OKSEA-HBOT 2200/5.5

HYPERBARIC OXYGEN THEARAPY CHAMBER

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1. SYSTEM DESCRIPTION

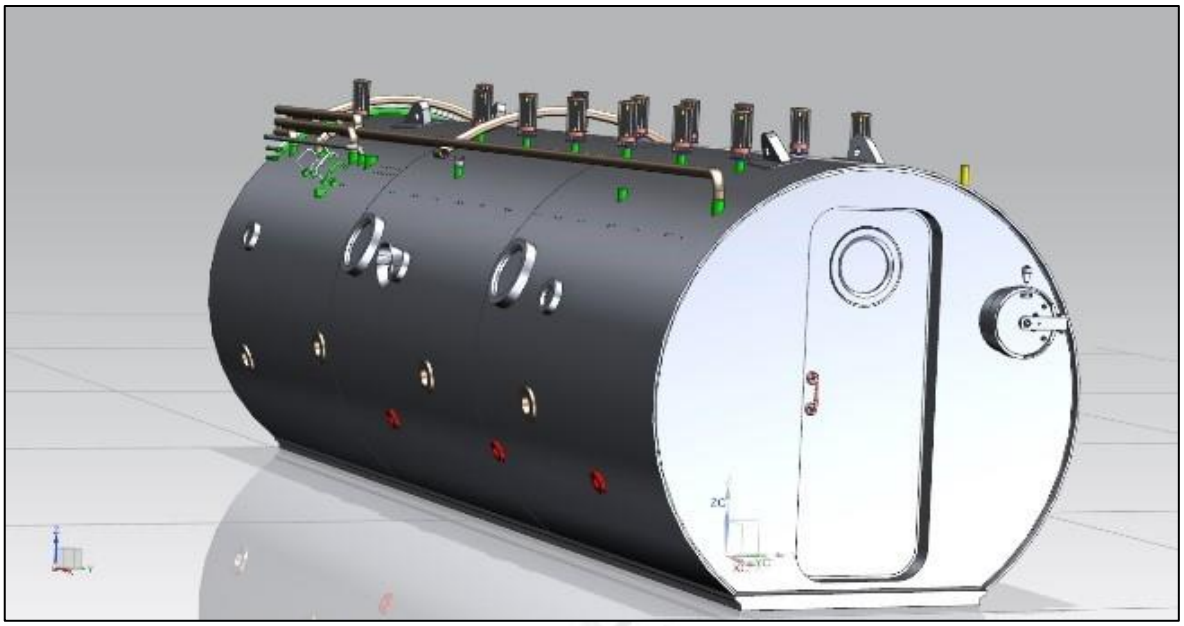

Figure 1 - Design Drawing

The chamber **OKSEA-HBOT 2200/5.5** is a two-lock chamber used for

HBO operations up to 2 bar
Hyperbaric therapy with air (up to 5 bar)
Divers tests and medical tests

Not allowed:

Operation of ante chamber with continued occupation by patients for treatment

All important control functions can be carried out from an **OKSEA-DIVECONTROLLER** control station for the pressure chamber system. The control station is described in detail in item 10.

The pressure vessel is constructed for a maximum pressure of 5.5 Bar (55 MSW) and designed as horizontal Omega Shape pressure vessel, divided in ante chamber and main chamber.

Figure 2 - Delivered System

1.1. TECHNICAL SPECIFICATIONS

Maximum working over-pressure	5,0 bar
Maximum design over-pressure	5.5 bar
Test over-pressure	8,25 bar
Material	P355GH
Main chamber capacity	10 + 1 persons
Ante chamber capacity	2 persons
Length of main chamber	5000 mm
Length of ante chamber	1000 mm
Main chamber volume	16.750 l
Ante chamber volume	3.900 l
Length overall (incl. control station)	6000 mm
Width overall (incl. control station)	2250 mm
Height overall (incl. lamps)	2250 mm
Number of doors	3 e/a
Number of windows in MC	4 e/a
TV-windows	4 e/a

Number of windows in AC		2 e/a
	TV-windows	2 e/a
Window-diameter free		300 mm
	TV-windows	150 mm
Medical lock main chamber MC		free diameter 250 mm
		free length 300 mm
Illumination		cold LED lights with acrylics
Depth Gauges Accuracy		Analog %0.25
		Digital %0.05
SP Phone		3 e/a
Oxygen BIBS Masks		14 e/a
Communication System		2-way Intercom
Humidity and Temparature Indicators		Digital
Connection load		approx. 5000 Watt
Electrical connected voltage		220 / 380 50 Hz

1.2. PRESSURE VESSEL EQUIPMENT

Omega Shape Pressure vessel, divided into main chambers and ante chamber

- Rectangular walkaway doors.
- 1 door between main chambers and ante chamber,
- 1 door in the end side of the main chambers
- 1 door in the ante chamber
- Supply lock with closure outside, flat door inside, equipped with safety devices and pressure gauge, for one-hand operation
- Observation windows, 300 mm Ø,
- TV-windows, 150 mm Ø
- Blind flange, free diameter 50 mm, blind leaf exchangeable formed.
- Hoisting eye bolts according to hoist standard (DIN 82024)
- Corrosion prevention and coat of varnish
- Several leadthroughs for pipework and cables
- ECU for cooling and heating chamber atmosphere

- Anti-slip floor in pairs (MC and AC),

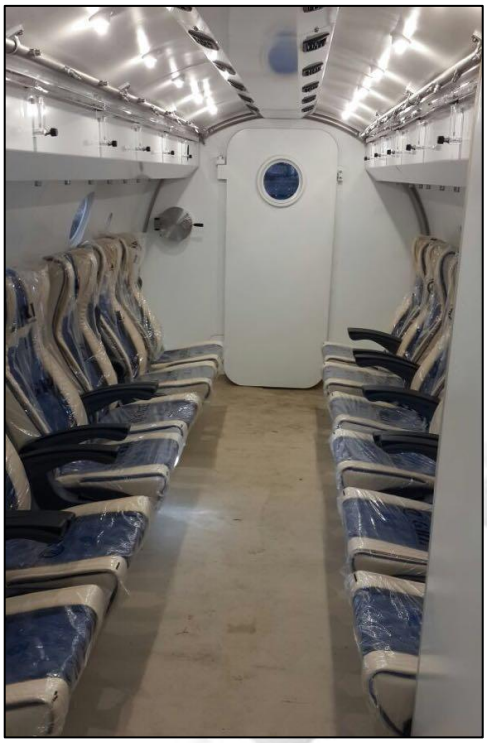

Figure 3 - Delivered System

Main Chamber Equipment

- 12+1 pieces hardly inflammable upholstered folding seats
- Loudspeaker and microphone of intercom system
- Sound powered telephone (SP)
- Digital Clock
- Button for emergency signal system.
- Release button for spray-fog fire suppression system (OKSEA-FIRE)
- Caisson Manometer
- 4 Observation windows
- Set of silencers for air inlet and outlet.
- Safety Valve
- Spray-fog fire suppression System (OKSEA-FIRE)

- UV-detectors for alarm signal in case of sensing a spark or
- Portable fire extinguisher
- Inner painting (non-toxic, hardly inflammable) Anti-slip floor, easy to clean
- Set of quick coupling connection (BIBS) for serial masks or Head tents Scott serial masks
- Illumination units (OKSEA-LUX)
- ECU inner unit.
- Medical Lock
- CCTV system
- Entertainment System

Ante Chamber Equipment

- Folding seats with back rest for maximum 2 seating persons equipped with one set of upholstery
- Loudspeaker and microphone of intercom system
- Sound powered telephone (SP)
- Digital Clock
- Button for emergency signal system.
- Release button for spray-fog fire suppression system (OKSEA-FIRE)
- Caisson Manometer
- 2 Observation windows
- Set of silencers for air inlet and outlet.
- Safety Valve
- Spray-fog fire suppression System (OKSEA-FIRE)
- UV-detectors for alarm signal in case of sensing a spark or
- Portable fire extinguisher
- Inner painting (non-toxic, hardly inflammable) Anti-slip floor, easy to clean
- Set of quick coupling connection (BIBS) for serial masks or Head tents Scott serial masks
- Illumination units (OKSEA-LUX)
- ECU inner unit.

- CCTV system

2. PRESSURE BUILD-UP I PRESSURE REDUCTION

- The treatment chamber type OKSEA-HBOT 2200/5.5 can be filled with atmospheric air up to a maximum working pressure of 5 bar (equivalent to (50MWS).
- As with pressure build-up, pressure reduction is affected by operational control from the control station.
- The gas is let into I let off the ante chamber and main chamber through high-effective silencers

2.1. VENTILATION

- During operation with air, oxygen supply and CO2 disposal are affected via fresh air ventilation.
- The quantity of ventilated air is separately preselected for main chamber and ante chamber
- Adjusting the number of persons on the semi-automatic system
- The ventilation in here is adjusted to the number of chamber occupants and to the prevailing chamber pressure.
- The selected number of persons is indicated at the control station.

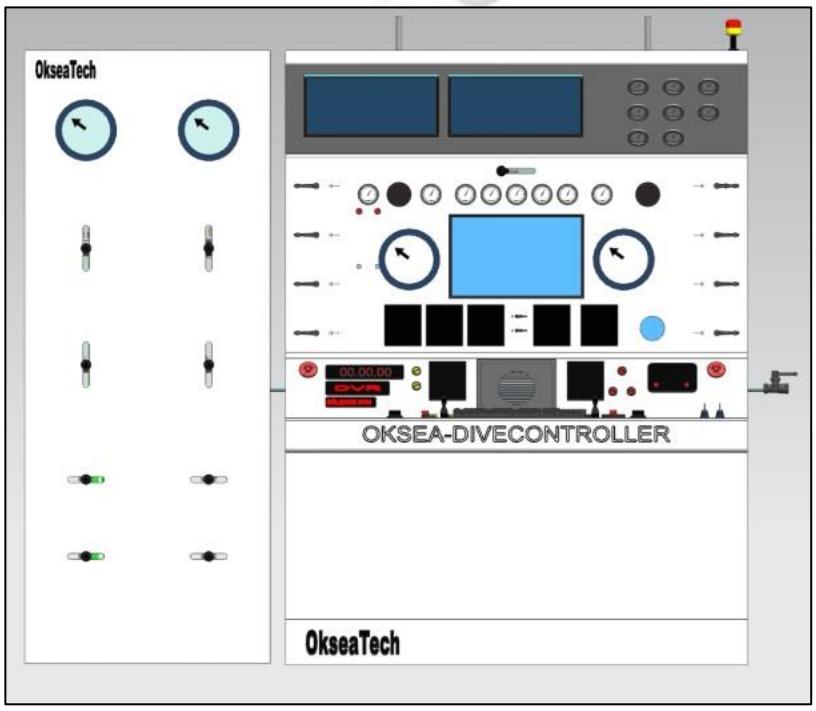

Figure 4 - Sample Project Drawing for Control Station

Figure 5 - Mechanic Control Panel

Figure 6 - Electronic Control Panel

3. BREATHING SYSTEM

Main chamber and ante chamber are equipped with an oxygen BIBS for:

- HBO treatment
- Improvement and acceleration of decompression

In both main and ante chamber there are couplings to connect Scott serial breathing masks) provided for each seat.

- The breathing units can be supplied with one of the following gases:
- Pure oxygen
- Air

For safety reasons the used gas is drawn off the chamber directly

Figure 7 - Oxygen BIBS System

4. COMMUNICATION

There are two possibilities of audible communication between control station and chamber rooms:

- Communication in Push-to-talk-mode, loudspeaker, and Microphone in one unit in the chamber, control station can hear the chamber compartments constantly (priority control).
- Sound powered telephone system with howler generator
- Emergency signal system.

5. ILLUMINATION

The chamber rooms are illuminated by **OKSEA-LUX** special, high-effective cold-light which are mounted to the chamber ridge

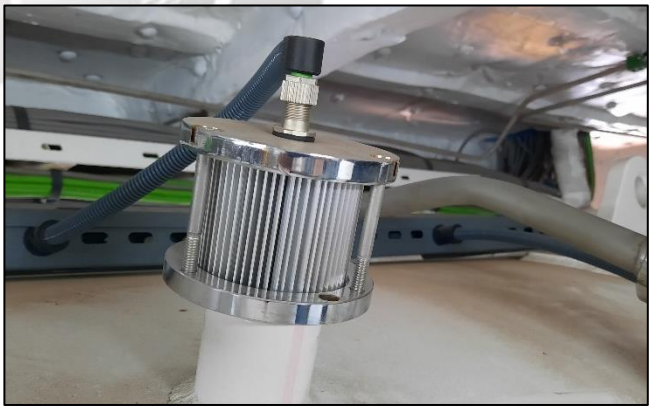

Figure 8 - OKSEA-LUX Cold-light

Figure 9 - OKSEA-LUX Cold-lights (inside view)

6. SUPERVISION

- Direct observation of the MC occupants is achieved by 4 windows with a clear width of 300 mm.
- 2 windows in the cylinder shell with a clear width of 300 mm allows the observation of the AC occupants.
- For TV supervision the MC is equipped with 4 CCD colour TV cameras installed outside of the chamber.

7. MEDICAL LOCK

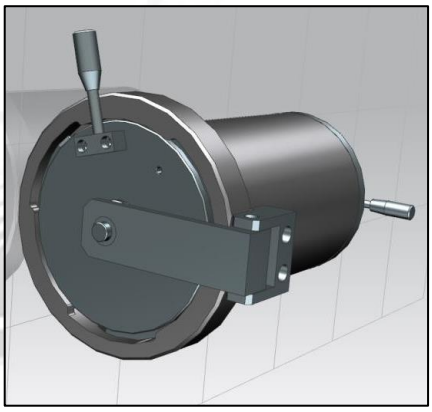

Figure 10 - Medical Lock Drawing

During long pressure chamber exposures, it is necessary to supply the chamber occupanits with medicaments, food, drinks, and other things. This can be done via the suppiy lock welded into the chamber wall,

- The lock has an inner diameter of 250 mm, an inner length of 300 mm and a volume of approximately 12l.
- The lock can be operated with one hand only, the other hand is free for the

locking of items.

- From the inside the lock is closed with a pressure-sealed lid and kept in closed position by a spring bolt.
- In case of pressure release in the main chamber the supply lock is thereby ventilated automatically.
- Pressure compensation with the chamber is affected via a twist handle which is used as ventilation valve at the same time.
- After pressure compensation the inner fid can be opened comfortably.
- A mechanical safety device (safety rod) ensures that the outer door cannot be opened at this stage. If the inner door is closed the outer valve can be opened. If the lock is at zero pressure, the outer bayonet door can be opened.
- The pressure of the lock is indicated by the outer ventilation valve-button.

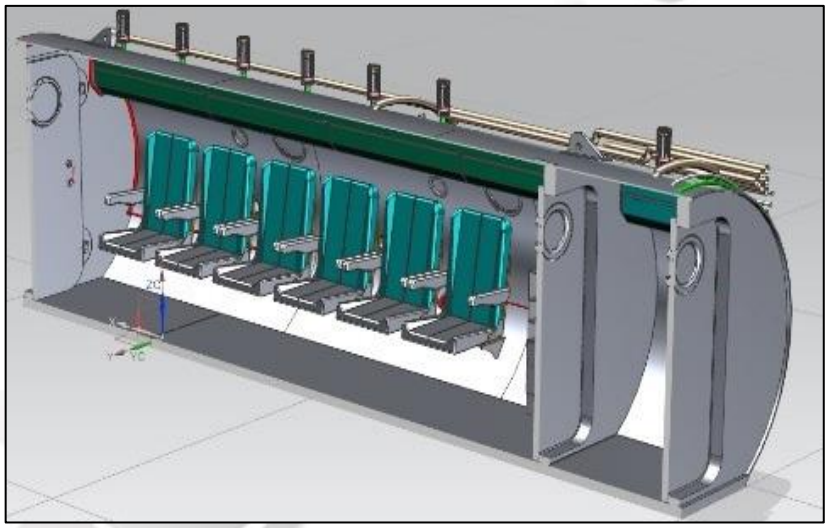

Figure 11 - Project Drawing

8. SAFETY INSTALLATIONS

As soon as the maximum working pressure is exceeded the safety valve reacts. Even if the air supply is further opened the pressure increases up to max. 10 % above the working pressure.

- The safety valves are installed at the chamber wall.
- It is equipped with an additional shut-off ball valve mounted between safety valve and pressure vessel.

- This ball valve can be manually closed in order to prevent the chamber from surfacing out of control on condition that the safety valve stays open for any reason.
- Fireproofness is ensured by the installed spray-fog fire suppression system, and the hardly inflammable interior fittings and colour coating

9. FIRE SUSPENSION SYSTEM

Fire outbreaks in pressure chambers in relation to freguency of missions occurred relatively seldom.

But once broken out fires astonishiy always rapidly evolved with fatal effects on chamber occupanis in cases were the content of oxygen exceeded 21%.

Fires in hyperbaric atmosphere are difficult to control:

Due to –

- Increased oxygen partial pressure in the chamber atmosphere
- High temperatures and thereon resulting pressure increase
- Short period for irreversible damages to occur
- Limited effectiveness of applicable fire extinguishing means

According to the requirements of the customer and safety regulations (NFPA 99), a SPRAY-FOG-SYSTEM is installed in the chamber system as fire protection.

- Each chamber compartment inlet pipe is equipped with a solenoid valve.
- The solenoid valve can be opened in the case of fire with an operating switch at the corresponding chamber compartment and / or control station.
- The switch catches: the system is turned off by rotating the button.
- The two bypass ball valves (sealed in closed position) can be opened manually in case of fire and malfunction of the solenoid valves.
- The chamber is equipped with 6 UV-(Ultra-violet) detectors (1 Smoke, 1 Flame in MCs and AC) which will release an accoustic and visual alarm (alarm lamps control station) on the control station in case of sensing an open flame or smoke
- The water reserve is stored in two 1m3 water tank positioned near the pressure chamber and equipped with valves for water filling / water outlet and pressure supply. It is designed for a maximum working pressure of 28 bar and is equipped with a safety valve.
- A safety device (swimming ball) in the tank closes the water outlet pipe when

the tank is empty, so that no air comes into the chamber through the fire fighting water pipe.

10. OKSEA-DECO AUTOMATION

Oksea-Deco automation system, produced by hyperbaric oxygen therapy room at the OkseaTech programmed to communicate with the operator's industrial control units, entering treatment system profiles and limit values, treatment monitoring and recording, copying, or printing of the records examined, limit values and control alarm and record consisting of the designed computer program.

Oksea-Deco automation software:

- Create a new profile for the treatment
- Assign patients to a generated profile,
- During treatment, you can follow the momentary values online
- System can interfere with treatment, based on manual check-out
- Save the values that occur during treatment,
- Change the values for the limit of the system,
- Non-visible alarms that occur in cases where the limit,
- You can review the data again, copy the recorded treatment or you can print.

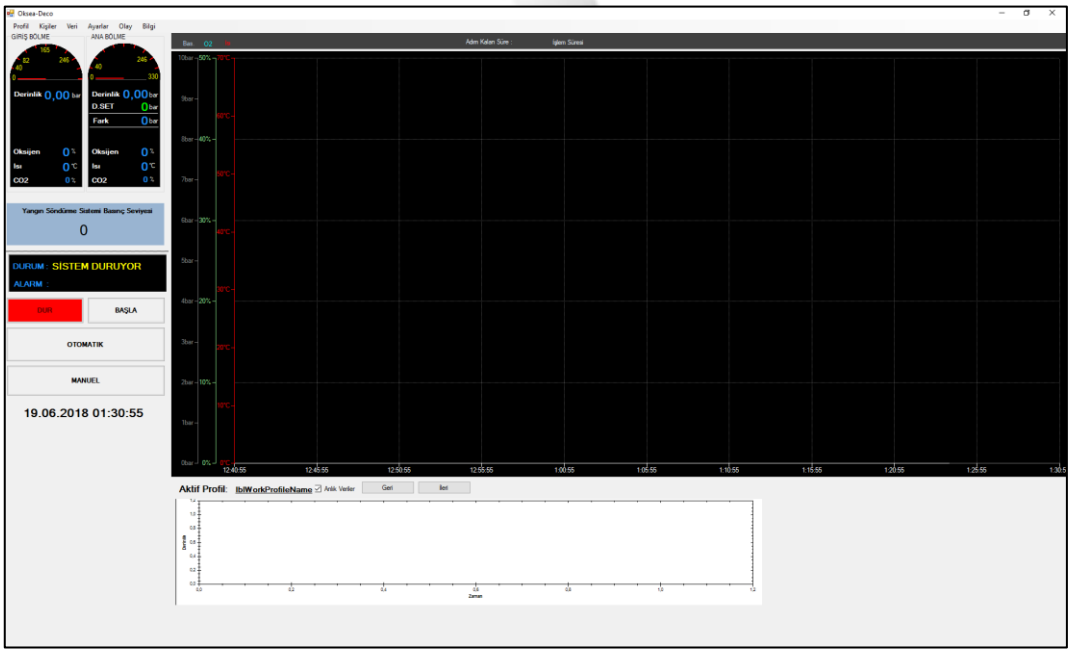

Figure 12 - Oksea-Deco automation software

11. REFERENCES

HBOT 2200/5,5

ALBANIA	AY-MED Hyperbaric Treatment Center, TIRANA 12+2, Installation and Maintenance
TAIWAN	SayHi Tec Hyperbaric Treatment Center, 12+2 Decomp. Chamber, Installation and Maintenance
İSTANBUL	AYMED Hyperbaric Treatment Center, Installation and Maintenance
İSTANBUL	Istanbul Hyperbaric Treatment Center, Installation and Maintenance
İSTANBUL	Hisar Hospital Installation and Maintenance
ANKARA	Fora Hyperbaric Treatment Center, Installation and Maintenance
KKTC	Burhan Nalbantoğlu Public Hospital, Installation and Maintenance
KOCAELİ	Gölcük Submarine Training Center Command, Installation and Maintenance

MILITARY PROJECTS

TCG ALEMDAR	Mixed Gas Diving Systems and 18+4 x 2 Diver Decomp. Chamber
TCG IŞIN	Mixed Gas Diving Systems and 7+2 Diver Decomp. Chamber
TCG AKIN	Mixed Gas Diving Systems and 7+2 Diver Decomp. Chamber
DALGIÇ-1 (DSV)	Mixed Gas Diving Systems and 7+2 Diver Decomp. Chamber
DALGIÇ-2 (DSV)	Mixed Gas Diving Systems and 7+2 Diver Decomp. Chamber

REVISION

GATA HAYDARPAŞA HOSPITAL	Galeazzi Chamber Overhaul and Revision

CONTAINERIZED DDC

STFA Deniz İnşaat	2 x Containerized Diver Decomp. Chamber 4+2, 10 bar
İLK Denizcilik	Containerized Diver Decomp. Chamber 4+2, 10 bar
ALESTA Denizcilik	Containerized Diver Decomp. Chamber 4+2, 10 bar
OPİ-MARİNE	Containerized Diver Decomp. Chamber 4+2, 10 bar