

**2007**



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## ***We supply Clean & Safe water without chemicals!***

The Josab Aqualite™ System has been developed to produce drinking water in accordance with the WHO's guidelines for safe drinking water.

### General Description

Our standard water purification system is based on the use of a pressure filter containing the mineral Aqualite™. This technique provides purification **without any chemical additives**. The units are able to filter out particles down to the size of 1-2 micron and the treatment capacity ranges between 0,5-100 m<sup>3</sup> per hour. The addition of UV light allows for a complete removal of, for example, heterotrophs, coliforms and E. coli bacteria, as well as Giardia lamblia and Cryptosporidium parasites. **The system is patent protected and in use within the UN system.**

### Operational Description

The Josab Aqualite™ System provides a micro-filtration system in which the mineral Aqualite™ serves as the filter medium. Accordingly, the following steps are part of the water treatment process:

1. Raw water suction and straining carried out by a centrifugal pump completed with a suction hose and a submersible pump.
2. Micro-filtration by Aqualite™. The filtration unit includes backwash piping, valves, gauges and pressure controls.
3. Disinfections by UV-filtration.
4. (Chlorination for residual effects) – WHO requirement.

The micro-filtration replaces coagulation, flocculation, and sand filtration. Filtration is completed in one step instead of three in order to achieve a high and flexible purification capacity, efficiency and simplicity to maintain low maintenance costs.

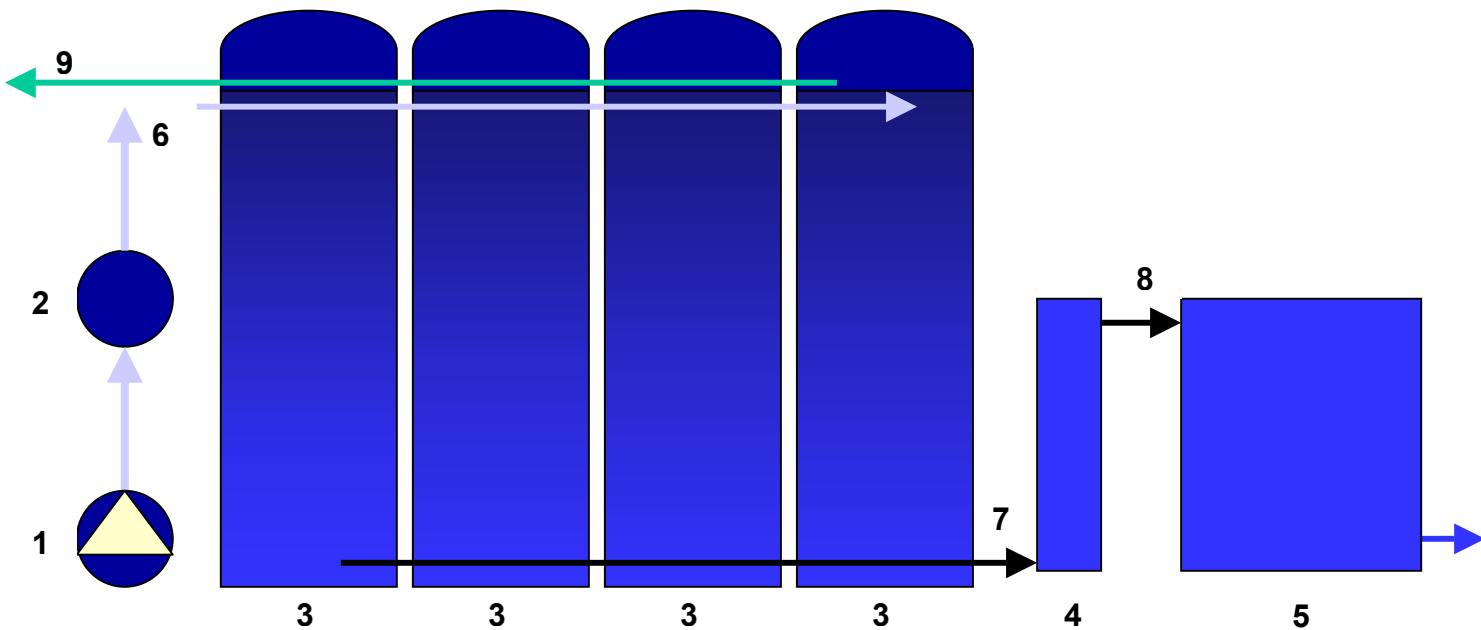
The system is operational immediately after the various units are linked together (installation). Due to the fact that it is uncomplicated and has very few components, the unit is easy to operate. Backwashing is done either automatically or manually while the unit is in operation and extra back-washing pumps and/or water tanks are not required. Maintenance, training and other activities related to the support of the Josab Aqualite™ System do not require specially trained technicians.

### C. General technical description

The Josab Aqualite™ System purifies water using unique methods. Through its adsorption and ion-exchanging properties, Aqualite™ effectively removes heavy metals, radioactive fallout (Cs, Sr), nitrogen compounds, oil by-products, etc.

It filters particles down to the size of 1-2 micron and provides purification without any chemical additives. In other words, Aqualite™ removes approximately up to 98 percent of bacteria and parasites. The downstream UV-filter ensures a complete removal of bacteria and parasites.

## No Chemical additives in the process



1 = Process Pump

2 = Sludge Filter

3 = Filter with Aqualite™

4 = UV-Filter

5 = Reservoir with treated water

6 = Inlet filter

7 = Outlet filter

8 = UV-treated water

9 = Backwashing water

***This configuration permits one filter to be backwashed with the treated water from the other filters***

## Portable

### High-quality, on-site water treatment



*Supply of high quality drinking water from polluted freshwater sources, at the point-of-need*



The steel-framed Portable<sup>Pro</sup> is used at the point-of-need, where there is a combined demand for premium water quality and a high volume output. Equipped with wheels, the unit weighs about 125 kg and is easily transported in the terrain. Josab's Portable<sup>Pro</sup> supplies up to 2,500 people with crystal clear drinking water. Polluted water from the ground, wells, rivers or lakes is purified by removing e.g., particles, odour, taste, heavy metals, bacteria and viruses, in compliance with the quality regulations of the WHO. Portable<sup>Pro</sup> purifies between 0,5 and 1 m<sup>3</sup> of water every hour, is delivered ready to use and does not require skilled personnel for its operation.

## Mobile

### High-capacity, mobile water treatment plant



*Transportable, high-quality supply of pure drinking water from polluted freshwater sources*



Josab's Mobile units were designed for fast transportation to the point-of-need, and for immediate performance at the site. These units are delivered either mounted on a trailer or for later mounting on a truck. With production capacities of up to 15 m<sup>3</sup>/h, one unit is able to supply as many as 35,000 people with pure drinking water. The Mobile units are complete on-road, water treatment plants able to purify ground-, well-, river- or lake water, by removing e.g., particles, odour, taste, heavy metals, bacteria and viruses.

The unit should be used where there are many different sites in need of high-quality drinking water.

## Modular

### Flexible capacity water treatment units

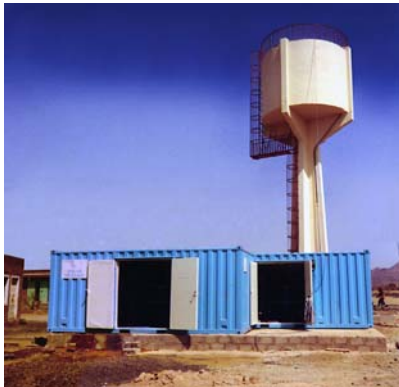


*Modular water treatment units  
for the supply of drinking water  
from polluted freshwater  
sources*

Besides the Mobile and Portable systems, Josab also markets Modular systems for permanent or semi permanent placement. These are comparable in price and performance with the Mobile systems, but are more flexible with regards to changes in future water demand. Simply by adding more modules, the system capacity is easily increased. Resting on pallets at the treatment site, Modular can be transported with relative ease. The purification capacity of these units ranges from a few m<sup>3</sup>/h to 100 m<sup>3</sup>/h.

## Stationary

**In-house water treatment units for permanent placement**



*Stationary water treatment plants for the supply of drinking water from polluted freshwater sources*

**Josab's stationary units are designed exclusively for permanent placement, either in-house or in a container. The purification capacities of these units are in the same range as for the Modular system.**

**For more information on our Modular and Stationary systems, please enquire.**

## Gardening

### Water purification, designed for horticulture



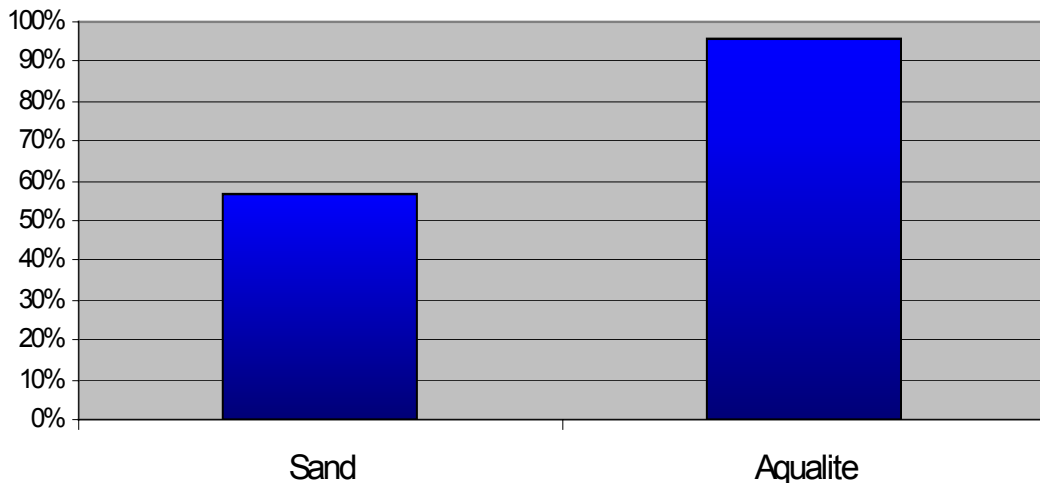
*Pure drinking water from  
polluted freshwater sources, in  
1 system and in 1 step, free of  
chemicals*

The Gardening system series exhibit a series of features that are beneficial for water treatment. Water from a variety of sources, such as ground water or rain water, is effectively cleaned. In horticulture, the systems are used primarily for either incoming water from the source, and/or for re-circulating water. The system series have been designed with references to experience from field installations in Denmark. Of all good qualities with Aqualite™, two major effects for the gardener stand out:

#### **1 Transmission values are dramatically increased**

Josab Aqualite™ System will filter off particles down to as low as 1 µm. In comparison, a typical sand filters remove particulates down to 50 µm, and carbon filters down to 25 µm. This is important for the efficiency of the down-stream UV. Hence, with your installed UV system, the flow rate can be increased accordingly. Alternatively, a smaller and less expensive UV source can be installed.

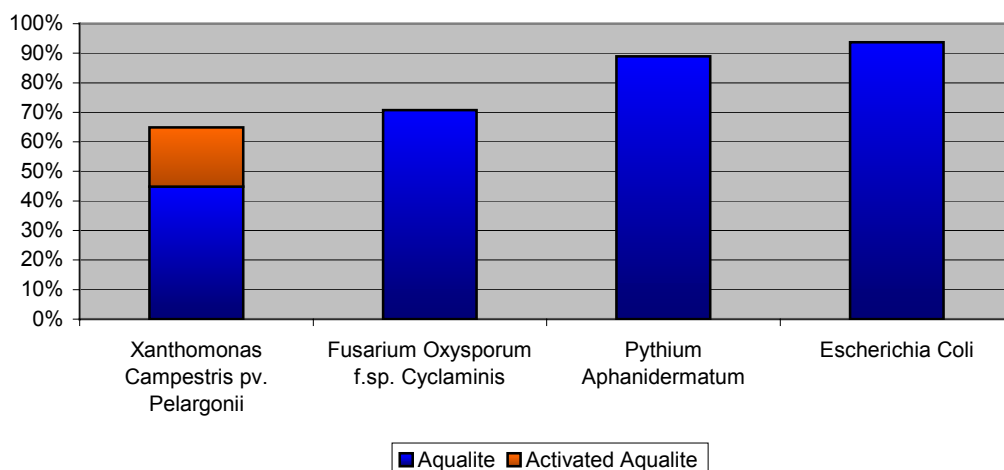
### Improvement of transmission values (T10) in Danish Greenhouses



## 2 The sterilization process starts already in the filter

The Josab Aqualite™ System exhibits a documented reduction of bacteria, viruses and fungi in the range from 66% to 98%. Bacteria are retained by the bed, partly because of their size. Clearly, no such effect can be seen in sand or carbon filters, that on the contrary are often media promoting bacterial growth. The combination of higher transmission values *and* less micro organisms in the effluent water, dramatically increases the efficiency of the UV.

### Example of reductions in Aqualite™ only



*The combination of higher transmission values and less microorganisms in the effluent water dramatically increases the efficiency of the UV.*



*What is*

**Aqualite™**



***A natural mineral with unique properties for water purification***

### **Physical properties**

- Uniform structure;
- Large pore volume;
- Very fine pores: 0.1 – 1.0 nm; and
- Large active surface area: 200 – 500 m<sup>2</sup>/g.

### **Function as an excellent filter material**

- Remove water-borne particles greater than 1 – 2 microns;
- Adsorbs chemicals and is an ion exchanger;
- Removes heavy metals, and ammonium and hydrogen compounds,
- Reduces COD, BOD and ammonium compounds;
- Bactericide and removes bacteria, such as E-coli, coliform, and heterotroph, as well as parasites, including cryptosporidium and giardia lamblia



## AQUALITE™

### The superior water purification material

The advantage of AQUALITE™ is its physical/chemical adsorption, ion-exchanging and catalytic properties:

- Uniform pore structure
- Pore diameter 0,1 – 1,0 nanometer (nm)
- Large pore volume
- Large specific area
- The cat-ions are removable and are easily replaced with ions
- The pores are filled with water, easily removed by heating, without affecting the crystalline structure

AQUALITE™ function like a molecular strainer (sieve): i.e. it removes substances from water by adsorption.

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### AQUALITE™ adsorbs

Ammonia, nitrate, nitrogen, hydrogen-sulphide, heavy metals, carbon-oxygen, oil-derivates, ethylene, ethane, n-butane, ethylene, oxygen, etc.

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### AQUALITE™ adsorbs and/or separates with catalytic effect

Potassium	K	Iron	Fe	Manganese	Mn
Calcium	Ca	Strontium	Sr	Lead	Pb
Copper	Cu	Silver	Ag	Mercury	Hg
Nitrogen	N	Nickel	Ni		

For production of drinking water, AQUALITE™ will change ions of pollutants to POTASSIUM- or SODIUM-ions, which are harmless.

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**AQUALITE™ is a bactericide. AQUALITE™ reduces Heterotroph, Coliform and E.coli bacteria with up to 98%.**

### Properties and saturation of the ion-exchanger.

This material has an ion-exchanging property, which means that in the material loosely bounded ions will be exchanged to other ions with capacity for harder bounding in the material (better “fit-up” in the structure).

By activating with special ions, which are loosely bounded in the material, the ion-exchanging capacity may be increased with 100%. These ions are counter-ion at the ion exchanging. The material has a fixed quantity of binding points, when all are occupied the material are “saturated”.

When a solution containing cat-ions passing through the ion-exchanger, the cat-ions will change place with the counter ions and therewith stay in the ion-exchanger and the counter ions goes in the solution. The cat-ions are adsorbed

Some cat-ions will be bounded stronger in the ion-exchanger than others will.

Priority order in AQUALITE™:

$\text{NH}_4 > \text{K} > \text{Fe, Mn} > \text{Cs} > \text{Zn} > \text{Ba, Sr, Pb, Ca} > \text{Cu, Ag, Hg, Co} > \text{Al} > \text{Mg, Li} > \text{Ni} >$

When a solution containing many cat-ions from above priority order, passing through the ion-exchanger, the competition for the binding points will be arranged according to the priority order, especially when all binding points are saturated. At last all binding-points are saturated with cat-ions from beginning of the above priority order, and material has to be regenerated or replaced.

### Physical properties:

Adsorption capacity	$\text{NH}_4$	12 – 13	g/kg
Adsorption capacity	$\text{CO}_2$	58	mm/l/g
Dynamic water adsorption capacity		26	mg/g
Particle density		2,2 – 2,3	kg/l
Volume density		0,8 – 0,85	l/kg
Ion-exchange capacity		1,2 – 1,3	mval/g
Ion-exchange capacity	Ag	1,77	mval/g
Ion-exchange capacity	$\text{NH}_4$	1,18	mval/g
Active area		200 – 500	$\text{m}^2/\text{g}$
Hardness		300 – 400	$\text{kp}/\text{cm}^2$

## ACTIVE FILTERMATERIAL: AQUALITE™

### ANALYSIS RESULTS - FILTRATION, ADSORPTION / ION-EXCHANGING AND BACTERIA REMOVAL

REFERENCE	PARAMETER		BEFORE FILTER	AFTER FILTER	REDUCTION
Cabinet Year 2004-2005					
Olle Bååth, Linköping	Iron	Fe	0,66	<0,2	71,2%
	Manganese	Mn	0,49	<0,3	40,8%
Cabinet Year 2004-2005					
Alf Johansson, Löberöd	Iron	Fe	1,5	<0,2	87,3%
Cabinet Year 2004-2005 pre-treatment (micronizer)					
B-Å Sparrman	Iron	Fe	2,02	0,672	66,7%
	Manganese	Mn	3,1	0,053	98,3%
Construction Site IKEA, Helsingborg, Sweden (through Aqualite filter in 2 steps) Year 2002					
	Cadmium	Cd	0,00028	0,00017	39,3%
	Cobolt	Co	0,0075	0,00091	87,9%
	Copper	Cu	0,015	0,012	20,0%
	Nickel	Ni	0,0059	0,0034	42,4%
	Zink	Zn	0,25	0,049	80,4%
	Benzene		0,007	<0,001	35,9%
	Ethylene				
	benzene		0,017	<0,001	94,7%
	M/P/O-xylene		0,048	<0,001	98,1%
	Aliphates >C8- C10		0,03	<0,02	70,0%
	Aliphates >C10- C12		0,12	<0,1	25,0%
	Aliphates >C2- C16		1,2	<0,1	92,5%
Construction Site Sundstorget Helsingborg, Sweden (mean value from 3 tests) Year 2002					
	Cadmium	Cd	0,000055	0,000016	70,9%
	Copper	Cu	0,0048	0,00087	81,9%
	Zink	Zn	0,1013	0,0032	96,8%
Portable Pro Test Accra, Ghana (local laboratory) Year 2003					
	Turbidity	NTU	67,0	0,0	99,9%
	True Colour	(Pt.Co.)	45,0	0,0	99,8%
	Total Hardness	CaCO <sub>3</sub>	80,0	2,0	97,5%
	Sulphate	SO <sub>4</sub>	80,0	9,0	88,75%
	Calcium	Ca	12,8	0,0	99,3%
	Magnesium	Mg	11,66	0,5	95,7%
	Iron	Fe	6,5	0,05	99,2%
	Manganese	Mn	0,11	0,0	18,2%
Kiam Giang Station Vietnam, Year 2004					
	Iron	Fe	0,34	0,07	79,4%
	Ammonium	NH <sub>4</sub>	14,53	1,64	88,7%
Gardening Persköp, Sweden (bacteria) Year 2006					
	Agro bacterium	No/100ml	90	<1	99,9%

**ACTIVE FILTERMATERIAL: AQUALITE™**  
**ANALYSIS RESULTS - BACTERIA REMOVAL**

**JOSAB Pressure-filter with AQUALITE™ only**

**BACTERIA REMOVAL**

<b>BACTERIA</b>	<b>RAW WATER</b>	<b>TREATED WATER</b>	<b>EFFECT</b>
Heterotroph 20° C 2 days	30800 nu / ml	2630 nu / ml	91,5 %
Heterotroph 20° C 7 days	39000 nu / ml	2860 nu / ml	92,7 %
Coliform bacteria	1600 nu / 100 ml	40 nu / 100 ml	97,5 %
E.coli	79 nu / ml	5 nu / ml	93,7 %
Cryptosporidium	100 nu / litre	10 nu / litre	90,3 %

**Above bacteria reductions are made by filtration in AQUALITE only. No UV-light or chemical addititves.**

**JOSAB Pressure-filter with AQUALITE™ and UV-light**

**BACTERIA REMOVAL**

*PATENT APPROVED COMPLETE SYSTEM WITH AQUALITE FILTER AND UV-LIGHT*

<b>BACTERIA</b>	<b>RAW WATER</b>	<b>TREATED WATER</b>	<b>EFFECT</b>
Kim* quantity 21□C	1100 pr ml	2 pr ml	99,82 %
Kim* quantity 37□C	>2000 pr ml	1 pr ml	99,99 %
Enterococcus	1 pr 100 ml	0 pr 100 ml	99,99 %
Termotol. Coliform	1 pr 100 ml	0 pr 100 ml	99,99 %
Heterotroph 20° C 2 days	30800 nu / ml	< 1 nu / ml	99,99 %
Heterotroph 20° C 7 days	39000 nu / ml	< 1 nu / ml	99,99 %
Coliform bacteria	1600 nu / 100 ml	< 1 nu / 100 ml	99,99 %
E.coli	79 nu / ml	< 1 nu / ml	99,99 %
Cryptosporidium	100 nu / litre	< 1 nu / litre	99,99 %

\* = The number of bacteria living of putrefaction, fecal coliform etc. i.e. organic substance in water.