Part I: General Description

**RED-OXY**

**Treatment**

**OXIDATION - ADSORPTION - FILTRATION**

Surface water + Ground water

- No Chlorine
- No Flocculent/alum
- No Acids
- No DBPs
- No Ozone

**RED-OXY**

Contact Reaction Tank

**OXY**

Dosing Solution (5% Strength)

**ADSORB** (optional)

Disinfection

Wastewater from any source

Contaminants treatable by **RED-OXY**

- Metal Cations removed
- Anions removed
- Oxidation
- Inorganic/organic Contaminants
- Disinfectant Oxidant
- Pharmaceuticals
- Pesticides
- Endocrine Disrupting Chemicals (EDCs)

**Well**

Well Pump

**RED-OXY-ADSORB**

Dosing Solution

**Contact Tank**

**KL unit 1**

**KL unit 2**

as many...

**Kalalox Light**

Clean water

Fig. 1

www.watchwater.de
Metal Cations Removed

- Aluminum Al (III)
- Arsenic As (III)
- Barium Ba (II)
- Cadmium Cd (II), Cd (III)
- Calcium Ca (II)
- Cerium Ce (III)
- Cobalt Co (II)
- Copper Cu (II)
- Lead Pb (II)
- Magnesium Mg (II)
- Manganese Mn (II)
- Mercury Hg (II)
- Potassium K (I)
- Silver Ag (I), Ag (II)
- Thallium Tl (III)
- Tin Sn (II)

Anions Removed

- Arsenate As (III)
- Arsenite As (V)
- Ammonia NH₃
- Chromate CrO₄²⁻
- Fluoride F⁻
- Molybdate MoO₄²⁻
- Phosphate PO₄³⁻
- Selenite SeO₃²⁻
- Silicate SiO₄²⁻
- Sulfate SO₄²⁻
- Sulfite SO₃²⁻

Oxidation

(inorganic & organic Contaminants)

- 1, - Diaminopropane
- 1,2 - Ethanediol
- 1,2,4 – Butanetriol
- 1,3 – Propanediol
- 2 – Mercaptopbenzoic acid
- 2 – Mercaptoethanesulfonic acid
- 3 – Amino-1- propanol
- 3- Mercaptopropionic acid
- Acetaldehyde
- Acetone
- Alpha-Hydroxy-toluene
- Ammonia
- Aniline
- Benzene sulfinic acid
- Chloral
- Cyanide
- Cysteine
- Cysine
- Diethylamine
- Diethylsulfide
- Dimethylamine
- Dimethylglycine
- Dimethylsulfoxide
- Ethyl alcohol
- Ethyl ether
- Ethylene glycol
- Ferrocyanide
- Formic acid
- Formaldehyde
- Glycerol
- Glycine
- Glycoaldehyde
- Glycolic acid
- Glyoxal
- Glyoxylic acid
- Hydrazine
- Hydrogen sulfide
- Iminodiacetic acid
- Isopropyl alcohol
- Methionine
- Methyl alcohol
- Methylamine
- Methylhydrazine
- Neopentyl alcohol
- Nitroacetic acid
- Nitrite
- Nitrosamines
- Methanol
Disinfectant & Oxidants

- Aerobic spore-bearers
- B. Cereus
- Bryopsis sp.
- Caulerpa taxifolia
- Dasya baillouviana
- Enteromorpha intestinalis
- Escherichia coli (E. Coli)
- F-specific RNA-coliphage QB
- f2 Coliphage
- S. aureus
- S. bovis
- S. globigii
- S. facalis
- S. flexneri
- Sphaerotilus
- S. Typhumurium
- Styela plicata
- Sulfite-reducing clostiridia
- Thermotolerant coliforms
- Total coliform

- Oxidation (inorganic & organic Contaminants)

Continues...

- N-methyliminodiacetic acid
- Oxylic acid
- Phenol
- p-Aminobenzoic acid
- P-Hydroquinone
- p-Nitroaniline
- p-Toluidine
- Sarcosine
- Thioacetamide
- Thiodiethanol
- Thiosulfate
- Thiourea
- Thioxane
- Trimethylaldehyde

Endocrine Disrupting Chemicals (EDCs)

- Bisphenol A
- Estrone (E1)
- 17 b-Estradiol (E2)
- 17 a-Ethynylestradiol (EE2)
- 16 a-Hydroxyestrone
- 4-Nonylphenol
- 4-tert-Octyphenol

Pharmaceuticals

- Sulfamethoxazole
- Ibuprofen

Pesticides

- 2,4 – Dichlorophenoxyacetic acid
- 2,4,5 - Trichlorophenoxyacetic acid
- Dursban
- EDB (Ethylene di-bromide)
High Purity FERRATE

Red-Oxy® process of mixing Hydrated ferric solution and strong OXYx solution is the easiest method to produce pure Ferrate in the reaction tank. The purity of Ferrate is more than 99% in the mixed form. The Ferrate reduced is an exclusive process of Watch-Water Germany.

Red-Oxy® is the safest oxidant, inexpensive and “environmentally friendly”, especially for potable water and waste water treatment applications. Red-Oxy® is an ideal treatment for industrial and municipal effluent containing hazardous organic and inorganic compounds as explained on page no. 2-3. Using Red-Oxy® there is no need to dose poisonous and corrosive fesses like chlorine, hypochlorite or ozone. These oxidants have deleterious side effects. Additionally, the handling of chlorine, hypochlorite, HOCl, chlorine dioxide or ozone are potential danger to workers due to their high toxicity. And a major disadvantage of chlorine and chlorine dioxide or any other chlorine-containing oxidant produce, chloramines, chlorinated aromatics, chlorinated amines or hydrocarbons. All of these oxidants are potential mutagens or carcinogens, are for sure more toxic than the parent contaminants.

Red-Oxy® a new oxidant is designed to move away from chlorine, as well as ozone. Both of the compositions in red and oxy are oxidation products and 100% biodegradable. The Ferrate molecule precipitates out of solution as Fe(OH)₃ and now the adsorption process starts to collect cation as well as anions from the water. The iron containing sales can be easily filtered out by Katalox-Light leaving iron-free water containing innocuous by-products.
What is Red-Oxy®?

Red-Oxy® is the most stable form of Ferrate (VI) because it is generated with Ferric Hexahydrate granules. The oxidant used in this process is a strong acid halogen which generated high voltage of oxidant without any DBPs. REDOX potential of the oxidant is as high as Hydroxyl Radicals. Watch-Water® has no doubt that its proprietary process will be commercialize world-wide with its own branches or through very close partners.

Watch-Water® understands chemistry. Generated Ferrate with its proprietary process of ONLY TWO COMPONENTS uses

\[
\text{Hexahydrate Granules} \quad \text{RED}^X \quad + \quad \text{Acidic Halogen Oxidant} \quad \text{OXY}^X
\]

Red-Oxy® spontaneously decomposes in the presence of all contaminants listed on page 2 & 3, in any kind of water into strong oxygen and the most powerful Adsorbent based no ferric hydroxide with the surface area of 3500 m²/gram.

The chemical formation reaction is

\[
\text{Fe(OH)}_3 + \frac{3}{4}\text{O}_2 + 2\text{OH}^- \quad \text{RED}^X
\]

This reaction is the strongest for the Oxidation-Adsorption of metals, non-metals and or organic contaminants in water and wastewater treatment. These include ammonia, cyanide, thiocyanate and very high concentration of hydrogen sulfide. All other contaminants are listed on Page 2 & 3. As many of the reactions are pH based reaction it can be controlled in the process with OXYX (the most powerful oxidant and disinfectant against viruses and Coli-form Bacteria). Inactivation of viruses and all kind of bacteria occur faster as the pH drops, a phenomenon that has been attributed to mono-protonated form of HFeO₄⁻.

Red-Oxy® treatment can be done without investing on the equipments as in most of the systems worldwide the dosing equipment can be used from existing feed pumps which will bring substantial improvements in finished water quality, especially as regards to trace organic contaminants and DBPs. Most water treatment systems, regardless of their size, use a coagulant which in future is RED and a chemical disinfectant which in future is OXYX and the sand filter in future are Katalox-Light systems. However only adding ISOFT Corrosion Control chemicals may be necessary if after treatment corrosion-control is needed. Watch-Water has developed this technology in INSTANT form of RED & OXYX to save transportation cost of chemicals.

Solutions for all contaminants problem just got much easier. How to approach come thousand so of communities, municipalities to use this innovative treatment: Red-Oxy® - Oxidation and Adsorption represents an improved Multiple Applications.
In order to get the best results and to ensure the necessary Ferric Hydroxide production, the operator should take into account the “Total Contaminants” to be removed.

Total contaminants and dosing ratio is 1 to 1. The dosing tank with mixer and the dosing pump should make the solution for one week. The flow control equipment to dose should be proportional. Watch-Water recommends the use of water-meters with contact cables.

Total B = Value1 + Value2. Select dosing 1xB amount of the prepared 5% OXYx dosing solution with combination with 0.5xB amount of the prepared 5% REDx dosing solution.

E.g. to neutralize 80 mg/L of phosphate dose 80 mg/L of OXYx & 40 mg/L of REDx dosing prepared solution. This would treat 1250 m³ of water with dosing solution prepared from 5 kg of OXYx and 2.5 kg of REDx.

### Example:

<table>
<thead>
<tr>
<th>Cations (mg/L)</th>
<th>Anions (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>As (III)</td>
</tr>
<tr>
<td>Lead</td>
<td>As (V)</td>
</tr>
<tr>
<td>Copper</td>
<td>Phosphate</td>
</tr>
<tr>
<td></td>
<td>Silicate</td>
</tr>
<tr>
<td>Value1</td>
<td>Value2</td>
</tr>
</tbody>
</table>

### Note:

- If ferrate dosing is low the results may not satisfactory and on the other hand if ferrate yield is too high, the pressure drop in the Katalox-Light unit will be high.
- There is virtually no limits of BOD or COD including TOC.

### Simple reaction tank should be chosen to provide a internal contact time of 3 to 5 minutes.
Katalox-Light Filtration

Water is fed to the Katalox-Light units for the filtration stage after Contact Reaction Tank. For Katalox-Light sizing please check Katalox-Light Technical Datasheet.

All salts and impurities captured by adsorbent are easier to filter out with Katalox-Light media, leaving iron free water containing none of the toxic byproducts.

In addition the nature of Katalox-Light can be utilized in urban or any industrial water treatment plants. Since the technology is the highest effective and disinfectant technology, it is possible to replace every Chlorinated drinking water equipment.

Therefore, any water, wastewatet, irrigation water, surface water or ground water mixed with organic, inorganic or biological impurities in water can install Adsorption/Disinfection equipment.

Watch-Water® is proud to announce the newest addition to the

**Oxidation and Adsorption in One process, RED-Oxy® Treatment**

Message from the Leader board

Our partners will build
- Laboratory pilot Scale
- On-site Pilot Scale
This will allow us to prove the technology.

If you ask, is \( \text{FeO}_4^{2-} \) is the solution for
- Disinfection
- Oxidation and
- Adsorption followed by KL filtration
- for water treatment in future?
The answer is YES!

Packaging:
- 60 liter drum of **RED** (Hydrated Iron in solid form)
- 60 kg drum of **OXY** (oxidizer chemical in solid form)
- 60 kg drum of **ADSORB** (adsorbent chemical in solid form)

*Red-Oxy®* is the most powerful multi-purpose and environment friendly technology known in water-treatment.

*Red-Oxy®* is available as INSTANT product (solid granule/powder form) that can be delivered worldwide without unnecessary water.

99% purification/separation can be achieved using *Red-Oxy®* (Ferrate Hexahydrate) Technology.

Manufactured by:

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