MAGUIRE®
Intelligent Simplicity

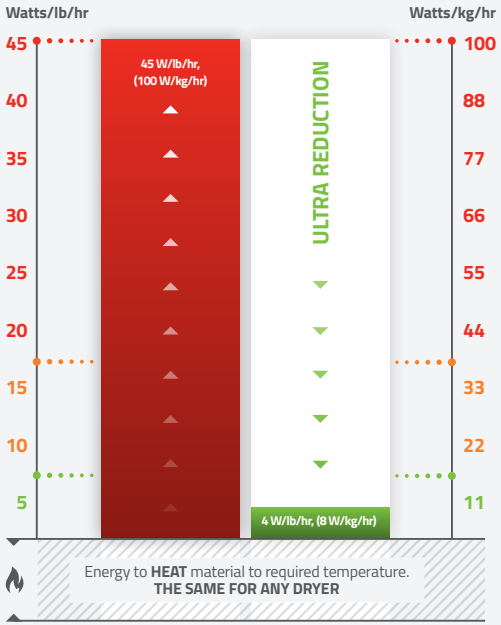
ULTRA Low Energy Dryer

PET Application Focus

Injection Stretch Blow Molding

ULTRA® BY MAGUIRE®

The First **ULTRA** Low Energy Dryer



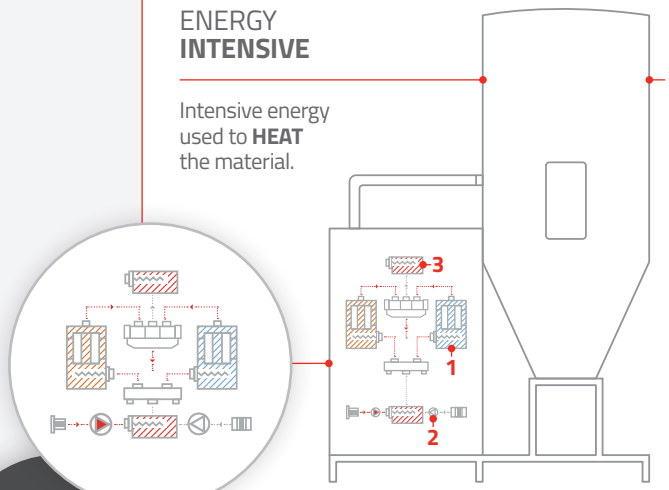
The difference in energy used to dry material, after it's brought up to temperature is huge:

A Desiccant Dryer Uses:	vs.	Our ULTRA Dryers Use:	Switching from Desiccant to ULTRA	Saves You:
45 Watts/lb/hr		4 Watts/lb/hr		41 Watts/lb/hr
100 Watts/kg/hr		8 Watts/kg/hr		92 Watts/kg/hr

Desiccant | High Energy Components

ENERGY **INTENSIVE**

Intensive energy used to **HEAT** the material.



Residence Time: 4-6 hrs

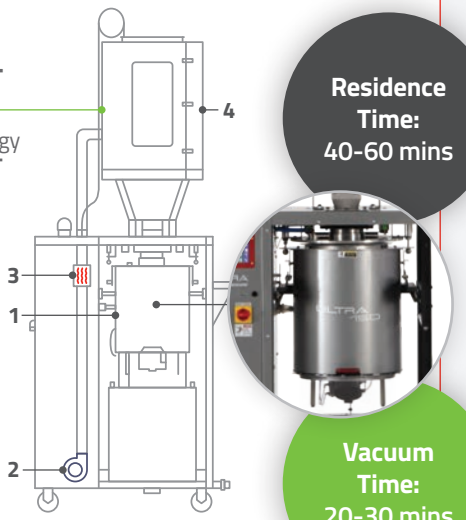
1. **Regeneration Process:** Desiccant beds become saturated with moisture and need to be regenerated which is **energy intensive.**
2. **Extra Blower & Heating Unit:** The regeneration process requires a separate heating unit, separate blower and chilled water.
3. **Frequent Maintenance:** The desiccant beds require replacement after 18-24 months. Filters need to be maintained weekly. Expensive dew point meters are required to ensure correct dew point & calibration.
4. **Material Residence Time:** With a desiccant dryer PET requires 4-6 hrs at a large volume.

vs.

ULTRA | ULTRA Low Energy Components

ENERGY **EFFICIENT**

Minimal energy used to **HEAT** the material.



Residence Time: 40-60 mins

Vacuum Time: 20-30 mins

1. **Vacuum Drying Process:** No regeneration process. No added energy used.
2. **Only one smaller blower & heating unit required:** For smaller volume and energy efficiency.
3. **Low Maintenance:** No scheduled maintenance requirements and no consumables.
4. **Compact Heating Hopper:** Less material in process, less energy used.

ULTRA efficient in every way!

PET Drying for Injection Stretch Blow Molding

The Injection Stretch Blow Molding (ISBM) process is very economical for container designs requiring low production volumes and short runs. It offers major benefits in terms of control of preform thickness that can then be shaped to allow consistent control of wall thickness when blowing rectangular and non round shapes.

Production Process

In the single-stage process both preform manufacture and bottle blowing are performed in the same machine, either over a 4 station or 3 station method of injection, reheat, stretch blow and ejection.

Technically the process stretches the raw material molecules vertically then blows to stretch horizontally. The biaxial stretching makes the molecules a cross shape.

These "crosses" fit together leaving little space as more surface area is contacted which makes the material less porous and increases barrier strength against permeation.

Importance of Good Materials Drying

Drying for hydroscopic materials that are used in this process such as PC or PET is critical given the technical requirements of the process and product, effecting process efficiency, product quality and overall operation cost.

Given the nature of the process materials usage can typically range from as little as 22 lb/hr (10 kg/hr) up to 551 lb/hr (250 kg/hr) on the largest of machines.

The Maguire ULTRA dryer range meets the throughput needs of the majority of injection stretch blow molding processes.

Typical Container And Bottle Applications:

Food jars and containers
Agri-chemical bottles
Cosmetic and toiletry packaging
Edible oil containers
Pharmaceutical/health and hygiene products

Desiccant Drying Process

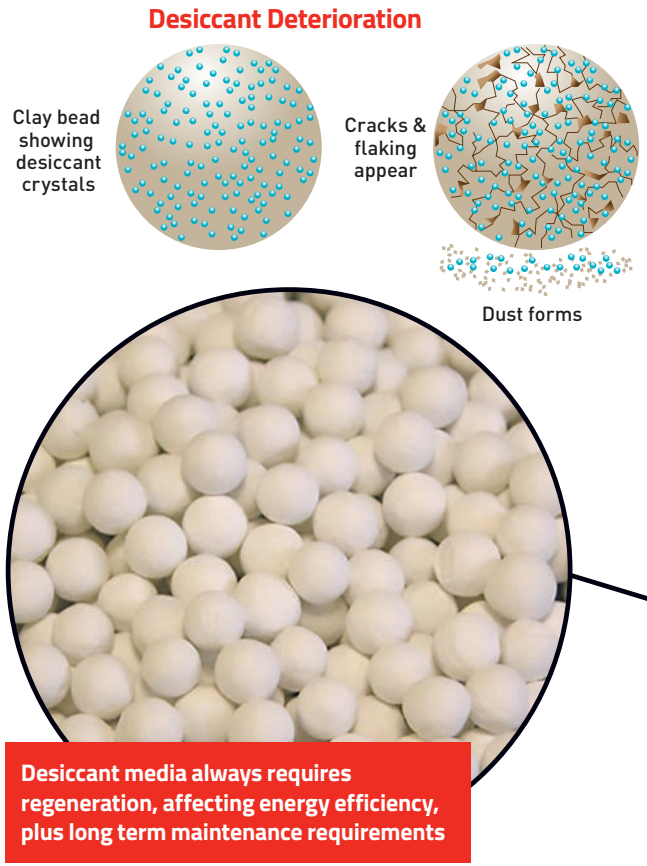
Drying for Injection Stretch Blow Molding processes have traditionally used desiccant based drying systems, positioned either beside the process or on a mezzanine above the throat of the process.

Desiccant dryers use either a twin tower or desiccant wheel that uses desiccant media to remove moisture from the drying process air to a dew point of typically -40 °F / -40 °C.

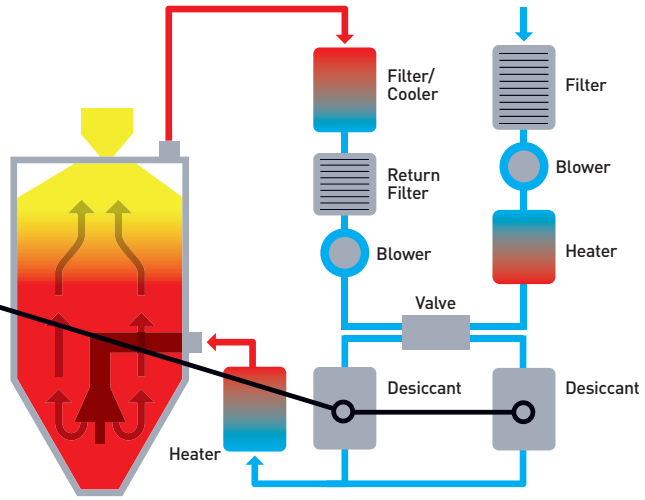
As the drying process air runs through the desiccant, moisture is removed to a dew point of typically -40 °F / -40 °C. The very dry air is then brought up to the required drying temperature and circulated through the material hopper.

Within 6-8 hrs the desiccant becomes saturated with moisture and has to be regenerated. The regeneration process requires a dedicated blower and heating unit.

In addition, it often requires services such as chilled water for heat exchanging to cool the desiccant before going back into production.



Desiccant media always requires regeneration, affecting energy efficiency, plus long term maintenance requirements



Issues of Desiccant Drying

1. **Drying System Hardware**
   Desiccant dryers require more heaters and process blowers for regeneration - more controls, multiple moving parts and maintenance
2. **Energy Consumption**
   Regeneration is energy intensive
3. **Desiccant Life**
   Desiccant Media requires replacing every 18 to 24 months on twin tower systems due to breakdown of desiccant media
4. **Dew point Consistency**
   As desiccant efficiency falls Dew point consistency can become variable
5. **Mechanical Maintenance**
   Blowers, filters, heaters, heat exchangers, control cards, valves and chilled water

The desiccant has to be heated up to temperatures in excess of 428 °F / 220 °C, which is energy intensive.

ULTRA Drying Process

ULTRA dryers use vacuum as the main method to dry versus air dew point. Drying by vacuum drops the boiling temperature of water to 133°F / 56°C. This creates a temperature and pressure differential that means moisture is rapidly released from the material. The ULTRA low energy dryer operates in a three-step process:

Step 1 - Heating Hopper

In step one the material is first loaded into a heating hopper to come up to the normal desired drying temperature for that material – for PET typically 40 to 60 minutes at a drying temperature of 338 °F / 170 °C.

Step 2 - Vacuum Chamber

In step two the preheated material then feeds by gravity into the vacuum chamber.

The amount of material is monitored by a pair of load cells to know the amount of material and adjust if required.

A high vacuum is applied to 700 mmHg (90% vacuum) and the material is held under vacuum for 20 to 30 minutes, depending on the material type, initial moisture and required throughput.

ULTRA uses a compressed air Venturi vacuum generator which operates for 1-2 min per cycle only. This ensures compressed air energy requirements are kept to a minimum.

Step 3 - Retention Hopper

In step 3 of the process the material is fed to the material retention hopper, which is also monitored by load cells. The load cells monitor usage and signal when to feed from the vacuum hopper.

The membrane dry air purge option provides a supply of -40 °F / -40 °C dew point air to purge the vacuum chamber and blanket the retention hopper. Using a slightly positive air pressure, the dried material is kept in a stable, dry environment.

ULTRA Energy Efficient

Key Benefits of ULTRA Dryers

What makes the ULTRA dryer the most energy efficient drying system on the market?

1 ULTRA Low Maintenance

- Touchscreen detects any issues by highlighting in red service boxes

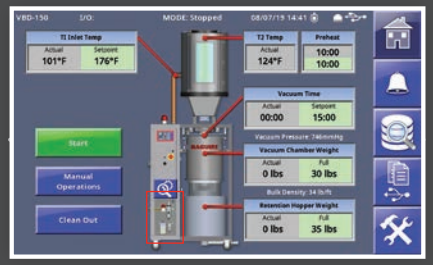
For example: Low air pressure

- System will not RUN if the process requirements are not met:

1. No vacuum / no heat

2. System logs alarm

✔ EFFICIENT PRODUCTION



2 ULTRA Energy Saver

- Temperature Sense: Temperature is controlled efficiently with energy saver modes built in as standard

✔ ENERGY EFFICIENT DRYING

3 ULTRA Smart Drying

- FlexBus Lite integrated to touchscreen - to allow control directly of your loading system to and from the ULTRA dryer - full feature materials conveying control
- Smart feeding of material to process
- Load cells monitor process demand by live lb/hr (kg/hr) consumption
- Automatic adjustment of amount of material under vacuum and in retention hopper feeding the process
- ULTRA signals when to release the next fresh batch
- Retention Insulation: The retention hopper is heavily insulated and enclosed to minimize heat loss and moisture reabsorption

✔ ULTIMATE PROCESS EFFICIENCY

4 ULTRA Quick Drying

Typically 1/6th of the drying time of conventional desiccant dryers. An ULTRA dryer can dry PET in 60 minutes versus 4-6 hrs with a desiccant dryer.

This dramatically reduces the energy required to dry material.

✔ MORE PRODUCTION TIME

✔ FASTER MATERIAL CHANGES

✔ MORE MACHINE UPTIME

5 ULTRA Heating Hopper

- Less raw material in process due to a compact heating hopper
- ULTRA avoids heating material that is not required for the process

✔ INCREASED EFFICIENCY

✔ LESS ENERGY USAGE

6 ULTRA Load Cells

- Use of load cells in the vacuum chamber and retention hopper allow the drying rate to match the process rate
- As lb/kg demands go up or down, the ULTRA matches the process requirements accordingly

✔ COMPLETE PROCESS DATA

✔ EFFICIENT PRODUCTION

ULTRA Green*

ULTRA dryers provide further savings from reduced CO_2e - Global Warming Potential (GWP). Running 220 lb/hr (100 kg/hr) provides a saving of 54,120 kW a year

This equates to saving:

38.6 tons CO_2e/year

*US Government source
https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

ULTRA Savings – How Does Desiccant Compare to ULTRA?

220 lb/hr (100 kg/hr) application

ULTRA dryers use energy to dry all type of resin at a drastically lower rate than a comparable new desiccant dryer. Savings with the ULTRA dryer are even greater in comparison with a less efficient older dryer.

Material	Drying System	Energy To Dry (Watts/lb/hr)	Energy To Dry (Watts/kg/hr)	Energy Cost To Dry*	10 Year ULTRA Drying Saving**	Heating Time Savings	Overall Drying Time Savings	Material In Process Savings
PC	Desiccant	59	130	$9,345.00	×	180 Mins	Drying Time: 180 Mins Start-up Time: 180 Mins	750 lb | 350 kg
At 250°F / 120°C	ULTRA	5	11	$792.00	$85,540.00	20-30 Mins	Drying Time: 20 Mins Start-up Time: 50 Mins	270 lb | 125 kg
PET	Desiccant	86	190	$13,622.00	×	300 Mins	Drying Time: 300 Mins Start-up Time: 300 Mins	1,100 lb | 500 kg
At 350°F / 180°C	ULTRA	7	15	$1,108.00	$125,140.00	40 Mins	Drying Time: 30 Mins Start-up Time: 70 Mins	250 lb | 115 kg

ULTRA RETURN ON INVESTMENT

Maguire reserve the right to change and update any information.

*DRY - This is the net energy used in the drying process to DRY the raw material. HEATING a lb or kg, energy usage is the same for ALL types of drying system and therefore excluded from these examples.

**Typical energy costs & savings calculated on lb and kg data. Example based on 220 lb/hr or 100 kg/hr, based on 6000 production hours per year, at an energy kW cost of $0.12.

ULTRA BY MAGUIRE

ULTRA dryers quickly pay-back in the short-term and continue to pay dividends through energy reduction in the long-term.

ULTRA Dryer

- Energy efficient, minimal energy used to dry material
- Cost savings year on year
- Fast return on investment
- Faster drying, heating & start-up timings
- Overall drying time savings
- Less material in process
- Significantly lower maintenance
- Intelligent controls and features
- Range of ULTRA options
- Wide range of models available to cater for small and large lb/hr (kg/hr) throughputs

Dosing Solution for Additive & Masterbatch

Alongside ULTRA efficient drying, Maguire offers ISBM processors solutions for blending, dosing and conveying. For dosing of additives and masterbatches (granules or liquid) Maguire offers the MGF Gravimetric Feeder and the MS4 Peristaltic Pump.

5 YEAR WARRANTY

MGF Gravimetric Feeding

For granule additive & masterbatch.

Simple Setup Procedure

Enter the percentage setting and then either the molding shot weight or extrusion throughput and then the MGF Feeder automatically doses.

Fast Material Change Over And Clean Out

The hopper is easily removed without need for tools by releasing 2 latches – this allows unused material to be removed and rapid cleaning prior to a next job start-up.

High Heat Applications

The MGF Feeder has a high temperature option for working in high heat applications like PET, designed to isolate heat transfer to masterbatch or additives.

Modular Design

Design allows key components to lock together. Easy disassembled for cleaning and reassembled for next job. No tools required.

New MGF Touchscreen Control Option Available

User-friendly controller features a 7" full color and fast response touchscreen.

MS4 Peristaltic Dosing

For liquid additive & masterbatch.

- **Peristaltic Pump** - self priming liquid color pump with no seals, check valves or clearances to avoid even the slightest internal leakage
- **3 tubing sizes available** - 3 tube diameters and assemblies are available to provide a wider range of dosing outputs
- **Automatic speed control** - self-adjusting accuracy provides dosing control
- **Precise metering** - high quality of the coloring process due to precise metering at low rates
- **Easy maintenance** - liquid delivery tubes are quick and easy to change when color changes are required and can be re-used
- **Robust design** - the solid, compression rollers never lose their tube compression tolerance
- **Run modes** - The MS4 Pump will run in Continuous, Injection Molding or Extrusion Following Mode
- **Easy disassembly** - Split head access is easy via the detachable cover
- **3 steps to easy operation** -
  1. Set shot weight
  2. Set liquid color percentage
  3. Set density of the liquid color

  The MS4 calculates the rest

Ready, Set, Go...

Blending Solution for Regrind, Virgin, PET, rPET, Additive and Masterbatch

Total control of a processors most expensive operational cost – raw materials.

WSB Gravimetric Blending

Simple Operation – Load, Set, Blend. Load material hoppers with regrind, virgin, PET, rPET, additive and masterbatch. Set the recipe percentage for each material. Run the blender and the system will automatically weigh out each material into a batch, and then blend batch to batch direct to your process.

Typical complete Return on Investment - within 6 - 9 months of installation.

Complete data on materials blends - 4 hours a day, 7 days a week.

High consistent accuracy - on every material with ±0.1% on a 1% setting.

Over 120 models - many configurations to choose from for every application.

Intuitive Control Software

- System monitors accuracy of total recipe
- Adjust dosing automatically
- Automatic error correction control

Integrated Conveying Control - touchscreen controller allows easy control of conveying to and from blender

FlexBus Materials Conveying

Full feature materials conveying control. Integrated to ULTRA and blender control touchscreen for local conveying.

Easy Installation

- Single wire connects the control to all receivers and pumps
- Adjusting to complicated material pipework layouts (with different material bulk density and throughput)
- System offers bespoke conveying solutions to meet individual requirements

Total Conveying Control

- Touchscreen, adjustable load, unload, priority, proportioning, purge, blowback and alarm settings, line cleaning
- Retrofit to existing pumps and existing receivers

System Compatibility

- Integrates with existing range of Maguire conveying equipment
- Can be integrate with many other manufacturers equipment

ULTRA Case Study - Complete Application Solution

A review of the complete Maguire system solution for conveying, loading, drying, blending and dosing of polymer raw materials for producing PET bottles.

Scenario:

Product requirements:

- A blending system with 3 receivers to blend: rPET, PET and regrind
- Feeding from a day bin
- Vacuum pump to convey material into the materials dryer
- Line cleaning valve so no material is left in the pipe

Process:

- Injection Stretch Blow Molding

Throughputs:

- From 44 - 308 lb/hr (20 -140 kg/hr)

Typical end product:

- PET jars and bottles

Solution:

The WSB blender is able to accurately control blender recipes and provide documentation and data.

The ULTRA dryer is an ideal match for the technical drying requirements of PET, ensuring product quality and consistency at the lowest possible energy cost.

FlexBus Central Conveying connects the whole system - simply & easily.

Result:

The blender provides precise control and flexibility over raw material recipes and data documentation.

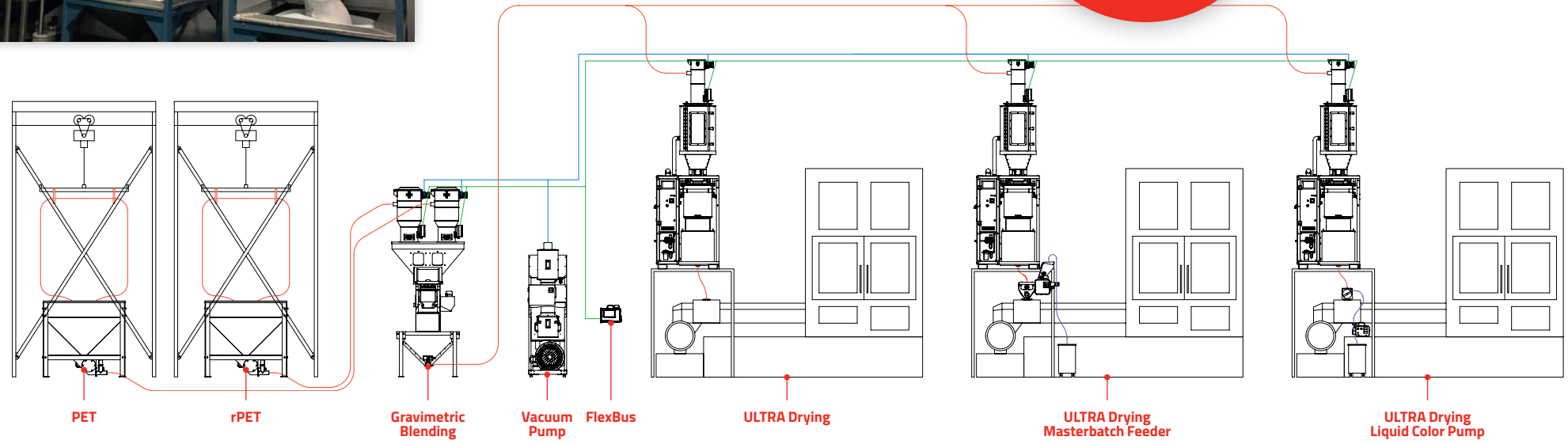
Improved process efficiency:

ULTRA drying provides the most efficient method to dry PET.

- Reduced energy usage
- Reduced drying time
- Reduced scrap
- Reduced maintenance
- Smart drying solution

Improved Process Efficiency

ULTRA PET ISBM Complete Solution



ULTRA Case Study - Energy Efficiency

ULTRA dryers increased drying efficiency at Greiner Packaging, Austria.

Greiner Packaging, a major manufacturer of packaging for food and non-food applications pursues a clear sustainability strategy. From recyclable products with a high recyclate percentage through to an energy efficient production process with reduced CO2 emissions. For their raw material drying process in injection stretch blow molding, the company has tested the ULTRA low energy dryer as a replacement for conventional desiccant dryers.

The First ULTRA Low Energy Dryer

Core Benefit: Energy Savings

Side by side energy trials at Greiner's production facilities have shown a clear reduction in energy consumption compared to conventional desiccant dryers.

ENERGY TO **DRY**

ULTRA Requires:

7 Watts/lb/hr
15 Watts/kg/hr

to DRY PET at 180°C / 350°F

THIS IS:

79 Watts/lb/hr
175 Watts/kg/hr

LESS than an average desiccant dryer

THAT'S A SAVING OF **90% ENERGY** VERSUS A DESICCANT DRYER

Additional Benefit: Reduced Drying Time

Drying time has been drastically reduced after switching from conventional desiccant dryers to Maguire ULTRA dryers!

Quick material changeovers within **40 mins** compared to **3 hours** with a desiccant dryer.

03 : 00 | Hrs
00 : 40 | Mins

Additional Benefit: Quick Material Changeovers

Result
More material trials per day.
8 material trials per day with the ULTRA, compared to 2 material per day with a desiccant dryer.

8 **2**

Additional Benefit: Reduced Footprint

By choosing the ULTRA dryer, Greiner have considerably reduced their footprint thanks to ULTRA's vertical, slim and compact design.

ULTRA dryers require **50% less space** than Greiner's conventional dryers where the hopper has to be placed separately.

50%

MAGUIRE®

Intelligent Simplicity