Quality Control Data
Leak Check & Test to Test Variability

June 2016

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Leak Check Video of Ford automated sample system

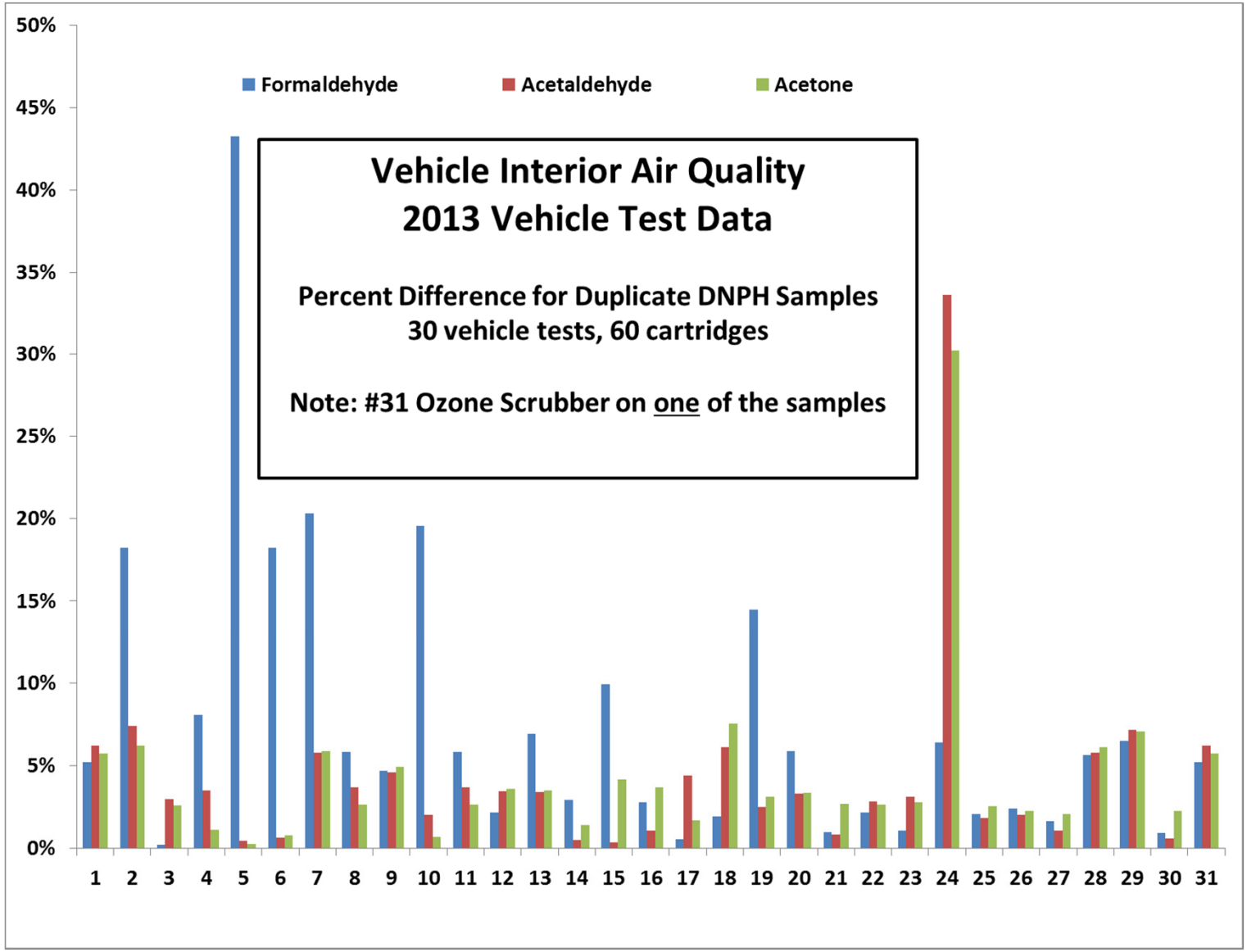
- 1st time was without tubes and cartridges connected
  - ❑ Starting vacuum was ~26 inHg
  - ❑ Ending vacuum after 10 seconds was ~0 inHg
- 2nd time was when the samples were connected but not pushed together far enough.
  - ❑ The DNPH Cartridges have a lure fitting with a 2 degree tapper and can leak if not pushed together tightly. Same can be true if soft tubes are used to connect to the cartridge. Not recommend to use soft tubes as the tube itself can off gas.
  - ❑ Starting vacuum was ~26 inHg
  - ❑ Ending vacuum after 10 seconds was ~20.5 inHg (5.5 inHg less)
- 3rd time was when the system was leak free after the
  - ❑ Starting vacuum was ~26 inHg
  - ❑ Ending vacuum after 10 seconds was ~25.3 inHg (0.7 inHg less)

Play Video

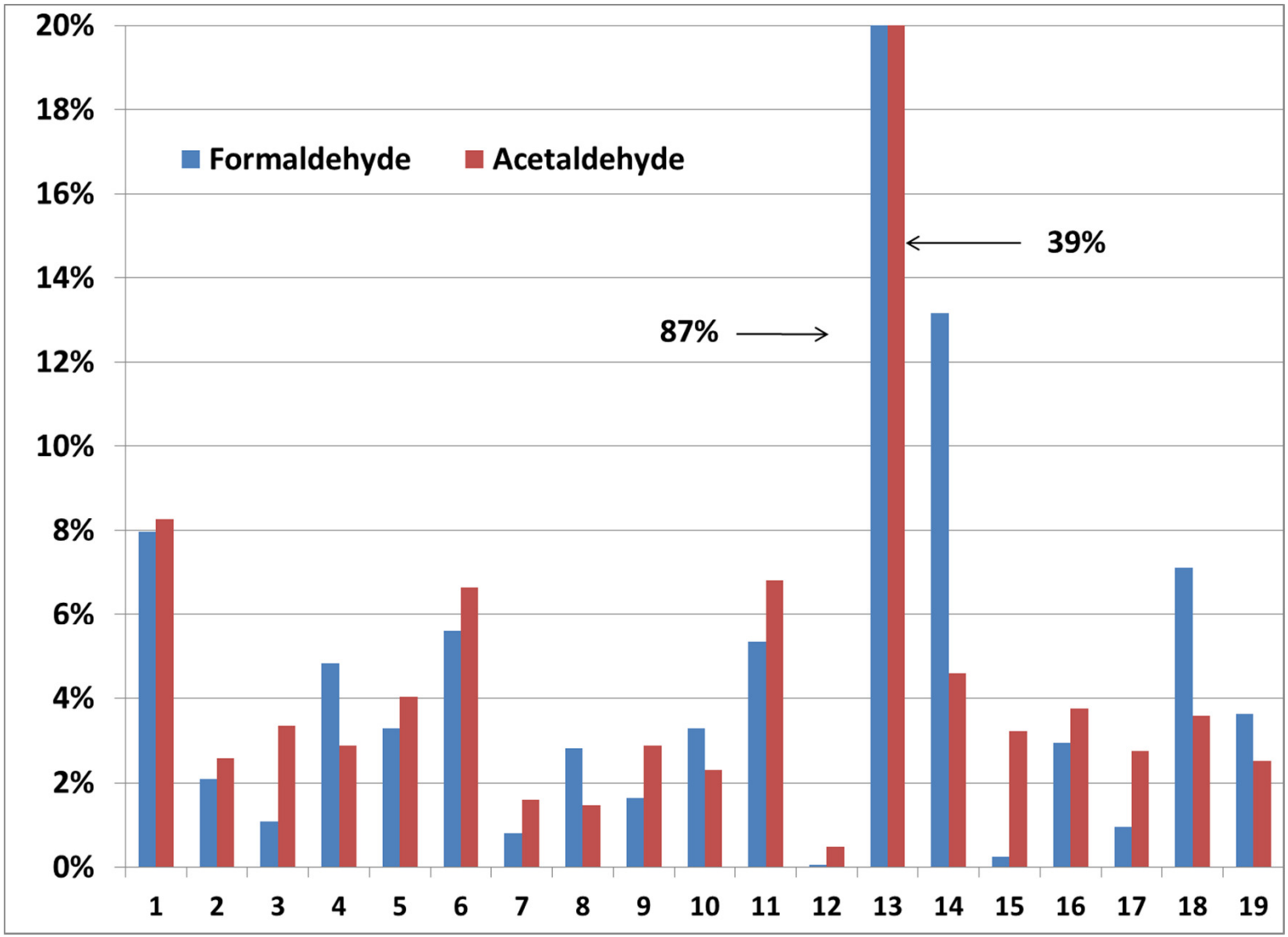
Duplicate Data

- The next two slides show duplicate DNPH data from VIAQ tests in 2013 and 2014.
- The bars represent the absolute value of the difference between the two DNPH samples as a percentage of values of 100 for Formaldehyde and 50 for Acetaldehyde.
- The differences are due to leaks, flow accuracy of the mass flow controllers (MFC), collection efficiency of the DNPH cartridge, background levels on the DNPH cartridge, and HPLC analytical accuracy.
- Based on the results the MFCs, HPLC process and collection efficiencies show good repeatability.
- The random errors are assumed to be the result of background contamination.
- The cartridge background contamination was worse in 2013 and improved after we worked with the cartridge manufacturer to reduce the background on the sample.
- Background contamination can still be an issue from time to time.

2013 Duplicate Data



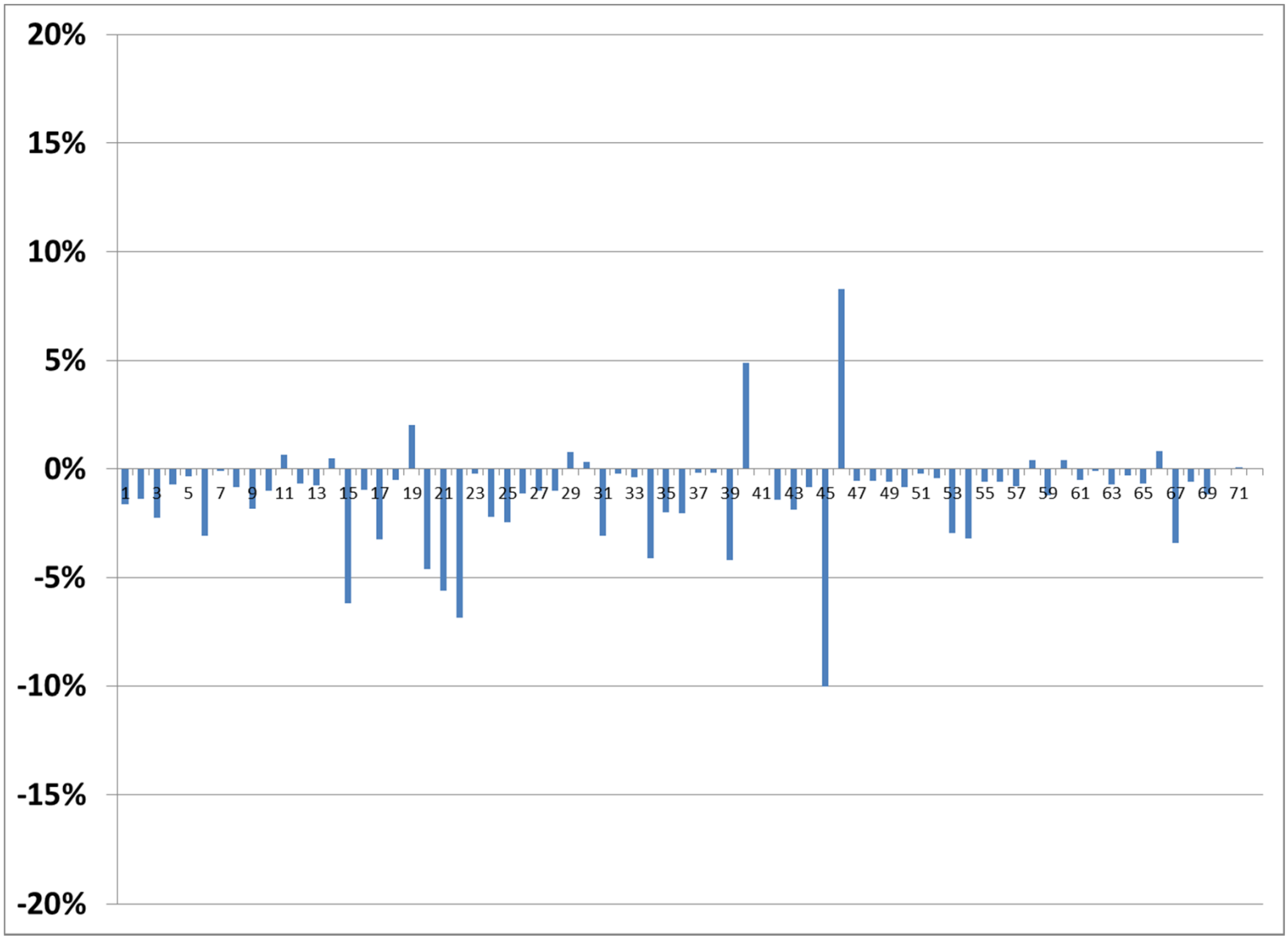
2014 Duplicate Data



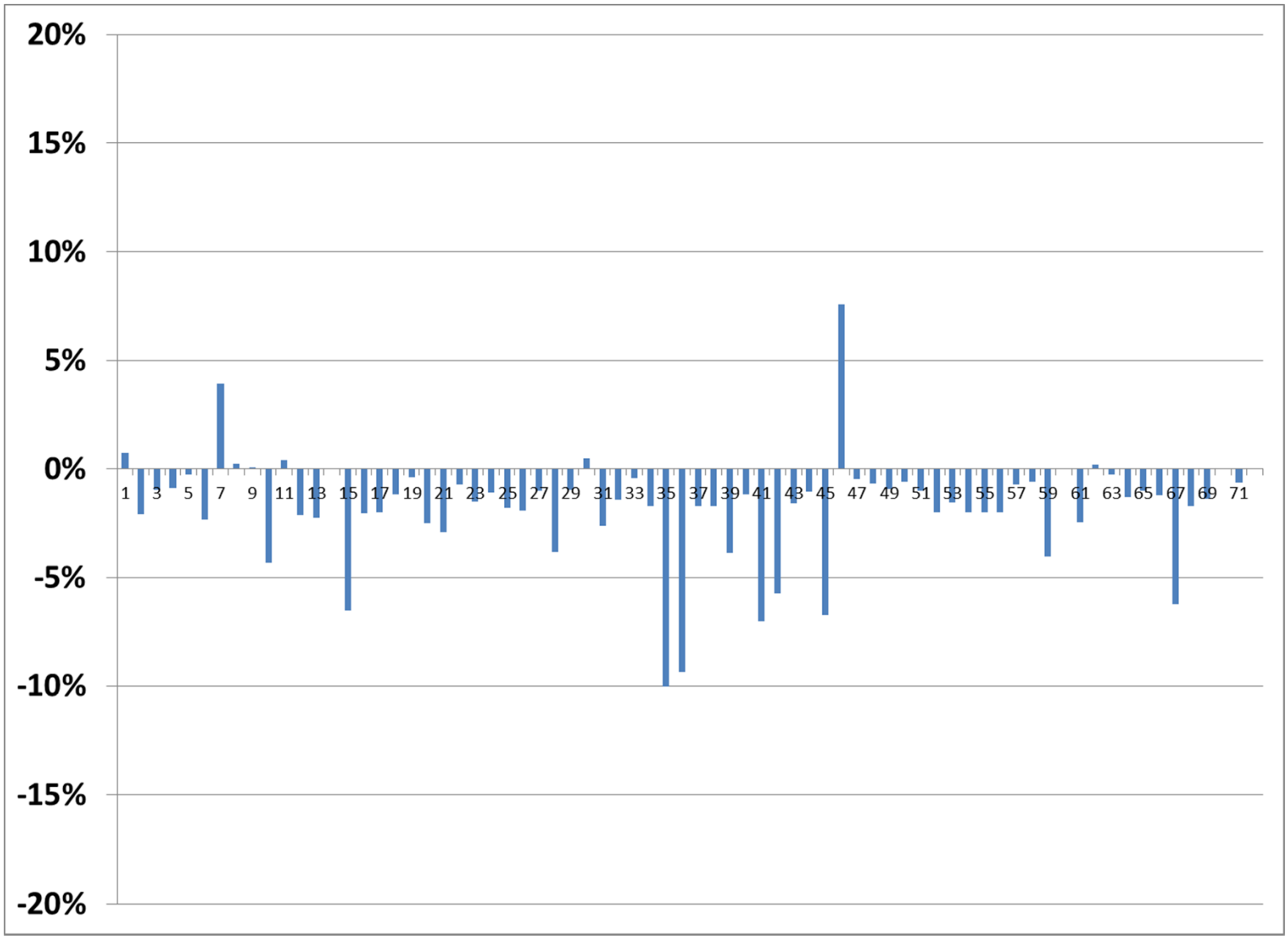
2015-08 to 2016-05 Duplicate Data

- Total tests = 72
- Data shown in chronological order
- All tests were with 16 hour soak time
- Age of the vehicles varied but mostly within 2 months of age
- Percent difference = (sample 1 - sample 2) / value below
  - ❑ Mass Flow Controller 1 and 2
    - Formaldehyde, 100
    - Acetaldehyde, 200
    - Acrolein, 50
    - Acetone, average of data
  - ❑ Mass Flow Controller 3 and 4
    - Benzene, 60
    - Toluene, 1000
    - Xylene, 1000
    - Ethylbenzene, 1000
    - Styrene, 260
    - TVOC, average of data

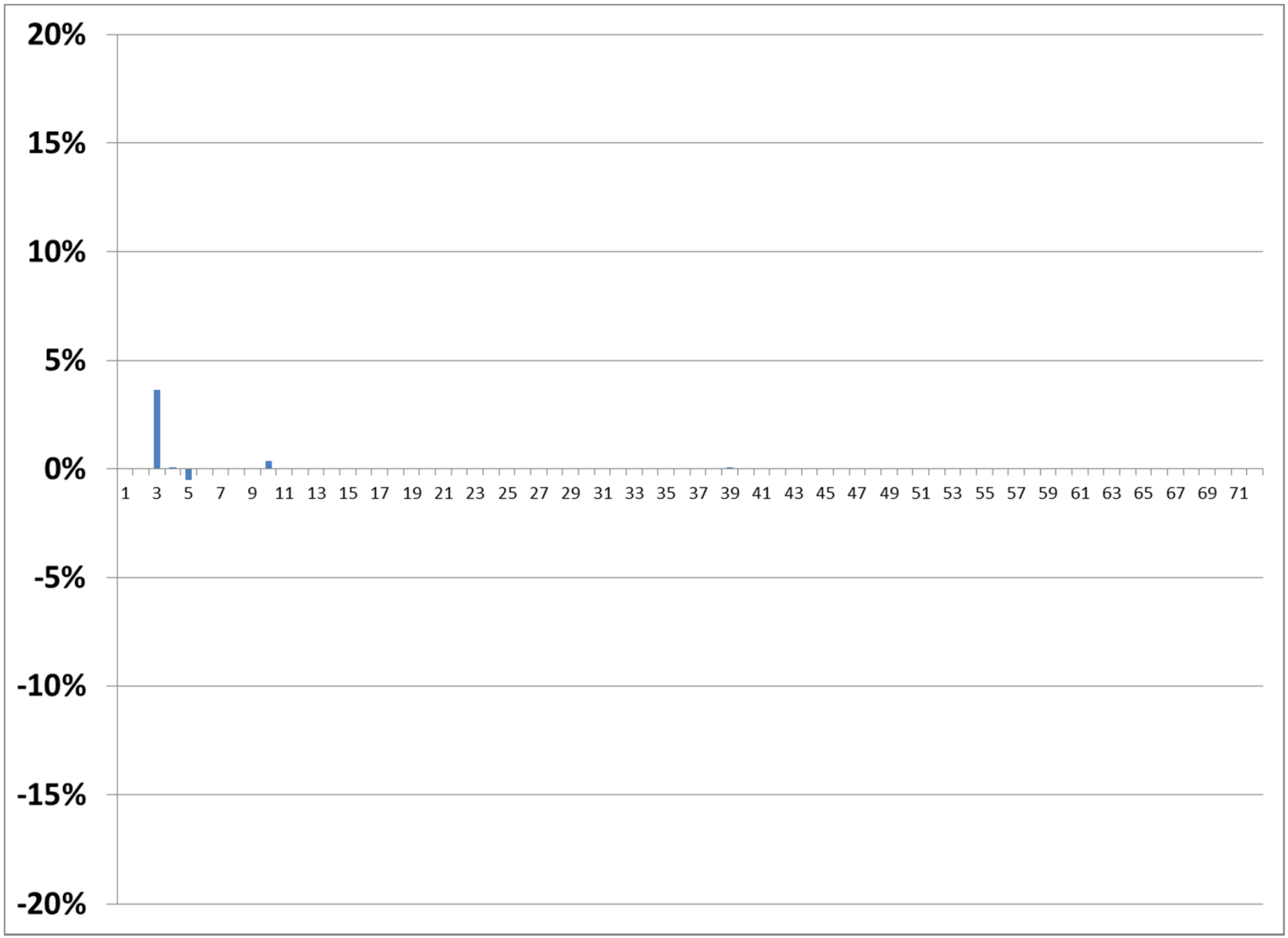
2015-08 to 2016-05 Duplicate Data - Formaldehyde



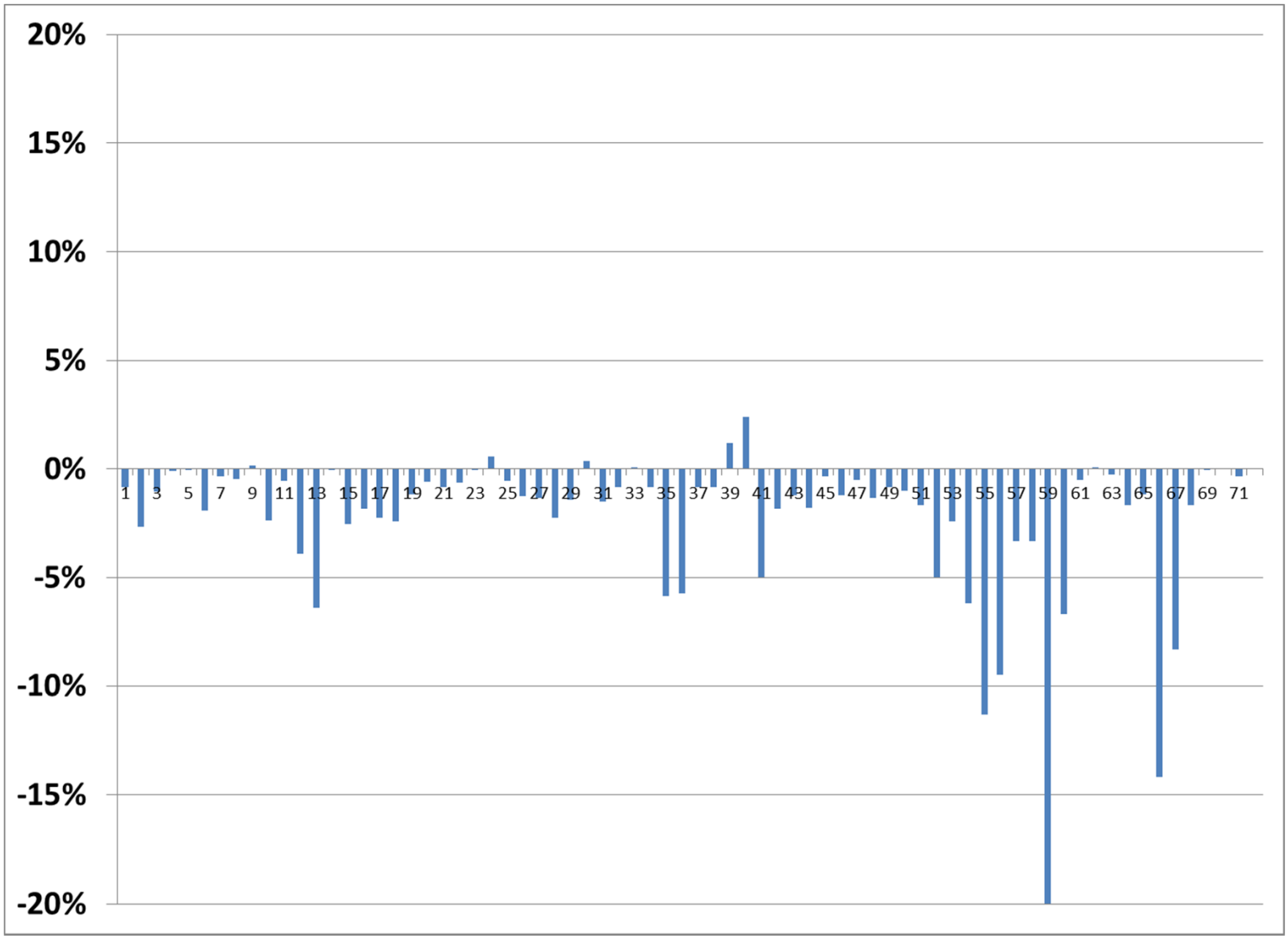
2015-08 to 2016-05 Duplicate Data - Acetaldehyde



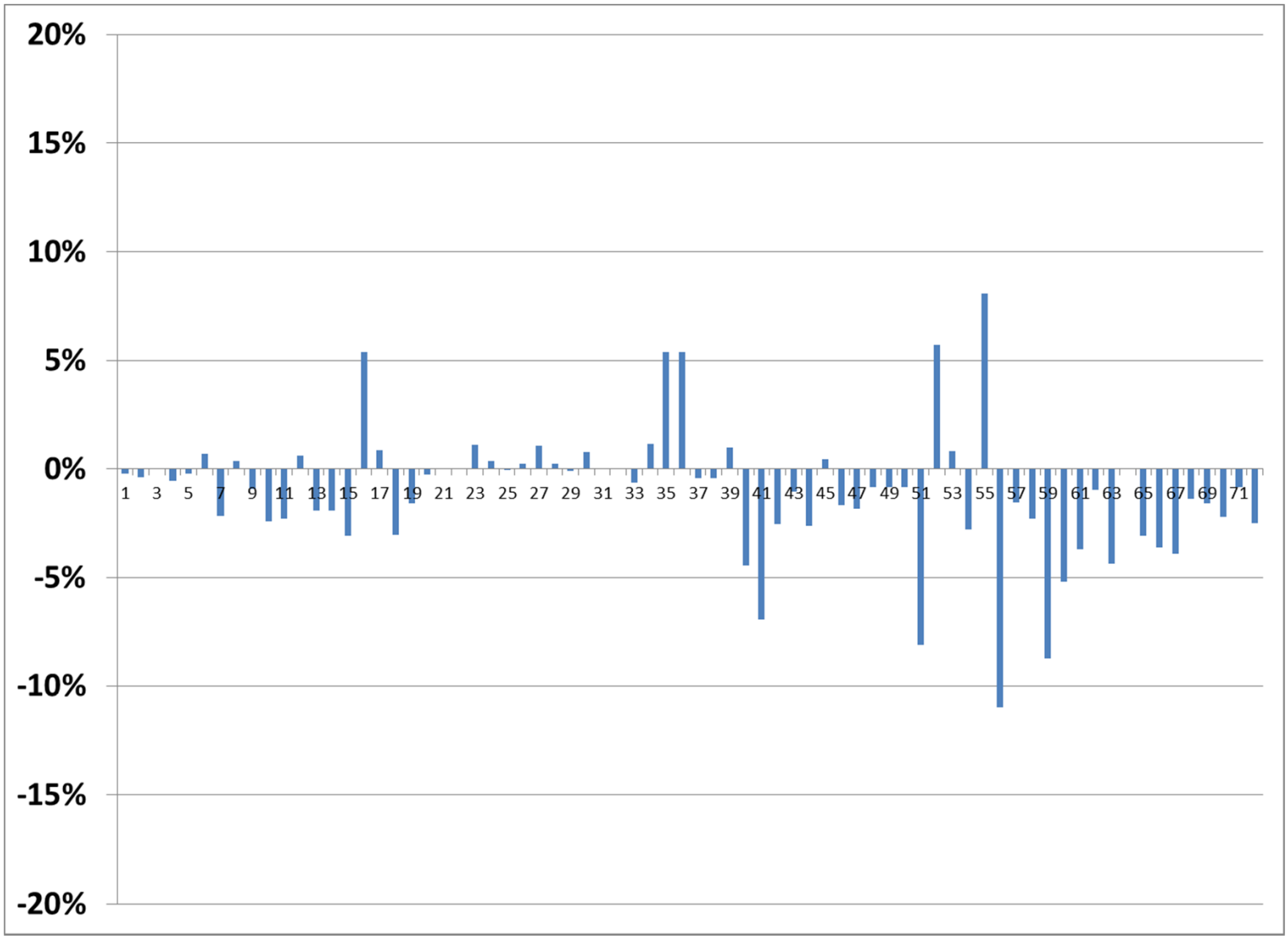
2015-08 to 2016-05 Duplicate Data - Acrolein



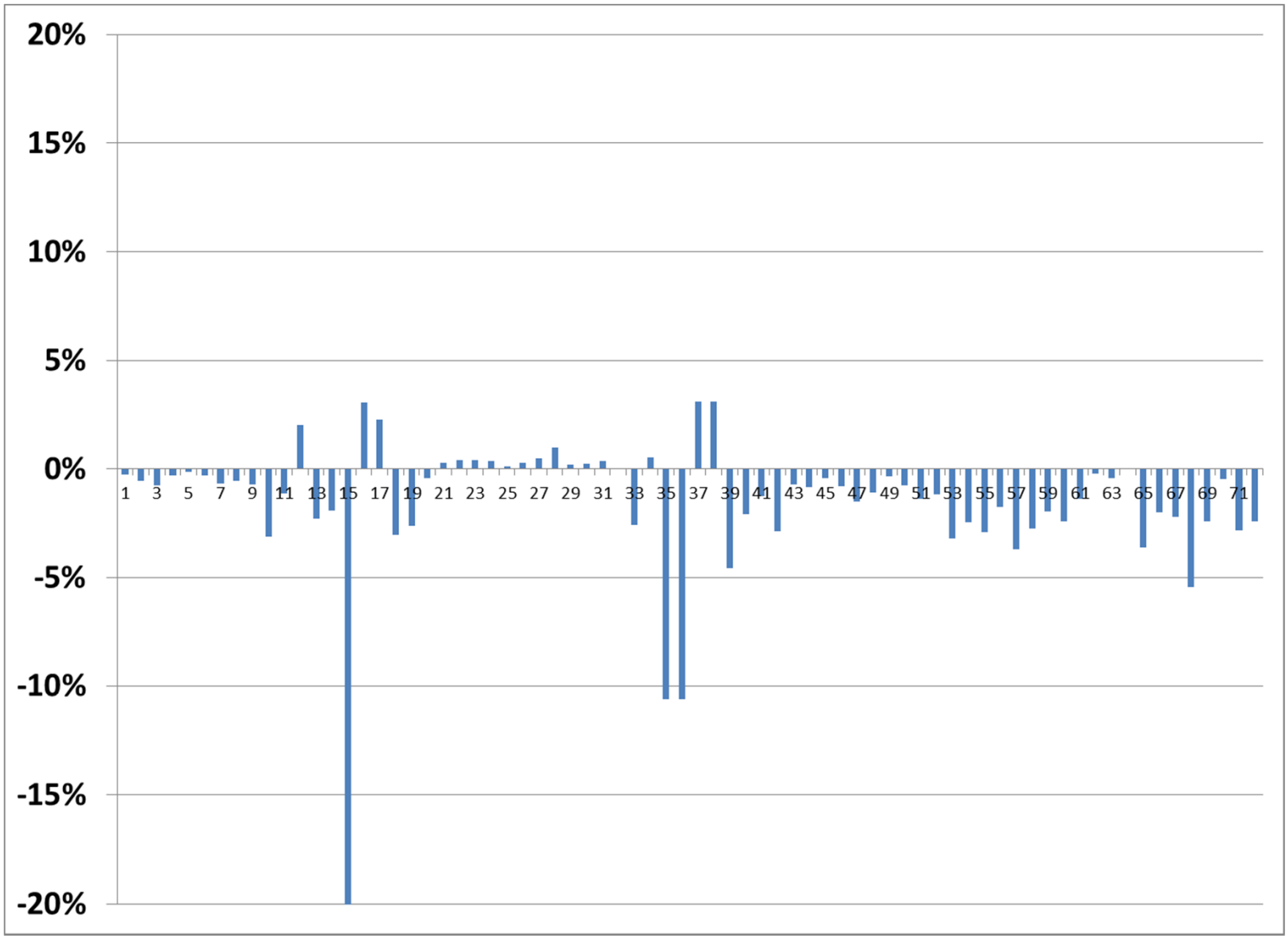
2015-08 to 2016-05 Duplicate Data - Acetone



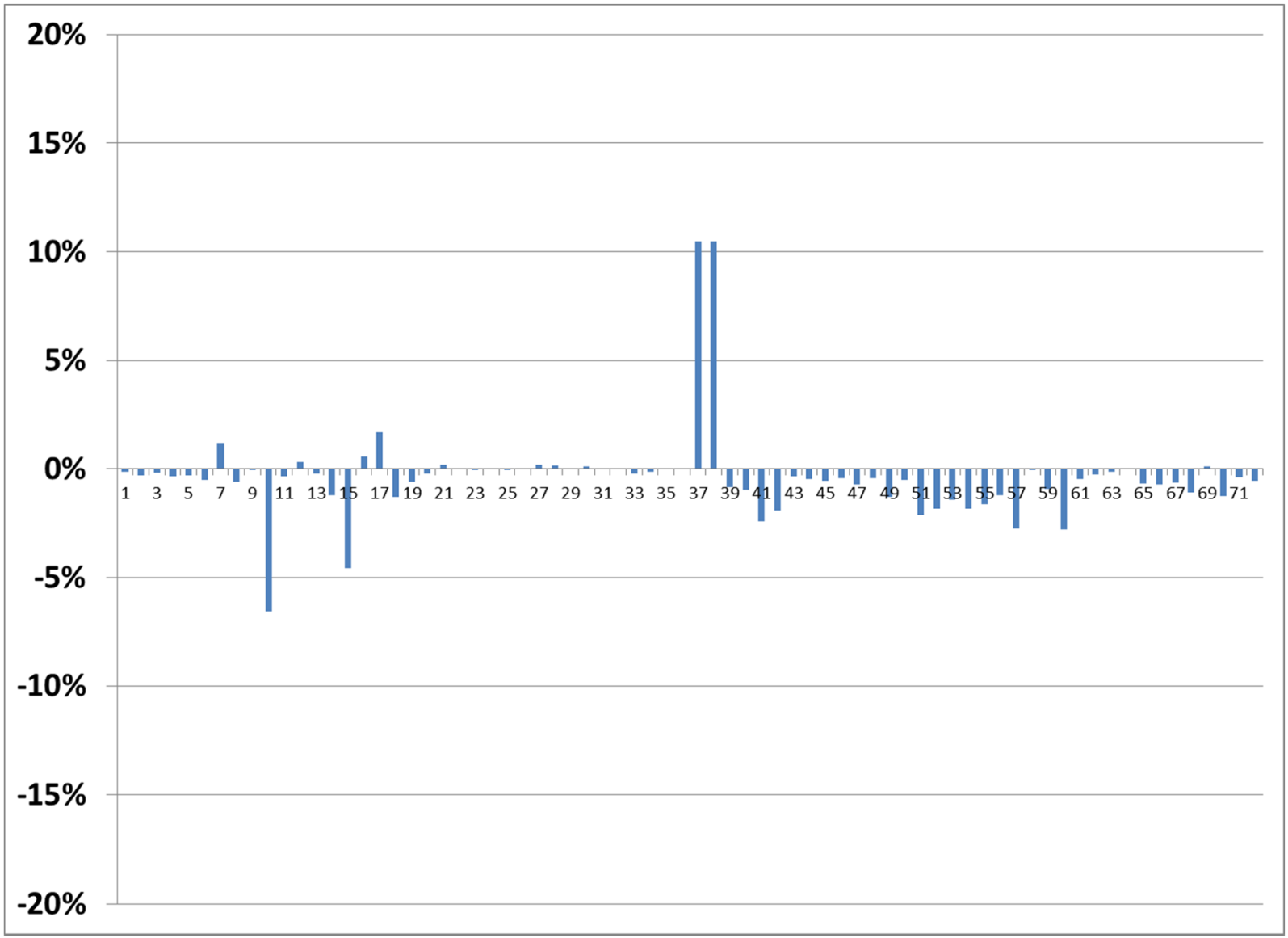
2015-08 to 2016-05 Duplicate Data - Benzene



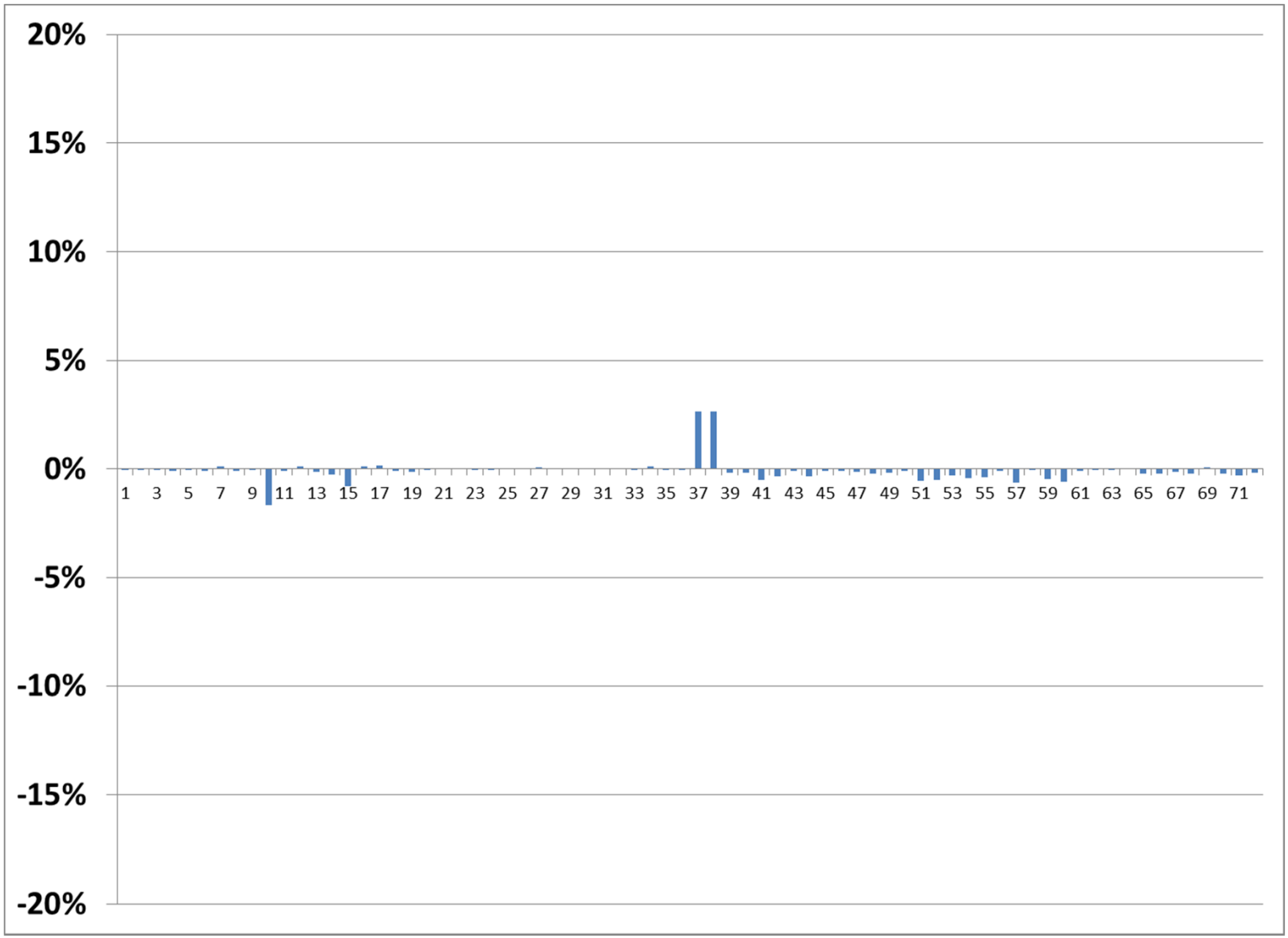
2015-08 to 2016-05 Duplicate Data - Toluene



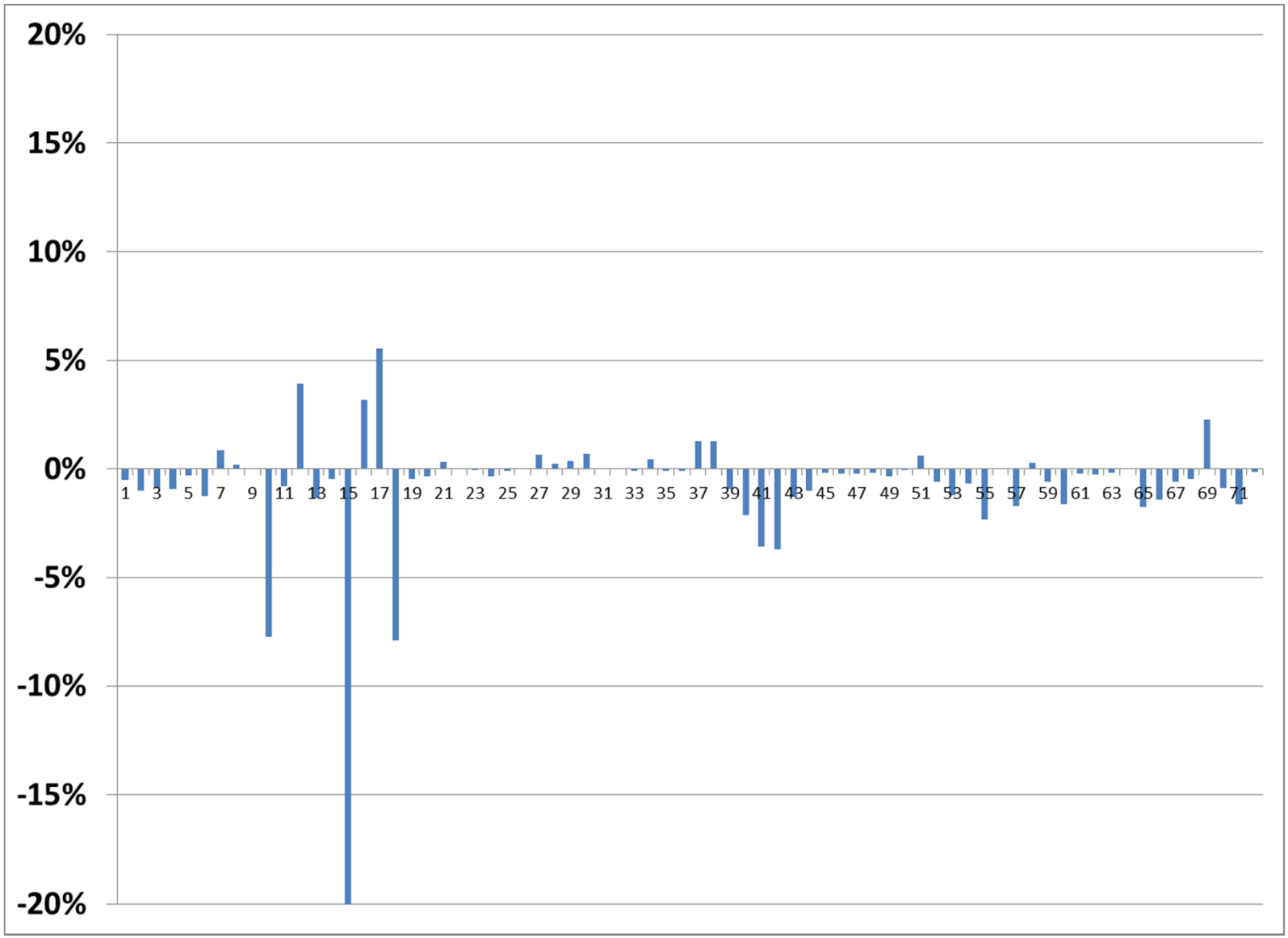
2015-08 to 2016-05 Duplicate Data - Xylene



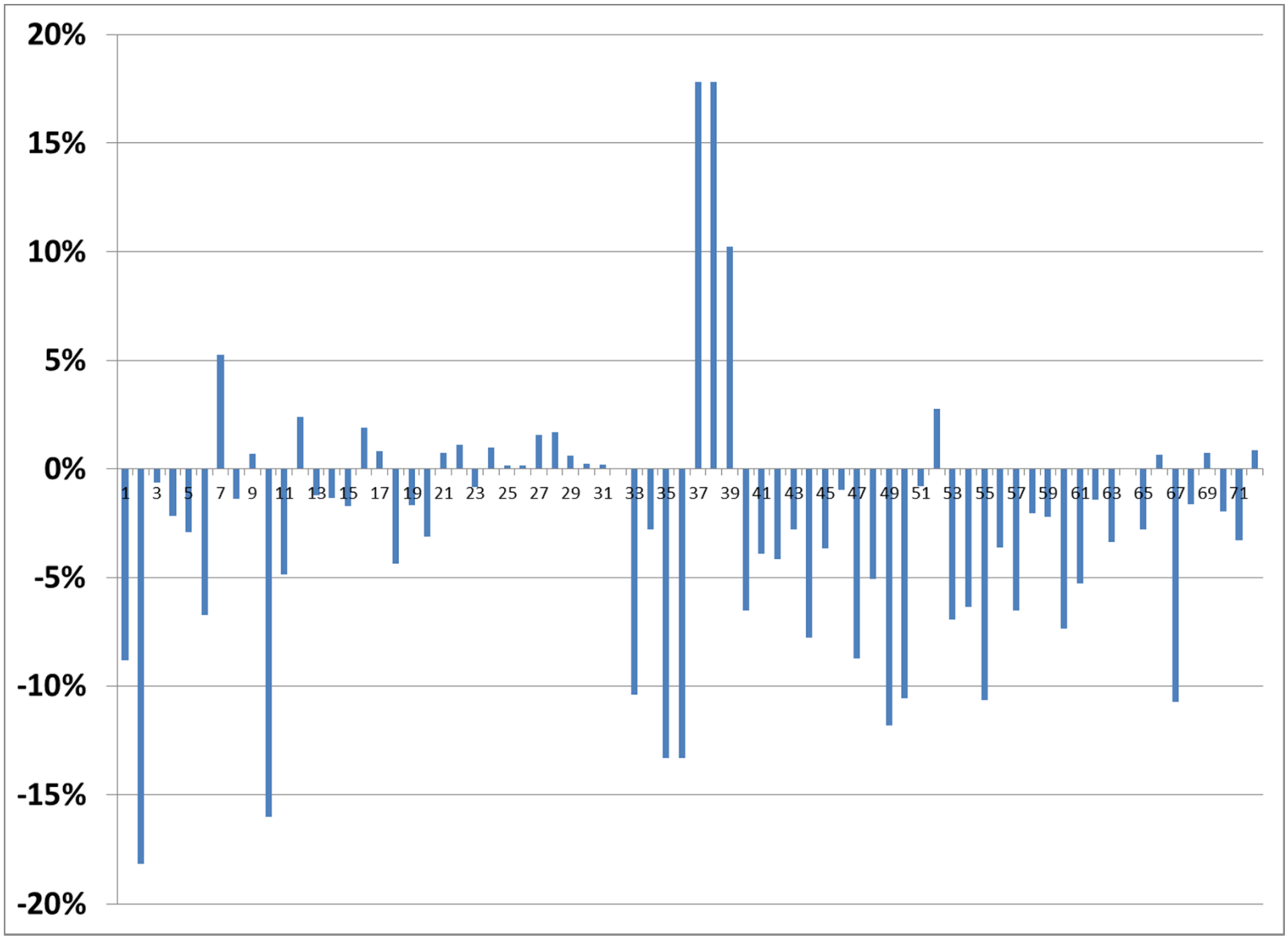
2015-08 to 2016-05 Duplicate Data - Ethylbenzene



2015-08 to 2016-05 Duplicate Data - Styrene



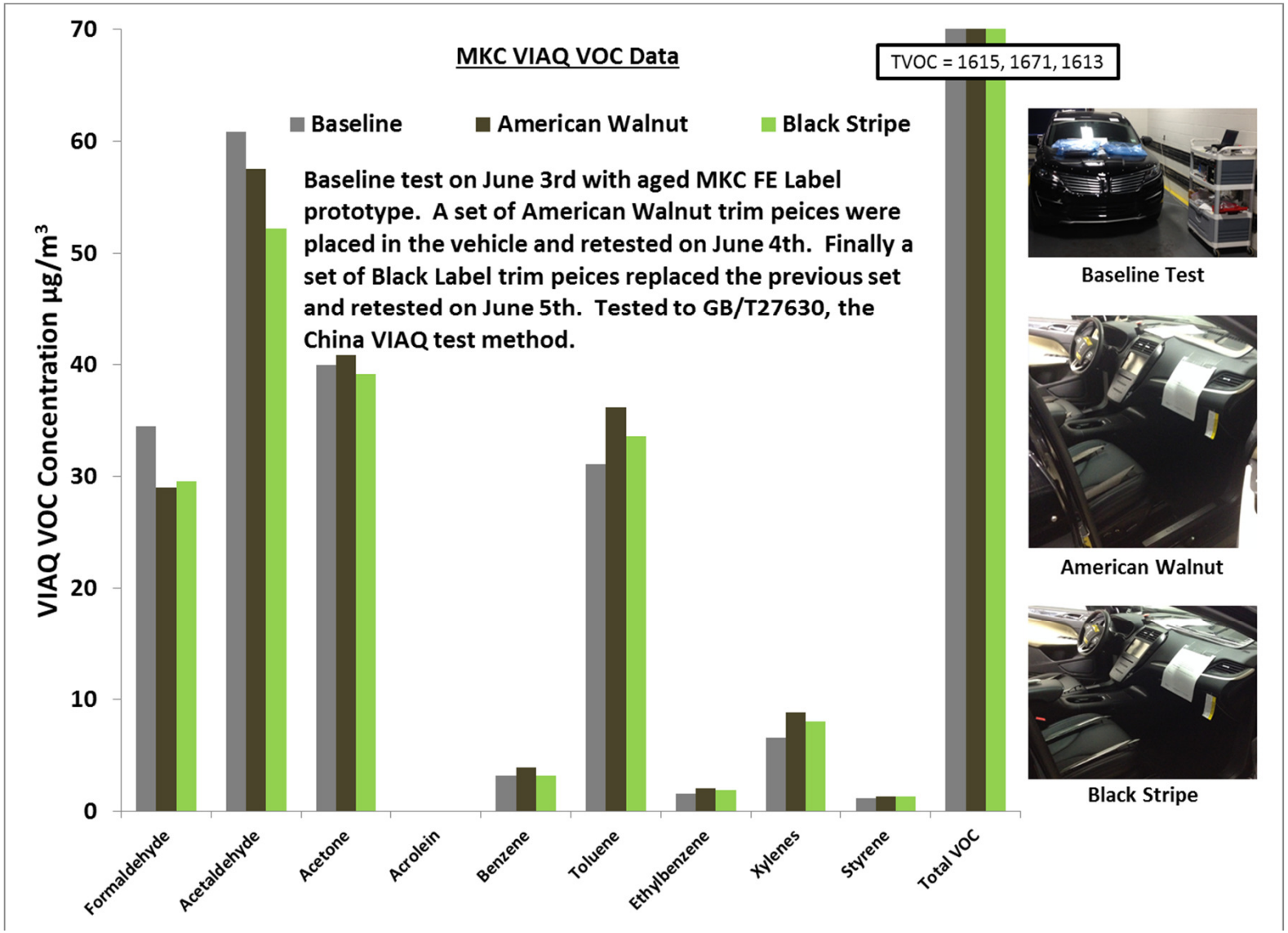
2015-08 to 2016-05 Duplicate Data - TVOC



2015-08 to 2016-05 Duplicate Data, n=72

	Average Difference	Standard Deivation
Formaldehyde	-1.1%	2.3%
Acetaldehyde	-1.7%	2.5%
Acrolein	0.1%	0.4%
Acetone	-2.3%	3.5%
Benzene	-1.0%	3.0%
Toluene	-1.7%	4.4%
Xylene	-0.4%	2.2%
Ethylbenzene	-0.1%	0.5%
Styrene	-0.8%	3.5%
TVOC	-2.6%	6.0%

Back to Back to Back Tests



Back to Back to Back Tests as percentage of China Limits