Application Note

Drinking water

Introduction

Drinking water treatment

One opportunity for the production of drinking water is the use of wells. Surface or river water is filtered by thick natural sand and gravel layers. This filtering process takes weeks or months.
Many un-dissolved materials are held back or diminished. Since the natural filtrate quantities often are not sufficient, additional basins, which are filled with sand and gravel, are used. Water seeps into it and is received as groundwater in some distance. With both procedures the impurities are separated by filtration. This raw-water with reduced impurities simplifies the water-treatment-process.

Drinking water processing

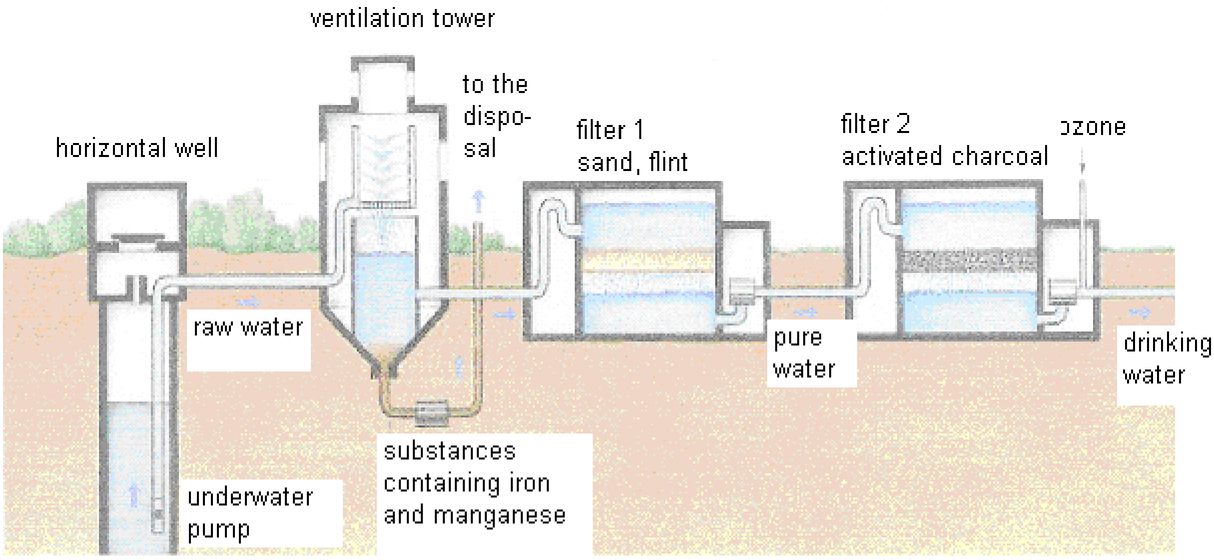
The raw water received from wells is prepared in the drinking water plant. First the raw water is sprayed into ventilation towers. Thus the oxygen from the air is dissolved in water. In some water companies' air enriched with Ozone is used for the treatment of the raw water. Bad smelling gases thereby escape or are diminished. Iron and manganiferous materials flake out. They are separated in sediment basins as well or in sand and gravel filters. Activated charcoal filters substances, which could colour the water and influence the taste or the smell. To destroy pathogens, Ozone or Chlorine is added.

Market segments

- Water works
- Drinking water treatment plant
- Installation contractors & control manufactures

Description of the challenge

Scheme of a drinking water treatment plant



Drinking water treatment occurs from the groundwater, the surface water and from the sea water and brackish water.

By means of Ozone, Chlorine and Hydrogen Peroxide, organic contamination can be removed. Depending on the raw water, more or less Chlorine and Ozone are added. Leakage of the above mentioned gases can not be excluded and thus local or personal monitoring is necessary. In addition, dangerous concentrations of the mentioned gases can occur in deposition-basins of water towers etc.

The disadvantage of disinfecting with chlorine is a bad taste in the water and the development of unwanted by-products like trihalogen methanes (THM), e.g. trichlorine methane (chloroform), which is carcinogen. Nowadays, chlorine dioxide is mostly used instead of chlorine to avoid the development of THM's.

At some plants additional dosing operations take place, these include: Carbon Dioxide to correct the PH (acidity) level and Ammonia to sweeten its taste. Both are applied in a gaseous form and their respective plant / dosing rooms would also warrant monitoring for accidental releases.

Diesel and gas powered generators are used on number of plants for a variety of purposes including electricity generation and pumping. Larger generator packages are often containerized or housed in purpose built rooms. Fuel and/or exhaust leaks give rise to potential fire, explosive or toxic risks.

Substances

name	Chlorine	Chlorine dioxide	Hydrogen peroxide	Ozone
formula	Cl_2	ClO_2	H_2O_2	O_3
MAK[1]	0,5 ppm	0,1 ppm	1 ppm	0,1 ppm
IDLH	10 ppm	5 ppm	75 ppm	5 ppm
attri-butes	- toxic, yellow-greenish, pungent-smelling gas - corrosive - non combustible - oxidising	- orange gas with pungent smell - oxidising - heavier than air - corrosive	- colourless liquid - boiling point 150°C - non combustible - oxidising - corrosive	- toxic, colourless or blue gas with characteristic smell - oxidising - heavier than air
name	Carbon dioxide	Ammonia	Sulphur dioxide	
formula	CO_2	NH_3	SO_2	
MAK[1]	5000 ppm	50 ppm	2 ppm	
IDLH	10 % by vol.	300 ppm	100 ppm	
LEL		15,4 % by vol.		
UEL		30,2 % by vol.		
attri-butes	- toxic, colourless, non smelling gas - non combustible	- toxic, colourless, pungent-smelling gas - corrosive - lighter than air - explosive when mixed with air	- toxic, colourless, pungent-smelling gas - non-combustible - very good solvent - produces H_2SO_4 (acid rain)	-

[1]all values are from 2003, subject to change [2]TLV-values

Solution from Dräger

For applications in drinking water treatment nearly all transmitters for electrochemical sensors can be used. The only exception is Polytron TX. Because of the sinter material in front of the sensor this instrument can not be used in this application.

- EC Cl_2 sensor for the measurement of Cl_2 and ClO_2
  (measurement range 0 – min 1ppm / max 50 ppm)
- EC H_2O_2 sensor for the measurement of Hydrogen peroxide
  (measurement range 0 – min 1ppm / max 50 ppm, cross sensitivity < 0.25 to Chlorine)
- EC O_3 sensor for the measurement of Ozone
  (measurement range 0 – min 0.5 ppm / max 5 ppm, cross sensitivity < 0.2 to Chlorine)
- EC NH_3 sensor for the measurement of Ammonia
  (measurement range 0 – min 50 ppm / max 1000 ppm)

Detection of Carbon dioxide can be performed with Polytron IR CO_2 in the range of 0 to 30 Vol%. The optical measuring technique guaranties the highest level of reliability and self diagnostic features.

Fixed point gas detector systems are also used to monitor flame, natural gas, LPG, Sulphur Dioxide & Oxygen deficiency when power generation stations are present.

If chlorine is used for disinfecting, the concentration of chloroform can be monitored by use of Dräger tubes (measurement range 2 – 10 ppm).

For detailed description of the technical features of all Dräger gas detection transmitters visit our homepage under www.draeger.com/gds.

Application of the different Dräger measuring tools

Measurement tool	Cl_2	ClO_2	NH_3	H_2O_2	O_3	SO_2	CO_2
Polytron 3000	☺	☺ *	☺	☺	☺	☺	
Polytron 7000	☺	☺ *	☺	☺	☺	☺	
Polytron 2	☺	☺ *	☺	☺	☺	☺	
Polytron XP	☺	☺ *	☺	☺	☺	☺	
Polytron TX			☺			☺	
Polytron IR CO_2							☺

☺ particularly appropriate   😐 to some extend   * Cross sensitive to Cl_2

Source

http://www.aquacare.de/trink/info/d_ro_tr.htm

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