Speed-O-clar

A Revolution in Sewage Treatment Plants

Documentation for engineering

Densiline

SUMMARY

EDITORIAL

Every once in a while as it unfolds before our eyes, we shall face a Rule : the tiniest things may hold the power to spark the greatest outcome.

During these times while the incalculable consequences of a virus bear upon us, it is delightful to witness a solution that can increase our dynamism to a great extent without financial strain. The Speed-O-Clar is one of those tiny things that are Sine qua non in waste-water treatment plants just as a rear-view mirror of a car. As of today, our invention is going viral. Furthermore, this brochure presents our innovative system that will help you in the engineering of new or existing Aeration Tanks and Clarifiers.

Thanks to the Speed-O-Clar system you will be able to downsize your structures and thus reduce building and operating cost or augment the capacity of already constructed ones.

Please feel free to contact us if you require any further information.

BACKGROUND

ABOUT US

Launched in 2001, our start-up has been initially developing a line of liquid density metering products, hence the brand name.

Our R&D led us to new horizons that we weren't exploring beforehand: waste-water treatment stations and their corollaries such as clogged clarifiers, sludge blanket, sludge cloud, Phosphates, suspended solids, etc.

Arising from the food-industry, in particular from the vinification, we weren't formatted by the calculation rules established by the waste-water industry.

It is on the grounds of our innovative engineering practices that we have asked the right questions:

- What are those sludge plates on the surface of the water in the Clarifiers?
- How do they appear?
- Denitrification or Cellular Lysis?

Subsequently, through analysis and solution we have engineered the prevailing process where a radical change in the flow sequence must be introduced in to the Circular Clarifiers.

SIMPLE → PASSIVE → MAINTENANCE-FREE → WEAR-FREE

This is how **Speed-O-Clar** was born, patented by **Mr. Gilles Galichet**, founder and CEO of **DENSILINE SARL.**

- The first prototype was succesfully tested in a **malting plant**.
- The second and upscaled giant prototype was tested in a **textile plant,** at **CROUVEZIER DEVELOPPEMENT.**
- Down the road, our product has been installed in many places across the industry in most instances during extensions and upgrades of underperforming waste-water treatement plants.

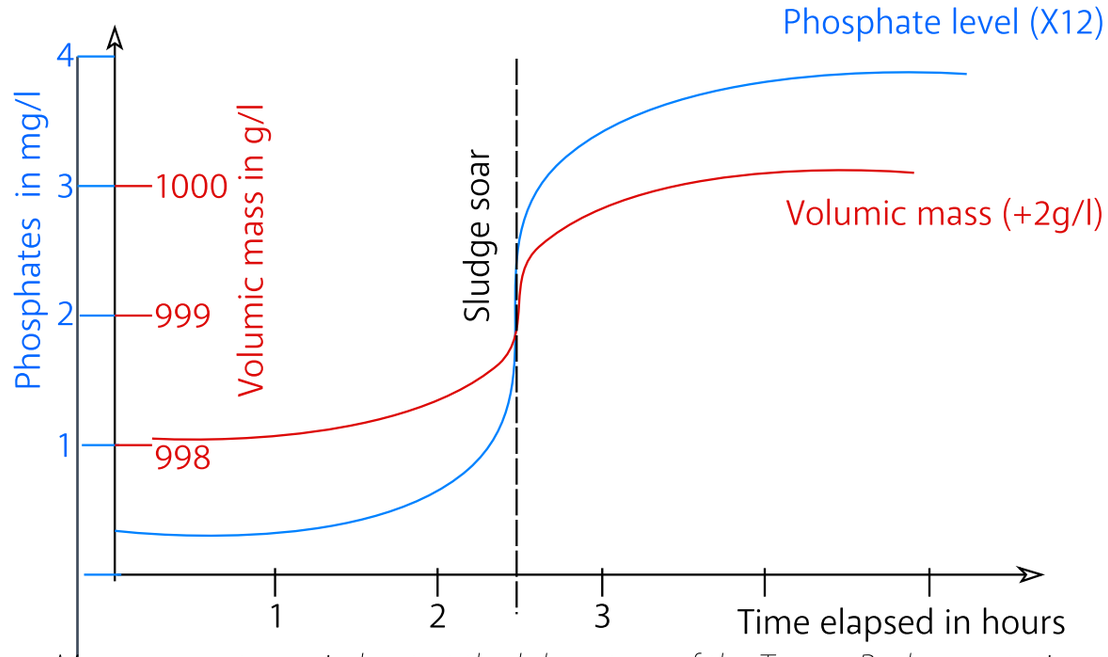
AS OF NOW, THE SPEED-O-CLAR HAS BECOME A FUNDAMENTAL COMPONENT FOR MUNICIPALITIES AND BUSINESSES WHO HAVE ALREADY ADOPTED IT.

WHY CHOOSE THE SPEED-O-CLAR ?

OUR INNOVATION BASED ON THE FOLLOWING OBSERVATIONS:

Sludge was extracted from an aeration tank into a laboratory-grade test cylinder and left to settle for **two and a half hours.** At that moment, the sludge physical characteristics are mutated sharply as the sludge separates into two main clusters: the largest portion soars to the surface, meanwhile the density of the clarified liquid rises by approximately 2gramms/liter, 80% of the cases.

At that same moment an increase of the diluted Phosphate load is revealed. This phenomenon corresponds to a **bacterial lysis** led by the intracellular enzymes which coact in the destruction of the cells.



Measurements carried out at the laboratory of the Troyes Barberey station

The intracellular content is then diluted in the settling medium, which gives a sudden density surge to 2g/l in the test cylinder. There is an inversion of thrust on the bacterial envelope that has been emptied of its contents. That is the phenomenon behind the soaring sludge.

The Speed-O-Clar was engineered for the specific task of promptly retrieve the sludge from the clarifiers before the critical 2.5 hour time mark.

In contrast with the operation of a standard Clifford, where induced currents cause the sludge to move away and towards the external walls, also causing propagation of a cloud of sludge and a settling speed limited by the updrafts, **the Speed-O-Clar causes counter currents which accelerate settling by adding downdrafts to the sedimentation rate.**

Accordingly, a clarifier equipped with the Speed-O-Clar, can pass a flow rate corresponding to **an ascending speed of 1m/h or higher per m^2 of mirror surface.**

EXAMPLE

Equipped **with the Speed-O-Clar system**, a clarifier of 100m^2 of mirror surface can be actuated to pass a peak flow greater than or equal to 100 m^3/h under normal conditions (sludge index, density of the treated water).

PRESENTATION OF SPEED-O-CLAR

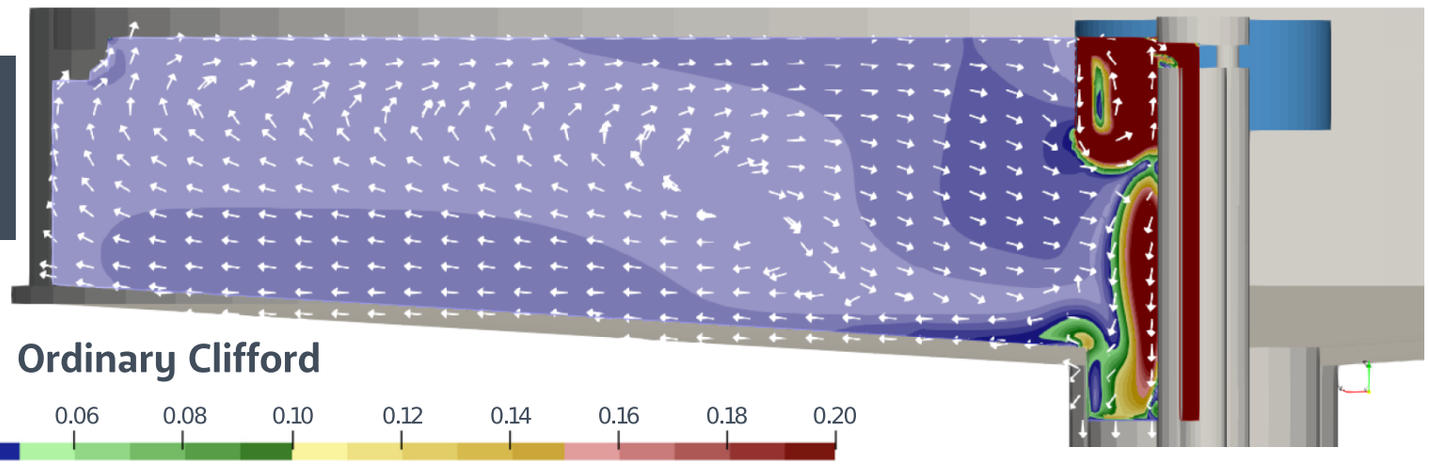
Just like the aerodynamic wing of a racing car the Speed-O-Clar is a hydraulic deflector that:

- Transforms the turbulent outflows into laminar flows
- Creates a set of counter currents which:
  - are centripetal at the bottom of the clarifier
  - vertically ascendants at the close vicinity of the center pier
  - descendants at the settling zone
- Facilitates, by the recirculation of the particles, the agglomeration of the smallest flocks with the larger ones that are flowing from the aeration tank to the clarifier.

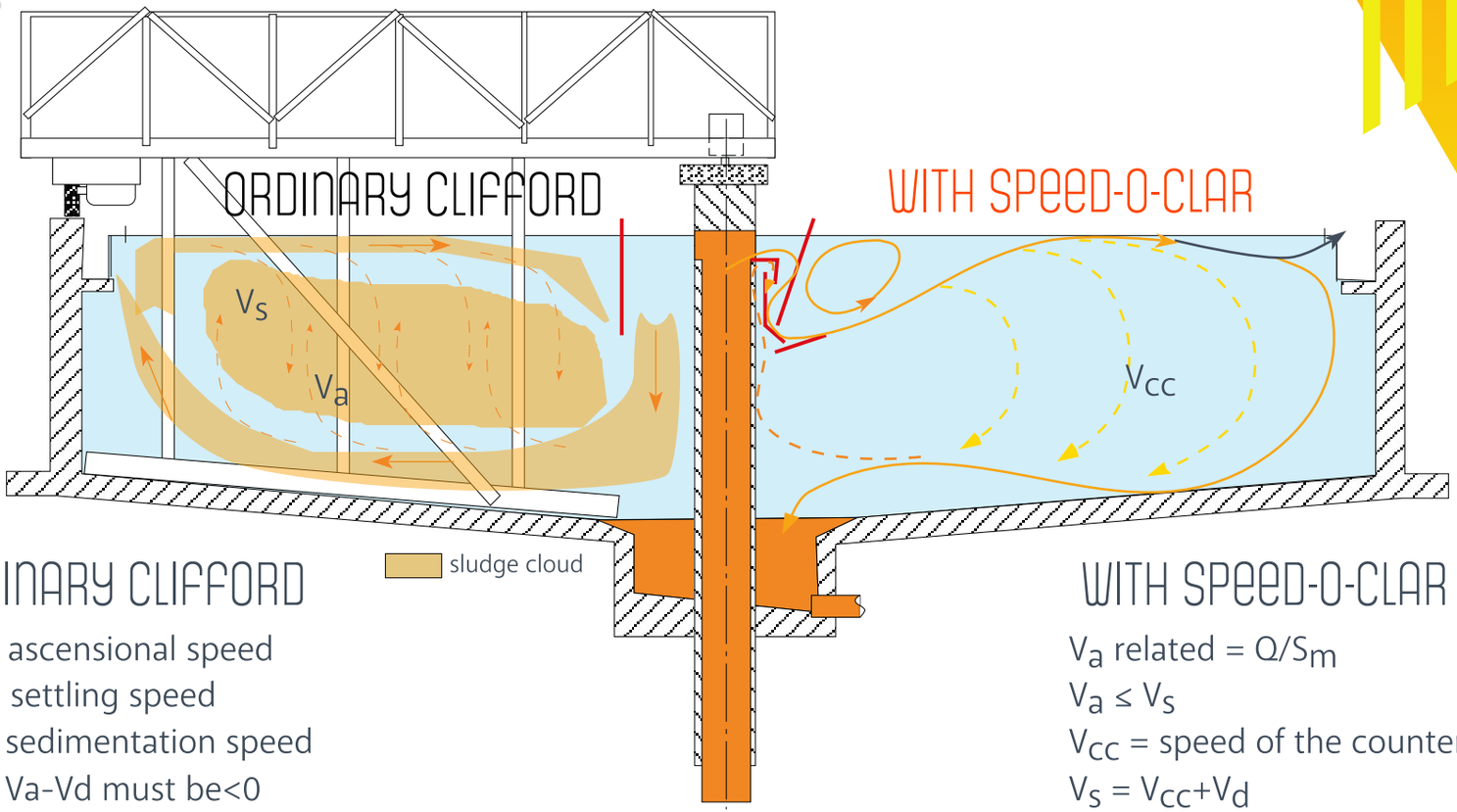
Reminder: Stokes' Law

The settling speed V_d of a particle is proportional to the square of its diameter D
$V_d = KD^2$

Significant recirculation within the device then vertical recirculation with currents at the bottom oriented towards the outside of the basin



Ordinary Clifford



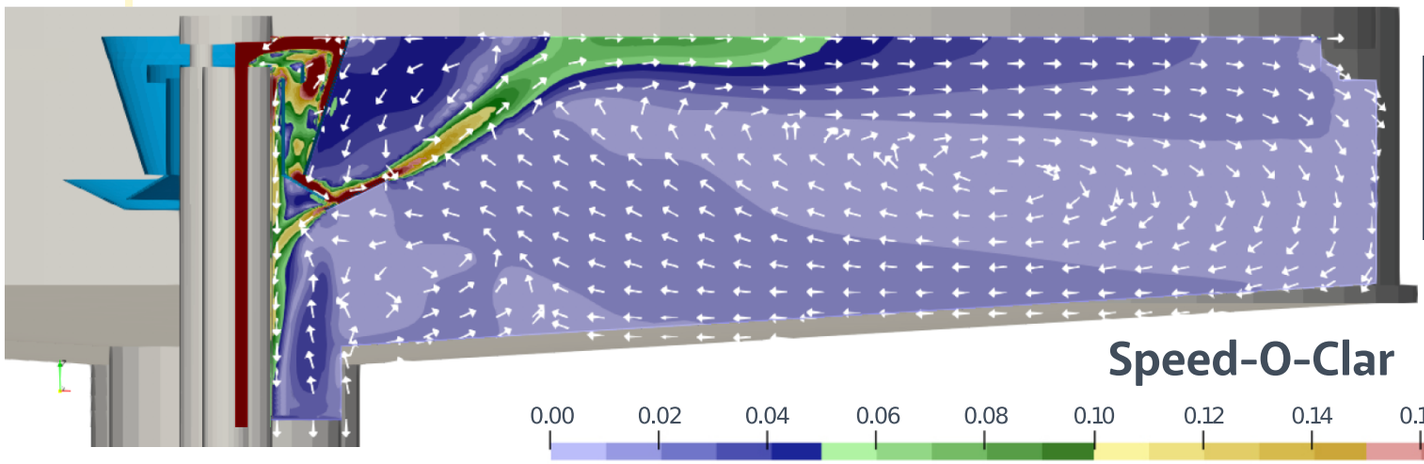
ORDINARY CLIFFORD

V_a = ascensional speed
V_d = settling speed
V_s = sedimentation speed
V_s = Va-Vd must be<0
V_a = Q/Sm often retained value: 0,6m/h
S_m = mirrored surface

WITH SPEED-O-CLAR

V_a related = Q/S_m
$V_a \leq V_s$
V_{cc} = speed of the counter currents
$V_s = V_{cc}+V_d$

$V_a \geq$ 1m/h



High speeds within the device then vertical recirculation at an even rate and currents at the bottom are oriented towards the recirculation

Speed-O-Clar

Accordingly, the Speed-O-Clar features **three effects**:

1. **The transformation of turbulent flow into laminar flow.**

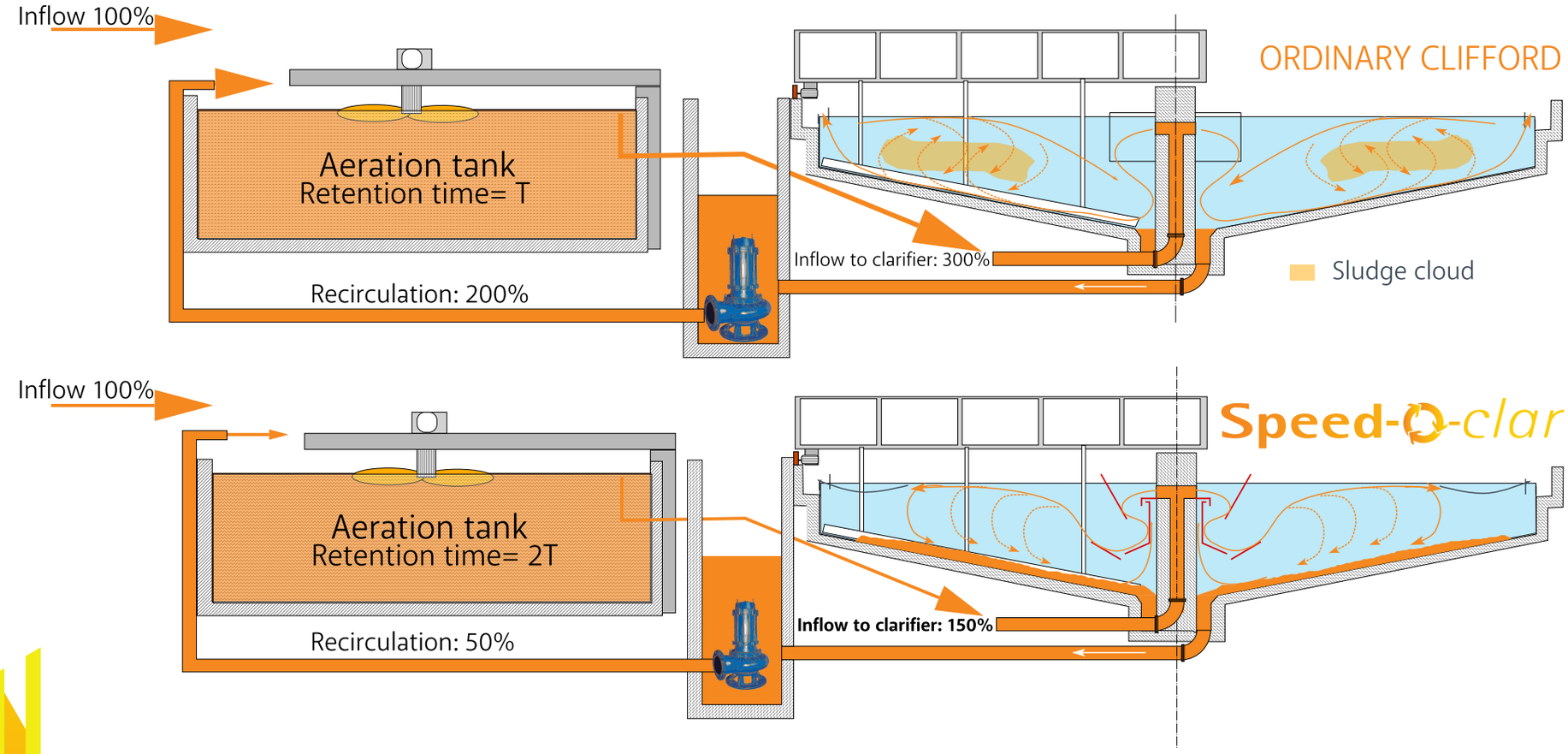
2. **The recirculation of small, non-decanted particles** towards the arrival of the flocks from the aeration tank in a chamber situated around the cylindrical part of the central barrel.

3. **The deflection of the laminar currents towards the surface** for the purpose of generating parabolic centripetal counter-currents which cause the sludge to settle at the bottom and then towards the center of the clarifier.

INFLUENCE OF SPEED-O-CLAR ON SEWAGE TREATMENT PLANTS (STP)

Comparison of results between the ordinary Clifford and the Speed-O-Clar system of recirculation:

- 200% between the clarifier and the aeration tank with Clifford
- 50% with the Speed-O-Clar because the sludge is concentrated at the base of the central pier and does not require energy to recover the sludge cloud, which is absent.



INSTANT OUTCOME:

- **Reduced inflow** at the clarifier
- **Improved** sedimentation
- **Increased retention time** of the sludge in the aeration tank

OUTCOME FOR THE PROJECTS:

- **Dimensioning of the clarifiers:** 1m^2 of surface allows a throughput rate of at least 1m^3/h
- **The size of the aeration tanks can be reduced** with a retention time calculation based on 1,5 times the inflow rate
- The retention time in the clarifier is very short (<2h), **the sludge remains activated** during the recycling. The contact zone (or Anoxic treatment) is not necessary and even counterproductive.

More generally, in a Speed-O-Clar-equipped clarifier, all the entering sludge is recovered under the effect of the counter currents. With the help of the sludge rake or the suction pipe, they are collected and recirculated entirely to the aeration tank.

Calculated data set confirmed by the observations and measures realized in the existing installations:

Bact. charge in Aerated tank (g/l) / Recirc. (%)	25	50	75	100	125	150	200	250	300
1	5.00	3.00	2.33	2.00	1.80	1.67	1.50	1.40	1.33
1.5	7.50	4.50	3.50	3.00	2.70	2.50	2.25	2.10	2.00
2	10.00	6.00	4.67	4.00	3.60	3.33	3.00	2.80	2.67
2.5	12.50	7.50	5.83	5.00	4.50	4.17	3.75	3.50	3.33
3	15.00	9.00	7.00	6.00	5.40	5.00	4.50	4.20	4.00
3.5	17.50	10.50	8.17	7.00	6.30	5.83	5.25	4.90	4.67
4	20.00	12.00	9.33	8.00	7.20	6.67	6.00	5.60	5.33
4.5	22.50	13.50	10.50	9.00	8.10	7.50	6.75	6.30	6.00
5	25.00	15.00	11.67	10.00	9.00	8.33	7.50	7.00	6.67
5.5	27.50	16.50	12.83	11.00	9.90	9.17	8.25	7.70	7.33
6	30.00	18.00	14.00	12.00	10.80	10.00	9.00	8.40	8.00
6.5	32.50	19.50	15.17	13.00	11.70	10.83	9.75	9.10	8.67
7	35.00	21.00	16.33	14.00	12.60	11.67	10.50	9.80	9.33
7.5	37.50	22.50	17.50	15.00	13.50	12.50	11.25	10.50	10.00
8	40.00	24.00	18.67	16.00	14.40	13.33	12.00	11.20	10.67
8.5	42.50	25.50	19.83	17.00	15.30	14.17	12.75	11.90	11.33
9	45.00	27.00	21.00	18.00	16.20	15.00	13.50	12.60	12.00
9.5	47.50	28.50	22.17	19.00	17.10	15.83	14.25	13.30	12.67
10	50.00	30.00	23.33	20.00	18.00	16.67	15.00	14.00	13.33
10.5	52.50	31.50	24.50	21.00	18.90	17.50	15.75	14.70	14.00
11	55.00	33.00	25.67	22.00	19.80	18.33	16.50	15.40	14.67
11.5	57.50	34.50	26.83	23.00	20.70	19.17	17.25	16.10	15.33
12	60.00	36.00	28.00	24.00	21.60	20.00	18.00	16.80	16.00
12.5	62.50	37.50	29.17	25.00	22.50	20.83	18.75	17.50	16.67
13	65.00	39.00	30.33	26.00	23.40	21.67	19.50	18.20	17.33
13.5	67.50	40.50	31.50	27.00	24.30	22.50	20.25	18.90	18.00
14	70.00	42.00	32.67	28.00	25.20	23.33	21.00	19.60	18.67
14.5	72.50	43.50	33.83	29.00	26.10	24.17	21.75	20.30	19.33
15	75.00	45.00	35.00	30.00	27.00	25.00	22.50	21.00	20.00
15.5	77.50	46.50	36.17	31.00	27.90	25.83	23.25	21.70	20.67

Data set of the sludge concentrations in the recirculation depending on the charge and the recirculation percentage of the inflow rate in the aeration tank.

CLIENT TESTIMONIALS

"The **Speed-O-Clar** supports peak flow rates at least 140 m^3/h, without decreasing the operation of the clarifier, doubling the amount of peak flow which was initially planned. "

ADAC 22 – Agence Départementale d'Appui aux Collectivités

RAPPORT ANNUEL D'ASSISTANCE TECHNIQUE - Station de Lanvollon/Vallée du Ségalen – 2019

"[...] the latest results from the station...
We are placing a new order for the manufacturing and installation of **another Speed-O-Clar** for our second treatment line for July 2018."

FIBRE EXCELLENCE SAINT-GAUDENS

Benjamin OÏFFER - FIBRE EXCELLENCE - 2018

"[...] The results of our plant operations for the first six months are particularly positive:
- No sludge flow despite high hydraulic loads,
- Improvement in the quality of the treated effluent (SS, COD),
- Phase out of the Ferric Chloride injection. "

BOURGES PLUS

Jean-Jacques BELLAYER – CEO, ASST BOURGES PLUS - 2016

Crouvezier
DÉVELOPPEMENT

[...] In 2011, the system was successfully tested for 7 months in our textile ennobling company's water-treatement station, at Crouvezier Développement, in Gérardmer (88). "We had problems with thickening sludge and a COD between 500 and 600 mg/l at the outflow. Now, the settling has been improved, and the COD rejected is in compliance with the regulatory 250 mg/l limits". At the same time, Phosphorus, Nitrogen and TSS discharge has also fallen sharply..."

Yves Crouvezier – CEO Crouvezier Développement - 2011

feurs
LOIRE

"[...] In reference to the Speed-O-Clar that you installed in the clarifier Nr.2 in December 2018, indeed we are highly satisfied with it. For proof, here are some figures:
- On the Speed-O-Clar-equipped line, we pass twice as much as on the line of clarifier Nr. 1, which is unequipped
- The sludge indices are exceptional (for us) and excellent: 160 against 600 on the other unequipped line.
- We have therefore significantly reduced the bypass flows during the intense rain periods.- MES and COD are maintained at very satisfactory levels given the flow rates we initially planned. If there are any municipalities or industries who wish to learn about this process, should not hesitate to contact us, we will share all our experience on this subject. "

Arlette Gay - Manager, Feurs Wastewater Station -2018

Other clients we are supporting:

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FRANCE
Water Team

AQUA VALLEY

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