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141

HIGH EFFICIENT DRYING SYSTEMS FOR ANY APPLICATION AND TECHNOLOGY

The new Genesys line of auto-adaptive single hopper drying systems from Piovan delivers optimal and consistent operating conditions and lower energy consumption. It is one of the first patent issued in Europe for a high-efficiency polymer drying system.

The plastics industry processes non-hygroscopic and hygroscopic polymers. In non-hygroscopic polymers, the moisture is superficial and therefore eliminated by routine drying. With hygroscopic polymers, on the other hand, the moisture also penetrates into the resin, and so a drying system generating dry air using aluminium silicate, a material capable of trapping water molecules, is required. Modern drying systems do not stop at drastically lowering residual moisture, instead they regulate the exact content to required levels for polymer processing. The systems are highly reliable - which means operating consistency and repeatable results - and energy efficient.

In developing the new Genesys, Piovan has incorporated process control elements in addition to these bonus features (high operating reliability, energy efficiency):

- **consistency in the physical characteristics of the polymer after drying;**
- **the system adjusts automatically to the initial conditions of the polymer and those required by the process.**

There are many variables in the drying process: drying temperature, air dew-point (the quantity of residual moisture), the airflow capacity and the properties of the plastic granule to be processed, ambient temperature, initial moisture, instantaneous quantity of material processed, residual moisture.

A SINGLE-HOPPER, INDIVIDUAL OR CENTRAL, FULLY AUTOMATIC DRYING SYSTEM

It can adapt and automatically control operating parameters based on ambient temperature, initial moisture level, type and quantity of polymer, the final moisture content of the polymer, and granule size. In conventional applications a drying unit is commonly used to generate dry air, which is then circulated in a drying hoppers. Polymers are different from each other and require specific individual conditions for optimum operation (airflow, temperature and pressure) depending on the different process variables. A safety condition is systematically adopted and the drying system is sized based on the most critical processing parameters, at maximum material consumption, at maximum temperature, with the highest airflow. However, this goes against any principle of energy efficiency and raises running costs, as these extreme conditions rarely occur. Instead, Genesys adjusts and controls optimal operating settings for the material to be dried, using only the overall amount of energy strictly required. The settings are constantly compared with the data collected by the sensors installed on the system. A patented measuring unit, located in the air supply line, adjusts and controls the airflow instantaneously and independently. The airflow is modulated automatically by the drying unit, resulting in optimum process operating conditions. This way, a medium capacity Genesys system (drying 200-250 kg/h of polymer) provides savings of as much as 50% with respect to a traditional drying systems of equivalent capacity.

Genesys is capable of calculating exactly how much material is used by the processing machine/s and adjusts the operating parameters accordingly. In addition to maintaining a constant dew-point, Genesys adjusts the airflow to the quantity of material effectively used, regulating the thermal load for each kg of polymer processed.

The control system of Genesys is provided with an algorithm which varies the quantity of air supplied to the hopper, circulating the air content required to keep the thermal load constant. Maximum operating efficiency is achieved when the entire thermal energy in the process air is transferred to the material. The air returning from the hopper to the dryer therefore does not require cooling water in order to ensure system operation and absorption by the aluminium silicate molecular sieves.

CONFIGURATIONS AND FEATURES

The Genesys range today comes in three configurations to meet diverse operating needs. A microprocessor provides electronic control. The operator's interface is an 8-inch, colour touch screen. The HMI offers access to all the system's components for specific adjustments or settings.

The hopper has new shock-resistant finish and maintain the exclusive Piovan design which, in addition to ensuring operator safety - independently from the internal temperature, the external surface temperature never exceeds 40°C - also enables maximum thermal exchange between air and the material.

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DUAL SYNCHRONIZED CUTTING FOR HIGH EXTRUSION SPEEDS

An innovative method patented by Sica makes it possible to cut PP, HDPE and PVC-UP pipes performing two operating cycles simultaneously, on the same machine, thus reaching very high production rates. For example, the Duet125 automatic cut-off saw can reach hourly production rates of 2000 and 2300 pipes, of 150 mm and 500 mm in length, in both cases complete with sockets. Thanks to the machine's CNC control system, installed on the machine, the necessary cut length precision (tolerance of ± 1 mm) is always guaranteed.
This system allows for a perfect synchronization of the cutting unit with the pipe extrusion speed and consequent exact positioning of the unit at the required cutting dimension. Moreover, the machines are equipped with specific anti-wear tools to guarantee an exceptionally high and enduring processing quality.
The logical control system also offers 'on the fly' cutting capabilities, optimizing the use of the effective stroke to further increase output in terms of the number of cuts. Equipped with an intuitive icon-based graphic interface and a classic production system for preset sequences of lengths, the machine also features a new length sequences management system. Specifically, having entered the basic production parameters (extrusion speed, pipe diameter, capacity of downstream machines) the user can define the required production batches, automatically optimized by the system in order to exploit the machine's potential to the full. Intelligent planning of production sequences in addition to the availability of libraries in which process parameters and user product dimensions can be stored, determines the definition of a new state of the art field in terms of versatility and ease of control.
Finally, given the large number of cuts that can be performed per unit of time, the machine has been equipped with an extra-powerful cyclone-type dust exhausting system.
The range of automatic in-line planetary saws in the Duet series (available in the Duet 125, Duet 160 and Duet 200 versions) includes the Duet/K (cutting with knife without material removal for HDPE and PPR) and Duet/C (cutting with chamfering unit and knife without producing chips inside the pipe) versions, in addition to the standard model for PVC. Duet/C is particularly suitable for PP lines equipped also for the production of double-joint pipes.
The machines are entirely based on an electro-pneumatic design, eliminating all possible problems linked to the use of hydraulic actuators and hydraulic power packs, and are configured in order to optimize total energy consumption.
With this range of saws Sica responds to market demands for cutting at high extrusion speeds with reduced energy consumption, ease of use and control.

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PRODUCING HIGH-QUALITY CHROME GRILLE COMPONENTS IN A SINGLE SHOT

With its FLEXflow technology, Italian hot-runner specialist HRSflow has developed an innovative solution for the injection moulding of high-quality parts primarily for the automotive industry. FLEXflow is a servo-driven, finely regulated valve gate system for hot-runner systems. The precise control of the melt flow of each individual hot-runner nozzle permits a very balanced filling of all cavities and uniform pressure distribution during packing stage, even with multiple gating and widely varying cavity volumes. The radiator grille from the HRSflow test mould measuring 580 x 330 mm with a total parts weight of 297 g and different wall thickness, from 2 to 3 mm, on cavities is subsequently chrome-plated and must therefore meet very high demands in terms of surface quality. Several car component suppliers have already positively tested this ABS and ABS/PC part on their electroplating equipment. The first chrome-plating applications are due to go into series production shortly.

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DIFFERENT SHOT WEIGHTS IN ONE FILLING PROCESS

With the FLEXflow valve gate system, even large-area parts can be moulded with high-grade surfaces. With the cascade injection moulding process that is normally used for this purpose, the electrically driven needle valve nozzles allow the precise, sequentially coordinated opening and closing of the valve pins with variable velocity over stroke length. This in turn permits accurate control of the melt flow on each hot gate and of the volume flow in the cavity as a whole. With the customized opening of the valves, the dreaded pressure loss that occurs with conventional cascade injection moulding methods is avoided, and, with it, the accompanying marks on the moulded part. Moreover controlled position of pin during packing stage allow to reach independent pressure control on each gate and thus desired shrinkage for each cavity, speeding-up matching of tolerance requirement and avoiding expensive modification of tools.

The injection-moulded radiator grille is produced in a single shot over ten gating points with nozzles from HRSflow's MA series. The system layout consists of a compact runner and is designed expressly not symmetrical. The volumes of the cavities for the individual moulding elements of the radiator grille have a ratio of 1:20 from the smallest to the largest mould cavity, with 30% of thickness variation from thinner to thicker. The injection time is 2.9 s, the holding time is 6 s, the hot-runner temperature is 255°C and the mould temperature 60°C.

In the past, to achieve the different shot weights and still meet the demands for chrome-plating and assembly tolerances, separate moulds would have been needed to produce this high-quality part. The aim of this hot-runner system layout was to prove the strengths of the FLEXflow technology with the aid of this multi-cavity application. Nicola Pavan, CAE department coordinator and project leader at HRSflow says: "To prove FLEXflow capability we intended to mold the components only with simultaneous opening of the electrically driven needle valve nozzles with a previously defined opening stroke setting.

The volume of injected melt for each individual nozzle is accurately controlled during filling and packing by changing needle strokes up to reach desired local pressure. So we have a local control of flow rates and applied pressure and the possibility to easily balance family tools and control warpage without part or runner modifications".

SIMULATION ANALYSIS WITH MOLDEX 3D

A mould-filling analysis with both the simulation programs Moldex 3D and Autodesk Moldflow calculated the optimum parameters for each of the ten nozzles of the FLEXflow system. During the injection process, every valve assumes a position that has been freely programmed by the user. The needles can be programmed using up to 8 different control points for both opening and closing, by defining velocity and position for each step. Up to two cycles of opening and closing can be programmed for each needle. The simulation analysis and practical application show very high conformity with the actual progress of the flow front in the individual cavities. With the FLEXflow technology, it is possible, with a short fine tuning stage, to produce parts without any surface defects even with limitation typical of family tools. This also drastically reduces the reject rate for the injection moulder. The moulded parts show reduced frozen-in stresses, are not overpacked, with controlled warpage and are ideally suited for the chrome-plating process.

BETTER QUALITY PARTS

With FLEXflow, the individual valve pins of the currently up to 16 hot-runner nozzles can be precisely opened and closed sequentially, independently of one another. Depending on the opening or closing step, up to eight valve positions can be predefined with a motor accuracy of ±10 micrometre. Through this extremely precise positioning and speed control of the valve pins, a very homogeneous pressure distribution in the mould cavity and thus in the entire molding is attained. As result of the much larger process window, necessary clamping force and even weight of the part can be reduced without any loss of quality. In automotive construction, the FLEXflow technology has advantages in particular on injection moulding of large-area exterior and interior parts such as bumpers, spoilers, instrument panel supports (IPS), door liners, roof liners, components for the vehicle's lighting and glazing systems, headlamp lenses and panoramic roofs.

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