

FERROLOX®

ARSENIC REMOVAL: PART I

By Deepak Chopra

July 2013

Watch: DWH®
GmbH

Fahrlachstraße 1468165
Mannheim Germany

Web: www.watchwater.de
email: info@watchwater.de
Telefon: +49 (0) 621 87951-0
Telefax: +49 (0) 621 87951-99

Watch Adsorption Specials

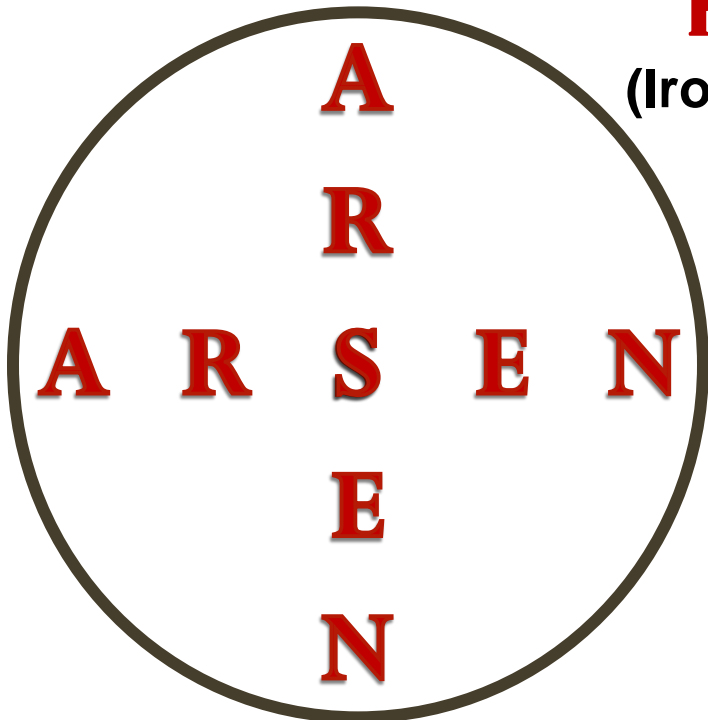
WATCHER®
WATCH WATER
a Water Company

„Technology with increasing demand“

REMOVAL OF ARSENIC FROM DRINKING WATER WITH

FERROLOX

(Iron hydroxide based)



(III)

Adsorption Technologies

-by Deepak Chopra

(V)

INDEX

- 1. ARSENIC CHEMISTRY**
- 2. ADSORPTION TECHNOLOGY**
- 3. APPLICATION**
- 4. SYSTEM DESIGN**
- 5. SYSTEM OPERATION**

1. ARSENIC CHEMISTRY

Arsenic Species



What is the significance of Arsenic speciation?

As (V) is more effectively removed by **FERROLOX** than *As (III)* but this is the case by most of the Adsorbents.

Arsenic Occurrence

Most of the surface waters as they get enough oxygen the Arsenic is

Predominantly *As (V)*

Lack of oxygen in Ground waters are usually found with *As (III)*. But some times they can be as *As (V)* or a combination of both *As (III)* and *As (V)*.

WATCH's SOLUTION

WATCH has changed the Arsenic Chemistry with **OXYDES** (H_2O_2)
And now maximum As can be removed with
Oxidizing As (III) to \longrightarrow As (V) before **FERROLOX!**

80% reduction and most effective?
With Solid Oxidizing Media (MnO_2 solid)
KATALOX LIGHT with **OXYDES**
As (III) Oxidation

**Nothing else is more effective
Than FERROLOX Process with Low cost and High removal capacity.**

Arsenic Rule

- ✓ Best Available Technology
- ✓ Maximum Percent removal As (III)

Removal Method	Product(s)	Removal
Oxidation and Filtration	OXYDES + KATALOX LIGHT*	80%
Adsorption	FERROLOX	20%

*Learn more about Advanced Catalytic Filtration from our [Online Learning](#) system.

Increasing the service life and capacity of **FERROLOX**:

Using pretreatment **OXYDES** + **KATALOX LIGHT** increases **FERROLOX** capacity up to 500%

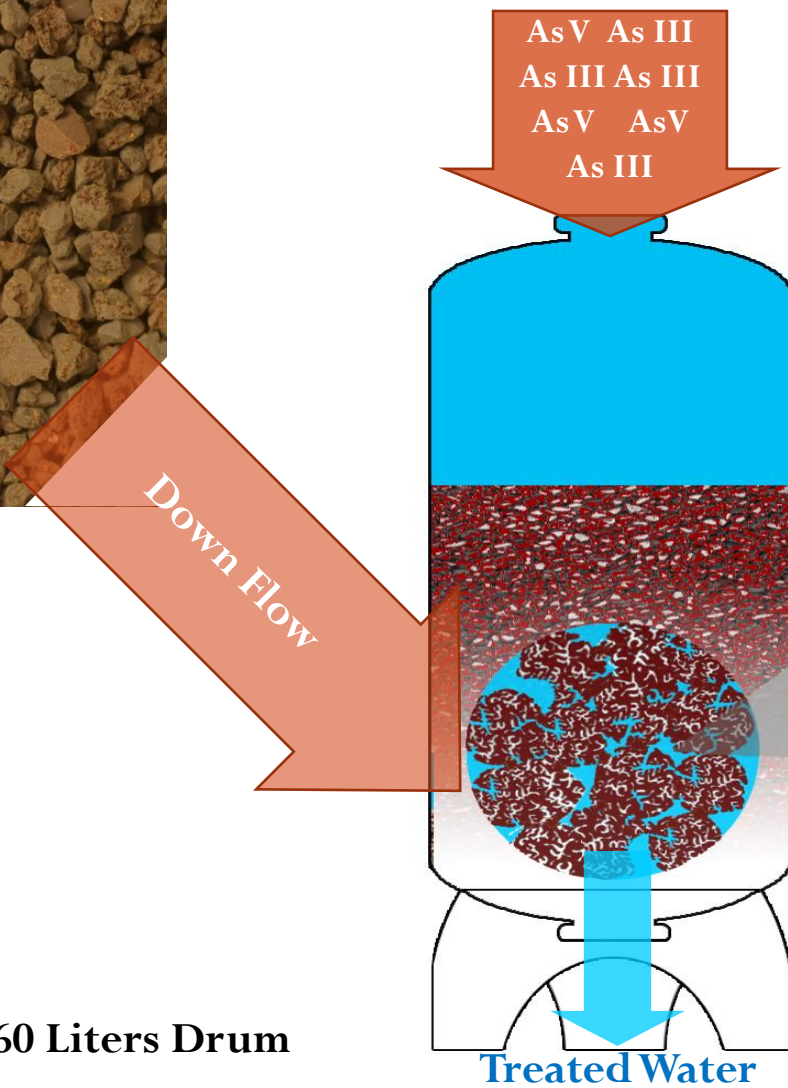
2. ADSORPTION TECHNOLOGY



FERROLOX® Media



Package: 60 Liters Drum



As Diffusion
> 99% of surface for removal is internal

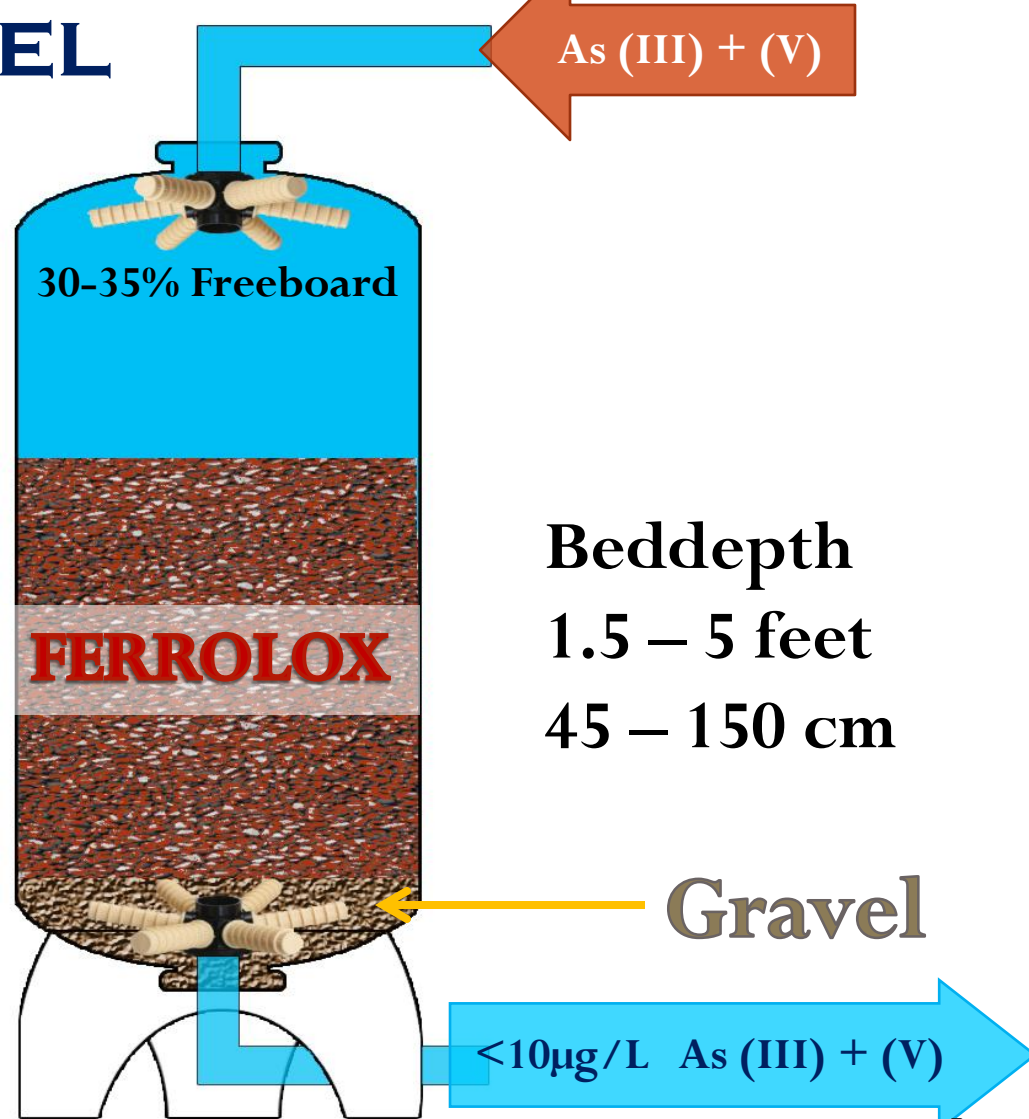
Watch Adsorption Specials

PRESSURE VESSEL

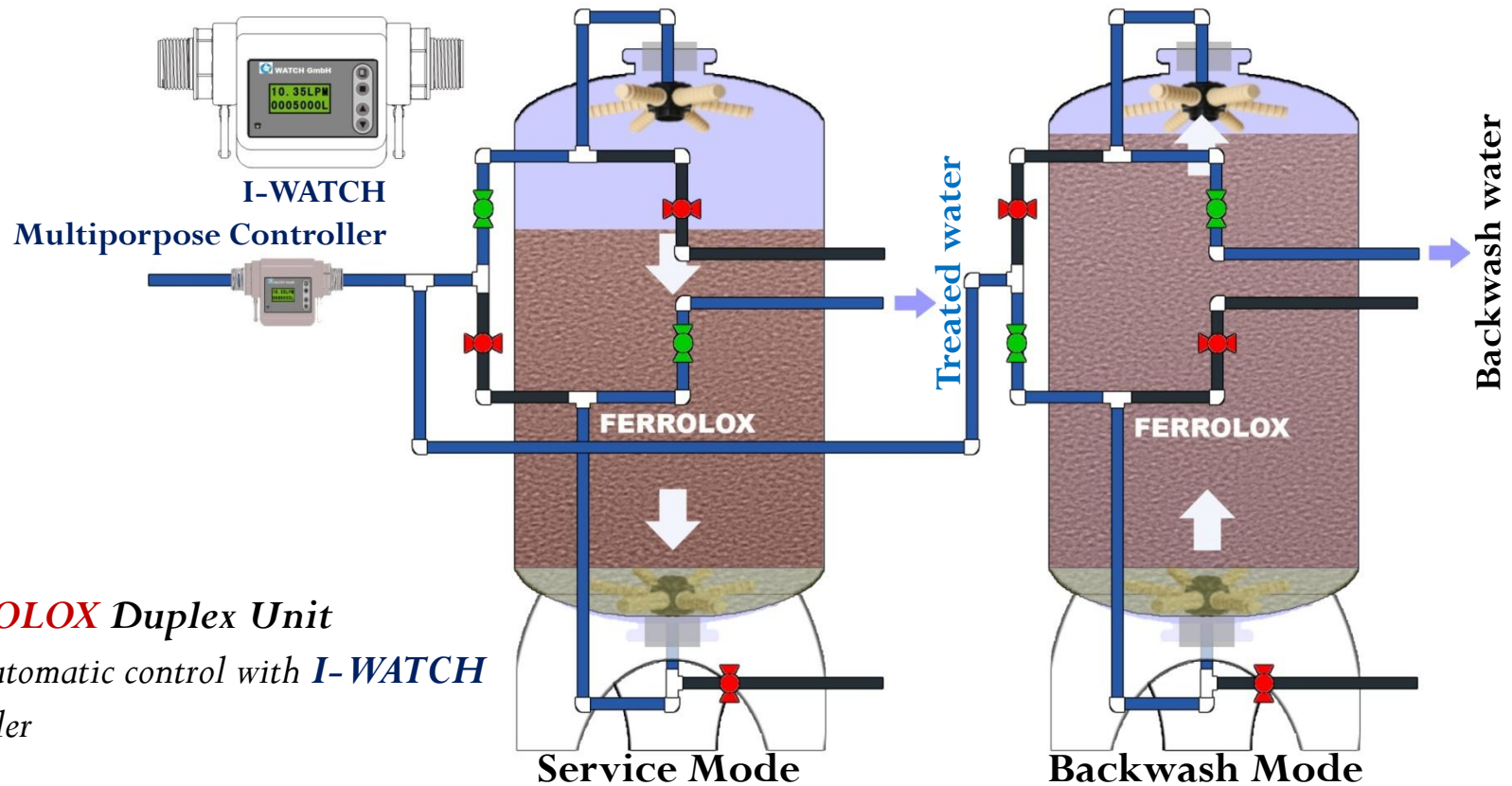
EBCT: 2 – 10 minutes

Lower the EBCT

- *Higher the unit flow rate*
- *Smaller the size of the pressure vessel*



„Technology with increasing demand“



FERROLOX Duplex Unit

Fully automatic control with **I-WATCH** Controller

- Systems Controls:** Manual vs. Automatic
- Pre-treatment:** Oxidation and pH adjustment
- Costs:** Watch always recommends Manual systems.
Easy to operate, very less backwash residual.

Oxidation with (**OXYMETAL**) converting As (III) to As (V)

Note: All adsorbents (based on IRON) have greater removal capacity of As (V) than As (III)

pH adjustment:

Arsenic removal performance for **FERROLOX** can be increased by adjusting the pH with **OXYMETAL**. Lower is the pH, greater is the removal capacity.

Arsenic Removal Project : Buenos Aires

Inlet Arsenic = 46 – 50 µg/L **As** at **pH 7.8**,
Media life 10,000 BVs with outlet **As** 10 µg/L

pH adjustment with **OXYMETAL**

At **pH 6.8**, media life 30,000 BVs with outlet 10 µg/L **As**

3. APPLICATION - WHY / WHERE ?

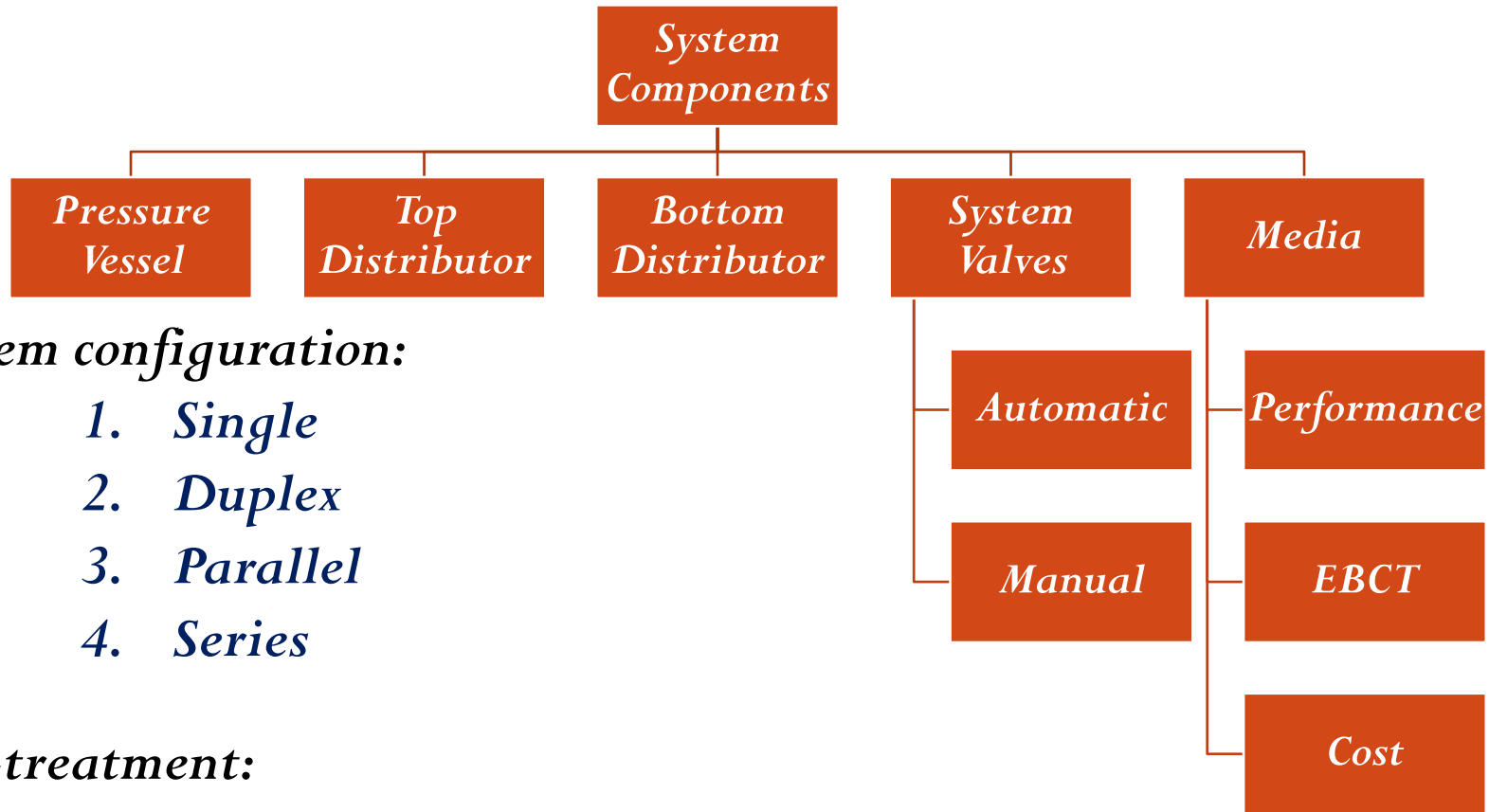
Why Manual units ?

Number One Reason – Very simple to operate

- ✓ Low operating costs
- ✓ Low investment costs
- ✓ Low arsenic in treated water < 2-3 $\mu\text{g}/\text{L}$ (ppb)

FERROLOX has very high adsorption capacity 15 gram/kg

„Technology with increasing demand“



System configuration:

1. *Single*
2. *Duplex*
3. *Parallel*
4. *Series*

Pre-treatment:

1. *Dosing station I-DOS*
2. *Proportional dosing*
3. *Oxidation (OXYMETAL)*
4. *pH adjustment with OXYMETAL*

5. OPERATION COSTS

	Amount	Cost per unit	Total
Pressure Vessel (s)	1	A	A
	2	A	2 x A
Gravel	liters	B	
FERRLOX media	liters	C	
Accessories			
Up Flow (Packed Bed)	0 valves	none	n/a
Down flow (single)	5 valves	D	5 x D
Down flow (duplex)	10 valves	D	10 x D
System Manufacturing	Workshop		
Grand Total			

Operational costs

If **FERROLOX** adsorbent is used only for one time use, the major cost item is media replacement (90%). 5% costs are related to disposal and 5% is manual loading or unloading of the media.

„FERROLOX can be regenerated“