

Below is a summarised background into the reliability issues associated with the site fixed NOx analyser systems, some possible root causes and the options I have been supplied with via consultation with specialists.

Background;

Over the past 2 years we have seen an increase in the amount of reliability and breakdown issues related to the NOx analysers which have resulted in losing confidence in the system as a whole. This has also had the consequence of increased cost to the company via labour and spares in repairing the breakdowns to return to systems back to operational service. We have dramatically increased the routine maintenance as a direct response to these issues (from Bi-weekly to daily) in order to keep the system online and the readings accurate.

Losing the NOx analyser CEM's systems through breakdowns have regulatory consequences which makes it harder to run the SCV's as manual samples are required to comply with MCERTs.

Reliability issues; There are 2 main issues

- Issue 1- Excessive moisture in the sample line, this causes the moisture sensor in the sample conditioning cabinet to detect the water and shut the sample off to the analyser to prevent damage to the PCB's and electronics. This results in the readings flat-lining and going off spec.

Potential root cause:

Consultation with SCV OEM has highlighted that the bath temp is higher than expected 12-15 degrees and should be lower 5-8 degrees, this could cause excess water vapour to be generated and exhaust via the stack and potential to accumulate in the sample lines of the NOx analyser system. I have undertaken research and the bath temp saw a step change around 2-3 years ago which coincides with the cold break through MOC and the start of the increased reliability issues.

- Issue 2- Non compatible manufacturer component change- The manufacturer of our current analysers have changed the type of the internal relays (without informing SHLNG) from standard (mechanical switching) to solid state, the new relays seem to have issues with the power supply and stick in a fixed position (usually open). Every 3 hrs the analyser will carry out a self-zero calibration, this will activate the zero relay shutting off the sample relay and apply zero gas to the analyser. What seems to happen is the sample relay sticks open and the analyser ends up zero calibrating on sample and then the analyser flat lines and goes off spec. We have had this occur on a newly installed analyser as well as analyser's months old.

Potential solutions;

Issue 1-Excessive water vapour

- Decrease the bath temp back to OEM recommended temperatures (review required as this may affect cold break through and FGH issues on minimum send-out).
- Keep the sample above the Dew point via;
 - Install heated sample probe,
 - Install heated sample lines,
 - Lag any parts open to ambient temperatures,
- Upgrade the efficiency of the sample conditioning system including moisture KO pumps, Chiller etc
- Change the type of cooler from a degrading Peltier chiller to a compressor chiller.
- Reduce the distance of the sample transmission via stack mounting the analyser.
- Install the sample probe at a 45 degree angle to knock out of large moisture droplets condensing on the metal of the probe.
- Add additional filtration direct to the sample probes to knock out moisture and particulates at source.

Issue 2- Non compatible manufacturer component change

- Look to upgrade the analysers themselves for a better more compatible and reliable units.
- Look at formalising a contract with the OEM as a single point to make responsible for a reliable, complaint and effective analyser system as a whole at all times. Current system has 3 aspects all installed by different vendors, e.g. sample transition- Process combustion, Sample conditioning and analysing- Orbital and Signal Transmission – Envirosoft.

NOX Analyser Upgrade options

I have contacted 4 companies to provide upgrade / improvement options. The four companies and their options are summarised below (Please note these are general quotes as these companies have not attended site to assess as yet).

ABB Option (Upgrade of existing system)		
ABB EL3000 Continuous Gas Analyser	£ 12,854.00	x2
ABB Sample Gas Cooler (SCC-C	£ 2,017.00	x2
Heated Sample Gas Line	£ 7,639.00	x2
ABB Probe Tube 42	£ 3,021.00	x2
Installation and commissioning	TBC	Site visit required for quote
Total	£ 51,062.00	Note this does not include labour
Orbital Option (Upgrade of existing system)		
Project Engineering & Design	£ 7,178.25	x2
60m Heated Sample Line	£ 11,842.50	x2
Heated Sample Probe;	£ 6,927.15	x2
Sample System Upgrades; ▪ Upgraded cooler	£ 4,178.25	x2
Installation & Commissioning	£ 9,420.00	x2
Total	£ 79,092.30	
Emerson Option 1 (Upgrade of existing system)		
Description :- Heated Sample Probe		
Sample Handling System		
Emerson XEGP Analyser (NOx/O2		
Description Analyser Cabinet		
Engineering, documentation, testing and project management		
Total	£ 92,545.45	
Emerson Option 2 (Base of stack mounted analyser system)		
Continuous Emissions Monitoring System (2 off)		
Description Sample Handling System		
Description Emerson XEGP Analyser (NOx/O2		
Description Analyser Cabinet		
Engineering, documentation, testing and project management		
Total	£ 191,327.71	
Lowe Engineering (recommended by Process Combustion)	No response	Failed to provide quote

Regarding stack mounted analysers, research and consultation with specialists has highlighted the following issues;

- ATEX zoning makes it difficult to house the analysers at the stack and remain ATEX compliant, this is not impossible but will come at a significant cost.
- Maintenance issues- Restrictions as result of weather.
- Exposure to vibrations,
- Increased infrastructure required.

We have spent Est 100k in past 3 years (from bad actor review) in corrective repairs alone and not including the routine maintenance, in house and vendor, therefore a new upgraded and reliable system should improve the down time and reduce cost of repair (effectively paying for itself in 3-5 years) whilst increasing confidence in the readings

Some good news from talking with the specialists, it doesn't seem that the low point / underground loop of the sample tubes should cause too much of an issue, provided that the sample transmission and conditioning is of the correct set-up for the requirements. Therefore my recommendation would be to pursue the ABB Option and Emerson Option 1 for a more detailed comparison and upgrade our current set-up to better meet the issues of increased water and reliability via components along with some minor in-house site modifications to the angle of the sample probe and looking at the reduction of the SCV bath temp

My recommendation would be to pursue detailed survey and quotes via ABB and Emerson and request site visits.

Added Pro to the Emerson option is we already have contracts in place for other aspects of the business which have resulted in a good relationship both Emerson and the go between of MJ Wilson.