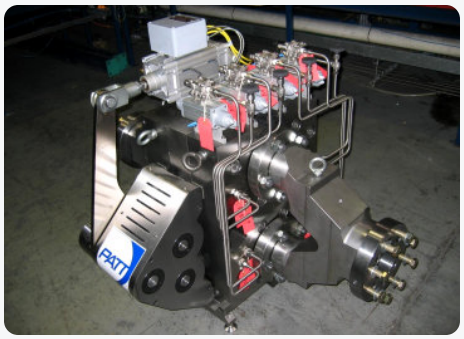
COLOSSUS™ · CASE STUDY

Backwashing candle filtration: 4× finer filtration at 15.8% lower system pressure.

Replacing a coarse 40-mesh (~400 µm) slide-plate screen changer with a 90 µm (150-mesh) COLOSSUS™ D automatic backwashing candle system and rheologically optimized PATT die expanded active filtration area by 210%, cut filter operating ΔP by 76.9%, reduced screen replacements by 95.7% to 97.9%, and achieved verified payback in 23–24 days.



COLOSSUS™ Dual-Chamber Backwashing Candle System · Up to 7,000 cm^2 (1,085 in^2)

+210% (3.1×)
Active filtration area: 310 vs. 100 in^2 (2,000 vs. 645 cm^2)

−76.9% ΔP
Filter operating pressure drop: 300 vs. 1,300 psi (21 vs. 90 bar)

−95.7% to −97.9%
Fewer media replacements while filtering ~4× finer (90 µm)

23–24 days
Verified payback period (>15× annual return on system cost)

The process bottleneck: rapid blinding and high operating pressure

On a high-output LDPE (MFR 1) extrusion and compounding line, an existing single-cavity slide-plate screen changer with 100 in^2 (645 cm^2) of flat filtration area was running a coarse 10/40-mesh (~400 µm) screen pack ahead of a 120-hole extrusion die. Under severe carbon-black agglomerate loading, filter operating differential pressure climbed to 1,300 psi (90 bar) and total melt-path pressure reached 2,015 psi (138.9 bar).

Operators were forced to index the slide plate every 45 minutes during best-case runs (32 swaps/day) and every 15 minutes during worst-case contamination surges (96 swaps/day). Each hydraulic shift triggered pressure spikes, off-spec scrap, and continuous screen consumption—while coarse 40-mesh openings still allowed fine agglomerates to pass into the finished compound.

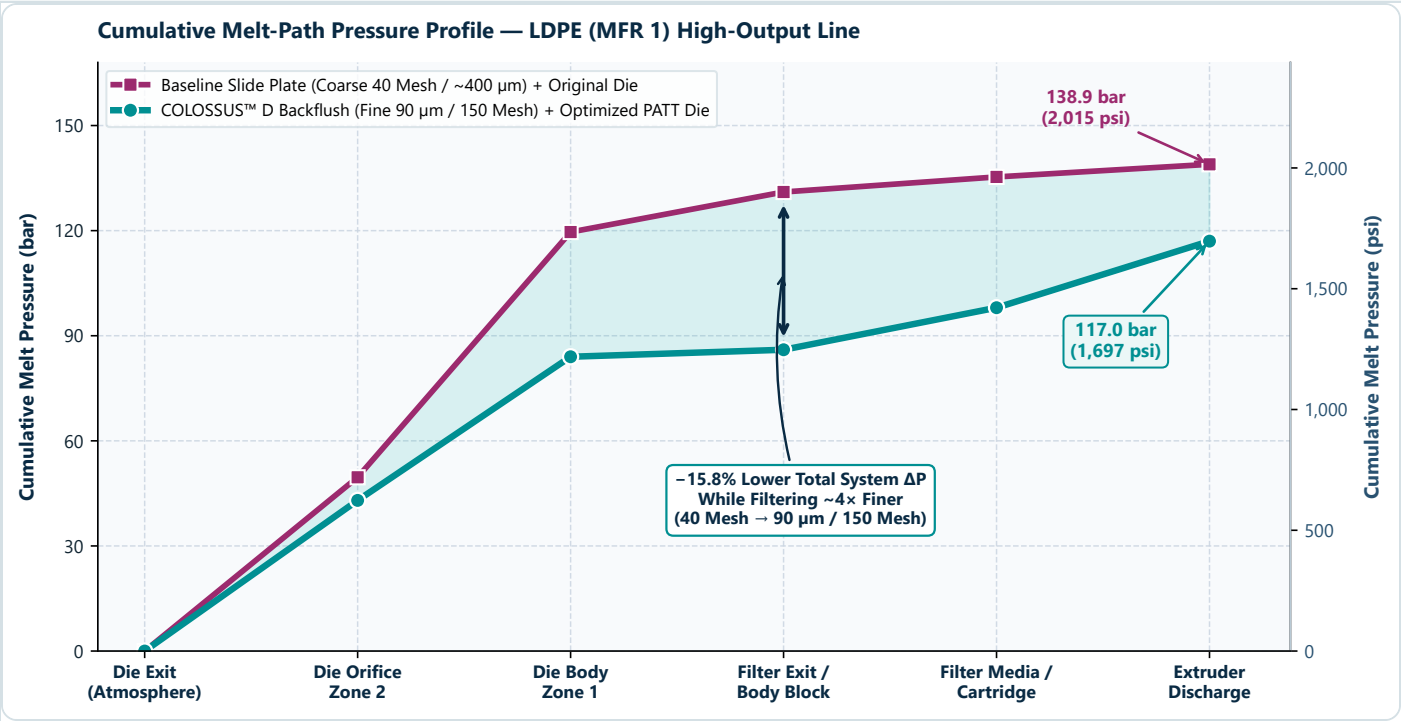
PATT engineered an integrated upgrade pairing a **COLOSSUS™ D** dual-channel backwashing candle filter (20 engaged cylindrical cartridges providing 310 in^2 / 2,000 cm^2 of active 90 µm / 150-mesh area) with a rheologically balanced 240-hole PATT extrusion die.



High-Surface Cylindrical Candle Filtration: Cylindrical candle elements pack 3.1× more active 90 µm filtration area into the melt path (310 vs. 100 in^2 / 2,000 vs. 645 cm^2) than the original flat slide plate.

Cumulative pressure profile and rheological comparison

Step-by-step melt-path pressure calculations from die exit back to extruder discharge confirm that tripling active filtration area and balancing die orifice geometry lowers total system pressure by 15.8%—even after tightening filtration fineness by roughly 4× (from ~400 µm to 90 µm).



Cumulative melt pressure across the six flow-path stations for LDPE (MFR 1). Total extruder discharge pressure drops from 138.9 bar (2,015 psi) to 117.0 bar (1,697 psi)—a 15.8% net reduction alongside a 4× finer filtration rating.

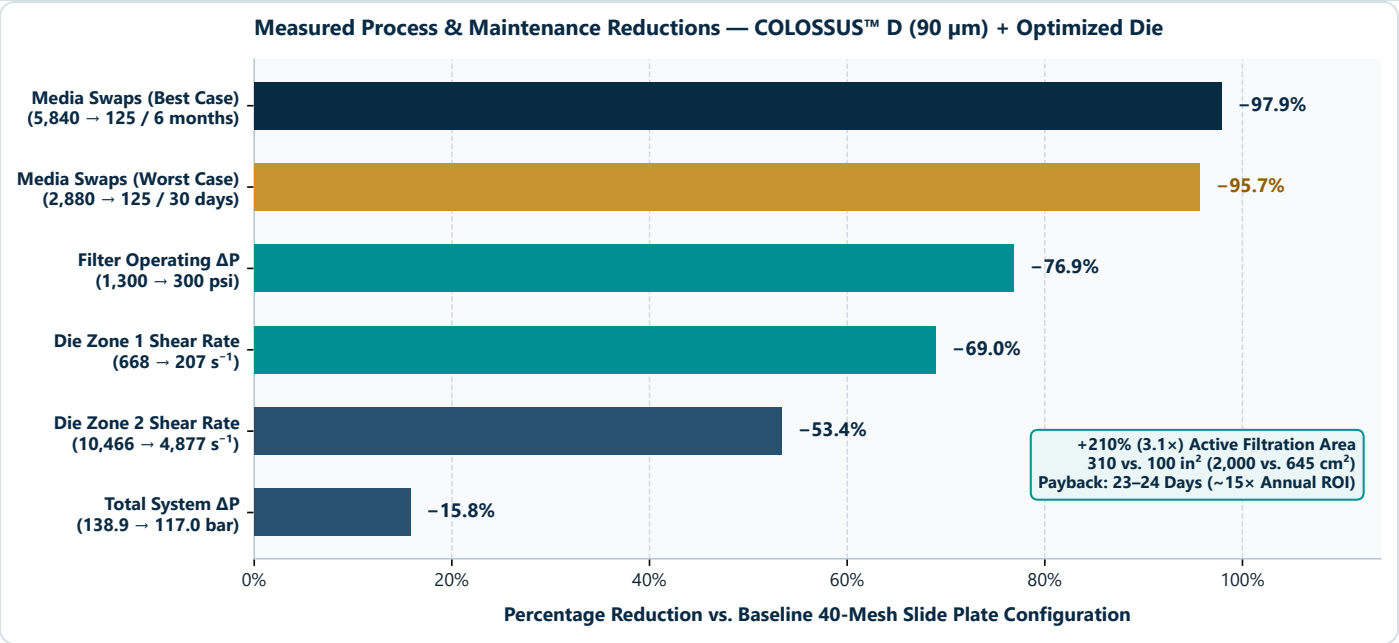
Station-by-station rheological engineering data

Measured and calculated melt-path parameters across filter and die zones (LDPE, MFR 1).

Melt-Path Parameter	Baseline Slide Plate (40 Mesh) + Original Die	COLOSSUS™ D (90 µm / 150 Mesh) + Optimized PATT Die	Relative Change
Filtration fineness	Coarse 40 mesh (~400 µm)	Fine 90 µm (150 mesh)	**~4× finer capture**
Active filtration area	100 in^2 (645 cm^2) · 1 cavity	310 in^2 (2,000 cm^2) · 20 engaged candles	**+210% (3.1×)**
Filter operating ΔP (production)	1,300 psi (90 bar)	300 psi (21 bar)	**−76.9%**
Die Zone 1 ΔP / shear rate	70.0 bar (1,015 psi) · 668 s^{-1} (120 holes)	41.0 bar (595 psi) · 207 s^{-1} (240 holes)	**−41.4% ΔP · −69.0% shear**
Die Zone 2 ΔP / shear rate	49.6 bar (719 psi) · 10,466 s^{-1}	43.0 bar (624 psi) · 4,877 s^{-1}	**−13.3% ΔP · −53.4% shear**
Total system cumulative ΣΔP	138.9 bar (2,015 psi)	117.0 bar (1,697 psi)	**−15.8%**
Media change frequency (best case)	1 screen / 45 min (~5,840 / 6 months)	125 cartridges / 6 months (offline swap)	**−97.9% fewer swaps**
Media change frequency (worst case)	1 screen / 15 min (2,880 / 30 days)	125 cartridges / 30 days (offline swap)	**−95.7% fewer swaps**
Verified payback period	Baseline (high scrap & frequent shifts)	23 days (best case) · 24 days (worst case)	**>15× annual ROI (~6.4% yr)**

Quantified process and maintenance reductions

Because automated inline backflushing regenerates each filter element for up to 200 cycles—and spent elements are replaced offline without stopping the extruder—economic payback remains virtually identical across both normal and heavy contamination swings (23 vs. 24 days; worst-case annual return retains 95.1% of best-case gain).

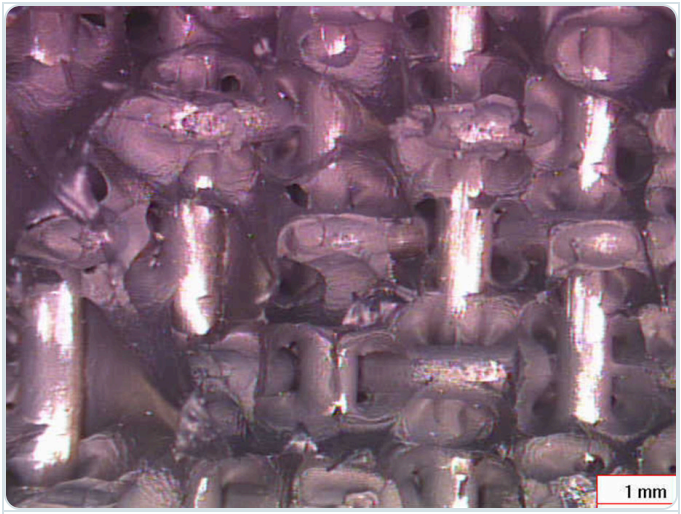


All percentage improvements benchmarked directly against the baseline 40-mesh slide-plate and original die configuration on the same production line.

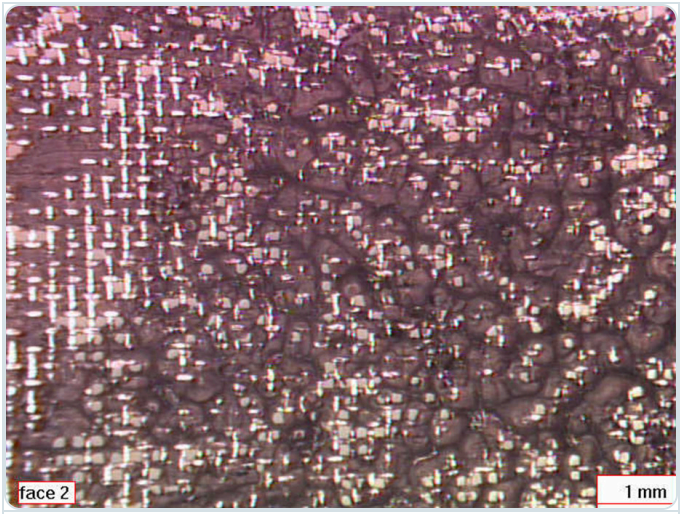
Contaminant root-cause analysis: screen residue microscopy

Laboratory scanning electron microscopy (SEM) on spent 40-mesh and 120-mesh screens from the line confirmed that retained residue consisted of **100% carbon black agglomerates**. Because agglomerates rapidly bridge small flat-screen cavities, expanding

active candle surface area by 3.1× and adding automatic backflush regeneration directly resolves the blinding mechanism.



Carbon black agglomerate buildup captured on a 40-mesh wire screen (original 1 mm scale bar).



Fine carbon black agglomerate loading captured on a 120-mesh screen (original 1 mm scale bar).

Automatic backflush lifecycle and screen media cost

Beyond eliminating scrap and pressure surges, COLOSSUS™ automated backflushing regenerates screen media for 100–400 operating cycles before replacement—cutting annual consumable media expenditure to a fraction of flat-screen or belt systems.

01

Dual-channel continuous filtration

Two parallel melt channels expand active filtration area while maintaining uninterrupted, constant-pressure delivery to the die—eliminating the hydraulic pressure spikes and off-spec start/stop scrap inherent to intermittent slide-plate changers.

02

Automated regeneration up to 200+ cycles

Automated inline backflushing restores filtration capacity continuously with zero operator intervention, extending element service life across hundreds of cycles and permitting clean offline media changes with zero production stops.

Benchmark Screen Media Economics (1,500 kg/h · 3,307 lb/h Continuous Line):

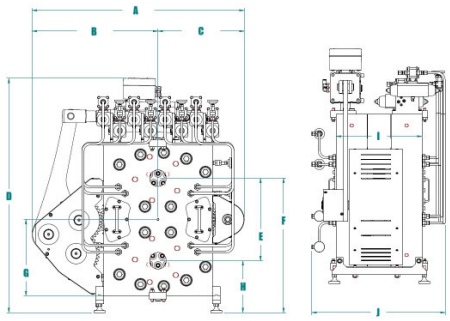
A continuous extrusion line consuming 230 ft^2 (213,672 cm^2) of flat filtration area over 22 operating days requires 9,712 cm^2/day (1,505 in^2/day) of fresh screen surface. A COLOSSUS™ disk carrying 5,652 cm^2 (876 in^2) rotates just **1.72 revolutions/day**. At 200 automatic backflush cycles per screen sleeve (116 operating days per sleeve), a 36-sleeve set requires only ~3 scheduled swaps per year across 340 working days—at roughly **~$5 per sleeve (~$540/year total screen media cost)** with zero production interruption.

Applying COLOSSUS™ to your high-output line

COLOSSUS™ C and D systems scale from 1,385 to 7,000 cm^2 (215 to 1,085 in^2) of active candle area for throughputs up to 61,700 lb/h (28,000 kg/h) and filtration ratings down to 1 µm—ideal for heavy PCR/PIR recycling, carbon-black or mineral-filled compounding, and high-tonnage pelletizing lines.

For an engineering sizing and pressure-drop review, send your polymer resin and MFR/viscosity, target throughput, operating melt temperature and maximum allowable pressure, current screen mesh and change frequency, and contaminant profile.

Explore COLOSSUS™ specifications →



COLOSSUS™ Installation Envelope (A–J): Engineered for seamless inline integration on high-output compounding, recycling, and pelletizing extruders.