COATINGS IN THE WATER INDUSTRY

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ABSTRACT

Water is one of the most abundant materials we have on this planet but much of the quality is less than suitable for human consumption, or difficult to harness. In our industry, it is most abundant as grey water to be upgraded or sewer water treated with the right technology to make it fit for human consumption. To enhance water quality is paramount.

Coatings are used to assist in the retention of water quality, or protect the assets designed to handle the water. These are often packaged into a single box and assessed on price, degree of preparation required before coating, or their ease of application. Appreciation of use on the common substrates of steel and concrete in relation to potable and waste water is a basic necessity.

This paper reviews a small area of the current standards relating to the water industry and applies them to coating selection. It is principally about retention of water quality and reviewing realistic selection criteria.

KEYWORDS

Waste Water, Potable Water, AS/NZS4020, Coating

1.0 INTRODUCTION

There are two predominant areas of coating use in the water industry:

- Protection of concrete and steel surfaces from the harsh effects of sewerage and other corrosive waste.
- Protection of the water supply that could be tainted by the concrete and steel surfaces, or by organisms and other materials that can thrive as a result of being in proximity with the substrate.

The protection of concrete and steel is quite well documented with many materials proving they are suitable, some of them having over 20 years history in use. The available methods of preparation of the surface and installation of the coating determine how long the coating remains adhered.

In water treatment installations essentially dealing with Hydrogen Sulfide and other corrosives, suitability has been complicated by the introduction of standards or acceptance criteria without rhyme or reason, creating indecision. With no uniform standard currently available, some simple criteria can be used that calls on the basic minimum demands to make sure the selection of materials is carried out effectively.

The protection of a water supply relates largely to making sure that drinking water quality is kept at a standard deemed safe for human consumption. Although the detail may differ depending on where you live (Adelaide or Hobart as an example), it is still health that is the key indicator. The AS/NZS4020 exists as the pre requisite selection method for coating suitability since it is this standard that rates whether a coating will adversely affect the water quality. The appreciation of this standard, its value and the way to review it

makes coating selection very simple.

2.0 DISCUSSION

2.1 Coatings for Concrete or Steel

Well designed coatings have the ability to be applied to both concrete and steel. Coatings may differ when significant effort by the formulator goes into improving application features or marketability.

Over the decades, enough has been done to prove up some very basic systems that have demonstrated decades of service. The common denominator in all work that has stood up for long periods is the correct surface preparation, and installation. A scope of work and clear instructions to follow are paramount, even for the world's greatest coatings.

2.2 The Services – Wastewater & STP

Service conditions encountered may be quite broad. Abrasion from undissolved solids can impact significantly on materials exposed to fluid flow. High levels of corrosive substances which may include hydrogen sulfide, chlorine, food acids and bacteria can also result in rapid deterioration of surfaces.

New surfaces, if left uncoated, could result in significant amounts of money being spent to correct, or arrest degradation in the future. The actual cost of the protective coating in new work rarely exceeds 20% of the total protective coating installation investment. Installation of protection at a later date, often coupled to correcting damage to the surfaces can increase the cost of preparation and application labour by up to 100% over the cost of initial treatment, with the cost of protective coating material (consumption) increasing by 200% depending on the extent of degradation and rebuild required.

2.3 The Services – Potable Water

With the primary function being to contain drinking water, coatings for these types of services can be straightforward to select. Critical criteria in nominating the material is its ability to be in continual contact with the water and not taint the water, leave a bitter taste, make it cloudy, or even promote bacterial or fungal growth. Service conditions also require good chemical resistance to Chlorine or the multitude of other compounds that can be introduced, such as bore water.

There are literally thousands of different bacteria that can infect our water supplies and to protect against this, coatings must not promote further growth. Accepted the coating should have good chemical resistance, adhesion and other properties associated with high performance coatings but the most critical is its ability to be inert to water and its quality, otherwise it may as well be coming off in sheets. Certainly if it taints the water supply or promotes some sort of growth, better it come away rather than sit there for eternity.

2.4 Coating Selection

Selection of the coating is not unlike selecting the type of metal for piping or tanks. Nominate the material for the service and make sure it is fitted out correctly. Adhesion, ease of application, and other factors that relate to installation have been ignored since these are often a part of the use instructions and are in the contractor's domain.

2.5 Waste Water & STP

The selection process is fairly simple and requires very little effort. In reality, there are so many products that have been around doing the job well for over 20 years that there is little reason to go beyond review of these materials on past history.

The collection of history can be complicated simply because those using the materials will often be protective of the work conducted and preserve confidentiality on their own clients. Changes in staff managing facilities also results in lost references or history.

Figure 1 covers selection in a very simple format with the following explanations:

- Obtain any technical information and history in service with chemicals, waste, etc. Do not overstate the conditions excessively but be realistic of concentrations of materials like sulfuric or sulfurous acid. Historical usage still needs to be backed by the provision of accurate service conditions from the operator/owner if a warranty is to be effectively maintained.
- If a coating has no history, do you have reason to look at it further? If so, for what reason, check its data and support line before accepting it for review.
- With good history, possibly some references, and sound technical information comes the acceptance for review. What do you look for? Do you really know or does it really matter?
- Ensure the information being presented has common sense and sound detail to be clearly acceptable, avoid ambiguous or ambit claims you cannot appreciate. If you do not understand it, how can you accept it?
- Acceptance of a material without proper representation from the vendor may transfer liability back to the operator/owner simply on the base of a lack of due diligence, or a vendor's claim of lack of supplied information.

Nominate products that have history and check to see whether support was there during the work or when problems occurred. No one expects problems but support is important to have.

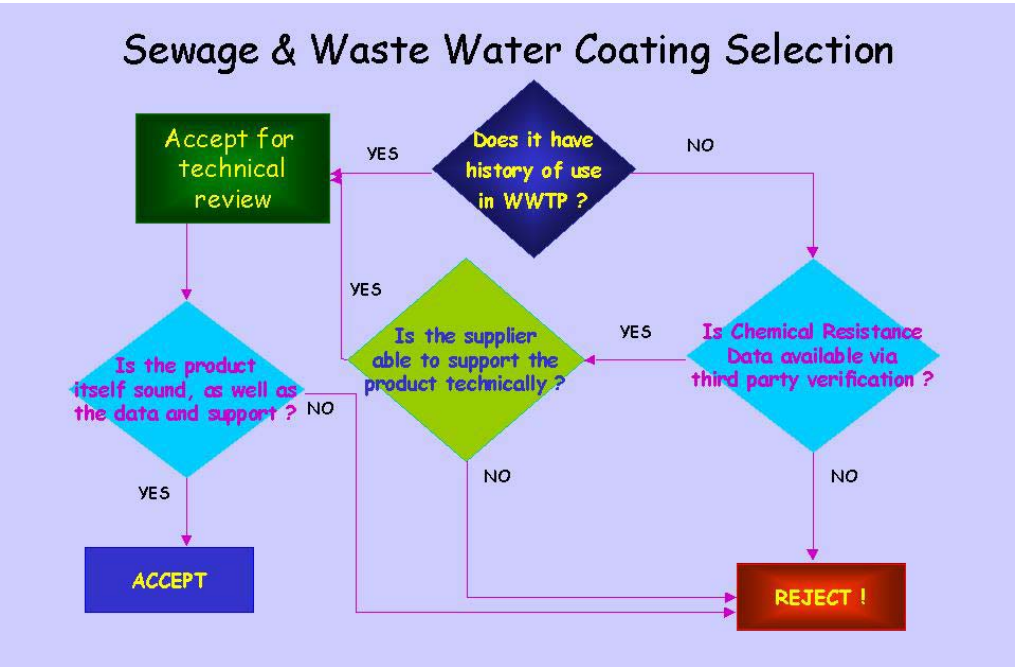

Figure 1: *Flowchart for Sewage & Wastewater Coating Selection*

2.6 Potable Water

The selection criteria in relation to potable water is straightforward and simple. Water quality is the key factor and significant focus comes onto AS/NZS4020. Many coatings have history in large volume potable water service but the AS/NZS is an evolved criteria with finite focus. AS/NZS4020 has its most recent release in 2005. Minor changes over prior releases relate to treatment and assessment of undercoats or primers, and test related factors. The alterations have negligible effect on single product systems other than poor performing products tested.

The following chart provides the basic step by step guide.

- Confirm assessment to AS/NZS4020: 1999, 2002, 2005 evaluated. Prior to 1999 the standard was an interim and is voided. Don't accept "exceeds AS4020", this is impossible. Get the report and verify the data, keep it on file. Also obtain a brief run down of where used. Without any testing to AS/NZS4020, seek other information. Rarely should alternatives be accepted but it is appropriate to review available information.
- With compliance to AS/NZS4020 comes the acceptance for review and if other documentation exists, review that too.
- Coatings cure sluggishly at low temperature and it is coincidental that many potable water assets are coated during the cold winter period when replenishment of tanks can be easily done. Was the testing carried out at low temperatures that could be similar to that to be experienced in reality? If not, there may be a problem.
- The AS/NZS cites a "surface area/volume" relationship, you cannot exceed the standard. The higher the surface area, the less impact on the water quality. The surface area/volume relationship is a maximum. Data that stipulates minimum is incorrect.

Nominate products that have the highest surface area/volume relationship, at the lowest test temperature. The coating is expected to last a long time and the better the product initially, the better it will perform in the longer term.

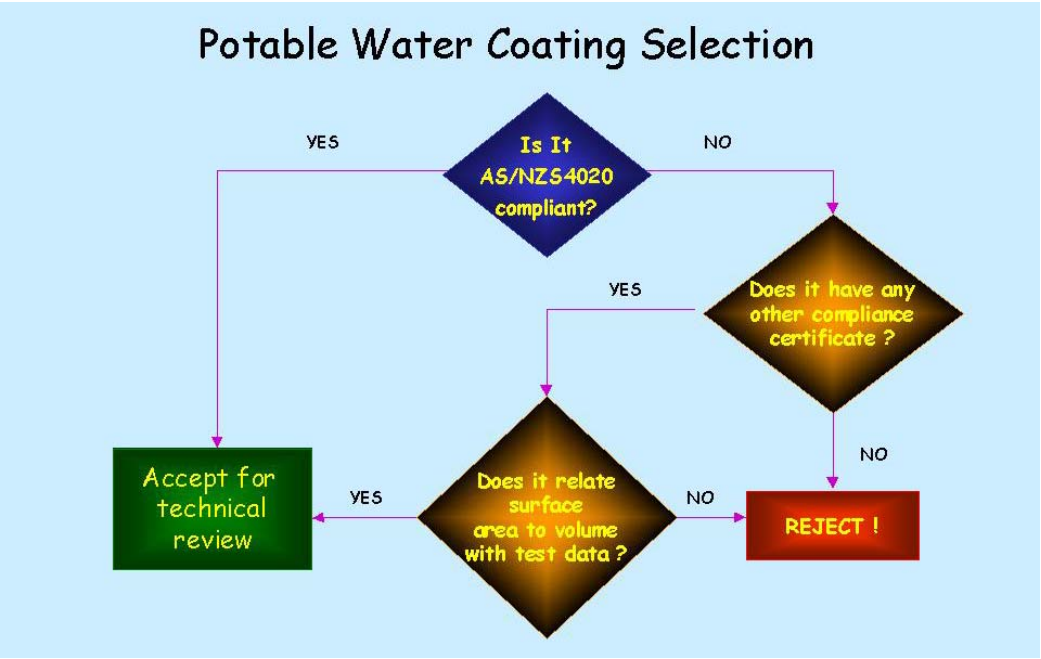

Figure 2: ***Flowchart for Potable Water Coating Selection***

3.0 CONCLUSION

Little reference to standards or bodies such as, NACE, APAS, SSPC, or any of the numerous others frequently encountered has been cited. Many of these references can have some requirement that complicates the coating manufacturer's primary task of producing a quality product. The manufacturer holds the responsibility of service irrespective of the standard.

Confusion between corrosion protection and coating suitability in drinking water should not exist. Common sense dictates that any materials complying with AS/NZS4020, as the primary instrument for potable water, should be the primary consideration above all else.

In the waste water sector, the important criteria must be the formation of technical competence coupled with history in the application.

In most other industries, materials are nominated on merit and then are assembled, used, placed, etc. The important fact is the materials are nominated. The water industry has a critical role to fill now, and in the future. If it is to live up to its role, it will assess clearly and decisively about the demands it places on all its direct and indirect suppliers, and be mindful of the due diligence it is expected to practice.

4.0 ACKNOWLEDGEMENTS

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