

Meeting EU Water Quality Standards

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Heightened public awareness about drinking water quality came to the fore during the extreme weather conditions of recent months. This increased awareness has been matched with a growing demand for potable water, prompted by the country's rapidly expanding population. This has placed a heavy burden on the existing water treatment infrastructure in Ireland. The consequence of this burden has manifested itself in a high degree of non-compliance with water quality requirements. Such shortcomings have resulted in numerous public health concerns which have heightened public awareness and given rise to a general lack of confidence in water supplies.

In December 2009, Shannon-based Chemifloc (www.chemifloc.com) became the first manufacturer of water treatment chemicals in Ireland to receive the Irish Standard Mark in

relation to three chemicals – aluminium sulfate, iron sulfate and aluminium iron sulfate – it supplies to Irish local authorities for purifying drinking water. This article outlines some of the measures that local authorities could take to improve drinking water quality and win back public confidence once again.

The Legislation

The EU Directive relating to the quality of water intended for human consumption is an obligatory instruction to National Governments to introduce appropriate legislation for drinking water quality. To this end, the legislation in Ireland is SI No. 278 of 2007 regulations, dated 12 June 2007. Duties of water suppliers stipulated in those regulations are as follows:

1. A water supplier shall ensure that the water is wholesome and clean and meets the requirements of the regulations.

2. For the purposes of paragraph (1) water shall be regarded as wholesome and clean if it is free from any micro-organisms and parasites and from any substances which in numbers or concentrations constitute a potential danger to human health.

The principal requirement for drinking water is that it be free of pathogens and toxic chemicals. The primary objective of water treatment is disinfection and one of the purposes of the prior stages of treatment is to prepare the water for disinfection. For example, chlorine is the most commonly used disinfectant and unless contaminants such as turbidity and colour, which exert a chlorine demand, are removed from the water, the efficacy of disinfection may be impaired.

The following table details all the chemical parameters which must be complied with under Regulation SI 278 of 2007:



Para No.	Parameter	Parametric Value	Units mg=milligram µg=microgram	Compliance Date
3	Acrylamide	0.10	µg/L	Now
4	Antimony	5.0	µg/L	Now
5	Arsenic	10	µg/L	Now
6	Benzene	1.0	µg/L	Now
7	Benzo(a)Pyrene	0.010	µg/L	Now
8	Boron	1.0	mg/L	Now
9	Bromate	10	µg/L	25 Dec 2008
10	Cadmium	5.0	µg/L	Now
11	Chromium	50	µg/L	Now
12	Copper	2.0	mg/L	Now
13	Cyanide	50	µg/L	Now
14	1,2-Dychloroethane	3.0	µg/L	Now
15	Epichlorohydrin	0.10	µg/L	Now
16	Fluoride	1.0	mg/L	Now
17	Lead	10	µg/L	25 Dec 2013
18	Mercury	1.0	µg/L	Now
19	Nickel	20	µg/L	Now
20	Nitrate	50	mg/L	Now
21	Nitrite	0.50	mg/L	Now
22	Pesticides	0.10	µg/L	Now
23	Pesticides-Total	0.50	µg/L	Now
24	Polycyclic aromatic hydrocarbons	0.1	µg/L	Now
25	Selenium	10	µg/L	Now
26	Tetrachloroethene & Trichloroethene	10	µg/L	Now
27	Trihalomethanes – Total	100	µg/L	25 Dec 2008
28	Vinyl Chloride	0.50	µg/L	Now

(Note the Compliance dates in the case of 3 parameters – bromate, lead and trihalomethanes (THM[®]).)

Chemical coagulation is the single most effective removal process that is conventionally applied to the production of drinking water. Chemical coagulation and flocculation is used for the removal of natural iron, natural aluminium, colour turbidity and algae from water. Coagulated and flocculated water is treated by sedimentation or flotation followed by rapid gravity filtration.

Cryptosporidium parasites at 4-6 μm in diameter, are too small to be removed without chemical coagulation. Removal relies on the achievement of effective chemical coagulation to incorporate such parasites into floc and efficient removal of floc by subsequent solids-liquid separation processes. This would be expected to achieve removal of 99% or more.

Inadequate chemical coagulation and flocculation result in poor performance of subsequent treatment processes. These processes (as well as chemical coagulation) need to be optimised to achieve maximum removal of raw water turbidity, colour, THM precursors and algae, and minimum carry-over of coagulant in the final water whilst minimising chemical usage.

Achieving good chemical coagulation and flocculation relies on the following:

- Good control of coagulant dose and pH to maintain optimum conditions particularly during the initial mixing stage. Under-dosing of coagulant or inadequate pH control produces poor floc, whilst overdosing increases the quantity of solids for removal and can in some cases produce large weak floc which can be difficult to remove efficiently;
- Good mixing at the point of chemical dosing to ensure rapid intimate contact between water and coagulant;
- Consideration of the influence of water temperature. At temperatures around 5°C or below coagulation

rates can be low, requiring 10-20 minutes longer for efficient coagulation to be achieved;

- Where mechanical flocculation is used optimum paddle speeds need to be determined;
- Avoidance of excessive shear after flocculation, which could result from weirs, pipe bends or constrictions, and high flow velocity (above 0.3m/s).

In order that removal of precursors is maximised it is important to utilise the correct coagulation conditions with respect to pH and coagulant dose.

This concept is not new, but in Ireland and the UK its application is not as widespread as it might be, because of additional costs for control equipment and chemicals. In the USA, the use of correctly optimised coagulation conditions is referred to as “enhanced coagulation”, because it achieves enhanced removal of organic compounds.

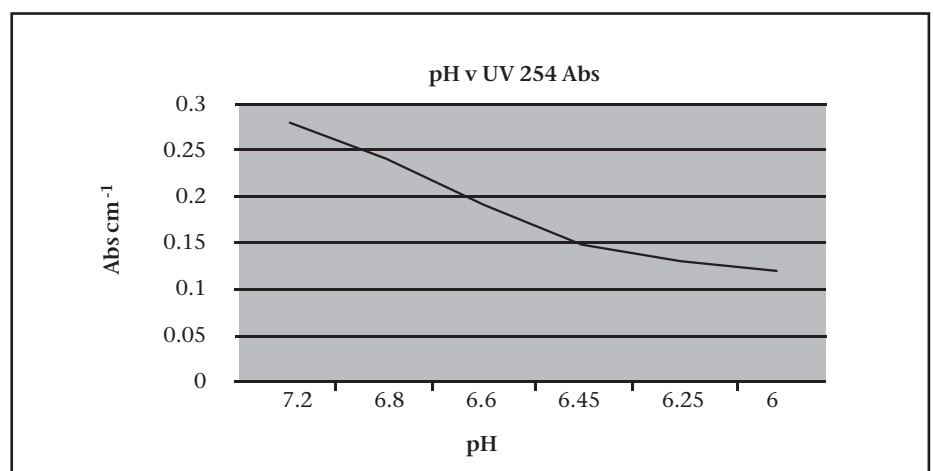
With the demands regarding THMs in the 2007 legislation, it is essential that “enhanced” coagulation with proper pH correction is carried out in Ireland. A large proportion of dissolved metal ion coagulant indicates unsuitable chemical conditions (particularly pH) or poor mixing. Large proportions of other dissolved metals indicate

incompatibility between pH conditions needed for coagulation and precipitation of other metals. In particular manganese precipitation can require a pH above 8, whereas the optimum pH for coagulation would be closer to 6.5.

The most appropriate coagulation conditions will depend on the type of water being treated and can be identified by use of suitable “jar tests”. Most operators of treatment works that use coagulation will determine the appropriate conditions from jar tests. Turbidity and residual coagulant have long been the water industry’s benchmarks for successful coagulation. However, when considering THM formation, the effectiveness of organic removal is best assessed by UV (254nm) measurement.

In general, chemical coagulation at the correct pH and flocculant dose will remove organic material and as a consequence will reduce the amount of THMs and bromates formed during subsequent chlorination. A further most important consequence is a dramatic reduction in the chlorine demand of the treated water and the resultant economic gain.

The use of UV absorbance (254nm) illustrates this result in the following chart.



Corrosion control, particularly with regard to reducing lead levels, is becoming a major issue in water treatment. It is possible to calculate the corrosion index of the treated water and, hence, the subsequent required pH correction which would lead to minimising metal levels such as copper and lead. Further treatment using phosphates in the form of Phosphoric Acid as a protective barrier is universally used for the control of lead in drinking water.

To promote increased consumer confidence in the water management sector, the National Standards Authority of Ireland (NSAI) has adapted into Irish law the guidelines for the purchase of chemicals used for the treatment of water intended for human consumption which have been prepared by the European Committee of Standardisation (CEN). In addition NSAI now offers a standard – ISO 24512. This standard recommends that the management and operators of publicly and privately-owned drinking water utilities establish operations that enhance all legal requirements and give consideration to recognised best practices. Adoption of ISO 24512 by drinking water utilities together with the NSAI certification of the water treatment chemicals supplied by Chemifloc would guarantee compliance with EU standards. These measures would contribute to safeguarding the provision of potable water to dependent communities and restore confidence in this, the most basic of human needs.

Teamwork and Hard Work the Winning Formula in Tidy Towns

All over the country local communities have been playing an active role in improving the visual presentation of their towns and villages as a very practical means of generating local pride in the community and improving quality of life in their area. What are the ingredients that go into this mobilisation of local volunteers for the benefit of the wider community? The example of Louth, which has scored recent successes in the national Tidy Towns competition and – through Dundalk – in the EU-wide Entente Florale competition, shows that it is often down to a combination of teamwork and hard work in the border county.

Louth retained all of its gold medals in the national Tidy Towns competition – meaning it remains the only county with four top-rated locations as Drogheda, Dundalk, Knockbridge and Tallanstown held on to gold in the keenly-contested awards organised by the Tidy Towns Unit at the Department of the Environment, Heritage & Local Government and sponsored by SuperValu.

In Tallanstown's case, the village came within a single point of overall national success – scoring 304 points compared to 305 for Emly, Co Tipperary which secured their first win in the competition's 51-year history.

As well as finishing joint second with Westport, Co Mayo and Ennis, Co Clare in the overall national competition, Tallanstown also won a further two special competitions – the Tidy Towns Best Bring Bank Award and the Tidy Towns "Can It!" Award. The Tidy Towns Best Bring Bank Award is sponsored by Repak to recognise community support in maintaining local bring banks and assisting with their general appearance and use. The Tidy Towns "Can It!" Award is a special art competition sponsored by the European Aluminium Association (EAA) to find the most novel artistic design made from used beverage cans and foils.

Louth's other three gold medallists also scored well – Knockbridge registering 300 marks (just five less than Emly); Dundalk 297 and Drogheda 294.

Conn Murray, Louth County Manager, said: "The sustained achievements by Drogheda, Dundalk, Knockbridge and Tallanstown in Tidy Towns are tremendous and it was great to see them acknowledged once again on the national stage. While resources are obviously an issue in the current funding climate, Louth Local Authorities remain committed to supporting the good work being done on the ground here as we recognise the value of proper presentation and how it feeds into people's sense of their own place.

"This type of success can only be achieved through teamwork where communities combine with the local authorities in a sustained effort to present their area in the best possible light. The Council's outdoor personnel do excellent work across Louth but they can only succeed if there's a genuine partnership with local people who are in the areas day in and day out. The communities who tend to