ABI Operator Training Manual

Dual-Phase Water Treatment System: Aqua PAC + Aqua Floc
This manual trains operators to run ABI's two-phase water treatment program safely, consistently, and effectively across all industries.

1. Program Overview
ABI's water treatment system uses two sequential phases:
Phase 1 — Coagulation (Aqua PAC)
Neutralizes particle charge
Collapses colloids
Forms microfloc
Prepares water for flocculation

Phase 2 — Flocculation (Aqua Floc)
Bridges microflocs using ultra-high MW PAM
Builds large, dense, drainable flocs
Improves sludge dryness
Enhances solids capture

Operators must follow both phases in sequence for optimal results.

2. Safety Requirements
Personal Protective Equipment (PPE)
Chemical-resistant gloves
Safety goggles
Dust mask or respirator (for Aqua Floc powder)
Protective clothing

General Safety
Never mix chemicals directly in dry form
Avoid inhaling polymer dust
Store chemicals in dry, cool areas
Follow SDS instructions for spills and exposure

3. Aqua PAC Handling & Preparation
Storage
Keep sealed
Protect from moisture
Store between 5–30°C

Preparation
Fill a clean container with water.
Add Aqua PAC slowly while mixing.
Mix until fully dissolved.
Use immediately for best performance.

Injection
Inject Aqua PAC into the rapid-mix zone.
Apply high mixing energy for 30–60 seconds.
Reduce mixing speed to allow microfloc formation.

4. Aqua Floc Handling & Preparation
Storage
Keep bags sealed
Avoid humidity
Store in a dry chemical room

Preparation
Prepare a 0.05–0.1% polymer solution.
Add Aqua Floc powder slowly to water.
Mix gently — avoid high shear to prevent polymer chain breakage.
Allow 30–60 minutes for full hydration.

Injection
Inject Aqua Floc **after** coagulation.
Use gentle mixing to avoid polymer chain breakage.
Observe floc formation and adjust dosage as needed.

5. Jar Testing Procedure
Jar testing determines the correct dosage for both Aqua PAC and Aqua Floc.

Step-by-Step

- Fill jars with sample water.
- Add Aqua PAC at different dosages.
- Rapid mix 30–60 seconds.
- Slow mix 10–20 seconds.
- Add Aqua Floc solution.
- Gently mix 20–30 seconds.
- Allow settling.
- Compare clarity, floc size, and settling rate.
- Select the best combination.

6. Troubleshooting Guide
Weak or small floc
Increase Aqua PAC slightly
Ensure proper rapid mixing
Check polymer hydration time

Floc breaks apart
Reduce mixing speed after polymer addition
Lower Aqua Floc dosage
Check for excessive shear in pumps

Poor sludge dryness
Increase Aqua Floc dosage
Verify polymer solution concentration
Check belt-press or centrifuge settings

Cloudy supernatant
Increase Aqua PAC dosage
Ensure proper coagulation before polymer addition

7. Industry-Specific Notes

Municipal Drinking Water
Use minimal Aqua Floc
Focus on clarity and turbidity reduction

Municipal Wastewater
Aqua Floc significantly improves sludge dryness

Industrial Wastewater
Chemistry varies; jar testing is essential

Food & Beverage
1. Floc collapses when oils or fats are high
Cause: Excess FOG (fats, oils, grease) interferes with polymer bridging.
Fix:
Increase Aqua PAC slightly
Add Aqua Floc more slowly

2. Floc floats instead of settling
Cause: Entrained air from proteins or dissolved CO_2.
Fix:
Reduce mixing speed
Allow longer floc maturation time
Add Aqua PAC earlier in the process
Reduce mixing intensity after polymer addition

3. Sludge becomes gelatinous
Cause: High protein content forms gel-like solids.
Fix:

Increase Aqua PAC dose
Reduce Aqua Floc dose
Add polymer at lower concentration

4. Polymer consumption spikes unexpectedly
Cause: Seasonal changes in raw materials (milk, meat, sugar, starch).
Fix:
Re-run jar tests
Adjust Aqua PAC first, then Aqua Floc
Ensure polymer solution is fully hydrated

5. Belt-press performance drops
Cause: Sticky solids from sugars or starches.
Fix:
Increase Aqua Floc slightly
Reduce polymer shear
Add a small amount of dilution water before polymer injection

6. Oily solids break apart during dewatering
Cause: High shear in pumps or centrifuges disrupts floc structure.
Fix:
Lower polymer dosage
Reduce pump speed
Add Aqua Floc further upstream

Mining & Mineral
1. Floc is too small or weak
Cause: High solids concentration overwhelms polymer bridging.
Fix:
Increase Aqua Floc dosage gradually
Ensure Aqua PAC is added early enough to destabilize fines
Increase slow-mix time to allow full floc growth

2. Floc settles too slowly
Cause: Clay fines or ultra-fine particles resist settling.
Fix:
Increase Aqua PAC dose to improve microfloc formation
Add Aqua Floc at a lower concentration to improve chain extension
Reduce mixing intensity after polymer addition

3. Thickener overflow is cloudy
Cause: Incomplete coagulation or polymer overdosing.
Fix:

Increase Aqua PAC slightly
Reduce Aqua Floc dosage
Check for shear in pumps feeding the thickener

4. Underflow density is too low
Cause: Floc is too fragile or too hydrated.
Fix:
Increase Aqua Floc dosage
Reduce polymer shear
Increase residence time in the flocculation zone

5. Tailings dewatering performance drops
Cause: High clay content or seasonal ore changes affect floc structure.
Fix:
Re-run jar tests
Adjust Aqua PAC first, then Aqua Floc
Add dilution water before polymer injection

Pulp & Paper
Aqua Floc improves fiber capture and enhances fines removal.
1. Floc breaks apart during mixing
Cause: Excessive shear from agitators or pumps.
Fix:
Reduce mixing speed after Aqua Floc addition
Lower polymer dosage
Check pump impeller type (avoid high-shear designs)

2. Poor fiber capture
Cause: Inadequate bridging of fines and fibers.
Fix:
Increase Aqua Floc dosage
Ensure polymer solution is fully hydrated
Add polymer earlier in the process

3. Sludge is too watery
Cause: Weak macroflocs or insufficient polymer chain extension.
Fix:
Increase Aqua Floc slightly
Reduce polymer concentration
Check belt-press pressure settings

4. Excess polymer consumption
Cause: High fines content or recycled fiber variability.
Fix:
Re-run jar tests

Increase Aqua PAC dosage to stabilize fines
Ensure polymer solution aging time is at least 30–60 minutes

5. Foaming in clarifiers
Cause: Surfactants or dissolved air in whitewater.
Fix:
Reduce mixing speed
Add Aqua PAC earlier
Consider adding a defoamer (Defoamer 2000) upstream

Oil & Gas
1. Floc breaks apart due to oil content
Cause: Oil droplets interfere with polymer bridging.
Fix:
Increase Aqua PAC dosage to destabilize emulsions
Add Aqua Floc more slowly
Reduce shear in pumps and mixers

2. Floc floats instead of settling
Cause: Entrained hydrocarbons or gas bubbles prevent floc from gaining density.
Fix:
Reduce mixing speed
Allow longer floc maturation time
Add Aqua PAC earlier to collapse emulsions

3. Sludge is sticky or difficult to dewater
Cause: High paraffin or heavy oil content increases sludge viscosity.
Fix:
Increase Aqua Floc slightly
Reduce polymer concentration
Add dilution water before polymer injection

4. Polymer consumption spikes
Cause: Variability in crude composition or tank bottoms changes wastewater chemistry.
Fix:
Re-run jar tests
Adjust Aqua PAC first
Ensure polymer solution is fully hydrated

5. Oily solids break apart in centrifuges
Cause: Excessive shear or insufficient polymer chain length.

Fix:

Reduce centrifuge speed

Lower Aqua Floc dosage

Add polymer further upstream to allow full floc formation

8. Operator Best Practices

Always hydrate polymer fully (30 – 60 minutes)
Never overdose polymer — it reduces performance
Maintain consistent mixing speeds
Keep chemical tanks clean
Document dosage changes
Perform jar tests monthly or when influent changes

ABI QUICK-REFERENCE TROUBLESHOOTING WALL CHART
Aqua PAC + Aqua Floc Dual-Phase Water Treatment System

This chart provides operators with fast, practical guidance for diagnosing and correcting common issues across all seven industries.

UNIVERSAL TROUBLESHOOTING (ALL INDUSTRIES)

Problem	Likely Cause	Quick Fix
Weak / small floc	Not enough Aqua PAC	Increase Aqua PAC slightly
Floc breaks apart	Excessive shear	Reduce mixing speed after Aqua Floc
Cloudy supernatant	Under-coagulation	Increase Aqua PAC dosage
High polymer consumption	Poor coagulation	Optimize Aqua PAC first
Poor sludge dryness	Weak macroflocs	Increase Aqua Floc slightly
Floating floc	Entrained air or oils	Reduce mixing speed; increase Aqua PAC

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FOOD & BEVERAGE

Problem	Likely Cause	Quick Fix
Floc collapses with high oils/fats	FOG interfering with bridging	Increase Aqua PAC; slow Aqua Floc addition
Floc floats	Entrained air or CO_2	Reduce mixing; allow longer maturation
Gelatinous sludge	High protein content	Increase Aqua PAC; reduce Aqua Floc
Polymer use spikes	Seasonal raw material changes	Re-run jar tests; hydrate polymer fully
Belt-press issues	Sticky solids (sugars/starches)	Increase Aqua Floc; reduce shear
Oily solids break apart	High pump shear	Lower polymer dose; reduce pump speed

MINING & MINERAL PROCESSING

Problem	Likely Cause	Quick Fix
Weak floc	High solids load	Increase Aqua Floc; extend slow-mix time
Slow settling	Clay fines	Increase Aqua PAC; lower polymer concentration
Cloudy thickener overflow	Overdose or poor coagulation	Reduce Aqua Floc; increase Aqua PAC
Low underflow density	Fragile floc	Increase Aqua Floc; reduce shear
Poor tailings dewatering	Ore variability	Re-run jar tests; adjust Aqua PAC first

PULP & PAPER

Problem	Likely Cause	Quick Fix
Floc breaks during mixing	High shear	Reduce mixing speed; lower Aqua Floc
Poor fiber capture	Insufficient bridging	Increase Aqua Floc; hydrate polymer fully
Watery sludge	Weak macroflocs	Increase Aqua Floc; check press settings
Excess polymer use	High fines or recycled fiber variability	Increase Aqua PAC; ensure polymer aging time
Foaming	Surfactants or dissolved air	Reduce mixing; add Aqua PAC earlier

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OIL & GAS / PETROCHEMICAL

Problem	Likely Cause	Quick Fix
Floc breaks due to oil	Oil droplets blocking bridging	Increase Aqua PAC; slow Aqua Floc addition
Floating floc	Hydrocarbon or gas bubbles	Reduce mixing; extend maturation time
Sticky sludge	Paraffin/heavy oil	Increase Aqua Floc; reduce polymer concentration
Polymer use spikes	Crude variability	Re-run jar tests; hydrate polymer fully
Solids break in centrifuge	Excessive shear	Reduce centrifuge speed; lower Aqua Floc dosage.

MUNICIPAL DRINKING WATER

Problem	Likely Cause	Quick Fix
Slow settling	Under-coagulation	Increase Aqua PAC
Floc too small	Low polymer dose	Add minimal Aqua Floc (0.1–0.5 mg/L)
Turbidity remains high	Poor charge neutralization	Increase Aqua PAC; verify rapid mix

MUNICIPAL WASTEWATER

Problem	Likely Cause	Quick Fix
Poor sludge dryness	Weak macroflocs	Increase Aqua Floc
Cloudy effluent	Under-coagulation	Increase Aqua PAC
Floc shear	Pump or mixer too aggressive	Reduce shear; adjust polymer addition point

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Operator Best Practices

Hydrate Aqua Floc fully (30–60 minutes)
Optimize Aqua PAC first, then Aqua Floc
Avoid high shear after polymer addition
Re-run jar tests whenever influent changes
Document dosage changes
Keep chemical tanks clean
Maintain consistent mixing speeds

Summary

Operators using Aqua PAC + Aqua Floc in sequence will achieve:

Stronger floc
Cleaner water
Lower sludge-handling costs
Improved dewatering
More stable plant performance

This manual ensures consistent, safe, and optimized operation across all industries.