COD Reduction in Fiberline

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Fall 2015 PAPTAC Bleaching Committee
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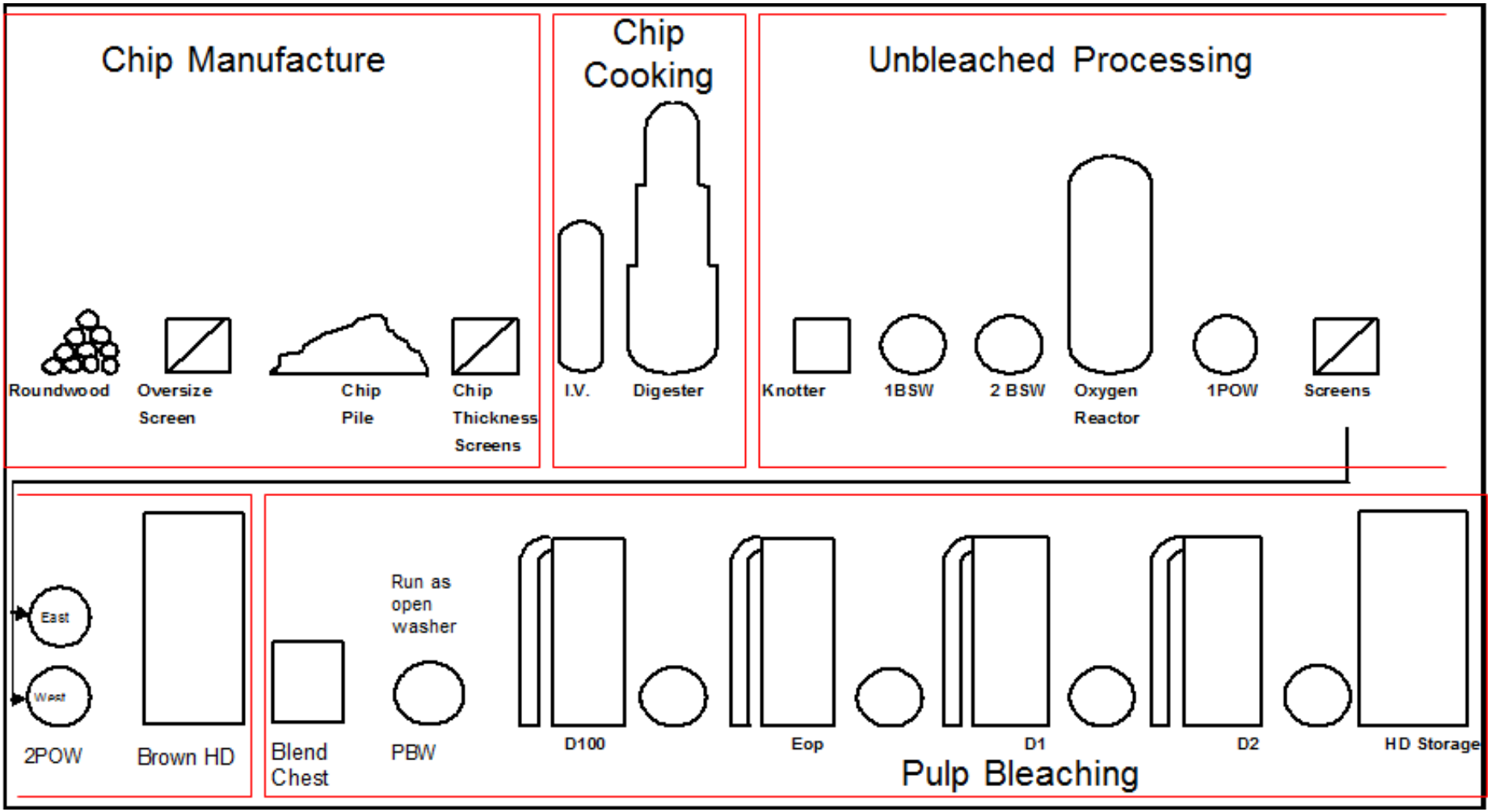
Background Information



Additional Information

- Since start-up in 1985 production through fiberline has doubled from the original 750 ADSTPD
- O2D added in 1990. No wash presses installed.
- Current specific loading on vacuum drum washers is 1.07 vs. good design of 0.65-0.70 for hardwood. Original loading was 0.56.
- Digester has a wash zone, but was not built for EMCC so has no additional zone between the main extractions and wash zone at the bottom

Open Pre-Bleach Washer 2006

- To address very high carryover into the Bleach Plant from the Brown Stock system, the Pre-Bleach Washer (PBW) was put into an open filtrate mode.
- Shower water for the washer had been a combination of evaporator combined condensate (CC), stripped condensate, and hot water
- Showers were changed to 90-100% hot water and stripped condensate and CC were moved to the #2 POW showers.

Impact of Open PBW

Process Measurement``	Units	Open Mode
Dissolved Solids	Pct Change	-50%
COD	Pct Change	-50%
Do Acid Use	Kg/ADMT	-2.5
Do ClO2 Use	Kg/ADMT	-2.25
Eop NaOH	Kg/ADMT	-.0.50

Impact of Open Washing

Property	Open Washing
Flow to Sewer	1000 – 1500 gpm
Soda Loss	+10 lbs/ADT
Fiber Loss	+1 TPD
Acid to D100 Stage	-5 lbs/ADT
ClO2 to D100 Stage	-4 lbs/ADT
NaoH to Eop Stage	-1 lbs/ADT
COD to D100 Stage	-50%
PBW Shower Flow	Does not need to change over Closed Washing
Total Solids to Sewer	+35 Lbs/ADT
Increased Slush Pulp	15 ADTPD

Opportunity / Issues

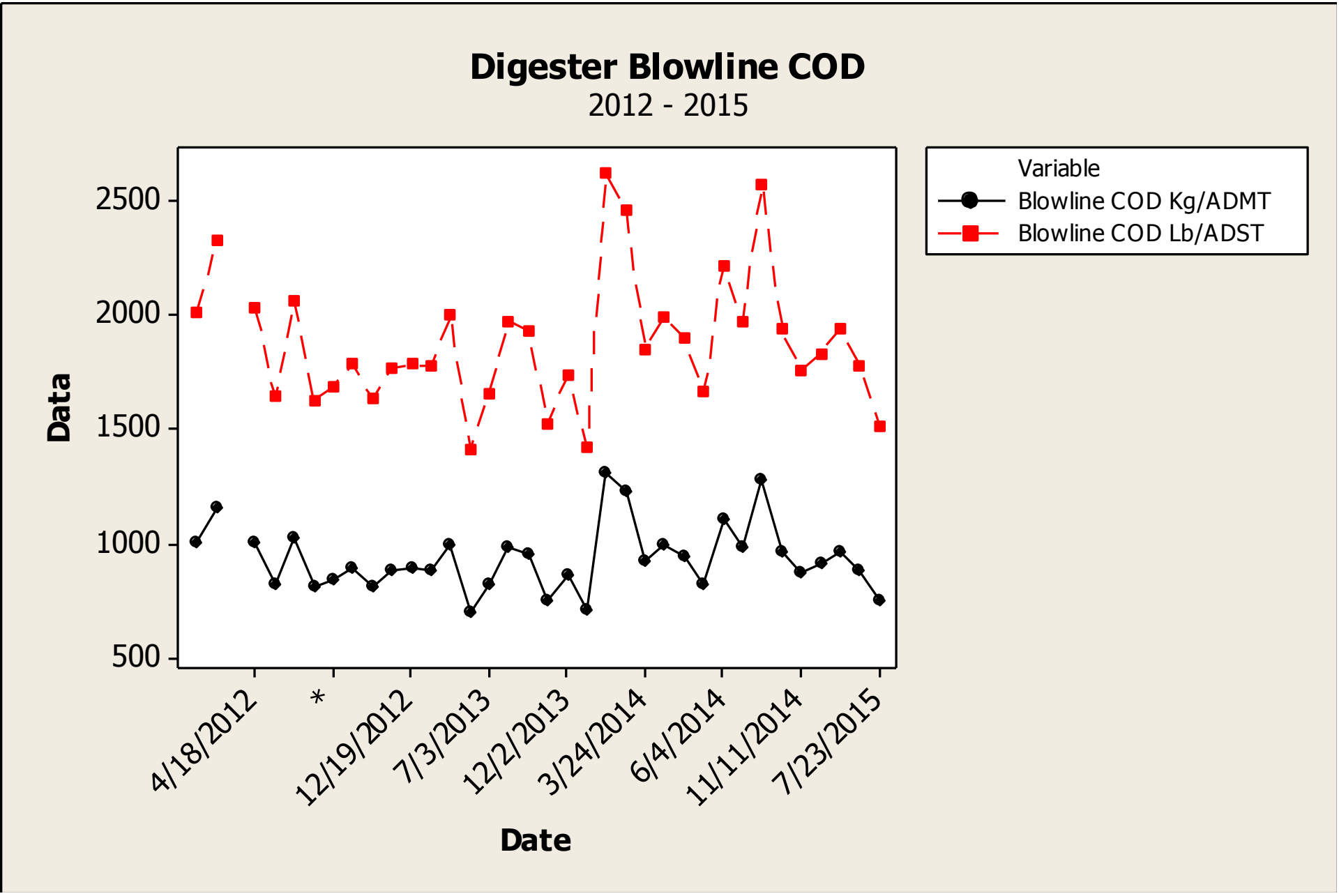
- Washer audits in 2013/2014 identified potential opportunities for low cost improvements
  - Automating level control on washers
  - Minimizing by-pass flows between filtrate tanks by improving washer drainage
  - Evaluating post Oxygen Delignification pH target as this pH correlated to pre-bleach washer conductivity and Do acid use
  - Improving shower performance by adjusting showers and keeping clean/unplugged
  - Challenging solids limit from the Evaporators, i.e. send lower solids
- Solids/T to O2D and Bleach Plant were very high

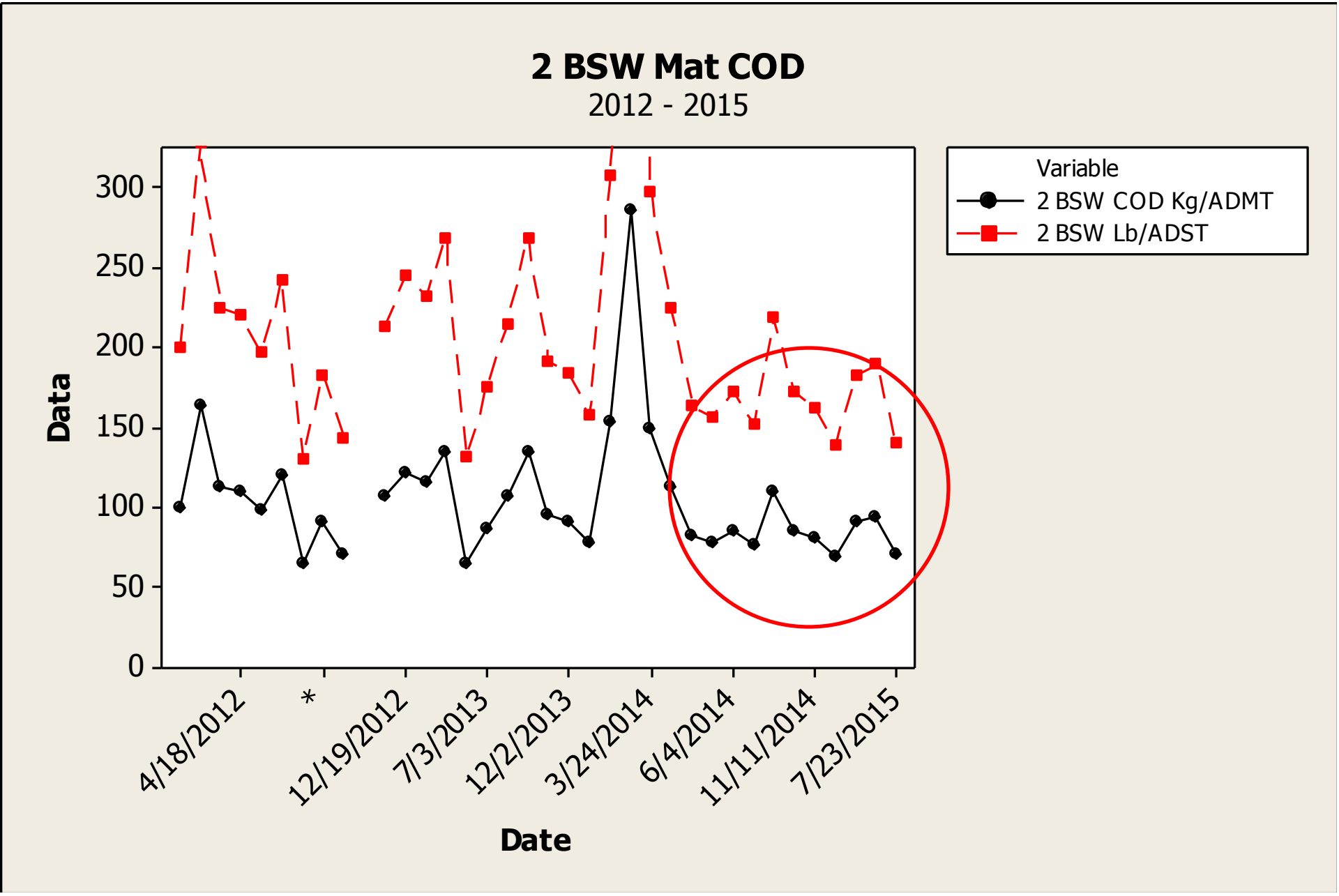
Results Prior to Washing Improvements

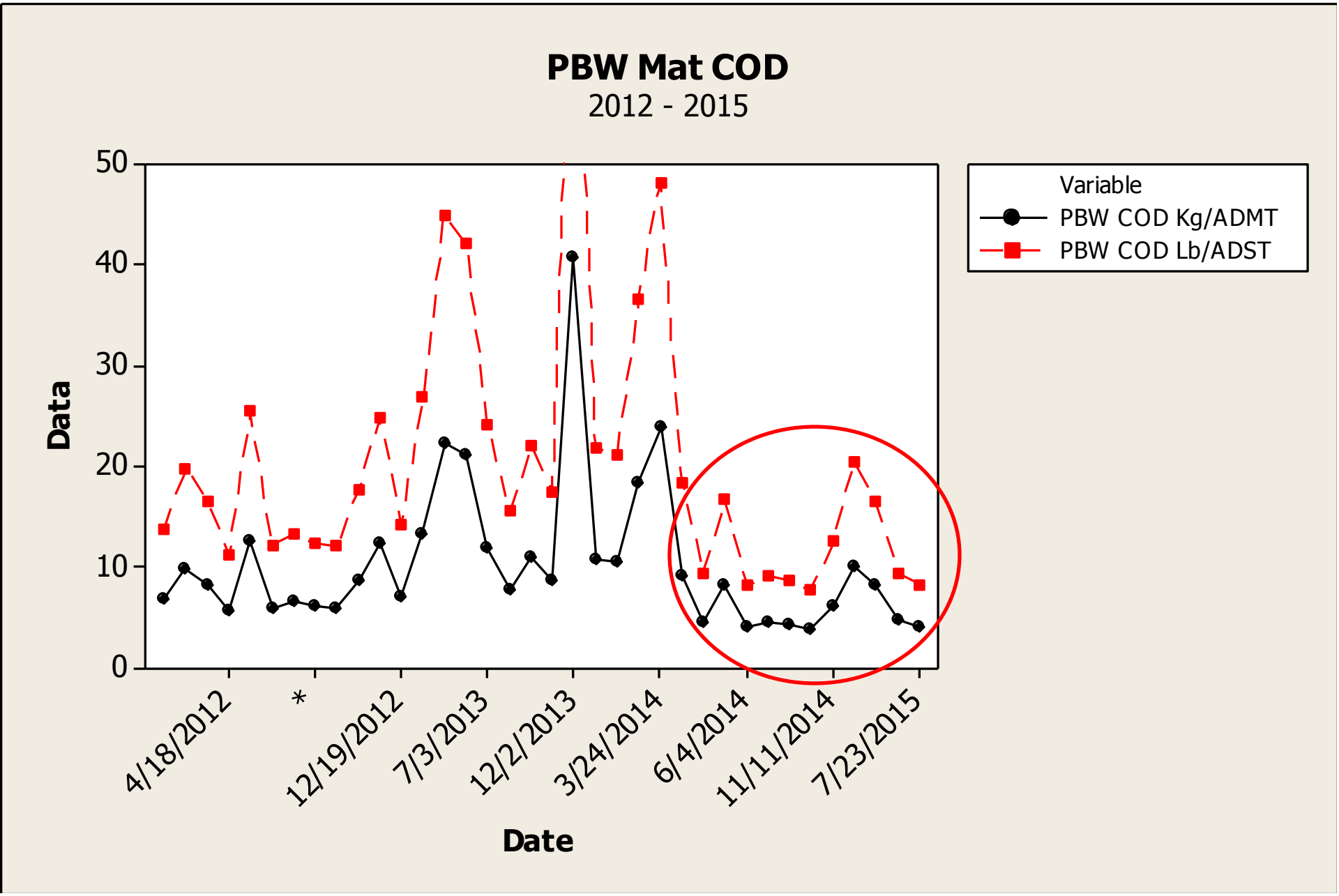
Measurement Location	Results in Lbs/ADST	Results in Kg/ADMT
Digester Blowline COD	1750	800
Into O2D system COD	225	110
Into Bleach Plant COD	18	8

Areas Addressed to Improve Washing

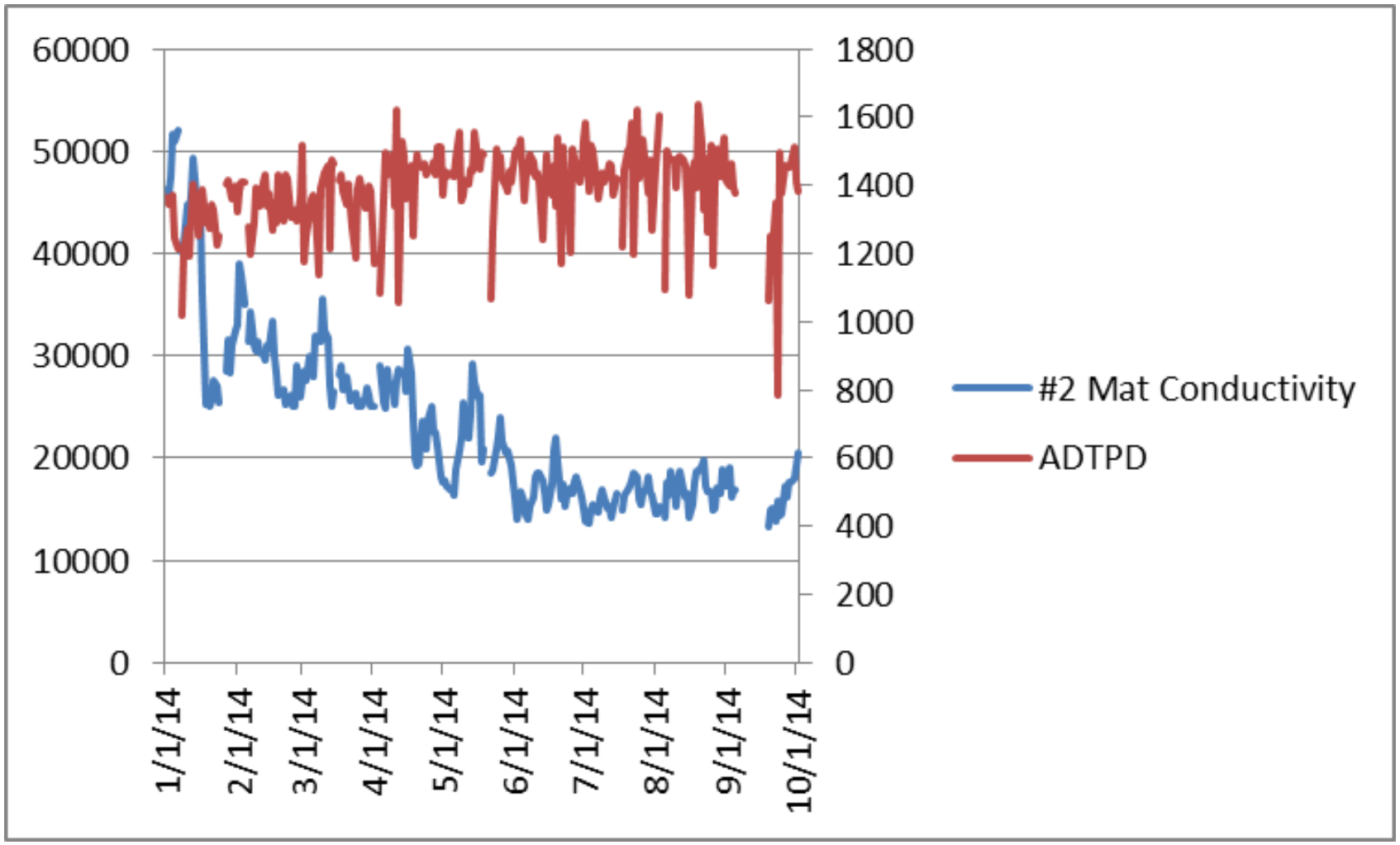
Area	Items Addressed / Investigated
Digester	Blow consistency, full Downflow Cooking, wash zone dilution factor, counterwash use, small changes to bottom of digester, controls for bottom, SOP's
Pre-O2D BSW	Defoamer type and application, Washer controls, washer mechanical issues, solids control strategy, solids target to R&U
Post Washing	New defoamer program, washer level controls, dilution factor control
O2D	Lowered pH target


Digester Blowline COD
2012 - 2015
Variable
Blowline COD Kg/ADMT
Blowline COD Lb/ADST
Data
2500
2000
1500
1000
500
4/18/2012
*
12/19/2012
7/3/2013
12/2/2013
3/24/2014
6/4/2014
11/11/2014
7/23/2015
Date

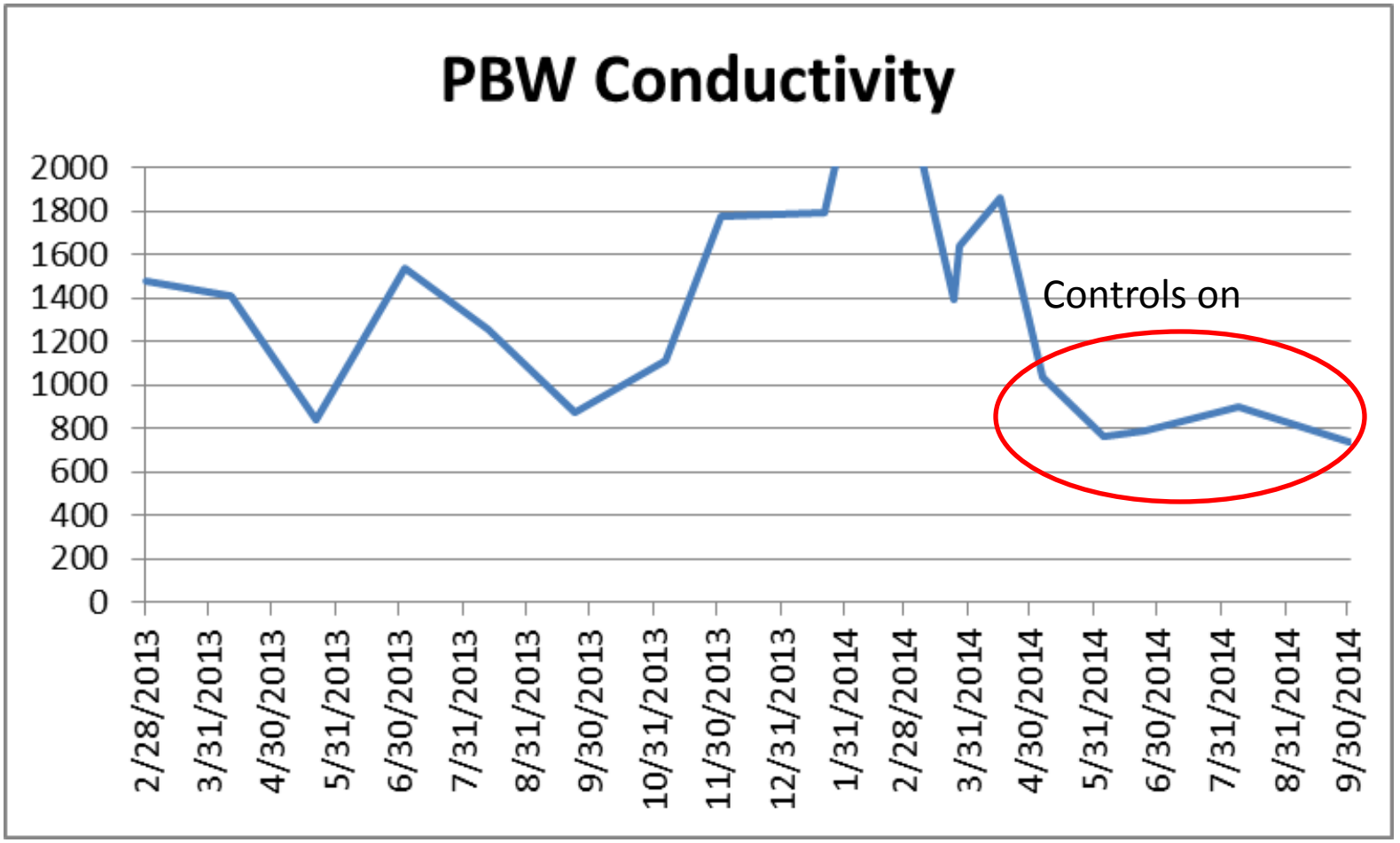

2 BSW Mat COD
2012 - 2015
Variable
2 BSW COD Kg/ADMT
2 BSW Lb/ADST
Data
300
250
200
150
100
50
0
4/18/2012
*
12/19/2012
7/3/2013
12/2/2013
3/24/2014
6/4/2014
11/11/2014
7/23/2015
Date


PBW Mat COD
2012 - 2015
Data
50
40
30
20
10
0
4/18/2012
*
12/19/2012
7/3/2013
12/2/2013
3/24/2014
6/4/2014
11/11/2014
7/23/2015
Date
Variable
PBW COD Kg/ADMT
PBW COD Lb/ADST

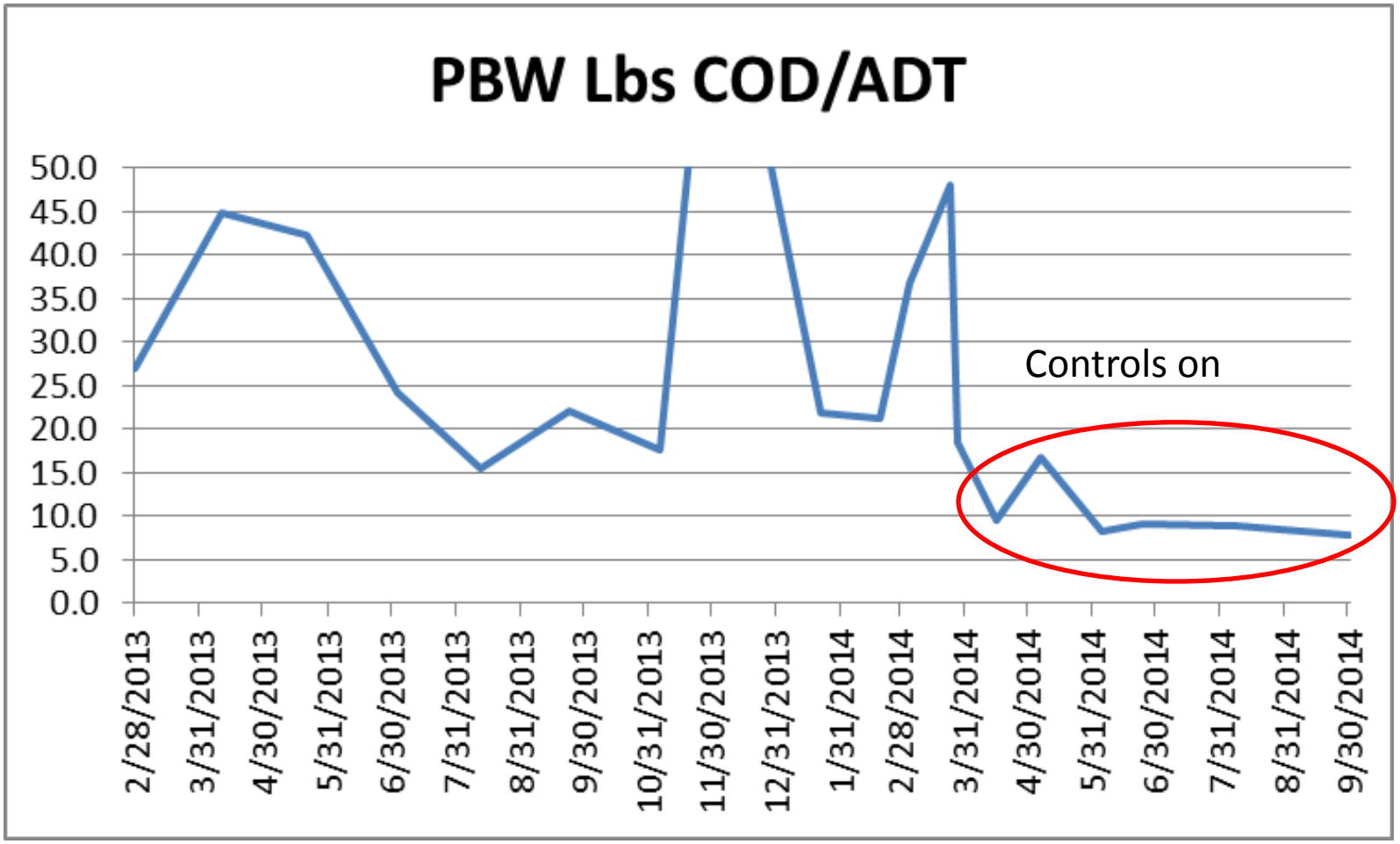
Impact on Pre-O2D Carryover



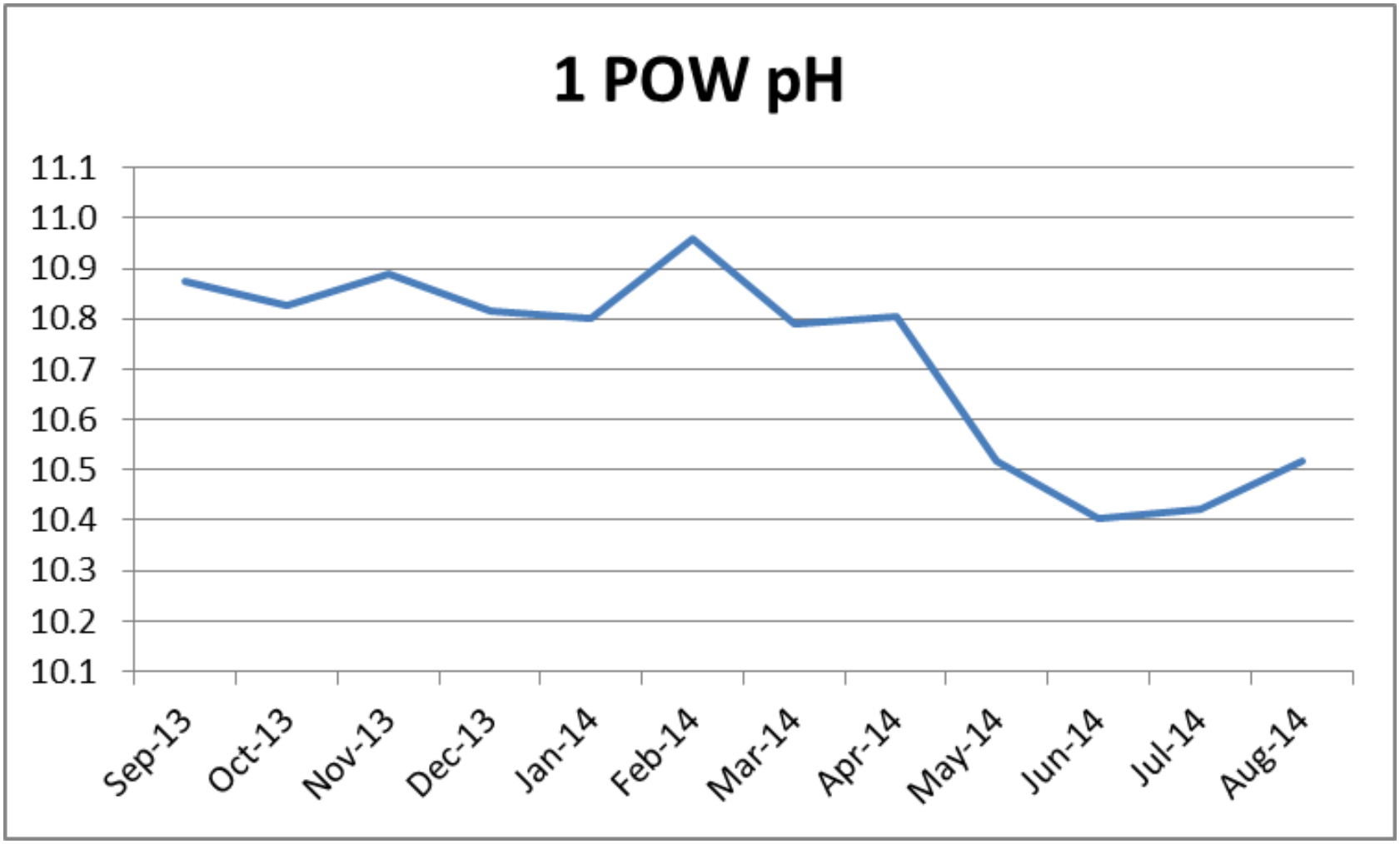
Pre-Bleach Washer Conductivity



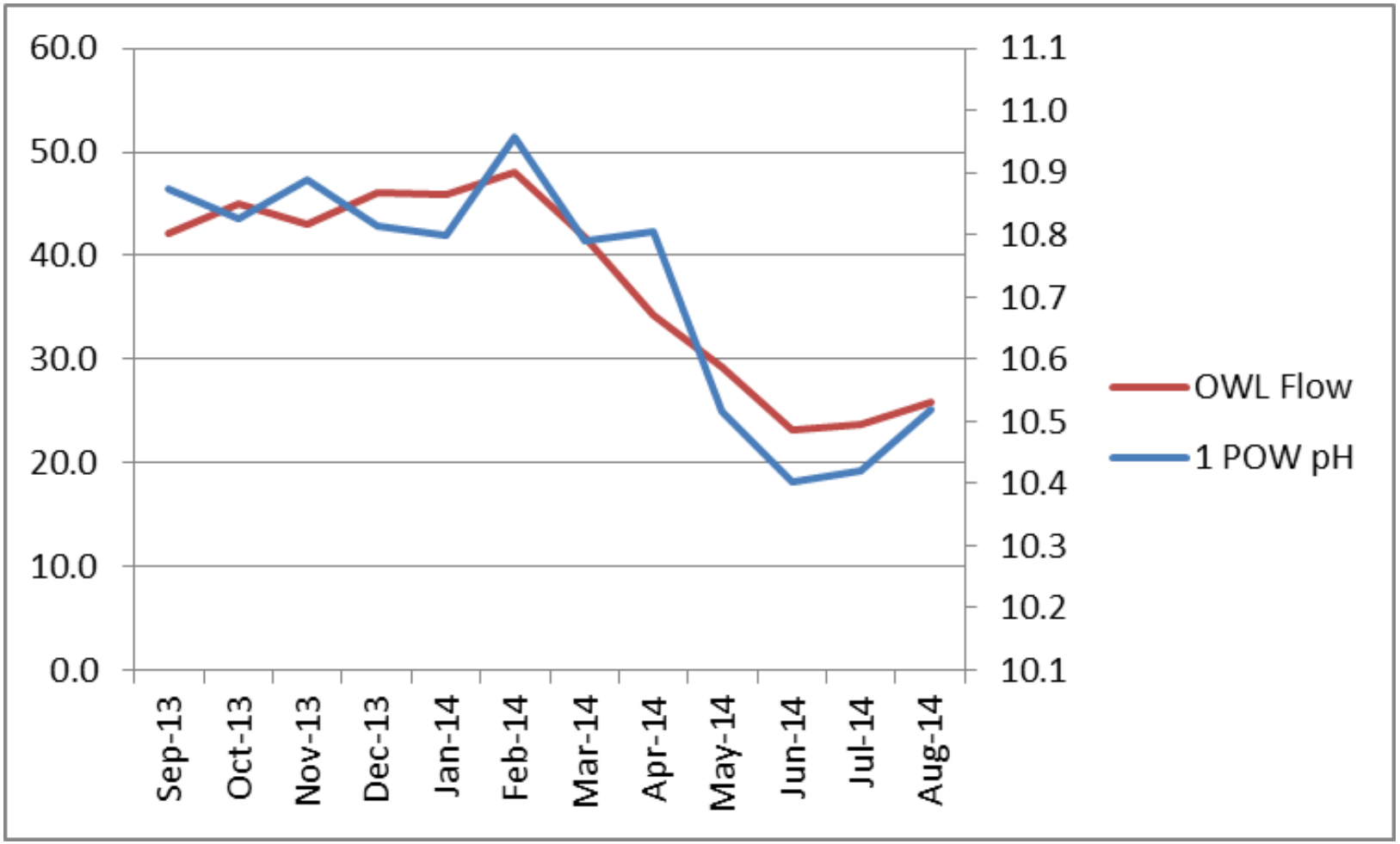
Impact on Pre-Bleach Carryover



Reduction in Post O2D pH

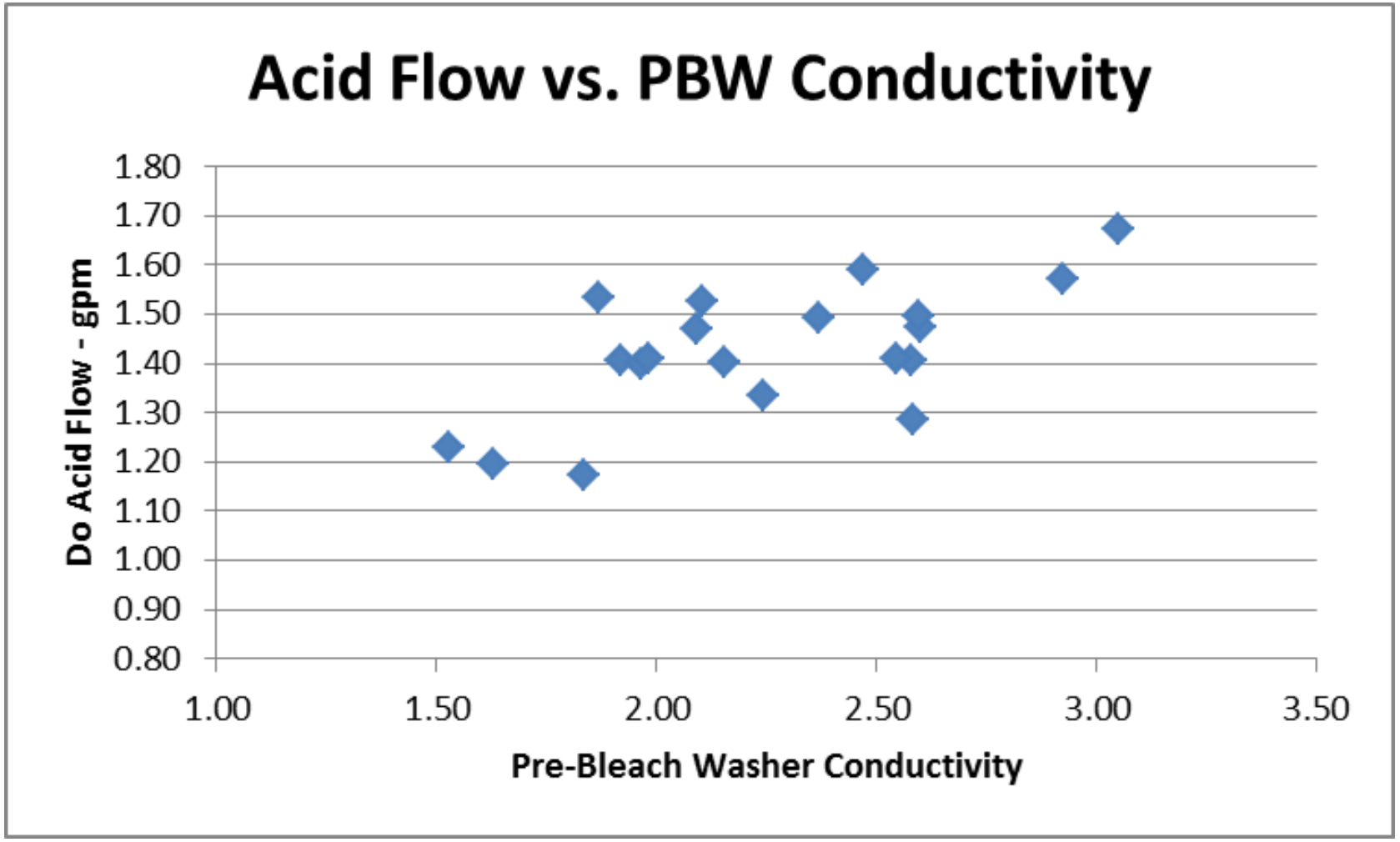


Reduction in OWL Flow

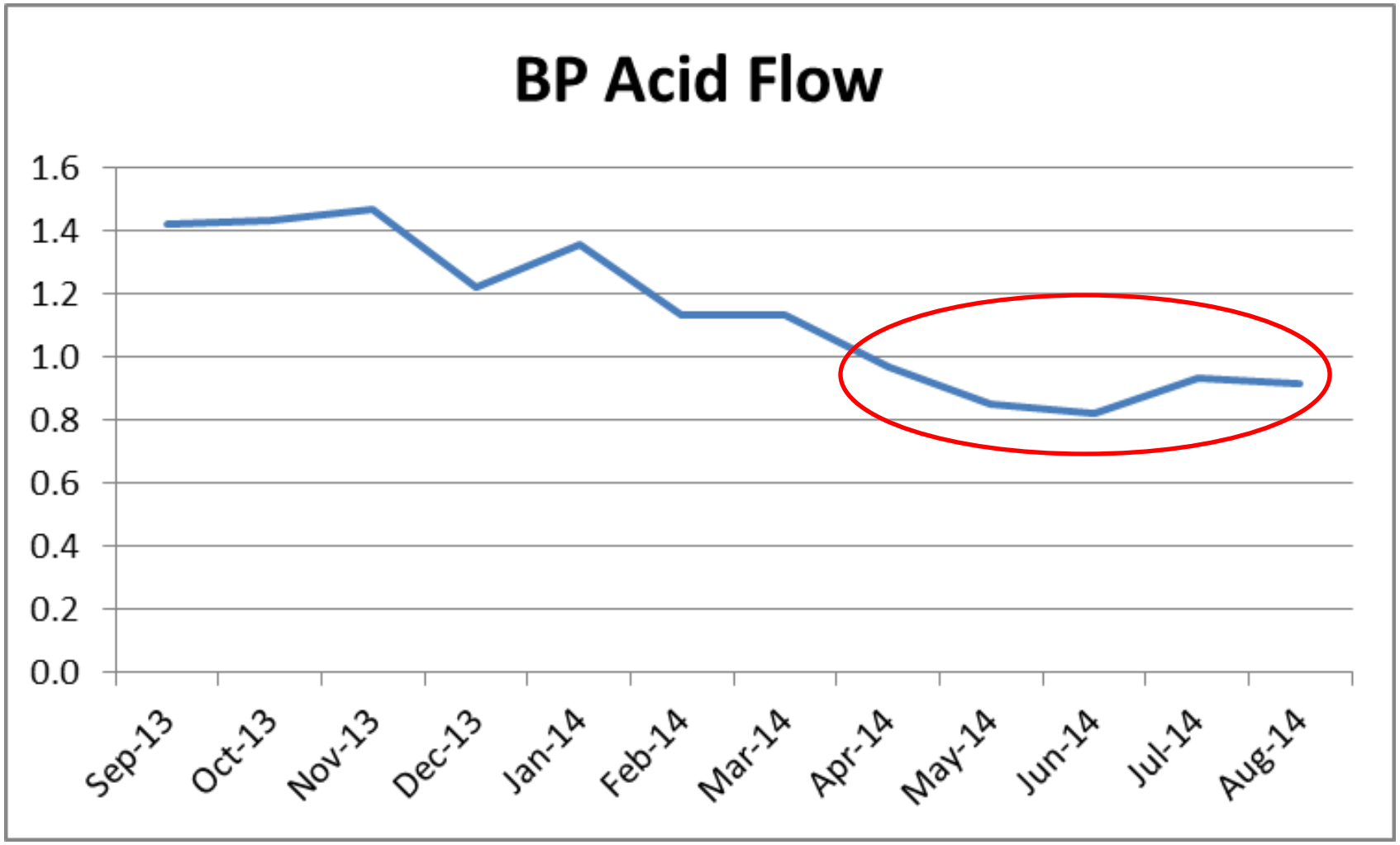


Note: using 1 gpm caustic to help maintain 0 sulfidity from WL Oxidizer. The flow reduction is a combination of the 1 gpm of caustic and the pH target reduction.

Impact of PBW Conductivity on Do Acid Use

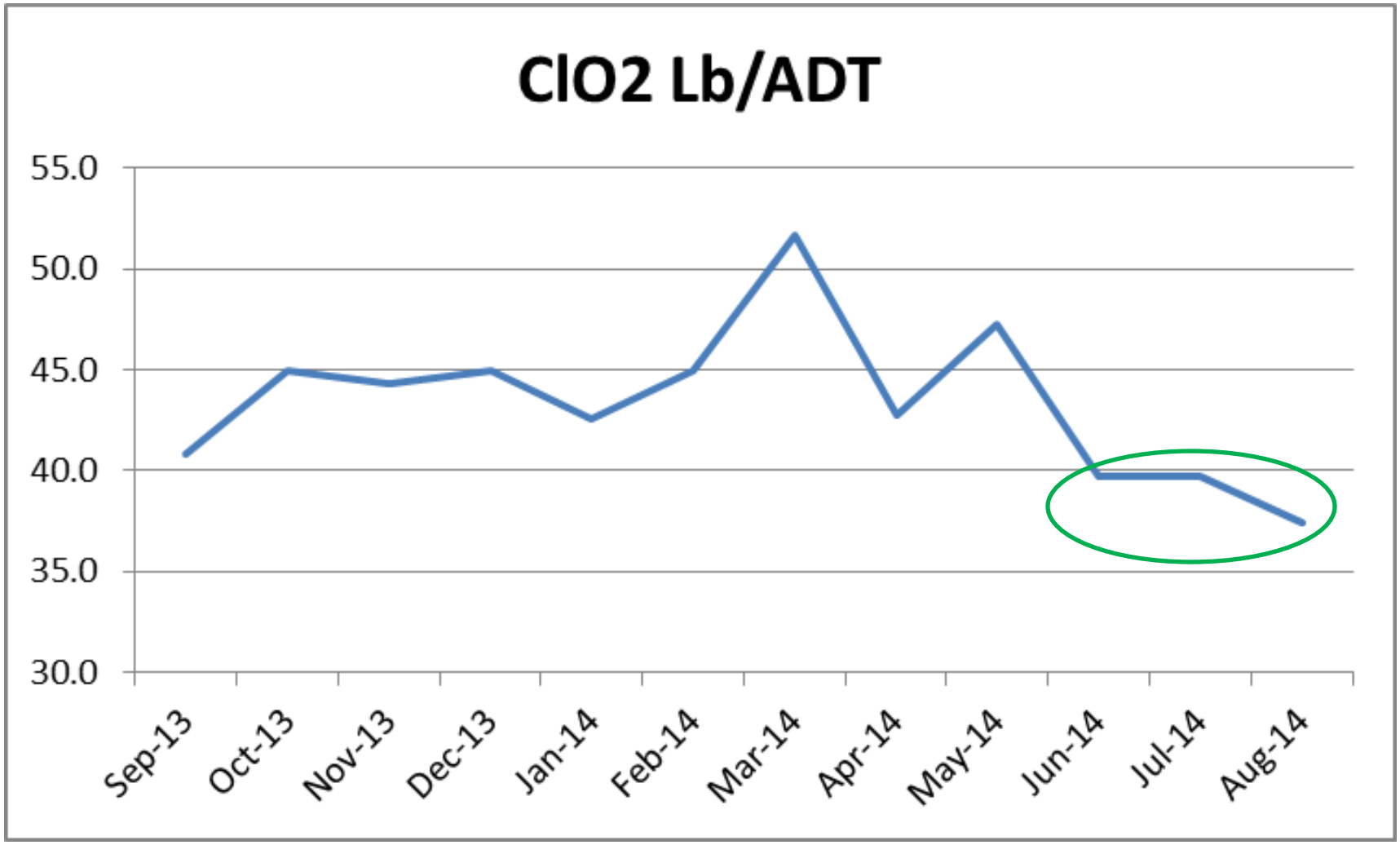


Impact on Do Acid Consumption

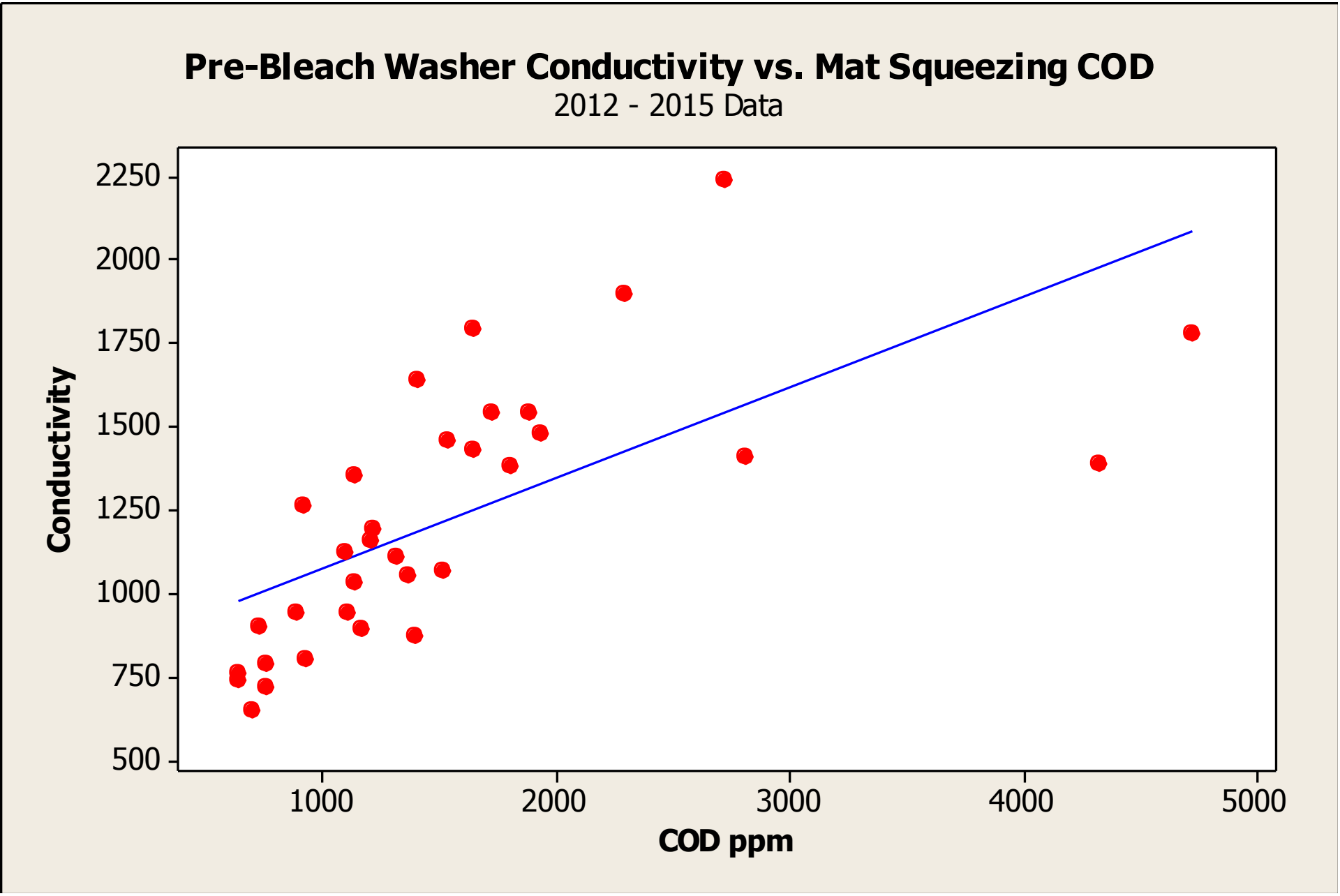


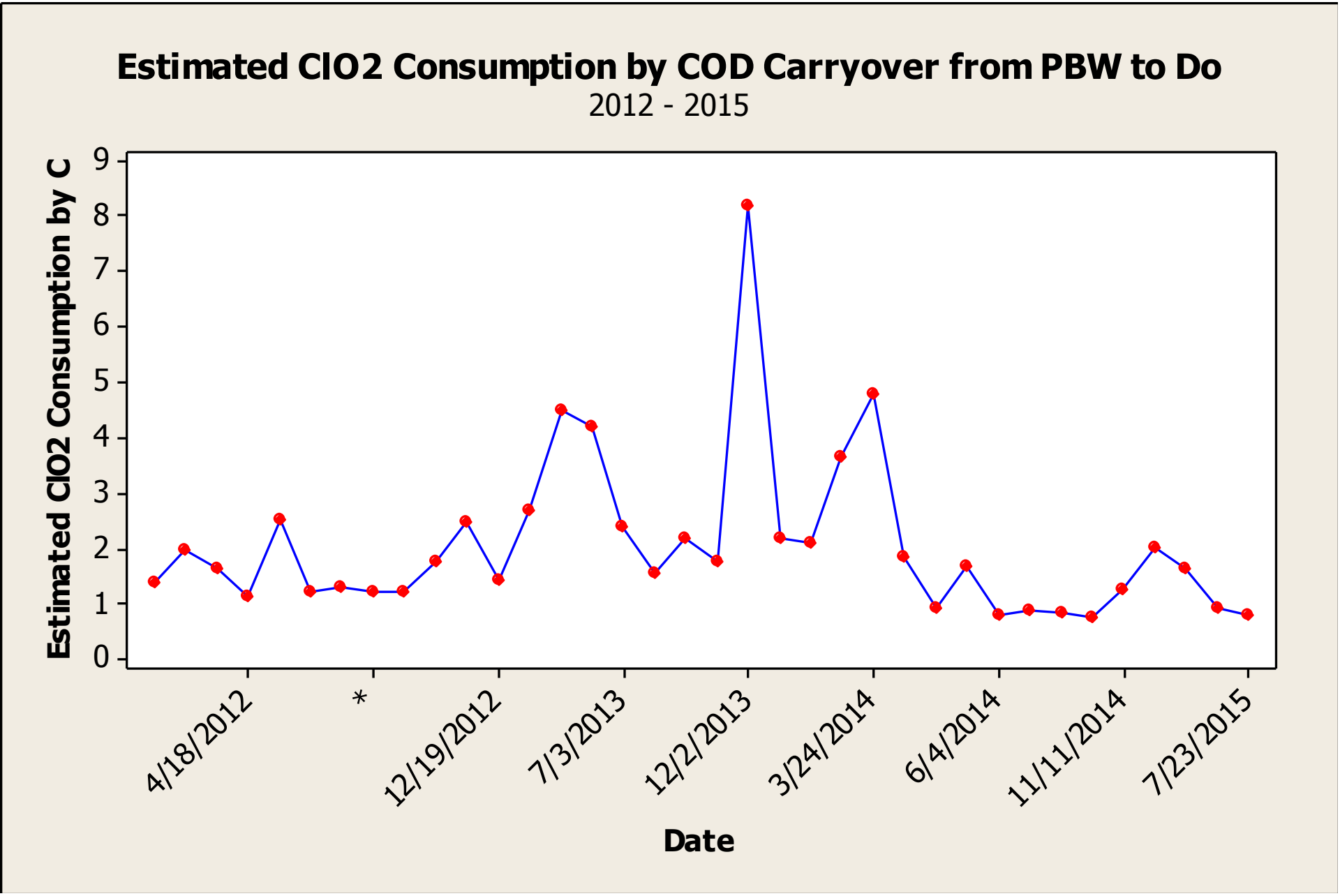
Acid use is down even though Do CLO2 use has also decreased

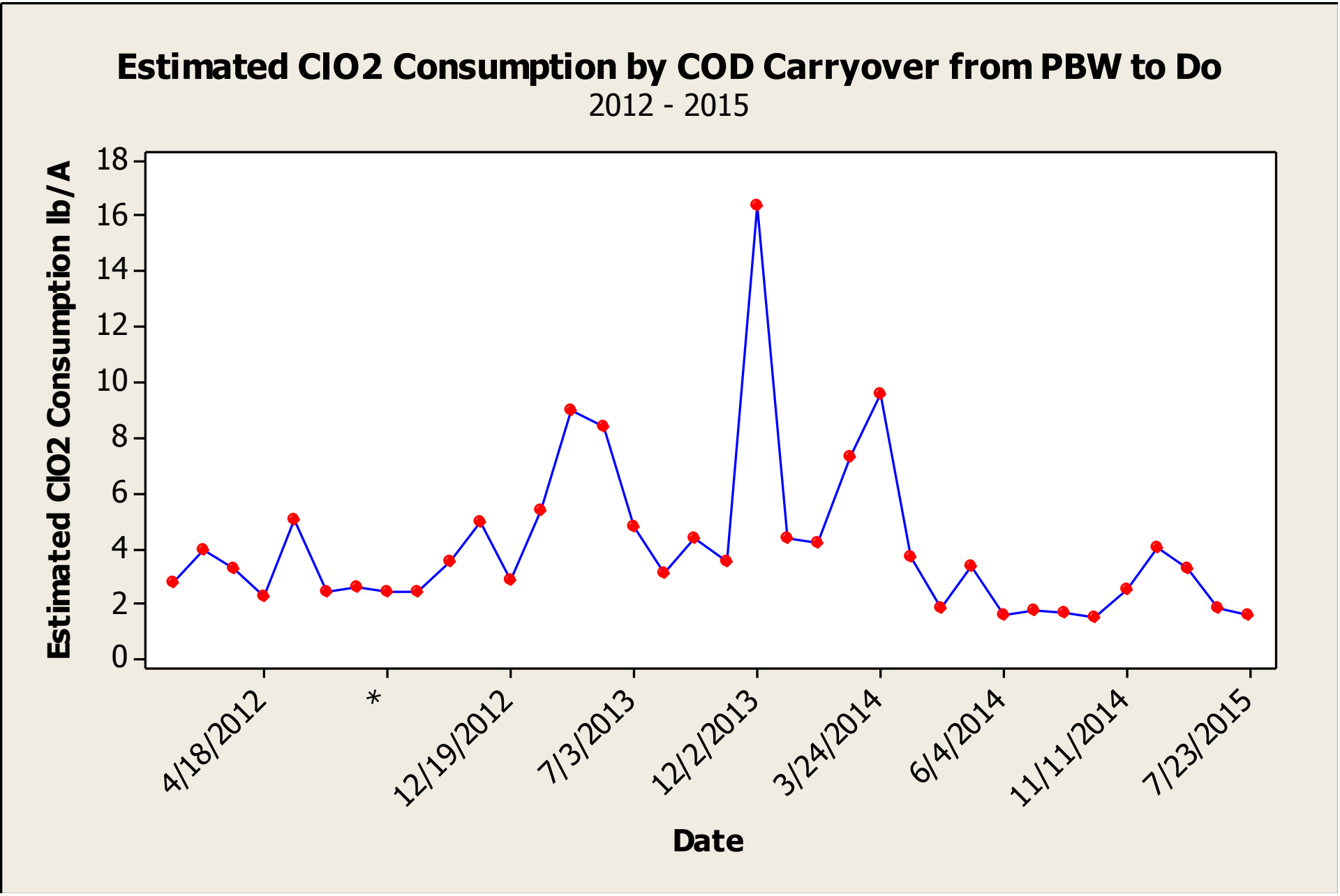
Impact on ClO2 Use



ClO2 use to the same final brightness has been reduced at record production rates


Pre-Bleach Washer Conductivity vs. Mat Squeezing COD
2012 - 2015 Data
Conductivity
2250
2000
1750
1500
1250
1000
750
500
1000
2000
3000
4000
5000
COD ppm


Estimated ClO2 Consumption by COD Carryover from PBW to Do
2012 - 2015
Estimated ClO2 Consumption by C
0
1
2
3
4
5
6
7
8
9
4/18/2012
*
12/19/2012
7/3/2013
12/2/2013
3/24/2014
6/4/2014
11/11/2014
7/23/2015
Date


Estimated ClO2 Consumption by COD Carryover from PBW to Do
2012 - 2015
Estimated ClO2 Consumption lb/A
18
16
14
12
10
8
6
4
2
0
4/18/2012
*
12/19/2012
7/3/2013
12/2/2013
3/24/2014
6/4/2014
11/11/2014
7/23/2015
Date

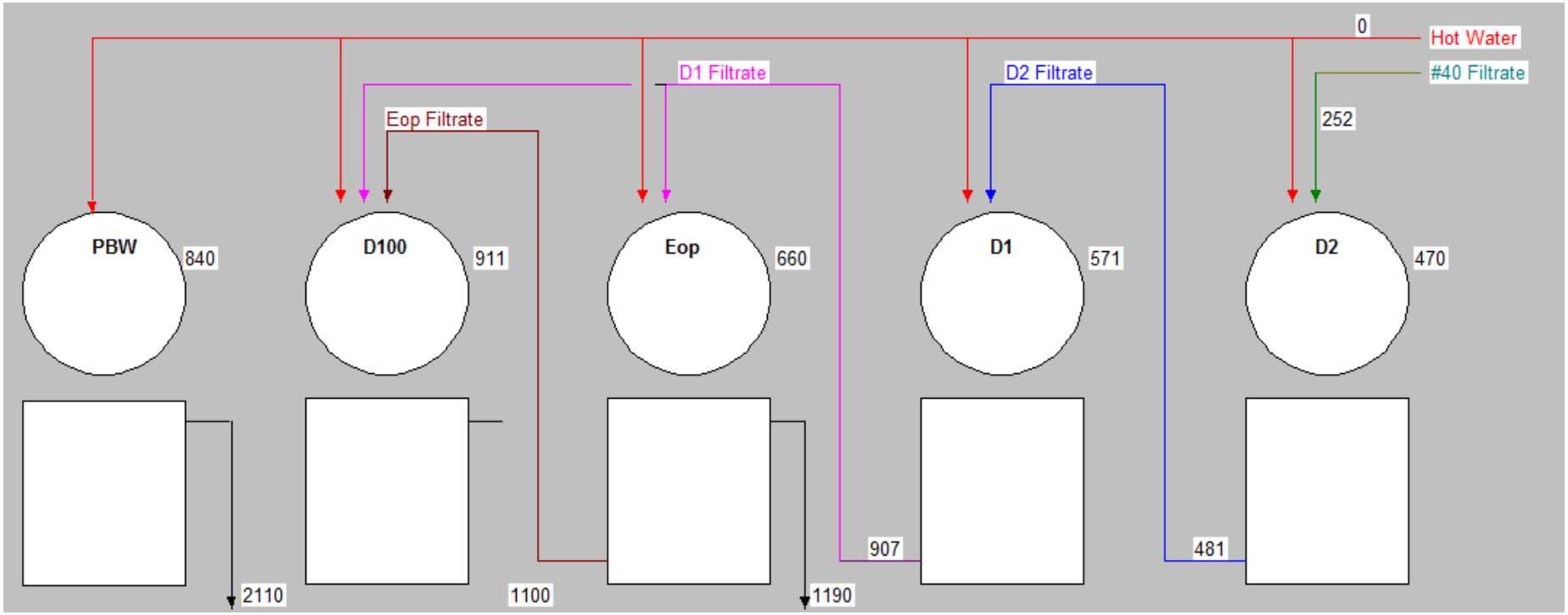
Bleach Plant COD Work

Current & Future Plans

Variability Across Eop Washer Drum

Location	Far South	South	Middle	North	Far North
Consisten	12.84	12.96	10.95	15.07	14.06
COD ppm	720	850	800	1000	950
Kg/ADMT	4.40	5.14	5.86	5.07	5.23
Lbs/ADT	8.80	10.28	11.71	10.14	10.45

Bleach Plant COD Profile



Further Work

- Additional Bleach Plant COD profile data for a baseline
  - Trials with differing shower and recycle configurations to evaluate COD impact
  - Develop the COD vs ClO2 consumption relationship for the washers
  - Regular washed/unwashed K# testing to be instituted
- Use of the above data to justify shower bar changes and to keep track of Bleach Plant washing performance