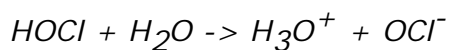




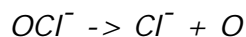
## NEUTRAL ANOLYTE FOR SWIMMING POOLS

Neutral Anolyte is a mixture of potent oxidizers which generally includes Hypochlorous Acid [HOCl] and Hypochlorite Ions [ClO<sup>-</sup>] with HOCl as the main ingredient.

When Hypochlorous Acid is added to water depending on the pH value it partly expires to hypochlorite ions:



This falls apart to chlorine and oxygen atoms:



Electrically Neutral Hypochlorous Acid [HOCl] Electrical Negative Hypochlorite Ions [OCl<sup>-</sup>] form Free Chlorine when bound together. This results in disinfection. Both substances have very distinctive behaviour. Hypochlorous Acid is more reactive and is a stronger disinfectant than hypochlorite. Hypochlorous Acid splits into hydrochloric acid [HCl] and atomic oxygen [O]. The oxygen atom is a powerful disinfectant. The disinfecting properties of anolyte in water are based on the oxidising power of the free oxygen atoms and on chlorine substitution reactions.

The cell wall of pathogenic microorganisms is negatively charged by nature. As such, it can be penetrated by the neutral underchloric acid, rather than by the negatively charged hypochlorite ion. Hypochlorous Acid can penetrate slime layers, cell walls and protective layers of microorganisms and effectively kills pathogens as a result. The microorganisms will either die or suffer from reproductive failure. Thus destruction of microorganisms is ecologically friendly unlike cases when other chemical substances are used.

The efficacy of disinfection is determined by the pH of the water. Disinfection with anolyte will take place optimally when the pH is between 5,5 and 7,5. Hypochlorous Acid [HOCl] reacts faster than Hypochlorite Ions [OCl<sup>-</sup>]; it is 80-100% more effective. The level of Hypochlorous Acid will decrease when the pH value is higher. With a pH value of 6 the level of Hypochlorous Acid is 80%, whereas the concentration of Hypochlorite Ions is 20%. When the pH value is 8, this is the other way around. When the pH value is 7,5, concentrations of Hypochlorous Acid and Hypochlorite Ions are equally high.

**No occurrence of chlorine odour** in a swimming pool if anolyte is used for disinfecting the water for the reason that neutral anolyte does not contain Cl<sub>2</sub> which is the cause of chlorine smell when it evaporates in the air after being released into the water. The Cl<sup>-</sup> gas, which is a part of the mixture of oxidants that make anolyte gives to a neat anolyte a slight chlorine smell but, due to the low concentration it disappears after anolyte is diluted in a swimming pool water.

**No irritation effect.** Neat anolyte is registered as a low toxic substance [4th grade] low enough to use for health purposes for humans and animals. NEAT anolyte itself can cause slight irritation and/or sensibility affects if concentration of active chlorine [or better to say oxidisers] exceeds 0.05%. No such affects are observed with 0.03% and lower concentrations. Being DILUTED in the swimming pool with ratio 1:1000 anolyte can hardly cause any irritation. Apart from this Neutral Anolyte[ANK] which we recommend to use for swimming pools disinfecting is made after initial brine solution undergone cathodic treatment [ in fact, in this case anolyte is made out of catholyte]. Thus ANK, due to the presence of H<sub>2</sub> which was formed in a cathode chamber and as a result of water electrolysis, retains some reduction properties. H<sub>2</sub> reduces the ORP of ANK anolyte and serves as a kind of cathode protection to treated subjects thus preventing eyes and skin irritation.

ANK Anolyte is generated by various Enviolyte devises during the electrochemical activation of NaCl- sodium chloride [table salt] solution. Anolyte is harmless, it does not cause allergy, does not irritate skin, nasal and optic mucous membrane. Eventually it decomposes into harmless initial materials [water and salt], but it kills all groups of bacteria, viruses and mould including legionella. It does not leave harmful by-products. Because of these qualities ANK anolyte suits perfectly for disinfection of water in swimming pools.

### Composition of anolyte as per EU classification:

Active materials	CAS-No	EINICS-No	Wt/vol %	Symbols
Sodium chloride	7647-14-5	231-598-3	0.26%	NaCl
Hypochloridic acid	90-92-3	231-959-5	0.05%	HClO
+ Hypochlorite	+	+		+
ion	7681-52-9	231-668-3		OCl
Water	7732-18-5	231-791-2	99.69%	H <sub>2</sub> O

The parameters of ANK anolyte used for disinfection of water in swimming pools are as follows:

- active chlorine ~ 0,05% [500 ppm]
- pH – 6,8 – 7.6 ;
- ORP - ~750 – + 900;

Considering the law requirements for swimming pools disinfection, the following dosing rates can be recommended:

**Injection rate:** From 1 to 2 litres of 0,05% anolyte to each 1000 litres of swimming pool water, dosing anolyte during water circulation. The specific quantity of injected anolyte is determined with the consideration of the size of a swimming pool, its pick attendance, speed of water circulation, etc. Therefor, it is necessary to constantly monitor the residual of active chlorine in the water of a swimming pool and set the dosing accordingly.

**Injection way:** Anolyte is injected into a flowing [circulating] water of a swimming pool using dosing pumps. It is advised to constantly monitor the chlorine or ORP residual in water in order to maintain the concentration, set in the hygienic norms [ HN 109:2005]:

1. For a big swimming pool [ adult's]:
  - marginal value of residual active chlorine is from 0,5 to 2,0 mg/l;
  - index of permanganate is 2,0-6,5 mg/l O<sub>2</sub>;

pH 6,5-7,8;

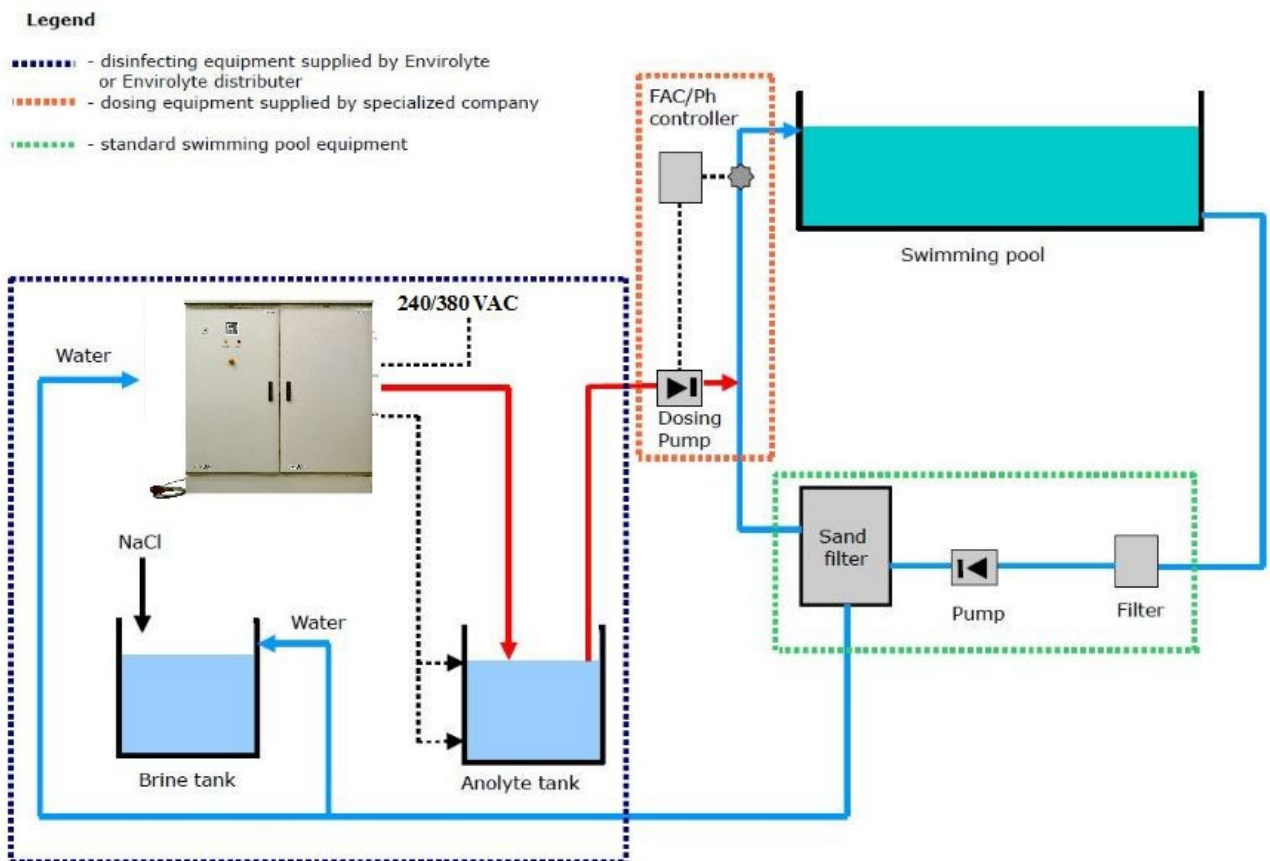
2 .For a small swimming pool [children's]:

- marginal value of residual active chlorine is from 0,3 to 1,0 mg/l;
- index of permanganate is 0,3-6,5 mg/l O<sub>2</sub>;
- pH 6,5-7,8.

### Advantages of ANK anolyte against other disinfectants:

It is effective biocide, does not irritate eyes and skin, does not have such sharp chlorine smell as other chemical products, therefore it does not irritate airway, does not cause allergy, it is easy to use and handle because one does not need to order and store it [it is prepared on site and on demand], it is cheap. Generation of 1 m<sup>3</sup> of ANK anolyte cost about ~ EUR 1.9.

## Swimming pool system with Enviolyte equipment



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2012