OBERZOM S.A.
Research and Development

CRO DESALINATION CONTAINER

00 CRO COINTAINER

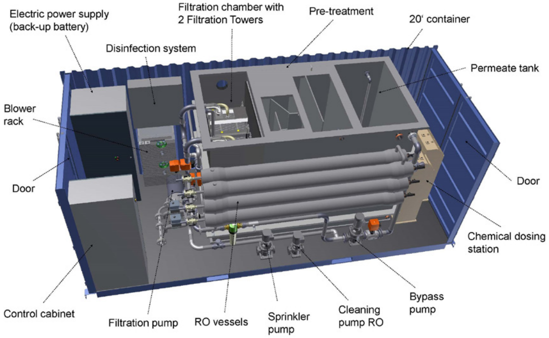
DESALINATION CRO CONTAINER

A complete desalination water treatment system integrated in a 20’ standard TEU-container (CSC-approved) from mild steel coated. This container produces approx. 100m³ of drinking water per day. Because of its unique technique the unit is able to work extremely efficient. The efficiency of this unit is better than from a large desalination plant.

This unit can be used as a stand-alone water treatment plant for 500 – 1,000 PE (people-equivalent) with well water and / or surface water as feed. Additional infrastructure components like raw water tank, holding tank for sludge, external product water tank, extra housing, power supply, foundation and others are not included.

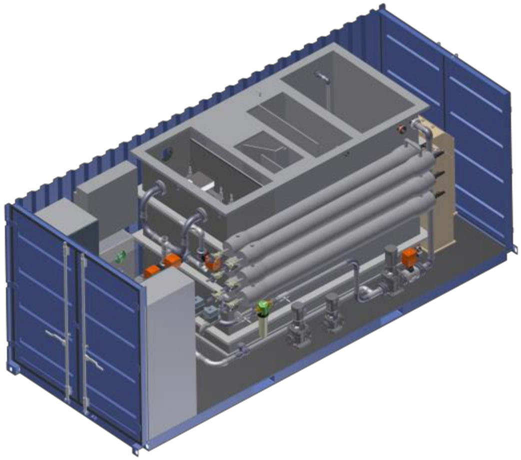
01 DESCRIPTION

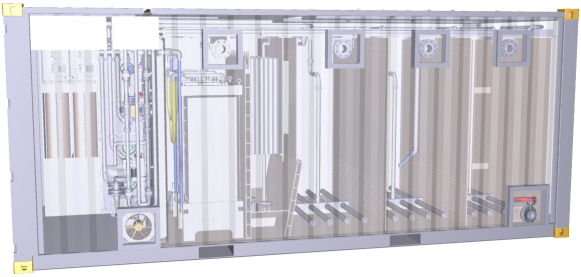
CRO-Container



- 20’ standard TEU-container (CSC- approved) from mild steel coated in white or blue with integrated chemical pre-processing, ultrafiltration with ceramic flatsheet membranes, reverse osmosis filtration and disinfection with anofluid for the production of potable water with double hinged doors on both sides.
- Main PE-tank with coated mild steel reinforcements integrating the chemical pre-processing chambers, UF-pre-filtration tank and product water tank.
- Pre-processing with plc-controlled pH-adjustment, aeration and chemical adjustment of oxidation potential controlled also by plc and detention area inside the main tank.

- Pre-filtration tank with two filtration towers with 7 modules each of 4m² of filtration area coated with nano-ZrO2 ItN module type (T) including piping and man-hole on top of the container for easy maintenance.
- Main filtration piston pump made from stainless steel for suction from the ultrafiltration ceramic flatsheet membranes and pressing into the reverse osmosis membranes with integrated energy recovery system by balancing chamber beneath each piston with DC-motor drive 48V.
- All high pressure tubes from the main filtration pump to the reverse osmosis vessels as well as the energy recovery system from stainless steel.
- Reverse osmosis membranes in six vessels with four standard cartridges in each of the vessels mounted aside of the main tank accessible from both sides for easy maintenance.





- TDS-control system with bypass line directly from the ultra-filtration to the product water tank for automatic and plc-controlled adjustment of the given TDS-value for the product water by PIDT- software controller.
- Manual drain valve for sludge removal from CRO-container.
- Integrated disinfection system with electrolytic chamber with semi-permeable membrane producing anofluid from NaCl fully plc-contolled.

CRO-Container

TDS-controlled flows

The mixing of the two streams with different total dissolved solids can be calculated as follows:

1) $\frac{dV}{dt} \overset{defl}{=} \dot{Q}$

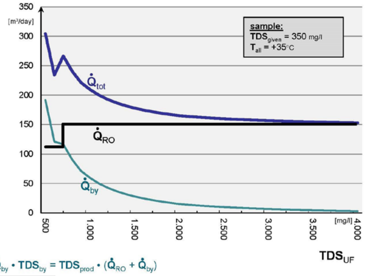
As to the ideal gas laws:

2) $PV = \kappa \cdot RT$ with $\frac{dm}{dv} = 0$ (incompress.)

Therefore we can assume:

3) $\dot{Q} \sim \frac{dm}{dt} (T)$ and as we have the same temperature in the whole system, we can calculate and control with $\dot{Q}$.

Now we can set up the mixing formular for the two streams with the following indexes:



RO: from RO
by: bypass
prod: product water

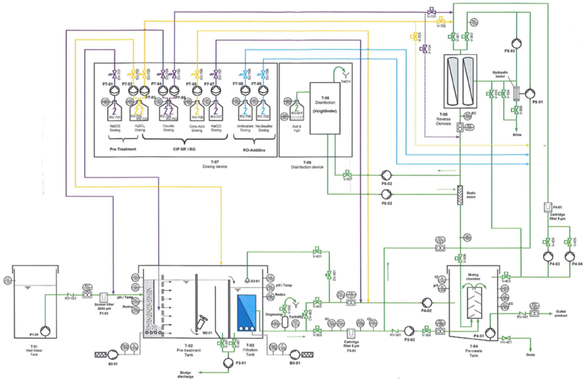
4) $\dot{Q}_{RO} \cdot TDS_{RO} + \dot{Q}_{by} \cdot TDS_{by} = TDS_{prod} \cdot (\dot{Q}_{RO} + \dot{Q}_{by})$

5) $\dot{Q}_{by} = \dot{Q}_{RO} \left[\frac{TDS_{prod} - TDS_{RO}}{TDS_{by} - TDS_{prod}}\right]$

As all values are drifting over time, a flexible control sytem is required!

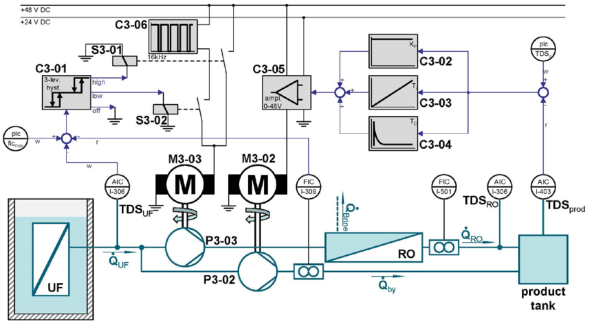
- Product water tank with integrated mixing unit of RO-water and bypass-stream and integrated water supply pump out of the CRO-container.
- Full sensor program with sensors for temperature, tank levels, flow through membranes, O2- concentration and ph-value.
- Blower rack with blowers for the pre-processing reaction chambers as well as the filtration chamber integrated into stainless steel rack connected to cooling grating on the side of the container.
- Input pump for feed from the raw water tank into the CRO-container is part of the systems delivery as well as a level sensor for the raw water tank.

- Programmable logic controls, man-machine-interface with LCD-screen, manual push buttons and electrical I/O-interfaces in built-in control cabinet 230 V AC 50Hz.
- CIP (cleaning-in-place) – unit for automatic cleaning with two chemical holding tanks for citric acid and NaOH with single dosing pumps on top for automatic cleaning of the UF-filters and the reverse osmosis membranes.
- Multipol cable connector for 3-phase power connection 3 ≠ 400VAC/50Hz – max. 18.0 kVA cos Φ = 0.8.



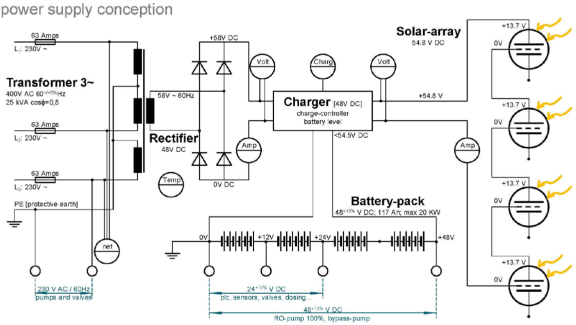
- Control software for the total unit in automatic mode with monitoring and communication interface for near filed communication, internet connection and wireless connection to mobile telephone network.
- Integrated emergency power supply unit 24V DC / 48V DC for controlled system shutdown in case of main power supply failure for longer than five minutes.

CRO-Container
product-TDS-control



- Chemical storage area inside the container for all required chemicals for at least one week of proper operation including dosing pumps fully automatic and controlled by plc.
- Software monitoring system of quality of potable water produced.
- 2 days of training on site by OZ engineer or technician (travel, accommodation and daily allowance included).

CRO-Container
power supply conception



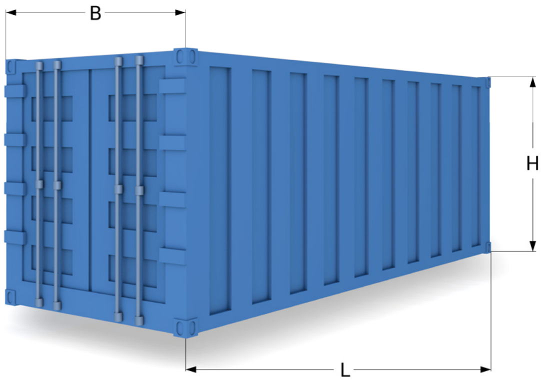
02 CONDITIONS

Before it is possible to start with the installation of the CRO container it is urgent to consider and review the following conditions:

- local guidelines and applicable regulations
- capacity of the supporting ground (through a construction engineer)
- the position of available tanks and pipelines
- pipe connection possibility
- installation of a safety rail
- frost protection for pipelines
- scheduled emergency spillways
- sludge storage and containment possibilities
- power supply and connection
- construction and safety equipment
- infrastructural accessibility for trucks

03 MEASUREMENTS

length [L]	20‘ = 6,1 m
width [B]	8‘ = 2,44 m
height [H]	8‘ 6“ = 2,59 m
net weight	18.735 lb = 7t



04 PHERIPHERY

Compensating reservoir	optional, Min. 20 m^3
sludge tank	optional

05 FOUNDATION CALCULATION

Before installing the MBBR Filter Container, it is necessary to calculate the stability of the groundwork to ensure the proper functioning of the system. Therefor it has to be lavelled into both directions.

TOTAL WEIGHT

The total weight of the container is dispersed across its four corners. The surface of each corner endures 290 cm³.

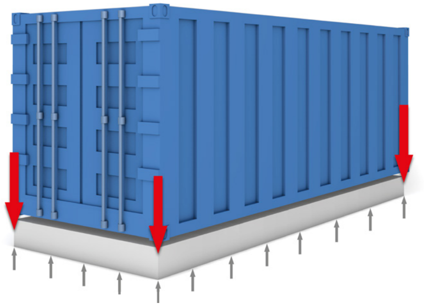
To calculate the total weight of the container it is necessary to consider the water weight, the weight of the container itself, of all connections, aggregates, membranes etc.

2.450 kg	[sea freight container]
1.600 kg	[net weight of the tank]
17.200 kg	[total water weight]
550 kg	[filter unit]
4.600 kg	[Pipes and equipment]
800 kg	[Biochip]
Total weight: 24.200 kg	

06 FOUNDATION

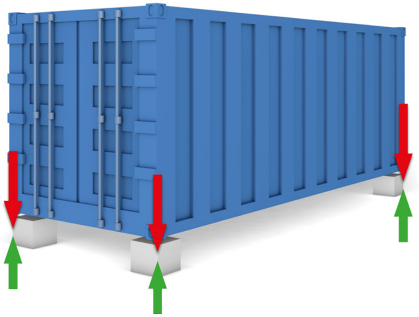
ALTERNATIVE I

gross weight	24.200 kg
foundation	15 m²
structural stability	1.613 kg/m²



ALTERNATIVE II

exposure of the corner	6.050 kg
foundation	0,6 m × 0,6 m = 0,36 m²
structural stability	16.805 kg/m²

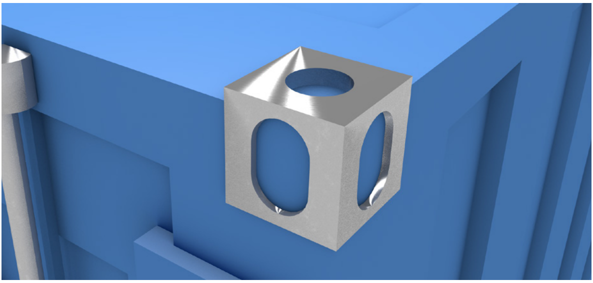


*Please keep under consideration that Alternative I and II are solely suggestions. The calculation of the foundation must be implemented by an engineer.

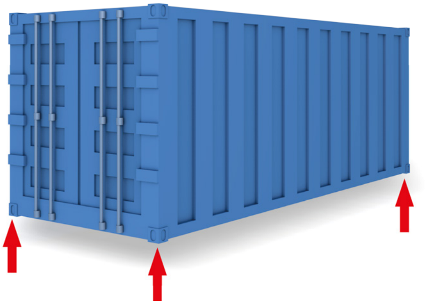
07 TRANSPORT AND LOADING

The delivery of the CRO container is being proceeded by a suitable truck for a 20’ sea freight container. The truck should have immediate access to the final location of the container.

Therefor the lifting device has to be suitable to lift up a 20’ sea freight container. All containers are provided with corner fittings as already described in ISO 1161.



The lifting of the container should only be used by the intended lifting points. As ISO 1496 and the safety terms describe, the lifting points are located at the four under and upper corners of the container.

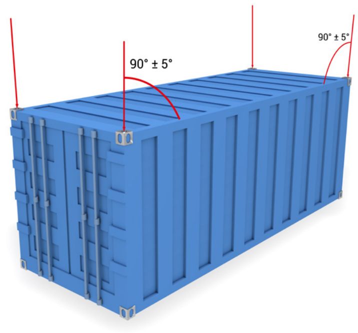


ALTERNATIVE I

Before the container can be lifted up, the lifting points on the ground have to be connected to the lifting device. The net weight of the container amounts up to 7000 kg. The angle of the lifting device has to endure a 90° angle over the length of the edges.
Through the chain usage with abbreviated limbs it is possible to take account of the main emphasis. Before connecting with the main unit, both triangle linkings should be connected with a travers. The travers are available in two different versions: adjustable or fixed.

ALTERNATIVE II

If the container is lifted up by a top lift spreader the angle of each connection to the upper side should amount to 90°. The lifting device has to be capable of raising an up to 7000 kg.



The total lift height of the crane has to be 7,15m (truck [1] + container [2] + lifting device [3] + hook [4]) and also be capable of lifting up the net weight of the MBBR.

08 REFERENCES

AVIATION

Our technology is used at various airports. These are safety-relevant systems. We supply the drinking water for various airlines and their planes.

- FraPort – Frankfurt Airport - Germany
- Saarbrücken Airport - Germany
- Rema Airport – Ethiopia
- Macao Airport - Portugal

FOOD / PHARMA

Even in the sensitive areas of the food industry and the pharmaceutical industry our technology is implemented. We recycle the water for critical processes.

- Buss Lebensmitteltechnik - Ottersberg, Germany
- Merck Pharma - Darmstadt, Germany
- Deutsche See - Bremerhaven, Germany
- Danone - Ochsenfurt, Germany
- Böklunder - Böklund, Germany
- Tnuva - Israel
- HatchTech - Veendendal, Netherlands

OBERZOM S.A.
Research and Development

REAL ESTATE / HOSPITAL

With the help of our technology large building complexes, hotels and nursing homes are provided with our perfectly prepared drinking water. Our quality is cruical for our success.

- ABG / FAAG Frankfurt - Frankfurt, Germany
- DoGeWo - Dortmund, Germany
- GfDE - Germany
- Phönix - Germany
- Vinzenz-Palotti-Hospital - Bergisch-Gladbach, Germany
- Universitätsklinik Würzburg - Würzburg, Germany

- Hotel Wilna - Erfurt, Germany
- Faktor 10 - Darmstadt, Germany
- Dr. Nees Liegenschaftsverwaltung - Oberramstadt, Germany

MARINE / CHARITY

We produce quality drinking water from sea water with our technology. These are also highly sensitive areas.

- Rema Äthiopien (Charity), Ethopia
- iTN (Water treatment), Saarbrücken, Germany
- BaWaPla (Marine), Bruessels

AGRICULTURAL

In agriculture, our technology is used to treat water fort he necessary processes. Again, our customers value the best quality.

- Agrargenossenschaft Gossmar - Heideblick, Germany
- Agrargenossenschaft Mönchholzhausen - Mönchholzhausen, Germany
- Behrens / Wiesenhof - Markhausen, Germany
- Seeger - Germany
- Cornelius - Germany
- Mecklenburger Ernte - Seevetal, Germany

- Evonik - Frankfurt, Germany
- Kartzfehn - Bösel, Germany
- PAL Bullermann - Markhausen, Germany

UNIVERSITY / EDUCATION

We supply various universities with high-quality drinking water. This water is also used at universities to do further research.

- Universität Saarbrücken - Saarbrücken, Germany
- Universität Newcastle - Great Britain
- Universität Bagdad - Iraq
- Universität Istanbul - Turkey

OBERZOM S.A.
Research and Development

Oberzom S.A.Research and Development
45-47 Route d'Arlon
L-1140 Luxembourg

Telefon (+352) 2786 0186
info@oberzom.com
www.oberzom.com