



Restoring Deer Creek WTP Performance

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Agenda

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Current Performance

Acknowledgements

Olympic View Water and Sewer District



- Scott Dunn
- Marty Henninger
- Jay Prosser
- Chris Scott
- Cody Gray (former)

HDR



- Beth Mende
- John Koch
- Ed Griffenberg
- Katie Walker
- Aparna Garg





Project Background



Olympic View WSD

- Serves Edmonds, Woodway, and Southeast Snohomish County
- Deer Creek WTP used to meet base demand
- Supplemental water purchased from Seattle Public Utilities

Deer Creek Springs Watershed

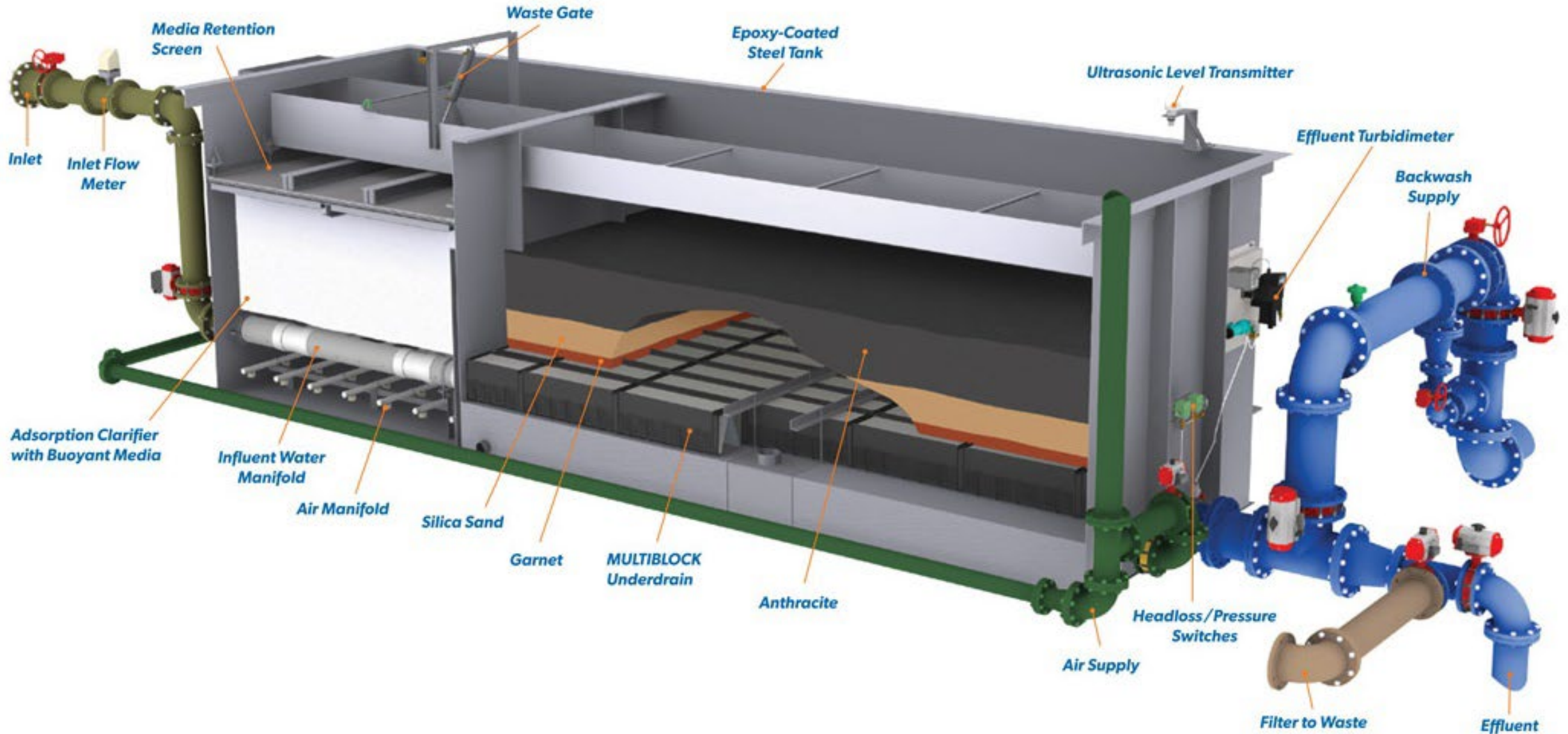


Deer Creek WTP

- Built 1998, renovated 2018
- 650,000 gpd
- Spring source affected by storms
 - Turbidity: 10 NTU to >100
 - Color: 4-5 to >50
- Trident Microfloc system
 - Alum
 - Coagulant and filter aid polymers
 - Phosphoric acid – corrosion control
 - Sodium fluoride – blend with SPU
 - Sodium hypochlorite



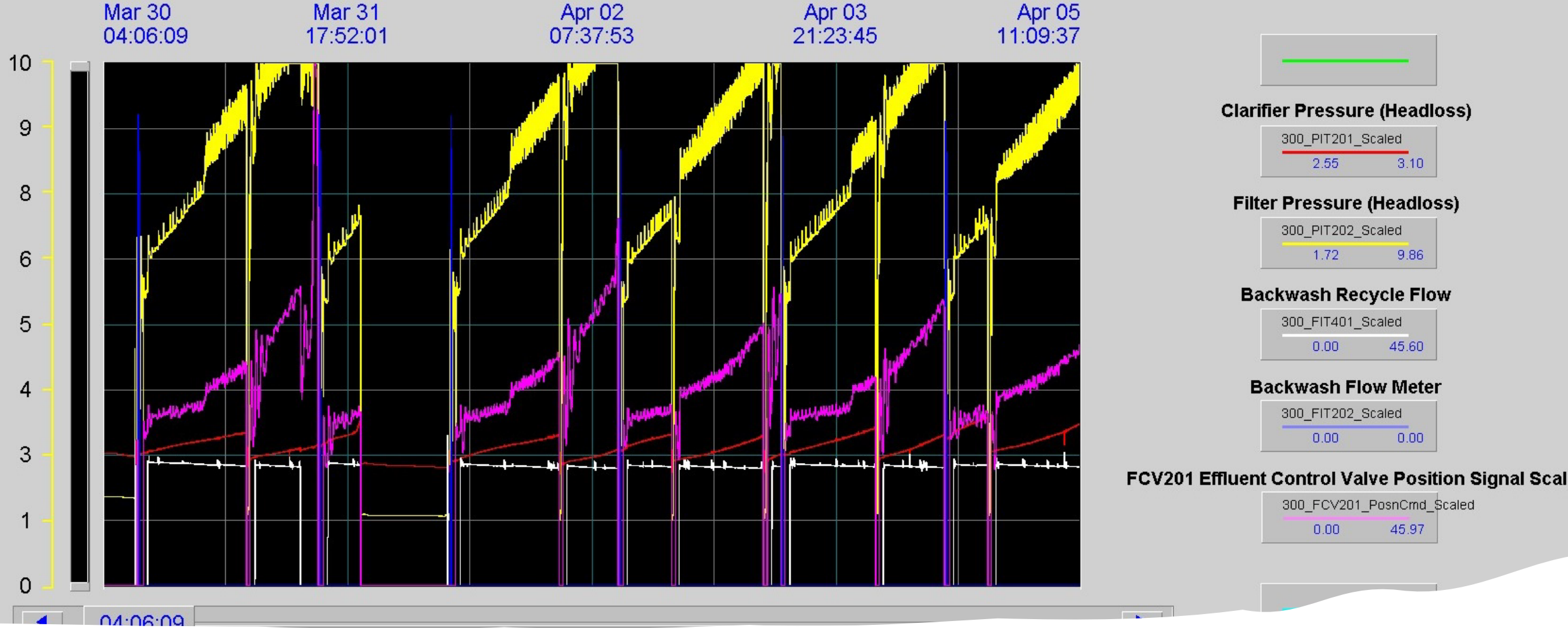
Trident Microfloc – Package System in Steel Tank



9-Month WTP Support

- Optimize physical operations
 - Performance monitoring
 - Troubleshooting
- Optimize staff operations
 - New training programs
 - Update SOPs
 - New recordkeeping procedures
 - New emergency response plans
 - Refresh maintenance program
 - New budgeting procedure





Plant Challenges

Filter Performance Degradation

Short Filter Run Time

- 36 – 40 hrs down to 12 – 24
- Increased backwashing

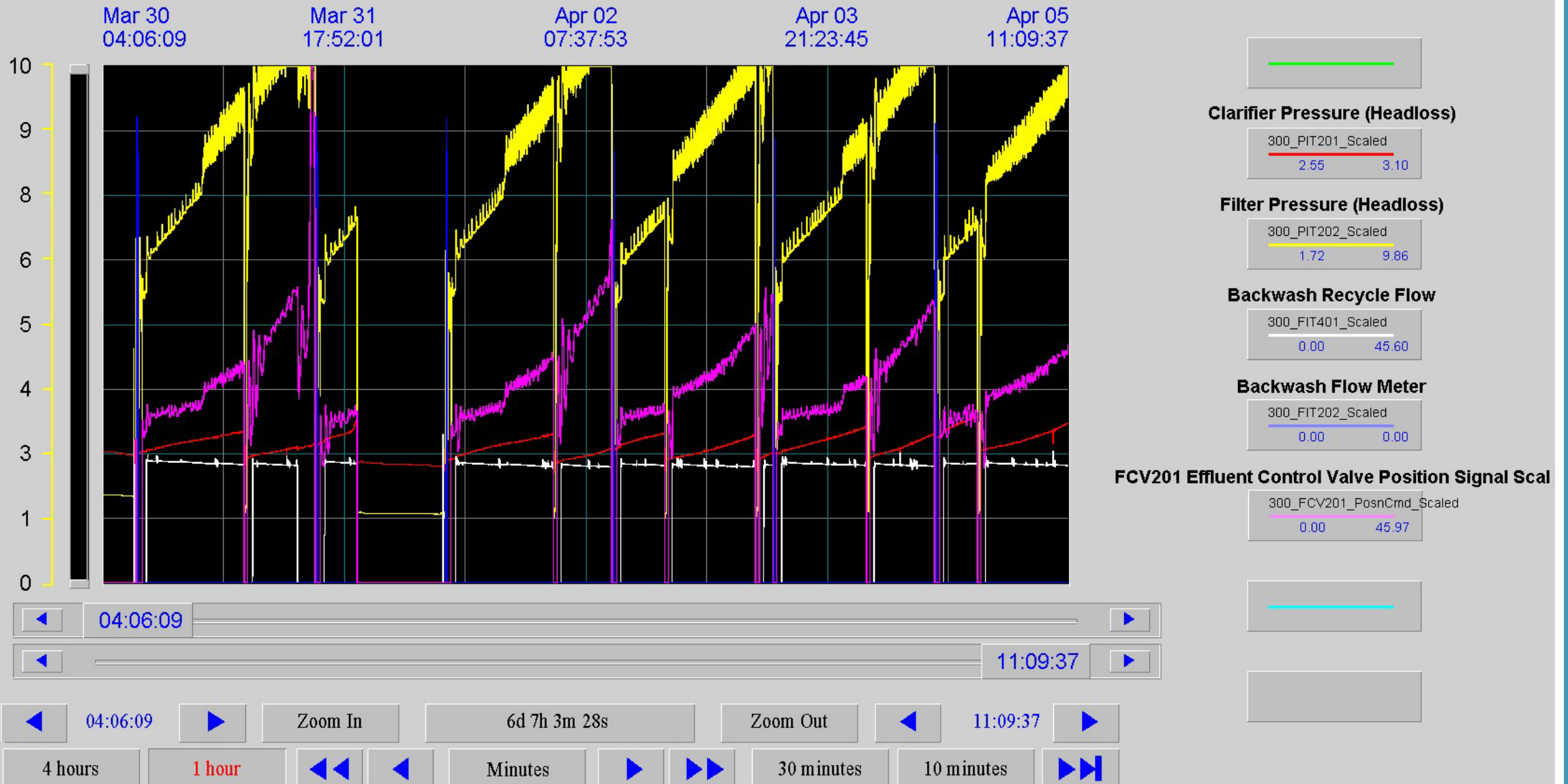
Filter Bubbling

- Air released during filter stand-by

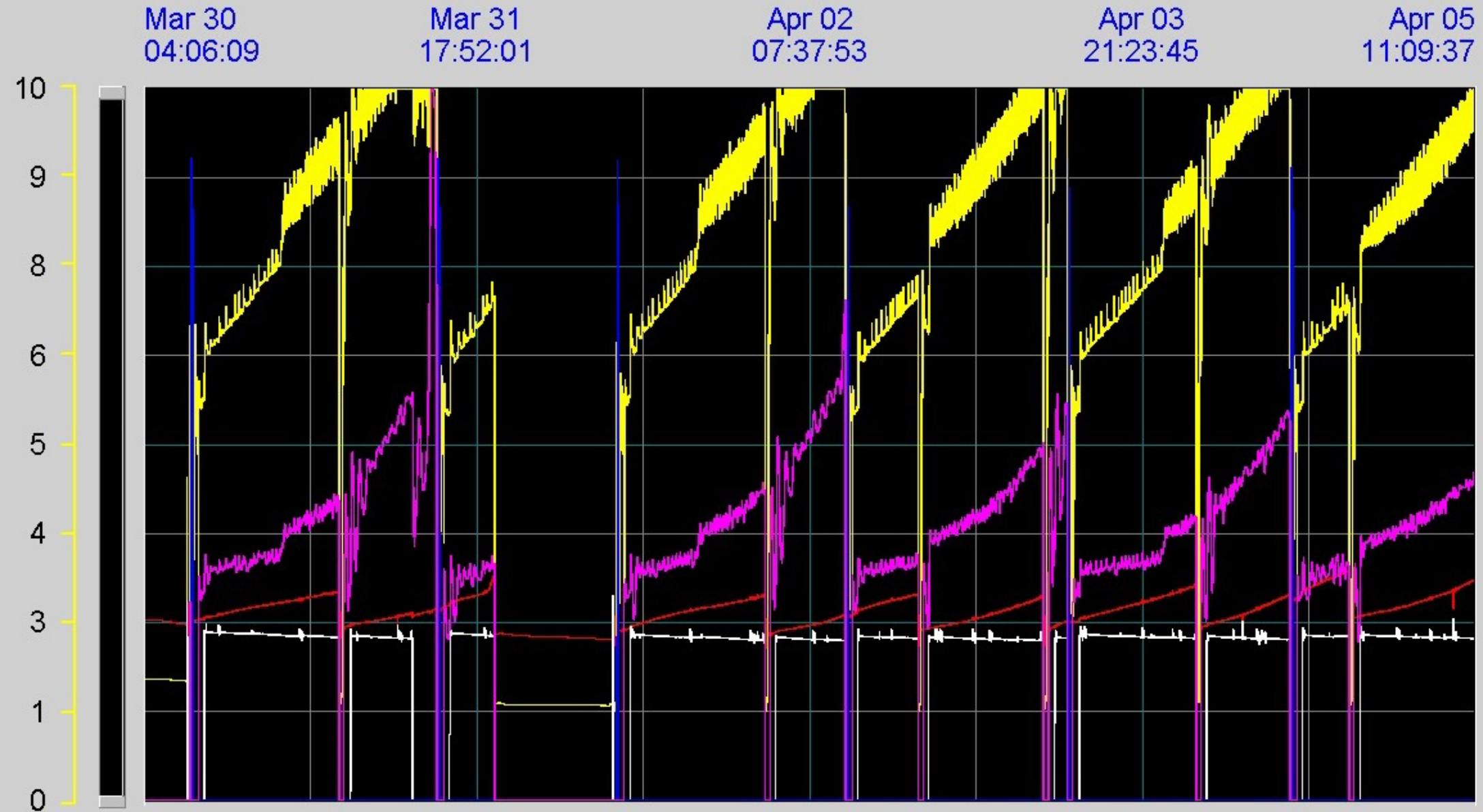
Coagulation

- Optimize chemical dosage to reduce costs

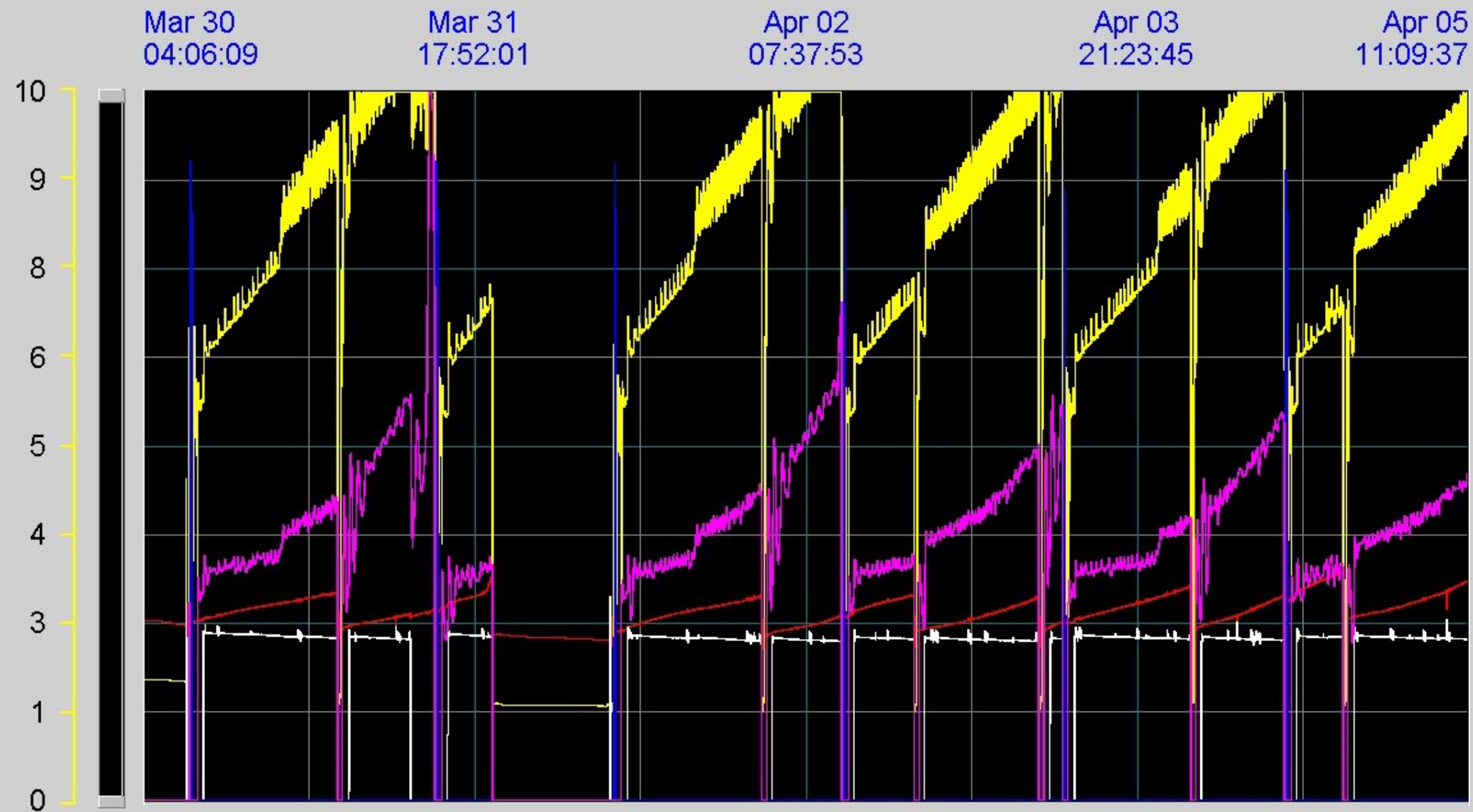
Historian Data = An Important Tool!



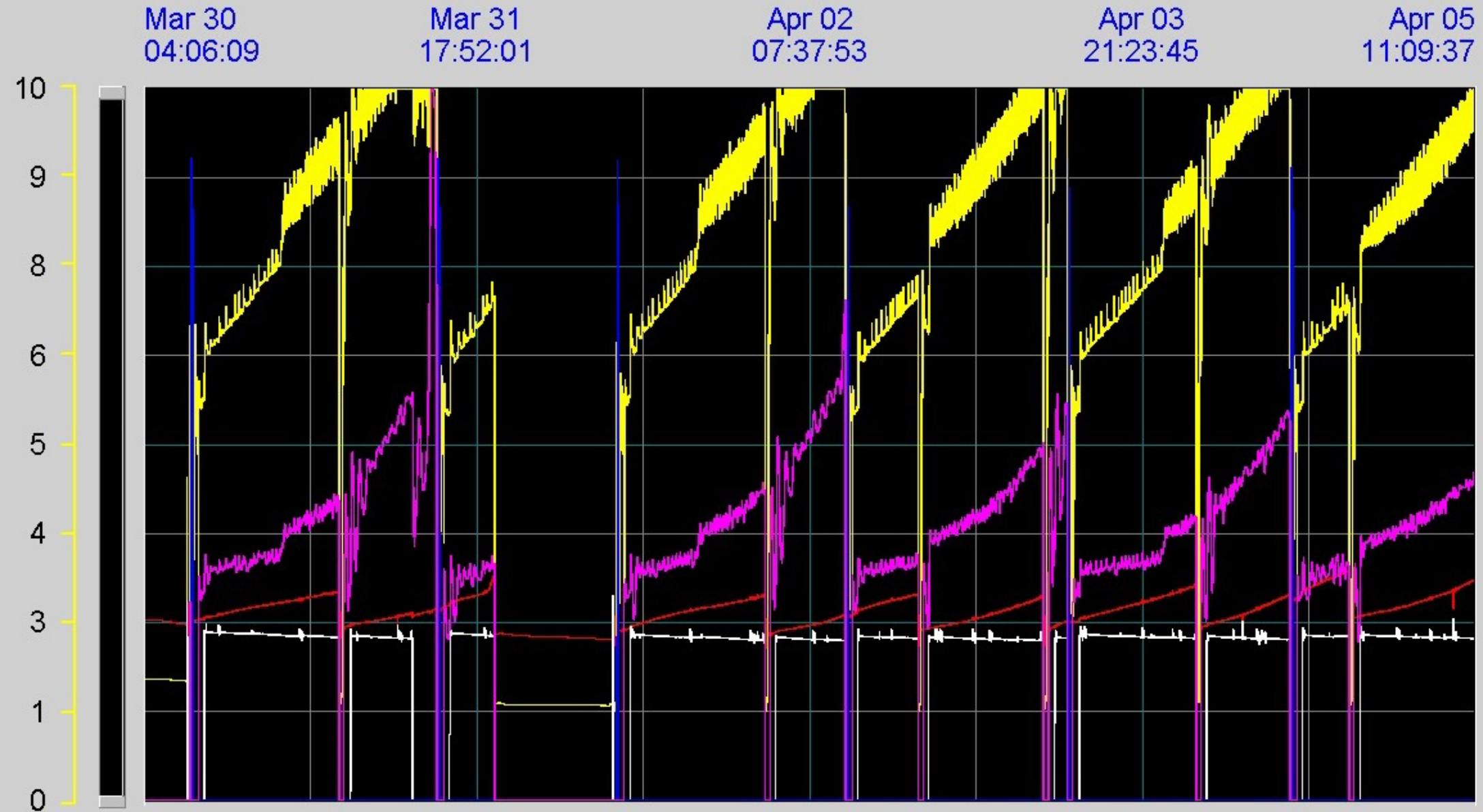
Clean Bed Headloss Increased from 3 psi to 6 psi



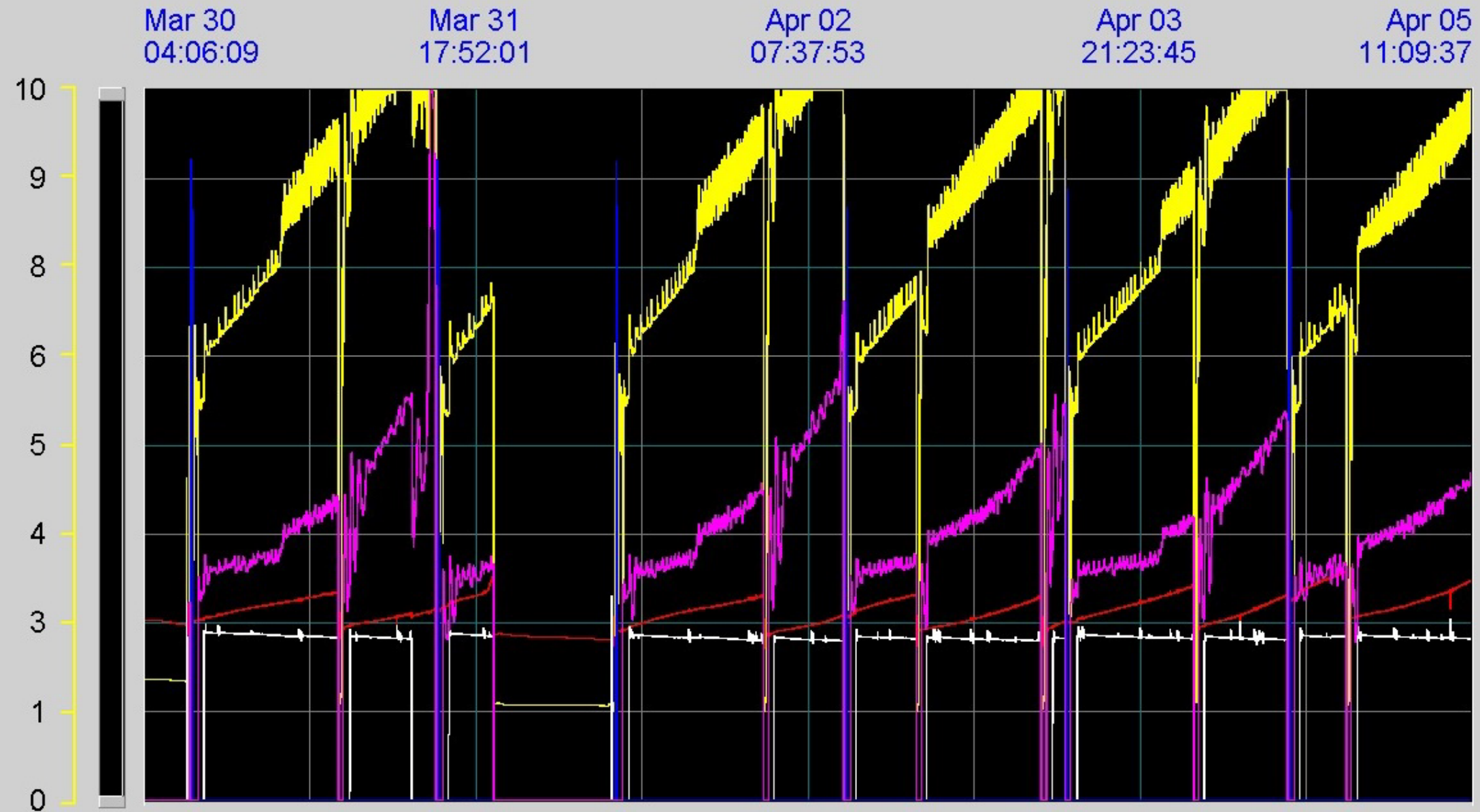
Initial Low Noise



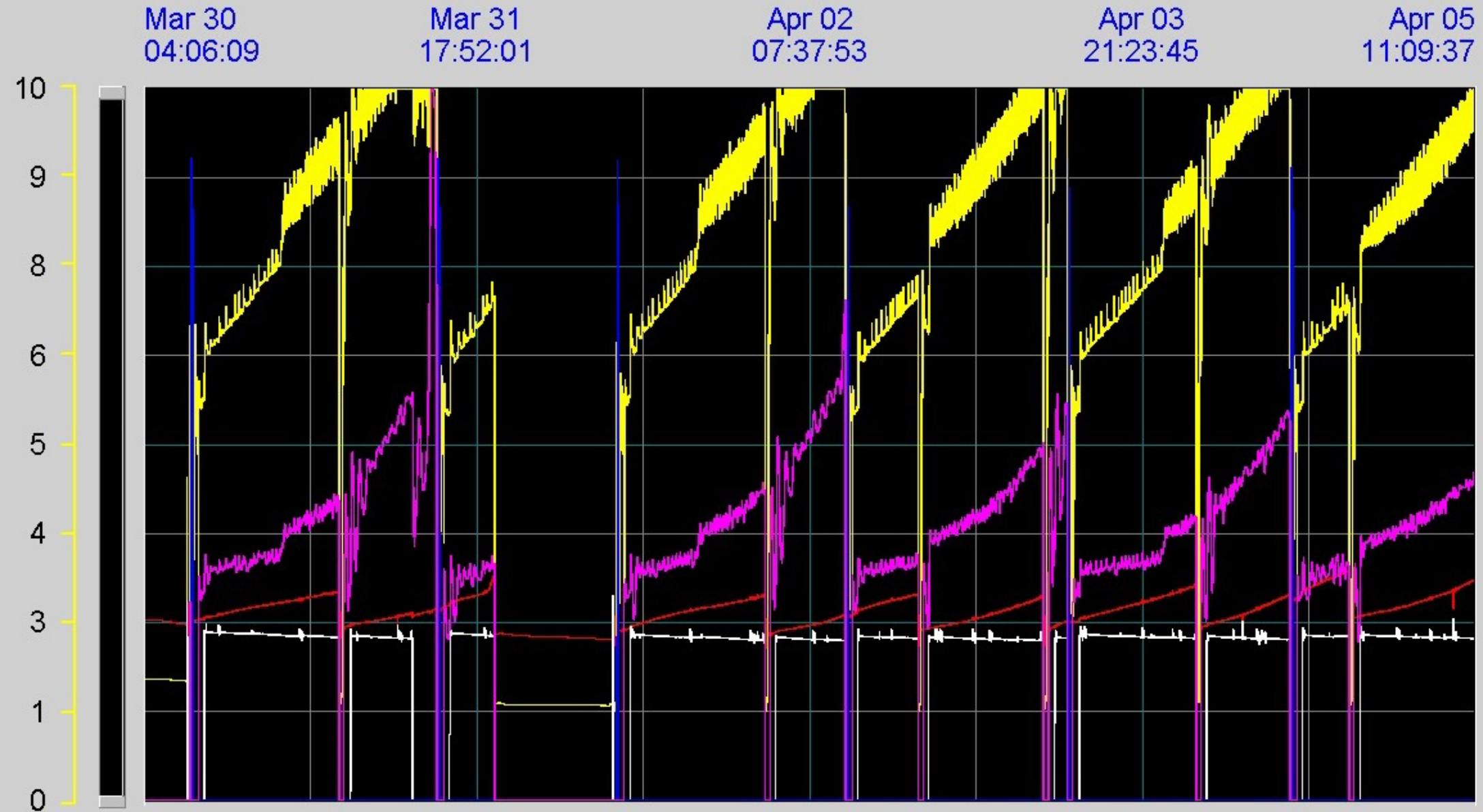
1 psi Pressure Jump Right at ~6 hours



High Signal Noise



Hit 10 psi Terminal Headloss Too Soon



Bubbly Filter

- Bubbles coming up from filter bed
- During entire filter run
- All across filter bed
- Worse when filter was resting



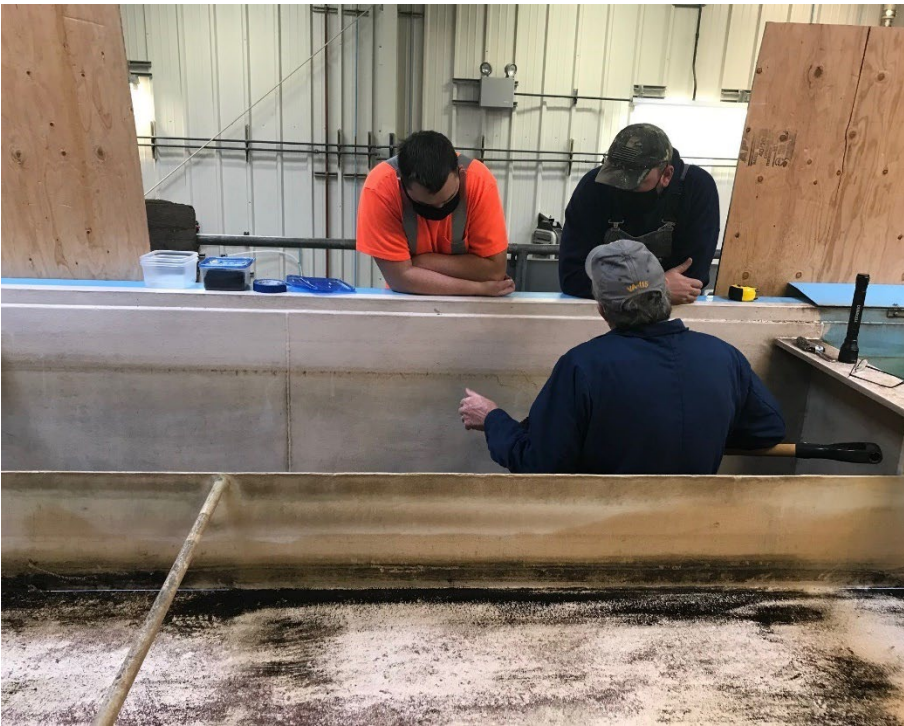


Performance Investigation

Operational Support

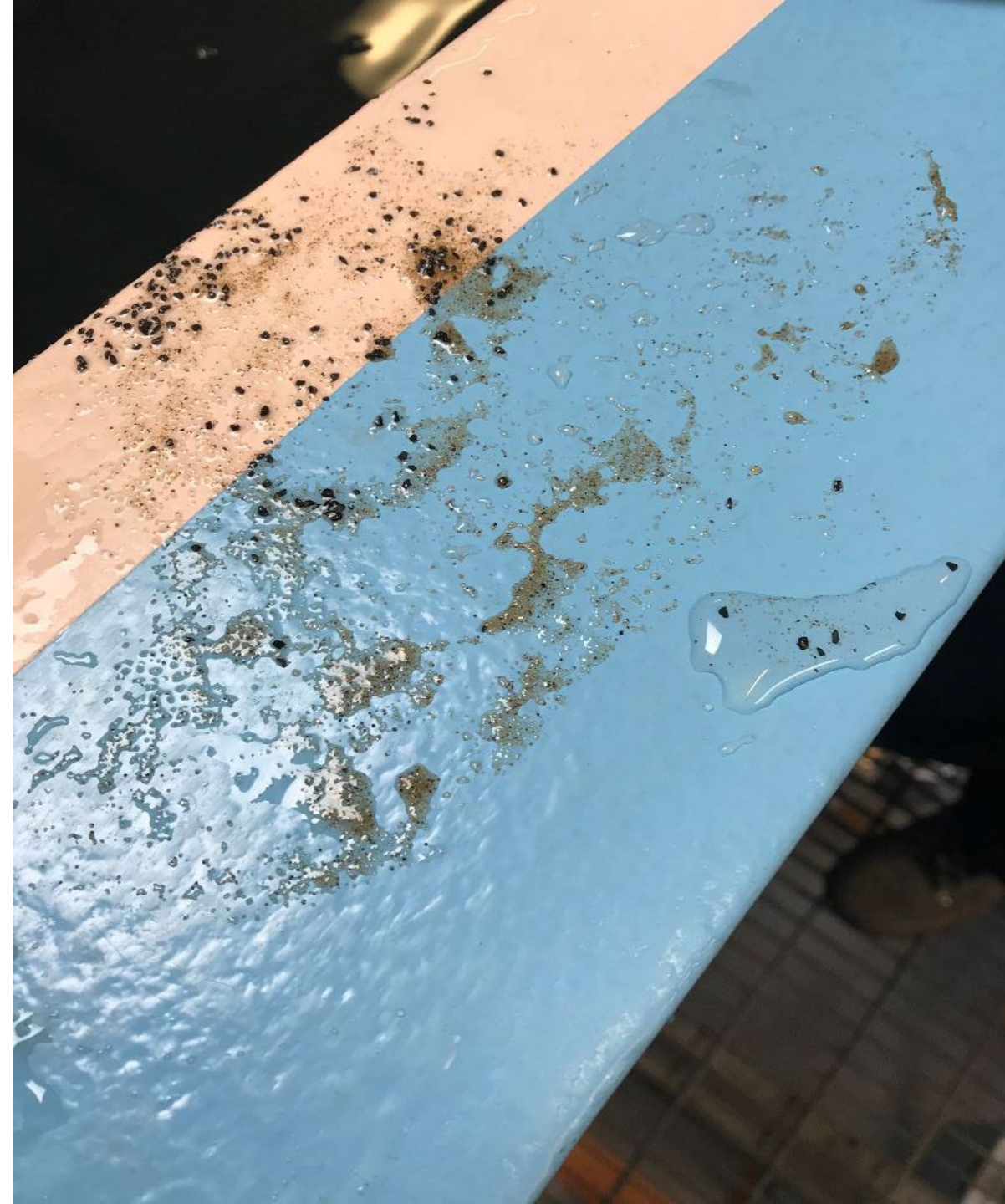
- Filter investigation
 - Changed filter setpoints
 - Media investigation
 - Leak testing
 - Pulled and verified every single instrument
- Jar testing for chemical optimization

.



Filter Investigation

- Filter media:
 - Anthracite
 - Silica sand
 - Garnet
- Sand and anthracite at top of filter
- Indicated that media may be intermixing
- Created headloss issues and impacting filter run times?





Excessive Polymer Usage Causing Mudballs?

- Plant polymer usage has been inconsistent and sometimes high.
- Coagulant aid polymer sometimes dosed up 1.0 mg/L

Free Chlorine Soak

- Added 8 gallons of 12.5% sodium hypochlorite directly to filter.
- Used blower to mix hypochlorite throughout bed.
- 24-hour soak, more chlorine when residual <0.5 mg/L.
- Backwashed at the end.
- Mudballs eliminated!



Media Investigation

- Cored filter to get media profile
- Dug up media down to the underdrains
- Pulled samples from various depths for analysis
- Media was consistent with specifications
- Media mixing was discovered throughout entire bed





Ideal Filter Media Distribution by Depth

0% 25% 50% 75% 100%

2"



15"



24"

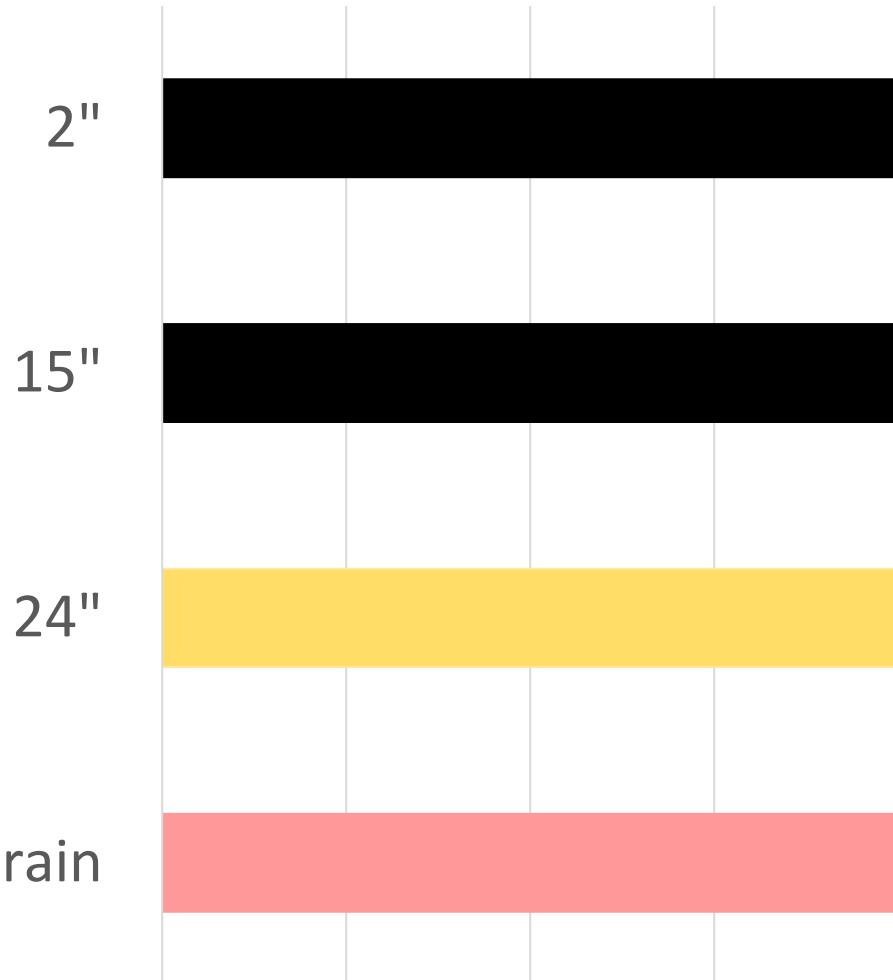


Underdrain



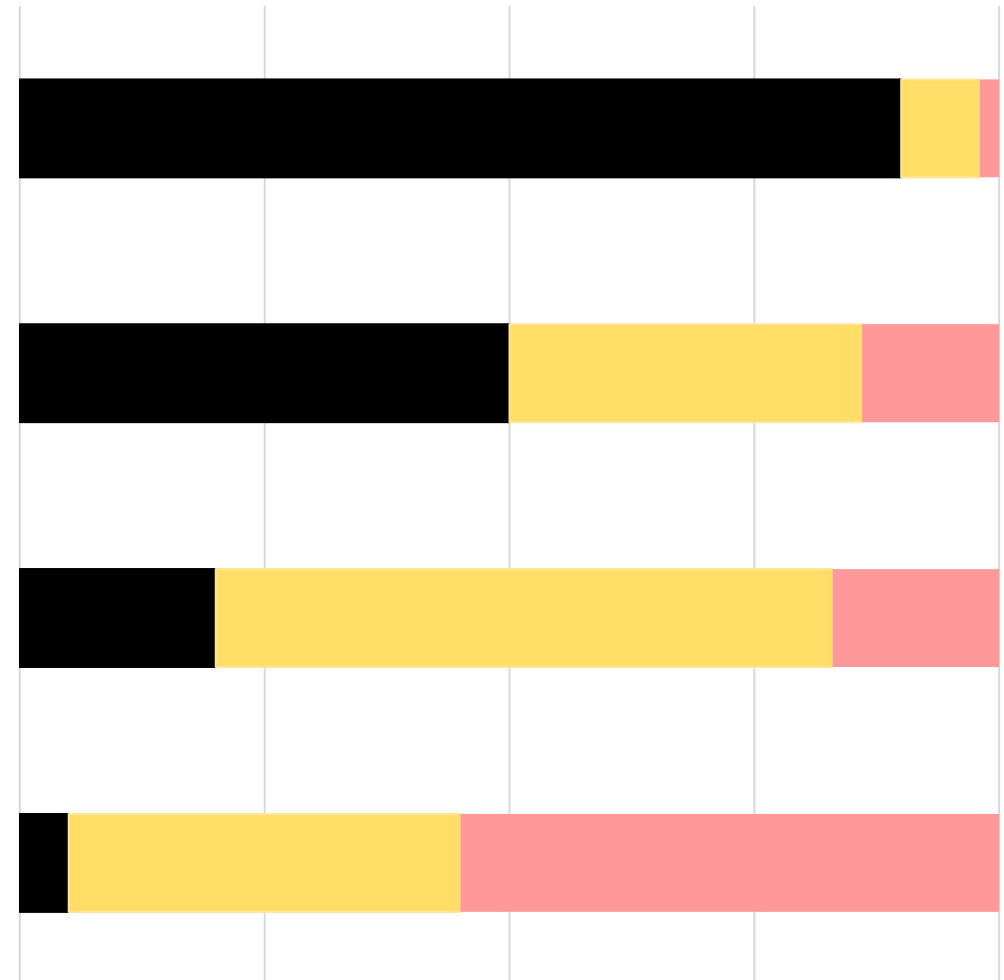
Ideal Filter Media Distribution by Depth

0% 25% 50% 75% 100%



Estimated Media Distribution by Depth

0% 25% 50% 75% 100%

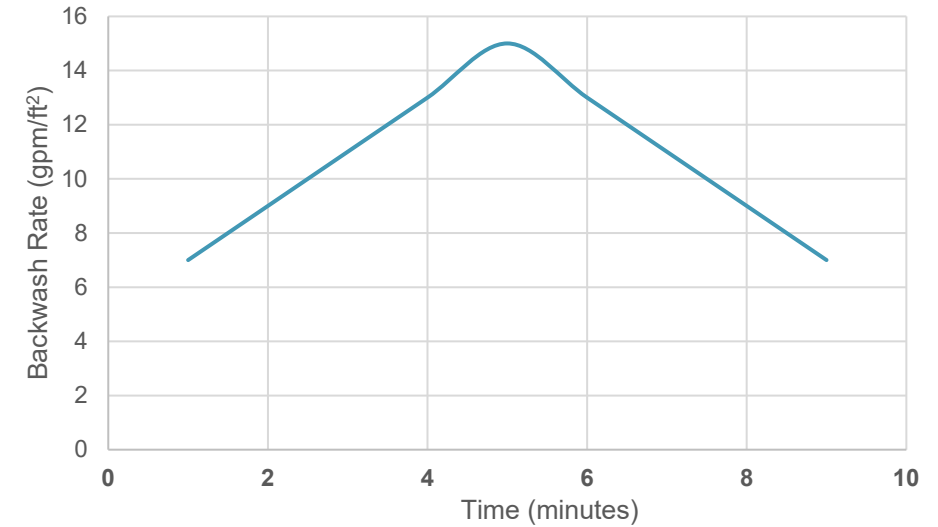




S.E.
Before

Media Restratification

- Backwashing rate overshoots backwashing setpoint
- Could cause media to mix and 'boil'
- Restratify media using an extended backwash
- Media was successfully restratified
- Added 4 – 6 hours to filter run times.
- Still not back to normal.



Plant Instruments?

- Tested every level element
- Found **both** level elements were off.
- Feedwater level sensor had faulty transmitter and had to be replaced
- Backwash sensor needed to be re-scaled
- Clean bed headloss dropped from 6 psi to 4 psi.



Filter Bubbling

- Smoke tested entire backwash air system
- Removed and inspected air check valves
- Plant smelled like incense for days
- Couldn't find a leak

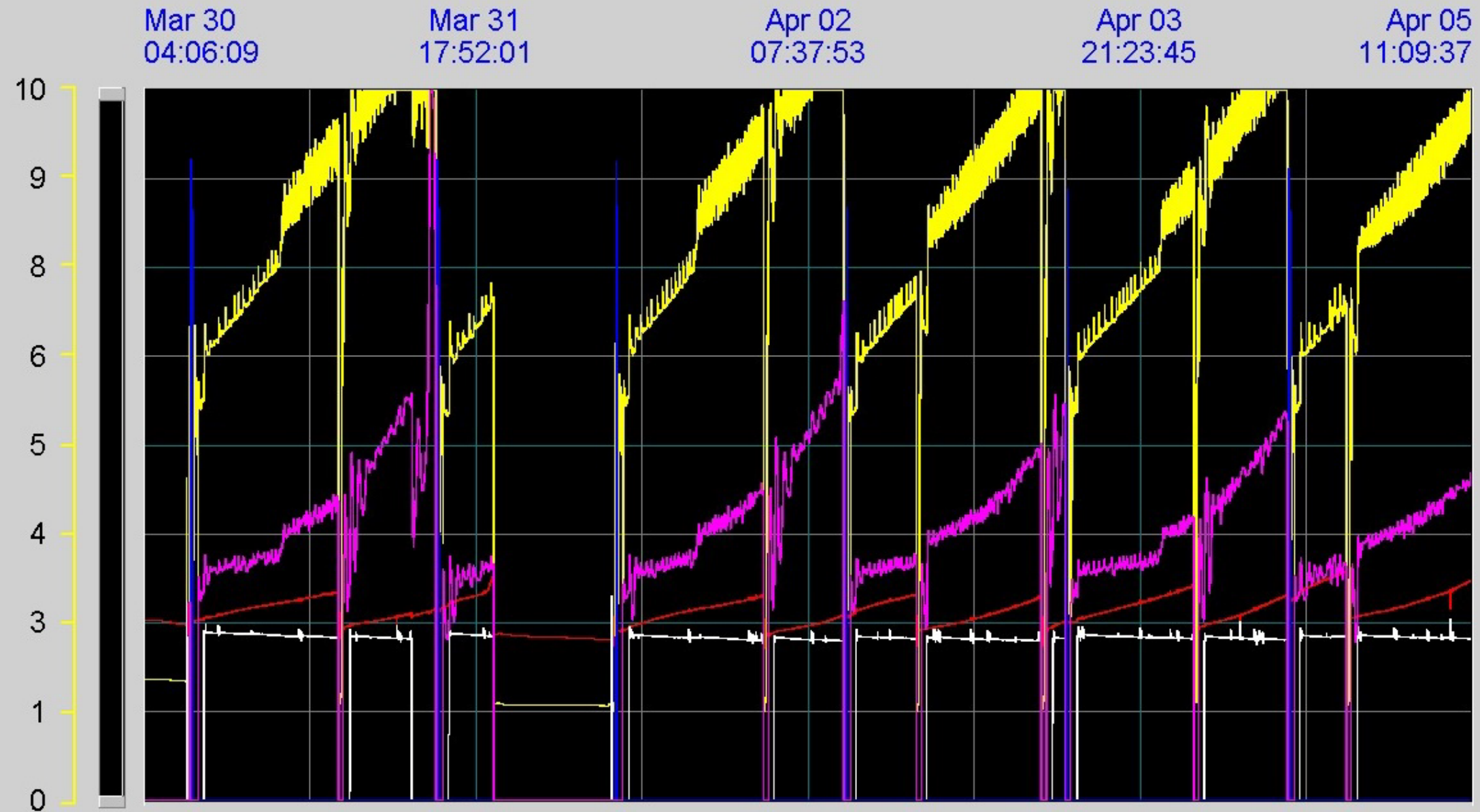


Found the Source!

- Air release valve on backwash waste line
- Meant to purge air with line is filled with backwash
- Wasn't seating and sucking air into pipe during filtration
- Air slowly built up in underdrains



High Signal Noise



Filter Issues

- Mudballs
- Destratified filter bed
- Bad sensors
- Leaking air valve
- 30+ hour filter run times
- Never got back to 3 psi clean filter bed headloss
- Damaged underdrains?



Jar Testing

- Primary goal
 - Educate new plant staff on coagulant chemistry
- Secondary goals
 - Lengthen filter run times
 - Minimize the amount of backwash waste generated
 - Reduce chemical costs





Teamwork + Knowledge = High Performance Staff



Current Operations

How is the District/WTP Doing Today?

Current:

- Happier, more educated staff
- Filter run times are back to 36 hours
- Backwash waste down 80%
- Faster, better responses in WQ changes

Next Steps

- No change in treatment systems
- More money in training / less in re-engineering
- Replace underdrains later this year



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