



Piovan

Customers. The core of our innovation

Packaging Solutions
PET Preform Systems

Piovan PET Preform Systems:
Complete solutions for concrete benefits



With specific skills and deep knowledge of the process, Piovan is a reference partner in the PET Preform sector.



Piovan's wide technological offer satisfies any requirement of treatment and handling of granules, of mould conditioning and cooling, of regrind recovery and plant supervision. All the solutions at the cutting edge of industrial applications, ensure the optimisation of energy consumptions and are able to automatically adjust the process to the real production conditions of the system.

Benefits

- Reduction of running costs:** innovative solutions equipped with Piovan patented devices ensure the careful management of energy and optimised production cycles.
 - Constant functioning:** the system works with no process interruption thanks to the exclusive design of the equipment which operates for more than 10 years, without extraordinary maintenance interventions.
 - Independent management of**
- all the engineering aspects in the realisation of the system: from the study and development phases to the commissioning ones.
- Variety of configuration:** which allows complete customised systems to be created for any production requirement, open to future enlargements.
 - Integration of the devices:** by means of supervisory software systems specifically for the production of PET preforms.



Piovan PET Preform Systems: Automatic handling and conveying systems



With a wide range of units and components, Piovan develops handling and conveying systems specifically customised for PET plants, able to reach throughputs of up to 3000 kg/h and cover distances of 250 m. The range includes outdoor and indoor silos, silos loading systems, big bag unloading stations, vacuum pumps and receivers, material selection stations.

Piovan adopts specific details and devices for the correct management of virgin, regrind or post-consumer PET material, as well as of additives and masterbatch which complete the production of preforms and containers. All the devices allow the operator to manage material conveying in an automatic and safe manner, with no waste.



The compact design of the machinery and availability of granule receivers integrated in the drying hopper allow the rationalisation of the production area.

Piovan PET Preform Systems: Energy efficient dryers



The most delicate phase of the production process is represented by drying, which must guarantee moisture removal and thermal conditioning, in order to achieve uniformity of the physical and chemical properties of PET.

Piovan dryers are designed to work in steady conditions in all the processing phases: start up, production, standby and system shut down. The process parameters and the Dew Point are kept constant and

always at optimal levels for adequate treatment of PET. At the forefront in the development of systems that are more respectful of the environment and able to minimise and optimise energy utilisation, Piovan has developed a new generation of dryers called GENESYS. Equipped with innovative and patent-pending devices, these units are able to adjust in a completely automatic manner the functioning mode of the drying system, thus optimising the performance at the maximum.

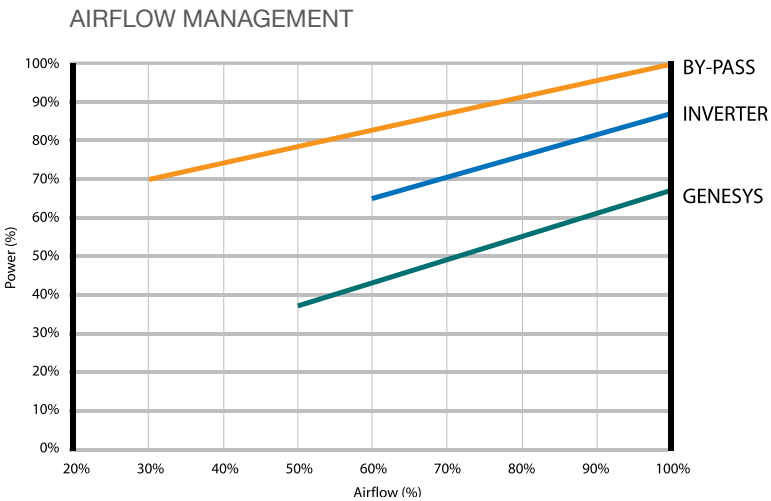
Genesys

Benefits

- Self-adjustment of the dryer to the real production requirements**, by means of the elaboration of signals deriving from high resolution load cells on which the drying hopper is installed and from a special air flow measuring device developed by Piovan. The system self-adjusts the set values, thus allowing the optimisation of the drying process as well as of the usage of necessary energy.
- Constant Dew Point, with no fluctuations**. A device managing the process airflows (an exclusive feature of Piovan dryers) keeps the Dew Point constant and at the required values, thus optimising the energy required for the tower regeneration, with consumption savings which can be higher than 50%. Every regeneration cycle saved results in the increased duration of the molecular sieves.

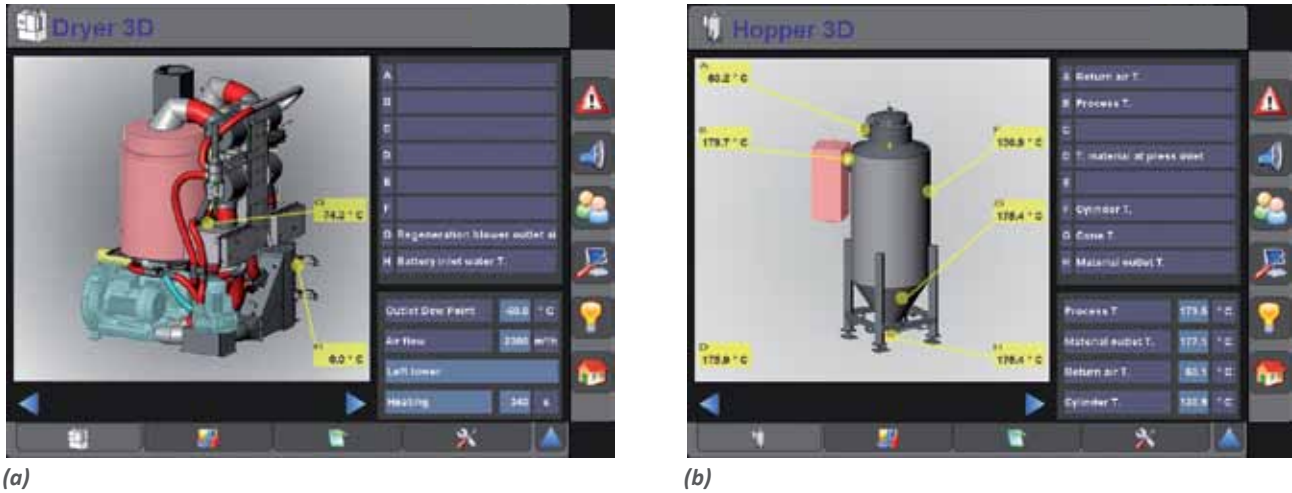


Piovan PET Preform Systems: Energy efficient dryers



Maximised efficiency of the system. The GENESYS dryers use 40% less energy than alternative typologies. The high performance blowers integrating a system which adjusts and regulates both the working frequency and the voltage of the motor, ensure a considerable optimisation of the resources and of the process.

Piovan PET Preform Systems: The revolutionary control system of Genesys



Supervision and management of the complete feeding and conveying system.



Benefits

- No dissipation of energy:** by means of the new Piovan software program, the system verifies that no energy loss occurs and it automatically intervenes on the regulation of the air/material ratio. In this way the process is constantly kept at excellent levels in the area of energy consumption.
- Elimination of the cooling water.** The requirement of water is accurately managed by means of a valve with PID control, which modulates the water flow in line with the working conditions of the dryer, up to the interruption of water usage with constant operations. A double energy conservation is achieved, related both to the dryer and to the cooling system.
- Intelligent regeneration.** The whole regeneration cycle is carried out without cooling water and the residual energy, given to the molecular sieves for water release, is totally recovered in the process.
- Reduction of maintenance expenses,** thanks to the usage with no imbalance and proportional to the real loads of all the key components of the unit. The processor guarantees the correct usage of the system through the maintenance management module, which prompts the operator about the ordinary interventions to be carried out according to the working conditions of the dryer.

An advanced processor, which is part of the standard configuration of the Genesys models, manages all the operations of the drying system, including the dryer **(a)**, drying hopper **(b)**, loading pump, mould dryer and heating chamber (electrical, gas or dual electric/gas versions). The control stands out for its high capacity of calculation and elaboration of a huge quantity of process data in real time and in a reliable manner.

The system installed onto the dryer is equipped with a large dimension touch screen monitor, which allows 3D visualisation of the plant, with the advantage of an improved and more complete understanding of the data. The user-friendly coloured graphics offer the additional benefit of navigating inside the machinery, up to entering the details of the key components; for each of these, it is possible to monitor the functioning mode and set new parameters.

The control of the Genesys dryers comprises a historical logbook of alarms and operating conditions of the last 3 months, which allows the operator to monitor the system in a simple and effective manner and immediately identify possible signals of error **(c - d)**.

By means of a connection with the company's network, it is possible to export data to carry out a more accurate analysis and define the most adequate solution to be adopted. Via internet it is possible to count on the support of the qualified staff of Piovan after sales department, which can monitor the dryer's status 24 hours a day and promptly intervene.



(c)



(d)

Piovan PET Preform Systems: Drying hoppers



Piovan drying hoppers are built in stainless steel with an insulation thickness of 100 mm both of the cylindrical and conical sections. They are available in the specific version for the treatment of granules and of flakes, with a capacity ranging from 1,500 to 16,000 litres. Thanks to an exclusive design, they guarantee that homogeneous temperature levels are kept in all the mass of plastic granules.



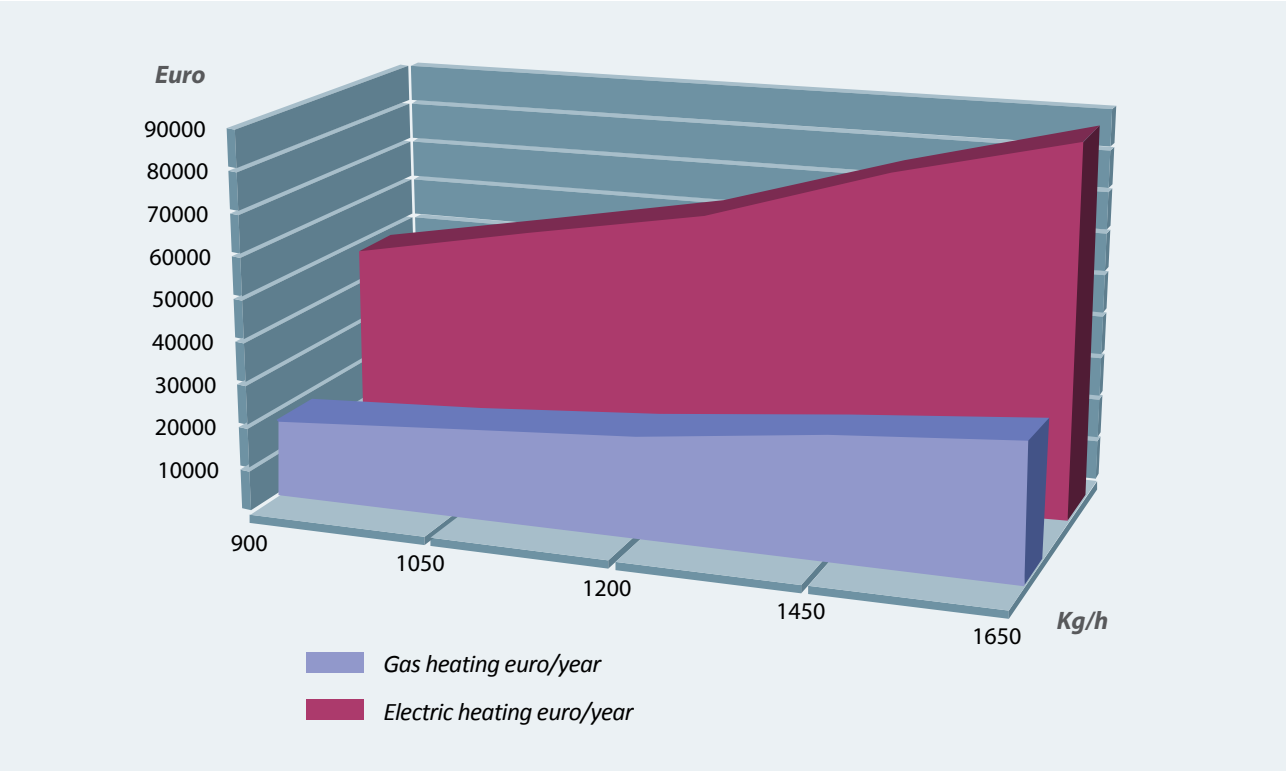
Benefits

- **The new patented interior design** and the cyclonic outlet allow the highest result in terms of airflow, which is diffused throughout the entire PET mass, and ensure optimal heating already from the production start up phases. The high efficiency of the system results into correct and uniform dehumidification of PET material, already from the very first batch.
- **The possibility to intervene on the filling level of the drying hopper** allows optimised management of temperature and energy usage, for the various production typologies, such as preforms of different weight.
- **No thermal dispersion into the environment.** The highly efficient system guarantees that the energy supplied is entirely absorbed by the material, with no risk for the operator of accidental contact with hot surfaces.
- **Possibility to continuously monitor material throughput:** the drying hoppers are equipped with load-cells which precisely provide the real consumption rate.
- **The suction boxes** specifically developed for re-conveying virgin PET and flakes to the secondary drying hopper in closed circuit avoid temperature drops and dust formation.

Piovan PET Preform Systems: The competitive alternative of gas heating chambers



Piovan has focused its attention on the use of low-impact energy resources, such as natural gas, for a more efficient and sustainable production process.



As an alternative to traditional electric systems for heating the process air, the drying units can be equipped with gas heating chambers, patented by Piovan, able to exploit the heat developed by burning gases. The GHP models comply with international safety norms, and employ environmental-friendly combustible materials as natural gas, propane, butane and LPG.



Benefits

- High standard of energy efficiency:** the continuous modulation of the flame of the burner allows the variation of the power ranging from 10 to 100%, thus ensuring optimised functioning. The energy provided always corresponds to the required one.
- Reduction of the operation costs** up to 50% compared with the use of electrical power, thanks to the competitive price of gas in many countries.
- High efficiency,** superior to 90% also with partial loads. The patented designs of the shell and tube heat exchanger, of the combustion chamber and of the fume paths, contribute to increase the system efficiency and guarantee high performances of thermal exchange.
- Continuous functioning of the drying system, at the most convenient cost.** The dual heating version (available as an option) allows the operator to select the most suitable heating mode (electric or gas functioning) at any time.
- Utmost flexibility of application:** it is possible to upgrade existing electrical chambers with the gas version. The new and more compact design and the range variety offer the possibility to create solutions which can easily be accommodated in the customer's plant.

Piovan PET Preform Systems: Reliable preform colouring units



Specifically developed for the PET sector, the range of Piovan dosers is able to fulfil the requirements of preform colouring as well as the necessity to add barrier or anti-acetaldehyde components.

The volumetric unit MDT 3 CH is ideal for dosing both crystalline and amorphous masterbatch materials, including low melting point micro-granules and additives of any typology. It always achieves high qualitative levels in terms of accuracy and repeatability, over the whole production range which goes from 0.06 to 60 kg/h.

Benefits

- **Precise dosing**, obtained by electronically controlling the number of revolutions of the dosing screws by means of brushless motors.
- **Quick start-up**. The rapidity to fine-tune the recipe and to match the colour allows an immediate adjustment of the dosing functions. The control is designed to memorise the dosing parameters and recall them when starting a new production lot, benefiting from the automatic functioning of the unit.
- **The continuous water circulation inside** the unit prevents any anticipated melting of the granules before entering the main PET stream, thus ensuring accurate dosing with no variation.
- **Correct functioning of the doser** in any operative condition, guaranteed by a special hopper which balances the pressures inside the system, avoiding inconstant dosing which would be caused by variations in pressure.



The range includes the LD 10 doser for liquid colorants, with a variable throughput from 50 to 2900 g/h. It can be used for various colorants specific for PET, with viscosity comprised between 300 and 34000 cP. In the configuration provided with mixer, completely in stainless steel and insulated in order to avoid thermal dispersions, the LD10 ensures homogeneous mixing of the additive with the granules.

Piovan PET Preform Systems: Preform and bottle recycling



In order to comply with the increasing requirements to reduce and optimise the usage of natural resources, Piovan has developed specific technologies for the recovery and treatment of production rejects and PCR (postconsumer regrind). Integrated systems including granulator, de-dusting unit, crystallizer and gravimetric blender allow the usage of PET flakes also in high percentages, keeping the aesthetic and mechanical characteristics of the final product unaltered.

For those processes which use amorphous PET – either flakes or granules – Piovan offers a complete range of crystallizers, allowing high percentages to be added to the process. The models ranging from the CR 200 to the CR 6000 have been specifically developed to overcome the material glass transition temperature and to guarantee homogeneous crystallization, with no risk of sticking or formation of bridges.

Once crystallized, the in-house regrind or the PCR are dosed and mixed with virgin granules by means of batch gravimetric blenders before the drying process. With a throughput ranging from 1200 to 2500 kg/h, Piovan MDW units stand out for their capacity to keep the proportions among the various components unaltered, thus ensuring high uniformity in batches and process repeatability.



Benefits

- **Energy efficiency:** thanks to the particular design of the lower section of all the models, the accurate circulation of the heating air inside the crystallizer ensures an effective energy exchange. Moreover, the adoption of gas heating chambers, in addition to the electric units, allows a further optimisation of the running costs.
- **Self-adjustment of the system:** level sensors allow the adjustment of the crystallizer's functioning mode, in line with the quantity of material to be processed. They ensure PET treatment in conformity to all beverage applications.
- **Optimal and continuous mixing of the material,** ensured by blades featuring a particular profile, also ideal in the case of mixed solutions using both flakes and virgin PET.
- **Feeding devices** suitably cooled with water guarantee the correct handling of granules and PET flakes, and avoid the common problems deriving from the early softening of the amorphous material during the loading phase.
- **No risk of contamination:** the unit is completely built in stainless steel, and the surface has no welding and rough points. The system complete with rotary valve at the discharge outlet avoids the degradation of the material.
- **Rapidity in production shift:** a wide hinged inspection door allows the operator to quickly carry out cleaning and maintenance operations. In the large capacity models, the cone is formed by two separate sections in order to ease extraordinary interventions.



The immediate recovery of preforms and bottles not complying with the standards can be easily carried out by means of granulators of the RS 26 and RS 30 series. The particularly silent cutting action contributes to minimising the noise level in the production department. The geometry of the rotor has been studied to ensure a high quality regrind, without dust and with regular dimensions.

Piovan PET Preform Systems: Mould dryers for faster and constant cycle times



The RPA Mould Dryers prevent the risk of formation of condensation inside the mould enclosure, guaranteeing constant moulding conditions and the maximum productivity of the PET system. Equipped with an adsorbing rotor with continuous and automatic cycle, the Piovan RPA units stand out for their high operative efficiency. The models, with an airflow range from 400 to 3000 m3/h, can be used to provide air with low Dew Point to a large variety of moulds, connected to one or multiple injection moulding machines.

Benefits

- High and constant productivity**, reducing rejects and processing imperfections on the moulded pieces.
- Reduced consumption of energy compared to alternative solutions**. The high performance rotor and the electronic control keep the energy requirement at minimum levels; the average consumption is <0.006 kWh per m3/h of process air.
- The special humidity detection kit**—patented by Piovan— self-adjusts and optimises the RPA

dryer’s functioning according to the atmospheric conditions, thus avoiding unnecessary energy consumption. With this device, an average energy saving of 35% is achieved.

- No maintenance cost for the mould**, which is protected from the risk of corrosion and damage caused by condensation.
- Thanks to their modularity**, the RPA models always permit to create the conditions of perfect efficiency for all typologies of mould.

Benefits

- Constant production and saving of energy**, thanks to the large dimension flywheel which ensures constant rotation and gives the granulator a continuous and balanced cutting power.
- No dust content guaranteed by the blower and cyclone system** which keeps the cutting chamber cooled and separates the finest dust particles. An additional de-dusting unit calibrated according to the type of material being used, eliminates the remaining dust specks.
- Automatic management of all the devices of the integrated system for the recovery of regrind**, by means of the PLC control which allows the operator to supervise the process phases. As an option, a touch screen operator interface is available too.
- Specific solutions for PET applications**, such as the wider slide gate for lighter typologies of flakes and anti-bridge devices avoid material stagnation and ensure continuous functioning of the system, with no interruption.
- Homogeneous and constant mixing**, thanks to the distinctive design of the MDW units which ensure uniform dosing with no preferential flows. The Regrind Management program contributes to automatically keep the correct ratio among the components, according to the availability of regrind.
- Premium control and communication system**, with high execution speed and user-friendly graphics instructions. It gives the operator the possibility to consult and export the functioning data in the on-line and off-line modes, for easy elaborations.
- Modular configuration**, with dosing stations of various capacity, provided with screws or slide gates and which can be extended from 2 to 8 stations at any given moment.
- Among the various configurations**, stainless steel hoppers and load-cells for high temperature are available too, for optimal treatment of hot materials up 180°C.



Piovan PET Preform Systems: Cooling systems PET Chiller



With a complete range of water- and air-condensed chillers and of machinery including cooling towers, dry coolers, pump groups and water tanks, Piovan develops refrigeration systems for any typology of plant all over the world.

Thanks to the high engineering capacity, the company can carry out the engineered and energetic studies, and supplies customised solutions which satisfy today's cooling needs. Piovan's offer also includes the new line called PET Chiller, developed for the specific requirements of PET productions. This ultra-compact and highly efficient system – designed around the application and dedicated to one injection moulding machine – is able to ensure the highest yield of the system while optimising the consumptions.

Benefits

- Reduction of the energy usage of 40% compared to traditional solutions.** The PET Chiller can dose the right amount of energy according to the real requirements of the IMM, ensuring the lowest usage of energy per one kg of processed PET material.
- Utmost performance of the mould,** by means of the enhanced and precise control and of specific devices which guarantee the absence of fluctuations in temperature, flow and pressure.
- The reduced amount of components** and the shorter routes of the water piping result into the simplified and quick installation of the refrigeration system.
- Constant functioning;** the standard configuration foresees some components which activate in the case of malfunctioning of the main devices, thus avoiding process interruptions.
- Optimisation of the production area.** The unit can be directly installed onto the mezzanine beside the drying, conveying and mould conditioning system, or located beside the injection moulding machine.



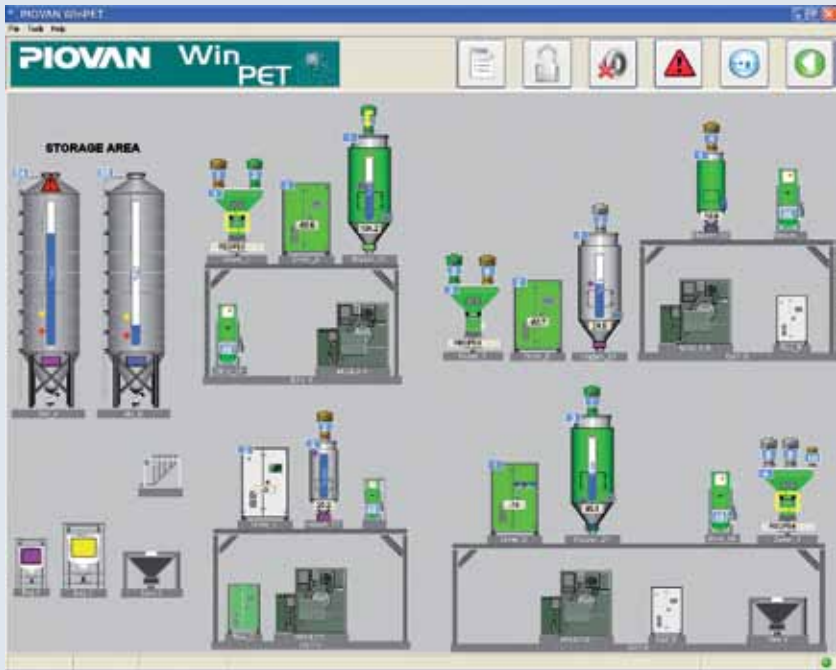
Piovan PET Preform Systems: Supervisory software for process management



For monitoring and managing the auxiliary equipment from remote stations, Piovan has developed the supervisory software Win PET, characterised by a standardised platform operating in Windows ambient.

With modules provided with specific properties and functions for PET preform productions, Win PET controls all the machinery of the system: dehumidifying dryer, primary and secondary drying hoppers, conveying units, mould dryer, gravimetric blender, water chiller and silos.

The modular architecture offers the advantage to carry out integrations and updating step by step, by increasing the operative efficiency.

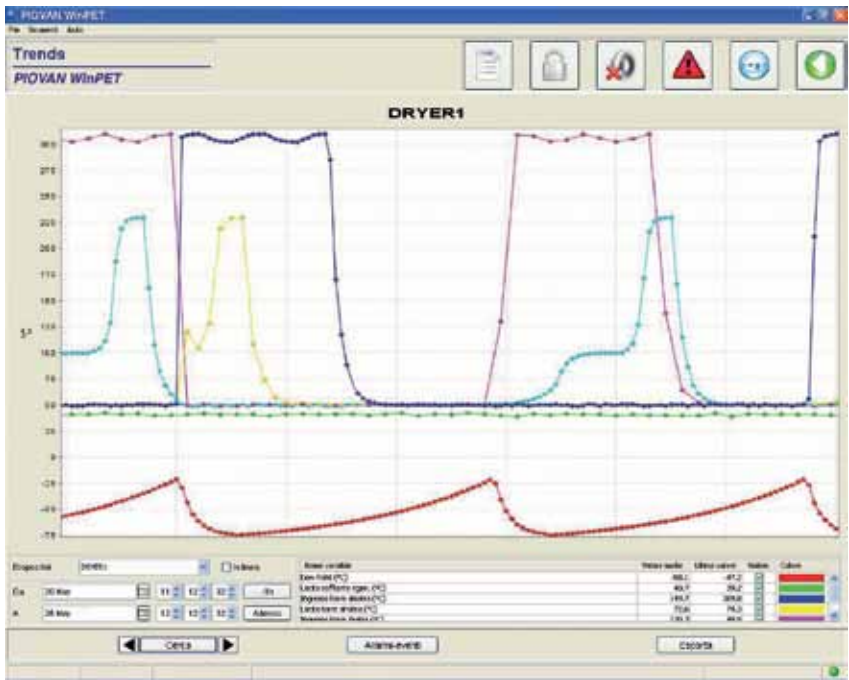


Benefits

- Self-configuration** of the system (plug&play type), with automatic recognition of the connected devices. The operator can create a personalised flow sheet of the system, in order to facilitate the use and identification of the machinery.
- Control of every single processing phase.** The structure with modules makes it easier to check and monitor the functioning parameters and control the working status of all the units.
- Collection and elaboration of the production data.** Besides the on-line monitoring of the machines, Win PET collects the system's data, allowing a complete and detailed analysis of the production process to be carried out.

Advanced functions

- Module for control and traceability of a production job.** It makes it possible the certification and the good execution of the moulded piece. Thanks to Win PET, the user has at his disposal all the process parameters – dehumidification trends, data related to material consumption, to the blends produced, to transport and to the alarms occurred – and relates them to a specific production job. In addition to this information, the software can provide the data of energy consumptions expressed in terms of percentage and in kWh (on line and historical modes), by means of the integrated Energy Consumption function.
- Product repeatability module.** It allows the user to manage the process through memorised configurations, thanks to the possibility to save the main working parameters in a recipe. This simplifies the plant's management and gives the guarantee of constant and optimal production.
- Maintenance module.** The software signals the need to carry out a cleaning or maintenance intervention, and it automatically provides the necessary instructions to carry out the operation.
- Tele-assistance module.** By means of a telematic connection, Piovan aftersales service can verify the correct functioning of the system and of every single unit controlled by Win PET. Through the analysis of the temperature trends and of the alarm logbook, it is possible to understand the causes of malfunctioning and suggest the user a different parameter setting or appropriately instruct a technician for a targeted intervention.



Piovan PET Preform Systems: PETes AA Analyzer



The measurement of the levels of acetaldehyde, generating in the PET transformation process, is among the key acceptance tests that preform producers are to perform. In order to guarantee the superior quality of the product and verify that the AA content is kept within strict and controlled limits, Piovan provides the PETes AA Analyzer instrument.

Thanks to the simple and automatic functioning mode, even non-specialised staff can carry out the on line measurement in just 30 minutes, with no preparation of the preform.

The instrument can be used for different typologies of preforms, always using the same de-absorption cell and without intervening on the unit's configuration.

Benefits

- Constant control of the process:** the possibility to detect the AA content in real time allows the certification of every single production lot. The connection with the company's network offers the possibility to access the process data constantly and elaborate them.
- High accuracy and repeatability of the measurement,** ensured by the instrument that, based on the "Fast Head Space Gas chromatography" technology, ensures a correct analysis, not linked to the various variables which intervene in the traditional methods.
- Reduction of the costs and times required to perform the tests.** The PETes unit, which can be installed in the production department or in the company's quality control laboratory, allows the operator to carry out the AA analysis at any moment, without requiring the support from third-party specialised technicians.

Piovan PET Preform Systems: Soft Drop for automatic storage



At the end of the production process, Piovan proposes the installation of a completely automatic preform storage system, called Soft Drop. The unit is designed for the accurate handling of

moulded pieces, which are conveyed and positioned in dedicated containers with no risk of damage by deformation or scratching. With the

new design and a rugged aluminium frame, the Soft Drop models ensure continuous functioning, with no interruption.

Benefits

- Completely automatic operations,** managed via a PLC control complete with touch screen operator interface for quick setting of the parameters.
- Protection from dirt,** thanks to the dust-proof cover which protects the preforms during the filling phase of the containers.
- Optimised filling of the containers.** Special vibrating platforms contribute to use at the best the capacity of the collection boxes, and increase that by 15%.
- The flexible configuration** allows the integration of the Soft Drop system with injection moulding machines of any size. According to the productions, the unit is provided in the version with one or two filling hoppers.

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