Instran®

ONLINE PARAMETRIC CONTROL IN WATER TREATMENT PLANTS

Control parameters in drinking water

Drinking Water Treatment Plants (DWTP) are the plants responsible for the treatment of water from different catchment points (rivers, lakes, etc.) for its subsequent supply to the public network and subsequent human consumption.

The quality of the water to be treated depends very much on the catchment point, as the different environmental conditions, as well as the place where the water is taken from, influence its quality. For example, the water conditions and dissolved components are different at the beginning of a river than if the water is collected at the river mouth.

This is why the treatments that the DWTPs must carry out on the water in order to supply it to the drinking water network depend on its location, acting on those parameters that are most critical according to their concentration when the water enters the drinking water treatment plant.

Thus, some of the parameters that have to be controlled are turbidity, colour, conductivity, pH or ammonium (NH4+). Other parameters will depend on whether they are used during the internal processes of the DWTP, such as iron or aluminium (when one of the two is used as a flocculant) or nitrite (when chloramination is used). Finally, there is a record of other parameters whose concentrations shall not exceed the established limits, such as nickel, manganese or chromium.

Current legislation in Spain

Royal Decree 902/2018 amends Royal Decree 140/2003, which established the sanitary criteria for the quality of water for human consumption. In addition, there is a draft Royal Decree of September 2021 establishing the technical health criteria for the supply and quality control of drinking water. Depending on whether the analysis is control or complete, the parameters to be determined are higher. In turn, the greater the capacity of the volume supplied, the higher the sampling frequency (the frequencies are indicated in the documents mentioned above). Some of the critical parameters in water are:

Parameter	Safe concentration	No admissible value
Ammonia (1)	0.50 mg/L	1.00 mg/L
Aluminum (1) (2)	200 µg/L	360 µg/L
Cupper	2.00 mg/L	-
Total Chromium	50 µg/L	-
Cyanide	50 µg/L	-
Fluoride	1.5 mg/L	-
Nickel	20 µg/L	-
Nitrate	50 mg/L	[ppm NO_3]/50 + [ppm NO_2]/3 ≤ 1
Nitrite (3)	0.10 mg/L	
Chloride (1)	250 mg/L	-
Iron (1) (2)	200 µg/L	400 µg/L
Manganese (1)	50 µg/L	150 µg/L

Different parametric limits of DWTPs discharge water

(1) Indicator parameters (2) Aluminum or iron used as flocculent (3) When chloramine process is used

Manufactured by:
Instru
Calle Penedés 46, 08820, El Prat de Llobregat
+34 93 478 71 61 | instran@instran.net

Instran®

As mentioned above, a thorough monitoring and further treatment of the parameter will not be necessary when it is certain that the established limits are not exceeded due to the type of water in the catchment. Parameters marked with an asterisk are those indicators of water quality.

Advantages of online analysis and monitoring of parameter concentration

After talking to staff from several DWTPs, they agree that there are two very clear advantages associated with automatic parameter control via online analyzers:

1- They make it possible to create closed loops within the plant with a reagent dosing system or parameter adjustments, allowing precise dosing of the chemical agents used, thus reducing their consumption and economic cost.
2- It allows for a large number of analyses (many more than one person is capable of performing in the laboratory) with the possibility of making decisions on the treatment to be followed more efficiently and with fewer subsequent analytical incidents. For example, one DWTP comments that being able to have 20 daily results for bromates instead of the 1 that a laboratory operator could perform daily allows better adjustment of the ozone dose, resulting in very low analytical incidents in the subsequent network.

Instran®

The Instran online analyzer is an analyzer that allows the concentration of different parameters, such as ammonium, manganese, aluminum, etc. to be monitored over time with a frequency of 10 to 20 minutes depending on the parameter in question and the measurement technique used.

The equipment allows the cleaning processes to be adjusted to the conditions of the sample, while avoiding possible cross-interferences between consecutive analyses. In addition, its simple design means that plant operators quickly become familiar with the equipment and its maintenance is very low, reducing time and saving money. All these features make Instran a unique analyzer on the market with exceptional performance for the control of critical components in water treatment plants, allowing compliance with current legislation, reducing analytical incidents and saving money through the correct adjustment in the addition of reagents.

Ammonium Instran®
The ammonium analyzer is silhouetted by a simply method which permits that any else parameter present in sample interferes in the analysis but amides. Moreover, standard known addition method used permits to correct in each analysis

Manufactured by:
Instru
Calle Penedés 46, 08820, El Prat de Llobregat
+34 93 478 71 61 | instran@instran.net

possible matrix sample variations, avoiding interferences. Finally, the low reagent consumption (0,5 mL/analysis) of each of both reagents needed, makes the *Ammonium Instran®* analyzer the best online analyzer in market.

Aluminum Instran®

The aluminum analyzer is based on a specific colorimetric method to determinate aluminum in water. Possible metals present in water do not interfere color development. With a low reagent consume of 0.6 mL and 3.0 mL per analysis for each of both reagents used respectively, *Aluminum Instran®* is a great and economical option to control, accurately, the presence of aluminum in water, as well at the inlet such as at the plant outlet.

Manganese Instran®

Although the presence of metals as cobalt or high hardness could interfere in the color development, method that Instran is based on to determinate the concentration of manganese, a reagent developed by Instrumentacion Analitica permits to remove its adverse effects. In this way, *Manganese Instran®* can be adjusted to the specific sample conditions. The low consumption of just 0.5 mL/analysis of each reagent offers to end user a way to save time and money while safe quality water is controlled.

Instran® cases of success

Although there are many cases of success of Instran in Drinking Water Treatment plants, nationally and internationally, below just two significant cases are presented:

PUB – Singapore

Singapore Public Utilities Board (PUB) is a national water agency that manages the potable water capture, treatment, and supplement to more than 5.5 million population. Singapore tap water has high standard where it is safe for direct drinking without any filtration. Ammonia is added in the treated water containing free chlorine to form a stable chlorine residual. Therefore, monitoring of ammonia by a reliable instrument is important for PUB to ensure the water quality.

Instran ammonia analyzer has been supplied to Singapore PUB by local distributor for drinking water treatment plants and desalination plants to monitor the dosing of ammonia in water as we as to ensure the ammonia concentration in water is within safe limit before discharge to public.

First Instran ammonia analyzer was installed in PUB in year 2017 and after years of **proven performance on its excellent accuracy, good repeatability, and low maintenance, it is now a reliable and reputable brand in Singapore** and is in used in several PUB plants for 24/7 monitoring.

Manufactured by:
Instru
Calle Penedés 46, 08820, El Prat de Llobregat
+34 93 478 71 61 | instran@instran.net

Instran®

Aigües de Barcelona – Barcelona

Sant Joan Despí DWTP is one of the 3 biggest drinking plants that supplies potable water to Barcelona Metropolitan Area, which comprehends more than 3.5 million population. It mainly supplies to Barcelona and Baix Llobregat area. To provide the best quality, Aigües de Barcelona counts on Sant Joan Despí one of the most outstanding DWTP in Europe, where water captured suffers up to 14 different processes to treat the water before discharge to public.

To control and optimize the processes, the plant has a huge laboratory where multiple water analysis are performed every day and a telecontrol center, from where automatic functionality of the treatment processes are managed. To ensure that the remote control is efficient and reliable, a huge number of analysis and results are needed, being online analyzers the only way to provide them.

On this way, Sant Joan Despí Drinking Water Plant have installed up to 4 Ammonia Instran, as well as online analyzers to measure nickel, aluminum, iron, and chromium, strategically distributed along the facility to its optimum functionality, such as water capture well, ultrafiltration (UF) process, sand filters, ozone process, etc. Each analyzer has specific functions:

- Ni and Cr analyzers permits to control those parameters in the plant
- Fe monitoring permits to control iron chloride dosing and to avoid that UF membranes could be damaged when Fe content is higher than expected
- Al monitoring permits to control the aluminum amount that has to be eliminated as well as avoiding that UF membranes could be damaged when Al content is higher than expected
- NH3 monitoring, besides to control this critical parameter along the plant, also allows an accurate adjustment of chlorine dosing on mixing chamber.

Author: Carlos Salinas, I+D director
June 2022

Manufactured by:
Instru
Calle Penedés 46, 08820, El Prat de Llobregat
+34 93 478 71 61 | instran@instran.net