Free Chlorine Monitoring
Chloribrid®

Overview

Despite the enormous worldwide need for residual chlorine monitoring, the most popular models come with high requirements for maintenance and validation checks. By incorporating both an amperometric and a colorimetric sensor, the Chloribrid® chlorine analyser from Process Instruments (Pi) was designed to have the advantages of both technologies (without the disadvantages) and to provide the following:

- ✓ Far fewer scheduled maintenance events
- ✓ Far fewer callouts
- ✓ No operator checks at all
- ✓ No calibration
- ✓ Greatly reduced TOTEX cost of ownership

These are big claims and in order to show that we are able to deliver on all of the claims above, we installed a system onto a real world site for a six month trial. Six months soon became 12+ months, leaving us confident that Chloribrid® is probably the most reliable and robust chlorine measurement technology in the world.

HaloSense (Amperometric) + DPDSense (Colorimetric) = Chloribrid® (Hybrid)

***Figure 1**: Pi chlorine monitoring options: HaloSense (left), DPDSense (middle), Chloribrid® (right)*

What Problems Does Chloribrid® Claim To Solve?

Operators on sites that require continuous chlorine monitoring will have come across some, if not all of the following problems:

- DPD chemicals need to be replaced monthly
- Amperometric sensors need to be checked weekly
- Failure of chlorine monitoring leads to 'high level' alarms, needing immediate attention

Chloribrid® has a number of innovations that directly addresses these problems:

1. Extended-Life DPD Chemicals

Conventional DPD reagents used in competitor systems typically expire and discolour after one month, requiring disposal even when unused. Pi has developed new, long life DPD chemicals that do not expire for more than six months, even when tested at elevated temperatures exceeding 40°C to simulate conditions in hotter climates.

***Figure 2**: New Pi Chloribrid® DPD1 reagents (left) vs. standard DPD1 reagents (right) 1 year post manufacturing*

2. Reduced Chemical Reagent Consumption

In normal operation, DPD is used only to verify the amperometric sensor reading. As a result, Chloribrid® consumes significantly less reagent than a purely colorimetric system. A single chemical pack lasts for six months .

3. Automated Calibration

Amperometric sensors require regular checking/calibration, whereas colorimetric systems do not. Chloribrid® uses its colorimetric measurements to automatically calibrate the amperometric sensor, eliminating the need for manual calibration and checking.

4. Continuous Measurement Through Redundancy

Because the two measurement technologies operate differently, they do not fail under the same conditions. If the amperometric sensor encounters an issue, the DPD sensor temporarily becomes the primary measurement method; if the DPD sensor fails, the amperometric sensor continues to operate. In either eventuality the Chloribrid® gives an alarm, but crucially carries on working. This ensures uninterrupted monitoring.

Performance in Field Deployment

Before examining the data presented below, from the perspective of a system operator here are the important numbers that the trial produced:

- ◊ Number of packs of DPD chemicals needed: 2 (vs. 12 for conventional DPD)
- ◊ Number of manual amperometric calibrations/checks needed: 0 (vs. 50+ for other systems)
- ◊ Number of emergency callouts e.g. after power cuts: 0
- ◊ Number of repairs required: 0

A term that has come to be used at Process Instruments to refer to the performance of this system is 'reassuringly boring'. Apart from providing new chemicals after six months of operation Chloribrid® 'just works'; it operated continually for an entire year and only needed an operator once, to provide the new reagents after six months, a HUGE improvement and massive cost saving over all currently available products.

The Chloribrid® system was installed in the municipal water supply at Edenfield Cricket Club in the UK and operated for 12 months.

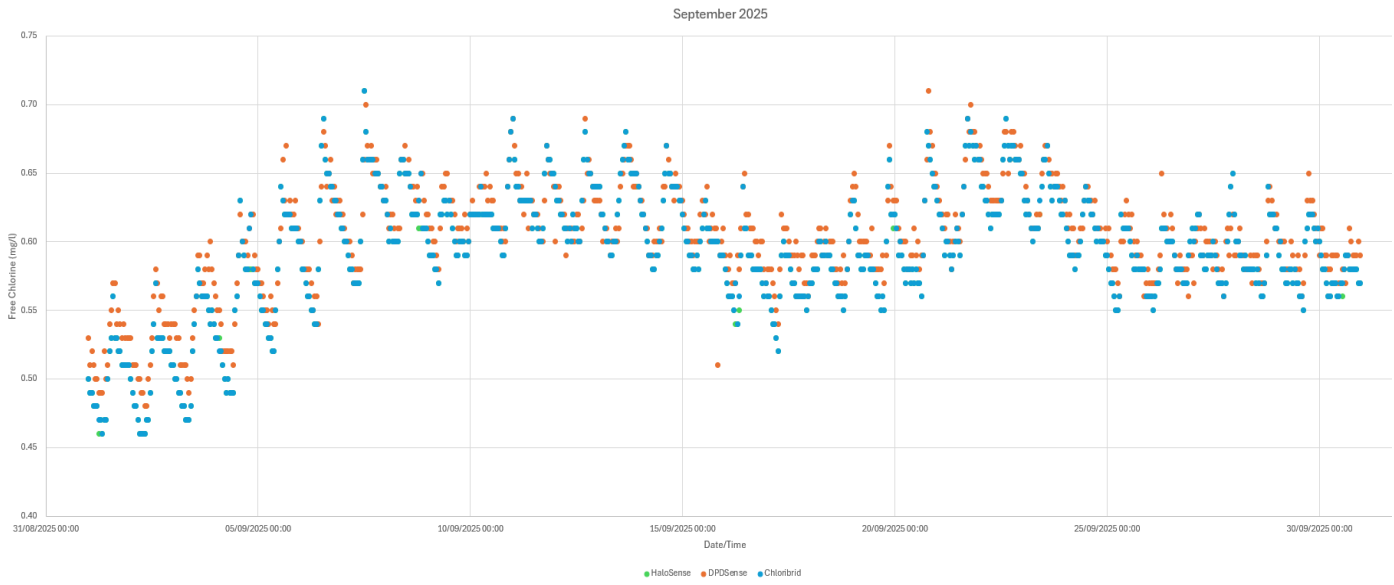

***Figure 3**: Monthly data snapshot of DPD and amperometric measurement comparison in a Chloribrid®*

System Stability

Data collected over a month (see graph above) demonstrates high stability, with the amperometric sensor providing the primary measurement and the colorimetric system validating its performance.

Performance in Field Deployment

Resilience

The system experienced several power losses due to being connected to the same supply as a drinks cooler. After power restoration, Chloribrid® entered a 'startup mode' in which the DPDSense temporarily became the primary measurement method. This is because

1. DPD systems do not require calibration and can resume measurement immediately
2. Amperometric sensors depolarize without power and require time to regain full responsiveness

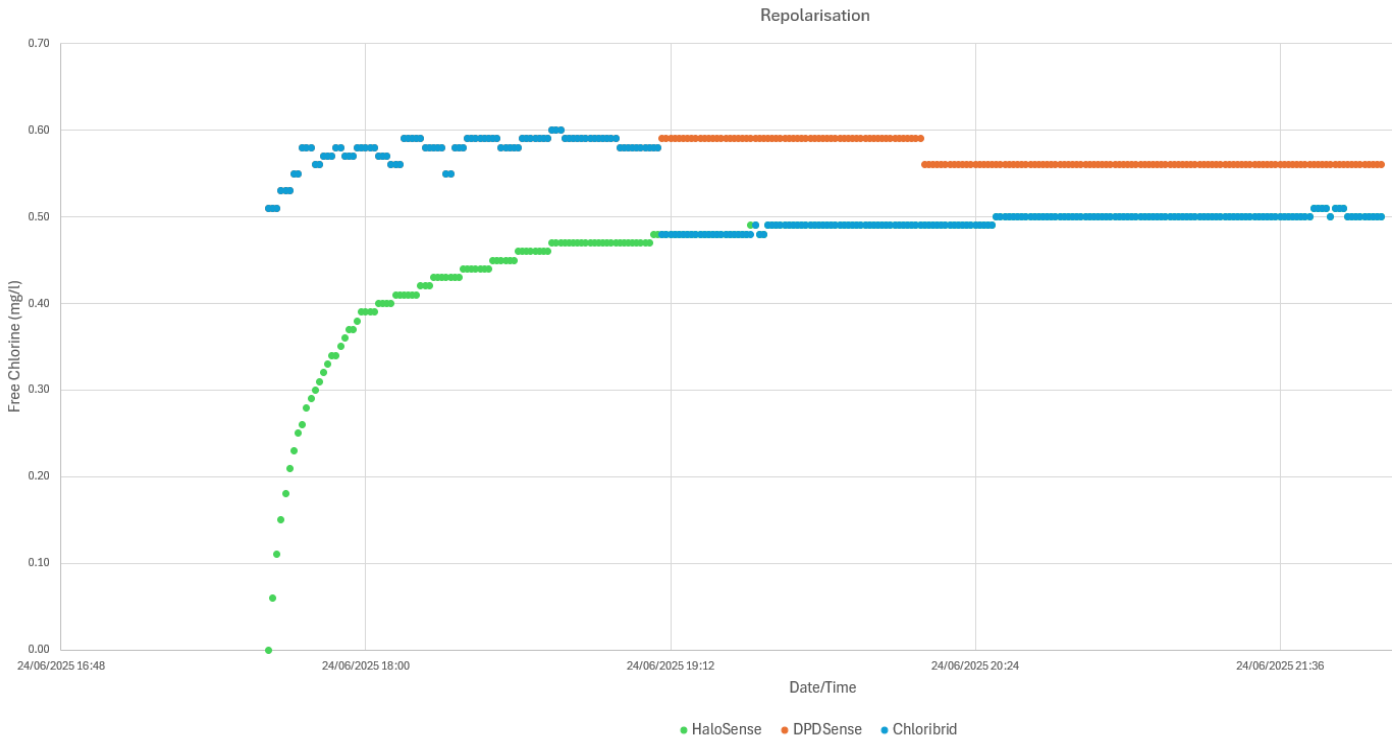

***Figure 4**: Data from the system recovering from a period of power loss*

In the graph above the HaloSense value can be seen increasing from zero as it repolarises, while the DPD system outputs accurate readings. Once the HaloSense value is stable, the amperometric sensor is calibrated by the DPD and he output reverts back to amperometric.

Performance in Field Deployment

Long-Term Operation

Across the full year, aside from occasional power-related repolarisation events, the system demonstrated consistent and resilient performance.

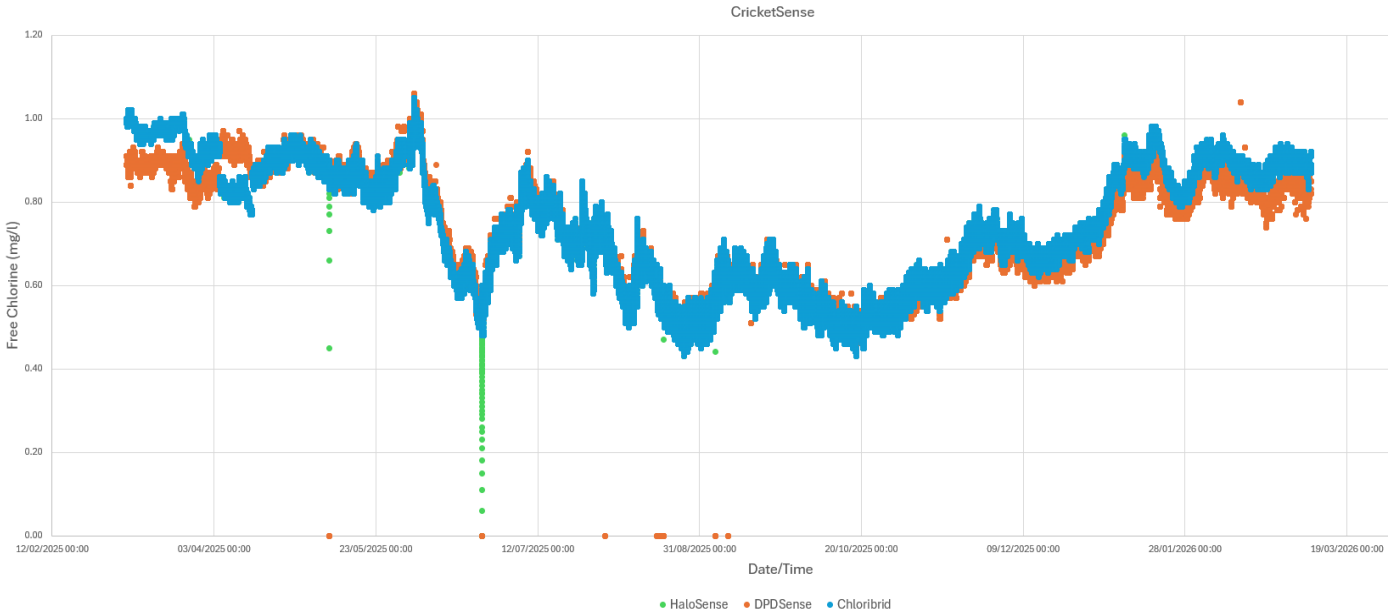

***Figure 5**: Chloribrid® chlorine monitoring data over an 18 month period*

Applications of Chloribrid®

Considering the findings above, Chloribrid® can provide significant extra value over single technology systems where:

1) *Continual measurement of chlorine is site critical.* Residual chlorine levels in final drinking water are an obvious example but many such processes exist. With single technology systems a failure state (e.g. amperometric depolarization, DPD chemical exhaustion) will cause a loss of accurate measurement. With Chloribrid® this is not the case.
2) *Short maintenance intervals are challenging* on unmanned or rural/isolated sites, validating an amperometric sensor every week or replacing DPD chemicals every month can be difficult, especially if a single operator is responsible for multiple systems/sites. Chloribrid® has a maintenance/ validation interval of six months, much longer than any single technology system, and creates a more manageable maintenance schedule.
3) *Emergency callouts are common.* On sites where the chlorine levels are critical, any loss of measurement is a 'code red' which needs to be addressed immediately (at any time). Events that cause failure of measurement in a normal amperometric or DPD system to fail will not cause a loss of measurement with Chloribrid® , meaning 'code red' events are reduced and issues can be solved during regular working hours.

Savings When Using Chloribrid®

As well as the benefits of more robust measurement, one of the major advantages of Chloribrid® is reduced running costs.

Consider a typical example where the monitoring site is 30 minutes away from a central office by road, meaning a site visit requires the operator to drive for an hour. Based upon normal maintenance intervals and taking into account consumables, spare parts and operator time, what is the total cost of operating each of the three technologies (DPD, amperometric and Chloribrid®) for one year*?

DPD Only

Part(s) Required	Cost	Quantity	Total Cost
Change/replacement of DPD chemicals	£66.88	12	£802.56
6-month maintenance pack	£266.25	1	£266.25
			£1,068.81

Action	Time (hrs)	No. per year	Total time per year	Total cost @ £21 per hour
Change DPD chemicals, prime pumps	0.5	12	6.00	£126.00
Install maintenance pack	1.5	1	1.50	£31.50
Travel to and from site (30mins away)	1	12	12.00	£252.00
				£409.50

Parts + labour:	**£1,478.31**

Amperometric Only

Part(s) Required	Cost	Quantity	Total Cost
Replacement membrane and electrolyte	£237.57	1	**£237.57**

Action	Time (hrs)	No. per year	Total time per year	Total cost @ £21 per hour
Build sensor/change membrane and electrolyte	1	2	2.00	£42.00
Validation check (on-site staff, no travel)	0.25	52	13.00	£273.00
Calibration	0.5	2	1.00	£21.00
Travel to and from site (30mins away)	1	2	2.00	£42.00
				£378.00

Parts + labour:	**£615.57**

Chloribrid®

Part(s) Required	Cost	Quantity	Total Cost
Change/replacement of DPD chemicals	£231.38	2	£462.76
6-month maintenance pack	£266.25	1	£266.25
Replacement membrane and electrolyte	£237.57	1	£237.57
			£966.58

Action	Time (hrs)	No. per year	Total time per year	Total cost @ £21 per hour
Change DPD chemicals, prime pumps	0.5	2	1.00	£21.00
Install maintenance pack	1.5	1	1.50	£31.50
Build sensor/change membrane and electrolyte	1	2	2.00	£42.00
Travel to and from site (30mins away)	1	2	2.00	£42.00
				£94.50

Parts + labour:	**£1,061.08**

**Prices correct as of May 2026*

Savings When Using Chloribrid®

Based on the calculations above, running a DPD only system is more expensive in parts and chemicals than an amperometric only system, but the amperometric sensor requires many more instances of operator intervention (mainly in the form of validation checks).

Previously a decision (amperometric or DPD) needed to be made; however whether the focus is more robust measurement, reduced operator demands or lower costs, Chloribrid® comes out on top:

- ✓ Dual technology means maximum uptime against both technologies in isolation
- ✓ Reduced chemical and parts costs vs. a DPD only system
- ✓ Greatly reduced operator intervention requirements vs. an amperometric only system

Conclusion

Chloribrid® provides the most robust free chlorine measurement solution available. Its benefits include:

- Significantly reduced maintenance time
- Lower DPD reagent costs
- Elimination of single point of failure vulnerabilities
- Automatic switching between technologies to prevent critical measurement gaps

While the two technologies are mature and accepted in the marketplace, they both have differing advantages and disadvantages. Pi has taken two kinds of chlorine monitoring and combined them in a way that maximises these advantages whilst limiting the impact of their disadvantages.

Chloribrid® is therefore suited to operators seeking a low maintenance, highly resilient chlorine monitoring system.

***Figure 6**: Chloribrid® free chlorine analyser*