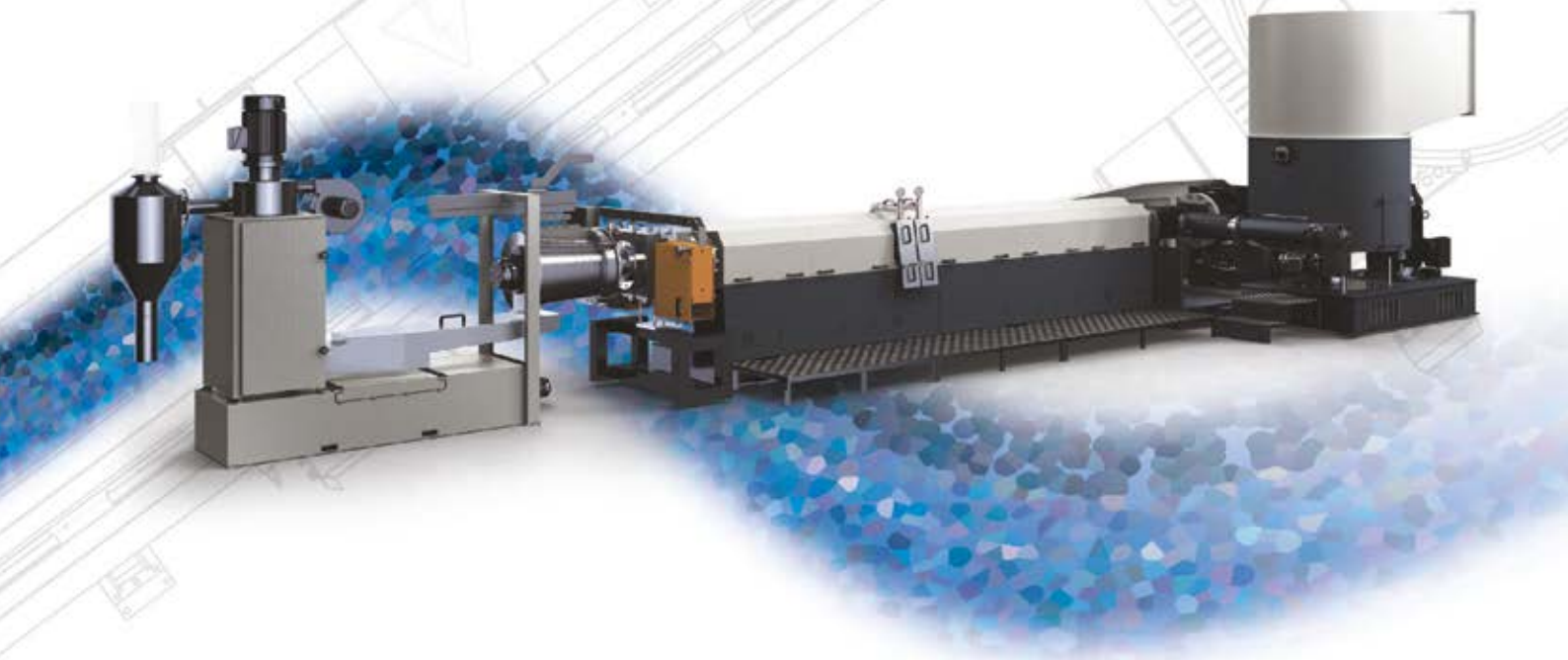
GAMMA MECCANICA

RECYCLING LINES FOR PLASTIC MATERIALS



RECYCLING LINES FOR PLASTIC MATERIALS

CHOOSE QUALITY, CHOOSE INNOVATION, CHOOSE FLEXIBILITY, CHOOSE ENVIRONMENT

Customized solutions for every need

Since 1987 in the world...
for plastic recycling

Gamma Meccanica S.p.A. in the world

Company

Since 1987 Gamma Meccanica S.p.A designs and produces machines and plants to recycle a wide range of plastic materials.
Every plant is custom designed, built to offer the best performance and yield the best quality granule or end product.

Main materials

Among the main materials that Gamma Meccanica S.p.A. lines can recycle there are: LLDPE, HDPE, LDPE, HMWPE, EVA, PP, BOPP, OPP, PS, EPS, XPS, ABS, PC, PET, PA, TPU, TPE, BIO-POLYMERS and much more.

Main types of equipment:

- COMPAC lines for the recycling and compounding of low bulk density materials with high residual moisture.

- CONVENTIONAL lines with various dosing systems for the recycling of plastics that have been pre-sized or ground prior to processing.

- TANDEM lines for the recycling of heavily printed, highly contaminated thermoplastic materials, with high residual moisture.

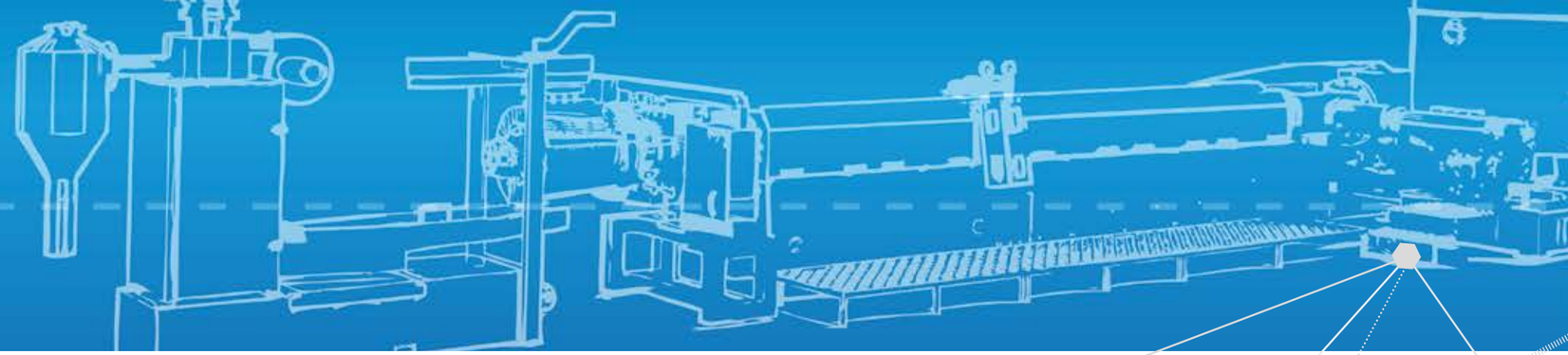
The company is present in 5 continents with offices, controlled and associated companies and agencies to guarantee effective and timely service in every country of the world.
The plastic recycling systems are used in the countries with greater sensitivity to environmental issues, but also in countries where the use of recycled product is economically advantageous.

The consolidated experience and core competencies combined with a high level of technical solutions enable the company to meet the growing needs of international markets and to offer customized solutions for each customer.

An important feature of Gamma Meccanica is the production process: the design, construction, assembly and testing of each machine are performed internally, so the company can directly control, in all their stages, both the development and the production ensuring that the equipment made is of the highest quality.
The customer is involved, through constant communication with the commercial and technical department, in all stages, from planning to project completion, up to the testing of equipment. This helps establish a trust based relationship and a mutually beneficial collaboration between the customer and supplier.

Head office & factory of
Gamma Meccanica S.p.A.

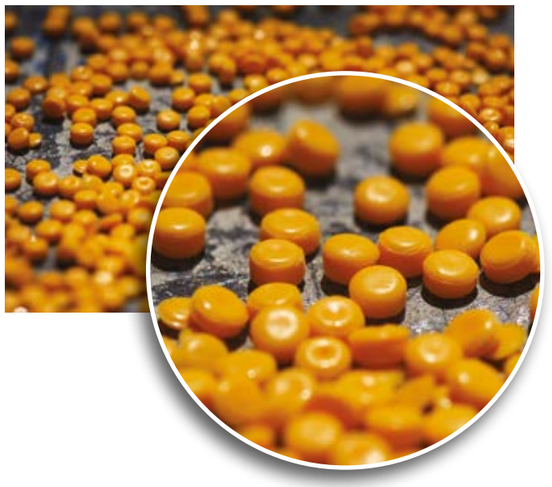
GM recycling lines
Quality, efficiency and flexible use

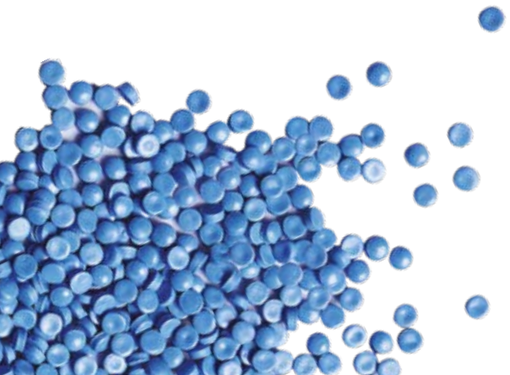


Distinctive characteristics of GM lines:

- More energy savings
- Increased production capacity
- Higher quality end-product
- Customized solutions

Every plant is custom designed and built to offer the best performance and yield the best quality granule that are distinguished by dimensional uniformity and absence of defects such as “air bubbles” or “twins”. Particular attention to detail ensures solutions that exceed expectations.





Recycling & Upcycling

Thanks to the continuous research and development of new lines, Gamma Meccanica can offer solutions aimed to “enrich” the final product so to increase the technical characteristics of polymer for specific uses (upcycling).

Digital integration 4.0
Digitalization of production processes

Gamma Meccanica lines are characterized by high level of automation, maximum quality of the recycled product (granules) and improved energy savings. Gamma Meccanica installs on all its lines devices for the remote connection of its machines. Through this connection it is possible to monitor the line while it is running and, if necessary, to modify and optimize the software.

By connecting to the customer database it is possible to upload data either to the Gamma Meccanica lines (for example, to set the necessary recipes for the production change) or to the database itself. The customer can store and download all operating parameters as well as machine alarms in real time.

Smart choice & compatibility

All components of a Gamma Meccanica regeneration line can be used to retrofit existing extrusions lines and installed on plants of other producers present on the market.

Degassing system

The degassing system eliminates the gas produced during the extrusion phase or incorporated by the material during the feeding phase. The extraction of the gas from the melted material prevents the beginning of defects in the granule such as “air bubbles”.

COMPAC lines

Superior efficiency, productivity and energy savings

REMOTE CONNECTION AND DATA EXCHANGE

CONTINUOUS QUALITY CONTROL

HIGH SECURITY STANDARDS

PRODUCTION CAPACITY OF COMPAC LINES

LINE	PRODUCTION CAPACITY (Kg/h)*	ENERGY CONSUMPTION (kWh/kg)
GM50	50÷150	0.25÷0.30
GM65	150÷260	0.25÷0.30
GM90	250÷500	0.25÷0.30
GM105	400÷680	0.25÷0.30
GM125	600÷950	0.25÷0.30
GM160	1000÷1400	0.25÷0.30
GM180	1500÷2000	0.25÷0.30
GM210	2000÷2800	0.25÷0.30

* The capacity refers to LDPE, and can vary depending on the density of the material, degree of pollution, print and humidity percentage.

The typical composition of the COMPAC line:

- conveyor belt with metal detector
- cutter-compactor
- extruder
- filter
- underwater pelletizer TI or water ring pelletizer TDA
- panel with touch screen

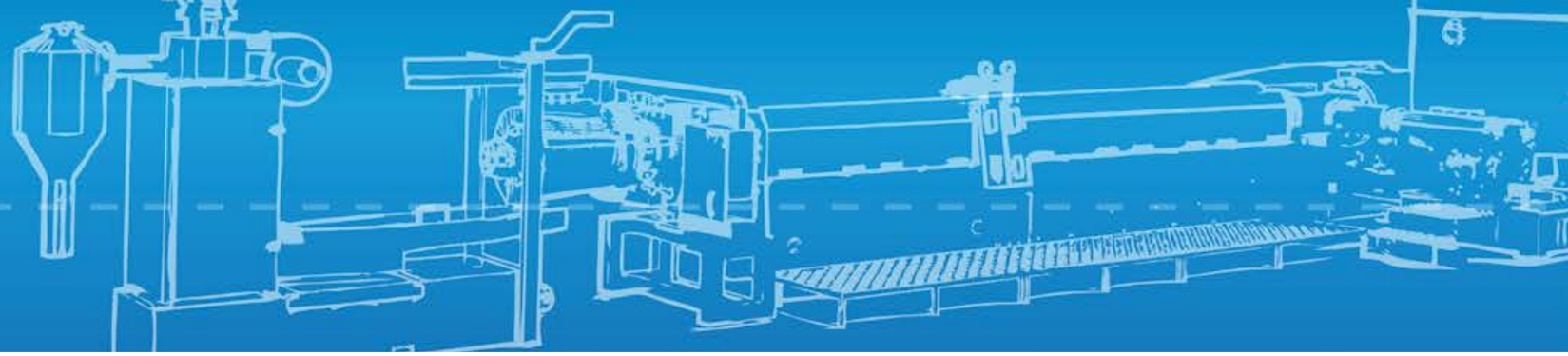
The COMPAC regeneration lines represent the most advanced technology in the market.
They are highly flexible and able to recycle most types of plastics from different forms: fibers, sheet, films, ground and densified materials, rolls.

This type of line is available in different models depending on the production capacity.

Every line can be customized upon request with additional components to satisfy the customers' requirements.

COMPAC lines

Superior efficiency, productivity and energy savings



Advantages of COMPAC lines

CUTTER-COMPACTOR

This feeding system allows processing material of various sizes. During this phase the material is preheated and compacted to render it suitable for the phase of extrusion, allowing for treatment of printed and humid materials.
The system is characterized by the flexibility in feeding of material. It is possible to use a conveyor belt, a roll feeder and dosing units for higher bulk density regrind materials.

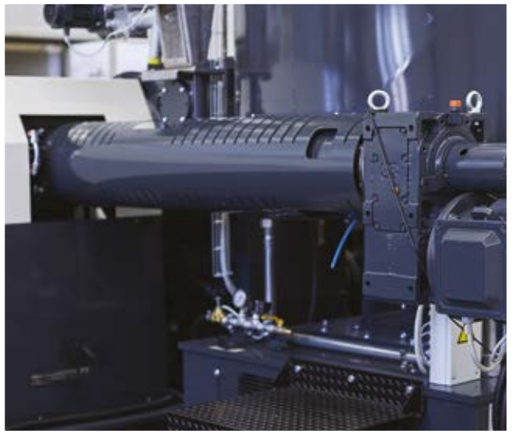
ECOTRONIC system

The patented ECOTRONIC system applied to the cutter-compactor guarantees a notable energy savings (up to 40%), offers the possibility to recycle materials with humidity levels up to 12% and guarantees a higher homogeneity of materials.
This system optimizes the speed of the cutter-compactor in order to maintain the requested temperature without the use of water. Energy consumption is therefore the minimum necessary for heating and preparation of the material.

Recycling line GM90 COMPAC

Feeding screw

The feeding screw is designed to transport and compact the material. It pushes the material (especially low bulk density) into the extrusion screw. The screw speed is automatically adjusted to keep constant the extruder production.



By-pass

The by-pass allows the installation of the dosing unit for granules, compacted and ground materials with higher bulk density, directly feeding the cutter-compactor as a single material or in combination with the material coming from the belt or from the nip roll system. Alternatively, the dosing unit can directly feed the feeding screw allowing the cutter-compactor to be switched off and consequently save energy.

GM TANDEM lines

for heavily printed, high humidity and contaminated materials

PRODUCTION CAPACITY OF TANDEM LINES

LINE	PRODUCTION CAPACITY (Kg/h)*	ENERGY CONSUMPTION (kWh/kg)
GM90	250÷500	0.30÷0.40
GM105	400÷680	0.30÷0.40
GM125	600÷950	0.30÷0.40
GM160	1000÷1400	0.30÷0.40
GM180	1500÷2000	0.30÷0.40
GM210	2000÷2800	0.30÷0.40

* The capacity refers to LDPE, and can vary depending on the density of the material, degree of pollution, print and humidity percentage.

The TANDEM technology applied to the recycling of heavily printed, contaminated and high humidity plastic materials guarantees the excellent quality of the granule with a notable energy savings in comparison with conventional recycling systems that foresee the re-extrusion of the material.

The plant is composed of a COMPAC unit and two extruders arranged in succession.
The short, non-vented primary extruder and the larger diameter secondary extruder allow for a reduction of the cutting forces (“shear rate”) and stress less the melted material.

Between the first and second extruders there is a high performance degassing chamber. Here the surface of material exposed to vacuum is 10 times greater than the exposure of a normal extruder, guaranteeing the extraction of large quantities of gas and contaminants.

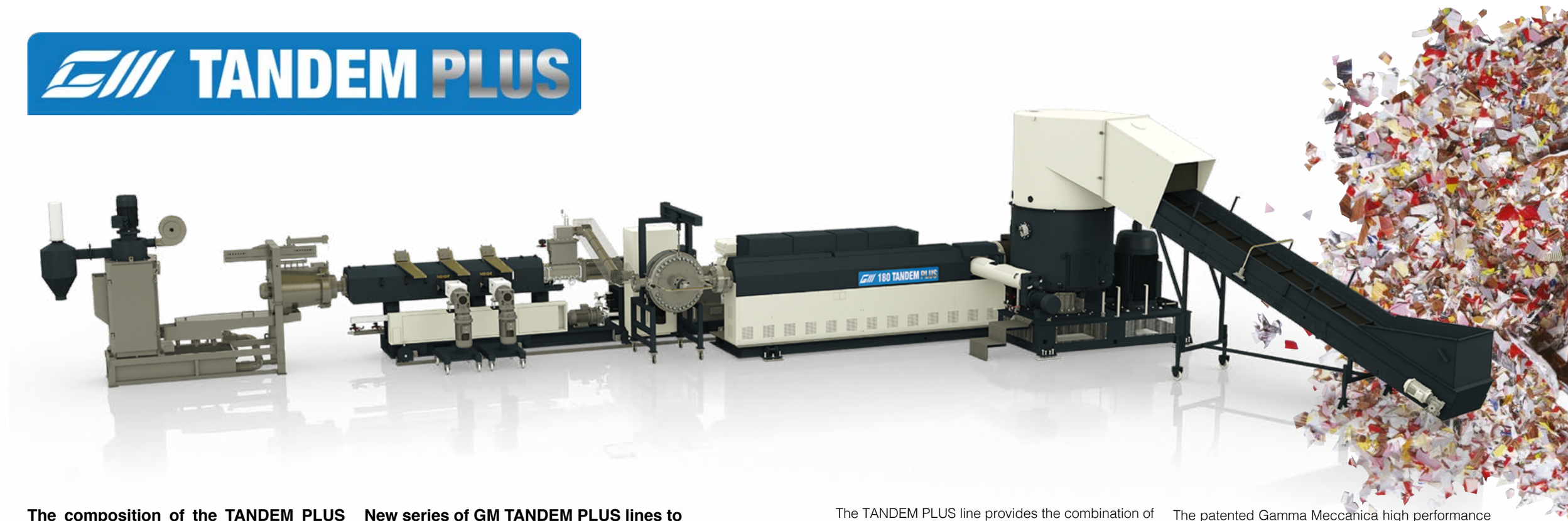
Another important benefit of the TANDEM line is the possibility to have double filtration.

Distinctive characteristics:

- **Line suitable for the recycling for heavily printed, high humidity and contaminated materials.**
- **High performance degassing chamber for removal of up to 10 times more gas and humidity in the melted material compared to other systems.**
- **Possibility to have double filtration.**
- **Possibility to have the first extruder as a single screw and the second a twin screw.**

GM TANDEM PLUS lines

The ultimate upcycling solution to add higher value to waste materials



The composition of the TANDEM PLUS line:

- gravimetric dosing system
- conveyor belt with metal detector
- cutter-compactor
- first single screw extruder
- screen changer
- vacuum degassing chamber
- second twin screw extruder
- underwater pelletizer TI or water ring pelletizer TDA
- panel with touch screen

New series of GM TANDEM PLUS lines to give more “added” value to waste materials

The ultimate TANDEM PLUS line allows to have all the advantages of the classic TANDEM plus the possibility to improve the characteristics of material during the upcycling process. This solution is ideal for the production of compounds for special applications.

The TANDEM PLUS line provides the combination of the first extruder as a single screw and the second a twin screw.
The regeneration and “upcycling” process begins with gravimetric dosing system to feed the materials in a more precise and accurate way to the COMPAC unit which has the function of shredding and densifying the waste material to be recycled. From the COMPAC unit, the material is pushed with constant flow from the feeding screw into the first extruder.
Connected to the first extruder there is a self-cleaning screen changer, installed to remove the contaminants present in the melted polymer. At the exit of the screen changer, the melt is “degassed” by the high performance vacuum chamber to avoid defects in the granules such as “air bubbles”.

The patented Gamma Meccanica high performance vacuum system allows for removal of up to 10 times more gas and humidity in the melted material compared to other systems. The polymer is “enriched” with master, carbonate and various additives inside the twin-screw extruder. The upcycling process ends with the cutting of the melted material inside the TDA or TI pelletizer systems.

Conventional lines AF

Reliability and experience

The conventional regeneration lines are ideal for the recycling of plastics that foresee the use of a granulator. It can be also equipped with our FORCE FEED system complete with storage silo, single or dual auger configuration for ground rigid materials, film and foam flake. This type of line is available in different models depending on the production capacity.

Every line can be customized upon request with additional components to satisfy the customer's requirements.

The typical composition of the line:

- force feeder
- extruder
- filter
- water ring pelletizer TDA or underwater pelletizer TI

LINE	PRODUCTION CAPACITY (Kg/h)*	ENERGY CONSUMPTION (kWh/kg)
GM65	180÷200	0.23÷0.28
GM90	250÷300	0.23÷0.28
GM105	400÷500	0.23÷0.28
GM125	550÷650	0.23÷0.28
GM160	900÷1100	0.23÷0.28
GM180	1000÷1500	0.23÷0.28
GM210	1100÷1900	0.23÷0.28

* The capacity refers to LDPE (excluding the granulator), and can vary depending on the density of the material, degree of pollution, print and humidity percentage.

Lines for PET recycling

Great efficiency, productivity and energy savings

This type of the line has been specially designed for PET recycling.
The PET lines are generally composed of conveyor belt, cutter-compactor, extruder, screen changer and underwater pelletizer TI.
The most important aspect of regeneration in this case is the need to limit the drop of the intrinsic viscosity value (IV). This value determines the mechanical performance of the material.

The lines proposed by Gamma Meccanica S.p.A. allow for treating the material limiting the fall of and increasing IV.
These lines are designed for the regeneration of PA as well.

PET recycling lines are available in different models based on production capacity.

PRODUCTION CAPACITY OF COMPAC PET LINES

LINE	PRODUCTION CAPACITY (Kg/h)*
GM50	50÷180
GM65	150÷300
GM90	250÷510
GM105	400÷710
GM125	600÷1000
GM160	900÷1450
GM180	1500÷2100
GM210	2000÷2800

*The production capacity can vary depending on the density of the material, degree of pollution, print percentage and humidity percentage.

Pelletizer Systems
Superior quality in every detail

Compatibility of components

All the components of a Gamma Meccanica regeneration line have been studied also for standalone use, therefore the customer can decide to combine them with existing lines.

Underwater pelletizer TI

Thanks to new developments in the processing of plastic materials Gamma Meccanica produced the underwater pelletizer, which allows the granulation of plastic materials with high MFI (such as PET, Nylon, etc) and low viscosity that cannot be processed with conventional systems. It is suitable for the following plastic materials: PE, PP, PS, ABS, MASTER, COMPOUDING, PET, PA, TPU, TPE, SAN, SBS, SEBS, PBT, PLA, HIGH MFI PP.

The cutting process is performed in immersion, with the die entirely underwater, thus allowing the material to assume the consistency necessary for cutting.

The start-up sequence and the main parameters influencing the quality of the cut product are automatically controlled by a PLC. The panel with PLC allows control of all the operating phases by avoiding system malfunctions and ensuring automatic supervision.

The underwater pelletizer is available in these sizes: TI 2.3, TI 4.5 and TI 5.6, depending on the production capacity.

TYPE	CAPACITY UP TO KG/H*
TI 2.3	500
TI 4.5	1200
TI 5.6	2500

* The maximum capacity refers to **PET** processing.

Water ring pelletizer TDA

The water ring pelletizer TDA allows a fast start/stop sequence and rapid material change. It can be installed on lines suitable to most plastic materials (PE, PP, PS, ABS, MASTER, COMPOUDING etc).
It is also compatible with all the extruder models currently proposed on the market, regardless of the manufacturer.

The Water Ring Pelletizer TDA is available in these sizes: 2.0, 4.0, 5.0, 6.0.

TYPE	CAPACITY UP TO KG/H*
TDA 2.0	170
TDA 4.0	700
TDA 5.0	1200
TDA 6.0	2200

* The maximum capacity refers to the **PE**.

ECO CLEAN

Cleaning system for the removal of printing ink from flexible plastic films

Function of ECO CLEAN

Eco Clean removes the ink deposited by the printing machines on the plastic films for packaging, making the recycling of the printed films more profitable. The result of the innovative process is a film completely cleaned from ink.

How does it work

Eco Clean removes the ink with the use of mechanical brushes and other ink removal equipment and processes. A specially formulated detergent is used to facilitate the removal of the ink. This detergent is not hazardous. It is renewable, recyclable and reusable in the same technological process.

Requirements of ECO CLEAN

The Eco Clean process is suitable for all types of flexible printed material rolls which are printed or contaminated on the top surface.

The minimum thicknesses of the film must allow the traction of the material without creating deformations on the surface, or tears, in the presence of mechanical surface treatments.

Advantages of ECO CLEAN:

- Cleaning speed of 40 meters per minute
- Fully automatic functioning that requires very little labor
- Very low detergent cost
- High energy efficiency

Our customer service

Experience of Gamma specialists and internal laboratory to offer customized solutions

Lab lines for customer's material testing and internal laboratory

To meet the customers' needs and to ensure precise and complete answers, Gamma Meccanica has created an internal lab to test the materials supplied by customers and to verify the quality of the processes.

The companies that are interested in this service can test different materials on the lab lines to get all the data useful for the actual purchase of a line. They can determine what hourly production will be guaranteed.
This allows the Gamma Meccanica team to provide qualified answers on the most complicated materials to be recycled.

List of lab tests:

- Moisture tests to measure the humidity contained in the material.
- Density tests to measure the specific weight of the material.
- Rheological tests to determine the rheological curves of the material, the curves that link viscosity, pressure and shear stress.
- Melt flow index tests to measure the fluidity of the material.
- Intrinsic viscosity tests on PET to measure the PET fluidity, indicating how much hygroscopic degradation occurs in the process.
- Calorimetric tests to determine the melting temperature, the degree of crystallinity, the specific heat and the latent heat of fusion of the material. On these basis we can estimate the composition of the material.
- Thermogravimetric tests to determine the amount of ashes, the percentage of carbon black and calcium carbonate of the material. Using these data we can estimate the composition of the material.
- PET tests to determine the quantity of impurities in PET flakes.

GAMMA MECCANICA

Gamma Meccanica S.p.A. locations

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