

TAYA Systems

From a concept to a line of products

Tal Ronen*

How was the product born

Mr. Natan Parsons, the founder of WFI Ltd, was a very special individual; He was an inventor who developed 120 registered patents.

Natan realized that all rural areas do not cope well with wastewater treatment. The existing extensive systems cannot meet the new regulations.

The TAYA system was born on a sunny day in Boston at Natan's home garden when he said we must develop a system suitable for rural areas i.e. a **robust** system, **low operation cost** that can produce **tertiary quality** effluent.

Rural area's WWTP challenges

- ⊕ Absence of professional wastewater are: technicians (operators, electricians, control, and maintenance team).
- ⊕ Fluctuations in flow and load (especially in tourist sites).
- ⊕ Sludge handling.

The Target

To develop a system that will ease the burden of these parameters while producing high quality effluent at low operation cost

The development methodology

The development methodology was based on analyzing extensive wastewater treatment such as wetland and pointing out the limiting factors. For each limiting factor a solution was tailored.



The main features of TAYA are:

1. **High oxygen supply** is the key element to achieve high quality effluent and nutrient removal. Oxygen supply is the limiting factor in existing extensive systems. The TAYA system is allowing all the bio-film to be saturated with air many times a day by exposure to air. **This is a very efficient passive aeration.**
2. **Low electricity consumption** was a major target without compromising on oxygen supply.
3. **Hydraulic Efficiency** is responsible for the efficient aeration based on the following guidelines:
 - a. Maximizes the use of gravity
 - b. Minimum head loss by pumping from the bottom
 - c. Open channel arrangement for minimum friction and head loss
4. **No sludge handling on a daily or monthly base** is due to the combination of fixed media and Starvation. It allows for long sludge age, minimum sludge yield and higher degradedability.
5. **Feed Management** allows immediate dilution of wastewater that reduces risk of toxicity.
6. **Operating flexible regime.** It is possible to adjust many parameters such as amplitude, number of cycles a day and length of 'resting time'. That allows the operator to optimize the process and the cost in reaction to load.
7. **Upgrading capacity gradually** by adding media to the same system, is a great advantageous.

The way it works

The TAYA system is based on the filling and draining of pairs of subsurface flow basins. The fluids are pumped from one side to the other.

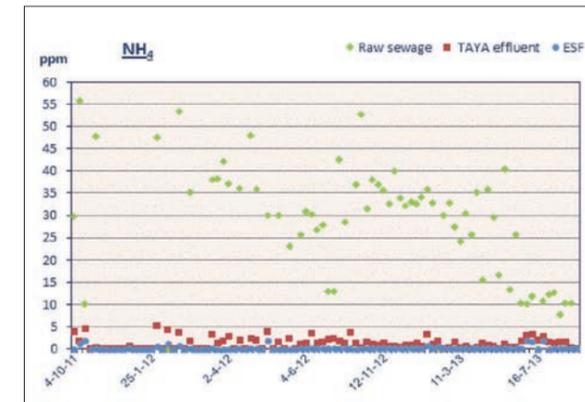
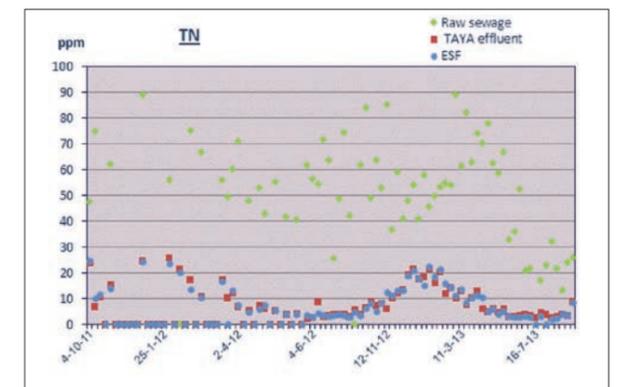
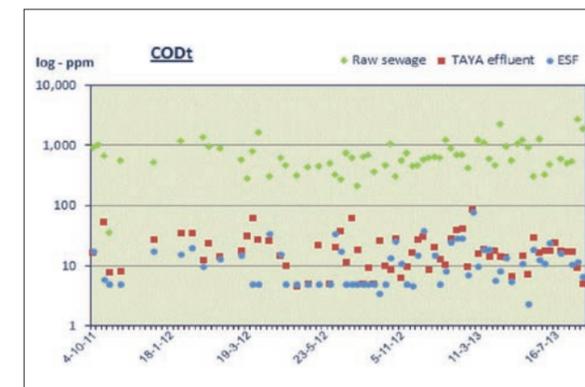
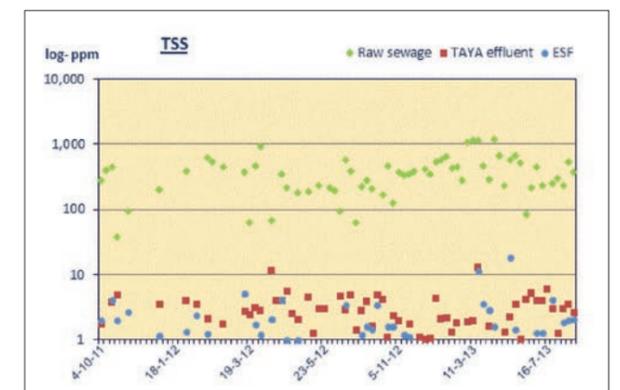
The number of cycles enables controlling the aeration rate while the level of fluids in the drained side defines the anoxic volume suitable for denitrification. Further on, the unique feeding process creating complete mix conditions that promotes denitrification and prevents clogging

TAYA-I, Gravel media

Our first product is a system based on Gravel TAYA. It is suitable for the following applications:

- a. Treating loads that are similar to domestic wastewater
- b. Polishing secondary effluent and finalizing ammonia treatment
- c. Industrial and agricultural heavy load with proper pretreatment

Fig. 1- Ramon Base WWTP results



The following results are an example to the level of effluent quality that can be achieved in 3 different cases.

1. **Domestic wastewater** treated to unlimited irrigation quality - Ramon base WWTP.
2. **Effluent Polish**, less than secondary level- Menashe-II WWTP designed for 5,500 m³/d
This plant is working for 3 months of running-in and already achieving the following effluent quality:

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Table 1. Menashe-II WWTP. Running- in results.

Date	Parameters	Influent	TAYA effluent
8.9.13	TSS	80.8	5.6
	BOD	50	6
	COD	131	20
	TN	27	4.7
	NH4	18	1

Menasheh-II project, 5,500 m³/d



3. Touristic resorts - Han Hashayarot, Treating variable loads of flow and organic matter 40 m³/d.

Table 2. Han Hashayarot - tourist resorts

Parameter (ppm)	Quality demanded	Plant Effluent
pH	6-9	6.8
BODt	20	4
CODt	70	15
TSS	30	3.5
N-NH4	50	15
TN	60	25.6



Industrial and agricultural wastewater are usually heavy loaded.

The gravel TAYA can be suitable for treating heavily loaded wastewater in cases that full treatment is needed.

The Lahav project is treating the heavily loaded piggery wastewater. The gravel TAYA performed as expected with high efficiency also on this load due to good pre treatment. The unique feature is the Nitrogen removal reducing NH4 level from 900 mg/l to 40mg/l .

Usually agricultural wastewater can be used as a fertilizer and not as effluent, therefore there is only a need to treat the TN level.

TN reduction from heavy load wastewater, is highly demanded .

TAYA - II, our second product, was developed for higher load applications of 4000 mg/l NH4. It is applying all TAYA's features but on a plastic media. That allows the system to nitrify-denitrify the TN without the need of massive solid separation.

The Plastic media is not as sensitive to solid accumulation. The solids are passing through the system. Our patented pumping chamber is used as an efficient mean of oxygen/ food transfer. Presently the system is introduced in Italy, Chile and the USA to the pigs and cows industry

Table 3. Typical design parameter for agriculture wastewater

Parameter mg/l	Inlet to TAYA system	outlet of TAYA system
COD	30,000	4000
BOD5	16,500	1000
NH4	3200	100
TN	4,000	400

In summary, the TAYA systems facilitates:

- A powerful treatment system of high ammonia loads and even with high TDS waste streams.
- Full treatment can be achieved with electricity consumption much lower than competing mechanical treatment technologies (about 90-80% saving).
- No sludge handling on a daily/monthly basis. That saves a lot in investment, operation and maintenance costs.
- Minimum area requirements compared to other more passive technologies.

The TAYA is practically an intensive system with regard to biochemistry aspect and an extensive system from the electro-mechanical aspects and the operational costs.