Wem: Implementing Innovative Low Footprint Wastewater Treatment for Small Communities

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Priority Topic Area: **Water and Sanitation**

1 – Aim/planned deliverables - The need for innovation

To futureproof Wem's sewage treatment works for 2038, a new facility was required to handle double the flowrate, increasing from 38l/s to 64l/s, while meeting stricter effluent quality consents for ferric (0.6 mg/l) and iron (4 mg/l) by December 2024. The innovative Oxibox process unit, effectively a reduced footprint activated sludge plant, was a new technology. The implementation required a novel control philosophy, process design, and commissioning, all successfully carried out by MMB on behalf of STW, to improve river quality and future proof the community.

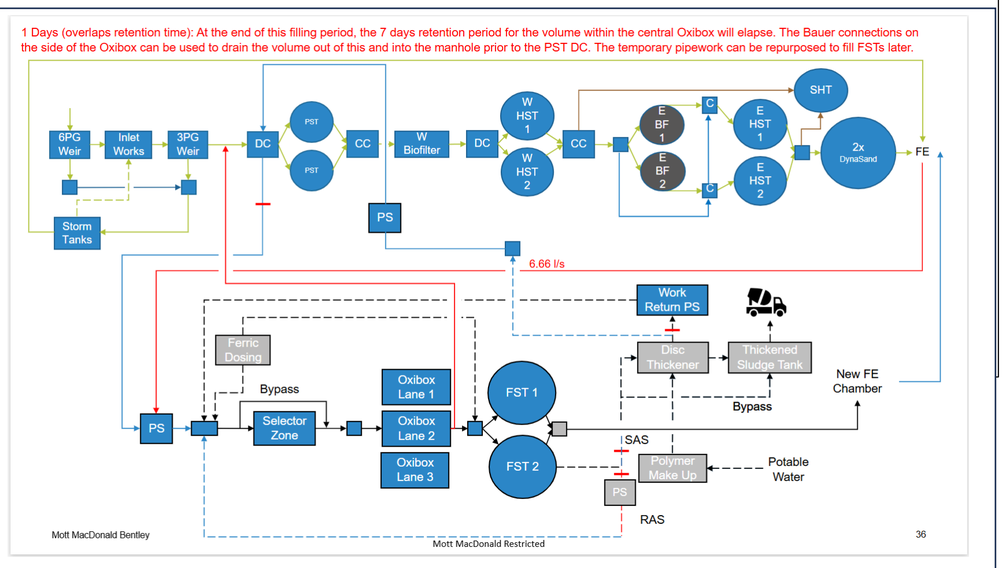

Figure 2: My process commissioning sequence, with an innovative colour coding, aiding clarity in seeing the assets turn on, in order, and where flows are directed.

Figure 1: Wem's successful aeration pattern test in September 2024, facilitated by my programming within the commissioning process sequence.

2 – Methodology – Intelligently building and commissioning innovation

I led the process calculations when, constructability and buildability safety reviews following poor ground conditions information, required switching the design from a 6m high box to a 4.5m high structure with a larger surface area, ensuring the treatment process biological requirements were met. Also, I developed a detailed process commissioning sequence for the new Oxibox and led comprehensive commissioning meetings with site operatives and the client's process representatives. These ensured continued compliance and allowed us to meet the regulatory effluent date with a very tight deadline, even accounting for supply issues over the course of commissioning.

3 – Outputs/Results/findings – Being adaptive

I developed a comprehensive control philosophy for the innovative Oxibox technology, a reduced footprint activated sludge plant. This was a new and unknown technology for my company, meaning we could not rely on pre-existing designs. I had to develop an in-depth understanding of the role of aeration in the nitrification and denitrification processes within the Oxibox. I incorporated my knowledge of two-film theory into the aeration calculations, ensuring precise control over the biological processes. Through diagnostic process calls, I addressed issues with the settlement tanks, ensuring timely resolutions. My commissioning sequencing allowed for effective planning around site constraints, such as programming issues and the arrival of broken subcontractor assets like the disc thickener.

I used my process understanding to correct issues such as solids rising within the final settlement tanks weeks after commissioning. I identified that inadequate periods without air supply (anoxic) were causing insufficient denitrification in the Oxibox, leading to nitrogen oxide release in the settled solids, disturbing the blankets and causing sludge rising issues. By adapting my process and chemistry understanding, and analysing the aeration data, I recommended increasing anoxic periods to decrease nitrogen oxide release, resolving the sludge rising issue. By addressing these challenges, I ensured the optimal performance of the Oxibox system, improving efficiency and minimizing environmental impact by reducing solids carryover.

Figure 3: Myself (right) presenting to the local community primary school on site, shortly before the children headed out to see the works!

4 – Benefit to society – Engaging with the community

I led a STEM engagement initiative at the local primary school, where I introduced students to the importance of wastewater treatment. I organised site visits, allowing the children to see firsthand the work being done to treat wastewater in their community. This engagement helped them understand the impact of population growth and the necessity of efficient wastewater treatment. Through these efforts, I ensured the successful implementation and operation of the Oxibox technology, while also fostering community awareness and education about environmental sustainability.

5 – Next steps

Next steps involve embracing change with enthusiasm, continuing to lead STEM initiatives across my projects, and developing new, innovative processes. I aim to find more sustainable ways to treat wastewater, ensuring that we not only meet current needs but also protect and enhance our environment for future generations.

References/Acknowledgements

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