

# UNUS-UWP

## C-MEM Zero

Ultrafiltration Technology  
for  
Drinking Water Treatment  
without the Need of Electricity



# CONTENTS

**Focus:** microbiological contamination of drinking water  
= the main reason for „unsafe“ water in the sense of the  
Drinking Water Directive

1. Requirements of treatment
2. Process applied
3. Implementation of the process as decentralized and low-maintenance system without the need of electricity



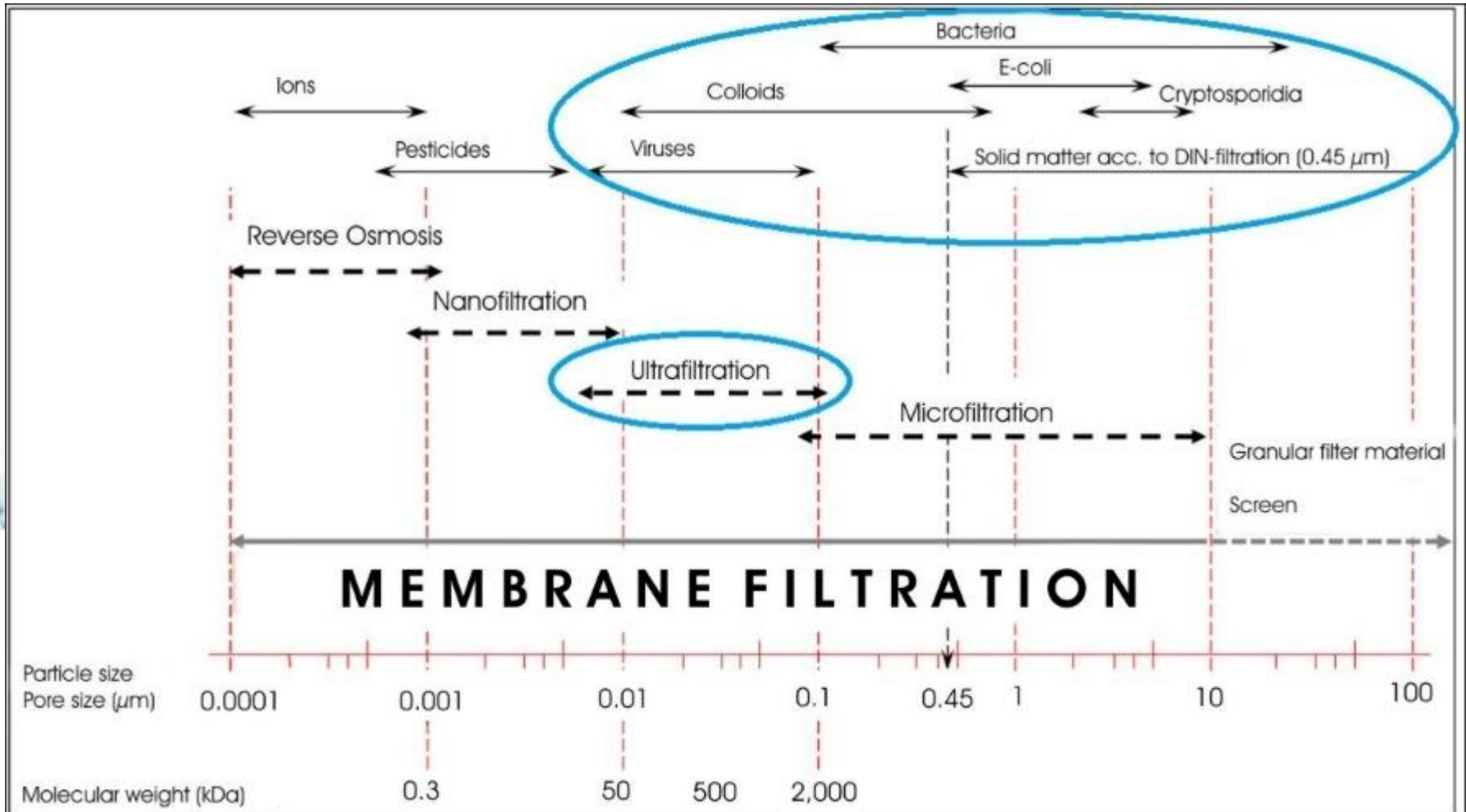
# WHO requests concerning microbiological elimination performance\*

Target	Log <sub>10</sub> Reduction: Bacteria	Log <sub>10</sub> Reduction: Viruses	Log <sub>10</sub> Reduction: Protozoa
Highly protective ☑	≥ 4	≥ 5	≥ 4
Protective	≥ 2	≥ 3	≥ 2
Interim	Achieves „protective“ target for two classes of pathogens and results in health gains		

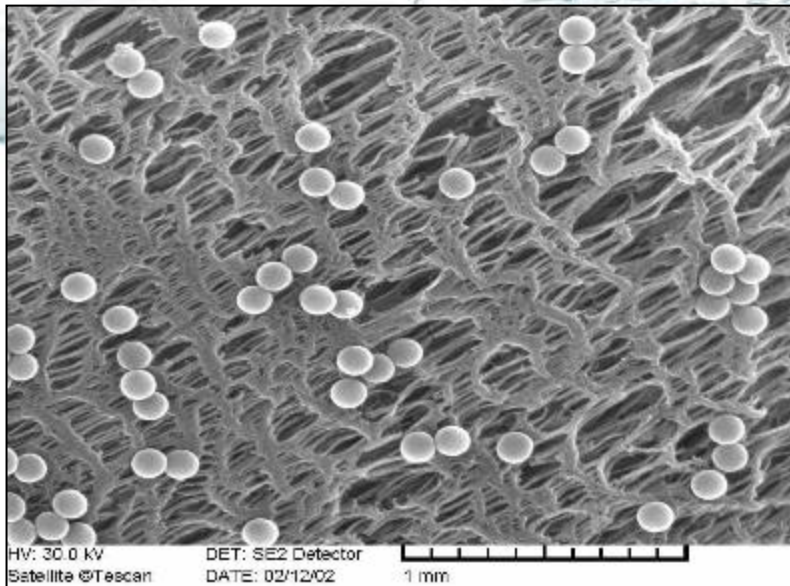
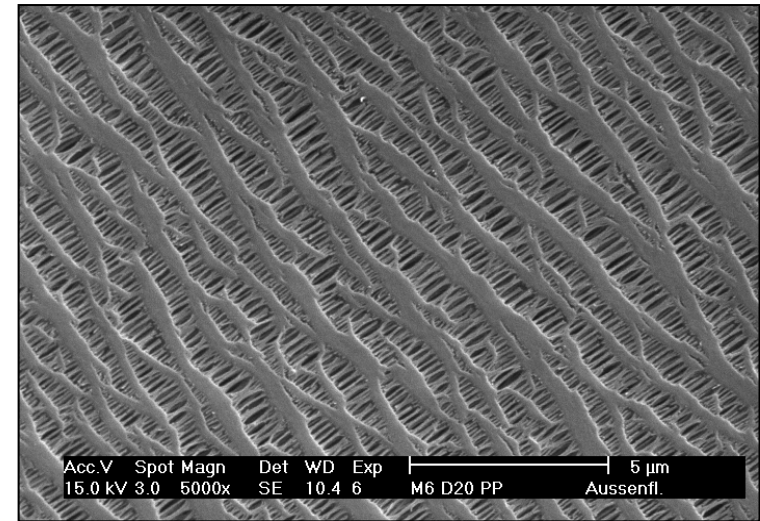
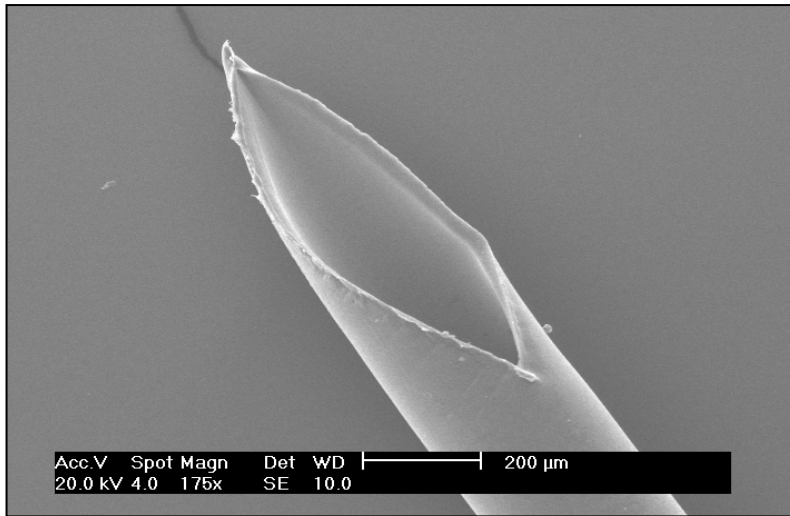
\* 2011 WHO report “*Evaluating household water treatment options: Health-based targets and microbiological performance specifications*” by applying the GDWQ concept of the tolerable burden of disease as an upper limit of 10<sup>-6</sup> disability-adjusted life year (DALY) per person per year



# ULTRAFILTRATION



Survey of Filtration Processes (Source: MELIN & RAUTENBACH 2007, modified)



## Hollow fibre ultrafiltration

- porous HDPE hollow fibres
- Ø 0.3 – 0.5 mm
- pore size: 20.1 nm
- 3D – pore structure
- hydrophilic
- anti-fouling coating

## Microbiological Performance

5 Log reduction prevents disease transmission:

diarrheal diseases, cholera, dysentery, typhus, cryptosporidium enteritis, cyclosporiasis, gastroenteritis, giardiasis, hepatitis E

## Chemical / Physical Performance

Removes suspended solids/turbidity:

suspended solids:  $\geq 5$  LVR

turbidity:  $\geq 5$  LVR



## Examples of Application

- rivers
- lakes
- rain water
- wells
- water springs
- stored water

## Limits of Application:

The removal of dissolved substances requires further treatment steps.

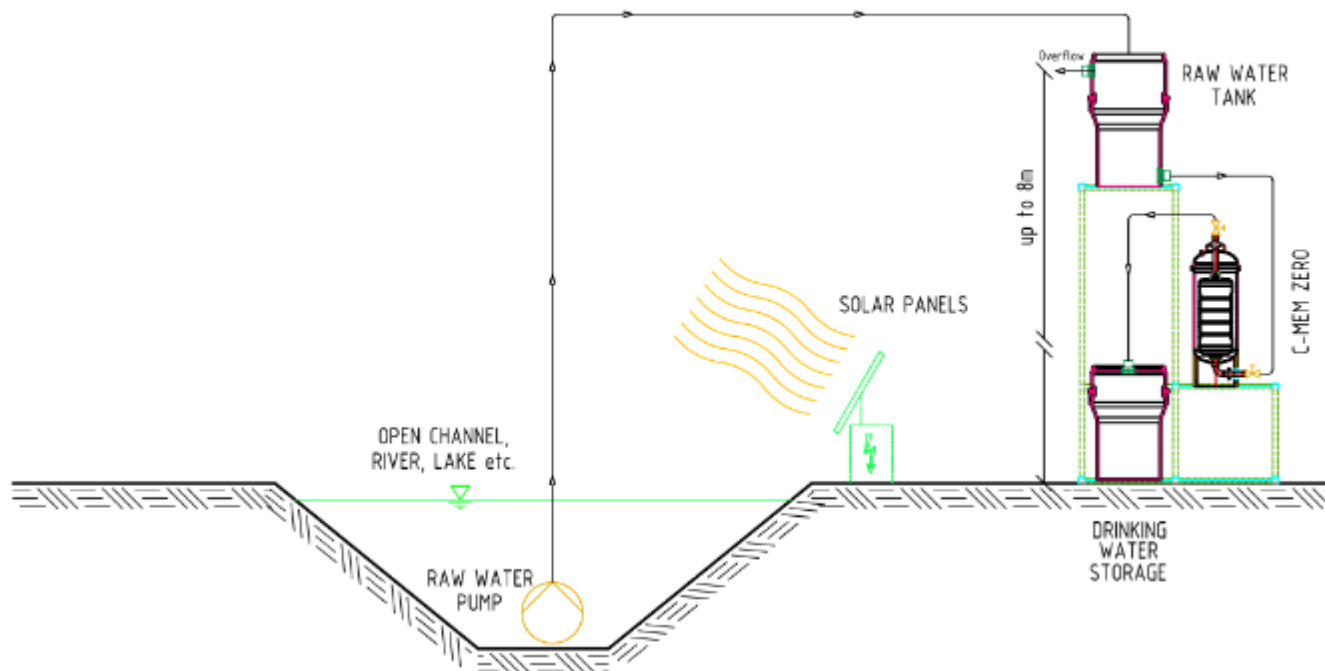
# Application





## Application

# Feeding of raw water tank by solar powered pump

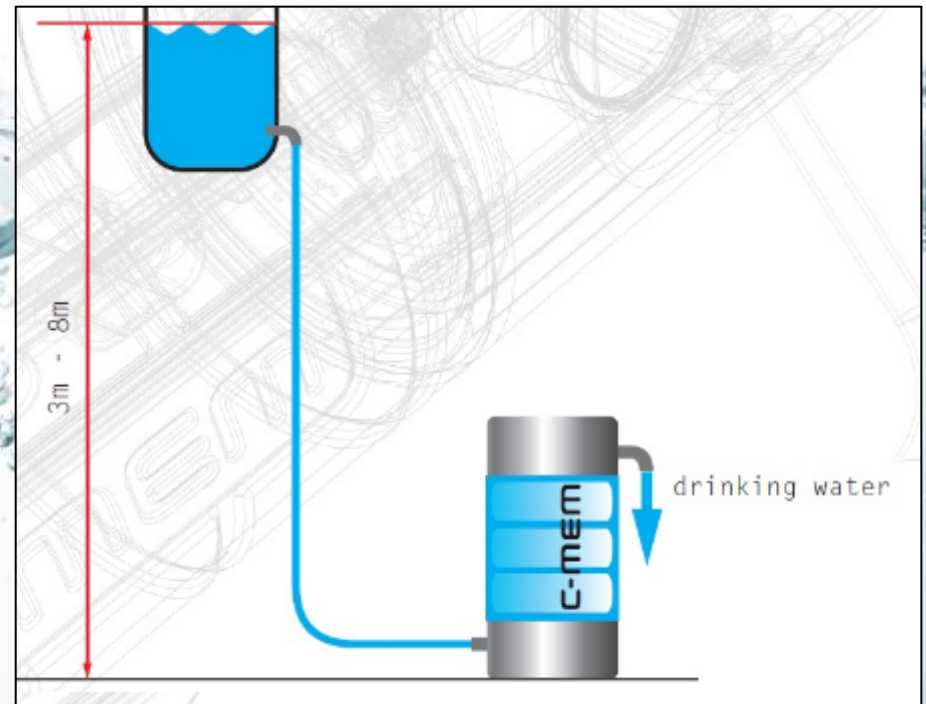


# C-MEM CARTRIDGES



- 6 m<sup>2</sup> membrane surface
- Flux: 30 - 360 l/h
- Pressure: 0.1 to 0.8 bar

Overcoming of the membrane resistance by hydrostatic pressure (“water column”)



# C-MEM ZERO EQUIPMENT COMPONENTS



- 1 raw water tank
- 1 filtration tank
- 3 valves
- 1 C-MEM cartridge
- 2 hoses





# C-MEM ZERO PERFORMANCE

30 – 360 l/h per unit at app. 1 to 8 m water column

## 1) Operation with regular cleaning: (30-360 l/h)

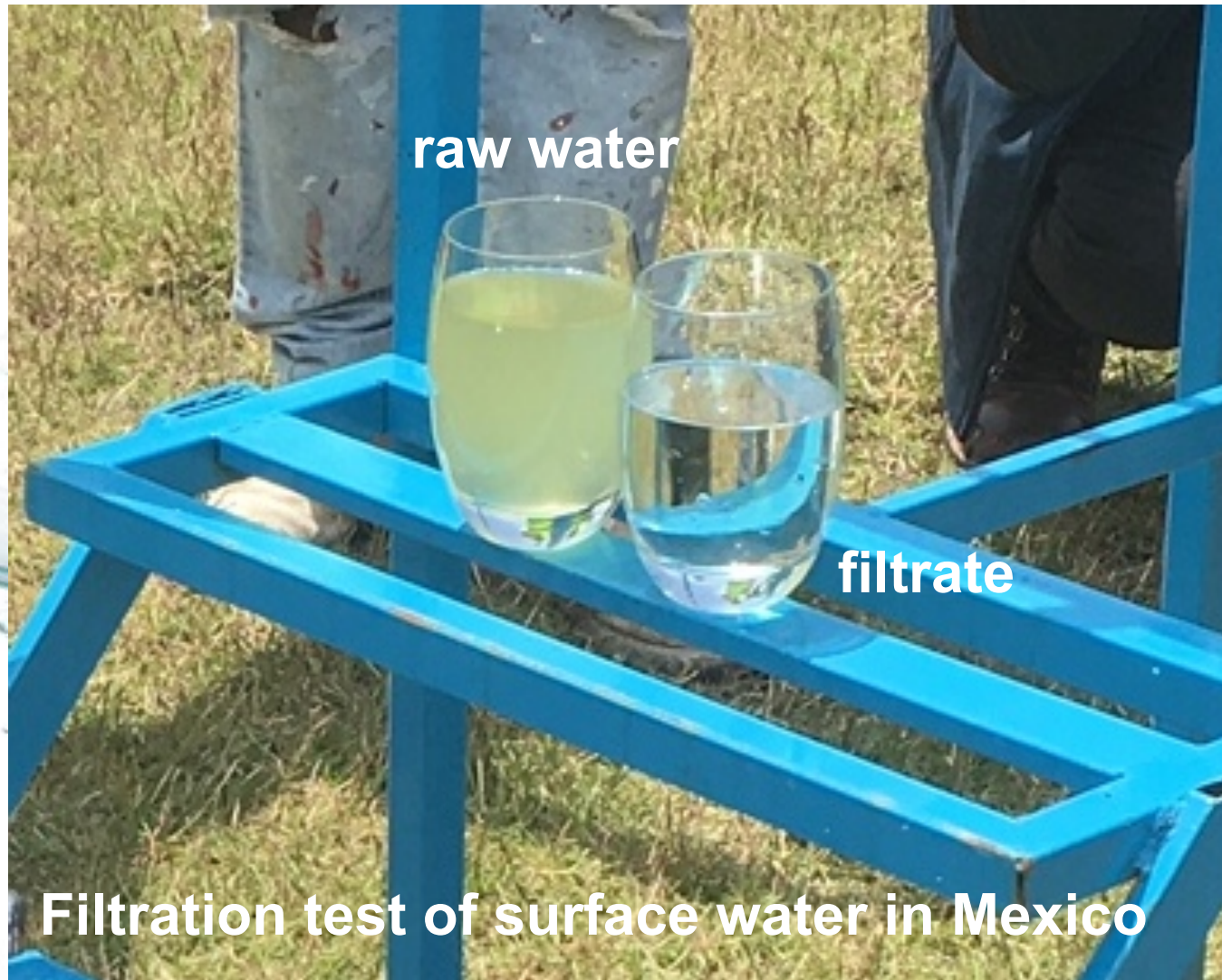
- (chemical) cleaning after performance drop
- flux after cleaning 75-100 l/m<sup>2</sup>.h.bar
- => 85 l/m<sup>2</sup>.h.bar x 0.15 bar x 6 m<sup>2</sup> = ca. 76.5 l/h

## 2) Operation without regular cleaning: (30-60 l/h)

- flux stabilizes after 1-2 months in the range of 5-10 l/m<sup>2</sup>h. Pressure independent!
- 7.5 l/m<sup>2</sup>h results in 7.5 l/m<sup>2</sup>.h x 6 m<sup>2</sup> = 45 l/h

## ADVANTAGES

- no electrical energy required
- no mechanical parts, pumps etc.
- light – ca. 16 kg per unit
- removal of suspended solids, turbidity, pathogenic bacteria, virus, worm eggs



**Filtration test of surface water in Mexico**

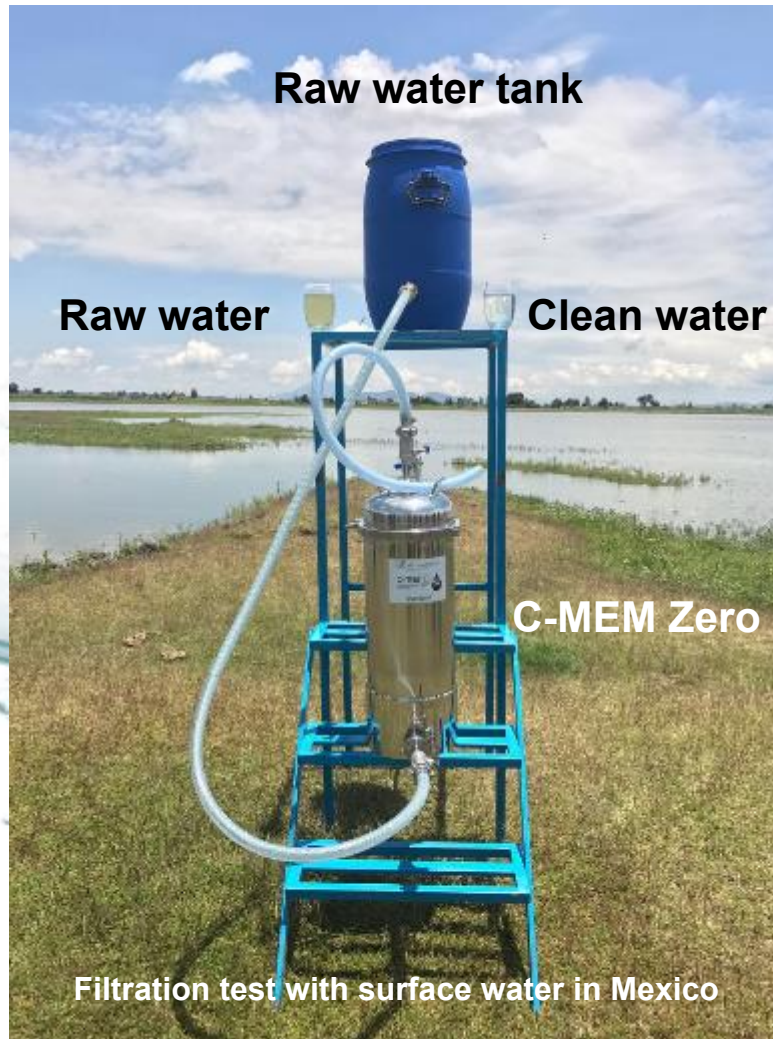


## C-MEM ZERO

- Production of 30 - 360 liters of drinking water per hour and skid at 1 - 8 m head
- Life time of membrane up to 10 years
- Easy cleaning
- Only membranes must be replaced after a certain time. The cartridge will be reused.
- Cheap solution for applications where no electricity is available

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# C-MEM ZERO



~~Electrical Energy  
Chemicals  
Moving Parts~~



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