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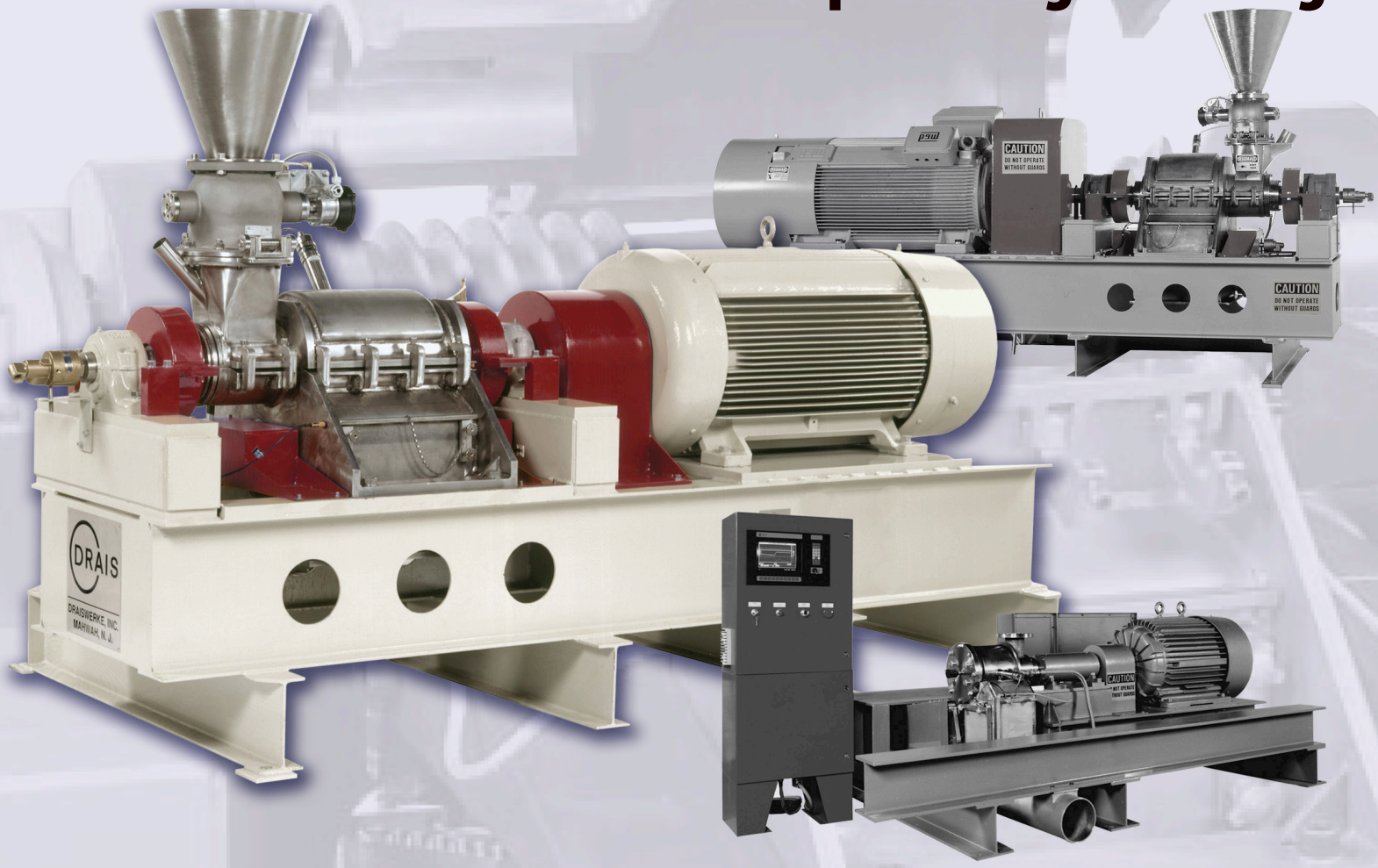
Gelimat™ Technology

Ultrahigh-Speed Thermokinetic Mixing, Compounding & Fluxing



Processing Excellence in Motion

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Gelimat™ Technology

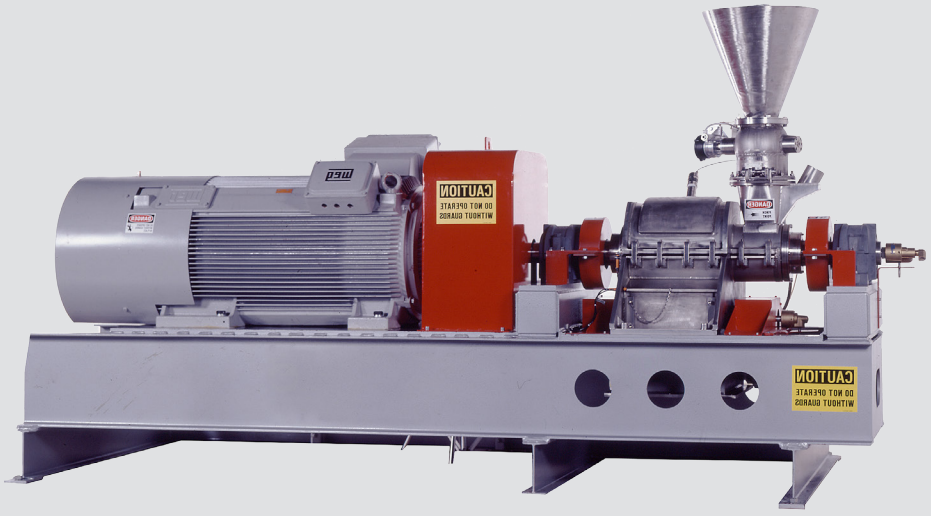
Optimum processing result and energy savings

DUSATEC advances plastic compounding processing to new levels of efficiency and quality with the company's line of Gelimat compounding systems. This technology integrates thermokinetic dynamics with advanced controls to optimize performance. The Gelimat platform can accomplish multiple changes in process parameters during brief cycle times. This feature allows the user to accelerate and optimize the processing of even the most difficult polymer compounds. The ability to change process parameters in a short time results in a highly versatile production device.

The Gelimat is ideally suited for the production of complex polymer compounds, wood or cellulose fiber composites as well as color concentrates (master batches). It also offers advantages for processing advanced high-temperature compounds. Uniform temperatures in excess of 500°F can be achieved in well under 30 seconds. Systems are available for laboratory scale ranging to production rates as high as 20,000 pounds per hour.

APPLICATIONS

- **Plastics**
- **Plastic alloys**
- **Wood plastic composites WPC**
- **Highly filled compounds**
- **Plastic/pigment masterbatches**
- **NANO composites**
- **Mineral composites**
- **Automotive**



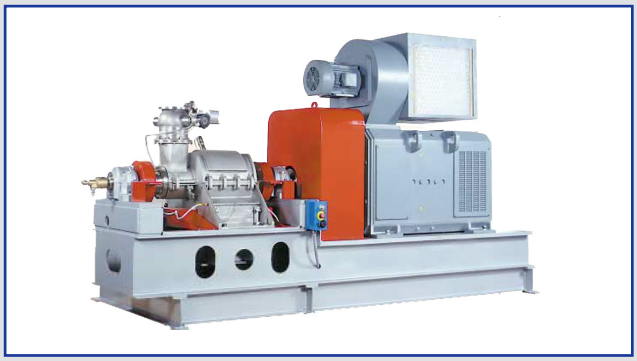
SYSTEM ADVANTAGES

The development of the Gelimat system marked the beginning of a completely new generation of processing equipment. In addition to extremely short production cycles, the system offers:

- Simplified design
- Lower operating costs
- Significant energy savings
- Optimum material and quality uniformity

HOW THE SYSTEM WORKS

The Gelimat is a unique mixer/compounder based on the high-speed thermokinetic principle. The machine consists of a horizontally positioned mixing/compounding chamber with a central rotating shaft. A number of staggered special mixing elements are mounted to the shaft at different angles. The specific number and positions of the mixing blades varies with the size of the mixing/compounding chamber. A premeasured batch can be fed via an integrated screw – which is part of the rotor shaft (G-S Model) – or fed through a door located on top of the mixer body (G Model). The processed material is discharged through an automatic discharge door at the bottom of the chamber.



In the compounding chamber, the material is subject to extremely high turbulence. The material particles are completely mixed and also subjected to rapid temperature increase as a result from impact against the chamber wall, mixing blades and themselves.

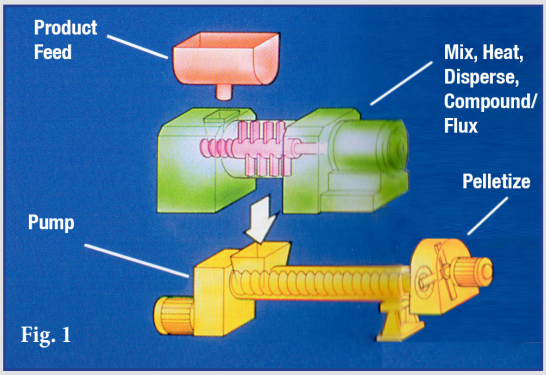


Fig. 1

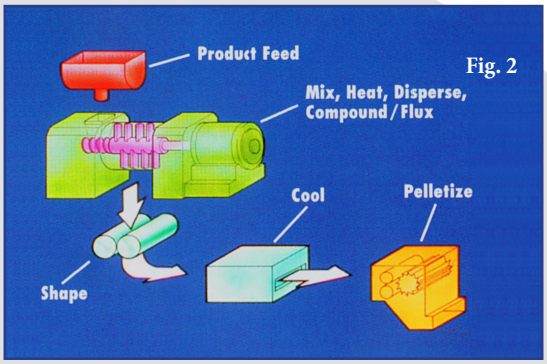


Fig. 2

The unrestricted impingement of materials against the interior of the mixing/compounding chamber induced by the high tip speed affects thermokinetic heating of the batch to be processed. Material temperatures of 140°C to 250°C can be achieved within 8-25 seconds. The process cycle is typically microprocessor-controlled by either peaks in energy input, temperature or time. In most applications, combinations of two or more of the above controlling parameters are used.

When a predetermined product/process condition is reached, the controller instantly opens the discharge door. Centrifugal action discharges the entire batch quickly. The discharged material is a uniformly blended, fully dispersed and, in most cases, fluxed compound that can be immediately processed by a simple shaping device using minimal power. All work pertaining to mixing, dispersing, heating and fluxing is performed in the Gelimat so downstream shaping is the only additional step necessary.

The total energy requirements for the Gelimat process, including blending, dispersing, fluxing and shaping, is typically .04 kilowatt per pound of product, compared with .06 to .12 kilowatt per pound of product estimated for conventional processing systems.

The resulting compounds may be converted by conventional methods such as injection molding, extrusion and calendering without further modification (Figs. 1 & 2). This results in considerably faster processing cycles and reduced residence time and minimizes the material's thermal heat history.

***Continued** on next page*

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Gelimat™ at Work

Optimum processing result and energy savings

Continued from previous page

When the material reaches its optimum processing temperature, it is discharged to prevent overworking and possible thermal degradation. Each batch — each particle or pellet in each batch –receives the same amount of mixing work and thermal exposure in every cycle, enabling the design of the shaping machine to be simplified (Fig. 3).

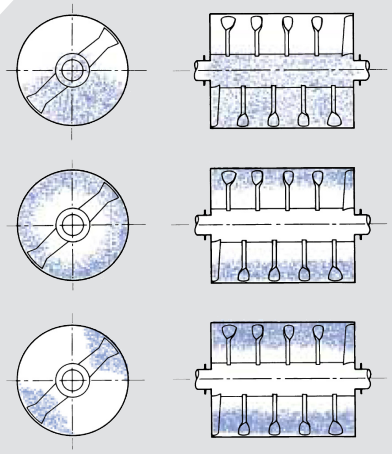


Fig. 3 Basic Gelimat Mixing
Product movement in the Gelimat at different mixing blade top speeds

Time-temperature sensitive materials process extremely well in the Gelimat system due to its short heating cycle of less than 30 seconds. After exposure of just a few seconds at very high temperatures, plastic materials are quicky processed and and then discharged for converting to the required final product shape.

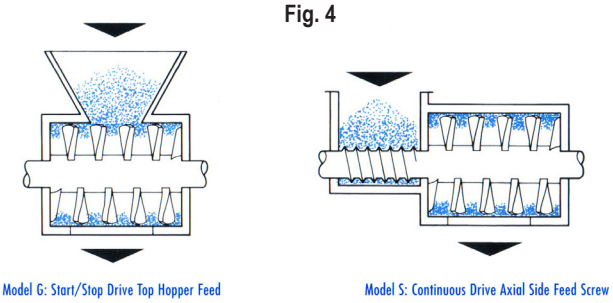
The Gelimat technology uses less energy to compound than conventional mixers and can be operated with less maintenance, so compounding costs are lower than those of conventional systems such as single-screw, twin screw or other processing device.

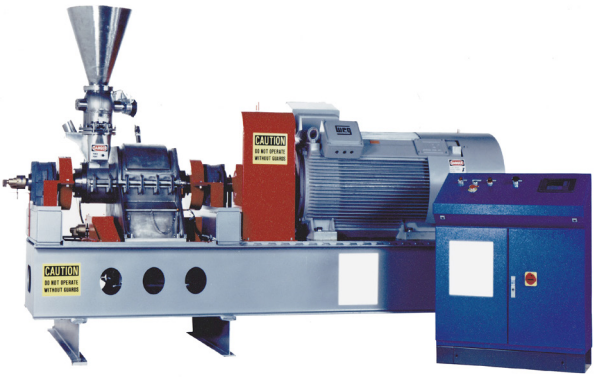
Practically any kind of dispersion, filler grade level and short polymer heat history can be achieved with the Gelimat's operational principle. To attain the most efficient and practical operating conditions, two basic Gelimat designs are available. (See Fig. 4)

The Gelimat technology is capable of melting, homogenizing and dispersing polymers with pigments and allows the addition of fibers or fillers at a predetermined shear rate. Because product uniformity is a direct function of residence time distribution, the Gelimat technology can deliver results superior to any continuous process. It allows a minimum heat history to reduce or even completely eliminate temperature degradation. Virtually every type of thermoplastic and thermoset resin – filled, alloyed and unfilled – can be processed in the Gelimat system.

The Gelimat allows the compounding of master batches either fully or partially fluxed with filler loadings up to 85% by weight.

Fig. 4





The technology can be employed for compounding all types of resins and fillers at temperatures considerably lower than the typical resin softening or melting transition point. Short residence times and reduced energy requirements possible with partial fluxing results in substantial cost reduction without compromising quality or performance.

In certain applications requiring stiffness and dimensional stability at elevated temperatures, mica composites prepared in the Gelimat system may be economically substituted for fiber-filled counterparts.

At the same time, product formulations can be changed quickly because the system is self-cleaning. Because of this feature, the Gelimat is extremely suitable for polymer alloying. In the alloying process, one polymer can used as an additive for another polymer, mostly in addition to some other additives.

An important feature of the Gelimat is its ability to perform partial flux processing by compounding highly filled thermoplastics. Extreme shearing forces exerted by the mixing impellers simultaneously mixes and disperses fillers to form finely dispersed compounds in a granular, partially fused state, which can be directly injection molded without pelletizing.

Mixing & Dispersing & Compounding - ALL IN ONE STEP

- **NO pre-drying of wood fiber**
- **Ultimate dispersion quality**
- **Shortest processing times**
- **Suitable for highly filled compounds (up to 85%)**

PE, UHMWPE, LLDPE, PP, PVC, ABS and virtually any other thermoplastics or thermosets can be processed in the Gelimat. Plastics, commingled with particulates from metals, glass, stones, etc. require almost NO separation.

From Landfill into Value-added Products

Wood Composites & Highly Filled Polymer Compounds Made Easy

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The Gelimat Advantage

Versatility and efficiency deliver exceptional results

Process Control

The batch residence time in the Gelimat typically ranges from 20 to 60 seconds. Depending on the material being processed, precise control may be achieved in a number of ways, including:

- Timed cycle
- Power regulated cycle
- Product temperature
- Combinations of power/time, temperature/time, etc.

Regardless of the parameters, the instant the material reaches its optimum processing temperature, a signal activates the bottom discharge door to open. The centrifugal action created by the rotor discharges the batch quickly and completely from the Gelimat. This system eliminates overworking of the material and potential thermal degradation is prevented.

Production Rates

The Gelimat's fast cycle times provide for high production rates. A 10-liter unit can discharge fully fluxed, four-pound batches of rigid PVC, PP, PE or ABS at the rate of more than 500 pounds an hour. These small batches can be fed directly to a very short barrel extruder with positive-feed. Easily changeable die heads permit production of various sizes of pellets or piping. Another processing option of the Gelimat is to discharge fluxed material into a single-screw extruder equipped with a hot die face cutter.

Additives

When polymer compounds require few additives, a direct feed to the Gelimat is preferred because the mixing action in the initial stage is more than adequate to achieve excellent dispersion.

Processing UHMW-PE

With molecular weights of 1 to 6 million, UHMW-PE has exceptional physical properties such as outstanding impact strength, hardness, high abrasion and chemical resistance. Conventional methods of processing may cause degradation of those properties. Because the Gelimat technology reduces processing time, it offers a new solution for processing this unique polymer. Additionally, the Gelimat brings the UHMW-PE to its processing temperature quickly without viscous shear, and the material is instantaneously discharged without loss of molecular weight.

The resin can be processed directly from the Gelimat mixer by conventional or modified plastic fabrication techniques such as compression molding, transfer molding and ram extrusion. Virtually every type of thermoplastic and thermoset, filled and unfilled, can be processed with a Gelimat system. In addition, some nonplastic materials such as food products can also be processed by this technology.

High Density Powder Dry Blends

The Gelimat systems has been used to increase by 15 to 50 percent the packing density of dry powder blends such as PVC and LLD-PE. This higher density powder can then be extruded at considerably higher throughput rates.

Regrinds

Regrinds of many products can be returned to the Gelimat system for processing. For instance, a 95-percent regrind of rigid PVC film edge trim can be used to make extrusion and molding compounds.

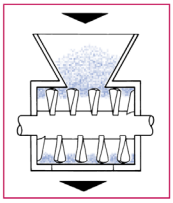
Foam Products

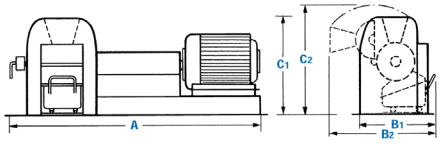
It's feasible to produce nearly any size and shape of foamed articles from most polymers in two relatively simple pieces of equipment: the Gelimat for mixing and heating and the mold.

Technical Data

Model G Series

Direct feed through top hopper with locking slide. Direct drive through clutch-brake combination.



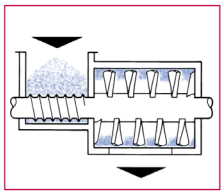


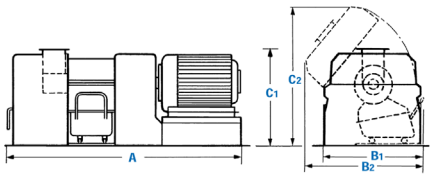
Gelimat G Series	G1	G2.5	G5	G10	G25	G40	G80	G250
Nominal mixer vol. ltrs.:	1	2.5	5	10	25	40	80	250
Batch Capacity lbs. (approx.)	1	2.5	5	8	20	30	55	130
Overall Dimensions								
Length (A) mm:	1020	1050	1100	1400	2200	2280	3150	5000
Width (B1) mm:	780	550	550	610	630	1250	1300	1250
Width (B2) mm:	—	—	—	—	1130	1450	1650	1980
Height (C1) mm:	830	600	620	700	950	1170	1450	2000
Height (C2) mm:	—	—	—	—	1100	1470	1620	2200
Motor rating (HP):	30	60	100	150	300	500	750	1500
Compressed air required (Max. 90 psi, Ltr/hr):	500	1000	1200	1400	2000	3000	5000	10,000

Technical Data

Model S Series

Side feed with axial feed screw. Direct drive through flexible coupling





Gelimat S Series	G1-S	G2.5-S	G5-S	G10-S	G25-S	G40-S	G100-S	G250-S
Nominal mixer vol. ltrs.:	1	2.5	5	10	25	40	100	250
Batch Capacity lbs. (approx.)	1	2.5	5	8	20	30	70	130
Overall Dimensions								
Length (A) mm:	1020	1050	1100	1400	2300	2600	3500	4500
Width (B1) mm:	780	550	550	600	650	1250	1250	1700
Width (B2) mm:	—	—	—	—	1150	1450	1450	2100
Height (C1) mm:	830	600	620	700	950	1170	1170	1700
Height (C2) mm:	—	—	—	—	1150	1470	1470	2500
Motor rating (HP):	30	60	100	150	300	500	1000	1500
Compressed air required (Max. 90 psi, Ltr/hr):	300	500	550	600	650	800	800	1000

DUSATEC reserves the right to modify designs, and all specifications/dimensions are subject to change.

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DUSATEC – A New Name with a Long-trusted History

Gisbert Schall

Fairfield, NJ-based DUSATEC, Inc. is a new name in processing equipment excellence. Although it was founded in 2012, the company's president and its products for decades have been market leaders in industrial processing, serving a global base of manufacturers involved in materials as diverse as paints and coatings, plastics, paper, food, chemicals and others.

DUSATEC is led by Gisbert Schall, president and majority shareholder. As an industry thought leader, he was the visionary behind the founding of Draiswerke, Inc., the North American subsidiary of Draiswerke GmbH. After building the business into the premier name in milling and processing – an achievement based on unrivaled technical service and support, engineering excellence and technological innovation – he eventually sold the company to the Buhler Group of Switzerland before going into retirement.

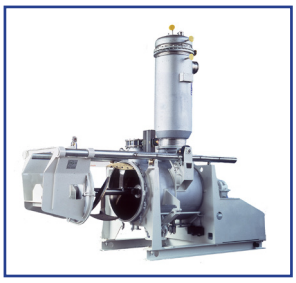
In 2012, Gisbert came out of retirement to form DUSATEC for the purpose of acquiring the Turbulent™, K-TT, K-TTP, K-TR and Gelimat™ lines from Buhler.

As he has done in building Draiswerke, Inc., Gisbert is following the same guiding principles in building DUSATEC: offer high-quality processing technology with superior operating efficiencies and supported by knowledgeable technical service professionals. With customers located around the world, DUSATEC is committed to tailored solutions based on their' specific processing needs and Gisbert's in-depth market knowledge. This approach enables the company to develop practical solutions to existing processing challenges.

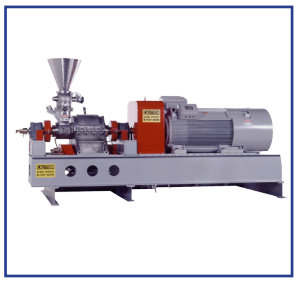
DUSATEC continues to offer customers in North America, Asia and EMEA the most innovative and reliable processing technologies in the industry. Manufacturers are invited to learn more about how its superior products can help them improve processing efficiencies, lower costs and enhance throughput.

The full line of DUSATEC Technologies

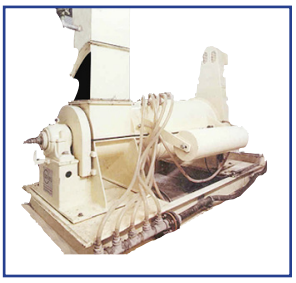
DUSATEC Turbulent



DUSATEC Gelimat



DUSATEC K-TT, K-TTP & K-TR Tornado



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