

CHEMICAL DOSING SYSTEMS. “NOT ALL PLASTICS ARE SUITABLE.”



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ABSTRACT

The purpose of this paper is to provide an insight to the plant operators, shire engineers, consultants and contractors to the water and wastewater and associated industries, of the many pitfalls and hazards associated with the supply and installation of incorrect materials by inexperienced contractors for chemical dispensing.

1.0 INTRODUCTION

There are many situations where local government and other organizations award contracts on price, to inexperienced suppliers, who have very limited knowledge and experience when dealing with hazardous chemicals, utilising the wrong materials, designs, and installation techniques.

This not only costs the customer considerable money due to excessive failures, down time, repair/replacement, it can also cause significant damage to infrastructure, pose serious health and safety risks to operational personnel, the public through over/under dosing of chemicals and of course the environment.

2.0 DISCUSSION

This paper is to highlight the need for an **industry standard**, covering

Material selection

Material installation

Equipment selection

Equipment installation

Process design competency

Installation standards

Installation personnel competency

The photo below is a standard PP fitting procured from most hardware/irrigation shops and installed on a typical chlorination system for a bore water supply with a local government authority. This is typical for many similar installations around the country.

Unfortunately, the material selected is not compatible with Sodium Hypochlorite solution and gradually degrades internally over a period of > 3 months and finally fails leaving a trail of destruction and an expensive repair bill for external damage created.

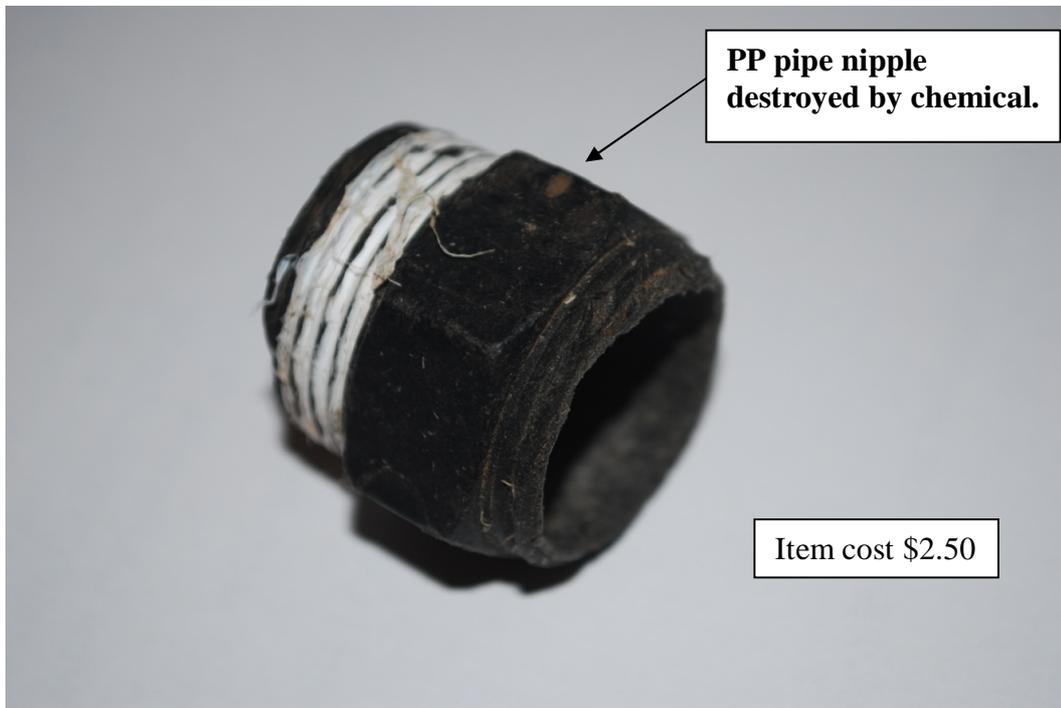


Figure 1: *Incorrect material selection.*

Table 1: *Approximate damage bill for use of inferior fitting.*

Description of damaged item	Qty	Repair cost
Electrical control panel	1	\$5,600.00
Water pump	1	\$ 900.00
Penalties for non-conformance water supply	1	\$ 3,500.00
Labour for mechanical and electrical repairs on site	1	\$2,500.00
Medical bill for operational staff (loss of time)	1	\$ 750.00
Repair/rectification bill.	Total Cost	\$ 13,250.00

2.1 Inferior solvent application techniques.

As can be seen in the attached photo Fig 2, the solvent application technique has not been followed, leading to subsequent premature failure. The joint below slowly leaked causing damage to a mag flow meter which was located directly below the fitting requiring replacement of the mag flow meter.

As can be seen from the photo, the pipe and fittings were not primed correctly, leading to ineffective solvent bonding, insufficient solvent was used and pipe was not inserted to the full length.

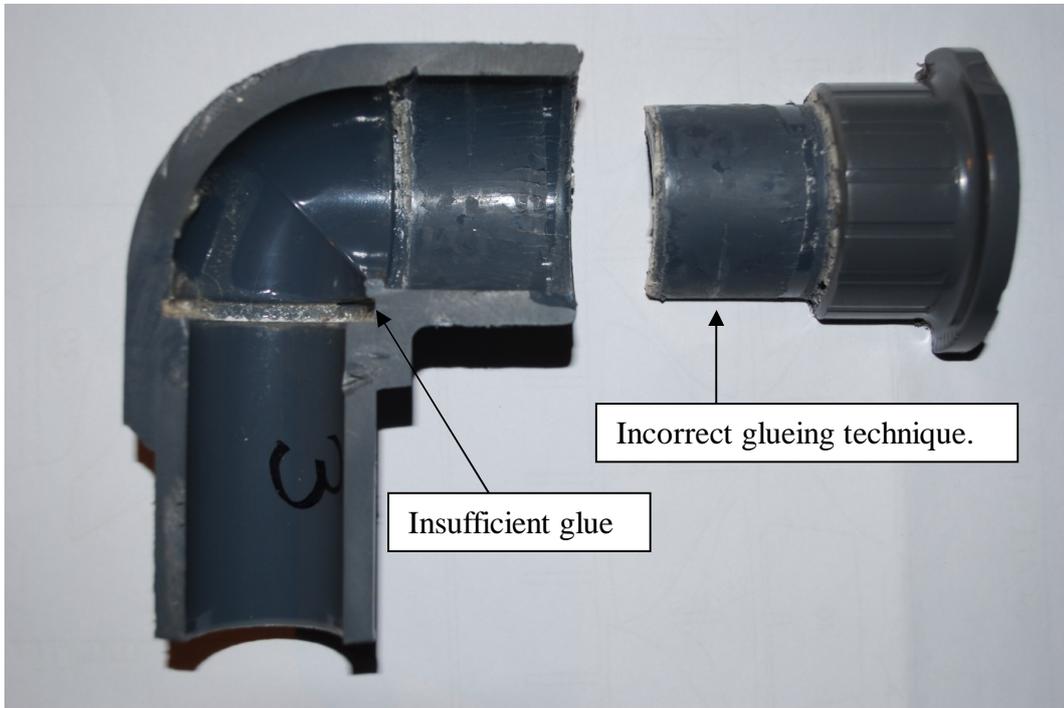


Figure 2: *Faulty elbow and pipe.*

Table 2: *Approximate damage bill due to incorrect gluing technique.*

Replacement cost including labour, materials and electrical installation.

Description of damaged item	Qty	Repair cost
Mag flow meter.	1	\$2,800.00
u-PVC fittings	1	\$120.00
Labour for mechanical and electrical repairs on site	1	\$2,500.00
Repair/rectification bill.	Total Cost	\$5,420.00

2.2 Inferior equipment installation and materials.

Plumbers are the usual first port of call as they are generally held in high regard, due to their expertise in the installation of pipe work and fittings for water and wastewater, **NOT CHEMICALS.**

CHEMICAL DOSING is a very specific field of expertise, requiring certain skills not taught in TAFE Colleges, or from a text book. These skilled people generally have a trade background, i.e. fitting with training and experience in:

- solvent application techniques,
- solvent selection,
- u-PVC pipe work assembly,
- chemical compatibility,
- technical knowledge relating to material selection,
- system design and layout, where health and safety is paramount, and
- considering all aspects of the installation to ensure health and safety protection for

all eventualities is given consideration.

A sound understanding of the effects on the environment these chemicals can have and how to protect it from spills and leaks.

The Chemical handling industry should adopt a similar practice as in the electrical industry, we all know how to wire a 3 pin plug but there are dangers in allowing anyone to do this and this is why in industry only licenced people can carry out this activity. It is no different to allowing untrained people to work on chemical systems.

2.3 The outcome for using untrained contractors supplying incorrect materials.

Health and Safety Impact

- Operation personnel are at great risk every time they enter a chemical installation as leaks, from incorrect solvent application or material selection, could occur at any given time, spraying chemical over the operator and equipment.
- Potential of over and under dosing of chemical where system design has been compromised through lack of knowledge and understanding.
- We have all recently heard about the Chemical plant explosion in Waco Texas, this could happen very easily with the right combination of chemicals. Recently we had a discussion with a client where they were proposing to place two non-compatible chemicals in the same bund which could have caused a serious incident should a leak occurred with cross contamination.

Financial Impact

- High costs for rectification and replacement. (can be more expensive than original capital costs)
- Downtime due to unreliable equipment.
- Possible penalties due to loss of water treatment. ie not meeting local government water guidelines. (expensive)
- Equipment damage from chemical leaks due to inferior products/installation. (expensive)
- Low capital cost does not mean equipment is suitable.

As can be seen in the Figure 3, the hose and fittings are incorrectly sized with very small reducers placing undue load on the dosing pump and hose. In an industrial application, hose should not have been utilised and should be rigidly plumbed, to ensure integrity of the system.

Galvanised fittings react with the chemical and will degrade the fitting and the chemical and in some cases cause adverse reactions, u-PVC should be used for this application.

Stainless steel valve has been utilised and should have been u-PVC as the metal fittings will degrade the concentration of the chlorine.

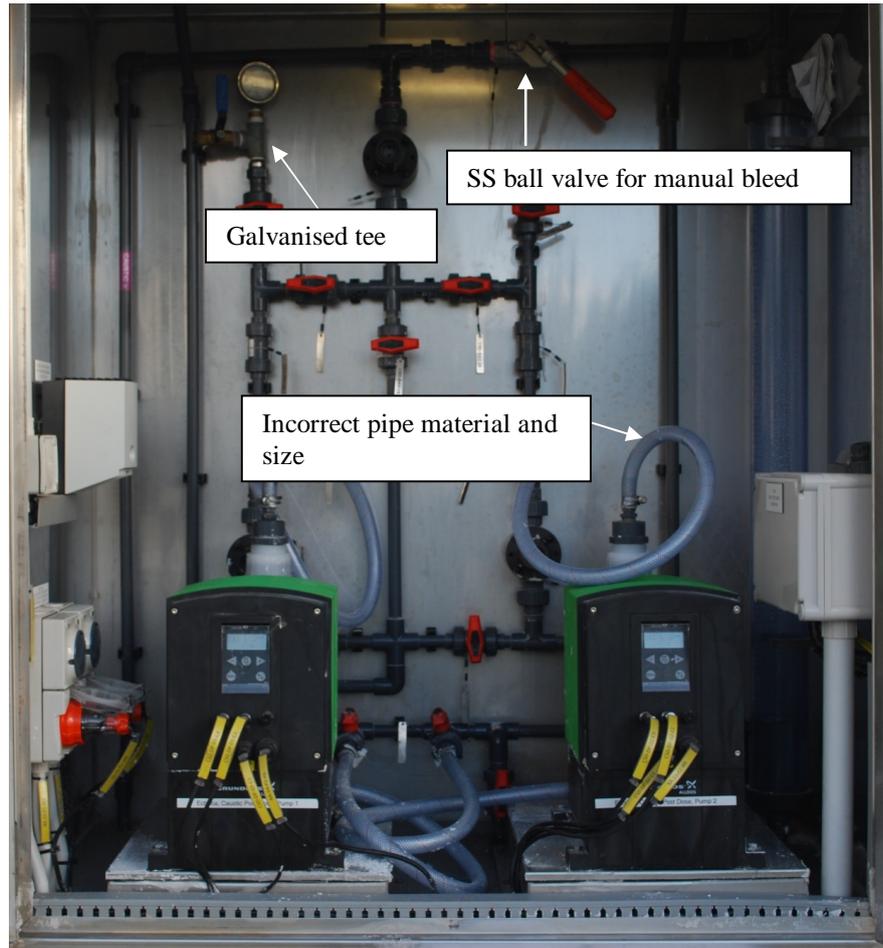


Figure 3: *Substandard Installation.*

Table 3: *Approximate rectification bill due to incorrect material selection.*

Replacement cost including labour and materials.

Description of damaged item.	Qty	Repair cost
u-PVC fittings	1	\$120.00
Labour for mechanical repairs on site	1	\$1,200.00
Repair/rectification bill.	Total Cost	\$1,320.00

3.0 CONCLUSION

Local government, organisations and consumers should always check the credentials and experience of the contractor, before issuing a purchase order. The order should not be price driven, as the end result can cost the consumer substantially more than the initial contract value.

Do some homework and check the supplier, as it may lead to major cost savings over the life time of the equipment being supplied/installed.

4.0 ACKNOWLEDGEMENTS

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