
CEMSUITE TECHNICAL DETAILS

Measurement Capability

CEMSuite software can accept data for 10 measurement points, each containing up to 16 measurands - providing potentially 160 data channels. These are grouped into 'pages' of data, where each page typically has common normalisation parameters.

We have included many different types of measurement and a brief example list is given below:

- Gas ppm wet
- Gas ppm dry
- Gas mg/m³ wet
- Gas mg/m³ dry
- Opacity %
- Tribo output
- Dust extinction
- Smoke
- Visibility
- Differential pressure
- Flow

This is not exhaustive and may be added to with a simple program modification.

Data Storage

- Each channel is stored with 16 bit resolution for data (+/- 32767) and with 8 bit validity information.
- Storage frequency selectable and dependent on system complexity; however, typically set to between 5 and 10 seconds.
- Data archive is greater than 10 years, even for the most demanding of systems.

Normalisation

Oxygen

Normally the biggest effect from normalisation is from the oxygen level, and this reference level varies between processes:

- Gas and oil: 3%
- Coal: 6%
- Waste: 11%
- Gas turbines: 15%

This is not an exhaustive list, but the reference levels required for most plants can normally be found on their process guidance notes.

CEMSuite uses the following formula to correct for air dilution:

- $\text{Correction} = (21 - \text{O}_2 \text{ reference level } \%) / (21 - \text{actual dry O}_2 \text{ level } \%)$

Water Vapour

Where measurements are made on a wet basis (i.e., they have not been dried by a chiller or filter before analysis) they should be corrected down to a dry measurement. It is preferable that a dynamic water vapour measurement is required, but should this not be practical, a fixed value may be used. The formula below is used by the software:

- $\text{Correction} = (100 \%) / (100 - \text{actual H}_2\text{O level } \%)$

Temperature

The reference temperature is usually 00C (273K) for Europe but may be 250C for the Americas. Most gas measurements are already corrected to standard temperature and pressure (STP) and so no correction applies. For dust and other measurements, however, the following formula applies:

- $\text{Correction} = (\text{Actual temperature C} + 273) / (\text{reference temperature C} + 273)$

Pressure

Again, most gas levels are reported at STP (see above) and no further corrections apply. For dust and other in-situ measurements, however, correction may be required. In such cases, the following formula applies:

- $\text{Correction} = (101.3 \text{ kPa}) / (\text{actual Pressure kPa})$

Averaging

The CEMSuite programs consider the data down to each minute, each minute data point being the average of all data within that minute; most systems are set to gather data every 5 - 10 seconds.

For longer term averages, two averaging bases are provided; a rolling average and a block average. Data during plant off periods (see below) or invalid data are not used when calculating the average values. Furthermore, there must be 2/3 (66%) of valid data for any given averaging time, i.e., for a one hour average, there must be 40 minutes of valid data while the plant was in operation for the averaged data to be considered as valid.

The 2/3 requirement is configurable, but usually set at this level.

Rolling average

A rolling average considers the data on a minute-by-minute basis; for each and every minute, the average is calculated from the preceding data for the selected average time.

Block average

Each block average is considered individually for the period; should a 1-hour average be selected, then the day will consist of 24 block averages. Each average will end at 59 minutes past the hour.

Average 1	00:00	to	00:59
Average 2	01:00	to	01:59
Average 3	02:00	to	02:59
...			
Average 24	23:00	to	23:59

Should a 30 minute average be used, then each will end at 29 and 59 minutes past the hour. As the average builds up during its period, it will be considered valid should 66% of the expected data points be available. So, for a 1 hour average at 00:29, there should be 30 points, so it will be considered valid if 20 minutes or more of valid data points exist.