OZONE TECHNOLOGY AND APPLICATIONS

presented to:

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by:

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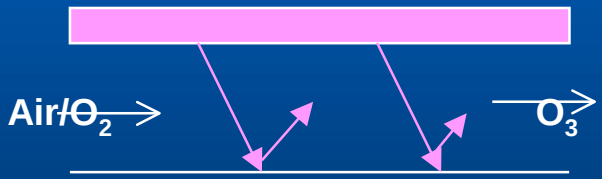
What is Ozone?

- **Ozone in an allotrope of the Oxygen molecule it is O3 instead of O2**
- **Ozone is very unstable it reverts back to O2 with a half life of 20-30 min at room temperature . For that reason it can not be stored and need to be produced on site from ambient air.**
- **Ozone is a very strong oxidant much more powerful then Chlorine.**

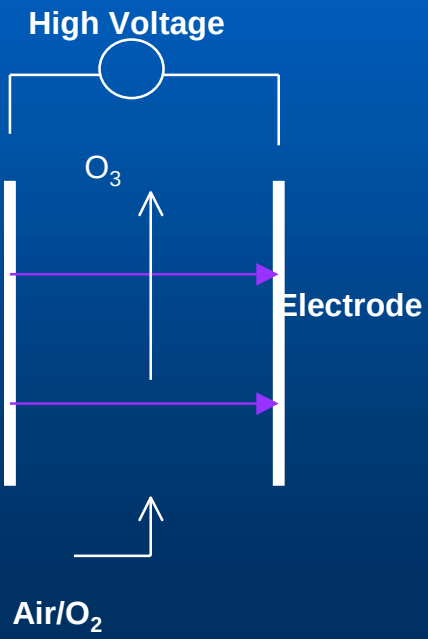
Ozone Production

- **UV Lamp**
  - **Ave. ozone production/ UV lamp**
    - **0.1 wt%**



Ozone Production

- **Corona Discharge**
  - **Ave. Ozone production**
    - **0 - 10 wt%**
  - **Energy Consumption**
    - **20 kWh/kg O_3 with air (LF)**
    - **10 kWh/kg O_3 with O_2 (LF)**
    - **10 kWh/kg O_3 with air (HF)**
    - **5 kWh/kg O_3 with O_2 (HF)**



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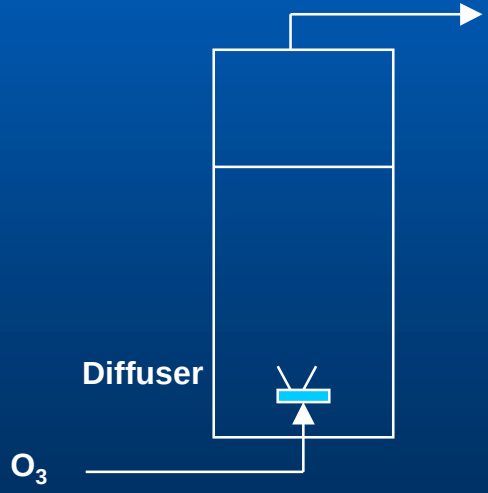
Ozone Reactivity

Oxidant	Redox (V)
O_3	2.07
HOCl	1.49
Cl_2	1.36
H_2O_2	0.87
O_2	0.40

Injection Methods

- **Contact Column**
  - **Efficiency**
    - **70% ozone dissolution**



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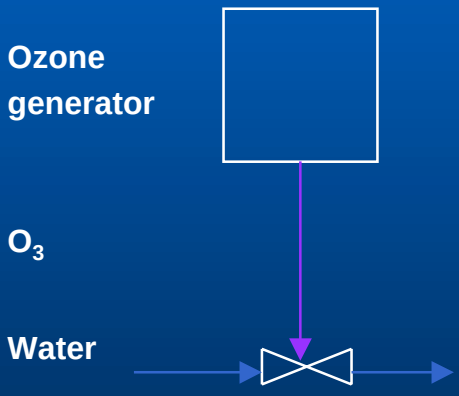
Injection Methods

- **Venturi**
  - **Efficiency**
    - **90% ozone dissolution**



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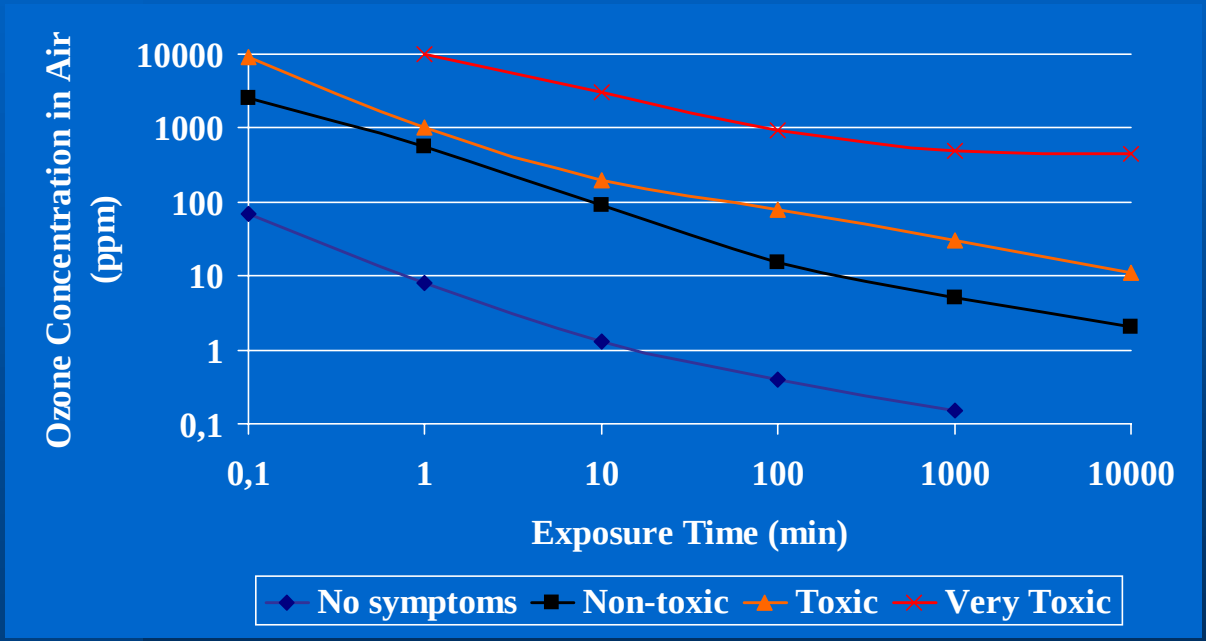
Ozone Toxicity

Ref: Perry, Chemical Engineering, Mai 1993



Biological Lethal Coefficients of Common Disinfectants

Ref: Hamil et Clawson, Water Technology, Avril 1997

Disinfectant	Entero-bacteria	Virus	Bacterial Spores	Amoebic Cysts
O_3	500	5	2	0.5
HOCl	20	1	0.05	0.05
OCl^-	0.2	<0.02	<0.0005	0.0005
NH_2Cl	0.1	0.0005	0.001	0.02

BLC : high value = high disinfection power

CT for Common Disinfectants

(pH = 6 - 9)

Ref: Hamil et Clawson, Water Technology, Avril 1997

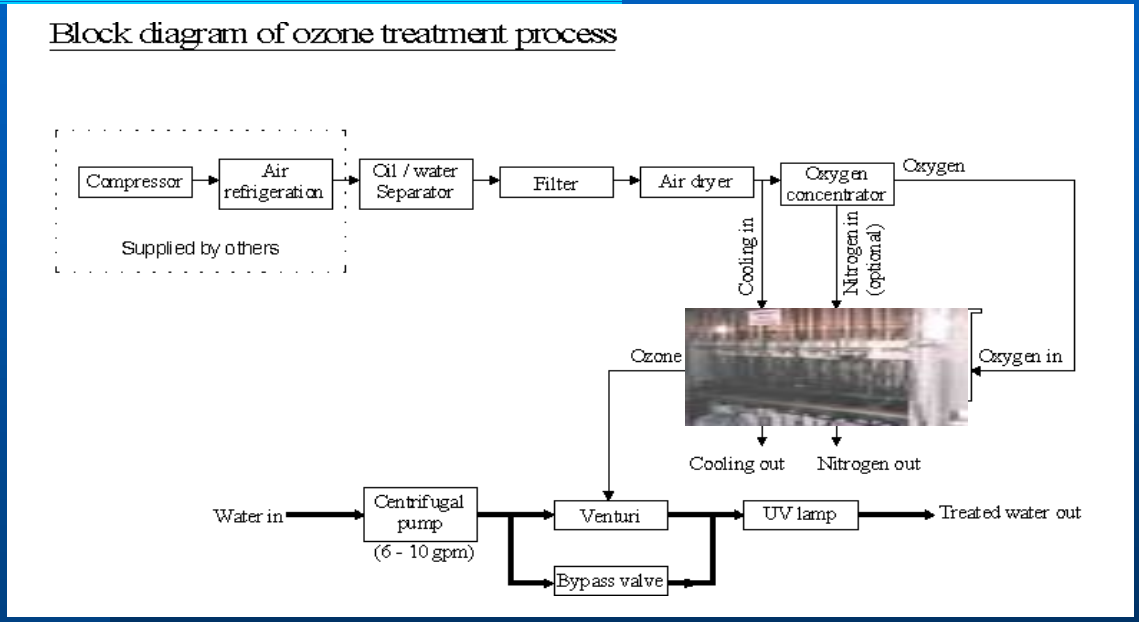
Micro-organisms	Free Chlorine Cloramine NH_2Cl	Chlorine Dioxide ClO_2	Ozone O_3
E.Coli	0.034 – 0.05	0.4-0.75	0.02
Rotavirus	0.01 – 0.05	0.2 – 2.1	0.006 – 0.06
G. lamblia cysts	47 – 150	____	0.5 – 0.6
G. muris cysts	30 – 630	7.2 – 18.5	1.8 – 2.0

* CT = Conc. O3 (ppm) x Contact Time (min)
* Established by EPA, 99.9% neutralisation of micro-organisms

Applications

- **Residential & Municipal drinking water treatment**
- **Domestic or Industrial waste effluent treatment**
- **Agricultural waste effluent, irrigation water treatment**
- **Agricultural odour elimination**
- **Food storage and sterilisation**
- **Residential & commercial pool & spa treatment**
- **Semiconductor and electronic**
- **VOC destruction from gaseous or aqueous effluents**
- **Laundry water recycling**

General O3 Treatment Configuration



Typical O3 Treatment plant

Air Compressors & dryers

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O2 & O3 Generators

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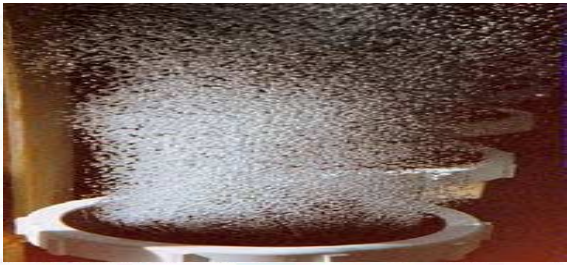
Ozone Injection



Retention Tanks

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A.Carbon Filters

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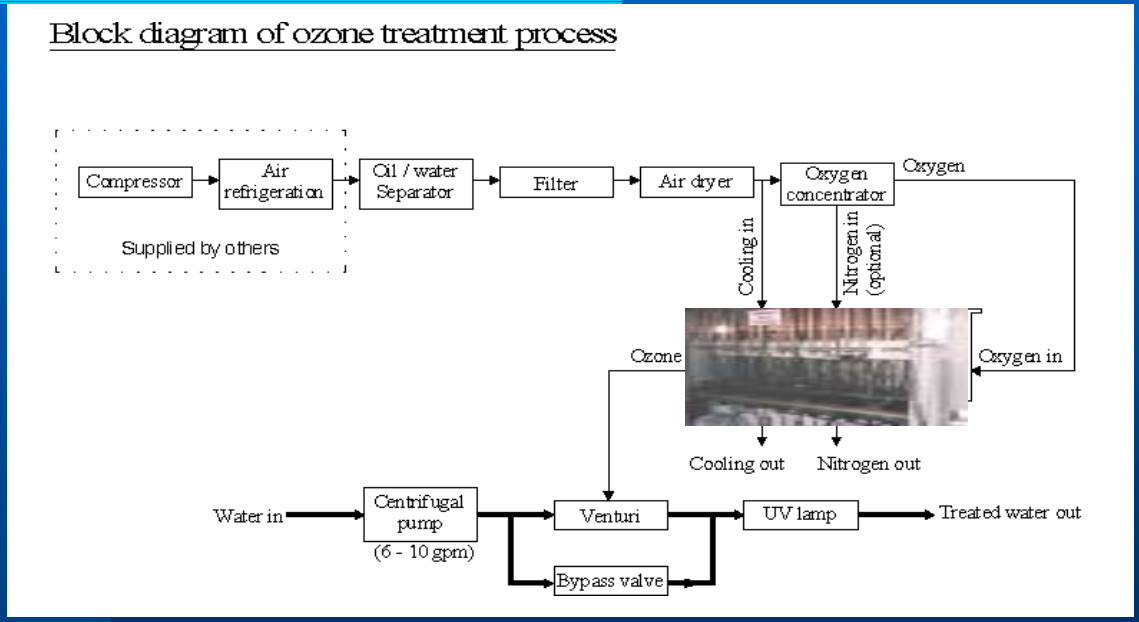
General O3 Treatment Configuration



Some Skid mounted Ozonisers

Important Features

- **Ozonator safety features**
  - **Emergency-off button**
  - **Internal lamp cooling**
  - **Nitrogen cooling (for explosion proof models)**
  - **Fan cooling**
  - **Thermostat**
  - **Flow switch for oxygen feed**
  - **Flow switch for internal cooling**
  - **Ozone monitor**
  - **Door switch**

Conclusions

- L'Ozonation et Ozonation Catalytique se distinguent par:

Espace d'Occupation	**Compact**
Coût de capitalisation d'équipment	**Bas-Moyen**
Coût d'opération	**Très faible**
Génération de particules en suspension	**Très faible**
Rigidité /Stabilité du procédé	**Très élevée**
Flexibilité du procédé	**Très elevée**
Expansion	**Très facile**
Complexité	**Minimal**
Manipulation des produits chimiques	**Faible/Inexistante**
Sécurités	**Très élevés**

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- **Please visit our website**

- **http://www.ozomax.com**

Your Questions