Commissioning Specialists Association
The HVAC and Building Services Commissioning Engineers Association

Guidance Note GN1

White Water Balancing

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The Problem

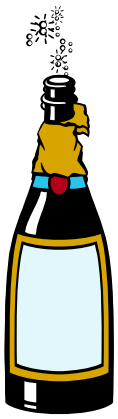
This Guidance Note deals with the potential problems of flow rate regulation in water systems where the water content has become aerated with myriad tiny air bubbles. Water affected in this way has an appearance often likened to Champagne.

The need for thorough air venting before commencing water flow regulation has been well understood for many years, but the "Champagne Effect" differs from ordinary air entrainment. The tiny bubbles cannot be released by ordinary venting procedures and even venting components which are normally highly effective appear to be unable to cope fully in some instances.

The Symptoms

The symptoms of this problem may first be noticed in the early stages of water flow regulation, after the normal air venting procedures have been carefully carried out. Volume flow rate readings will be irregular and erratic and, possibly, at wide variance to that which would be expected. The reason for this is that the entrained air, whether as "normal" or "micro" bubbles changes the density of the fluid so that it no longer behaves like water. This causes the readings to deviate from those expected. Then, unless the bubbles are distributed absolutely evenly throughout the system, the density will vary as the water circulates. This causes the erratic and non repeatable readings.

the Champagne Effect



The Cause

It is believed that the micro bubble contamination does not result from air present during the system filling operation, but is caused by:

a) The properties of the water itself.

b) Chemical treatment applied either in the course of flushing and cleaning of the system, or the dosage applied for operational water quality control.

In some instances where this problem has been encountered the fill water has been obtained from a borehole or well, rather than the water suppliers mains. This suggests the possibility of some element in the water which responds to the action of pumping – or the reduction in pressure which results in lifting it from a deep borehole – and results in "fizziness".

The other (and perhaps more likely cause) is the unforeseen reaction of dosage chemical used to control water quality with the residue of substances used in the flushing and cleaning operation, for example corrosion inhibitors, acidity (pH level) controls, algaecides, bactericides, etc., giving rise to unpredicated interactions and therefore causing continuous effervescence.

The Response

Where the Commissioning Specialist has reasonable grounds to suspect the presence of micro bubbles, or

is able to demonstrate this by means of water samples taken from the system, he should, as soon as possible, advise the appropriate person on the project:

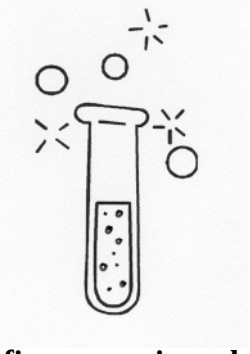
a) that his attempts to regulate the system have been unsuccessful and seem likely to remain so.

b) what he suspects (or can demonstrate) to be the cause of the problem (i.e. the air entrainment).

The Commissioning Specialist should make every effort to avoid being drawn into making attempts to solve the problem. The solution is most unlikely to be provided by anyone other than a water treatment specialist, as detailed chemical knowledge and analysis skills may be needed. There may also be contractual implications and repercussions.

The Solution

Note: The purpose of this section is to outline a "good practice" approach to dealing with the problem. It is stressed that the commissioning specialist should not implement these measures unless he is instructed to do so within his terms of reference and contractual liabilities or on a time charged basis.



The first step in solving the problem is to find out what is causing the "fizziness". The logical procedure here is to take samples of the "contaminated" water and to have them analysed and reported on.

It may be advisable for the analyst to be an independent specialist with no connection to any of the parties involved on the project. The result of this is more likely to be a simple and straightforward report. This report should include recommendations on how to counteract the problem.

Where the analysis and report indicates that the problem results from actions taken by a party to the project (e.g. the water treatment specialist) the report and its conclusions should be disclosed to them and their comment sought.

Where more than one measure is recommended it is strongly advocated that the Commissioning Specialist should:

a) hold discussions with the analyst and others to establish and agree the order or likely effectiveness of the various measures (i.e. which measures seem likely to have the most favourable effect).

b) prepare and record cost estimates for each of the recommended measures and viability of implementation (these would be prepared in conjunction with the other parties).

c) taking account of both a) and b) above, place the recommended measures in order of likely outcome.

d) implement the recommended measures in the sequence, one at a time, leaving a sufficient period to assess the effectiveness of the measure; record any comments on the measure and its outcome.

e) stop the process of implementation as soon as satisfactory results are obtained from a recommended measure; record comments on the successful measure (e.g. details of how the measure was applied, time elapsed after implementation for satisfactory results to appear, etc.).

Continuation

As soon as the system water content has stabilised, volume flow rate regulation can proceed in a normal manner.

Commissioning record sheets for the systems(s) concerned should be annotated with brief, general details of the problem and how it was overcome. *This provision is important in case the aeration should recur at a later date.*

This Guidance Note was compiled for the CSA Technical Committee by R.J. Oughton. Published by the: Commissioning Specialists Association, July 1997

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