Novel & Unique Technology for Water Purification....DEFERUM

“DEFERUM™” IRON REMOVAL TECHNOLOGY

ALSO IN SAME PROCESS WE EFFECTIVELY REMOVE GASES

“HYDROGEN SULPHIDE, METHANE, CO2, RADON, AMMONIA”

A novel and unique cleaning system that requires no pump, no air, little water and the minimum of time to reactivate has been installed at more than 100 locations in the Ukraine, Russia, Moldova, Belarus, Australia, New Zealand, Africa and Canada.

500 m3/day (steel)

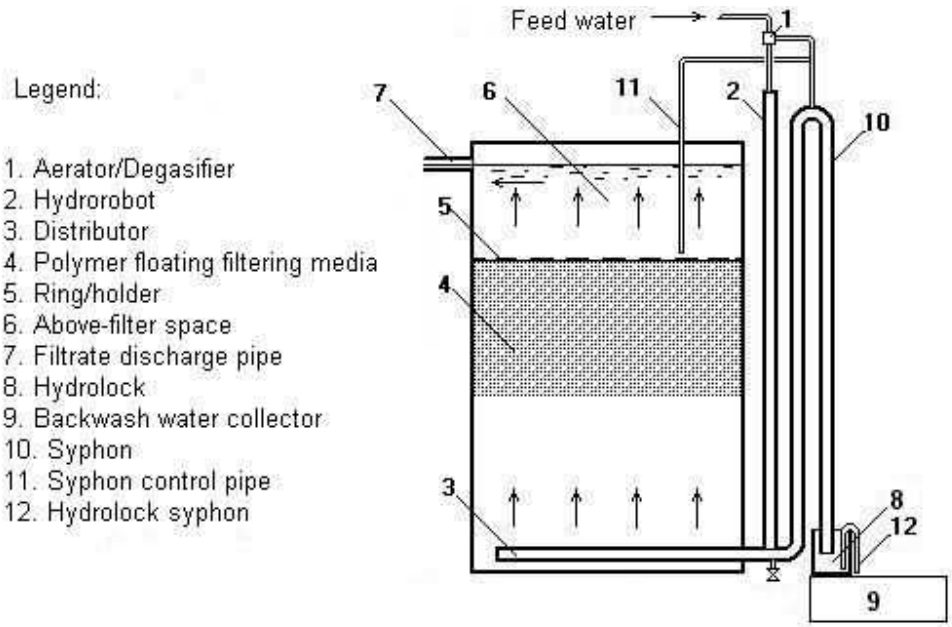
500 m3/day (steel)

100 m3/day (poly)

“DEFERUM” up to 132,500 gpd.

Because the system uses floating particles to filter contaminants, it is less prone to clogging, requires much smaller filtration units and is exceptionally easy to backwash. It is, therefore, ideal for treating polluted water, whether from industrial and mining operations or from agriculture or domestic sources.

Developed by a team, including inventor, Mr. Alex Remizov, Director of Akvastroiservis, a Ukraine company based in Rovno. The system's Polymer Floating Filter Medium (PFFM) buoyancy causes it to arrange itself as a floating filter bed. Filtration is in the upward or downward direction, depending on application, with the 'bed' restrained by a fine mesh and supported by a grid. Gradual fouling of the bed increases its resistance, raising the water level in an adjacent 'hydro-robot' until it reaches the top of a siphon. This draws water out of the filtration chamber at such a speed that flow through the filter bed reverses, and the filter bed is backwashed. There are no sensors, electronic controls, floats or other moving parts to worry about.



Simplified schematic of a hydro-automatic filter based on the polymer floating filtering media

During the backwash, the filter bed is expanded by 30 to 70%, with the combination of the downward flow of filtrate and the upward buoyancy of the floating media producing a vigorous agitation and scrubbing effect. The tank for backwash water is only 15% of the size of that used in a conventional filtration system, although the company also has a new design, patents-pending, that discharges no backwash water at all.

Systems on offer can treat a very wide range of pollutants. A combined degassing unit and aerator, for example, is effective in the removal of both dissolved gases and high concentrations of iron, which it oxidizes to the ferric state so it may be precipitated as solids and removed by the filtration system.

The device comprises a set of ejection heads and vacuum chambers. Feed water is supplied at a pressure of three to four atmospheres and the velocity of water flow reaches 180km/h, creating a deep vacuum in the vacuum chambers. Dissolved gases are immediately released. The water flow sucks atmospheric air into the device, causing the water to break up and expose a surface area of up to 12,000 m2 where the release of dissolved gasses is greatly intensified. "The view is impressive," says Remizov. "The water appears to boil and turns as white as milk. Gases are removed in a fraction of a second".

It should be noted that these results are achieved without the use of additional equipment or the use of electricity. An aerator/degasifier installed on a ground water treatment plant removes dissolved gases and up to 70 mg/l of dissolved iron. After filtration by the PFFM media, the iron is reduced to less than 0.3 mg/l.

Design Pointers
Filter units have 40% of the cross sectional area of conventional designs.
Backwash time is typically reduced less than 5 minutes. No air, pumping, sensors or electronics are required.
The size of tank for collecting backwash water is about 15% of that in conventional designs.
Water used for backwash is about 1.5% to 3% of the daily flow rate of the filter, and is available with zero backwash water option.
Combined degasifier/aeration units efficiently remove all dissolved gases and oxidize iron to a form, where it can be filtered out, without the addition of any chemicals

DEFERUM 2000 (poly)

DEFERUM 4000 (steel)

Technical specifications of the "HGF"systems:

- Rate of water filtration: from 1.0 m/hour to 10 m/hour
- Height: from 2.5 m. (standard) to 3.5 m. (individual)
- Top height of piping: 2.6 m. (standard) to 4.2 – 5.8 m. (individual)
- Consumption of water for backwash: 0.8 %(standard) to 3.5 % of the daily flow capacity
- Duration of backwash: 75 – 240 seconds.
- Mode of operation: Continuous or periodic.
- Automatic operation controls and filtrate quality controls: Hydro-automatic

PFFM MEDIA

PFFM Media

Iron Removal Media

New Start up In Service

Comparative Technical Characteristics of Heavy and Polymer Floating Filtering Media (PFFM) and Associated Equipment.

Methods of technical modeling by D.Mintz.

Example:
Co = 170 mg/l (initial concentration of contaminants)
Reagent dose: 16 mg/l
C/Co = 0.01 (C - concentration of contaminants in filtrate, mg/l)

Position	Sand, particle 1 mm.	Polymer, particle 1 mm.
Particle shape factor	1,14	1,11
Depth of filtering bed, m	1,0	1,0
Rate of filtration, m/h	10, 0	10, 0
Rate of head loss in the media during filtration, m/h	0,209	0,161
Rate of contaminants advancement into the depth of the media bed, m/h	0,0558	0,0545
Factor of media free space saturation with contaminants	0,645	0,660
Factor of contaminants adherence to the media	17,3	16,0
Safe filtration time, min	372	456
Duration of backwash to restore the initial resistance of the media, min	16,0	2,0
Use of air in backwash	yes	no
Use of pump in backwash	yes	no
Tank for collecting backwash water	100%	15%
Filtration unit area	100%	40%
Hydro-automatic self-backwash	no	yes

The Polymer Floating Filtering Media (PFFM) is an effective alternative to traditional heavy filtering materials such as sand, clay, anthracite, etc.

The PFFM is manufactured from polymer material already certified for contact with drinking water.

The floating capacity of PFFM make it possible to develop water treatment facilities with far more superior technical, economic and operational characteristics in comparison with traditional heavy filtering media installations.

Application of PFFM brings remarkable benefits to the overall configuration of water treatment facilities. For example, the backwash of the PFFM is conducted by the reverse gravity flow of water and is 100% hydro-automatic. No electronics, no pumps, no compressors or any other additional equipment is involved in the backwash process. The backwash process is based entirely on gravity force and difference of water levels.

During the backwash, the PFFM bed is expanded by 30-70%, and the combination of a downward reverse flow of water and upward movement of floating media produce a vigorous agitation/scrubbing effect resulting in the fast (up to 3 minutes) regeneration of the PFFM.

The loss of water for backwash purposes normally does not exceed 1.5 to 3.0% of the daily flow of water. Obvious advantages are: simplicity and reliability, reduced foot print (by 2-3 times), reduced capital, operational and maintenance costs.

We have developed an optional process for zero backwash discharge filtration to meet demanding water saving requirements and to reduce technological chain in wastewater treatment.

During the commissioning, the PFFM facility is tuned to the optimum operating parameters, which are independently (without control devices or operator's intervention) supported by the facility throughout all the years of operation.

Water treatment facilities, based on the PFFM, operate with a prolonged filtration cycle. The combination of different grades of PFFM in the filtering bed provides an increased contaminant-arresting capacity of the filter, such that the initial concentration of suspended solids before the PFFM filter can be up to 500 mg/l.

PFFM is an ideal filtering material for the so-called "contact" filtration when reagents are introduced in the feed liquid immediately in front of the filter.

Water treatment facilities based on PFFM are very easy to fabricate even in the basic conditions of an ordinary metal workshop. Required fabrication materials comprise readily available items such as steel/plastic sheets, pipes of various diameters, plastic mesh and PFFM.

Facilities based on PFFM can operate both in pressure and pressure-free mode. Quite often, the developers adopt the pressure-free mode. In such a case, the electricity is required only for the feed pump (for example, well pump) and the filtrate-forwarding pump. The facility itself does not contain any pumps.

Continuously operating PFFM facilities do not require sheltering and can work at ambient air temperature of - 30 C (minus thirty). In such cases, ice serves as a heat insulator.

The water treatment facilities based on PFFM can be positioned underground, on the ground or at the top of water towers.

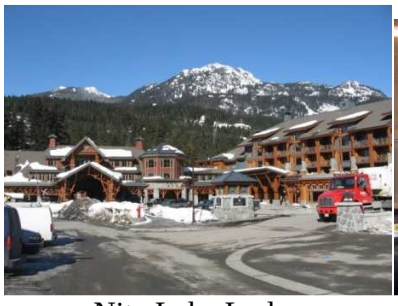
The water treatment facilities based on PFFM are distinguished for their compactness; modular design; high reliability due to the absence of operator meddling, electrical, moving or rotating parts; ease of fabrication and maintenance and very low operational costs.

The water treatment facilities based on PFFM can be designed for a wide range of flow rates: from 4.5 m^3/day to 100,000 m^3/day.

Technical Specifications of the "DEFERUM" System

Flow rate, m^3/day	Diameter. Height. Length x Width x Height	Top height of piping	Note
12	Diameter 0.76 m. HT=1.52 m.	1.52 m. (Automatic installation)	Plastic installation. Stock of filtrate for instant use = 0.35 m^3 Power required = 0.30 KW/ m^3
100 to 250	Diameter 1.60 m. HT=2.52 m.	3.75 m. (Self-backwash)	Steel or plastic installation Filtrate discharge is at the height of 2.40 m.
500	Diameter 2.32 m. HT=2.27 m.	3.50 m. (Self-backwash)	Plastic installation (550 kg.) for the sea container. Filtrate discharge is at the height of 2.2 m.
500	Diameter 2.42 m. HT=2.52 m.	3,75 m. (Self-backwash)	Steel (2600 kg.) or plastic installation (1000 kg.) for the lorry or for the railway.
1 000	Two Deferum-500	3.5 m. or 3.75 m. (Self-backwash)	Steel or plastic installation
5 000	Ten Deferum-500	4.25 m. (Self-backwash)	Steel or plastic installation
6 500	10.2 x7.8x3.0 m.	4,25 m. (Self-backwash)	64 m^3 of ferro-concrete. Filtrate discharge is at the height of 2.90 m.
13 000	Two Deferum-6500	4,25 m. (Self-backwash)	Ferro-concrete
52 000	Eight Deferum-6500	4,25 m. (Self-backwash)	Ferro-concrete

Nita Lake Lodge, Whistler, BC Canada – DEFERUM High Iron Removal Plant



Nita Lake Lodge

DEFERUM 250x2

Backwash – Iron Removal

Ground Water Characteristics

Parameters	Unit	Permissible levels	Note
Ions of two-valent iron	mg/l	From 0.30 to 75	Any forms of iron are removed
Ions of two-valent manganese	mg/l	From 0.05 to 7	Oxidants: Atmospheric oxygen, catalyst, bacteria or reagent
pH	-	From 5.4 to 8,2	pH of feed water can be raised without chemical reagents by using aerators/degasifiers.
Hydrocarbonates	mg/l	From 30 to 500	Alkalinity of feed water can be raised by using natural minerals
Hydrogen sulphide	mg/l	From 0.030 to 9.0	Removed by aerator/degasifier
Free carbon dioxide	mg/l	Up to 300	Removed by aerator/degasifier
Radon	pCi/L	From 60 to 1000000	Removed by aerator/degasifier
Suspended and colloidal particles	mg/l	From 1.5 to 120	Removed by filter
Water temperature Turbidity	^{o}C NTU	From 1 to 40 deg. Up to 20 NTU	Water temperature may be raised by 0,5 up to 6 deg. if aerators/degasifiers operate in the recycling regimen. Removed by filter

Quality of Filtrate

Parameters	Unit	Achievable results	Note
Total iron	mg/l	Less than: from 0.0 to 0.30	Results achieved in 2 – 7 days after system commissioning
Manganese	mg/l	Less than: from 0.05 to 0.10	Use combination “Deferum / Demagnum”
pH	-	From 6.7 to 7.8	Results achieved in 2 – 7 days after system commissioning
Hydrocarbonates	mg/l	Optimum level for system non-reagent operation	-
Hydrogen sulphide	mg/l	Less than 0,0030	Results achieved in 2 – 7 days after system commissioning
Carbon dioxide (corrodes steel and concrete)	-	Stability index From - 0.1 to +.0.1	Results achieved in 2 – 7 days after system commissioning
Radon	pCi/L	Less than: 60	Results achieved in 2 – 7 days after system commissioning
Suspended and colloidal particles	mg/l	Less than 1.5	Results achieved in 2 – 7 days after system commissioning
Water temperature	^{o}C	-	Results achieved in 2 – 7 days after system commissioning
Redox potential Turbidity	mV NTU	From +50 to +150 <1 NTU	Results achieved in 2 – 7 days after system commissioning As above

Parameters	Value	Note
Operating personnel	-	Systems of Deferum-500 m^3/day do not require an operator
Mode of operation	Continuous / periodic	The system can be stopped for several hours a day
Feed water pressure in front of the system at ground level. If aerators/degasifiers: If without aerators/degasifiers:	65 (4.50) 7.0 (0.50)	-Bore pump should be selected for optimum operation -Gravity flow of raw water
Consumption of water for backwash, % of the daily flow capacity	0.0 to 3.0	Depending on the initial concentrations of contaminants
Duration of self-backwash, seconds	180	Depending on the quality of filtrate after backwash
Oxidants for ions and organics	-	Atmospheric oxygen, bacteria. In exceptional cases use of reagents.
Automatic operation controls and filtrate quality controls	-	Hydroautomatic. In special cases – use of reagent dosing devices, pH monitoring probes, ion monitoring probes.
Average energy consumption by a bore pump, kW / m^3	0.19 or 0.050	In some cases, where levels of dissolved gases are extremely high, a recycling pump for non-reagent raise of pH may consume additional electricity by aerator/degasifier.
Operating cost is only the cost of electricity consumed by the pump to supply feed water to the system at 65 PSI and in some cases by a recycling pump. USD/m^3	Approx. 0.010	Based on USA and Australian costs
Fabrication materials	-	Choice of plastic or steel for the body and pipes; polymer floating media and stainless steel mesh.
System location	-	Suitable for both indoors and outdoors.

Mobile DEFERUM Ground Water Dewatering for High Iron Removal – Canada

DEFERUM 500 UNITS

SET UP

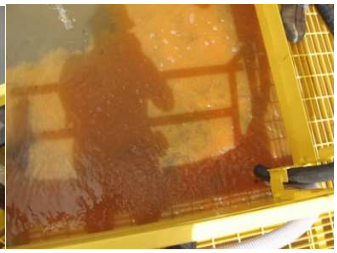
BACKWASH

DEFERUM "high iron removal" Piloting – Ethanol Plant, Oregon



DEFERUM 24 Pilot Set up


Filtrate (iron free)

Backwash (high iron)

Well Water

Reactor vs Filtrate

Filtrate vs Raw Iron

INDEPENDENT WATER ANALYSIS RESULTS FOR DEFERUM PILOT

ChemTreat, Inc.

PWC, PURE WATER CORP
5318 - 4A Ave.
Delta, B.C.
V4M 1H5

Certificate of Analysis

DEFERUM 24 PILOT

July 30, 2008

Laboratory No. 08-07-30-22
Company CASCADE GRAIN PRODUCTS, LLC
Address 81200 KALLUNKI ROAD, CLATSKANIE, OR
Engineer JOHN DORR
Sample Date July 25, 2008
Sample Class Waters

Analysis	COLLECTOR WELL	PROCESS TK	PROCESS FILTER	DEFERUM FILTRATE
pH	6.97	8.39	8.40	8.32
Conductivity, µmho	437	778	778	591
"P"-Alkalinity, as $CaCO_3$, mg/L	–	6.0	9.2	4.2
"M"-Alkalinity, as $CaCO_3$, mg/L	166	272	269	251
Calcium Hardness, as $CaCO_3$, mg/L	125	98	97	92
Magnesium Hardness, as $CaCO_3$, mg/L	78	66	64	229
Iron, as Fe, mg/L	6.1	0.62	0.55	0.05
Copper, as Cu, mg/L	<0.01	<0.01	<0.01	<0.01
Zinc, as Zn, mg/L	<0.01	<0.01	<0.01	<0.01
Sodium, as Na, mg/L	9.8	27	27	8.8
Potassium, as K, mg/L	3.1	124	123	3.1
Chloride, as Cl, mg/L	29	55	54	34
Sulfate, as SO_4, mg/L	3.5	4.1	4.1	3.1
Nitrate, as NO_3, mg/L	<0.10	0.24	0.23	<0.10
Ortho-Phosphate, as PO_4, mg/L	<0.5	<0.5	<0.5	<0.5
Silica, as SiO_2, mg/L	55	47	47	41
* Manganese, as Mn, mg/L	1.7	0.31	0.31	0.53
Total Iron, as Fe, mg/L	42	–	–	–

DEFERUM FILTRATE

WELL WATER

* MANGANESE REDUCTION WITHOUT SECONDARY TREATMENT

Respectfully Submitted,
Mark A. Cordrey

Mark A. Cordrey
Manager Customer Service Analytical Lab
ChemTreat, Inc.

CC: JOHN DORR
JOHN WENGERT
RICH CARDILE

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For more references…. please visit – http://www.deferum.com/testimonials.html

DEFERUM 500 - Carbon Steel

DEFERUM 4000 – Carbon Steel

DEFERUM 2000 – Poly/PVC

DEFERUM 6500 Concrete

Deferum
Unique Iron Removal Technologies

DEFERUM VARIOUS SIZES

DEFERUM 12 SOLAR – DOMESTIC

PS. We have DEFERUM plant installations in Nigeria with very good results.