

Mechanical / Chemical Wastewater Treatment MeChem®



Your Challenge:

You need to improve your water quality on a tight budget

Our Solution:

Cost-effective and modular mechanical / chemical
wastewater treatment



►► The Economic Principle

The most economical solution either achieves a given benefit with the least costs, or it achieves the greatest benefit on a given budget.

►► The Law of Degressive Benefits

To achieve a treatment efficiency of say 50 %, you have to make a certain investment. To improve the efficiency further to 75 %, you have to invest the same amount again. And if you want to increase the efficiency to 87.5 %, you need to invest the same amount a third time.

Your first investment is two times more economical than your second investment, and four times more economical than your third investment.

In other words: Treatment costs rise exponentially with treatment efficiency.

►► More of Less Beats Less of More

As an example, let us assume that there are four cities of equal size along a river. None has any wastewater treatment facility. Your budget is limited. You have just enough money to build a single state of the art plant with full biological treatment removing 90 % of the chemical oxygen demand (COD).

If you spend all your money on this single plant you reduce the pollution of the river by 22.5 %. If you invest instead in basic technology for four plants, you can reduce the pollution from all four cities and the pollution of the river by 50 %. With the same investment you achieve a 50% instead of a 22.5 % reduction of the river's pollution.

►► First Things First

If you want to spend your money wisely, you should invest in basic wastewater treatment first. This is not only more economical, but has the additional benefits that basic technologies are much quicker to design and implement, and easier to operate and maintain.



ROTAMAT® Fine screens in Argentina for the removal of solids from a sea outfall



Micro-Screen ROTAMAT® RoMem in a channel

►► Step by Step with Modular MeChem® Solutions

Our MeChem® Solutions are modular. You improve the treatment efficiency step by step, as your budget permits. Each step is built on the prior one, all equipment remains in full use.

With every step you further improve the quality of your effluent, and you widen your options for its beneficial reuse, such as irrigation. In this way you can gradually implement sustainable water quality management.

Such a gradual approach is the only affordable and the fastest method to achieve the Millennium Development Goals (MDG) of the United Nations for water and sanitation quality.

Step 1 – Fine Screening

Screening is the indispensable first step of wastewater treatment. Fine screens with openings of 1 to 6 mm remove solids such as plastics, paper and hygiene articles. The removed screenings are washed, dewatered, compacted, bagged and then disposed of on a landfill or incinerated.

Step 2 – Micro-Screening

Micro-screens have a mesh size of 0.2 to 1 mm. They remove fine particles, faecal matter, hair and fibres. The screenings are removed as a sludge that is digested or composted, dewatered and land applied for soil improvement.

Step 3 – Coagulation/Flocculation

Coagulation by addition of chemicals, such as Fe-, Al- or Ca-salts, generates micro-flocs from colloidal matter. Flocculation by addition of polymers agglomerates micro-flocs to macro-flocs that can be retained by the micro-screens of Step 2. Depending on the type of

coagulant used, phosphate can be precipitated into solid material and also be removed. Phosphate is a nutrient which is beneficial for agriculture, but damaging to surface waters because it can lead to excessive algae and plant growth through eutrophication, and to oxygen deficits.

Step 4 – Micro-Straining

Micro-strainers are even finer than micro-screens; they have a mesh size of only 0.01 to 0.1 mm and remove virtually all particles and flocs. Only dissolved pollution remains in the filtrate. The solids are removed as sludge and are blended with the sludge from the micro-screens.

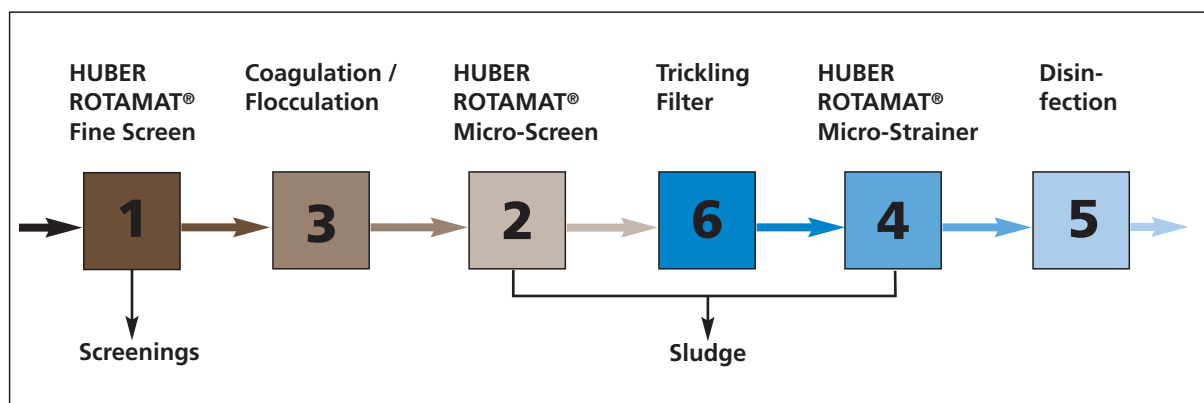
Step 5 - Disinfection

Disinfection, preferably by UV-radiation, of the virtually solid-free effluent, kills pathogens and permits reuse of the effluent even for the irrigation of crops that are grown for human consumption. It also permits reuse as process water.

Step 6 – Biological Treatment

Addition of biological treatment between the micro-screens and the micro-strainers permits removal of dissolved organic pollutants. The flocculation with polymers of Step 3 is now no longer needed, but addition of phosphate precipitating salts is continued where P-removal is required to prevent eutrophication of surface waters.

Preferably, simple trickling filters are used for biological treatment. The micro-strainers are now used for the removal of the biomass that is sloughed off the trickling filters. Expensive clarifiers are not required.



Step-by-step implementation of modular HUBER MeChem® Solutions

➤➤ Maximizing Investment Results

As an example, let us assume that your budget permits an investment of 1 million Euros.

The following table compares how much COD you can remove with MeChem® Solutions. It also shows the specific investment per COD removal capacity.

Mechanical treatment has the additional advantage of very low operation costs compared to chemical and biological treatment.

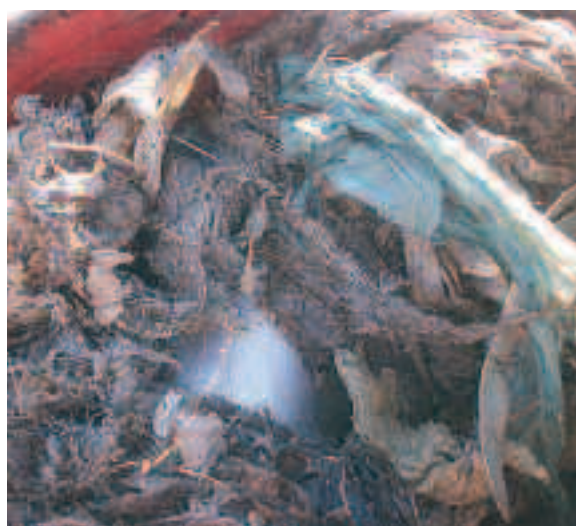
Chemical treatment has low investment, but high operation costs. For this reason the overall costs of step 3 and 4 are significantly higher than those of step 2.

Disposal costs of screenings and sludge are not included in the table.

It should also be noted that specific costs depend on individual and local circumstances. In any case, they are degressive with rising plant size.

MeChem® Solution (Steps)	Unit	1	1 + 2	1 - 3	1 - 4	1 - 5	1 - 6
Investment per capita	€/C	3	13	18	25	29	125
Population served	C	333,000	77,000	55,500	40,000	34,500	8,000
COD freight in	kg/d	40,000	9,230	6,667	4,800	4,140	960
COD removal efficiency	%	7.5	25	35	50	50	95
COD freight removed	kg/d	3,000	2,300	2,333	2,400	2070	912
Investment per COD removal capacity	€/(kg/d)	335	435	430	420	485	1,100
Operation costs	-	very low	low	high	high	high	medium

COD freight removal with an investment of 1 million € in progressively efficient MeChem® Solutions



Screenings are washed, dewatered and compacted, and then landfilled or incinerated



Sludge from micro-screens is treated by digestion or composting and then land applied for soil improvement

►► Your Final MeChem® Solution Depends on Your Needs

Solution 1 – Fine Screening

Outfalls to insensitive water bodies, e.g. sea outfalls;
Screened effluent can be reused for irrigation of non-edible crops, such as cotton.

Solution 2 – Micro-Screening

Outfalls to low-sensitive water bodies, such as sea or river outfalls;
Micro-screened effluent can be reused for drip irrigation of parks and of crops that are not consumed by humans.

Solution 3 – Coagulation/Flocculation

Outfalls to moderately sensitive surface waters; to prevent eutrophication, phosphate precipitating coagulants should be used;
Treated effluent can be reused for irrigation; phosphate precipitating coagulants should not be used because nutrients should remain in the irrigation water.

Solution 4 – Micro-Straining

Outfalls to sensitive surface waters.

Solution 5 – Disinfection

Effluent can be reused for spray irrigation or the irrigation of crops that are grown for human consumption;
Effluent can be reused as flush or wash water.

Solution 6 – Biological Treatment

Outfalls into highly sensitive surface waters or such that are used for bathing or as drinking water source;
Odourless effluents can be reused for irrigation of gardens or golf courses. Biological treatment should not include P or N removal;
The effluent can also be reused as process water.

►► MeChem® Solutions for Industrial Applications

Industries producing effluents with a heavy freight of solids and COD are charged with high sewer fees. Such industries include food processing, breweries, pulp and paper, plastics, construction materials, laundries, etc.

Solids and COD concentrations, and therewith the sewer fees, can be considerably reduced with

MeChem® Solutions. In some cases it is possible to recover products from the effluent.

Treated effluents that are virtually free of solids can be reused as process water. Fresh water consumption and water bills are considerably reduced.

►► Pilot Testing for Optimal MeChem® Solutions

Since every wastewater is different, we conduct pilot testing to determine the best MeChem® Solution for each individual case. Performance depends on many

factors, such as the type of screens, their mesh size, the type and dosage of chemicals, their reaction times, etc.



ROTAMAT® Fine screens installed in the Middle East ...



... where the effluent is reused for drip irrigation

➤➤ Benefits of MeChem® Solutions

- Optimal water quality improvement on a limited budget
- Least expensive removal of solids, BOD and COD
- Modular design permits step by step improvement of treatment efficiency
- Fast and easy design and implementation
- Small footprint
- No need for large and expensive clarifiers
- Simple, but efficient equipment that is easy to operate and maintain
- Minimal power consumption
- Low production of sludge that can be reused for soil improvement
- Enclosed equipment prevents odour nuisance
- Stainless steel equipment for long life
- Global Huber Service



Micro-Screen ROTAMAT® RoMesh in a tank

➤➤ Applications of MeChem® Solutions

- Inexpensive wastewater treatment in developing and emerging countries
- Low-cost solutions for river and sea outfalls
- Cost-effective solutions permitting effluent reuse for irrigation with no or little loss of nutrients
- Economical solutions permitting effluent reuse as process water
- Cost-saving solutions for the reduction of sewer fees for industrial effluents and/or for product recovery
- Efficient solutions for the treatment of combined or sanitary sewer overflows (CSO and SSO)
- Easy and fast solutions for the reduction of freights to overloaded wastewater treatment plants

➤➤ Combination with Urine Separation

If urine is separated, the efficiency of MeChem® Solutions is further improved because the wastewater contains less dissolved COD. In addition, the wastewater contains far less N and P nutrients and thus a reduced potential for eutrophication.



ROTAMAT® Micro-strainer RoDisc for removal of very fine particles

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Subject to technical modification

MeChem®