
Make it move - a common sense approach
AquaSafeSkills

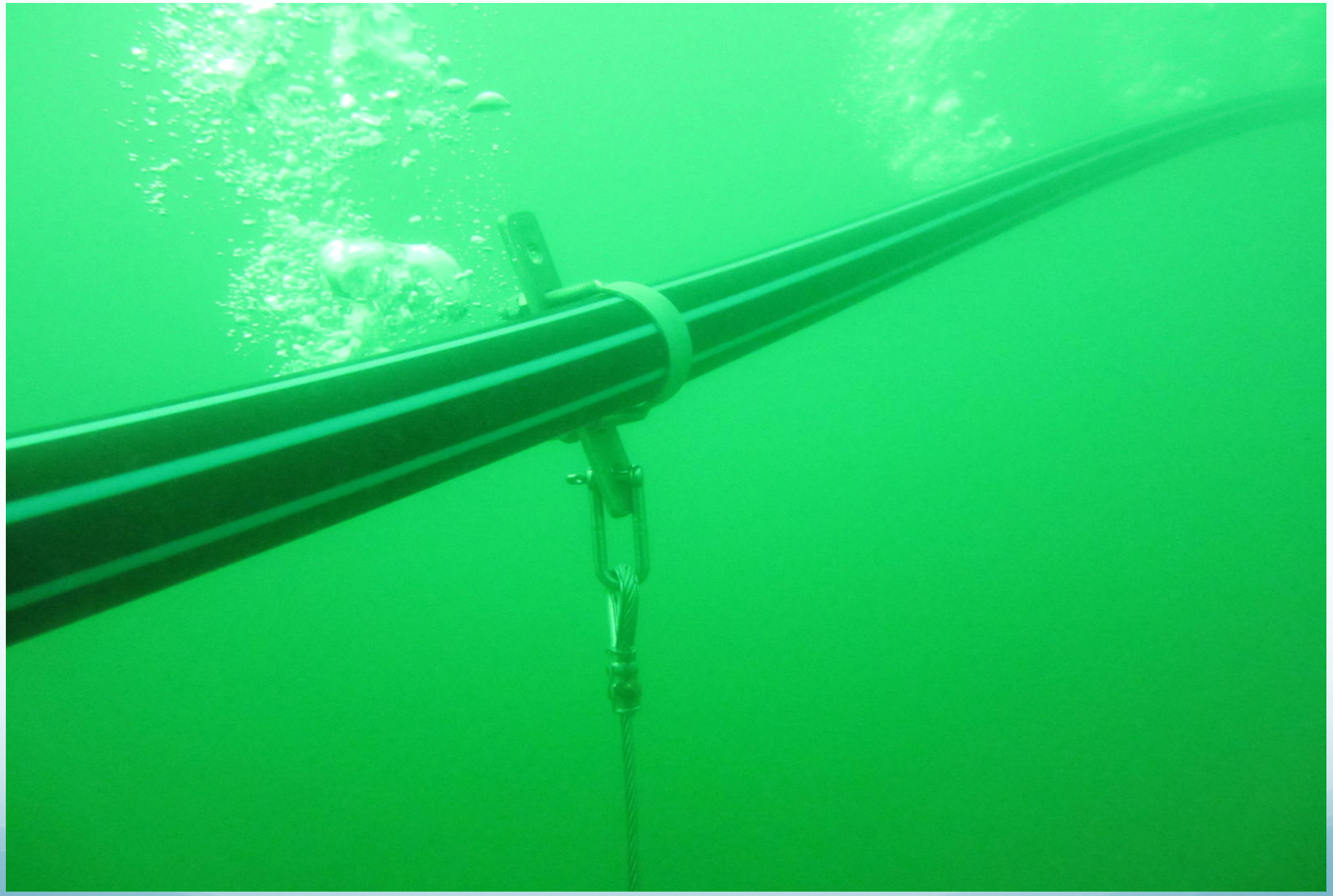
Overview

- In our World, everything needs to move to stay alive and healthy. People, animals, transport and much of our natural environmental factors such as air and water.
- Being at a water industry conference, I will leave the other issues to the relevant experts and concentrate on water.

Water moving in streams and rivers appears to be a better alternative than water laying around, not moving and becoming stagnant, although it is possibly more attractive to some of our smaller water borne creatures who live in it. Imagine our poor mosquitos trying to breed and raise a family if they keep on being swept away!

Our water industry has four main areas that benefit from movement: River catchments, Dams, Distribution systems and Storage tanks. Rivers seem to take care of themselves, with rainfall and gravity being the main inputs to water movement.

- Dams have water moving slowly in and out as part of their intended function and are often enhanced by the addition of mixing systems to improve the overall water quality. These systems can be either aeration pipelines or mechanical mixers, that move the water up and down to prevent it from forming thermal layers and retaining natural minerals such as Iron and Manganese.

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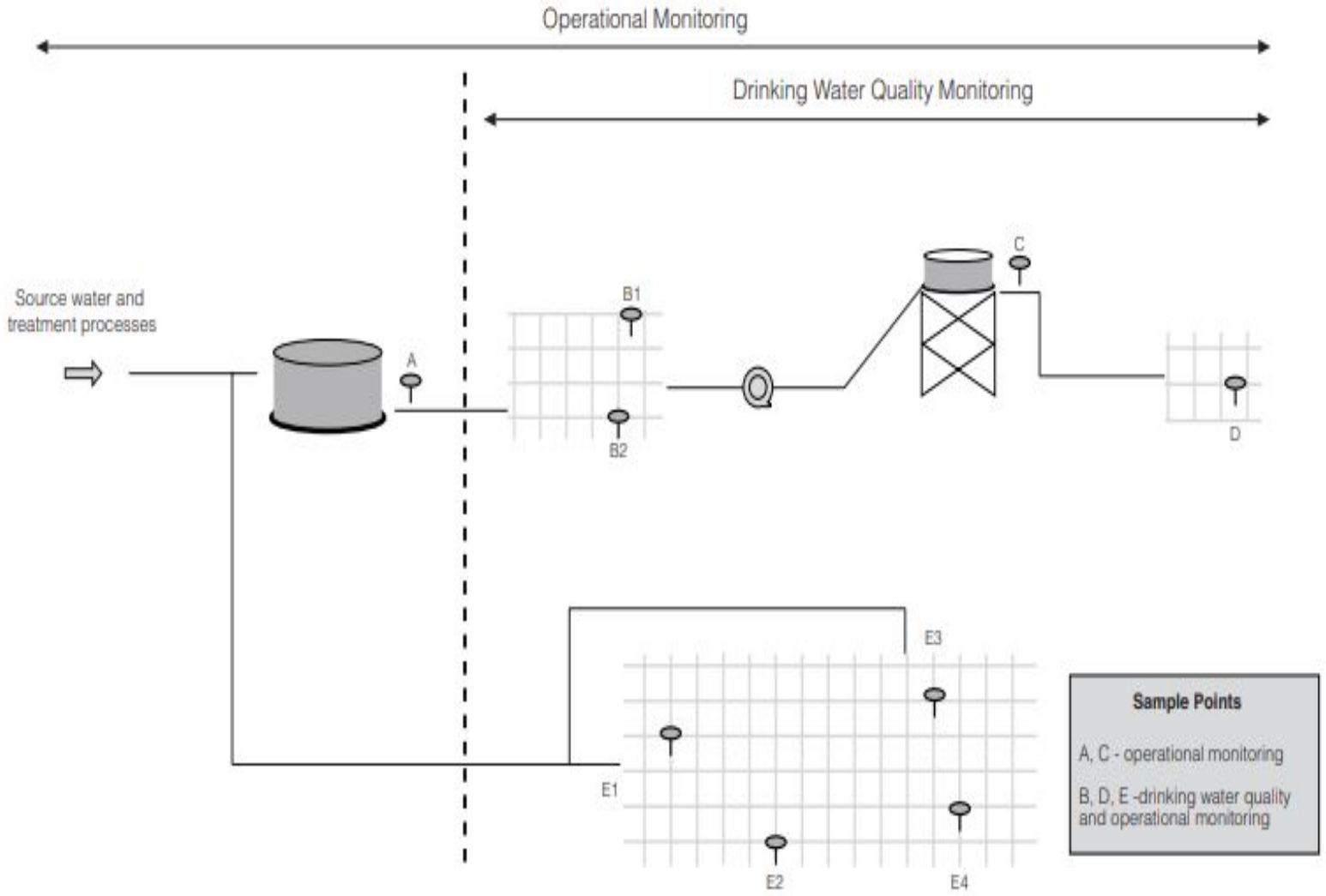
- Distribution systems require movement to transport the treated water around the local areas being serviced. Water is either pumped or relies on gravity and it is important to not have ‘dead ends’ in any section of the system. Water not moving can become stale and deficient in disinfection residuals. However, one downside is excessive movement during times of high usage, as this can disturb sediments settled out in the pipework and lead to dirty water issues.

Figure 9.3 *Example of sample locations in a typical distribution system*



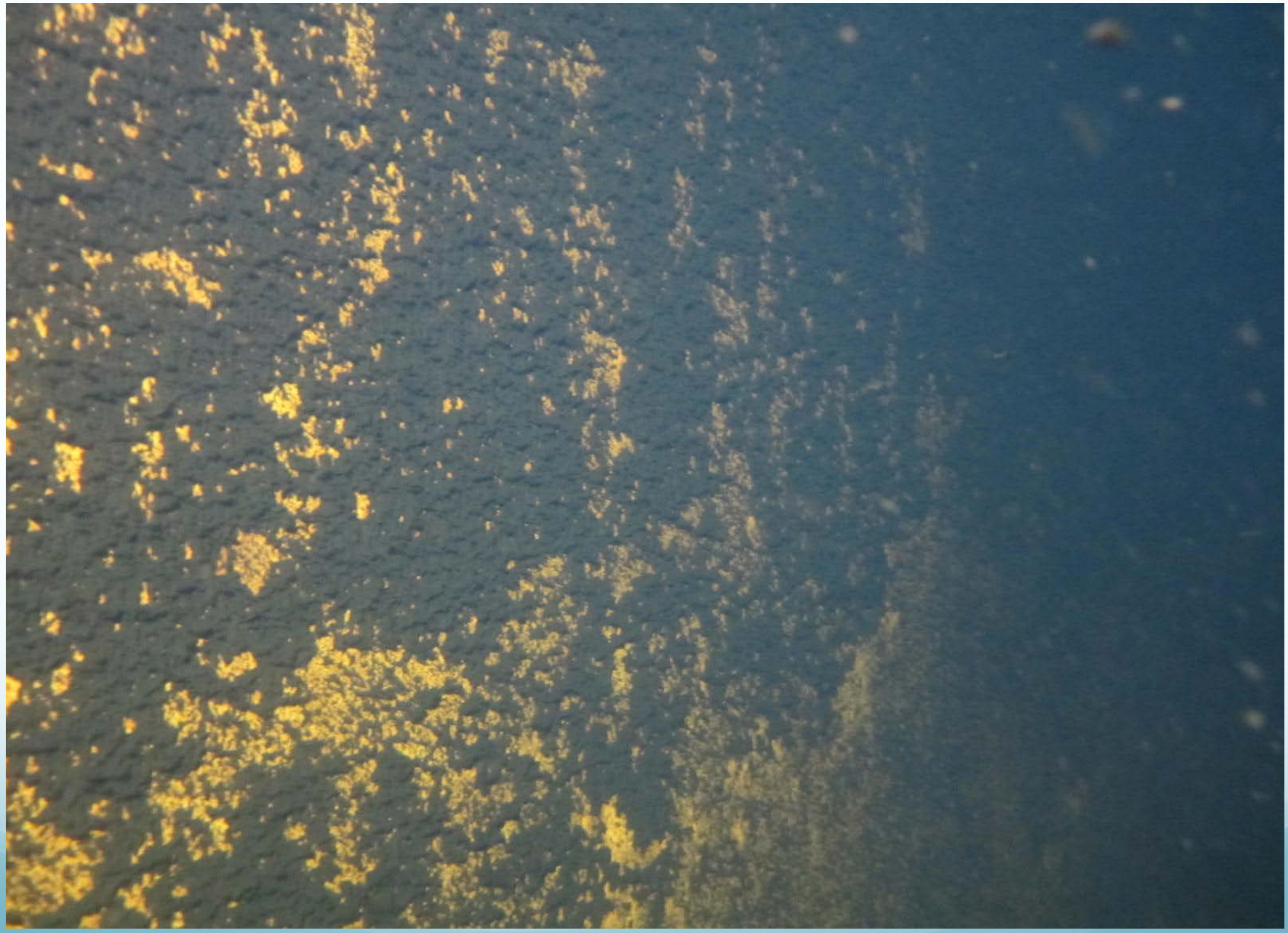
- It has become advantageous to now use smaller sized pipework within distribution systems to keep the pipework cleaner, as sediments don’t have the opportunity to settle out as frequently as in larger diameter pipe lines, that have less velocities of water movement.


Storage tanks are the last part of our water system that require movement, both up and down and around and around to maintain good quality of the stored water.

There are many ideas and systems in place to maintain this important requirement and having a working interest in tanks, leads me to give this part of the water system more detail than the other previous areas.

Water movement can be simple and inexpensive or complicated and not always affective. I will list some of the factors involved beginning with the KIS principle…'Keep It Simple'

1. Operate the tanks so that they empty and fill on a regular basis. In Winter time when water usage is reduced, several tanks in a system may be taken out of service (if possible) to make the others turn over more regularly. We have noted water quality issues with tanks that are kept full all the time. The inlet and outlet cycles are short, which reduces turnover and appears to cause sediments to accumulate on the walls. Longer filling cycles cause more water movement up and down and the walls remain cleaner.



2. Designing or renovating inlet and outlet pipework to move the water effectively and in a considered pattern of turnover is the first simple option. I have often been asked “where is your science and research in this particular area”. My answer as a diver, is simply being inside the online tank as it operates and watching the water movement and sediment patterns as it occurs! This is more ‘true to life’ than modelling, where incorrect information can be used to create a desired scenario.

3. Correctly positioning inlet pipework so that it moves the new water in a predetermined pattern without disturbing the existing sediments settled out on the floor is essential. Water should be introduced from the floor area upwards as this will not affect the settled-out sediments.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4. While ‘top fill’ inlets can move the water, they have a history of disturbing the sediments if the water levels accidently become too low. They can also aerate the new water as it enters, reducing the disinfection levels and cause structural damage to roof members through physical splashing contact or by creating a gaseous environment.

Common inlet and outlet pipework was once common in tanks, which had a single pipeline leading up to the asset. So top fill inlet systems were often installed as a renovation process, to create separate penetrations. 2 way directional nozzles can now perform the same task, when fitted to a common penetration. Inlet water is jetted across the tank in a predetermined mixing pattern, while outgoing water is pulled back through the top of the nozzle and also through the side flap area, so that any restrictions of flow are not created.


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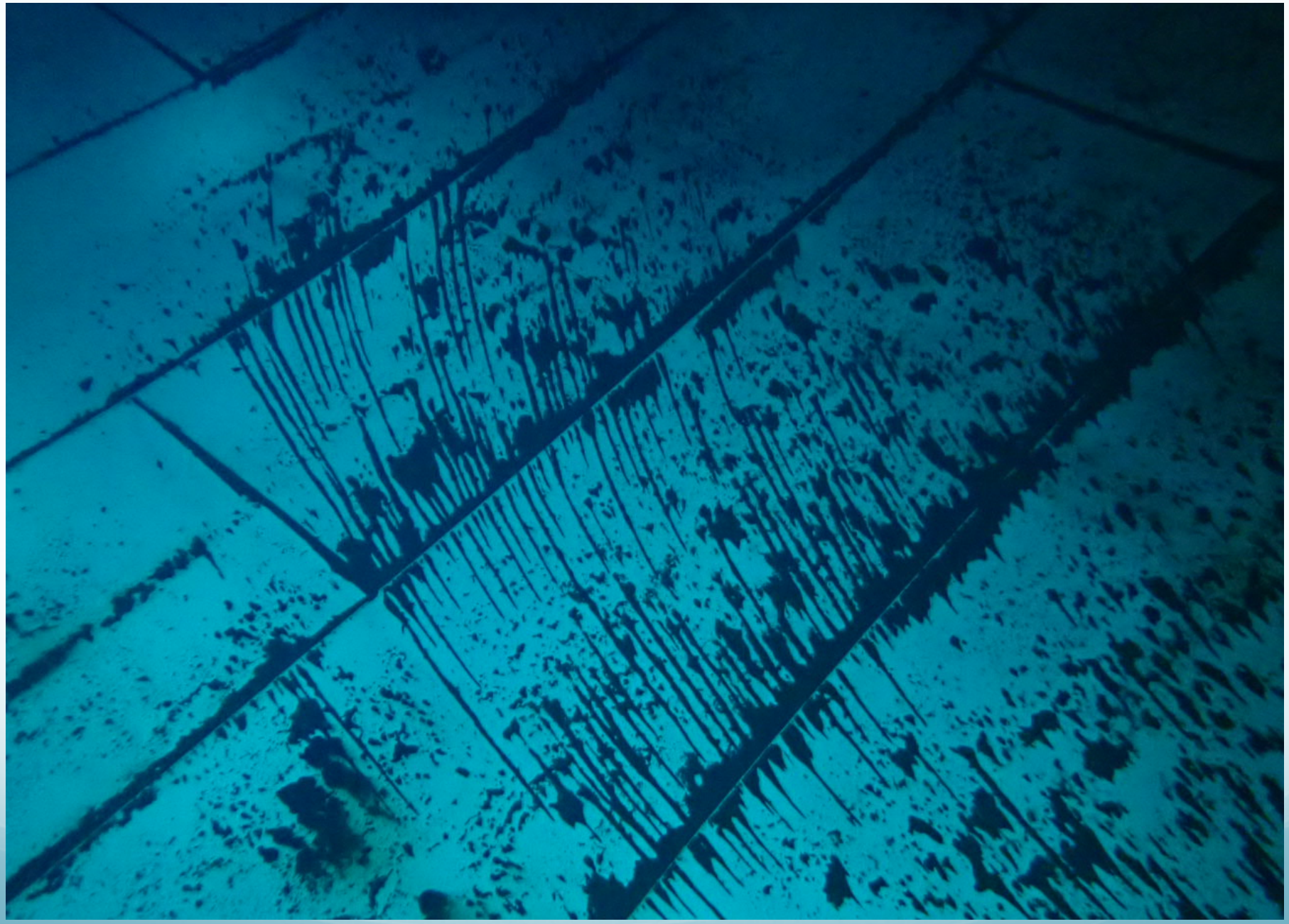


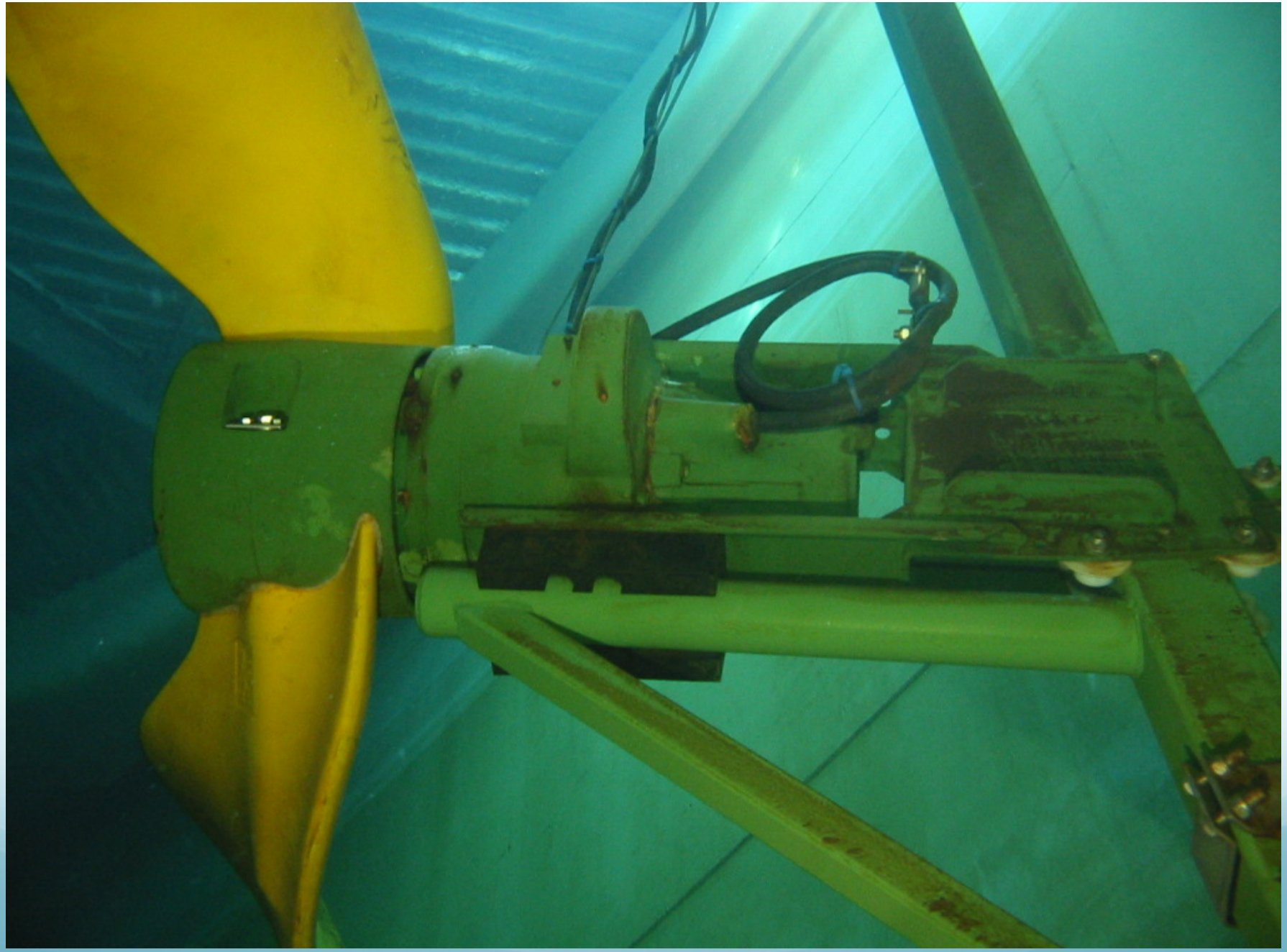
5. Directional inlet nozzles and 2 way nozzles are the simplest and cheapest mixing option. Incoming water is directed into an effective mixing pattern, that gently moves both up and down and slowly around and around. The evidence is shown by the sediment patterns. If correctly positioned, there will be an even covering of sediment across the whole floor area and NOT either all deposited into the centre of the tank or only around the walls.

Most directional nozzles are fitted with a SS Ramtube, to create improved mixing velocities, without causing a restriction to the incoming water.

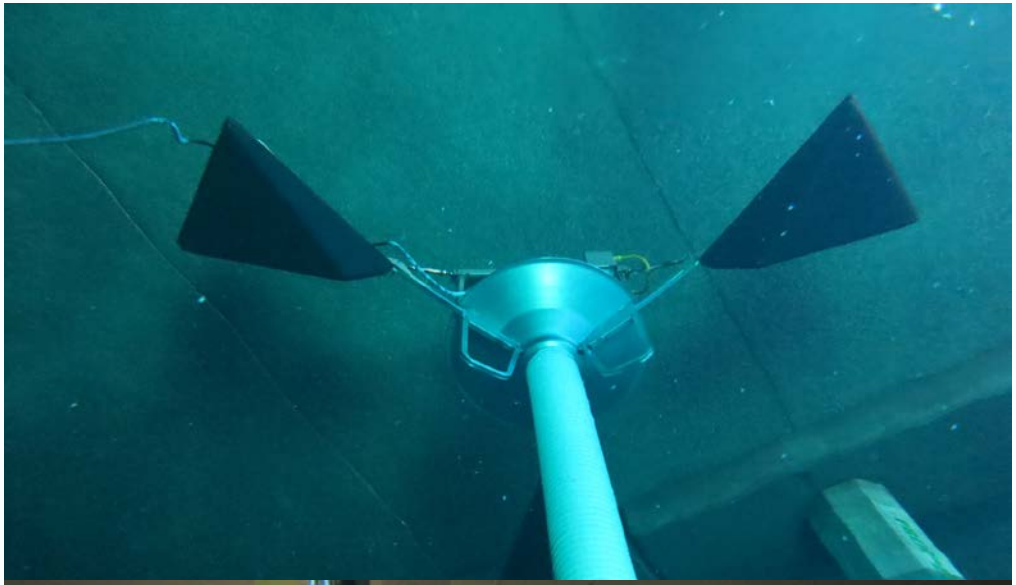
The SS nozzle acts like a funnel to increase centre velocity, but water can still bypass around the edges of the unit during high filling cycles.

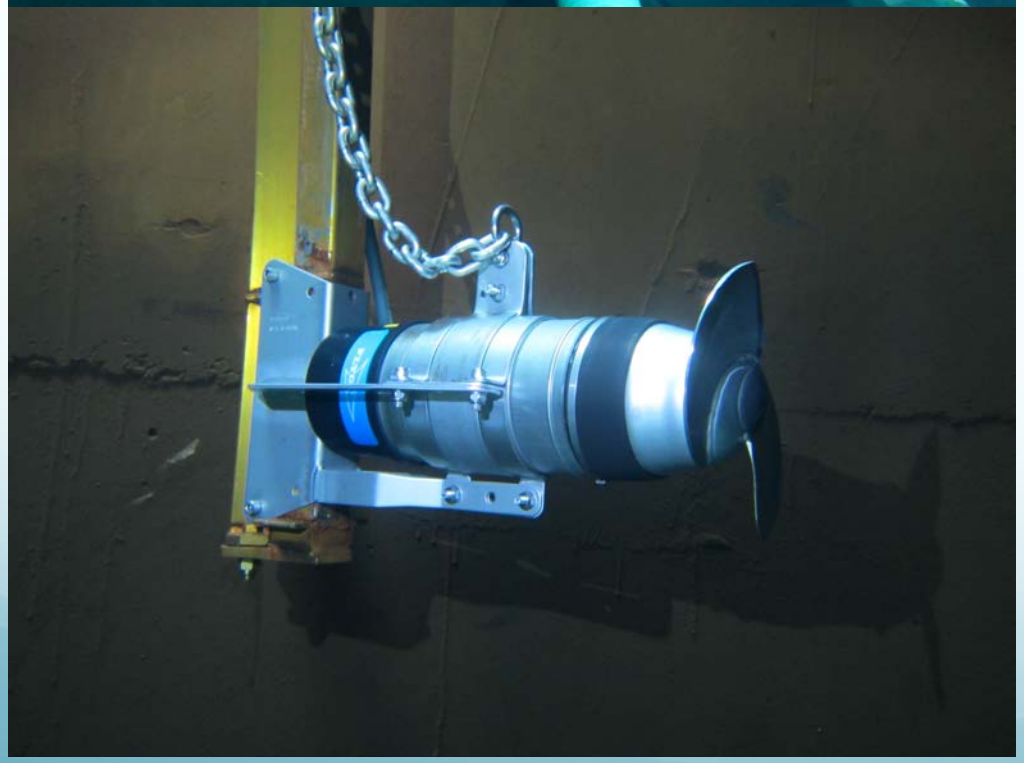
A similar mixing nozzle is connected to an external pumping system. This is a practical, additional water movement system that does not have the motor section inside the tank, thereby alleviating any corrosion or electrical issues often experienced with other mixing units. Chlorine tablets can also be easily and safely added into the mixer as a top up disinfection system.

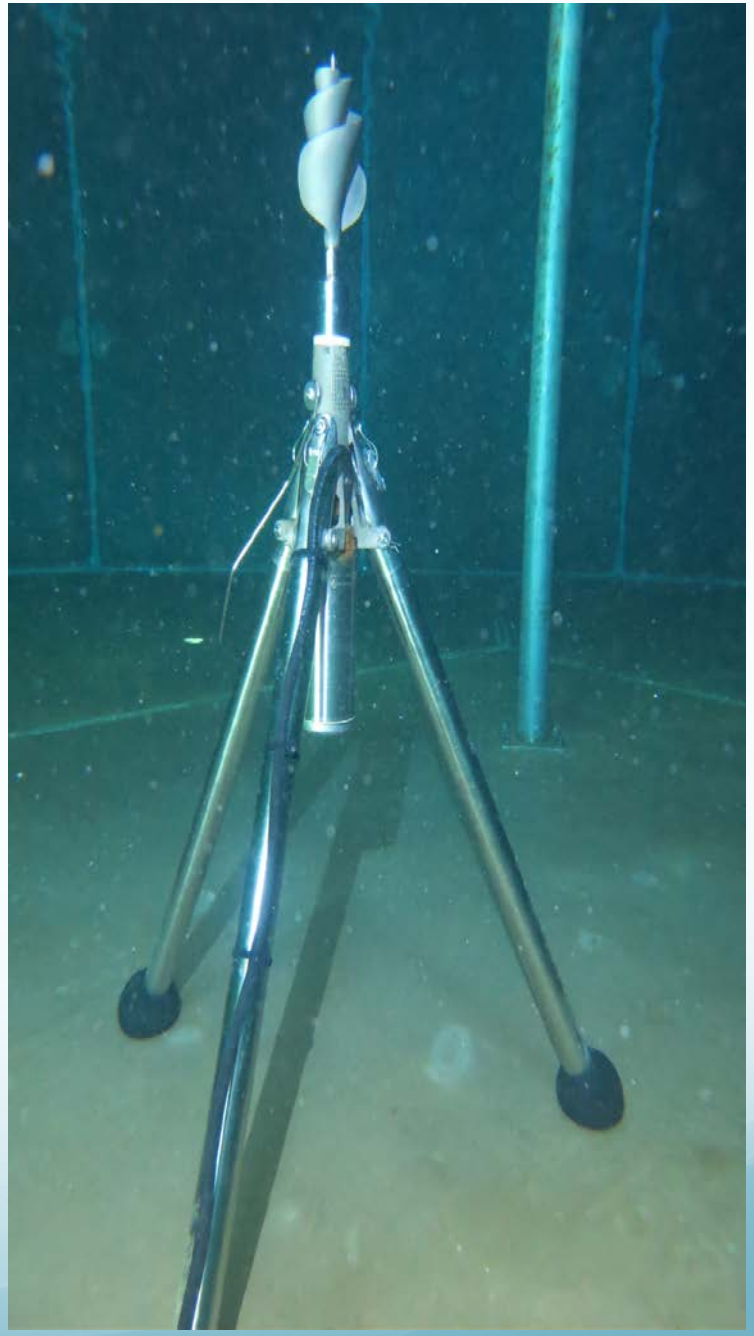
I have dived in large tanks with mechanical mixers not correctly positioned and have recorded temperature differences from the circumferential areas as being over two degrees warmer than the water in the centre area. This indicated the centre area water is entrapped in a whirlpool effect and is not moving. Water quality testing taken from the external outlet areas does not reflect this phenomenon of stale water.



6. We have a variety of mechanical mixers available to move the stored water, and each has its good and bad points. They are mainly spruiked by designers and salesmen who have little understanding of actual operating conditions... did I mention ‘modelling’? Some are merely poorly installed or are not sized according to the diameter and depth of the tank.







Once again as a diver, I have stood next to and in front of a variety of mechanical mixers and observed the supposed water movement and its intended direction. Some motors have even been rotating in the opposite direction, due to incorrect electrical connections.

7. It is a difficult thing to report on some of these poor outcomes, when the customer has outlaid considerable amounts of money and assumes that all is well. Not many people like hearing negative outcomes to a system they have invested in and trusted to work effectively. But an accurate image does not lie, even if the truth is a little ‘twisted’!

8. So, this presentation is an attempt to show what works and what doesn't, based on diving in and inspecting over 8000 storage tanks across a wide area of our 'Great Southern Land'. I will end this session with a quote from George Orwell…" Some ideas are so stupid, that only Intellectuals believe them" Luckily as a diver I do not consider myself as 'an Intellectual'! But I can and have lifted heavy things, which in the longer term doesn't turn out to be very smart after all!