

CARBON CAPTURE GAS ANALYSER SYSTEM

BACKGROUND

Process Instrument Solutions were approached to provide a complete suite of instrumentation, valves and gas analysers for a high-profile overseas carbon capture project. The objective of the project was to significantly reduce the amount of Carbon Dioxide (CO₂) emissions released into the atmosphere while also demonstrating that captured CO₂ could be successfully reused elsewhere within the process.



At the heart of the project was a bespoke gas analysis and conditioning package, critical to ensuring the accurate and reliable performance of the carbon capture system. The installation was designed as a modular, containerised solution, enabling the entire system to be transported, dismantled and re-installed at multiple locations as part of the wider proof-of-concept programme.

The pilot plant was designed to handle approximately 10% of the intended full-scale process capacity, allowing the customer to validate the transition from theoretical design to practical operation.

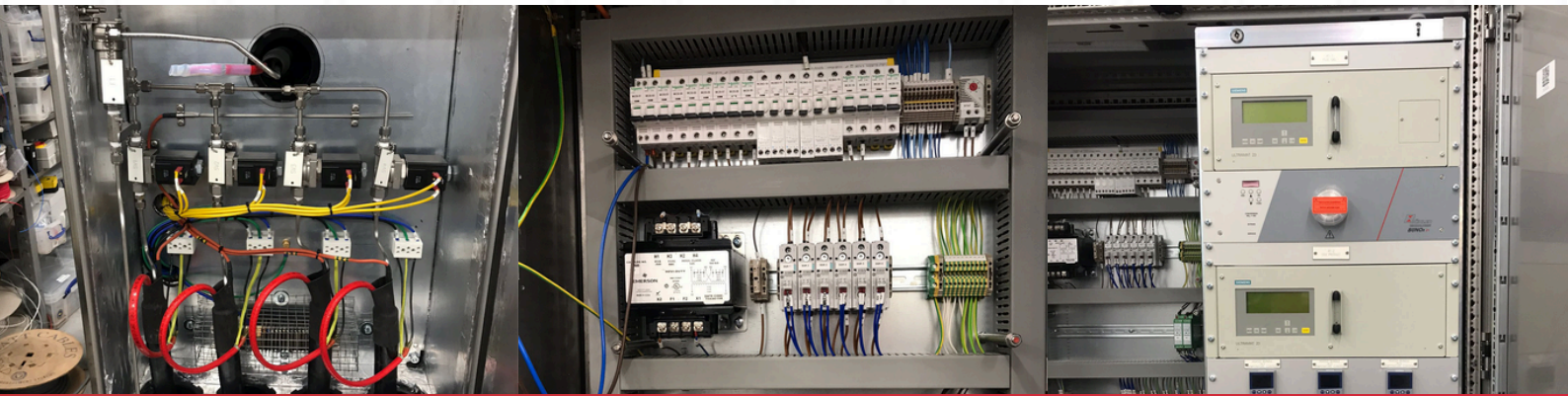
CHALLENGE

The project presented several significant technical and environmental challenges. The gas mixture required highly accurate measurement across a wide range of concentrations, including low percentage CO₂ concentrations up to 45%, high purity CO₂ concentrations between 95–100%, sulphur dioxide (SO₂) at 70 ppm, nitrogen oxide (NO) at 15 ppm and oxygen monitoring.

Achieving reliable measurement performance was further complicated by large variations in sample and ambient temperatures, a dusty and demanding operating environment, the requirement for exceptional measurement accuracy at both low and high CO₂ concentrations, and the need for a fully modular and containerised installation that could be easily relocated and recommissioned.

The customer also required the complete system to operate reliably within a compact footprint while maintaining safe and stable sample conditioning throughout the process.





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SOLUTION

Working closely with Siemens and other leading instrumentation manufacturers, Process Instrument Solutions designed and delivered a fully integrated gas analyser and gas conditioning system tailored specifically to the application.

The solution was centred around two Siemens Ultramat 23 gas analysers. The first Siemens Ultramat 23 was configured to analyse low percentage CO₂ concentrations up to 45%, while also monitoring sulphur dioxide at 70 ppm and nitrogen oxide at 15 ppm using a UV measurement bench. The second Siemens Ultramat 23 was dedicated to measuring captured gas purity, ranging from 95–100% CO₂. To ensure accurate and stable sampling conditions, the system incorporated heated sample lines, advanced filtration, KNF sample pumps, rack-mounted panel enclosures and automated sample control via a Siemens LOGO PLC.

Additional instrumentation and control components included Burkert 330 3/2-way solenoid valves, Burkert 20734 2/2-way solenoid valves, Siemens TS200 PT100 temperature sensors and Siemens LVL100 tuning fork level switches.

The complete analyser and conditioning package was designed within a modular containerised arrangement, allowing straightforward transport, installation and future expansion.

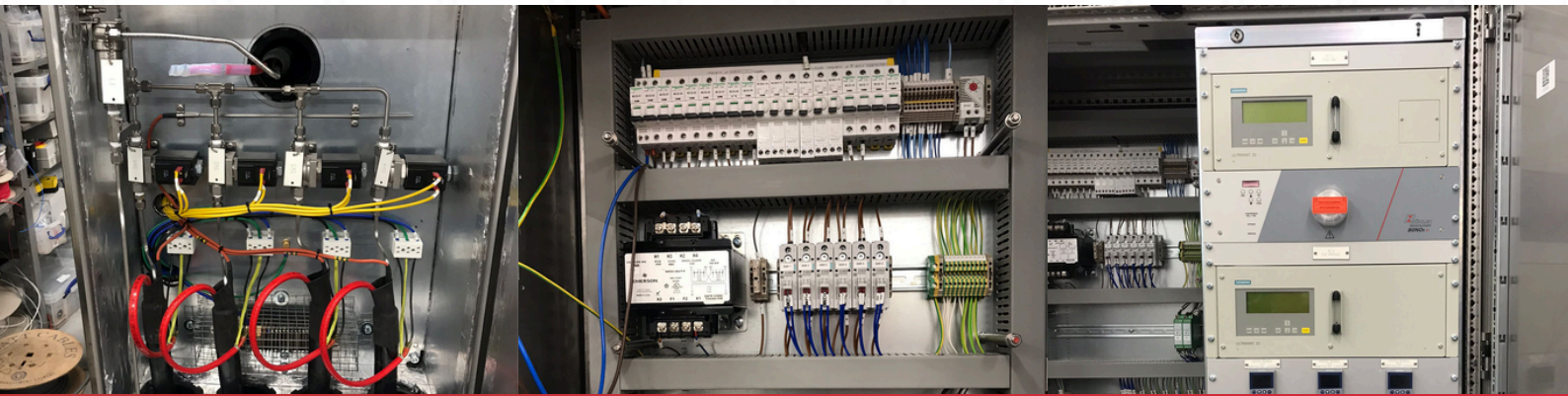


RESULT

The completed system successfully demonstrated the viability and scalability of the customer's carbon capture process, delivering performance that significantly exceeded the original project expectations. The analyser package provided highly accurate and reliable gas measurements across all required process conditions, enabling the customer to confidently validate the effectiveness of the carbon capture technology.

As a direct result of the project's success, increased carbon capture volumes were trialled to further expand the process capability, the end customer commissioned plans for a full-scale carbon capture plant capable of handling 100% of the facility's exhaust gases, captured CO₂ could be reused within the production process reducing the requirement to purchase additional CO₂, and harmful greenhouse gas emissions to atmosphere were significantly reduced.





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The project demonstrated Process Instrument Solutions' capability to design and deliver complex, high-accuracy gas analysis systems for demanding environmental and industrial applications.

EQUIPMENT SUPPLIED

- Siemens ULTRAMAT 23 Extractive Gas Analyser
- Siemens LOGO PLC
- KNF sample pump
- Burkert 330 3/2-way-solenoid valves
- Burkert 20734 2/2-way solenoid valves
- Siemens TS200 PT100 sensor
- Siemens LVL100 tuning fork level switch



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