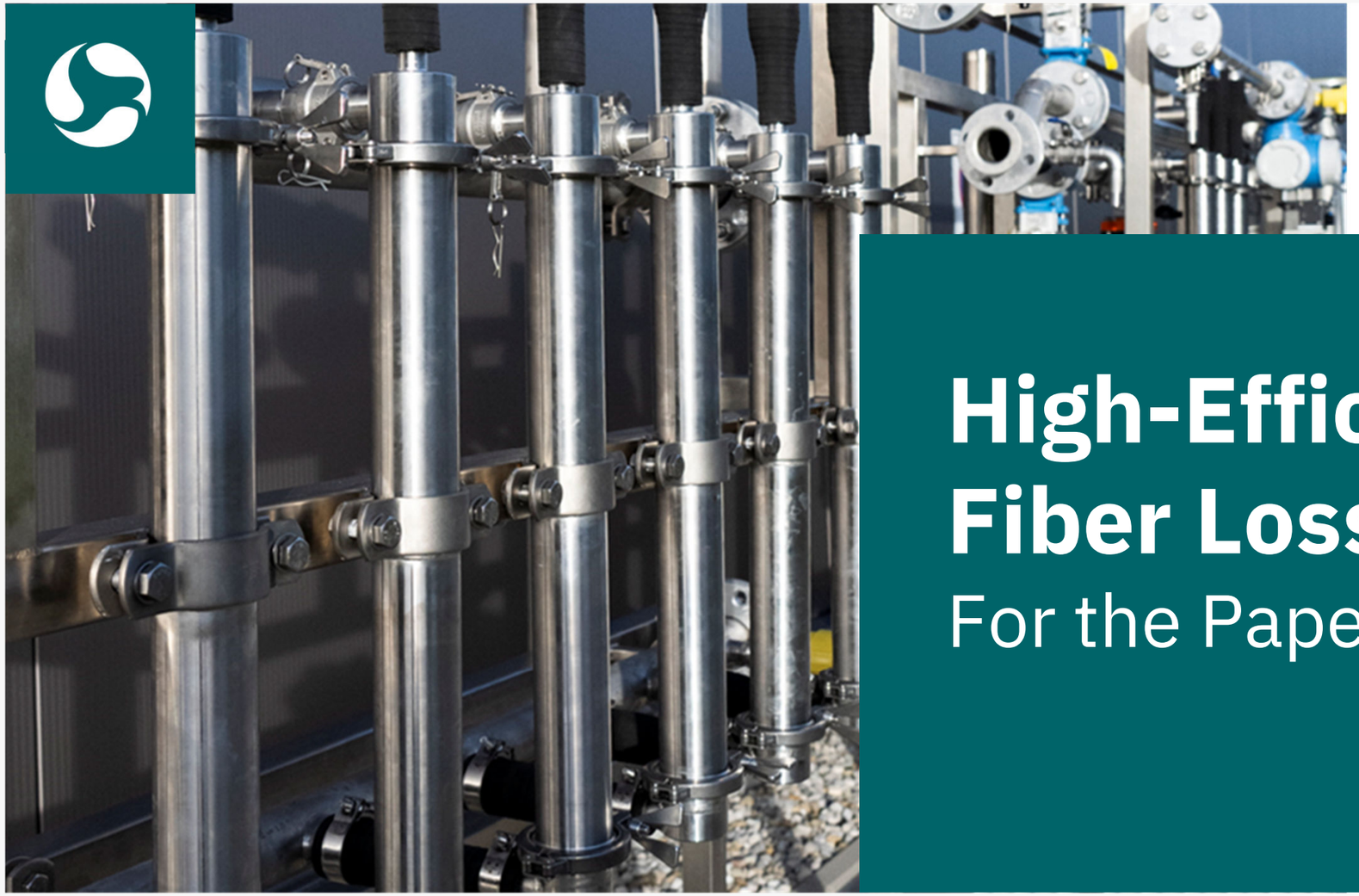


ECOFARIO

High-Efficiency Fiber Loss Reduction

For the Paper Industry

SUSTAINABLE DEVELOPMENT GOALS

6 CLEAN WATER AND SANITATION

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LEBEN AN LAND

The Problem

ECOFARIO

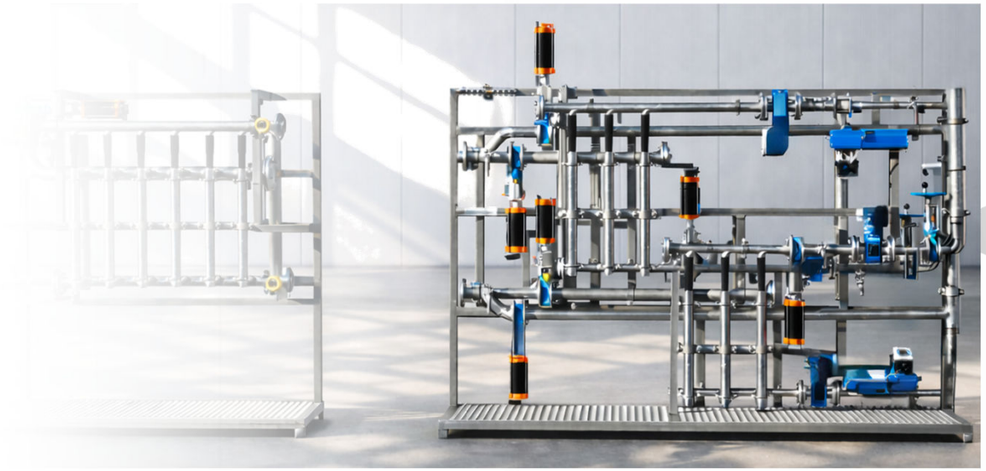
Fine Reject Fiber Losses

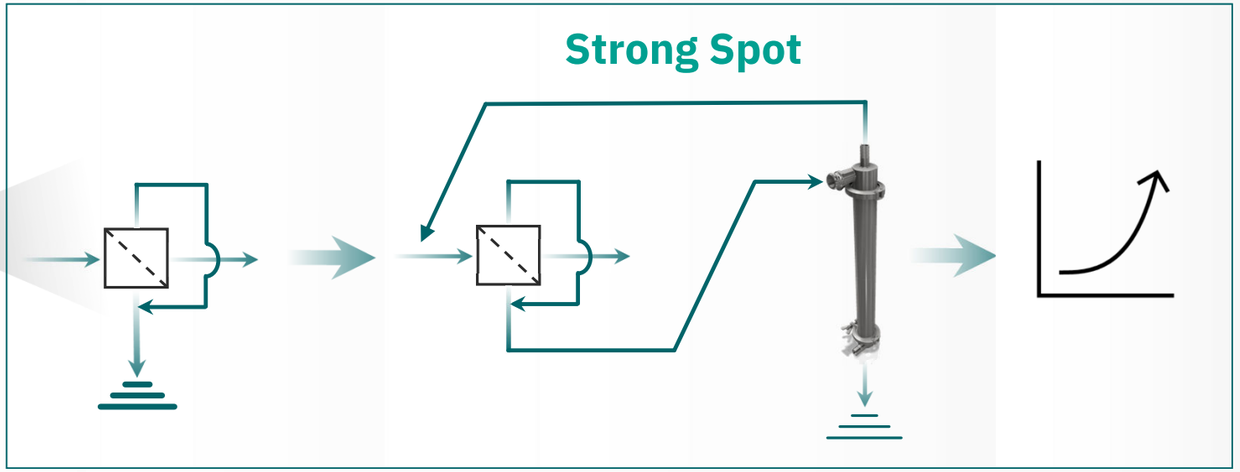
- Reduces raw material efficiency
- Weakened CO_2-Footprint
- High disposal costs

Profitability

The Solution

Radically modified hydrocyclones // The High-G Technology



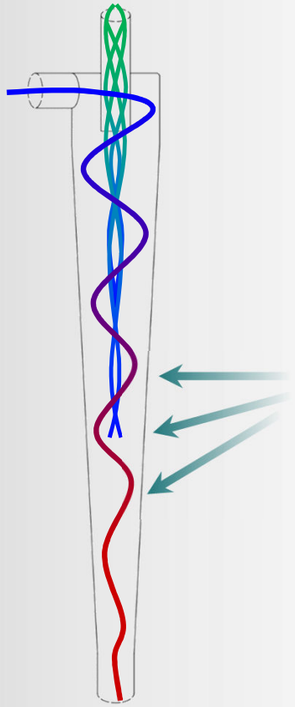


Gains for the Paper Industry:

- Low CapEx and OpEx
- Plug & Play
- No Clogging No Dilution
- More than 50% fiber recovery
- Extremely energy efficient
- Typical ROI << 18 Months

The ECOFARIO High-G-Separator

Conventional



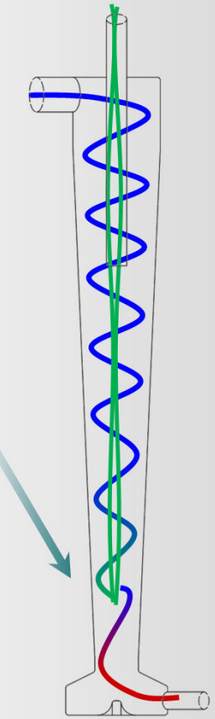
Free flow reversal

- Static reject rate & flow
- Not suitable for fine rejects
- High Thickening / Dilution required
- High OpEx (Wear & Energy)

vs.

Higher G- and Fluid Forces
→ Better Perfomance

High-G-Separator



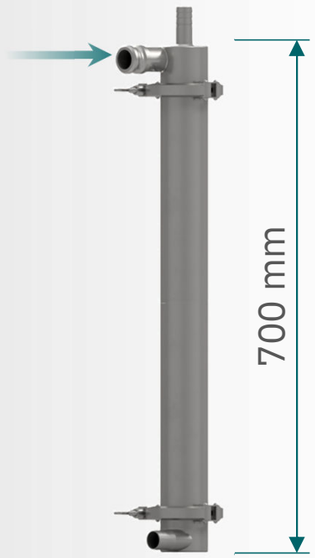
Defined flow reversal

- Adjustable Flow and Reject Rate
- Designed for Complex Rejects
- Low Thickening / No Dilution
- Low OpEx (Low Wear & Energy)

High-G-Separator / Sizes and Specifications

High-G-Separator 1"

1" Inlet (Camlok)



Capacity: 6-12 m³/h

Consistency: < 2.0 %

Specifications:

Reject rates [RR]:	10-35%
[RR] for fiber suspensions:	20%
Feed pressure [pIN]:	~ 2.0 bar
Differential pressure [Δp]:	~ 1.5 bar
Specific Energy [Espec]:	0.1 – 0.2 kWh/m³
Material:	1.4404 / 1.4571

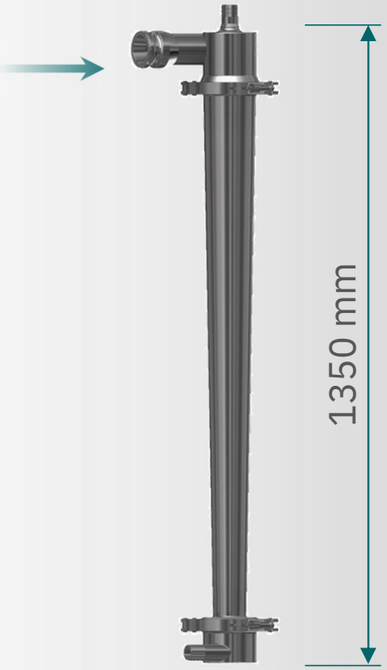
Optimal solution for:

- Stock preparation
- Approach flow system
- Wastewater treatment plant

Multi-stage or tail stage.

High-G-Separator 2"

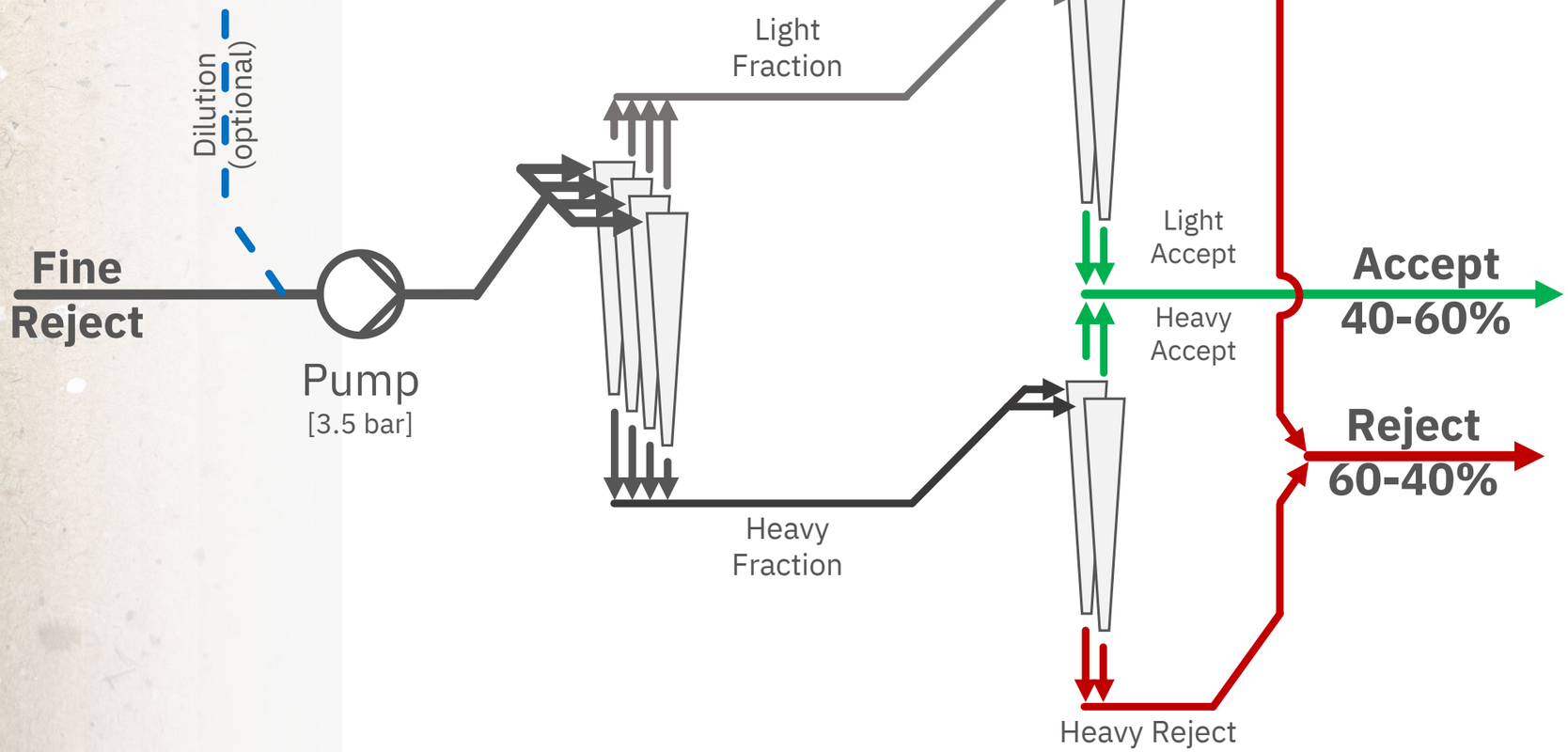
2" Inlet (Camlok)



Capacity: 24-45 m³/h

Consistency: < 2.5 %

High-G Combi-Line for OCC Fine Rejects



Light Reject

Light Accept

Heavy Accept

Heavy Reject

High-G Combi-Line / Economics Example for OCC

Metrics

Production Capacity:	1,000 t/d
Fine Reject Rate:	1%
Fine Reject Mass:	10 t/d
Raw Material Costs:	100 €/t
Disposal Costs:	80 €/t
Disposed Reject Dry Content:	50%
Electricity Price:	100 €/MWh
Yearly Production Days:	350 d/a

High-G Combi-Line

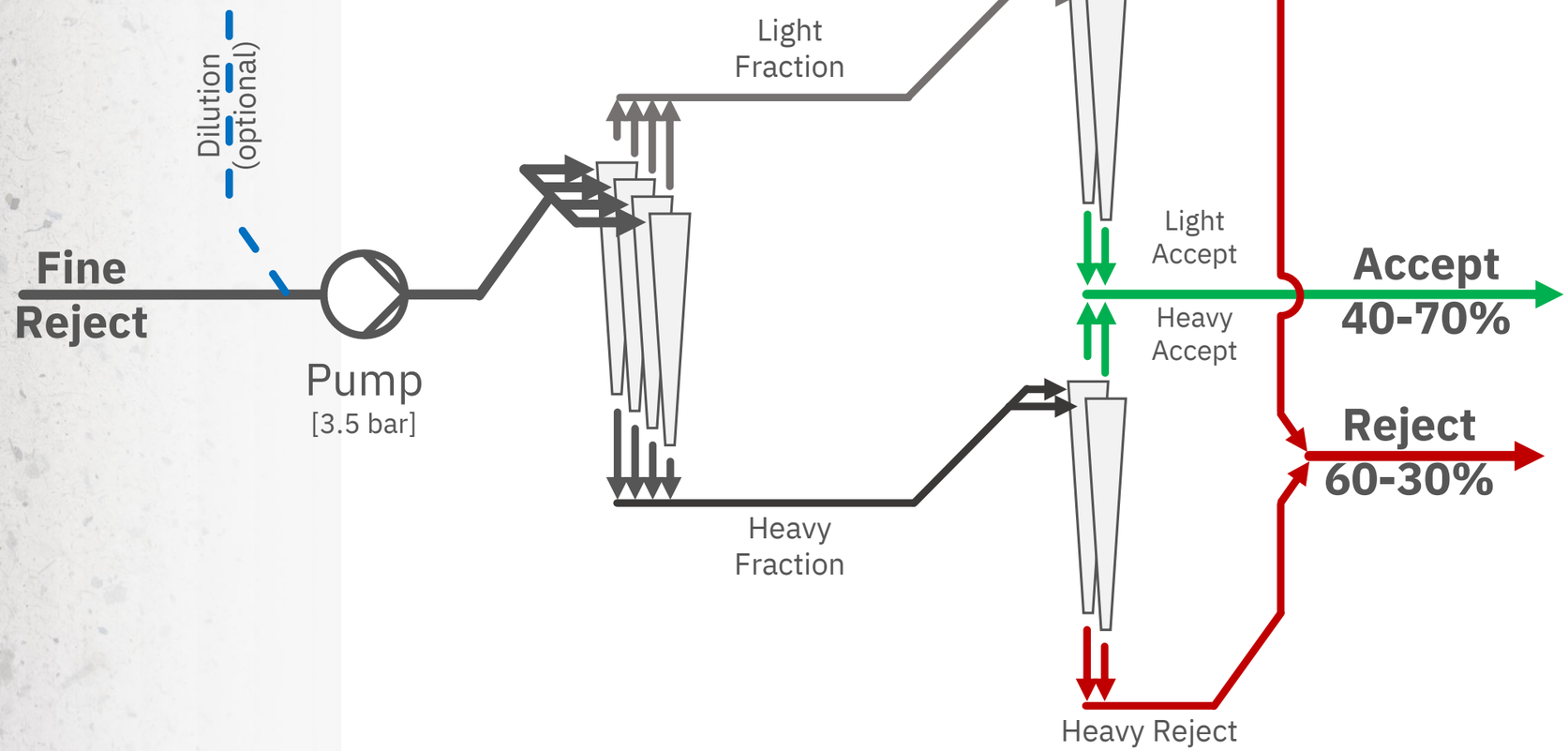
Production Capacity:	10 t/d
Reject Rate:	50 %
Hydraulic Capacity:	45 m³/h
Electric Power Consuption:	15 kW
Plant Price:	**400k €**

Plant Economics

Raw Material Savings:	5 t/d
Reject Disposal Reduction:	10 t/d
Power Consumption:	360 kWh/d
Raw Material Savings:	1,750 t/a
Reject Disposal Reduction:	3,500 t/a
Power Consumption:	126 MWh/a
Raw Material Savings:	175,000 €/a
Disposal Cost Reduction:	280,000 €/a
Electricity Costs:	12,600 €/a
Maintainance:	1,000 €/a
Total Savings:	**441,400 €/a**

ROI: 11 Months

High-G Combi-Line for DIP Fine Rejects



Light Reject

Light Accept

Heavy Accept

Heavy Reject

High-G Combi-Line / Economics Example for DIP

Metrics

Production Capacity:	1,000 t/d
Fine Reject Rate:	1%
Fine Reject Mass:	10 t/d
Raw Material Costs:	200 €/t
Disposal Costs:	80 €/t
Disposed Reject Dry Content:	50%
Electricity Price:	100 €/MWh
Yearly Production Days:	350 d/a

High-G Combi-Line

Production Capacity:	10 t/d
Reject Rate:	50 %
Hydraulic Capacity:	45 m³/h
Electric Power Consuption:	15 kW
Plant Price:	**400k €**

Plant Economics

Raw Material Savings:	5 t/d
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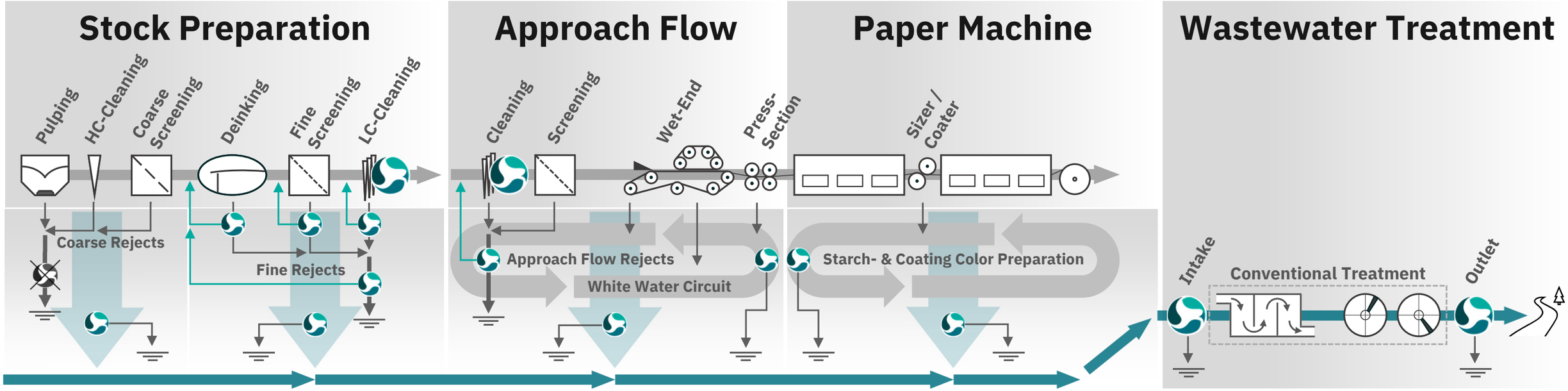
Raw Material Savings:	1,750 t/a
Reject Disposal Reduction:	3,500 t/a
Power Consumption:	126 MWh/a
Raw Material Savings:	350,000 €/a
Disposal Cost Reduction:	280,000 €/a
Electricity Costs:	12,600 €/a
Maintainance:	1,000 €/a
Total Savings:	**616,400 €/a**

ROI: 8 Months

High-G-Technology / Technology Positioning



LC-stock cleaning
→ Quality Improvement

Fine reject treatment
→ Fiber loss reduction

Effluent treatment
→ Effluent purification

Stock cleaning
→ Quality Improvement

White water treatment
→ Quality Improvement

Reject treatment
→ Fiber loss reduction

Efluent treatment
→ Effluent purification

Coating color treatment
→ De-sanding / De-aeration

Starch treatment
→ De-sanding

Effluent treatment
→ Effluent purification

Intake treatment
→ De-sanding

Outlet treatment
→ Microplastics removal

Legend:

= ECOFARIO Technology Positioning

Current Installations / Pfleiderer Spezialpapiere

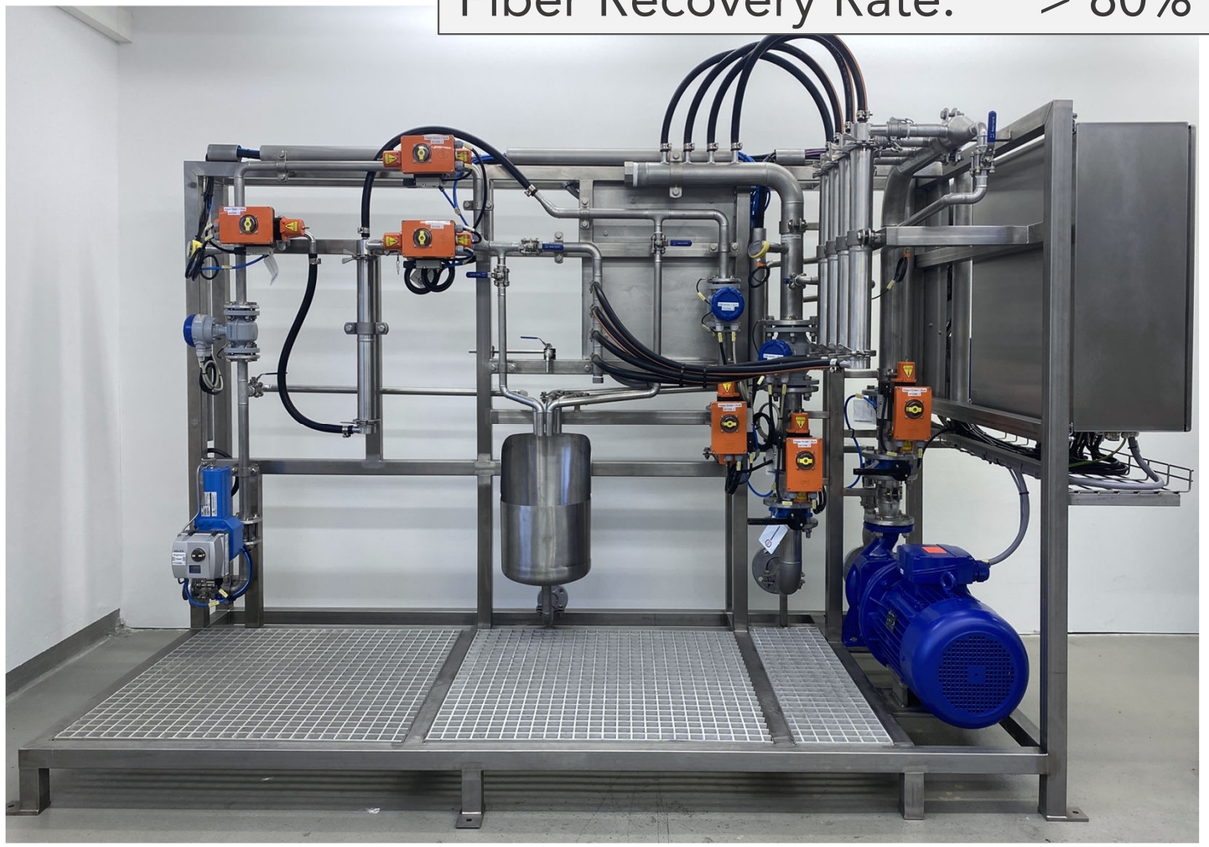
Point of Installation:	Approach Flow
Design:	1-Stage Heavy-Line Unit
Capacity:	6-10 m³/h at ~1% Consistency
Start-Up:	07/2022
Fiber Recovery Rate:	> 80%

Current Installations / Munich University of A. S.

Point of Installation:	Research Plant
Design:	1-Stage Heavy-/Light-Line Unit
Capacity:	5-15 m^3/h at up to 3% Consistency
Start-Up:	12/2022

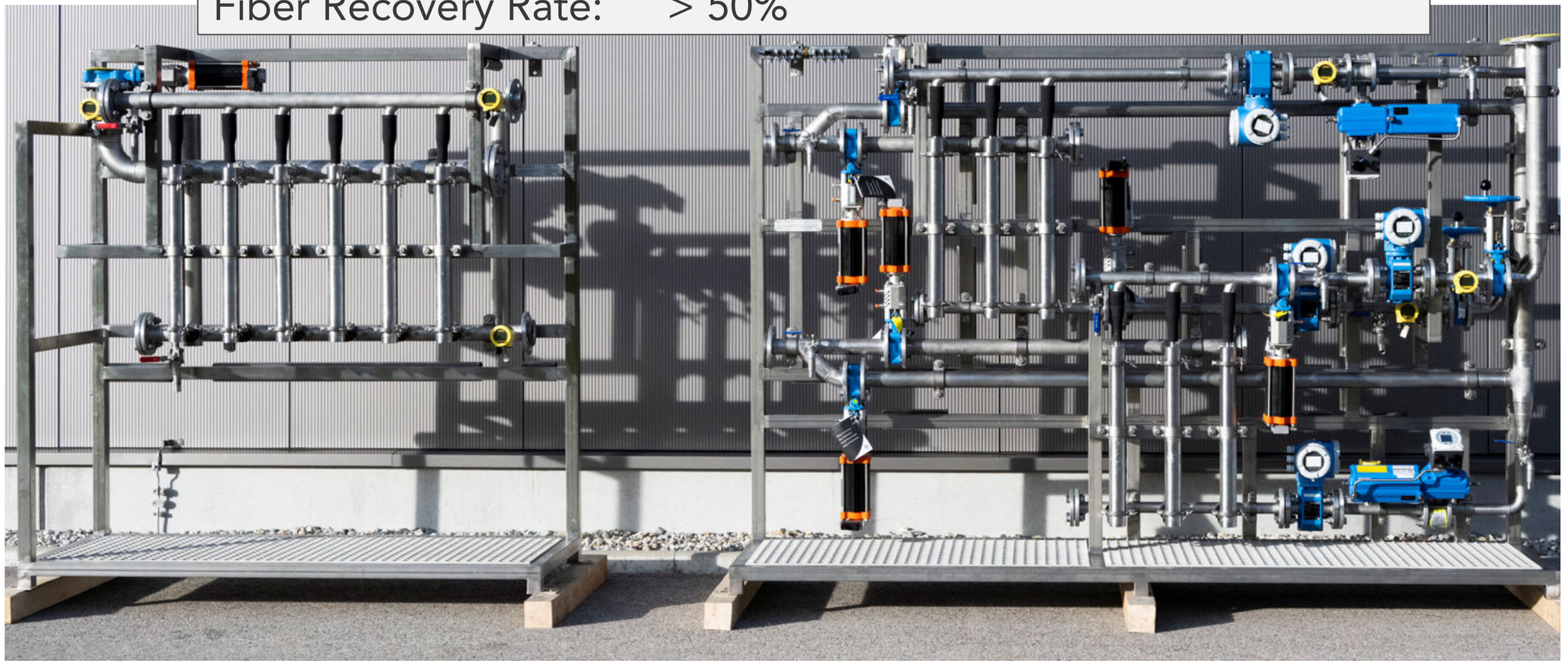
Current Installations / Grünewald Papier

Point of Installation:	Stock Prep & Approach Flow
Design:	2-Stage Heavy-Line Unit
Capacity:	25-36 m^3/h at up to 2% Consistency
Start-Up:	01/2024
Fiber Recovery Rate:	> 80%



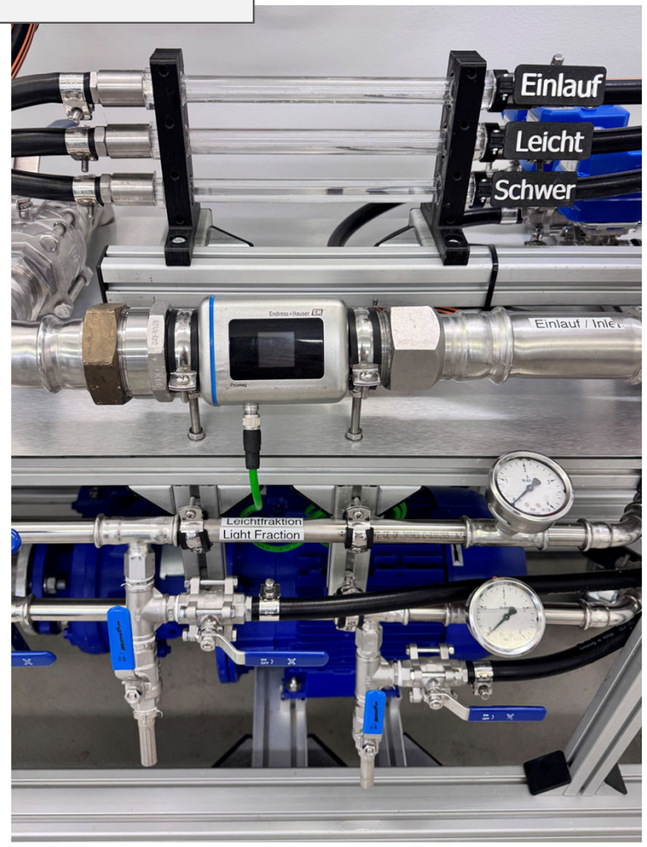
Current Installations / Hamburger Rieger Trostberg

Point of Installation:	Stock Prep & Approach Flow
Design:	Combi-Line Unit
Capacity:	27-45 m³/h at up to 2% Consistency
Start-Up:	01/2026
Fiber Recovery Rate:	> 50%



Lab & Pilot Units / 1“ – Lab Unit for Batch Trials

Design:	Heavy- / Light-Line Unit
Capacity:	6-10 m³/h at up to 1.5% Consistency
Test Volume:	50-100 l
Electrical Connection:	380V / 16A CEE



Lab & Pilot Units / 2“ – Mobile Pilot Unit

Design:	Heavy- / Light- / Combi-Line Unit (up to 3 stages)
Capacity:	20 - 60 m³/h at up to 2.5% Consistency
Test Volume:	500 – 1200 l (batch)
Electrical Connection:	380 V / 32 A CEE
Specialty:	Integratable into any system (Plug & Play)

High-G-Technology for Next Generation Paper Making

- Untapped Fiber Recovery Potential → Typically Higher than 50%
- Online Monitoring of Mass Flows → Real-Time Performance Monitoring
- Easy to Install → Modular Plug & Play Units built on Racks
- Easy to Operate → Advanced Automation Concept for Highest Yield
- Highest Energy Efficiency → Eligible for Funding
- Extreme Wear Resistance → Extraordinary Product Life Cycles
- Easy to Maintain → Low Maintainance Costs

High-G-Technology for Next Generation Paper Making

Return on Investment

Typically << 18 Months

ECOFARIO
– Technology of Tomorrow

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