

Rich Grundza

From: Szappanos, George [George.Szappanos@lubrizol.com]
Sent: Monday, November 26, 2012 2:37 PM
To: 'Altman, Ed'; 'Angela Willis'; 'Bruce Matthews'; Brys, Jerome; Buchanan, Jessica; 'Doyle Boese'; 'Glaenzer, Dave'; 'Janet Buckingham'; 'Jason Bowden'; 'Karin Haumann'; NON-LZ LANG PATRICK; NON-LZ LEVERETT CHARLIE; Rich Grundza; 'Tim Caudill'; Ritchie, Andrew (Andrew.Ritchie@Infineum.com)
Subject: RE: Sequence III PVIS severity task force

Meeting minutes:

On call -

Szappanos, George; 'Altman, Ed'; 'Angela Willis'; Buchanan, Jessica; 'Doyle Boese'; 'Janet Buckingham'; 'Jason Bowden'; 'Karin Haumann'; LANG PATRICK; 'Richard Grundza'; Andy Ritchie; Dwight Bowden

Summary -

Rich Grundza's presentation re oil consumption suggests that a shift occurred in 2007. There is some correlation to severity.

Recommendation to revisit Doyle's analysis from IIIG. **Action: Doyle to investigate**

Suggestion to apply Todd's analysis of IIIG severity, but applied to IIIF. **Action: Todd to investigate**

Suggestion to create CUSUM chart on 60 and 70 hr intervals. **Action: Rich to investigate**

Question of when was the current block introduced; is it related to the shift. **Action: Labs/chairman to investigate**

Suggestion to investigate individual labs' oil pressure data. **Action: Labs to investigate -**

- Higher resolution would allow a more precise determination of dip location
- Additional analysis might include:
 - Oil pressure change, overall and at each oil add
 - Is there a fundamental difference in the shape of the pressure signature

What about blowby- has the level changed; should revisit Todd's analysis. **Action: Labs to investigate**

Next meeting Dec 12, 11am

-----Original Appointment-----

From: Szappanos, George

Sent: Friday, November 16, 2012 2:28 PM

To: Szappanos, George; 'Altman, Ed'; 'Angela Willis'; 'Bruce Matthews'; Brys, Jerome; Buchanan, Jessica; 'Doyle Boese'; 'Glaenzer, Dave'; 'Janet Buckingham'; 'Jason Bowden'; 'Karin Haumann'; NON-LZ LANG PATRICK; NON-LZ LEVERETT CHARLIE; 'Richard Grundza'; 'Tim Caudill'

Subject: Sequence III PVIS severity task force

When: Wednesday, November 21, 2012 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).

Where: conf call; call-in number TBD

Thanks to everyone that volunteered for this task force (and even those that were volunteered!). It may be a challenging proposition, but I'd like to see if we can schedule a conference call next week.

The objective of the initial conference call will be to establish the scope and goals of the task force and develop a plan of attack.

Here's a DRAFT of an agenda (please reply with suggestions):

- I. Overall Goal – identify the cause of PVIS severity trend and implement a correction
 - a. Validate Lubrizol's findings that the trend exists
 - i. It would be ideal if TF members begin investigating in advance of the call
 - b. Identify the point in time that 433 begins to shift
 - i. Determine the degree of the severity (in either PVIS or test hours)
 - c. Analyze test variables to detect correlation with the shift point
 - i. Hardware
 - ii. Fuel
 - iii. Oil
 - iv. Procedural changes
 - v. Other
 - d. Investigate alternative (statistical) methods such as industry correction factor
- II. Scope – sequence IIIF
 - a. Initial investigation should be targeted at IIIF
 - b. Secondary analysis to include IIIG
- III. Implementation of a fix

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IIIF Hardware Analysis to Date

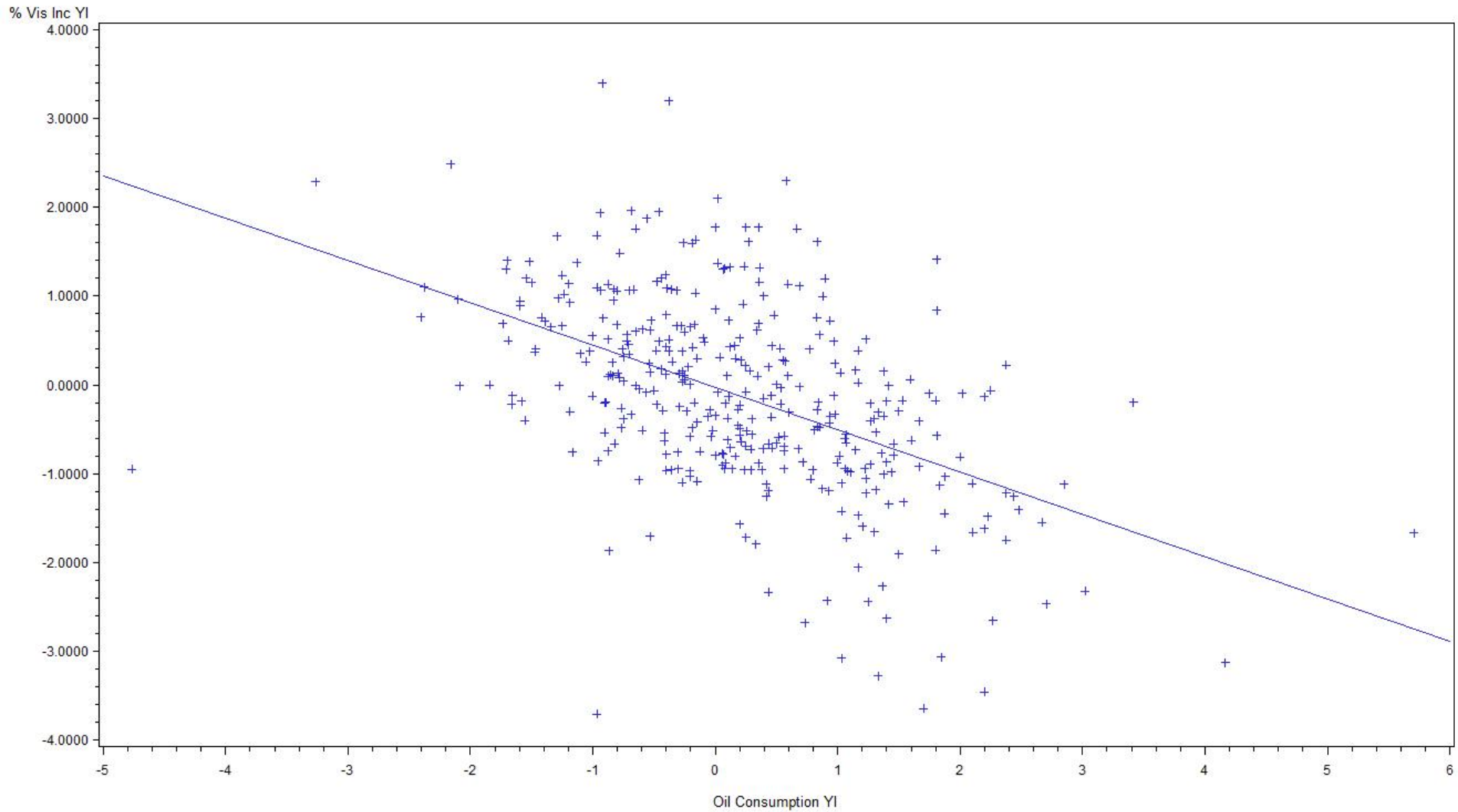
11/12/12 Conference call

PVIS Shift and Factors

- One Suggestion was shifts in oil consumption may be driving PVIS severity, Attached plot of PVIS (transformed) versus Oil consumption.
- Oil Consumption targets derived from same data sets used for test parameter targets.
- Regression analysis suggests significant correlation between oil consumption and vis increase, though only about 25% of the variability can be explained by the changes in oil consumption.

Sequence IIIF

Plot of Vis Increase delta/s versus Oil Consumption Delta/s



r-square = 0.248

11/21/2012

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PVIS Shift and Factors

- Next plots show the trends in Pvis severity for all oils and oil 433-1 only.
- Industry appears to shift around the beginning of 2007, 433-1 appears to mimic this behavior.

% VISCOSITY INCREASE

CUSUM Severity Analysis

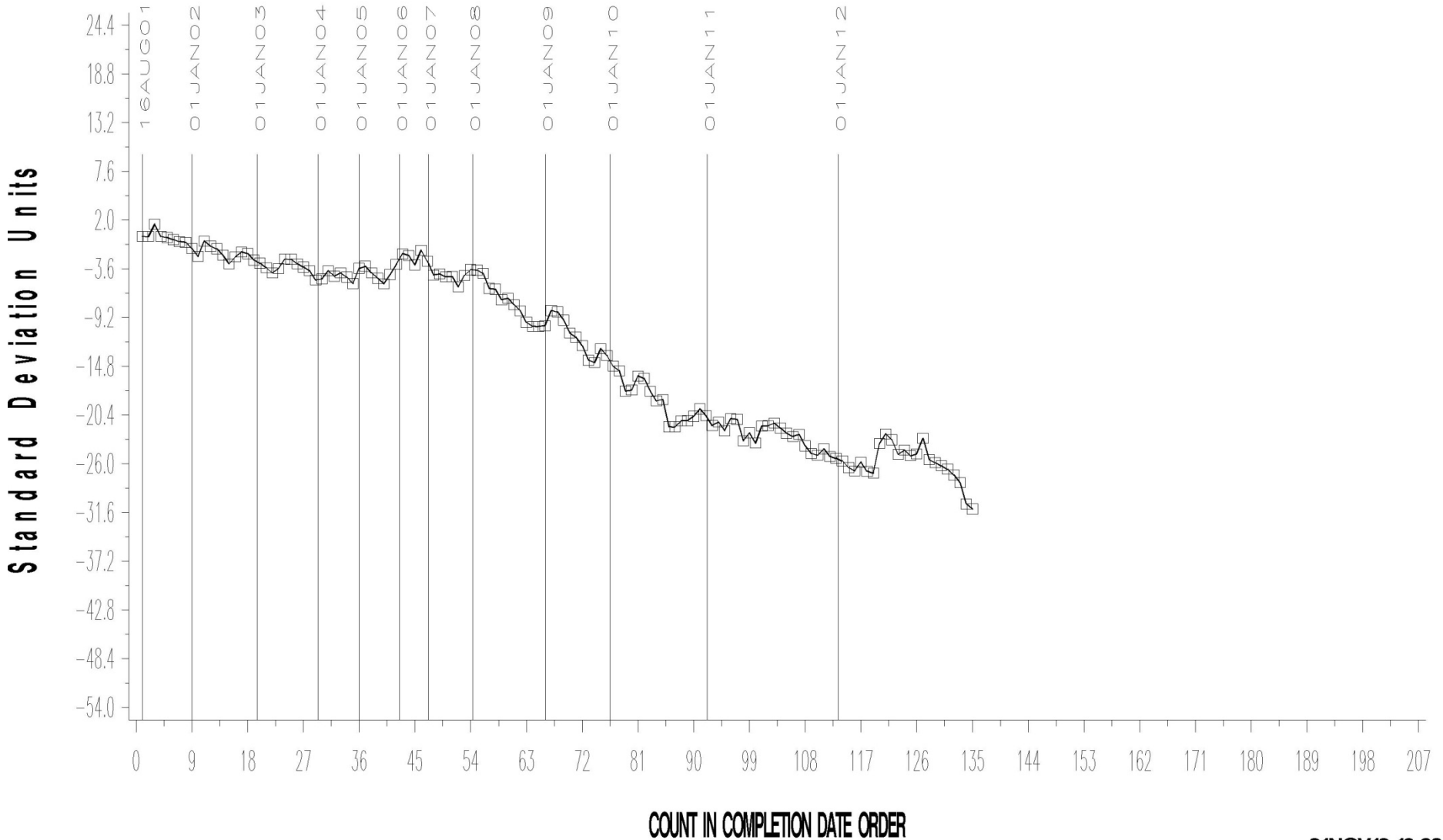


SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

Reference oil 433-1 Only

% VISCOSITY INCREASE

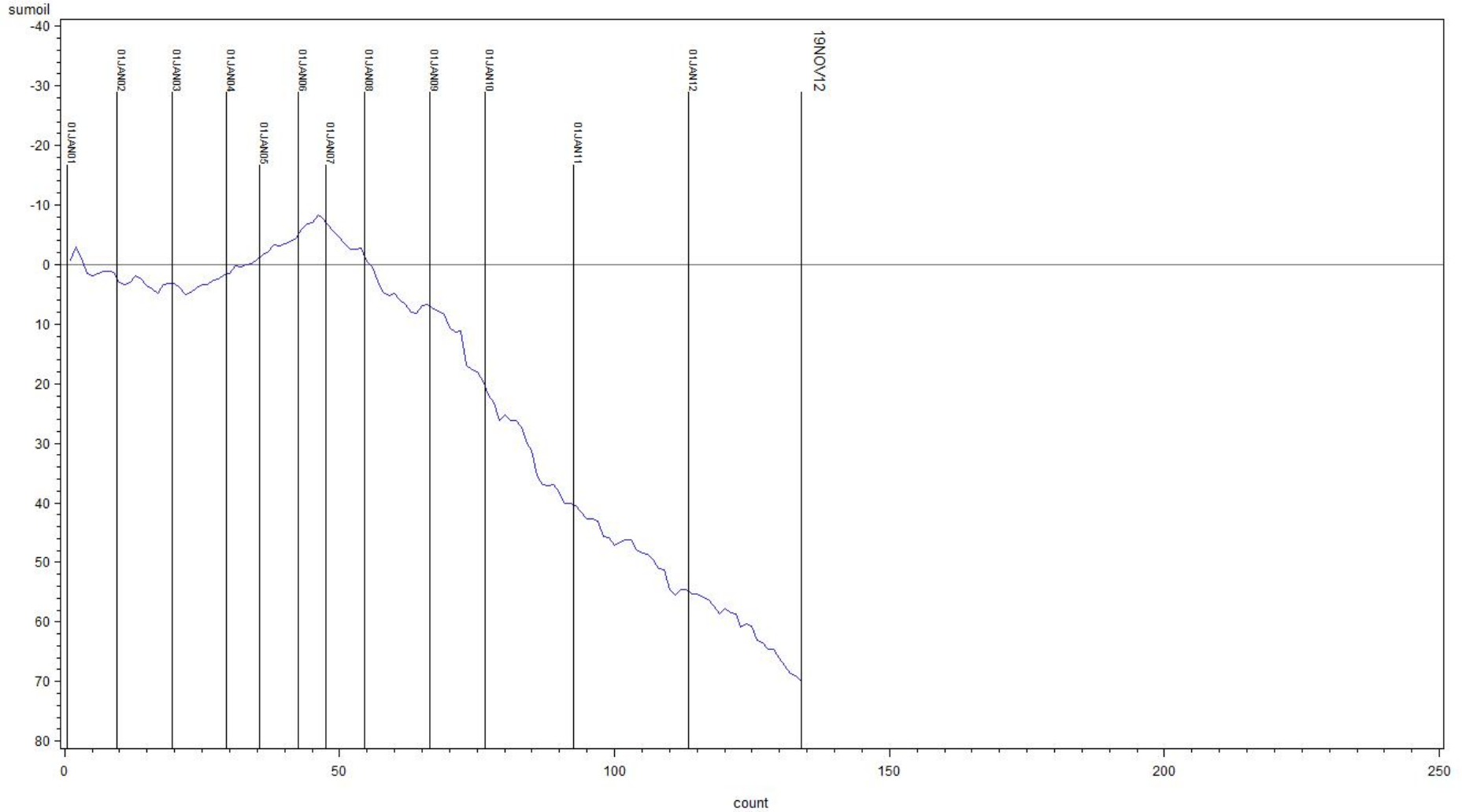
CUSUM Severity Analysis



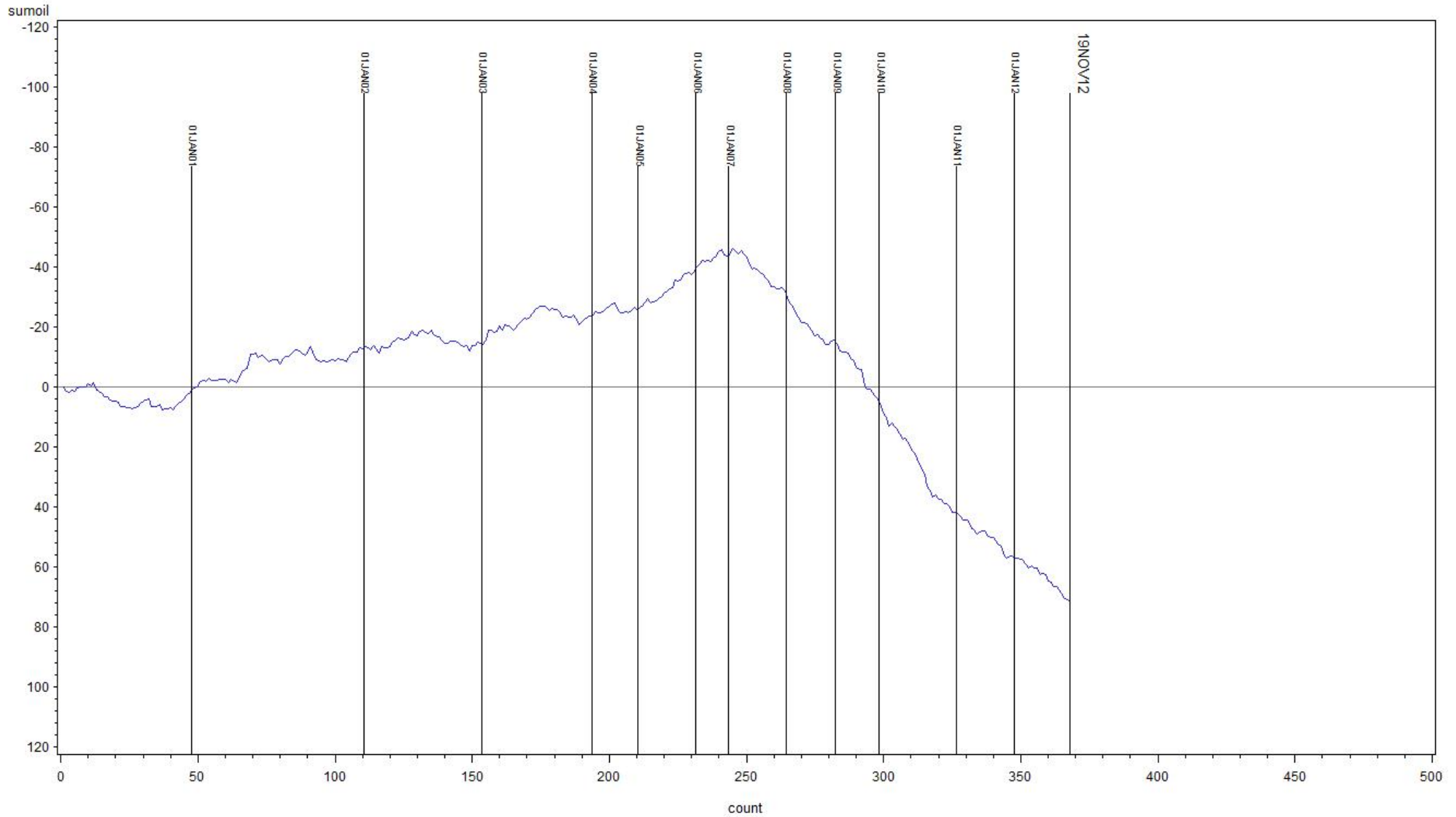
PVIS Shift and Factors

- Next plots show the trends in Oil consumption severity for all oils and oil 433-1 only.
- Industry appears to shift around the beginning of 2007, 433-1 appears to mimic this behavior, similar to pvis.
- Plots of ring batch versus vis increase and oil consumption.
- Ring batch probably not associated with shift.
- Also Honing change in IIIG took place in late 2003, probably not a factor in IIIF shift, but labs might like to comment on whether blocks are honed similar to IIIG or not.
- Continue to evaluate hardware factors, pistons, valve seals.

SEQUENCE IIIF CUSUM Plot of Oil consumption 433-1 only

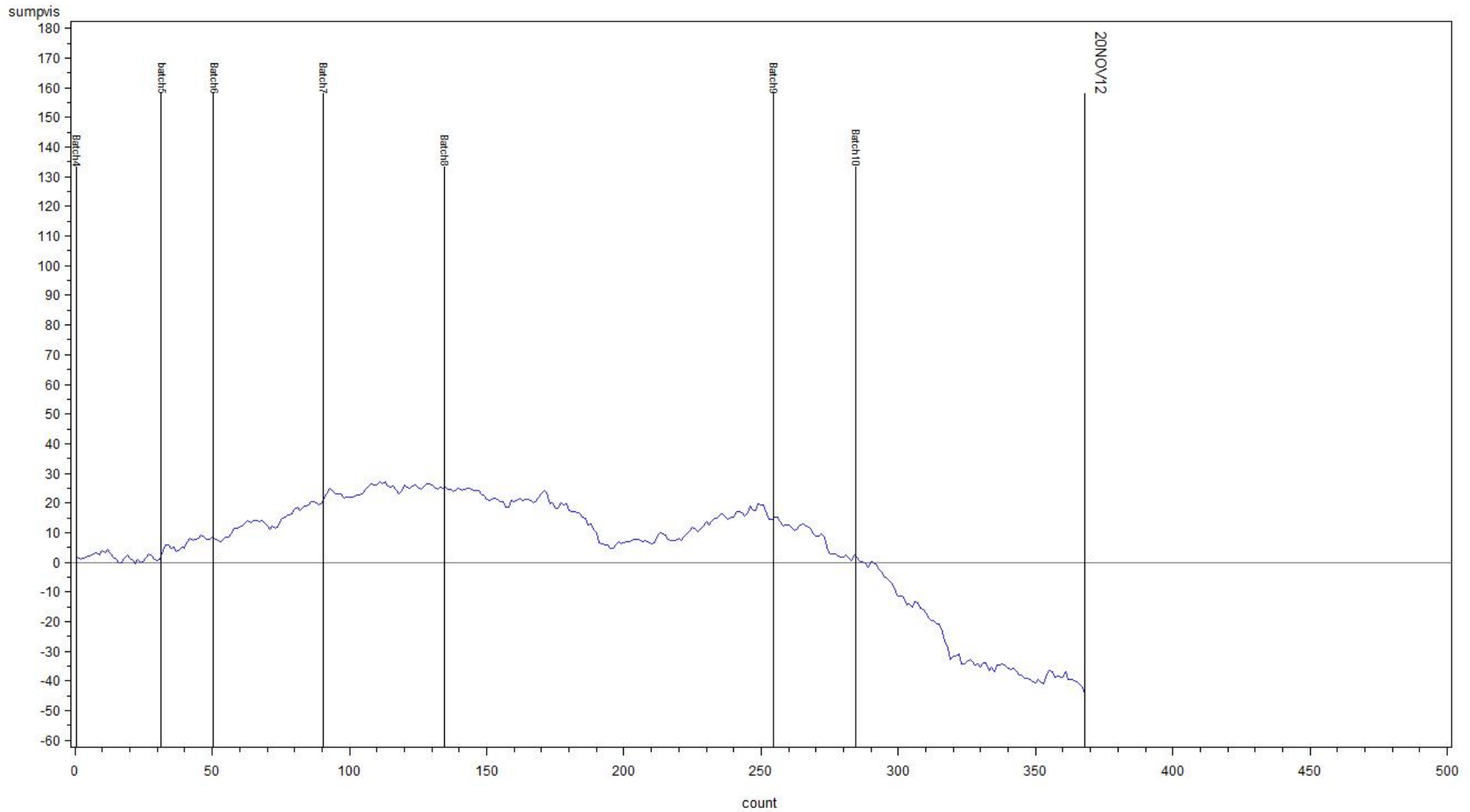


SEQUENCE IIIF CUSUM Plot of Oil consumption



SEQUENCE IIIF

CUSUM Plot of VIS Increase by ring batch



r-square = 0.248

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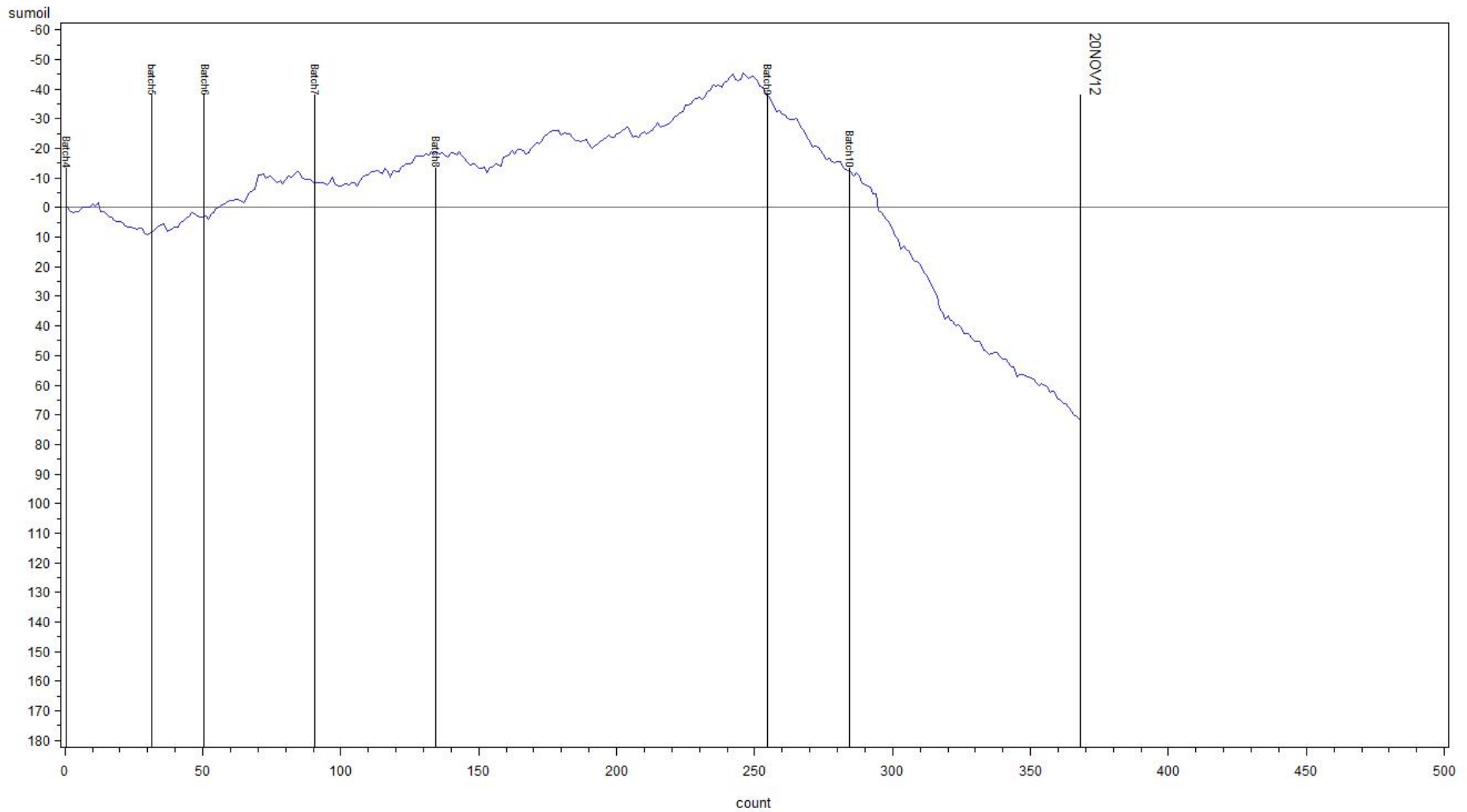
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SEQUENCE IIIF

CUSUM Plot of Oil consumption by ring batch



r-square = 0.248

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