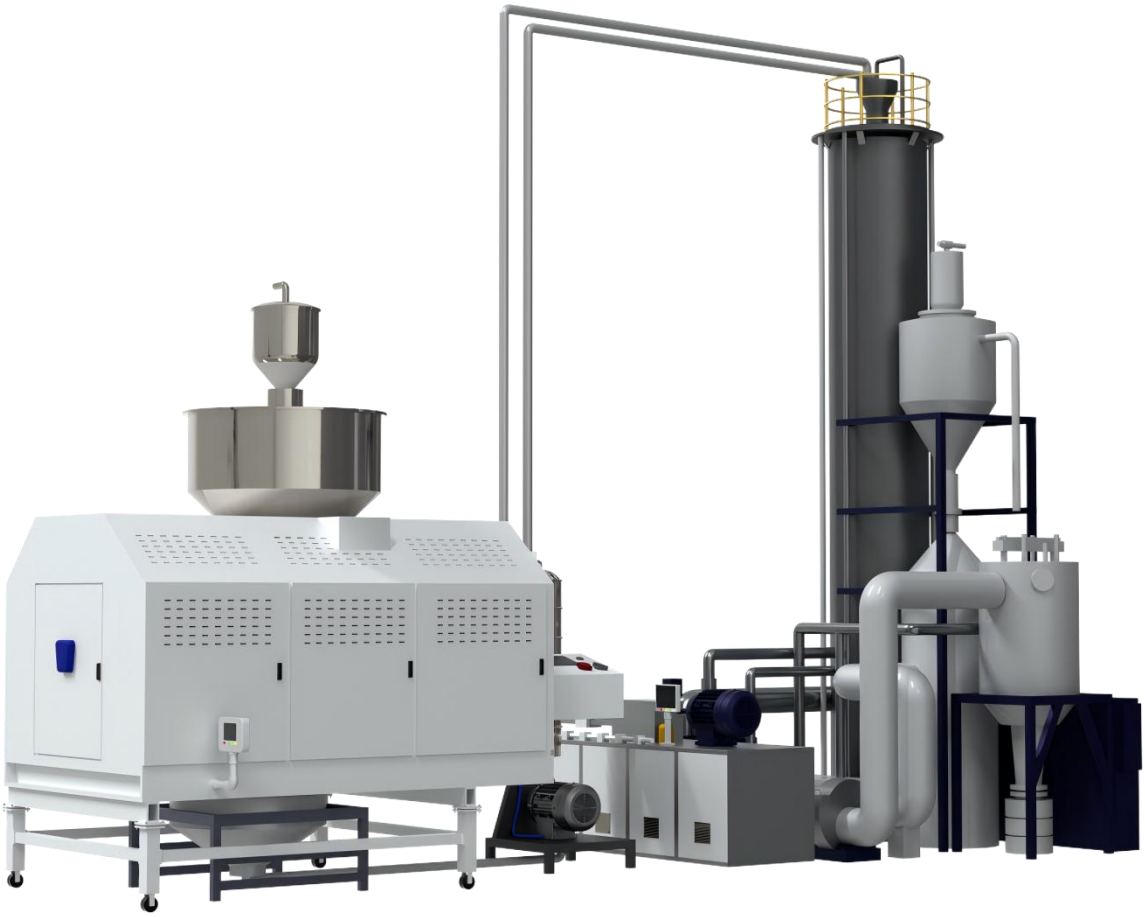
联达机械
-LIANDA MACHINERY-

Infrared Rotary Dryer +SSP system

To increase the viscosity of r-PET Flakes/Pellets



Before 0.6dL/g

Viscosity Increased

After: ≧0.8-1.2dL/g

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About Us

Solid-phase polymerization (SSP) is the key technology for achieving "quality upgrade" and "green recycling" in the PET industry chain.

LIANDA MACHINERY deeply integrates **INFRARED ROTARY DRYER with the SSP system** to form an integrated solution of "Efficient moisture remove - Precise viscosity increase - Low-consumption operation",
This significantly improves rPET physical properties, thermal stability and chemical purity. This technology plays an irreplaceable role in the PET industry chain (especially high-quality recycling and high-performance product production).

If you need to know the specific process parameters or equipment configuration, please contact Lianda Machinery to obtain customized technical solutions

Process Analysis

1 Pre-processing Stage

Drying& Crystallization

In one step
≤50ppm

25-30mins

T:180-210℃

Acetaldehyde removed

Via

Infrared Crystal Dryer (IRD)

Drying: PET is hygroscopic and needs to be removed by IRD(After IRD, the PET final moisture ⩽ 50 ppm) to avoid hydrolysis and degradation at high temperatures.

Crystallization: PET pellets are crystallized by IRD (crystallization degree is about 30–40%) to prevent the PET pellets from sticking or melting in subsequent high temperatures, while providing a stable solid environment for polycondensation reactions.

2 Solid-phase Polycondensation Reaction Stage

SSP Reaction System

The elongation of PET molecular chains

−PET−OH+HO−PET−

8-10hours | Vacuum degree⩽1Pa

Nitrogen system | Temperature 210-230℃

Acetaldehyde⩽1ppm

−PET−O−CO−PET−+H_2O/EG

(Viscosity 0.60dL/g →1.2dL/g)

The reaction temperature is 210–230℃, and the residence time is about 8–10h. The molecular weight is increased to increase the viscosity from **0.60dL/g →1.2dL/g** The molecular weight of the polyester is increased to the required range after the polycondensation reaction (depending on the reaction temperature and residence time).

The chips sent from the nitrogen delivery system fall into the reactor, and the material slowly moves downward while the polycondensation reaction occurs. The by–products entrained in the chips are taken away by the counter–flowing nitrogen,.

In addition, the acetaldehyde content is reduced to below 1ppm.

LIANDA MACHINERY integrates Infrared crystal dryer (IRD) with the SSP system, which uses infrared wave to quickly and evenly heat the material, shorten the pre-treatment time, and optimize the mass transfer efficiency in the solid phase reaction, making the entire system highly energy-efficient, with large processing capacity and high product stability. It is especially suitable for large-scale high-quality production of recycled PET.

If you need further technical details or customized solutions, you can contact Lianda Machinery for professional support

Advantage of IRD + SSP system

Lianda Patent: Infrared Crystal Dryer

- Uniform and higher crystallinity(35-40%)
- Dry PET to Final moisture ⩽50ppm
- More heat transported to the SSP
  = energy saving/ less residence time
- Remove the plastic powder
- Decontaminated: Remove EG, Acetaldehyde
- Save energy 40-50%

SSP+Vacuum + Nitrogen system

- Energy consumption is reduced by 30-50%
- Quality restoration suitable for r- PET
- The IV value has been increased from 0.65 dL/g to over 1.2 dL/g, meeting the requirements of various products (such as fibers, engineering plastics, bottle flake recycling, etc.).

In combination with infrared drying technology, it realizes the integration of "decontaminated + drying + viscosity enhancement", promoting the closed-loop recycling of PET.

Advantage	Specific Performance
Molecular weight increase	The intrinsic viscosity (IV) is significantly increased and the mechanical strength (tensile strength, elastic modulus) is improved by 30 – 50%.
Thermal stability optimization	The melting point (Tm) is slightly increased (about 5 – 10℃), the crystallinity is improved, and the high temperature resistance is enhanced (suitable for heat-resistant bottle preforms).
Improved chemical purity	Removes residual monomers (such as formaldehyde, acetaldehyde) and oligomers (content drops to less than 50 ppm), meeting food grade standards.
Gentle handling properties	Solid-state reactions avoid thermal oxidative degradation caused by high-temperature melting and are particularly suitable for quality restoration of recycled PET.
Process flexibility	The viscosity of the final product can be precisely controlled by adjusting the temperature, time and vacuum degree, thus meeting various demands.

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Application

PET preform

- High transparency bottle production:

Enhances the uniformity of PET viscosity, reduces stress cracking of the bottle body, suitable for carbonated beverages, cosmetic containers, etc.

- Heat-resistant bottle development:

Via SSP, the IV value is increased to above 0.85 dL/g, suitable for heat-filled beverage bottles (such as packaging for instant tea, coffee).

Recycled PET quality upgrade

- Recycling of recycled bottle flakes:

Post-consumer PET bottle flakes are treated with an integrated process of "drying - decontaminated - viscosity enhancement" to remove EG, Acetaldehyde, VOC and restore viscosity, returning them to food-grade or industrial-grade applications (such as fibers, sheets).

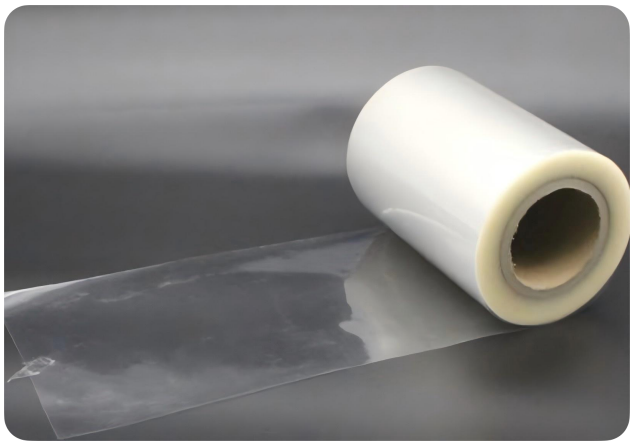
- Circular economic value:

Combined with infrared drying (IRD) technology, "low-energy dehydration + efficient viscosity enhancement" is achieved to promote closed-loop recycling of PET

Engineering plastics field

- High-performance PET preparation:

Production of high-viscosity PET (IV>1.0 dL/g) for use in automotive parts (such as gears, bearings), electronic and electrical housings, etc., to replace traditional engineering plastics.



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