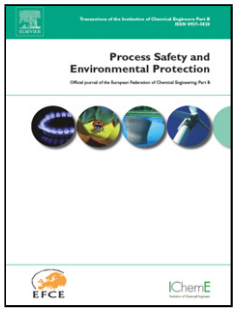
Accepted Manuscript



Title: A new integrated potable reuse process for a small remote community in Antarctica

Author: Jianhua Zhang Adrian Knight Mikel Duke Kathy Northcott Michael Packer Peter J. Scales Stephen R. Gray

PII: S0957-5820(16)30170-7
DOI: http://dx.doi.org/doi:10.1016/j.psep.2016.08.017
Reference: PSEP 858

To appear in: *Process Safety and Environment Protection*

Received date: 2-5-2016
Revised date: 22-8-2016
Accepted date: 24-8-2016

Please cite this article as: Zhang, Jianhua, Knight, Adrian, Duke, Mikel, Northcott, Kathy, Packer, Michael, Scales, Peter J., Gray, Stephen R., A new integrated potable reuse process for a small remote community in Antarctica.Process Safety and Environment Protection http://dx.doi.org/10.1016/j.psep.2016.08.017

A new integrated potable reuse process for a small remote community in Antarctica

Jianhua Zhang[a,*], Adrian Knight[b], Mikel Duke[a], Kathy Northcott[d], Michael Packer[c], Peter J. Scales[b], Stephen R. Gray[a,*]

[a] *Institute for Sustainability and Innovation, Victoria University, Melbourne, Australia*
[b] *Department of Chemical and Biomolecular Engineering, University of Melbourne, Parkville, Australia*
[c] *Australian Antarctic Division, 203 Channel Highway, Kingston, Tasmania, 7050, Australia*
[d] *Veolia, Bendigo Water Treatment Plant, Kangaroo Flat, Victoria, 3555, Australia*
**Corresponding Author*

Abstract

To meet water reuse and discharge requirements in Davis Station, Antarctica, an advanced water treatment plant (AWTP) had been designed and tested for nine months. The key design factors for operating in small communities in remote areas included low maintenance requirement (low chemical inventory, minimal onsite labour), high LRVs for pathogens, robust operation, and high automation. Based on these requirements, the seven-barrier AWTP included ozonation, ceramic microfiltration, biological activated carbon, reverse osmosis, ultraviolet radiation, calcite filtration and chlorination. The nine month test demonstrated that the plant was able to provide minimum LRVs of 12.5 for virus and bacteria, and 10 for protozoa. The overall estimated chemical consumption was lower than equivalent continuous operations elsewhere due to a reduced number of Clean in Place (CIP) cycles as compared to industry. This was achieved by optimised integration of the barriers. Furthermore, there was no functional failure of major barriers and the automated online pressure decay test (PDT) validations for MF and RO were successful. Although some minor improvements, such as a reduced frequency of RO pre-filter cartridge replacement, are still needed, the new integrated plant has fulfilled the requirements of high pathogen LRVs, remote online control and validation, and relatively low chemical consumption.

Keywords: Water treatment; water reuse; potable reuse; advanced water treatment plant

1. Introduction