. By using this pressure de-watering device the volume flow of the water-pellet mix inside the crystallisation tower can be decreased without influence on the necessary water flow at the cutting chamber. As a result, the dwell time can be increased dramatically without x-times extension of the tube length.



Complete concept Opti-Line

BKG labline in Münster, Germany

From visions to entire solutions.



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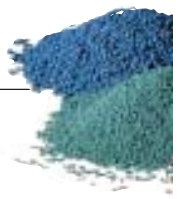
Questionnaire underwater-pelletizing systems



Customer: _____

Contact person: _____

Address: _____

_____

_____

Phone: _____

Fax: _____

E-Mail: _____

Quotation specifications

Product: Output in kg/h:

Viscosity: Residial moistness in %:

Weight of pellets : /100 pellets Pellet-Ø in mm:

Extrusion line ☐ Reactor line ☐

Power supply: Supply voltage: Volt

Supply frequency: Hz

Control voltage: Volt

Kind of protection: IP Explosion protection:

Other components

Screen changer:	Yes ☐	No ☐
Melt pump:	Yes ☐	No ☐
Adaptor:	Yes ☐	No ☐
Control/switch cabinet:	Yes ☐	No ☐

Extruder typ:

Language of quotation: German ☐ English ☐

Special features/requirements

_____

_____

_____

_____

We would like to receive further information about

- ☐ **Melt pumps**
- ☐ **Valve technology**
- ☐ **Melt filters**
- ☐ **Die plates and cutters**
- ☐ **Control systems**
- ☐ **Mixing technology**
- ☐ **Special silos**
- ☐ **Recycling lines**
- ☐ _____

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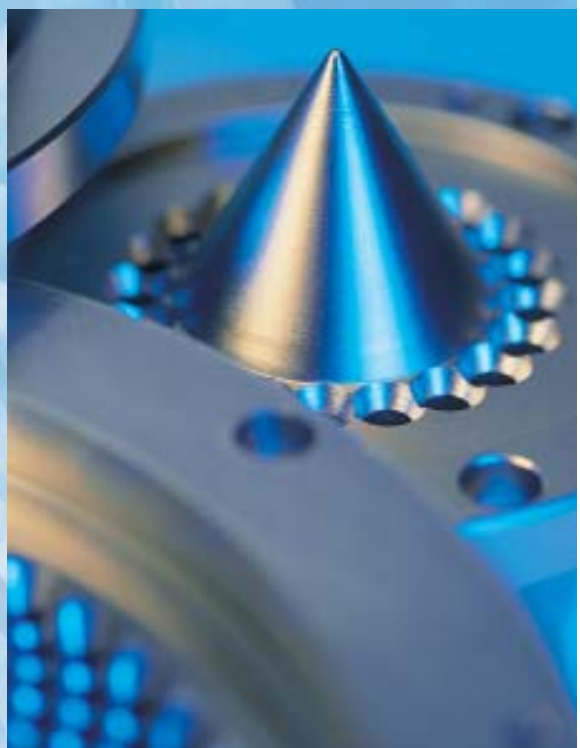
Representative:



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