**Logic for NOx Calibration Software**

**Identifying Calibration Cycles**

* Find time periods of data > 200
* Only keep the time periods that are longer than 20min
* Determine Max (NO) value and its time stamp within the time periods

**Determine start of calibration cycle**

* Iterate backward in time from the max value to identify local minimum for each of the time period
  + val(t) < val(t-1) and val(t) < val(t+1)

**Determine end of calibration cycle**

* Iterate forward in time from the max value to identify as value that satisfies:
  + val(t) > 300
  + val(t+2)/val(t) < 0.2
  + val(t+3) < daily mean
* The end of the calibration cycle is set to be the timestamp of val(t+3)

**Data Calibration**

Data between the calibration cycles are calibrated using the values obtained in the calibration cycles before the data and after the data.

**Zero offsets**

The difference between the starting and ending zero offset is computed. This difference is divided evenly over the time difference between the end of the pre-data cycle and the start of the post-data cycle, and applied to each measurement in between to maintain a smooth transition between the two cycles.

offSetStep = (zeroValEnd-zeroValStart)/timeLength

offSetInc = timeIndex\*offSetStep

offSetApplied = zeroValStart + offSetInc

offSetCalib = float(inputVal) - offSetApplied

where timeIndex is the timestep number, timeLength is the number of seconds between calibration cycles.

**K-factors**

A Target value (of usually 400 ppm) is divided by the max NO value to determine a Kfactor for each calibration cycle. The difference between Kfactor of the pre-data cycle and the Kfactor of the post-data cycle is computed, and this difference is divided evenly over the time period between the cycles. These Kfactor increments are applied to each measurement in between to maintain a smooth transition between the two cycles

KFac = spanTargetValStart/spanValStart

nextKFac = spanTargetValEnd/spanValEnd

KFactStep = (nextKFac-KFac)/timeLength

KFacInc = timeIndex\*KFactStep

KFactApplied = KFac + KFacInc

and the final calibrated value is determined to be

calibratedVal = offSetCalib\*KfactApplied

**NOxCalibration Software**

The software provides a platform to:

* Customly change the zero offset, Kfactor and target values for each cycle
* Exclude certain chosen cycles from the calibration calculation.
* Exclude certain data ranges from the final output

Once manual adjustments are finalised, the software provides an option of exporting the calibrated data into a csv file.