



Chemical-free, CIP, Pulse OxidationTM technology.

Validation of the Oxi-Tech Pulse OxidationTM
system within a bottling Clean In Place (CIP)
process at Sandford Orchards



EXECUTIVE SUMMARY

This report evaluates the integration and performance of the Oxi-Tech Pulse Oxidation (PO) system within the Sandford Orchards bottling Clean In Place (CIP) process. The primary objective of the trial was to verify that the PO system operates effectively within an existing live production CIP system and delivers hygiene performance comparable to, or better than, conventional chemical cleaning methods.

ATP monitoring was used to assess hygiene performance across multiple critical points in the CIP circuit following both hot caustic and PO wash cycles. Results demonstrate that PO washes consistently achieved low ATP readings and showed greater stability compared with hot caustic washes, which exhibited occasional elevated readings.

These findings confirm that the Oxi-Tech PO system can be successfully integrated into a live bottling CIP process.

This will ensure a significant drop in the use and cost of hot water and harsh chemicals in the CIP process.

This also moves the process towards zero environmental downstream impact, dramatically reducing the carbon footprint of the business.

BACKGROUND

The current Clean In Place (CIP) process in the Sandford Orchards bottling system uses:

- A hot caustic wash after bottling / production.
- A disinfection wash with a cold Peracetic Acid (PAA) immediately before the next bottling session.

The Pulse Oxidation (PO) system generates dissolved activated oxygen in water and has been integrated into the Sandford Orchards bottling CIP system as a replacement for conventional chemical cleaning steps. It has been used to replace a proportion of hot caustic washes with cold Oxi-Tech PO washes as part of the trial.

Ongoing monitoring of the bottling system has been carried out using ATP swabs to verify hygiene performance of the Oxi-Tech PO system.

The primary objective of this trial is to verify that the Oxi-Tech Pulse Oxidation (PO) system functions effectively within an operational bottling CIP system and delivers hygiene performance comparable to, or better than, existing chemical-based cleaning processes.

This report summarises and interprets the ATP readings collected to date as part of the trial.

DATA OVERVIEW

ATP swabs were taken at four hygiene critical points in the bottling CIP circuit:

- **Buffer Tank (P1)**
- **Sample Tap**
- **Bottle Filler (No.11)**
- **Carbonator**

For each wash event, ATP swabs were taken immediately following either a hot caustic wash or a Pulse Oxidation (PO) wash.

RLU value after hot caustic wash				
Date	Bottler	Sample Tap	Buffer Tank	Carbonator
07 October	2	0	1	0
13 October	2	7	257	2
07 November	114	74	105	87
25 November	2	3	0	0
26 November	0	10	0	0
10 December	1	70	1	1
16 December	1	2	0	0
19 December	1	1	1	0
Average	15	21	46	11

Table 1. Post caustic wash data

The tables below show the relative light unit (RLU) values obtained from ATP swabbing.

Key: **0-30 Good** | **31-100 Moderate** | **100+ Poor**

RLU value after Oxi PO wash				
Date	Bottler	Sample Tap	Buffer Tank	Carbonator
23 October	0	0	0	0
29 October	9	7	5	5
11 November	2	6	5	6
13 November	5	4	2	9
01 December	1	38	0	1
03 December	0	6	0	0
12 December	5	12	8	5
18 December	3	1	5	2
Average	3	9	3	4

Table 2. Post Oxi-Tech PO wash data

Figure 1. ATP comparison between caustic and PO washes

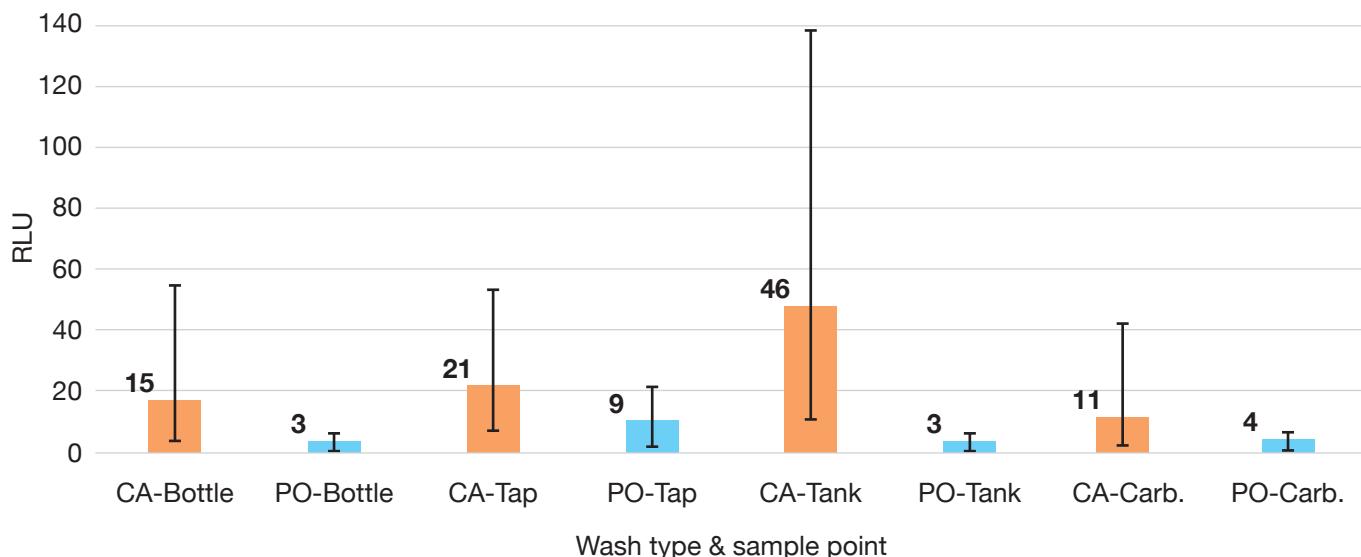


Figure 1. ATP comparison for each sample point

Figure 1 presents the average ATP readings for each of the four sample points after a hot caustic wash (CA - Orange) and a cold Oxi-Tech PO wash (PO – Blue). Each bar includes a standard deviation error bar, illustrating how consistent (or inconsistent) results were for each wash type at each location.

Across all four sample points, the Oxi-Tech PO washes show low and tightly clustered ATP readings, indicating stable and consistent performance.

In contrast, the caustic washes show higher averages and much larger standard deviations, driven by occasional high ATP spikes.

Overall, the figure clearly shows that PO delivers more consistent hygiene outcomes than hot caustic.



FINDINGS AND NEXT STEPS

The results directly address the primary objective of the trial by demonstrating that the Oxi-Tech PO system performs effectively within a live beverage and bottling CIP environment and maintains hygiene performance across multiple critical sampling points.

With 64 samples included in the dataset, comprising 32 samples for each wash type, the trend across all four sample points is clear:

- PO is matching or outperforming hot caustic.
- PO results are consistently low and more stable.
- PO washes have not shown any high ATP spikes, in contrast to the hot caustic washes where spikes have been observed.

These findings provide confidence to progress to further applications, including evaluation of PO at higher utilisation and assessment of PO as a replacement for terminal Peracetic Acid (PAA) disinfection. Results from these next studies will be reported separately once additional data has been collected.

The data generated during this trial sits alongside extensive laboratory data, and provides practical validation that the Oxi-Tech PO system can be successfully integrated into an existing bottling CIP process and used as a reliable alternative to conventional chemical cleaning steps, reducing chemical costs and significantly reducing the carbon footprint of the business user.

FINDINGS AND NEXT STEPS (CONTINUED)

In terms of Carbon Footprint Savings:

For the Sandford Orchards Pulse Oxidation System, at full production volume, with normal cleaning schedules the system can save 4-6 Tonnes of Carbon per year on Sandford Orchards' facility.

Carbon Savings include:

- Hot Water use reduction of 300L of water per wash (15 °C → 60 °C) (>15 tonnes of water not heated)
- 52 Hot Washes per year avoided all together
- 826 Kg of Caustic Soda reduced per year
- 203 Kg of Peracetic Acid reduced per year

The improvement in safety and environmental cost of buying, handling, storing and disposal of these aggressive chemicals can also be considered a benefit.



**Paul Morris, CEO,
OxiTech Solutions Ltd.**

It is really encouraging to see the hard data now showing improvements in Cleaning and Disinfection using Pulse Oxidation at Sandford Orchards. We are always happy to work with partners that really do care about the environmental impact of their operation, and the Sandford team are clearly in business not just to provide a great product, and to grow their sales, but also to try and improve the sustainability of their production facility and help the environment in their community. These objectives don't need to be mutually exclusive. In addition to this, with the project involving our commercial partners Stratos 3, and our final assembly team at DASL in Exeter, this is a great local success story.



**Barny Butterfield, Founder & CEO,
Sandford Orchards**

We are delighted to see less chemicals used in the cleaning of our production processes, and even more happy to see a reduction in our carbon footprint of in excess of 4 tonnes per year. This is just one initiative we have for making great tasting products for our customers, whilst making every effort to reduce our environmental impact within our business, our community and our planet.



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