

PURESTEAM: THE FUTURE OF HIGH-PURITY PLASTICS

Advanced Deodorization &
Decontamination Technology



Altero Recycling Machinery | Powered by Fych Technologies

The Achilles Heel of Post-Consumer Plastics



The Odor Barrier

Post-consumer polyolefins (PE, PP) absorb deep-seated VOCs from detergents, cosmetics, and oils. These contaminants survive traditional washing and extrusion. The resulting residual odor traps mechanical recyclers in low-margin applications and severely depresses the selling price of pellets.

The Premium Value Potential



To command top-tier market prices and enter the lucrative cosmetic and sensitive packaging sectors, recycled plastics must achieve near-virgin odor intensity. The barrier is entirely chemical.

UNLOCK PREMIUM MARKETS WITH THE POWER OF STEAM

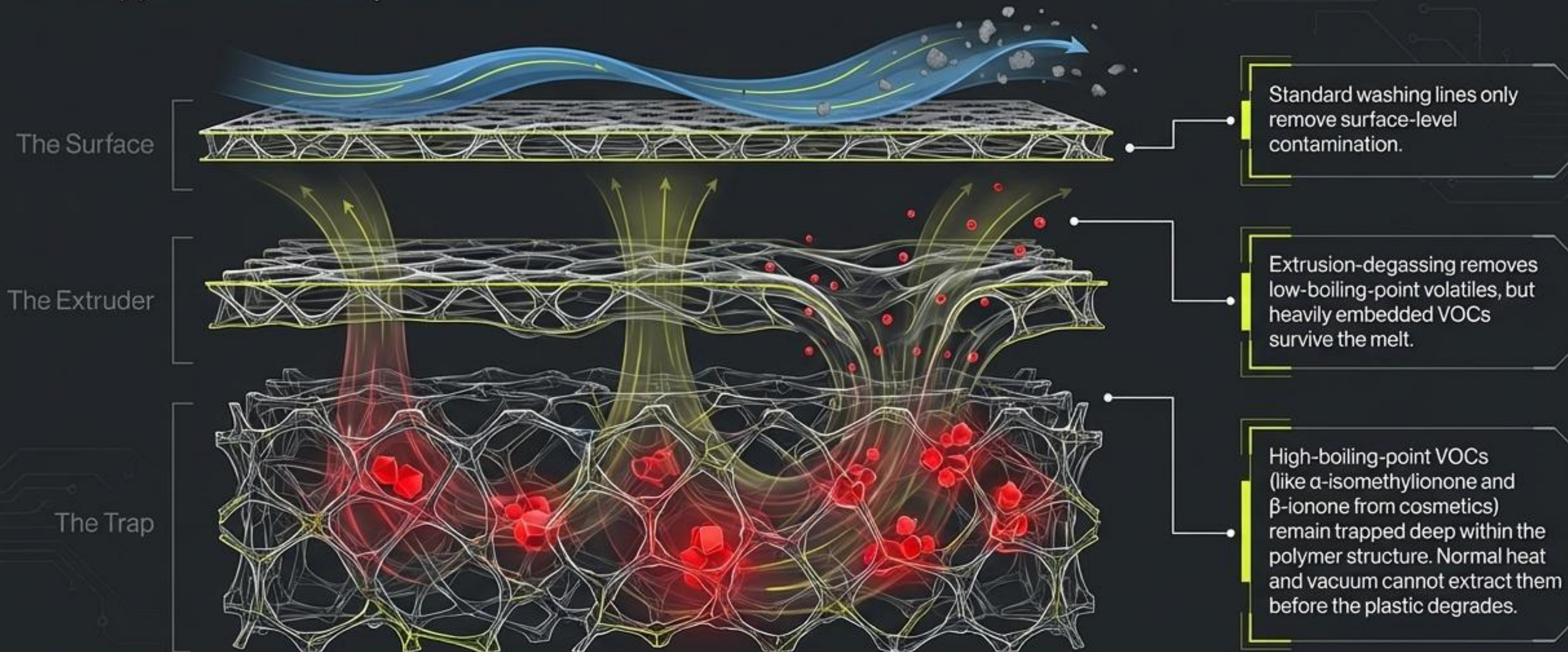
Altero PureSteam transforms odorous, contaminated plastic into high-purity, odorless raw material.

Utilizing globally patented technology (FYCH Patent EP4013300A1), the system breaks the VOC barrier, upgrading post-consumer waste into a premium commodity ready for the most demanding applications.

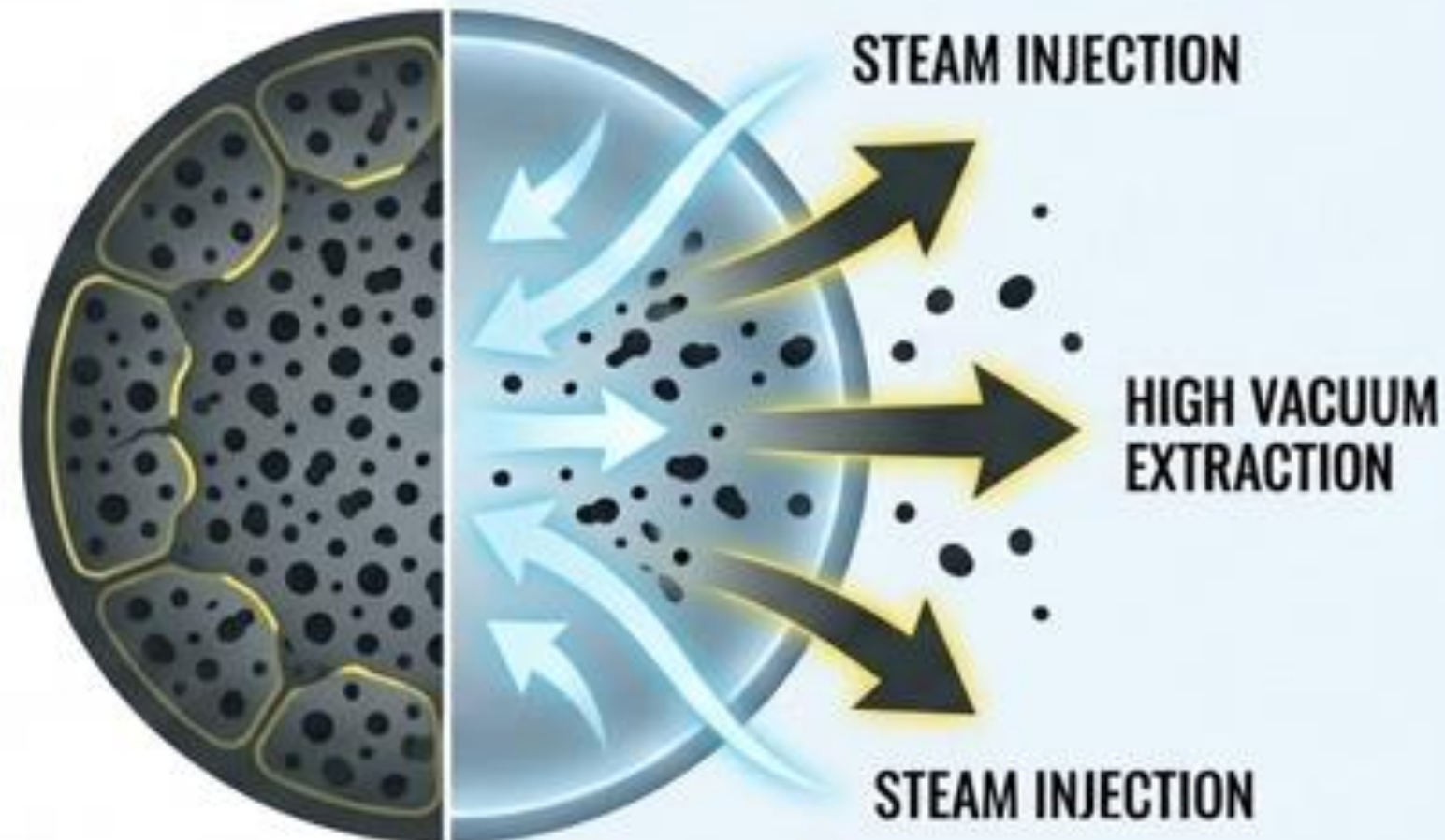


Why Traditional Extrusion and Washing Fails

The Trapped VOC Conceptual Model



THE SYNERGY OF STEAM + HIGH VACUUM



THE MECHANISM

We accelerate the migration of deeply embedded VOCs from inside the plastic matrix.

THE STEAM ADVANTAGE

Steam stripping leverages a physical principle (the azeotrope) to 'pull' the VOC like BPA from the inside of the pellets at a temperature below 100 °C. To achieve same effect using conventional air stripping, we would need to operate at temperatures above 100°C—a temperature that would melt or severely degrade the polymer. Instead, steam acts as an efficient carrier that safely extracts the contaminant.

THE VACUUM ADVANTAGE

Vacuum use is only to be able to operate steam at 70-80° instead of 100° so there is less risk of melting the material

ODOR REMOVAL

Decontamination technology allows for the removal of unpleasant odors present in recycled plastics.

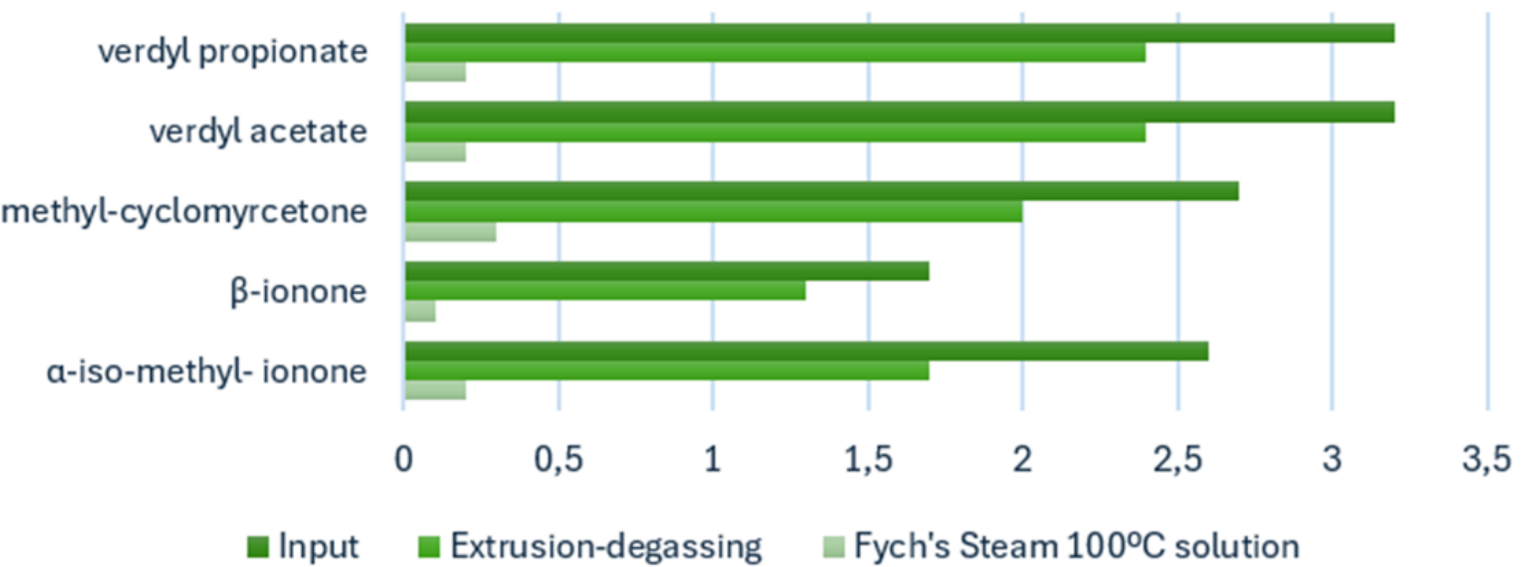
TESTED with:



CHEMICAL ANALYSIS

Fych's technology reduces odors in recycled plastics by over 96%, compared to 25% with extrusion and degassing.

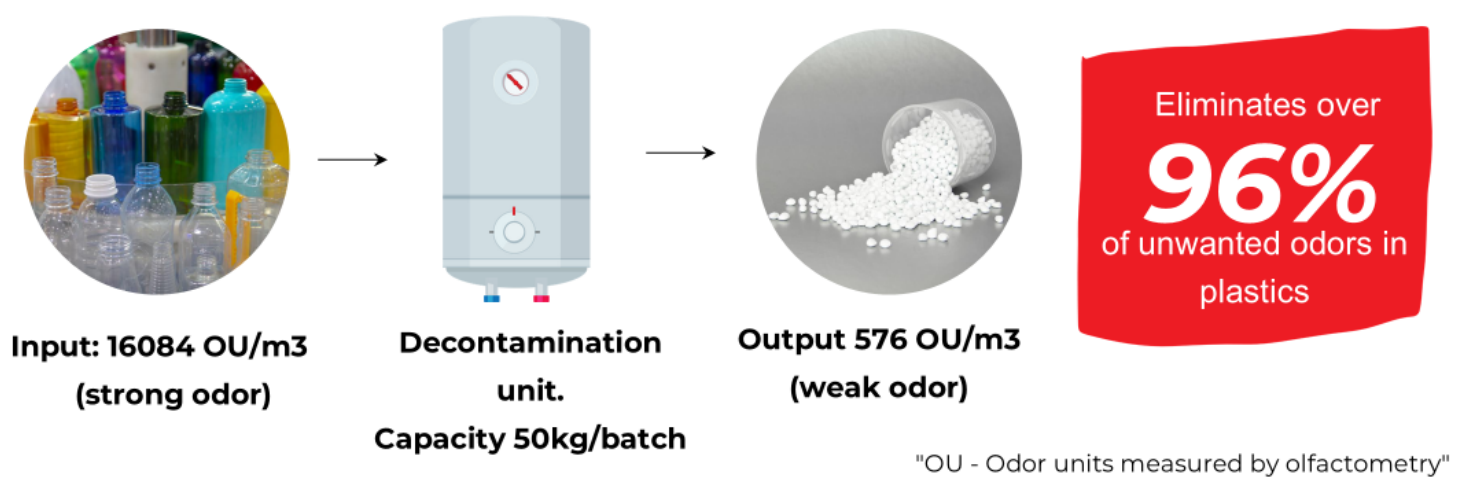
Graphic 1: Chemical analysis of post-consumer HDPE



DECONTAMINATION TECHNOLOGY.

The recycling process.

A MECHANICAL RECYCLING PROCESS THAT TREATS UNWANTED ODORS AND VOCS PRESENT IN RECYCLED PLASTICS USING EXCLUSIVELY WATER VAPOUR.



ELIMINATION OF VOCs

Decontamination technology enables the removal of volatile organic compounds (VOCs) and toxic substances present in recycled plastics.

FOOD GRADE POTENTIAL

Through global migration tests of rLDPE from post-consumer polyal treated with Fych's steam decontamination system, results have shown an LDPE with potential to be food grade.

Table 1: Global Migration Analysis on rLDPE from food contact post-consumer packaging

Food Simulant	Test Conditions	INPUT- Overall migration (mg/dm2)	OUTPUT- Overall migration (mg/dm2)
Ethanol 10% (v/v)	10 days at 40°C	2.8 ± 0.4	2.4 ± 0.4
	2 h at 100°C at reflux / 1 h at 120°C	4.2 ± 0.6	2 ± 0.3
Acetic Acid 3% (w/v)	10 days at 40°C	9 ± 1.4	4.5 ± 0.7
	2 h at 100°C at reflux / 1 h at 120°C	8 ± 1.2	5.9 ± 0.9

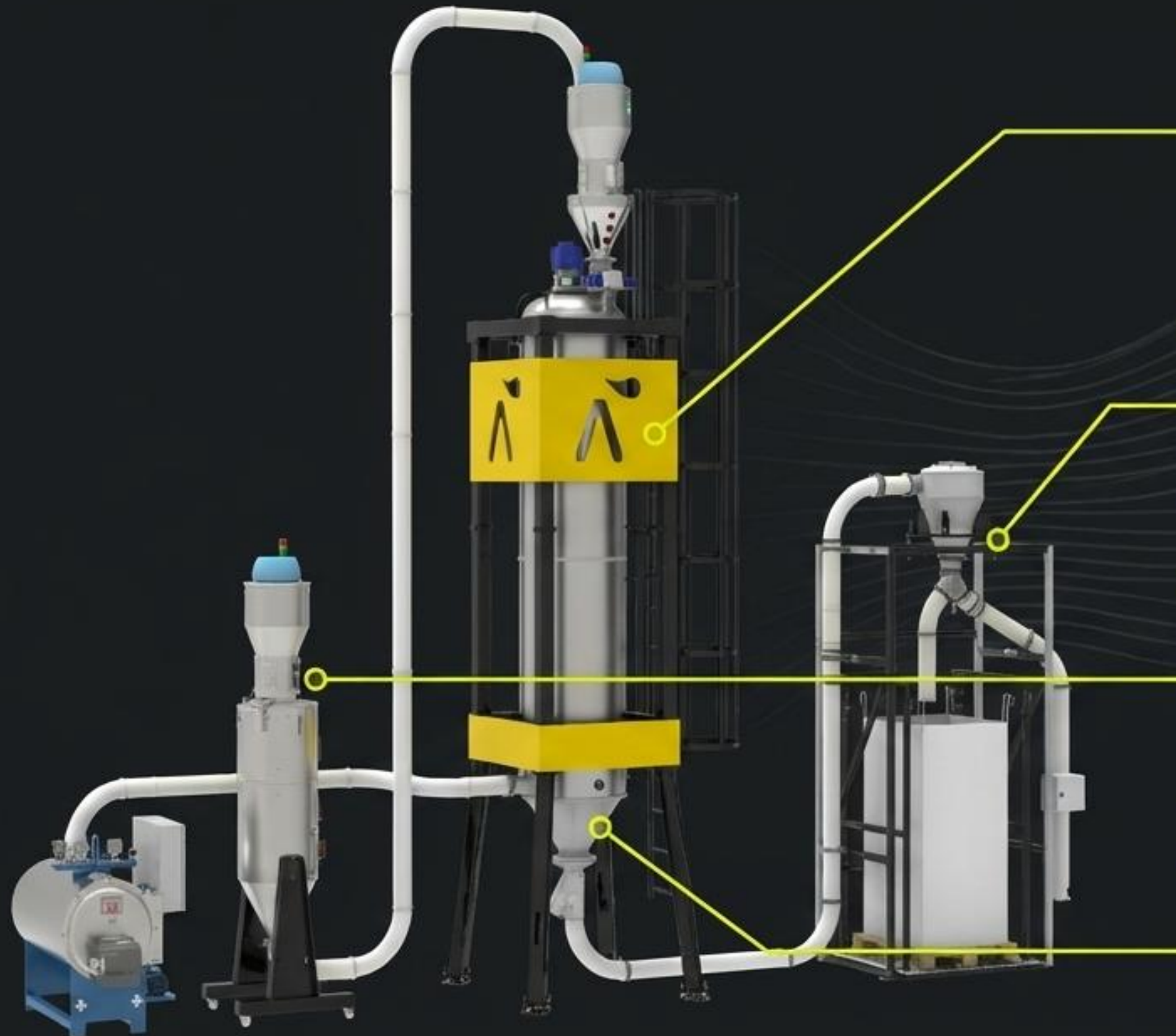
LIMIT < 10 (mg/dm2)

THE DEFINITIVE MARKET ADVANTAGE

	PURESTEAM	OTHER SYSTEMS (HOT AIR)
Environment	High Vacuum + Steam	Hot Air
Processing Time	3 - 10 hours	8 - 12 hours
Total VOC Reduction	> 96%	< 57%
Emissions	Zero VOC Emissions	Requires post-treatment

Steam stripping leverages a physical principle (the azeotrope) to 'pull' the limonene and other VOC from the inside of the pellets at a temperature below 100 °C. To achieve the same effect using conventional air stripping, we would need to operate at temperatures above 100°C—a temperature that would melt or severely degrade the polymer. Instead, steam acts as an efficient carrier that safely extracts the contaminant.

System Anatomy & Operational Footprint



Micro-Batch Operating Mode:

Ensures homogenous steam distribution and prevents material clumping. Includes an internal stirrer for guaranteed discharge.

Modular Integration:

Can be installed as a standalone unit or seamlessly integrated into an existing pelletizing line.

Continuous Monitoring:

Real-time pressure and temperature sensors at critical junctions. Sample extraction is possible without interrupting the process.

Optimized Geometry:

Engineered to maintain the exact steam velocity required to strip high-boiling-point compounds.

Closed-Loop Sustainability & ROI

ZERO EMISSIONS

Unlike conventional air-stripping systems that vent extracted toxic VOCs directly into the atmosphere, PURESTEAM is a strictly closed-loop system.



Superior quality
without
environmental
compromise

ENERGY REUSE

The heat generated by the steam boiler is actively recovered and reused to power the thermal pre-conditioning silo, lowering energy consumption per kg.

CONDENSATION RECOVERY

Extracted gases, volatiles, and heavy oils are safely condensed and captured in a dedicated sealed tank, ensuring total regulatory compliance.

Every PureSteam system is fully integrated with Altero Connect, our Industry 4.0 communications platform.

- Real-time KPI and alarm tracking from any web-enabled device.
- Secure remote diagnostics and predictive maintenance analysis.
- Augmented Reality (AR) remote assistance to guide operators through live problem-solving.



Elevate Your Plastics. Transform Your Margins.



Command

Command Higher Prices

Break the odor barrier. Access the highly lucrative cosmetic packaging and sensitive applications markets.

Ensure

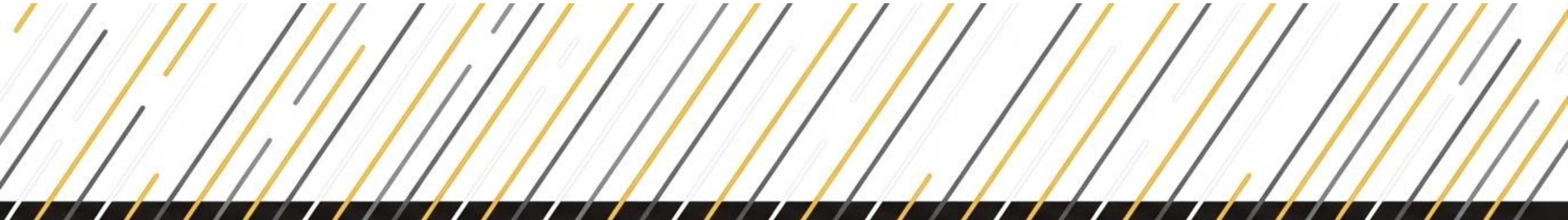
Ensure Compliance

Future-proof your plant with a 100% closed-loop, zero-emission process.

Maxibility

Maximize Uptime

Rely on bimetallic durability, micro-batch flexibility, and Altero Connect predictive monitoring.



RECYCLING SOLUTIONS FOR A SUSTAINABLE FUTURE.

Altero Recycling Machinery | PureSteam powered by Fych Technologies

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