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RPS DIVISION

U.C.D.®
-
DEGREMONT COMPACT UNIT
-
REGISTERED TRADEMARK

GENERAL PRESENTATION

CONTENTS

1. INTRODUCTION

To serve the drinking water needs of urban centres and small communities, where simplicity of operation is an absolutely essential parameter, our company has developed a range of:

UNITES COMPACTES DEGREMONT – U.C.D.®
(Degrémont Compact Units)

These U.C.D.® are designed for the production of drinking water from non-brackish, chemical pollution-free surface waters or borehole waters. The range is composed of 14 models and covers a wide and ascending range of capacities: from 5 to 720 m^3/h (1.4 to 200 l/s).

These compact plants, based on conventional technologies, are made with robust equipment which is set to a simple design, thus providing a complete treatment of the water. The process includes coagulation, flocculation, settling, sand filtration and disinfection.

The clarified water pumping system delivers a 2 bar pressure after the filters, which may ensure the supply of a clarified water tank if necessary. This pressure may be tailored to suit individual client needs.

The dimensions of these units have been carefully chosen to conform to international quality standards and norms.

The main characteristics of the U.C.D.® are exposed in the table here after :

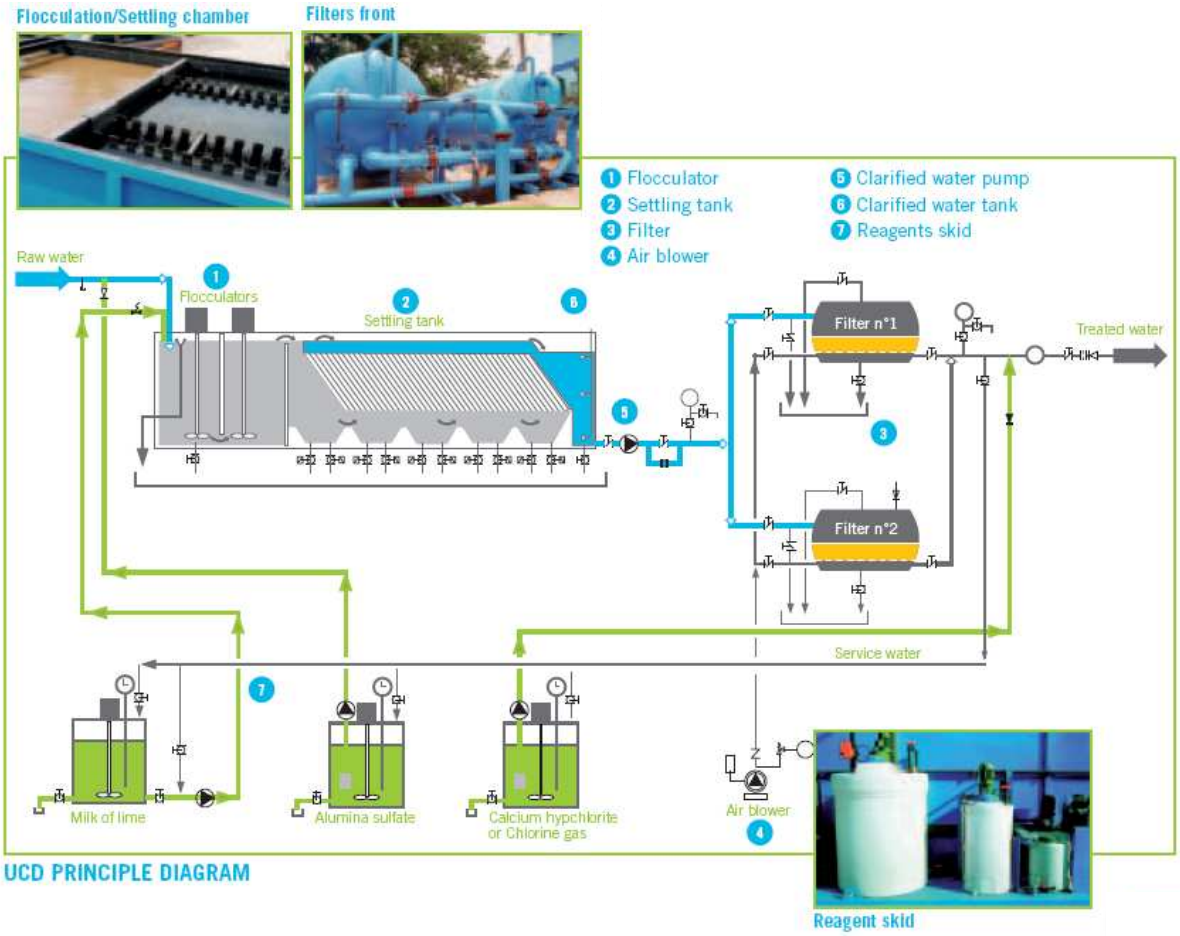
U.C.D. type	Units	5	10	15	20	30	50	80	100	180	200	250	360	540	720
TECHNICAL CHARACTERISTICS															
Daily production (23h/24h)	m³/j	115	230	345	460	690	1150	1840	2300	4140	4600	5750	8280	12420	16560
Instant flow rate	m³/h	5.0	10.0	15.0	20.0	30.0	50.0	80.0	100.0	180.0	200.0	250.0	360.0	540.0	720.0
Instant flow rate	L/s	1.4	2.8	4.2	5.6	8.3	13.9	22.2	27.8	50.0	55.6	69.4	100.0	150.0	200.0
Installed power	kW	5.3	6.2	7.0	8.0	10.3	13.3	18.7	25.9	37.4	45.4	48.9	61.2	80.8	115.3
Power consumption (standard conditions)	kW	3.3	4.1	4.5	5.2	6.4	9.4	13.9	18.4	29.3	33.4	40.0	47.7	70.5	89.9
Available treated water pressure (standard conditions)	bar	2	2	2	2	2	2	2	2	2	2	2	2	2	2

DIMENSION AND WEIGHT															
Quantity of skids	-	1	1	1	1	1	3	3	3	5	5	5	7	10	12
Global dimensions	m x m	5.5 x 2.6	6.2 x 2.6	8.3 x 2.6	9.7 x 2.6	12.2x2.6	9.7 x 5.8	13.4x5.7	13.5x 6.5	22 x6.3	23.3x6.3	26.4 x 6.3	26.2x10.5	40.4x11.5	45.3x12.8
Concrete slab foot print	m²	14.3	16.12	21.6	25.3	31.8	56.3	76.4	87.8	138.6	146.8	166	275	465	580
Total empty weight (including sand)	tonnes	3.5	5.5	7.0	9.9	13.4	24.8	27.7	36	65	73	84	97	135	173

MAIN EQUIPMENT															
Number of flocculators / lamellae settlers	-	1	1	1	1	1	1	1	1	2	2	2	3	-	-
Number of flocculators	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3
Number of lamellae settlers	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3
Number of filters	-	2	2	2	2	2	2	2	2	2	2	2	3	3	3
Type of pressure filters	-	Vertical filters						Horizontal filters							
Reagent/Pump skids	-	-	-	-	-	-	1	1	1	1	1	1	1	-	-
Reagent skids	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Pump skids	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1

2. PROCESS

2.1. TREATMENT STAGES



2.1.1. Coagulation - Flocculation

Water usually contains fine, colloidal suspended matter which must be gathered into a bulky heavier floc to allow settling to take place.

The first treatment stage consists in coagulation and flocculation of Suspended Solids (SS) using reagents chosen according to raw water quality.

The **aluminium sulphate** is generally used as coagulant. This strong acid salt lowers the pH and may render the water agressive. It may then be necessary to adjust the pH using **lime** or

sodium carbonate. **In this case of Iraq_Kurdistan project, the equipment for the pH adjustment is not included in our proposal.**

To ensure this first treatment stage, the U.C.D® is fitted with a flocculator with a slow mixer.

The homogeneous, slow and mechanical mixing improves the arrangement of the "floc" (built-up of the SS thanks to the reagents).

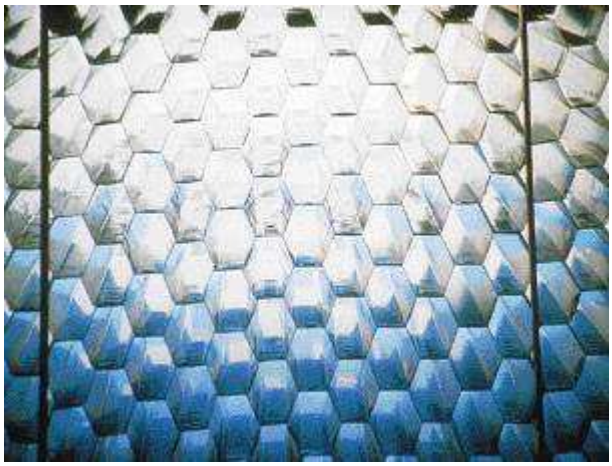
The tank, mixing system and ancillary equipment are designed with the aim of:

- Preventing still zones (e.g. bottom deposits),
- Recovering the dissipated energy as turbulence,
- Preventing preferential paths between tank inlet and outlet.

2.1.2. Settling

Settling allows the separation of the previously formed floc.

The installation of **lamellar modules** (forming hexagonal cells) in the settling tank optimizes the settling surface while reducing the footprint.



The floc forms a sludge that is concentrated in the lower part of the settling tank and is extracted at regular intervals thanks to an automatic valves system.

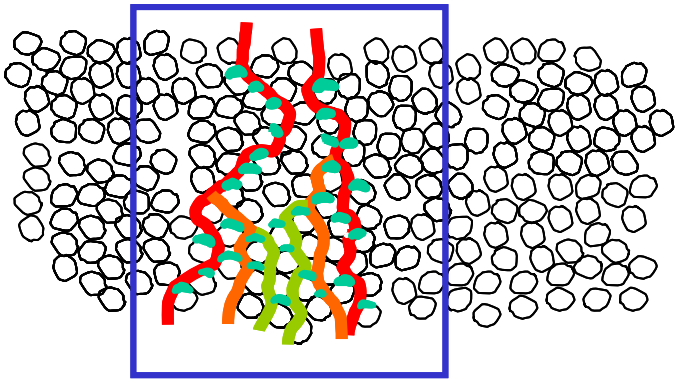
The clarified water above lamellar modules is retrieved in a launder system allowing a downstream flow recovery and distribution (DEGREMONT's patent) on the overall structure.

Then it is transferred in a clarified water reservoir and pumped to the sand filters.

2.1.3. Filtration

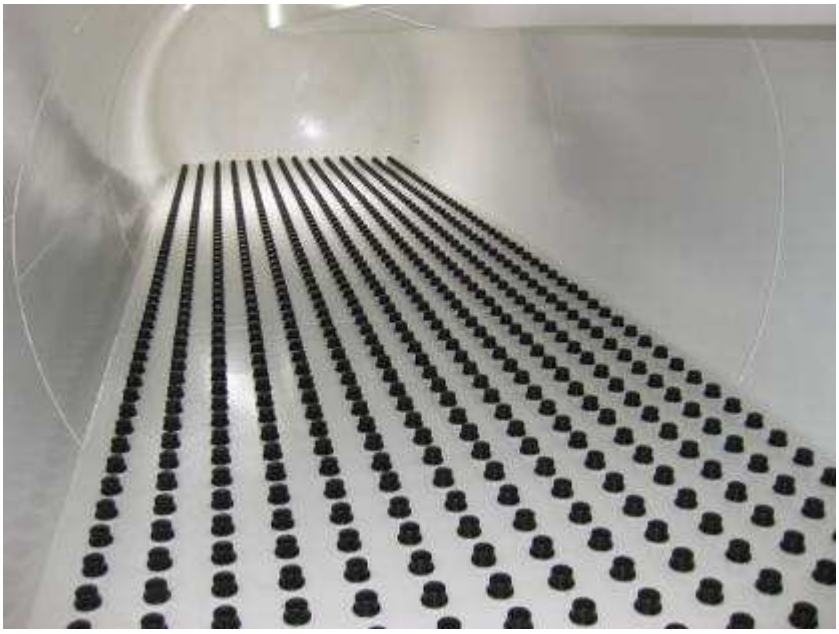
Filtration is designed to remove any suspended solids left in the clarified water.

Suspended solids gradually block the interstices of the filtering media. This phenomenon is known as "filter clogging". As clogging increases, the head loss across the filter also increases.



We have chosen pressure sand filters which fulfilled the most surface raw waters challenge.

These filters contain a single filter media placed on a metal floor fitted with screwed-in nozzles.



The « air and water washing » has been chosen and offers the following advantages:

- Thorough cleaning of the filter media and reduced risks of in-depth clogging,
- Short washing duration (roughly 10 minutes),
- Limited wash water requirements (savings on treated water).

Scour air is supplied by an air blower integrated in the unit, backwash water is supplied by the clarified water pump: water treated on one filter is used to backwash the second one.

As a consequence, it is not necessary to install neither a backwash tank (reduction of civil works costs) nor a backwash pump.

The filter outlet pressure, approx. 2 bars, allows the direct feeding of a reservoir.

2.1.4. Disinfection

Disinfection allows the removal of harmful micro-organisms.

All water whether or not it has undergone prior treatment, is contamined by microbes detrimental to health.

It is necessary to disinfect the water entering the distribution network.

Depending on its availability, the disinfection agent will be :

- Calcium or sodium hypochlorite,
- Chlorine gas (optional)

The dosing is interlocked to treated water flow.

2.1.5. Metering

A direct-reading instantaneous flow measure is provided to check the correct running of the installation (with analog converter).

2.2. OPERATION

2.2.1. Semi-automatic operation (basic UCD)

The standard installation is of the semi-automatic type:

- Automatic sludge draw-off,
- Filters washing sequences manually operated,
- Chemicals dosing adjustment being manual,

The unit starts up automatically upon a signal (Customer's scope) delivered to electrical cabinet that sets in case of pressure failure in filtered water delivery piping or water shortage in the treated water reservoir (Customer's scope).

The clarified water pump(s) starts.

"Raw water supply" (Customer's scope) is interlocked to:

- Medium level in the clarified water tank(s), which delivers a signal to the terminals of the raw water electrical cabinet: raw water admission,
- High level in the clarified water tank(s), which delivers a signal to the terminals of the raw water electrical cabinet: raw water shut-off,

Disinfectant, aluminium sulphate and lime dosing pumps running are initiated by the starting of the clarified water pump.

During long shut-down periods, the lime piping and pump(s) are flushed manually using clean water.

A lack of disinfection causes the installation to stop automatically and sets off an alarm signal.

The electric stirrers in the hypochlorite and aluminium sulphate preparation unit are started manually and will operate for approximately ten minutes until the correct dilution is obtained.

The stirrer in the lime preparation unit works continuously to avoid deposits in the tank.

Low level contacts in the disinfectant and chemical tanks control the running of the stirrers and pumps.

The clarifier(s) sludge draw-off is automated by electrical valves initiated by an adjustable rate-duration device.

The head loss is controlled by checking differential pressure measurement of pressure manometers located on the inlet and the outlet of the filters. When the head loss across the filter battery reaches **0.25 bars**, filters washing sequences must be launched by the operator according to the DEGREMONT procedure.

Each filter washing is carried out by filtered water returned from the filter(s) being still in operation and by injection of blown air.

The clarified water pump can be started, except in case of low level in the clarified water storage tank.

The metering pumps can be started, except in case of low level in the corresponding storage tank.

2.2.1. Automatic operation (optional)

In this version, filters wahing sequences start and carry out automatically with the high pressure detection.

The head loss is controlled by checking differential pressure measurement of pressure manometers located on the inlet and the outlet of the filters. When the head loss across the filter battery reaches **0.25 bars**, filters washing sequences are launched automatically (all filters will be washed in succession). This sequence can also be launched thanks to a clock.

The electro-mechanical equipment can be controlled by an operator in "manual" mode, for test procedures for example; for this, the selector switches are placed in "Manual" position.

3. PERFORMANCE LEVELS

3.1. CHARACTERISTICS OF THE WATER TO BE TREATED

The plant is designed for non-brackish, chemical pollution-free surface water and bore hole water, having a SS* less than or equal to 500 mg/l.

The plant can treat raw water with an SS content higher than 500 mg/l but with a reduced throughput.

If the suspended solids (SS) in raw water content are greater than 2000 mg/l, it is advisable to stop production to avoid the clogging of the installation.

A water analysis is requested in order to check its treatability.

3.2. CHARACTERISTICS OF THE TREATED WATER

The produced water is a drinking water in accordance with the WHO directives for the quality of drinking water.

Superior quality guarantees may be given after a study of raw water analysis.

4. ADVANTAGES

4.1. FLEXIBLE OPERATION

These plants may be operated intermittently. They are designed to start or stop automatically according to water demand.

There is an automatic sludge draw-off system.

Filter washing is manual with basis solution but can be automated if this option is chosen.

Field training can be offered to enable operators to easily tend to the operation and maintenance of the installation.

With an operator input of around 1 hour a day - for the purposes of preparing the chemicals, filter washing and planned maintenance - the units are very labour efficient.

Standardization of equipment between different plants permits the reduction of spare parts stock.

4.2. SKID-MOUNTING

The quality and reliability of the installations are ensured through shop manufacturing, inspection and testing before shipment.

4.3. ON-SITE INSTALLATION

Skid-mounting enables a rapid site set-up with a simple hydraulic and electrical connecting.

In addition, this design ensures that the plant is portable allowing easy relocation if required.

U.C.D.® installation only required a platform and a gutter fitted with sewer for the drains.

Nevertheless, our plants are made of various equipment containing some fragile components:

- Plastic (lamellar plates, pipes …),
- Rubber (seals…),
- Electrical material (electrical cabinet, relays, motors…).

To keep the equipment in good condition, the ambient temperature must be between 5° C (minimum) and 40° C (maximum): **housing in a light structure protecting against atmospheric conditions is recommended** (see example below).

UCD 180 - Tamokra (Algeria)

Our Customers often undertake the construction of an operators' building comprising two main parts:

- A room for storage of spare parts and small tools for planned maintenance and chemical storage,
- A laboratory-office.

This building can be containered and proposed on demand.

Significant notice

If water level in treated water storage tank is below level of UCD skid, we recommend installation (on treated water feeding pipe) of a safety loop (fitted with a vacuum breaker) to prevent from siphon off event.
(See paragraph 5: “Treated water outlet mark 1/”)

4.4. INCREASABLE CAPACITY

An increase in capacity can be easily obtained with additional units.

4.5. LOW POWER REQUIREMENT

Where electricity is not readily available, a small power generator (optional) is sufficient to run the units.

Clarified water pump connected on the skid is used to feed and to wash filters and can also be used as allocating treated water pump because of its 2 bars delivered. Consequently, required power is lower.

4.6. CHEMICALS

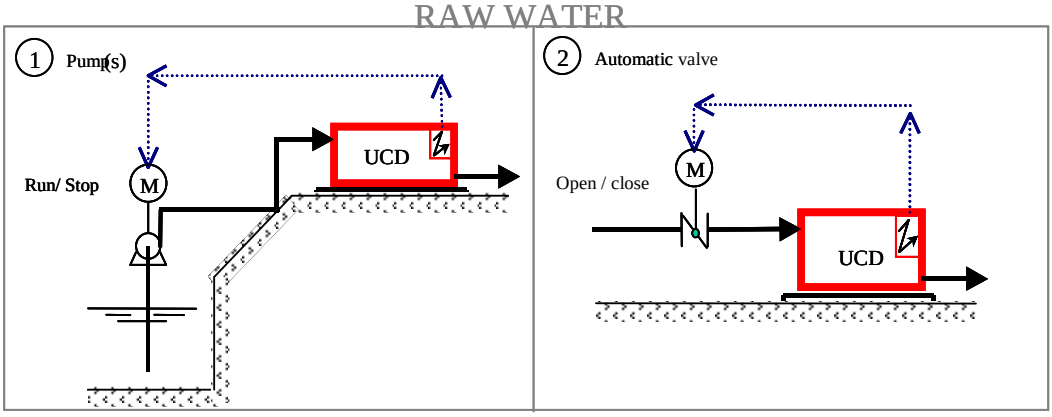
The recommended chemicals have been chosen for their **low cost** and **ready availability**:

- Aluminium sulphate,
- Sodium carbonate or lime,
- Calcium or sodium hypochlorite.

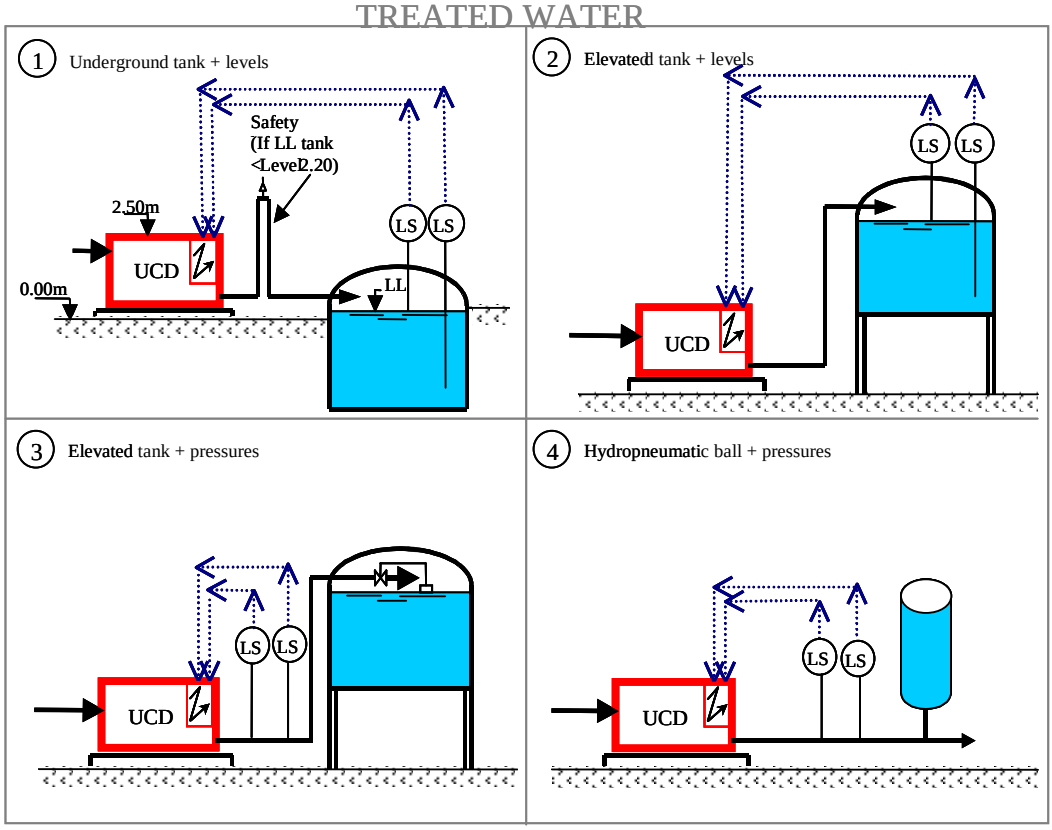
Those chemicals can be modified according to local availabilities and treatment demand.

5. INSTALLATION DIAGRAMS

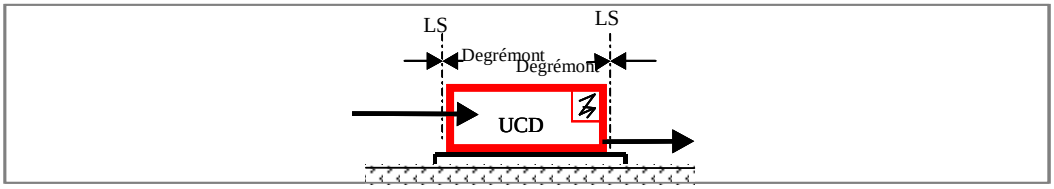
RAW WATER



TREATED WATER



LS: LIMITS OF DEGREMONT



6. PHOTO GALLERY

UCD 20 – Brazzaville (Congo)

UCD 100 – Vergt (France)

UCD 180 – Ocotal (Nicaragua)

UCD 360 – Samarinda (Indonesia)

UCD 540 & UCD 720 – Nizip (Turkey)

19 UCD 200 – Bagdad (Iraq)