Mobile Drinking Water Treatment Systems for Emergency and Disaster Rescue Operations

Austrian Showcase Hanoi, Socialist Republic of Vietnam

Presented by
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Managing Director
OVIVO Austria GmbH
Hydrotechnik GmbH

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OVIVO Water Group

Ovivo, a “GLV” company – a leader in advanced technological solutions used in water purification, filtration, mechanical/chemical/biological treatment, and recycling, serving the Industrial (power, petrochemical, refining, pulp & paper), Municipal, Food & Beverage, as well as many other markets.

Ovivo consists of the merger of Eimco Water Technologies, Brackett Green, Enviroquip and Christ Water Technology under one name to create a global force in clean water production, treatment and re-use.

Ovivo heritage includes 100+ years of experience in cooling water intake screening and advanced condenser protection with the superior line of Brackett Green products.

Ovivo is able to supply the full compliment of products, serving the complete plant’s Water and Wastewater flow sheet needs.
Ovivo at a glance

- The only global business dedicated solely to water.
- 1500 employees in 5 continents and 21 countries.
- Water expertise in 17 industries.
- Supported through 15 Global Centers of Excellence.
Ovivo Austria

History

- Founded > 55 yrs ago in 1956 as private co.
- Taken over by BWT in 1993
- ISO certified since 1999
- Demerged from BWT within CHRIST in 2005
- Located in Ovivo Industrial group
- Specialised in industrial process and waste water systems in customised flow sheet solutions
- Participating in GCoE Energy
- Leading GCoE Deployable
## Scope of Services

<table>
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<th>Design</th>
<th>Construction</th>
<th>Operation</th>
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<tr>
<td>Conceptual Design</td>
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<td>Preliminary Design</td>
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<td>Final/Detailed Design</td>
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<td>Shop Drawing</td>
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<td>Manufacturing/Procurement</td>
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<td>Construction Management</td>
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<tr>
<td>Supervision/Installation</td>
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<td>Commissioning/Training</td>
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<tr>
<td>Maintenance/Service</td>
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**Quality Assurance/Cost Control/Scheduling**

**Project Management**
Water Treatment Plants were outside Europe installed in Abu Dhabi, Azerbeidschan, Syria, Iraq, Iran, Lebanon, Oman, Taiwan, Thailand, Cyprus.

Customers are Siemens, Alstom, Vattenfall, ATP, Technip, Voest, VATech Hydro, Lurgi, Mondi a.o. paper ind., breweries, municipal customers, etc.
We apply a wide range of processes in water treatment, i.e.

- Accelators
- Contact sludge decarbonisation
- Open gravel and multilayer filtration
- Pressure gravel and multilayer filtration
- Precoat cartridge filtration
- Activated carbon filtration
- Microfiltration and Ultrafiltration
- Nanofiltration and Reverse osmosis
- Electro de-ionisation
- Ion exchange (Upcore, Liftbed-, Econex-, Rinsebed,
  pressure water and Multistep technique)
- Membrane de-aerators
- Wastewater treatment by use of heavy-metal precipitation
- Wastewater treatment by use of heavy-metal precipitation
  selective ion exchange
Strengths & Achievements

- Very good Reputation for quality, reliability of technical solutions and customised systems
- Strong installed plant base
- Strong Technology base:
  - River Water Treatment, Decarbonisation, Filtration, MF, UF
  - Demineralisation by IEX, RO and EDI, Dosing systems
  - Flue Gas Wastewater Treatment (FGD)
- Good Market Knowledge in CEE
  - Energy
  - Industrial Process and Wastewater
  - Food & Beverage
- Strong local Service Organisation
Combination of UF + RO + MB
2 x 16 m³/h, CCPP Ankara, Turkey
Containerized 2 staged SWRO Plant
2 x 70 m³/h, Sohar Oman
OVIVO FABRICATION

FABRICATION AND ASSEMBLY

Assembly and workshop 1350 m²

Store
750 m² indoor & 1800 m² outdoor

Steel fabrication
at HINKE Tamasi
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In the period of 1990 to 2008 the global death toll due to climat hazards was 600.000 people. The economic damage amounts to 1,7 Billion US Dollar.

Socialist Republic of Vietnam is 4th most affected on risk scale.
In the top 10 most affected countries there are exclusively countries from SE Asia and Central America.
GLOBAL TRENDS

Trends in number of reported events

Much of the increase in the number of hazardous events reported is probably due to significant improvements in information access and also to population growth, but the number of floods and cyclones being reported is still rising compared to earthquakes. How, we must ask, is global warming affecting the frequency of natural hazards?

All disasters include: drought, earthquake, extreme temperatures, famine, flood, insect infestation, slides, volcanic eruption, wave / surge, wild fires, wind storm.
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Countries are annually hit by various disasters

In practice aid is late, often due to insufficient tools and facilities

Disaster handling to be simultaneously, systematic and fast to minimize losses to community and assets

Drinking water fundamental for human being, to be provided immediately to avoid wide spread disease (could reach epidemic scale if not attended)

Important for recovery and mental rehabilitation to victims

In practice water supply must be handled conceptually and professional; Armed Forces or other Security Forces / Institutions are the most professional Department to implement & operate such project

Recent disasters globally underline shortcomings in local facilities and management while magnitude and frequency of disasters seems to increase
GENERAL PROJECT TARGETS

PROJECT IS INTENDED TO

- Solve water supply problems for disaster victims with clear or drinking water rapidly, avoid dehydration and improve sanitation; most affected are poor, woman and children
- Reduce people sufferings from water born diseases in disaster
- Contain the risk of epidemic spread of disease amongst disaster victims; especially in camps and villages with high pop. density
- Produce clear water to WHO drinking water standard
- Use containerized WTP systems of reliable, robust and mobile concept for easy and flexible transportation with consideration of local available facilities (land, sea, air)
- Design WTP systems for usage in mixed condition of raw water from different sources

AND

- System should be simple and flexible
- Operation and maintenance should be easy and low in cost to ensure longterm sustainability
  Technical assistance with adequate training & capacity building shall be provided
In practice 2 levels in emergency.

Initial first project phase considers EMERGENCY only.

- **LEVEL 1 – EMERGENCY**
  
  In condition shortly after disaster and where drinking water is urgently needed to save lives and to provide basic quantity of 15 ltrs / person / day in critical condition (use EMU 025 and EMU 050 with or w/o supporting unit)

- **LEVEL 2 – RECOVERY (after Level 1)**
  
  In condition to recover after disaster before drinking water is reinstated to provide basic drinking water and sanitation water supply for medium term local water works support (use EMU 250 with or w/o supporting unit in case of longer duration of emergency)
Level 1 – EMERGENCY
HIGH IMPORTANCE

- VOLCANIC ERUPTION
- EARTH QUAKE
- TSUNAMI
- HURRICANE
- FLOOD
- INDUSTRIAL ACCIDENT
Level 2 – RECOVERY
MEDIUM IMPORTANCE

AND FOLLOWING RECOVERY FROM LEVEL 1 DISASTERS
## SHORT-TERM EFFECTS OF MAJOR NATURAL DISASTER

<table>
<thead>
<tr>
<th>Effect</th>
<th>Earthquakes</th>
<th>High Winds (without floodings)</th>
<th>Tidal waves/flash flood</th>
<th>Floods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casualties</td>
<td>Many</td>
<td>Few</td>
<td>Many</td>
<td>Few</td>
</tr>
<tr>
<td>Severe injuries requiring extensive care</td>
<td>Overwhelming</td>
<td>Moderate</td>
<td>Few</td>
<td>Few</td>
</tr>
<tr>
<td>Increased risk of communicable diseases</td>
<td>Potential risk following all major disasters (Probability rising with overcrowding and deteriorating sanitation)</td>
<td>Potable Water constitutes key element in communicable disease control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food scarcity</td>
<td>Rare</td>
<td>Rare</td>
<td>Common</td>
<td>Common</td>
</tr>
<tr>
<td>(may occur due to factors other than food shortage)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major population movements</td>
<td>Rare</td>
<td>Rare</td>
<td>Common</td>
<td>Common</td>
</tr>
<tr>
<td>(may occur in heavily damaged urban areas)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
Figure 1. Hierarchy of water requirements
(after Abraham Maslow's (1908-1970) hierarchy of needs)
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SCOPE OF PROJECT

- **FEASIBILITY STUDY (REVIEW OF COUNTRY DATA)**
  Update with local progress in planning for emergency relieve program and emergency water supply, disaster handling in institutional and operational aspect, selection of operational base location and catchment areas

- **PROJECT MANAGEMENT (OVIVO + Client)**
  All project management until implementation and completion

- **DESIGN OF EMU SYSTEM (OVIVO + Client)**
  Arrangement of plants and technical design, planning of usage, planning for transportation facilities, local human resources provision and extended O&M training to staff at base location(s)

- **ARRANGEMENT OF BASE FACILITIES (Client)**
  Location preparation, transportation, handling and storage / maintenance facilities
SCOPE OF SUPPLY & SERVICE

- **FABRICATION & SUPPLY (OVIVO)**
  - x nos. 2,5 m³/h op. modules type EMU 025 (advanced design with BW salinity removal)
  - x nos. 5,0 m³/h op. modules type EMU 050 (advanced design with BW salinity removal)
  - x nos. 5,0 m³/h op. modules type EMU 050S (advanced design with SW salinity removal)
  - x nos. Supporting equipment modules with genset, tools, mini lab for field operations
    - Heavy duty flexible piping and inflatable tanks
  - 1 Lot Spare parts for field operation for each unit, spare parts at base for scheduled maintenance, special tools for base workshops, spare membranes, OP consumables

- **PROJECT SUPERVISION (OVIVO + Client)**

- **PROJECT TRAINING (OVIVO + Client)**
  - Foreign training for selected key staff prior to equipment dispatch (train the trainers)
  - Local training in Vietnam at base location and under field conditions

- **OPERATION & MAINTENANCE (Client)**
  - Technical assistance for operational and maintenance & support for 12 months
SUCCESSFUL SUPPLIES

Started in 80’s with supplies to Iraq
SUPPLIED PROJECTS

100 UNITS RIVERWATER TREATMENT PLANTS FOR RURAL EMERGENCY WATER SUPPLY IN EGYPT

HydroCompact HC

2 UNITS GROUND WATER TREATMENT PLANTS FOR RURAL EMERGENCY WATER SUPPLY IN EGYPT

Aqua Compact

2 UNITS GROUND WATER TREATMENT PLANTS FOR RURAL EMERGENCY WATER SUPPLY IN EGYPT

CHRIST

EMERGENCY UNIT FOR DUTCH CIVIL DEFENCE

HydroCompact HCRO

33 UNITS BRACKISH WATER DESALINATION PLANTS FOR EMERGENCY WATER SUPPLY IN KUWAIT
EMU BASIC UNIT DESIGN

REQUIREMENTS

- Rapid erection and start-up
- Easy operation and maintenance
- Reliability under heavy duty field conditions
- Designed for easy and safe moving, lifting (particularly airlifting) and handling
- Minimum chemical consumption & consumables
- Independent operation without local power supplies
- Save storage but quick activation for emergency usage
- Allowing operations in parallel through modular arrangement with flexible interconnections for reliable field usage
- Using standard proven equipment and components, standardized for all units and interchangeable for effective maintenance.
- Use advantaged technology to ensure good quality product water as of WHO recommendations and good microbiological standards
EMU TECHNOLOGY USE

- Safe separation of bacteria & virus needed (elimination of water born bacteria)
- Membrane separation required (see chart)
- Adequate pre-treatment of raw water needed to ensure good operation of membrane separation
- MF (micro filtration) or UF (ultra filtration) selected process
- Reverse Osmosis for salinity removal for brackish (saline) water resource up to 5,000 mg/l as optional operation facility if required due to saline raw water resource; design upgrade to seawater salinity removal available
- UV disinfection of treated (desalinated) water
- Disinfectant may be added after membrane separation to guarantee depot effect for transport / storage of produced drinking water
PARTICLE SEPERATION

- Dissolved salts
- Colloids
- Org. macro. molecules
- Suspended solids

- Viruses
- Bacteria
- Parasites

- polio virus
- smallest micro-organism
- Crypto-sporidium
- hair

- Reverse Osmosis
- Ultrafiltration
- Microfiltration
- Conventional Filtration
TECHNOLOGY APPLICATION

MEMBRANE FILTRATION & REVERSE OSMOSIS

+ NOT Sensitive to changing rawwater condition
+ FULL removal of oil, organics, pesticides
+ SALINITY removal up to 5,000 ppm
+ GOOD process control
+ GOOD established technology
+ REDUCED chemical demand
+ UV disinfection
+ Setup and startup in FEW HOURS
+ SUITABLE for longterm storage
+ Conservation of membranes needed

Hydrocompact EMU 025 & 050
Mobile Emergency WT Unit
PROCESS UNITS

MAIN PROCESS UNITS

Raw water intake unit
Raw water pump with screen filter
flexible hose connection & power cabling to WTP
+
ULTRAFILTRATION UNIT (see pictures)
Permeate tank

REVERSE OSMOSIS UNIT (see pictures)
Chemical dosing stations
Potable water tank & distribution pump
Electrical / control system and instrumentation
+
Loose items & accessories
(spare parts, special tools, laboratory skids, connection kits, distribution skid, gen set, etc.)
EMU FIELD APPLICATION

20’ ISO Container **Operation Module**
EMU FIELD APPLICATION

20’ ISO Container **Operation Module**  LEFT SIDE VIEW
EMU FIELD APPLICATION

20’ ISO Container **Operation Module**
EMU FIELD APPLICATION

20` ISO Container **Operation Module**

TOP VIEW
EMU FIELD APPLICATION

20` ISO Container **Auxillary Module**

**LEFT SIDE VIEW**
EMU FIELD APPLICATION

20` ISO Container **Auxillary Module**

RIGHT SIDE VIEW
EMU FIELD APPLICATION

20` ISO Container **Auxillary Module**

TOP VIEW
EMU FIELD APPLICATION

EMU 025 from store
BY TRUCK / AIR LIFT

RIVER

Raw Water Intake

FLOOD

with Task Force Team
with or w/o Supporting Module(s)

Potable Water Supply
**EMU FIELD APPLICATION**

**SUPPORTING MODULE FOR STAND ALONE OPERATION**

- Generator set (integrated into Supporting Module)
- Inflatable tanks (5 units per EMU 025 & 050 Supporting Module)
- Temporary hose connections and fittings
- Mini field test laboratory set
- Accessories, spare parts, tools
EMU FIELD INFRASTRUCTURE
## FIELD POWER SUPPLY

### ENGINE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer / Model</td>
<td>JOHN DEERE 3029TF120 4-stroke, Turbo</td>
</tr>
<tr>
<td>Cylinder Arrangement</td>
<td>L</td>
</tr>
<tr>
<td>Displacement</td>
<td>2.6L [1706973.3Gal]</td>
</tr>
<tr>
<td>Bore and Stroke</td>
<td>106mm [4.17322,2in.] X 110mm [43070.0in.]</td>
</tr>
<tr>
<td>Compression ratio</td>
<td>17:1</td>
</tr>
<tr>
<td>Rated RPM</td>
<td>1500 Rpm</td>
</tr>
<tr>
<td>Piston Speed</td>
<td>5.85m/s [1864440.6ft/s]</td>
</tr>
<tr>
<td>Max. stand by Power at rated RPM</td>
<td>43 kW [6300kW]</td>
</tr>
<tr>
<td>Frequency regulation, steady state</td>
<td>+/- 2.5%</td>
</tr>
<tr>
<td>BMEP</td>
<td>11.5 bar [16635psi]</td>
</tr>
<tr>
<td>Governor type</td>
<td>MECA</td>
</tr>
</tbody>
</table>

### EXHAUST SYSTEM

- Exhaust gas flow: 105.6GPM [39377.55692m³/min]
- Exhaust temperature: 540°C [992°F]
- Max back pressure: 625mm CE [2465525 in. W/G]
- Exhaust gas flow: 105.6GPM [39377.55692m³/min]

### FUEL SYSTEM

- Total oil capacity, liters: 5L [15.872gal]
- Oil Pressure low side: 16bar [232.0psi]
- Oil Pressure high side: 64bar [925.5psi]
- Oil consumption 100% load: 0.0056L [0.00909090909090909gal/h]
- Oil consumption 100% load: 0.0056L [0.00909090909090909gal/h]
- Oil capacity: 5.3L [140026.0gal]

### OIL SYSTEM

- Oil pressure: 64bar [925.5psi]
- Oil consumption: 0.0056L [0.00909090909090909gal/h]
- Oil capacity: 5.3L [140026.0gal]

### THERMAL BALANCE

- Heat rejection to exhaust: 38kW [160088BTU/tn]
- Radiated heat to ambient: 5kW [284398BTU/tn]
- Heat rejection to coolant: 28kW [1562020BTU/tn]

### AIR INTAKE

- Max. intake restriction: 300mm CE [1181100in. W/G]
- Engine air flow: 37.6L/s [0.010152204cfm]

### COOLANT SYSTEM

- Radiator & engine capacity: 16.1L [425302.2gal]
- Max water temperature: 105°C [221°F]
- Outlet water temperature: 50°C [122°F]
- Fan power: 1.5 kW
- Fan air flow w/o restriction: 1.8m³/s [63.115036609cfm]

### EMISSIONS LEVEL

- PM: 90 mg/m³
- CO: 190 mg/m³
- NOx: 300 mg/m³
- HC: 190 mg/m³
AQA: Set it up to your requirements

VWV photometers are distinguished for their instruments supporting Analytical Quality Assurance (AQA). User-friendly operation for checking the instrument and test kits for single users are supported as well as an extensive user administration for a multiple user environment. The AQA can be switched-on or switched-off optionally. In addition, ISO certificates assure quality and add to the reliability of measuring results.

Multi-level AQA functions

A wide range of testing equipment and AQA functions for instrument and reagents is available. The AQA functions can be accessed easily via function keys “F1-F4” in context with the performed task.

- Calibration interval for instrument and test kits (time or number of measurements)
- PhotoCheck menu-guided check of zero, barcode reading unit, checking three wave lengths at 4 measuring points ( benches)
- CEN/ENV standards
- Default values for standard parameters including tolerances for standard solutions
- MethodCheck with spiking/dilution procedures including calculation of recovery rates
- User administration providing administrator, user and guest profiles

Routine measurement at its best!

- Cell recognition: Open lid, insert cuvette, read result. The photoCheck2000 models recognize the cuvette size automatically, no matter whether round: 16, 20 or 25 mm.
- Barcode recognition for round and rectangular cells: For all test kits with barcodes, the relevant default values are set automatically via stored method data for round but also rectangular cells 16, 20, 25 mm.
- For round cells via barcode: For rectangular cells via the AutoDiluter coming with the test kits.

Systematic Analysis

A standard task in water analysis and service laboratories is the concentration measurement of various parameters. With the well proven combination of rectangular and round cell compartment with barcode recognition, the photoCheck2000 series is perfectly equipped.

More than 150 methods for commercial test kits with automatic setting of all relevant test characteristics including reagent blank via barcode. Updates are always available via Internet.

Direct methods, such as the measurement of SAC at 254 nm – an indicator for organic load.

Test user-defined methods. Calibration curves can be assessed or measured.

Advanced optical elimination of cuvette failures.

Drains for optimal protection against reagent incidents – a must for professional laboratories.
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TRAINING PROGRAM

STAGES OF TRAINING

Phase 1  **Overseas training in Austria** for selected Client personnel designated for the project as trainers to support local training

Contains theoretical and practical training on plant, operation & maintenance, requirements for setting up of local support facilities, course / technical assistance proposed in cooperation with AFDRU

Duration planned for 2 weeks

Phase 2  **Local training in designated Country** at designated Operational Base of plants

Contains theoretical and practical training on plant, operational availability, scheduled and after mission maintenance, preservation and preparation for field use, review of local support facilities and logistics, etc.

Duration planned for 6 - 8 weeks

Phase 3  **Local training in designated Country** at designated Operational Base of plants and in simulated field missions

Contains practical training on plant setting up in the field, startup and operation, maintenance, quality assurance, decommissioning, return to base, etc.

Duration planned for 2 x 2 weeks
HEAVY DUTY CONCEPT

HIGH QUALITY FOR SUSTAINABILITY

- Fully containerized modular system for stand alone operations
- Membrane separation versus conventional process design
- Use of high end industrial components from int´l suppliers
- Interchangeability of consumable items from int´l suppliers
- High grade materials used in all plant
- Stainless steel frames and high pressure piping (Duplex material for seawater RO plant for best corrosion protection)
- Heavy duty design for shock resistance in transport and handling
- Fabrication to ISO 9000 quality standards
- Equipped with field lab for fully stand alone quality control in the field
- Equipped with power generator for fully stand alone operation in the field
- Equipped with various flexible water connection, inflatable tanks and all loose items for fully stand alone rawwater intake and distribution in the field
LOGISTIC SUPPORT

LOCAL LOGISTIC REQUIREMENTS BY CLIENT

STRUCTURE

the operative and command structure to use the equipment appropriately under an institutional frame work for disaster relieve operations under civilian humanitarian missions

BASE

to store, keep ready, maintain and preserve equipment for field missions

Needs open and covered storage area for EMU units,
covered storage are for spare parts and consumables,
workshop facilities for scheduled and reactive maintenance,
bay for testing and preservation
LOGISTIC SUPPORT

LOCAL LOGISTIC REQUIREMENTS BY CLIENT

STAFF

to support equipment regular requirements at the Base and in the field
Needs supervisory staff (preferable experts in water treatment, mechanical / electrical engineering)
Needs field operating and maintenance staff designated to accompany EMU units in field missions

TRANSPORT

availability of transportation facilities to manipulate equipment at Base and to dispatch EMU units to the field for mission and return equipment from field after mission accomplished

Transport weight per 20 feet container unit approx. 10 tons

Containers to standard ISO dimensions

Road transport by both container trucks or flat board (commercial trucks)
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PRELIMINARY IMPLEMENTATION SCHEDULE

Detailed Design  
Fabrication 1st Lot  
Overseas Training  
Arrival 1st Lot  
Fabrication 2nd Lot  
Local Training @ base and field  
Arrival 2nd Lot  
Implementation and training completed

month 0 – 3  
month 4 – 8  
month 8  
month 10  
month 7 – 10  
month 11 – 12  
month 12  
month 14

and

12 months Technical Assistance for Operation and Maintenance
Other Emergency Project

**Hydrotechnik** supplied 13 saline ground water desalination units of each 1.125 m³/day potable water for strategic locations all over Kuwait in Phase 1 (1988)

Including design and installation

Financed by Kuwait Government

Second phase of 20 units ordered from Kuwait (exile) Government early 1991 prior to liberation with fast track supply and installation right after liberation by US forces.
THANKING YOU - Q & A

Clean Water is Life .................