

# 120ML/DAY FLUORIDATION DOSING PLANT HOW TO BUILD YOUR OWN HYDROFLUOROSILIC ACID DOSING SYSTEM



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## **ABSTRACT**

As the eventual asset owner and operator of the fluoridation dosing plant, with the responsibility for all future costs together with the associated WHS, asset and risk management issues Port Macquarie-Hastings Council wanted to ensure that this new facility would not be developed and delivered as a simple “least capital cost” solution.

In this regard Council undertook a rigorous design development process which included site inspections of similar facilities owned and operated by major water utilities including; Brisbane Water, Hunter Water, Sydney Water and several Victorian water authorities. These visits included detailed discussions with plant operators to determine current industry best practice and important issues to be considered in the design, construction, operation, maintenance and repair of a new fluoridation dosing plant.

Council also engaged industry experts including the NSW Department of Public Works and Hunter Water Australia to assist in the development and design of a facility to meet all the requirements of NSW Health’s “Code of Practice for the Fluoridation of Public Water Supplies”. These consultants together with a variety of specialist equipment suppliers assisted Council to ensure the long term reliability of the day-to-day operations and ongoing maintenance of this new facility.

This detailed design approach by Council did result in protracted discussions and negotiations over a six (6) year period with a number of State Government agencies responsible for the regulation and approval of fluoridation in NSW. These agencies included the NSW Office of Water (technical approval of design and plant commissioning) and NSW Health (capital works funding).

During these six (6) years the Council consistently argued that as all future costs and operational risk management issues would be its’ responsibility there was a need to ensure that this new facility was delivered as a “best practice project”, with “least operational costs” rather than a “least capital cost satisfactory solution.”

In February 2012 Council successfully commissioned the 120ML/day Fluoridation Plant located at the Rosewood Reservoir site and commenced fluoridation of the water supply scheme.

## **KEY WORDS**

Fluoridation and hydrofluorosilic acid dosing systems.

## **1.0 INTRODUCTION**

Fluoridation of the Port Macquarie-Hastings Water Supply Scheme commenced in February 2012 following a directive by the NSW Dept. of Health issued in August 2004.

Fluoridation of public water supplies in NSW is covered by the Fluoridation of Public Water Supplies Act 1957, the Fluoridation of Public Water Supplies Regulation 2007 and the Code of Practice for the Fluoridation of Public Water Supplies, April 2011.

The Port Macquarie-Hastings Council recognised that the construction of the associated Fluoridation Plant represented both a complex and critical project which would require the delivery of high quality chemical dosing systems, to ensure full compliance with the stringent requirements imposed by both the NSW Office of Water and NSW Health.

It was also important that the Fluoridation Plant would be operationally reliable and constructed to easily facilitate ongoing maintenance and repair requirements associated with this liquid acid fluoridation chemical product.

Council decided that to achieve these aims it would need to complete the design and construction of the chemical dosing systems in-house, utilising a team of dedicated staff members who had over a period of time developed extensive skills and expertise in the successful delivery of several major liquid chemical dosing systems.

This paper will outline how Council approached this challenging project, negotiating with the NSW Office of Water and NSW Health and then constructed and successfully commissioned a 120Ml/day Fluoridation Plant.

## **2.0 DISCUSSION**

### **2.1 Background**

Fluoridation of the Port Macquarie-Hastings Water Supply Scheme was first addressed by the former Port Macquarie Municipal and Hastings Shire Councils prior to amalgamation in 1980. The Council's resolved to defer a decision on fluoridation for the newly constituted Hastings Municipal Council in 1981.

Fluoridation was not considered again until 1985 when a series of reports and discussions on the issue over several years resulted in the decision to hold a referendum on the issue at the September 1991 Local Government election. This decision to conduct a referendum was made exactly nine (9) years after the deferral of the decision to fluoridate by the two (2) former Council's.

The poll results reported to the November 1991 Council meeting were 20,533 votes "No" to fluoridation and 8,198 "Yes". Based upon these results, Council resolved not to fluoridate but acknowledged the dental health benefits provided by fluoride and resolved to lobby NSW Health for an upgrade of dental services in the local area.

The issue of fluoridation remained dormant until the 31<sup>st</sup> May 2004, when Council resolved to have the question of fluoridation of the water supply scheme determined by an expert panel/committee appointed by NSW Health in accordance with Section 6A of the Fluoridation of Public Water Supplies Act 1957. This approach was on the basis that fluoridation of the water supply was essentially a community and public health issue that should be managed by NSW Health.

The Fluoridation of Public Water Supplies Committee determined after due consideration, that fluoridation should be introduced to the Port Macquarie-Hastings Water Supply Scheme. Council was directed by the Director General of NSW to fluoridate the water supply scheme (NSW Government Gazette No, 131, 6 August 2004).

Following protracted and difficult negotiations over a period of six (6) years with the NSW Office of Water and NSW Health, finally in May 2010 Council signed a \$1.78M funding agreement for the construction of the fluoridation plant.

Construction of the fluoridation plant, funded by NSW Health was completed in November 2011. Approval to commence fluoridation of the water supply was subsequently granted by NSW Health in January 2012.

## **2.2 The Long Road to Design & Construction Approval**

Following a number of representations from NSW Health, including an offer to fully fund all the capital works required to implement fluoridation of the Port Macquarie-Hastings District Water Supply Scheme, Council considered the issue of fluoridation at its meeting held on 31<sup>st</sup> May 2004.

At this meeting Council adopted a resolution, which in summary requested the NSW Government under the provisions of Section 6A of the Fluoridation of the Public Water Supplies Act 1957 to establish an “Expert Panel” to advise the relevant Minister and Council whether there was a strong case to fluoridate the Hastings District Water Supply to address serious public health issues.

Council also requested NSW Health to fund 50% of the recurrent costs associated with the operation of the fluoridation dosing plant, including; chemicals, water testing, maintenance, repairs and future refurbishment costs. Unfortunately, this request was denied and Council would be responsible for all future costs associated with this facility, which are in the order of \$250,000pa plus the ongoing depreciation of these assets.

Subsequent to that meeting of Council, the Director General of the Department of Health, in the Government Gazette on 6<sup>th</sup> August 2004, issued a direction to add fluoride to the public water supply in accordance with the requirements of the “Code of Practice for the Fluoridation of Public Water Supplies”, Fluoridation of Public Water Supplies Act 1957.

In accordance with this direction from the Director General of NSW Health, Council commenced investigations to determine appropriate options for the fluoridation of the water supply scheme.

Hunter Water Australia (HWA) was engaged by Council to develop and review suitable options (including; type of fluoridation agent ie. powder or liquid and both centralised and decentralised fluoridation dosing plant options) and to provide a recommended concept design for the fluoridation dosing facilities.

This technical engagement of HWA included a requirement to develop and provide a concept design for the proposed fluoridation dosing facility to meet all the requirements of NSW Health’s “Code of Practice for the Fluoridation of Public Water Supplies” and also ensure the “least operational cost” for Council of all future operational, maintenance, repair and asset refurbishment commitments.

During the latter half of 2004 and early 2005 Council staff made contact with a number of water authorities who owned and operated large fluoridation plants to request information in relation to the design, construction and operation of these facilities. A number of site inspections were also arranged with staff travelling to Brisbane, Newcastle, Sydney and Melbourne to inspect these facilities and discuss related issues with management and operational staff members.

In October 2005, three (3) Council water supply staff members successfully completed the technical component of the required NSW TAFE – NSW Health/NSW Office of Water Fluoridation Operators Course held in Bowral.

In November 2005, Council approved a development application of a centralised 120ML/day capacity fluoridation dosing plant located at the Rosewood Reservoir site.

The concept design prepared by HWA was then independently reviewed by the NSW Department of Public Works (PWD) and then developed by PWD into detailed design plans and specifications. This design process included all the information which had been obtained from the 2004/2005 site inspections and discussions with other water authorities with large scale Fluoridation Plants.

In March 2006, Council submitted to NSW Health its “Form 1 Application” for the fluoridation of the Hastings District Water Supply Scheme for review and also referral for approval to the Fluoridation of Public Water Supplies Advisory Committee. This application included detailed design drawings, contract specifications, procurement strategy and a preliminary capital cost estimate of \$1.89M.

In July 2006, Council received a reply from NSW Health indicating that a maximum subsidy of \$650,000 only, would be approved for the construction of the Rosewood Fluoridation Plant. This maximum subsidy funding amount was based upon advice, which NSW Health had received from NSW Office of Water.

In August 2006, Council requested both NSW Health and NSW Office of Water to provide a detailed response listing all the design points of concern and cost-effectiveness issues raised in relation to the submitted design and specifications. This was requested in order for Council to review this information and provide an informed response to these concerns and then be able to advance the project to construction.

While awaiting this advice from NSW Health and NSW Office of Water, Council re-engaged HWA to independently review both the detailed designs and cost estimates prepared by PWD.

Following a protracted period of discussions, meetings, design reviews and funding negotiations with both the NSW Office of Water and NSW Health, finally in 2010 approval was granted for Council to proceed with its adopted fluoridation plant design and project procurement plan. Funding in the amount of \$1.78M would be provided by NSW Health for this project.

### **2.3 Construction and Commissioning**

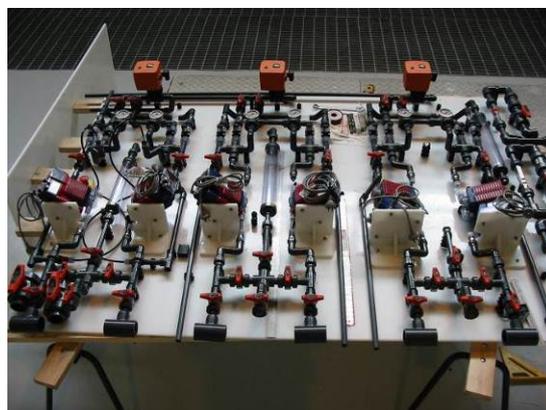
Council’s procurement plan included for all site and civil construction works to be completed under a detailed design contract, which had been prepared by both Hunter Water Australia and NSW Public Works.

This civil construction works contract included; site road works, drainage, dosing pit and building, chemical waste tank, bunded areas, bunded area shade structure and roofing, electrical switch room, dosing room and all associated site facilities.

A separate electrical contract was used to procure a “Type 3B” electrical control switchboard, based upon a detailed design completed by PMHC and NSW Public Works. This contract included programming of the local PLC & OMI display screen, based upon a detailed design control philosophy which had been developed and documented by PMHC and NSW Public Works.

The supply and installation of all the dosing system plant, equipment, pipework and instrumentation would be completed by PMHC’s staff and selected local contractors who had previous experience in the construction of liquid chemical dosing systems.

To facilitate the completion of these complex dosing system works by PMHC’s staff, a dosing system work area was established at the adjacent Wauchope Water Treatment Plant as indicated below.

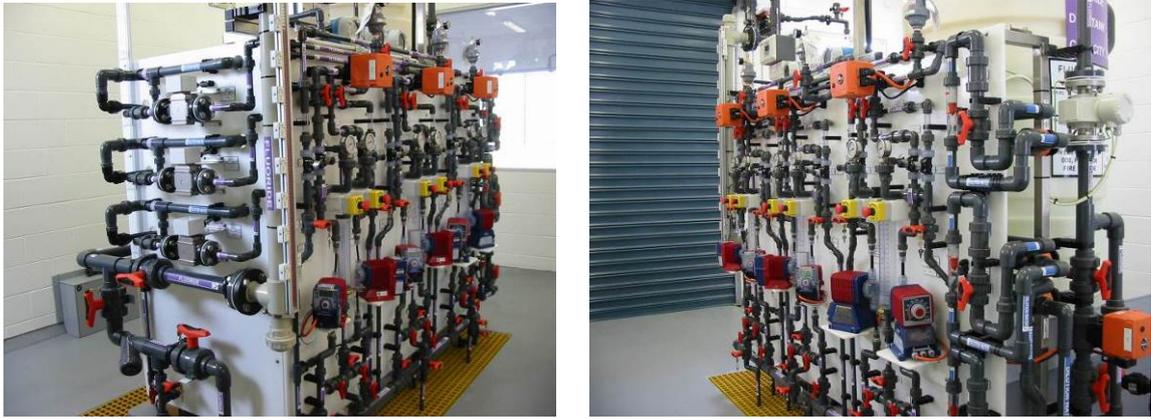


**Figures 1 & 2:**      *Wauchope WTP with the Fluoridation Dosing System Work Area & Final Dosing System Configuration*

It was then possible for staff to work upon this dosing system project in a clean and safe environment. The detailed configuration of the required three (3) independent dosing systems with associated pipework, fittings, valves, pumps, instrumentation, etc. required a great deal of thought and consideration.

This included the correct selection of suitable materials and jointing arrangements to prevent possible chemical leaks together with the positioning of these items to ensure reliable plant performance and also the need to be able to remove and replace equipment in the future. A lot of trial and error was used to develop the final dosing system configuration before the pipework, fittings, etc were correctly positioned and constructed as indicated in the photograph above.

The final fluoridation dosing plant arrangement was installed onsite and successfully commissioned in February 2012.



**Figures 3 & 4:**      *Fluoridation Dosing System at Rosewood Reservoir Site*

### **3.0 CONCLUSION**

Port Macquarie-Hastings Council through long term determination and the ability of its own internal resources has been able to design, construct and now successfully operate a major fluoridation dosing facility.

This project has been completed in partnership with water industry experts who have been able to advise and assist Council in delivering a “best practice” project, which will ensure the “least operational costs” over the life of this facility.

It may have taken Council thirty one (31) years, from 1981 to 2012, to achieve this goal, but the outcome is now to provide ongoing benefits to the local community.

The local community can now enjoy improved dental health benefits and be assured that the fluoridation plant will operate reliably and safely on a daily basis.

### **4.0 ACKNOWLEDGEMENTS**

The assistance provided by the following individuals and organisations is gratefully acknowledged; Bevan Hudson, Steve Harris, Dan Hayes, Adam Carson and Danny Roberts from PMHC, Mid Coast Telemetry, Garry Bannister Constructions, Hunter Water Australia, NSW Department of Public Works, North Coast Area Health Service, NSW Office of Water and NSW Health.

Unfortunately during this project the NSW Dental Health Officer John Irving passed away suddenly, John had been instrumental in getting this project “off the ground” and continued to be a huge source of assistance and encouragement to all those involved in the project. A plaque has been erected onsite to commemorate John’s involvement in this project and his strong passion for the importance of dental health.