Instran®

CHLORINE IN SEA WATER

Necessity of measuring chlorine in seawater

With the increasing shortage of water and ever increasing cost of water plants, especially those located close to the sea are increasing turning to the use of readily available cheap water. This water has to be treated with chlorine to prevent the growth of algae etc. and hence it is important to know that there is sufficient chlorine to treat this infestation. On the other hand, this water is often returned to the sea and now environmental issues have to be considered and the level of chlorine of necessity must be low so as not to harm aquatic life. Hence, the control of the chlorine content is imperative both to the plant and the environment.

Chlorine Instran – Cl2®

Principle of measurement:

The potassium iodide reacts with both the free and total available chlorine, usually present as chloramines resulting from the reaction of any ammonia present with the free chlorine, resulting in the liberation of iodine. The reaction is stoichiometric and one mole of iodine is formed for every mole of chlorine present.

$$Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$$

The acid added ensures that the chloramines are broken down to yield free chlorine. The electrode contains a platinum (redox) sensing element and an iodide sensing reference element. The platinum element develops a potential which is dependent upon the relative concentrations of molecular iodine and iodide ions in the solution.

Advantage of the method:

The method is specific for the measurement of total available chlorine as the reaction of the iodide ions to release free iodine is a very specific reaction for chlorine.

The calibration is easier as the calibration may be made with potassium iodate solutions which is far more stable than a solution of chlorine in water. The acid reagent reacts with the iodate to liberate the molecular iodine.

It is found that the electrode is remarkably stable and has a constant slope of about -29 mV.

Amperometric methods used for the measurement of chlorine in drinking water do not function in seawater. A colorimetric method using the standard DPD procedure had been developed but using hexamine as the buffer in place of the normal phosphate buffer. **The method using the above described electrode method is far more simple and reliable.**

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Applications

In Spain, some power plants placed near the coast have faced the necessity of measure chlorine in high conductivity water. Thanks to the nearness to the sea, they use sea water on their cooling systems and return it to the sea. So, as mentioned above, they have to handle the problematic issue of measuring chlorine in sea water.

Vandellos Nuclear Power Plant

One of these companies is Nuclear Association Asco – Vandellos (ANAV). This company has 2 nuclear power plants in Catalonia. One is placed in Asco, which is placed inland, and the other once is in Vandellos, at the coast. The first one uses fresh water from the river on its cooling system and they use DPD method to measure chlorine in water. **However, Vandellos plant, which at the beginning had a DPD online analyzer, faced the problematic that the method showed instability and non-accurate results**. The fluctuation of the conductivity and calcium caused it. It was when they decided to use **ISE Chlorine Instran in April 2018** to solve this issue and the analyzer has been working since then showing better results than they used to have.

Endesa Fossil Fuel Power Station – Menorca

A similar situation happened in one of the Endesa fossil fuel power station. Endesa is one of the biggest electrical companies in Spain and in its power plant located in Menorca island, they use sea water from Mediterranean Sea to cool the plant. Facing the same needs explained, as the chlorine control, **Chlorine Instran was installed in October 2018**, being a reliable source of chlorine measurements.

Union Fenosa Gas Natural Thermal Power Plant – Sagunto

Gas Natural Fenosa, currently named Naturgy, controls the thermal power plant in Sagunto, Valencia. **In 2011 an online Chlorine Instran** was installed in its plant to control chlorine in water before spilled it to the sea. Thanks to the performance and the reliability of the analyzer, they bought a second **Chlorine Instran in 2013** to run similar tasks on a different point of the process.

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