

# AquaLife Activate (Saltwater Formula) vs FRITZ-Zyme 9 and Turbo Start



## Introduction

To demonstrate the potency and effectiveness of Activate (Saltwater) vs the competition, sample of FRITZ-Zyme 9 and Turbo Start were obtained directly from the manufacturer (ordered on October 31, 2012). The price for a 4 oz bottle of Turbo Start was \$24.99 (plus air freight), and the price for a 32 oz bottle of #9 was \$15.99 (sent regular ground freight).



**AquaLife  
Activate,  
16 Ounces**

## Dose Rates



**FRITZ-Zyme  
Turbo Start  
4 Ounces**

The dose rates taken directly from the bottles of product are as follows:

- FRITZ-Zyme 9 - For a New System, 4 oz per 5 gallons
- FRITZ-Zyme turbo Start - One ounce per 20 gallons
- AquaLife Activate - One ounce per 20 gallons

## Measure of Bio-Solids and Functioning Rate of Each Product

Three methods were used to measure the biological active ingredients and efficacy of each product.

### A. Settled Solids

A standard 1 liter settling cone was used to measure the settleable solids content of each product. In this test, a well-shaken sample of product is introduced into the cone, and one hour elapses before a reading is taken. Solids settle to the bottom of the cone, and the volume of solids (in ml) is read using the calibrations on the cone. A final value in ml solids per liter of solution is obtained, and this gives a rough indication of the concentration of active ingredient in the products.

### B. Heterotrophic Bacterial Count

First, to distinguish between heterotrophic and nitrifying bacteria, heterotrophic bacteria consume organic carbon, and would be responsible for digesting sludge, excess food, fecal matter, etc. in an aquarium. Heterotrophic bacteria are responsible for keeping the aquarium clean. In contrast, nitrifying bacteria consume NH<sub>3</sub> and NO<sub>2</sub>, converting it into NO<sub>3</sub>. Nitrifying bacteria are not capable of consuming organic carbon. Therefore, standard nutrient agar "plates" used to identify and count bacteria only work for heterotrophic bacteria. Nitrifying bacteria do not grow on standard nutrient agar plates. Standard nutrient agar plates were used to determine the heterotrophic bacteria count (those bacteria that digest sludge and keep an aquarium clean) for all three products.



**FRITZ-Zyme  
No. 9  
32 Ounces**

## C. Nitrification Tests

To determine nitrification rates of each product, 3 identical 40 gallon aquariums were set up with standard and identical gravel, aeration, heating to 75 F, pH of 7.8, and bacterial dosing was performed based on the label directions.

Results for all three test types (settling cones, standard agar plate counts, and nitrification) are presented next.

## Results

### A. Settled Solids - Settling Cone Test

As noted previously, the settling cone provides a rough visual indicator of the concentration of bio-solids in the product. Some bacteria are free-floating, and remain in suspension (and therefore do not sink into the “settled solids zone”). However, the settling cone provides a quick indicator of the product strength. Results of the settling cone test are shown in the photo, and summarized below.

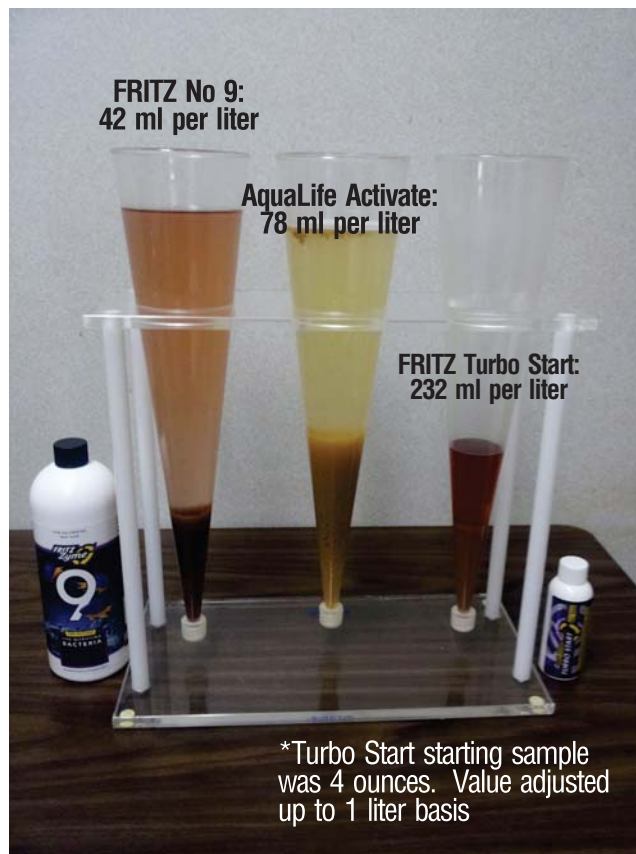
FRITZ No 9: 42 ml settled solids/liter  
AquaLife Activate. 78 ml solids/liter  
FRITZ Turbo Start: 232 ml solids/liter  
(note: Turbo Start sample was only 4 oz, so settled value was scaled upwards to provide a one liter basis).

From these tests, it is obvious that Turbo Start has the highest concentration of settled solids, though given its extremely high price (and the high cost of air freight, and its need for refrigeration). The AquaLife Activate product showed intermediate settled solids between the No9 and turbo Start Products.

However, the settled solids test only provides a visual indicator, and does not provide actual biological activity or content. To measure the actual active, live ingredients, the heterotrophic plate counts and nitrification tests are necessary.

### A. Heterotrophic Plate Counts

Nutrient agar was prepared according to standard methods:  
Nutrient agar is a microbiological [growth medium](#) commonly used for the routine cultivation of [non-fastidious](#) bacteria.



Nutrient agar is useful because it remains solid even at relatively high temperatures. Also, bacteria grown in nutrient agar grows on the surface, and is clearly visible as small colonies.

- 0.5 % Peptone
- 0.3 % yeast extract
- 1.5 % agar
- 0.5% NaCl
- distilled water
- pH adjusted to neutral (6.8) at 25 °C

After standard dilution rates, the final heterotrophic bacterial counts of each product were as follows (again, heterotrophic bacteria are the type that consume aquarium sludge or other organic compounds, and therefore can grow on nutrient agar):

- FRITZ-Zyme 9: CFU (colony forming units) = 2.1 Million per ml
- FRITZ-Zyme turbo Start - CFU (colony forming units) = 700,000 per ml
- AquaLife Activate - CFU (colony forming units) = 18 Million per ml

As seen in the above number, AquaLife Active contain nearly 10 times the heterotrophic plate count compared to FRITZ No. 9, and about 25 times the heterotrophic bacterial count shown by Turbo Start.

**NOTE: While FRITZ No 9 and Turbo Start may not intentionally include heterotrophic bacteria, the relatively tiny counts of heterotrophic bacteria in these products means that No 9 and Turbo Start will not effectively digest sludge or keep an aquarium clean. In contrast, the high population of heterotrophic bacteria present in AquaLife Activate provide excellent cleaning and sludge digesting function, and is a considerable advantage when comparing the AquaLife versus the FRITZ products.**

### C. Nitrification Tests

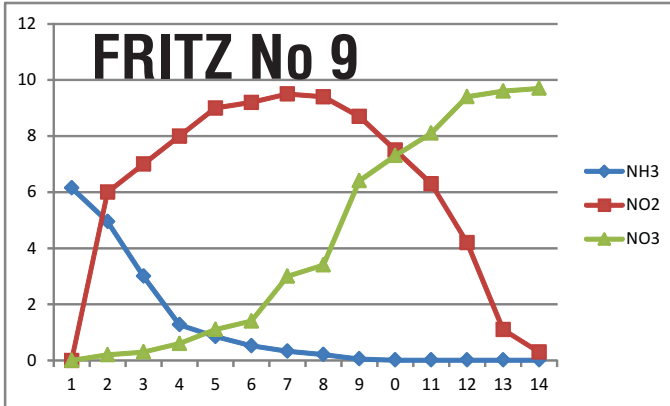
Nitrification tests are most likely the most important of the three test methods in this report. Nitrification is the sequential conversion of toxic ammonia into less toxic (but still problematic) nitrite, and finally into relatively non-toxic nitrate. The FRITZ labels indicate that the products contain saltwater specific nitrifying bacteria, and do not even mention heterotrophic bacteria. In contrast, the AquaLife Activate product is both a starter (nitrification product) and cleaner (sludge digester, requiring heterotrophic bacteria).

To test the nitrification ability of each product, identical 40 gallon saltwater aquariums (specific gravity 1.023 with Instant Ocean) aquariums were set up, and dosed with each product as follows:

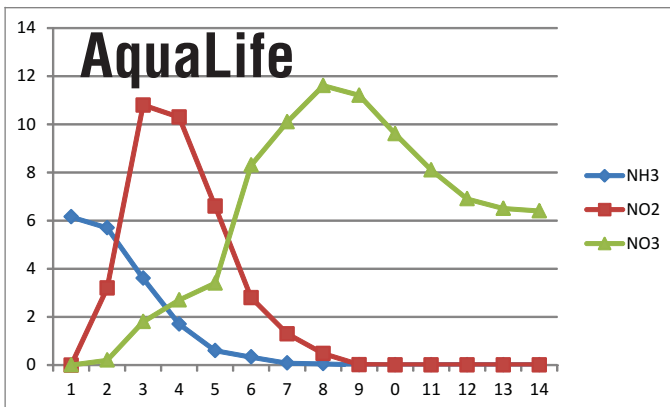
Initial parameters and product dose:							
	Dose (oz)	Tank size	NH3 (ppm)	NO2 (ppm)	NO3 (ppm)	Temp (F)	pH
FRITZ No 9 Tank	32	40 gal	6.15	0	0	75	7.8
FRITZ Turbo Start Tank	2	40 gal	6.15	0	0	75	7.8
AquaLife Tank	2	40 gal	6.15	0	0	75	7.8

Once the products were dosed (at the rates shown in the table, previous page), NH3, NO2, and NO3 concentrations were measured daily for 14 consecutive days.

At the beginning of the test run, the ammonia concentration in each aquarium was 6.15 ppm (a highly toxic NH3 level for an aquarium). The following charts show the progress over time for each of the three products relative to NH3, NO2, and NO3:



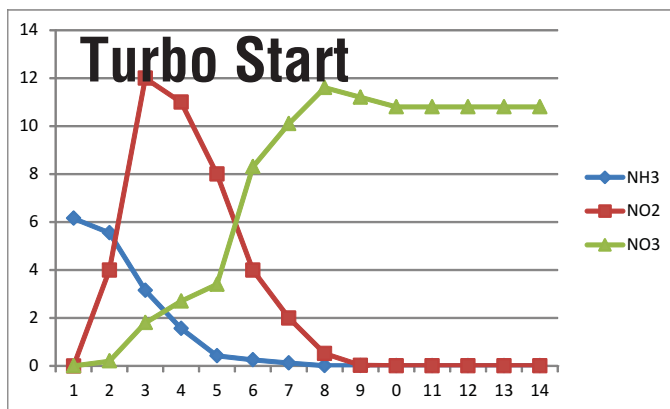
As shown in the charts, the No 9 product, with a dose of 32 oz per 40 gallons, was similar in nitrification to the other two products. However, **No 9 nitrite reduction was by far the slowest** of the three products, taking the full 14 days to eliminate NO2.



All three product removed the toxic ammonia in about 5 days. However, AquaLife was added at the same dose as was Turbo Start. **Given the extremely high price of Turbo Start compared per ounce to AquaLife Activate, the AquaLife product dramatically outperformed Turbo Start at ammonia removal on a cost per ounce basis.**

And of course, there is no need to refrigerate AquaLife (for shipment or storage).

Another significant difference was the nitrate trend vs time. AquaLife include sludge digesting and denitrifying bacteria. As can be seen in the AquaLife performance chart, NO3 levels declined over the course of the test, and at 14 days, were 40% lower (better) than Turbo Start. AquaLife, when used regularly, will reduce long-term nitrate build up, which is a major advantage over the FRITZ products.



Days of Reaction

## TEST SUMMARY

**Settled Solids** - As expected, Turbo Start had the highest level of solids in the cone test.

**Plate Counts** - Only AquaLife had significant levels of sludge digesting, nitrate reducing, heterotrophic bacteria in its sample (10 to 25 times more than No 9 and Turbo Start respectively)

**Nitrification** - All three products nitrified similarly under the test conditions. However, 32 oz of No 9 was used in comparison to just 2 oz of AquaLife and Turbo Start. Also, No 9 was relatively slow at nitrite removal. While the NH3 and NO2 removal of AquaLife and Turbo Start were similar, AquaLife had two huge advantages. First, it is dramatically less expensive per ounce than Turbo Start. Plus, AquaLife provides nitrate reduction, which Turbo Start does not offer at all.