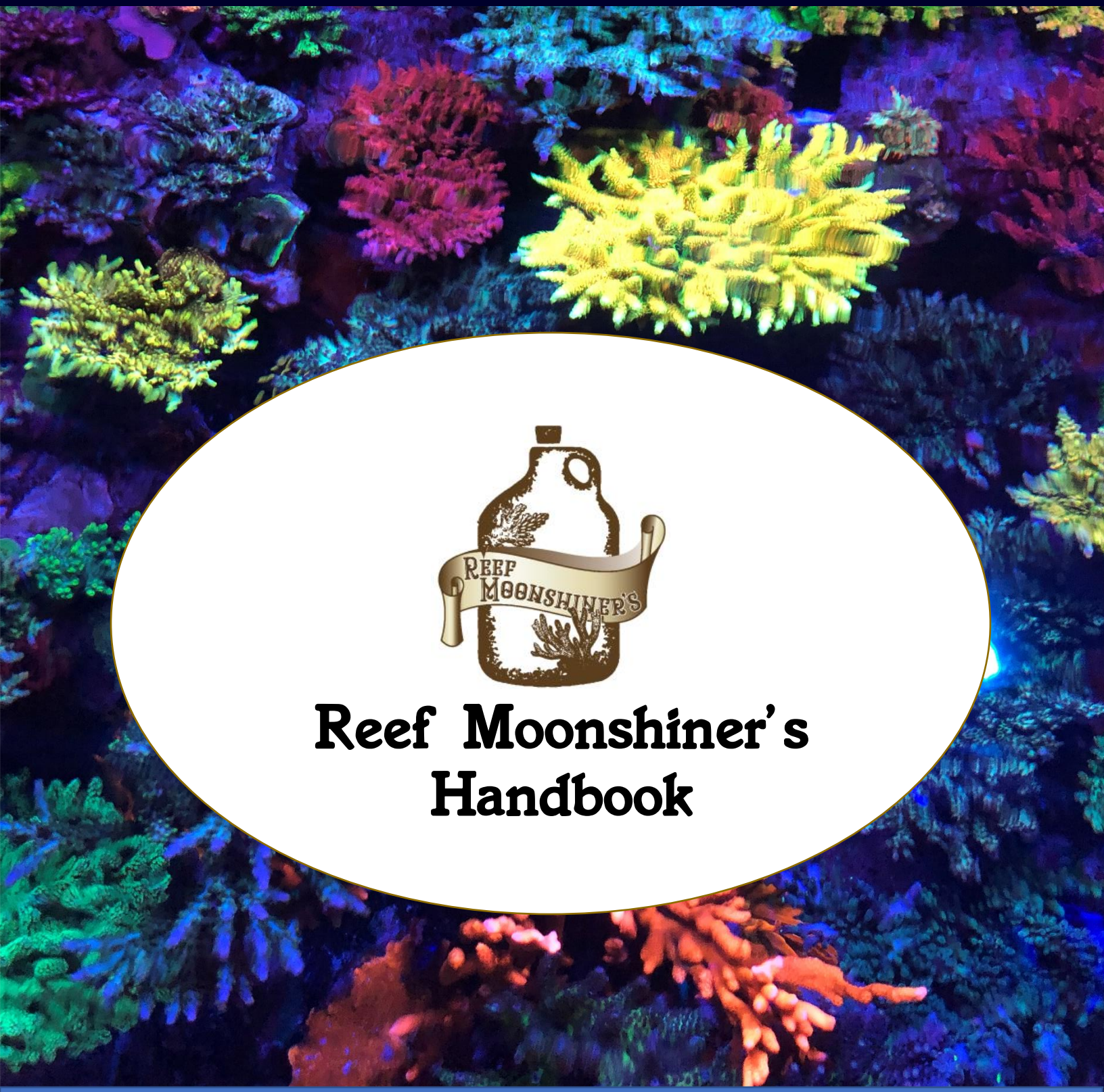

Reef Moonshiner's Handbook

COMPREHENSIVE USER MANUAL

Contents

Reef Moonshiners TM Tanks after 24 months of growth, initially filled, first ICP done a week later after first fill. From that point, no (regular) Water changes been performed and only Reef Moonshiner method is been applied. Needless to say, these tanks needed already a lot of fragmentation already, to keep Corals in shape.

SPS Dominated with multiple specimen of delicate soft corals, Bounces, Torches, Hammer and Zoa, this setup is an example of the possibility that all these Species can be kept in the same Reeftank system without the myth of outcompeting each other, as long the required trace elements are provided.

Credit

At this point I would like to thank all the Reef Moonshiner users out there for their loyality and trust given in this method and relevant products, and a big thank you to everyone who contributed to the success of the Reef Moonshiners method by asking questions, bringing ideas for improvement on the Products and Tools.
Thank you very much, couldn't have done that without you !

-Addendum after 5 years, still the same to all of you.

-Andre

Rev.5

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The Reef Moonshiner's method in a quick overview

In a few words, the Reef Moonshiner's method is a smart and very easy way to manage the entire Reef Chemistry on a Reef tank in the most effective way that will allow the Reefkeeper to grow nearly any coral since there will be no limitations anymore that would avoid keeping the most difficult Corals when it comes to the required chemistry of the water.

Basically, all important Trace elements, major and minor are individually measured, adjusted and maintained above natural seawater levels. So, there will be no room for questioning if anything may be depleted or missing that may lead to poor coloration or insufficient growth.

The adjustment and corrections on depleted elements are performed after an ICP test.

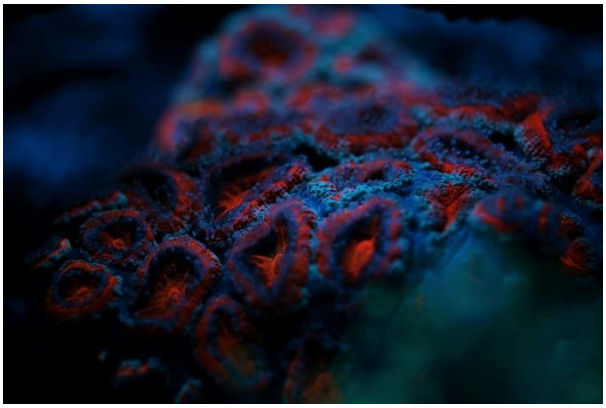
Also a few Elements are supplemented daily, to take advantage of the daily need of certain elements that usually deplete within a day or two after dosing or water change.

The beauty is that there will be no overdosing possible of any element, since each element is monitored and supplemented individually via a calculation tool that makes the determination how much solution and for how many days it will need to be dosed to achieve the desired level.

As soon the monthly or bimonthly corrections are performed, there is no worry about the chemistry for quite a while, and there is no real need for struggle with Test kits that may or may not correctly indicate Iodine, Potassium, Strontium etc. besides the fact that many minor elements not very significantly change between testing, hence no need for struggle and reading coloring charts not to mention the cost to maintain and keep the test kits.

No limitation on Livestock such as the most sensitive SPS species after the corrections, that require high level maintenance normally. This method brings the tank to highest level standards, without having a Master's degree in Chemistry or Biology! However this is not a magic Juice, the hobbyist is still required to manage filtration, biology and nutrients his personal preferred way.

Results and improvements can take from a few days usually until full effect that normally is seen after the first few months. Also, there is a high potential to waive water changes, which many users do not perform anymore after applying this method.



Trace Elements overview and it's importance

The below Summary is intended to give a brief overview of the required Trace Elements.

It is no secret anymore that Trace elements have to be maintained in some way to avoid depletion and enhance certain color effects and health of our corals.

However, what most people won't realize is that Trace elements are also very important for a healthy biology since certain bacteria also require trace elements for their metabolism and to maintain a healthy biological diversity. Same applies to the Aquariums Microfauna!

If certain Trace elements are below a particular range, the entire growth cycle is impacted and not just the coloration. A few elements that can't even be measured with home test kits will cause the entire calcification process to stop and cause other elements such as Calcium, Potassium and Strontium for example to creep up into ranges that they will then bleach corals, makes them more sensitive to light burn or even contribute to Tissue Necrosis (RTN/STN).

In a lot of cases I have seen that simply only Barium in depleted levels, did bring the entire Reef tank to a full stop, causing other elements going out of whack really badly. The Reef Moonshiner's method and elements, will avoid that with ease, and it makes sure that individual elements can't increase into excessive levels.

The Reef Moonshiner's method is designed to manage the entire Reef Chemistry with lowest possible cost for the Reefkeeper and is a mix of Reef Moonshiner Elements as well as common available Products which are recommended to be used and to be mixed and used in line with the Moonshiner Dosing tools for adjustments/corrections. All the above is supported by an easy to use Online tool that is downloaded for free and used to assess the ICP Tests and determine what and how much need to be supplemented.

Categories of Trace Elements dosing under the Reef Moonshiner's method

Dosing Regime is split in 3 simple categories:

- **Daily dosing** 6 elements (determined by the ICP Assessment and Dosing Tool)
- **Correction dosages** after each ICP - on monthly or bimonthly basis, can be extended

  No other dosing needed in between, if Calcium and Alkalinity is maintained via dosing or Calcium reactor.
- **Daily/Monthly/Quarterly** dose of Rubidium (with the newer Reef Moonshiners Test kits, this is a corrective element)

Daily Dosing (also called "The Dailies") :

These Elements are dosed daily to ensure small amounts of these traces are continuously available for most stability. The Tool will determine if required to be dosed, based on the ICP test results. Dosing of the below daily elements usually takes only a few minutes.

- Iodide
- Manganese
- Cobalt
- Chromium
- Iron
- Selenium
- Vanadium (if required by the Tool)
- Liqui Mud and Vitamin-X as additional options (see Website Product description)

Dosing after ICP (so called Corrections)

These elements are simply going to be corrected back to the recommended target levels if required after each ICP result. Target levels are shown in the Reef Moonshiner calculation tools. Use of Calcium reactors usually minimize the need for corrections significantly, depending on the media that is used.

- Calcium (typically maintained by the hobbyist already anyways)
- Magnesium (typically maintained by the hobbyist already anyways)
- Potassium
- Bromine
- Strontium
- Boron
- Fluoride
- Barium
- Molybdenum

- Nickel
- Zinc
- Rubidium (Is only tested with the newer Reef Moonshiners Test kits)
- Copper (if determined by the ICP Assessment and Dosing Tool)
- Tin (available on special request, normally not required)

Dosing monthly/quarterly - Rubidium

Rubidium CAN be a little bit of an exception from the above dosing regime and a correction will be dosed initially to Natural Seawater level, when the method will be started first time, and then subsequent dosed in a smaller maintenance dosage on either a monthly or quarterly basis **in case the ATI ICP Test** is used.

The "ICP Assessment and dosing tool" also advises the daily Rubidium if desired.

Rubidium is not a mandatory element to be dosed in the beginning, however it has shown to be extremely beneficial to mixed reefs that also include Torches, Zoa, and exotic Shrooms and other Soft corals. The experience is from trials is that Bounces and Shrooms and Zoa are reproducing much quicker and more than without the supplementation of Rubidium. Rubidium is usually always going nearly depletion levels in normal tanks, since it is a costly element and barely included in most supplements and Salt mixes.

Depending of which ICP Test will be used, which will be explained in more detail later, Rubidium can be dosed as a Corrective Element as well, since the Reef Moonshiner's ICP Test kits do measure Rubidium as part of the measured Elements as well, the ATI Test kit doesn't measure it at the time of this Handbook release.

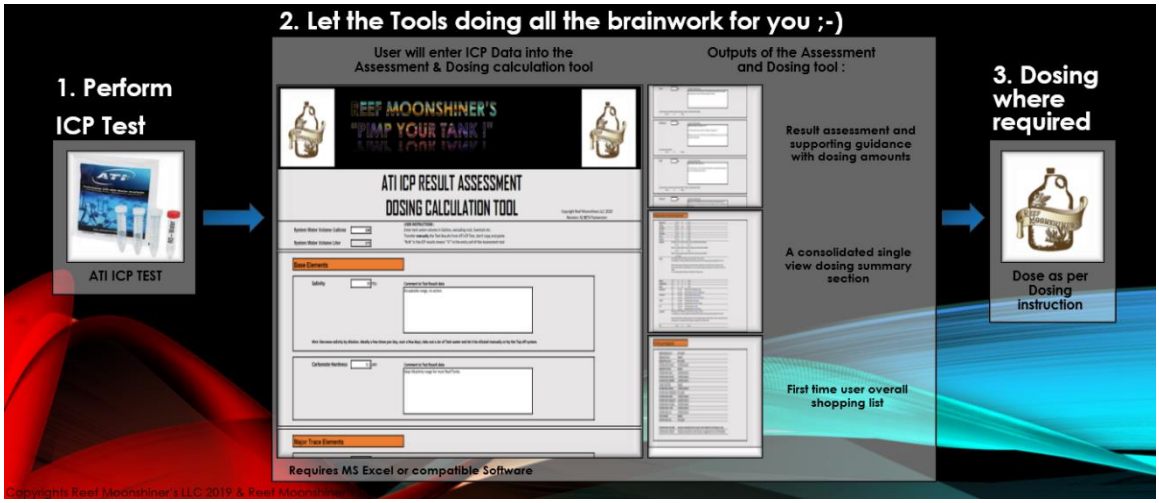
Applying the method

Applying the method is actually very easy. There are free digital tools available which will fit beginner and Pro Reefkeeper.

1. Perform one of the supported ICP Tests (ATI ICP or Reef Moonshiner's ICP)
2. Enter the Tank Volume and Test Results into the automated "ICP Assessment and dosing tool" and let the tool doing all the calculations for you fully automated to the Moonshiner target levels!

   As a Beginner, use only the ICP Assessment Tool!

   The Reef Moonshiner's Tool also allows manually in the Classic calculator section to dose any element to the Reefkeepers own preference, however this needs significant knowledge and understanding to operate the Tools for these purposes.
3. Perform the corrections as needed with the elements in accordance to the tool you chose. Simply speaking, create the needed saltwater mix we want for our corals!
4. Dose the daily elements as instructed by the "ICP Assessment and dosing tool" which advises to dose these daily elements, as well how much. See the Section "Dosing the Elements" in this Handbook to learn some useful hints and tricks for dosing the elements and handling and storing the products.



The following sections in this Handbook will describe in more detail the functions of the Digital tools, the Reef Moonshiner system uses.

- ICP Assessment and dosing tool (Automated to meet the Target levels)
- For advanced Reef Moonshiner's Users only: Reef Moonshiner Calculator
  (Semi Automated Calculator for Reef Moonshiners and supported Products to allow individual dosing to preferred or users own target levels)

Be aware, the Digital Tools are MS Excel based, and may or may not be compatible to Non MS Excel software. Please test the tools prior purchasing the products. In many cases where compatibility problems did arise, Google-Sheets was successfully used as alternative. Be aware that the Excel sheets can't be edited on most mobile devices, hence they won't work on phones and such.

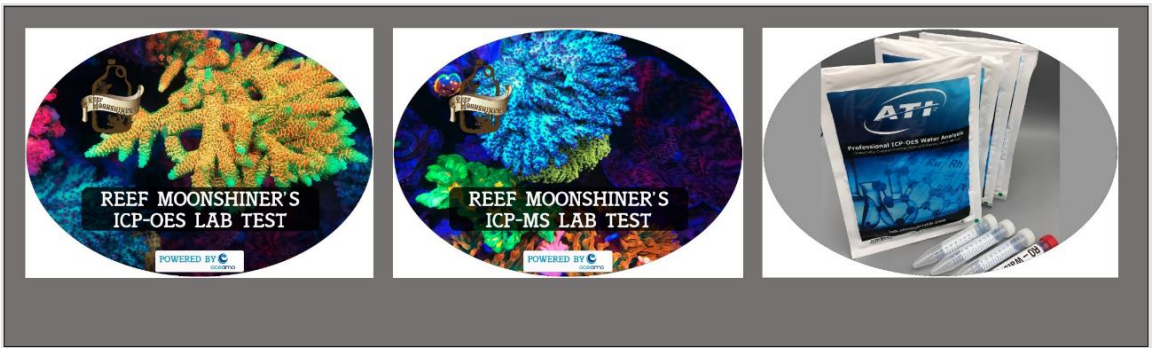
Choose and perform the right ICP Test

The Reef Moonshiner's method has selectively chosen a very small but extremely reliable variety of Test kits that are to be used in conjunction with the Tools and Products for many reasons.

The success in this method starts with the Test kit results from a high quality and scientific operated Laboratory based on professional equipment installation. Do not deviate from the recommended laboratories that are listed next. There is a reason for those Test labs.

The following ICP Test kits are to be used:

- ATI ICP-OES Test kit
- Reef Moonshiner's ICP-OES Test kit (Analyzed by Oceamo Labs)
- Reef Moonshiner's ICP-MS Test kit (Analyzed by Oceamo Labs)



Here is some background information which will help to choose the right Test kit for your case.

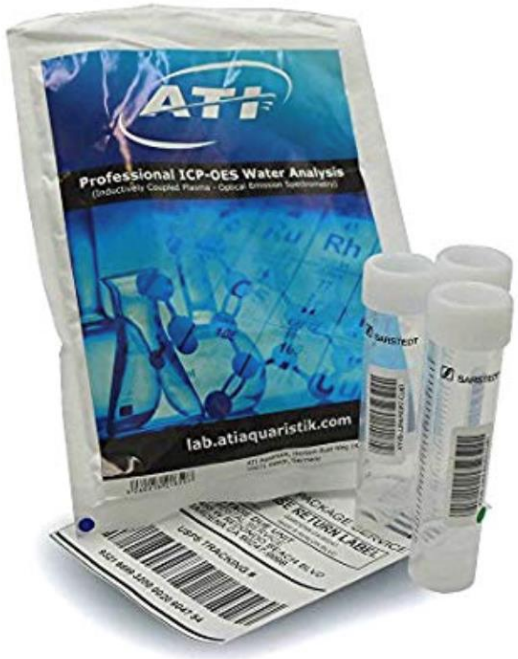
Read the below details for each kit and learn about benefits and disadvantages of each.

ATI ICP-OES

This test kit is the basic minimum standard ICP test you can start the method with perfectly fine. ATI has been used over the last years by thousands of Moonshiner users until the Reef Moonshiner's test kits have been released on the market. The ATI kit does often ships free on Amazon, is available in many local stores as well as in many countries around the world. Disadvantage of any ICP-OES, compared to an ICP-MS test is that some of the very important minor trace elements are shown as non-detected in the results, since an OES test kits does not detect them around below the 1ug/L range. So between 0 ug/L and around 1 ug/L this is with these test kits more of an unknown factor where our tank really is. Also Rubidium is not measured in this kit. It also has a few more Elements tested in his RODI testing part than many other Test kits.

It comes with a Pre-Paid return label, turnaround is around 10-14 days normally.

I do recommend personally any Starter in the Reef Moonshiner's method, to start with one of the ICP-OES test kits, unless you feel you are dealing with severe bleaching and faded corals, then the ICP-MS test may be the better choice anyways since it provides more and better data for troubleshooting a tank system. If budget is not a concern, go with the ICP-MS test kit right away!



Follow the instructions on the test that you receive, to set up the account at the first time.

Simply place it into the package slot/box at the Post office or use your own mailbox to get it out.

The ATI user interface and database keeps track of all results and the user can unlock all elements to be shown in graphs and curves, customized to show the element trending over time.

The sample shall be taken 2 days at least after the last water change, and prior the daily doses if you already do the daily elements dosages.

As soon the email with the Test results have been received, the second column (in the red oval) as part of the result table does show your measured parameter of the sample you sent in.

That is all you are looking for as part of this Test kit, ignore their reference values and dosing instructions completely to continue with the Reef Moonshiner's method!

Potassium	423.7 mg/l	406.3 mg/l
Bromine	95.30 mg/l	66.72 mg/l
Strontium	10.42 mg/l	7.97 mg/l
Boron	6.27 mg/l	4.38 mg/l
Fluorine	1.48 mg/l	1.29 mg/l
Minor elements		
Lithium	416.3 µg/l	169.3 µg/l
Silicon	108.2 µg/l	99.58 µg/l
Iodine	68.33 µg/l	64.73 µg/l
Barium	40.73 µg/l	9.96 µg/l
Molybdenum	1.74 µg/l	11.95 µg/l
Nickel	u.	0.50 µg/l
Manganese	u.	1.00 µg/l
Arsenic	u.	1.49 µg/l
Beryllium	u.	0.10 µg/l
Chrome	u.	0.50 µg/l
Cobalt	u.	0.10 µg/l

The "reference values" in the Test result and dosing instructions in the ICP result from ATI can be ignored if the Reef Moonshiner method will be applied.

The column with the "reference value" is showing the ideal parameter you would need to maintain, "IF" you would try to maintain the ionic ratio of Seawater in line with your "current" salinity!

Means, if your salinity would have been measured higher, all the trace elements would be shown higher in the "reference values".

Unless you do not fully understand the ionic ratios of trace elements in natural seawater complex, these values can be ignored and won't be needed for our purpose.

The Data will be transferred into the Reef Moonshiner's ICP-Assessment Tool which will assess the results and advise the required dosages and what need to be purchased if you are a first time user.

Reef Moonshiner's ICP-OES (Analyzed by Oceamo)

The Reef Moonshiner's ICP-OES test kit is an advanced OES test kit as part of the Reef Moonshiner's ICP test kit family! It still has the same disadvantage as any ICP-OES, compared to an ICP-MS test is that some of the very important minor trace elements are shown as non-detected in the results, since an OES test kits does not detect them around below the 1ug/L range. So between 0 ug/L and around 1 ug/L this is with these test kits more of an unknown factor where our tank really is.
The big advantage of this kit is that is measures Rubidium which makes Rubidium a controlled and corrective element of the Reef Moonshiner's method, which ATI's test doesn't measure.

The Reef Moonshiner's ICP-OES test kit does also measure Nitrite as part of the Nutrients section which can indicate issues in the Nitrogen and bacteria biology if significantly increasing over time.

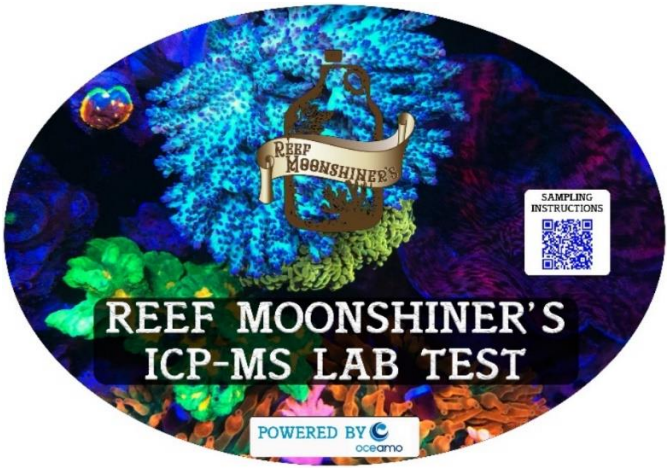
The RM ICP test kits also measure your RODI water, however will only report the 3 most important and usually first impurities that show up when the RODI unit need maintenance. Those are Silicates, Copper and Zinc. Any of those detected, means cartridge replacement.

Another important aspect of the Reef Moonshiner's test kits is that it includes a sterile Syringe and a Micro filter which is used to remove/reduce biological and biochemical contaminants which will results in more accurate results as well much higher stability during transit of the samples.

It also comes with a pair of gloves, that are not simply there to avoid to get your hands wet, but also reduces the contact of the test tubes with greases and chemicals in the sampling process that the Hobbyist constantly spreads and can have an affect on the very sensitive ICP equipment or water sample characteristics.

The big disadvantage of the Reef Moonshiner's test kit is that it is not readily available and typically need to be purchased from the Reef Moonshiner's webstore/website and is subject to additional Shipping fees. I recommend therefore strongly to buy the Reef Moonshiner's Test kits with a first time or reorder of any elements or products to make the most out of the Shipping fees.

I do recommend personally any Starter in the Reef Moonshiner's method, to start with one of the ICP-OES test kits, unless you feel you are dealing with severe bleaching and faded corals, then the ICP-MS test may be the better choice anyways since it provides more and better data for troubleshooting a tank system. If budget is not a concern, go with the ICP-MS test kit right away!



Reef Moonshiner's ICP-MS (Analyzed by Oceamo)

The Reef Moonshiner's ICP-MS test kit is the most useful Flagship of all available Test kits on the market!

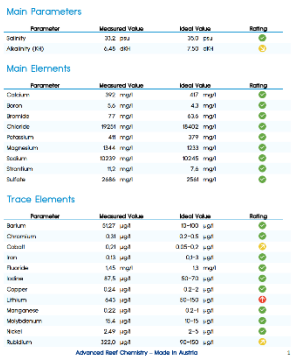
It has the benefits as the previous mentioned Reef Moonshiner's ICP-OES test kit, but it comes with the additional feature that is does also truly and accurately reads in the ultra low trace element ranges. That means it will give you an accurate reading result below the detection limits of all the OES test kits.

This is especially important for the very crucial minor traces that are part of the Corals photosynthetic processes that do play a role in the energy supply, Amino acid synthesis and Nutrition transport inside the very complex Coral/Symbiotic algae organism!
Those are but not limited the daily elements such as Manganese, Iron, Cobalt, Chromium and Selenium but also Copper. Any of these are truly depleted to zero and your Corals do will not be able to perform some of the crucial biochemical processes that they need to live and thrive and color up at the end.

Not to mention to be able to resist infections and diseases, that is many times very underestimated. Reef Moonshiner tanks under this regime have been surprisingly well survived and recovered from major disasters such as Freeze, Heat, Power outages and Storms.

Disadvantage of this test is the additional cost it comes with, higher than the ICP-OES test kit.

I do recommend personally any Starter in the Reef Moonshiner's method, to start with one of the ICP-OES test kits, unless you feel you are dealing with severe bleaching and faded corals, then the ICP-MS test may be the better choice anyways since it provides more and better data for troubleshooting a tank system. If budget is not a concern, go with the ICP-MS test kit right away!



Main Parameters

Parameter	Measured Value	Ideal Value	Rating
Salinity	31.2 psu	35.0 psu	
Alkalinity (KH)	6.45 dKH	7.50 dKH	

Main Elements

Parameter	Measured Value	Ideal Value	Rating
Calcium	390 mg/l	417 mg/l	
Boron	5.6 mg/l	4.3 mg/l	
Bromide	77 mg/l	63.5 mg/l	
Chloride	19231 mg/l	18402 mg/l	
Potassium	411 mg/l	379 mg/l	
Magnesium	1344 mg/l	1233 mg/l	
Sodium	10339 mg/l	10245 mg/l	
Strontium	11.2 mg/l	7.6 mg/l	
Sulfate	2686 mg/l	2561 mg/l	

Trace Elements

Parameter	Measured Value	Ideal Value	Rating
Barium	0.27 µg/l	10-100 µg/l	
Chromium	0.38 µg/l	0.2-0.5 µg/l	
Cobalt	0.01 µg/l	0.05-0.2 µg/l	
Iron	0.15 µg/l	0.1-3 µg/l	
Fluoride	1.65 mg/l	1.3 mg/l	
Iodine	57.5 µg/l	50-70 µg/l	
Copper	0.24 µg/l	0.2-2 µg/l	
Lithium	8.43 µg/l	50-150 µg/l	
Manganese	0.22 µg/l	0.2-1 µg/l	
Molybdenum	10.4 µg/l	10-15 µg/l	
Nickel	2.49 µg/l	2-5 µg/l	
Rubidium	122.0 µg/l	50-150 µg/l	

Advanced Reef Chemistry - Made in Austria

Results are easy to read and transferred into the ICP-Assessment Tool.

Simply transfer the "Measured Values" into the Tool and see the comments and relevant dosing instructions.

"Ideal values" are referencing to Natural Seawater habitats and are not to be followed in order to continue with the Reef Moonshiner's method.

Reef Moonshiner's ICP Testing Sequence and Turnaround

Each Test Envelope has a QR code on the right side of the colorful sticker that will link you to the very detailed Testing and sampling instructions of the test.

The link of that QR code will lead you to the website's instructions:

https://www.reefmoonshiners.com/icp-sampling

PLEASE NOTE:

The sampling instructions are written for the RM ICP-OES & RM ICP-MS test kits, however the MS test comes with an additional blue capped tube, that is not included in the OES test kits.

So if you are sampling with the OES test kit, you can ignore the instructions concerning the blue capped test tube.

The usual turnaround is 5-9 days within the United States .....

Reef Moonshiner's took the additional step to take on it's own ICP test kit and domestic and international distribution.

In the instructions you are advised to take a picture quick of your test tube and USPS shipping label. That is very important!

Every sample that arrives via the USPS return label in Houston on "Monday" or "Friday" is going to make the Expedited Airfreight to Europe that night, usually arrival on Wednesday (on a Monday Plane) or Monday (on a Friday Plane) in the Oceamo Lab in Austria.

Then it can take 1-2 days to get the email with the result attached. Make sure you got an email with the registration, so then you ensure you will receive the email with the results as well!

Typically the results roll-out will be all MS test results first, and then the batch with the OES results will be sent via email.

Holidays or Disasters in the US can delay that process by a day with ease due to international outbound logistics.

Check your USPS Return Label tracking number for when it arrived the Collection point in Houston for more details as described above.

Calculate and perform the Corrections

With the knowledge of the current measured levels from the ICP test and the Target levels we want to achieve, it's now easy to identify which elements need correction! Basically, all elements that are below the target levels!

There are 2 ways now, how to assess the results and the required dosing:

1.) The easy way: Run the ICP Assessment and dosing tool (Automated to Target levels)

2.) Manual Calculation: Reef Moonshiner Calculator (Semi Automated Calculator)

I will explain on more depth how the Reef Moonshiner calculator works in a later section if interested in the manual way, so here the quick and easy summary how to get the ICP results being assessed and the required dosing to be calculated.

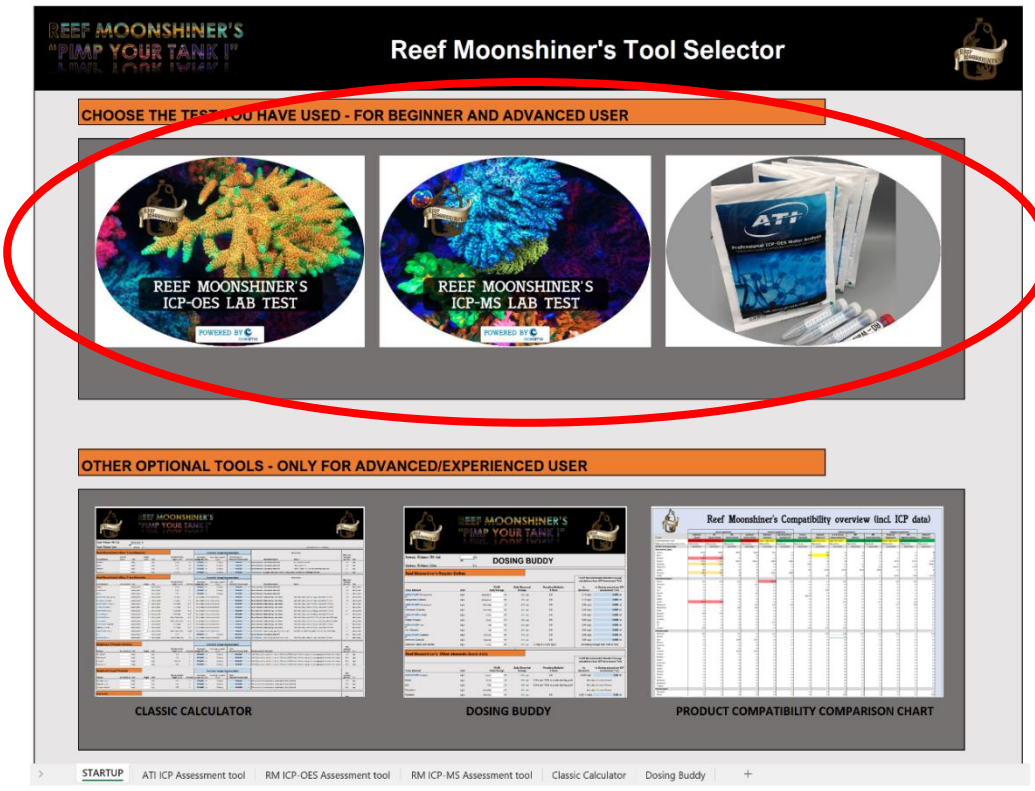
First thing is to download/open the Reef Moonshiner tool from the Website.

https://www.reefmoonshiners.com/handbook-tools

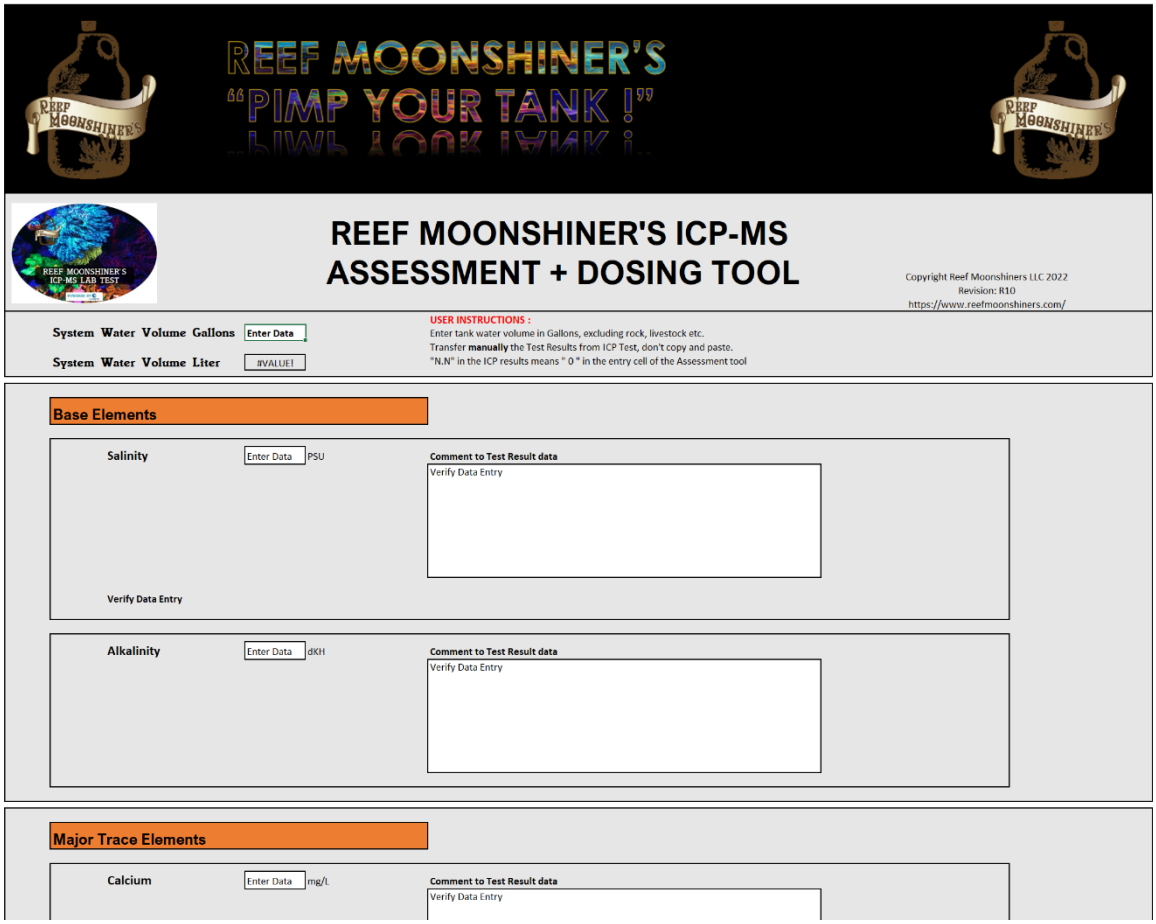
ICP Assessment and Dosing tool (The most preferred way, especially for beginners)

Using the Assessment tool is extremely easy.

First you open a fresh File of the ICP Assessment tool and choose/click the Test kit you have used in the Startup Screen. If you use Google-Sheets, then you may need to select the particular tool section by clicking the Tab on the bottom of the screen!



The lower section shows optional Tools for advanced users only!



1. Enter the Tank system volume in Gallons into the tool, consider the Water volume with no rocks etc. A good estimate is good enough.

   Often the Display tank volume is as a result the closest water volume of the entire system. Do only count the water volume during a normal operation of the Reeftank system including all reactors and sumps and connected water bodies.

2. Transfer the Test results from the ICP test result into the Assessment tool, element by element.

   The manual transfer of these values will incredibly fast educate and make you familiar with good and bad ranges of many new parameter you had no idea can be of importance for your Reeftank and Corals!

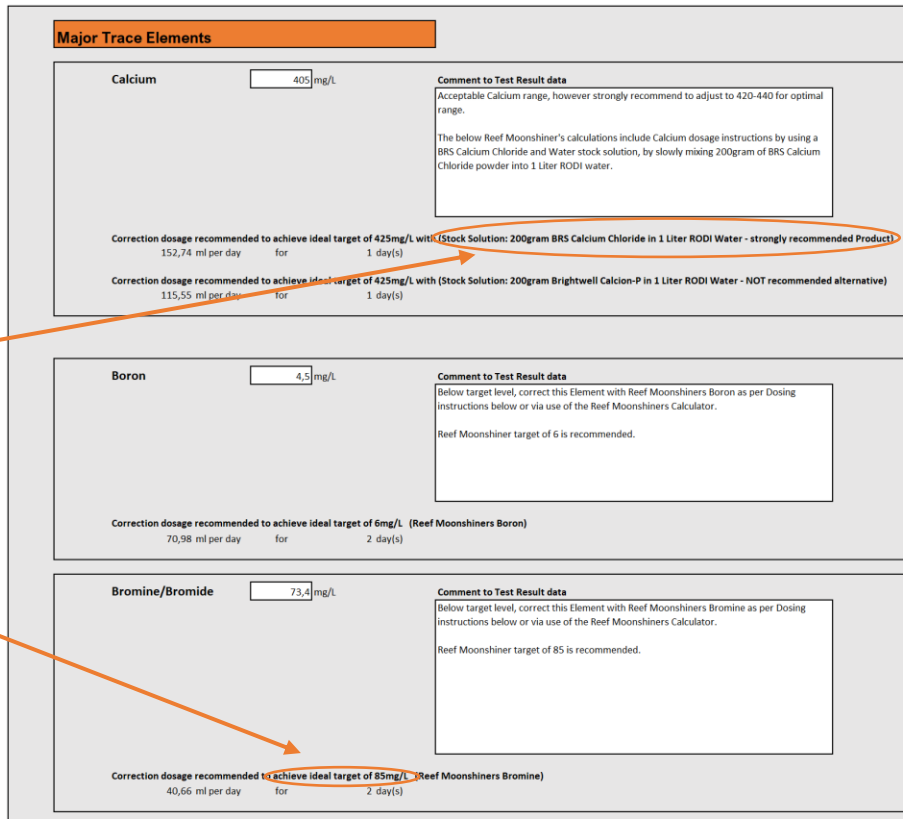
3. Read all the detail comments on the right side, and get the corrections or daily elements dosages from the tool.

   All ICP Tools do show some differences in the individual comments and are customized to each test, so go through the comments every time, especially when you use another test at that time than before.

The Tool shows the required dosages for corrections below each comment window!

Some Major Elements provide a choice of Products that can be used, as well their mixing recipe as shown here.

The section with the correction Dosages also always show the target levels it will correct the water parameter to!



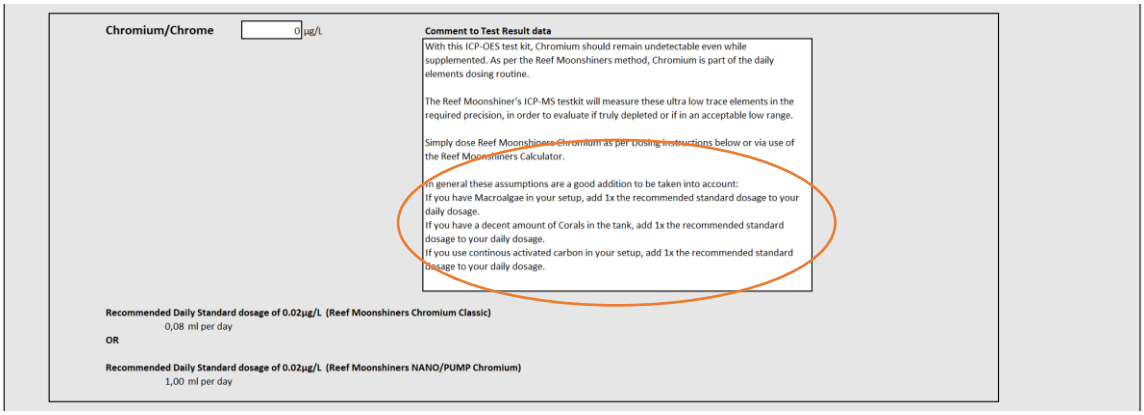
Correction dosages are also shown in the amount per day, and for how many days they may be dosed in case they need to be split up in multiple dosages. After the correction is complete, you wait for the next ICP test to arrive.

On **Daily elements**, you will see the recommended 1x daily standard dosage for your tank.

In the detail comments you will find a guidance for how many times you may need to multiply this 1x daily amount.

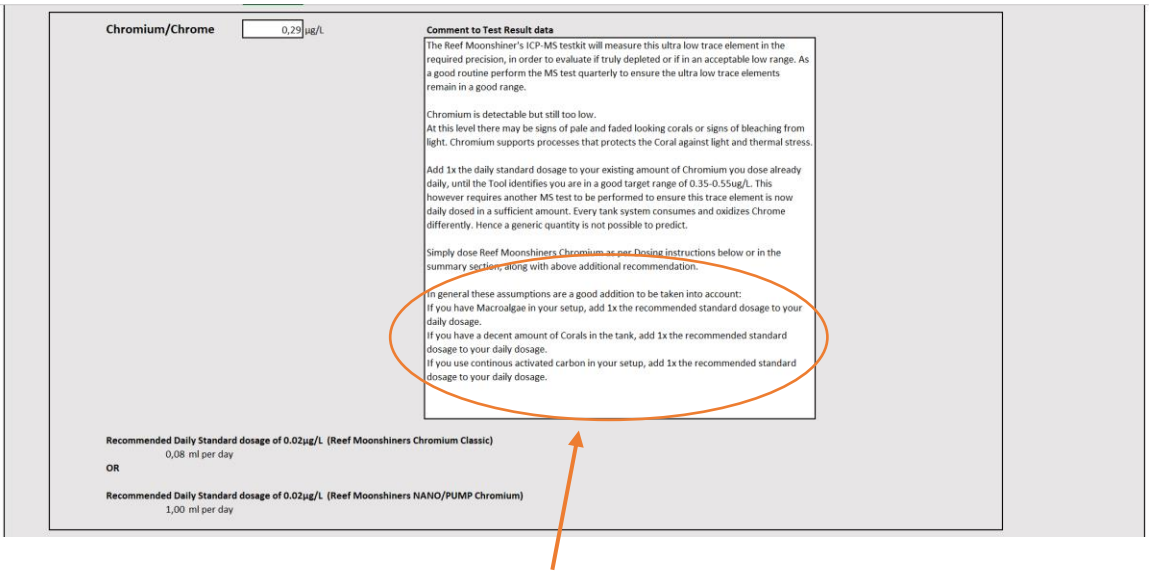
This applies to the OES Test kits for the most, since the ICP-OES kits cannot read below the 1ug/L range accurately. Most dailies are however hovering and targeting below the detectable limits.

All Daily dosages are shown for the Classic Elements as well for the **NANO/PUMP** Elements. There is a section in this Handbook describing these 2 versions in more detail.



Under the **ICP-MS tool**, the **Daily elements**, you will see the recommended 1x daily standard dosage for your tank as well.

In the detail comments however you will find a guidance for how many times you may need to add to the already dosed or current dosed amount.



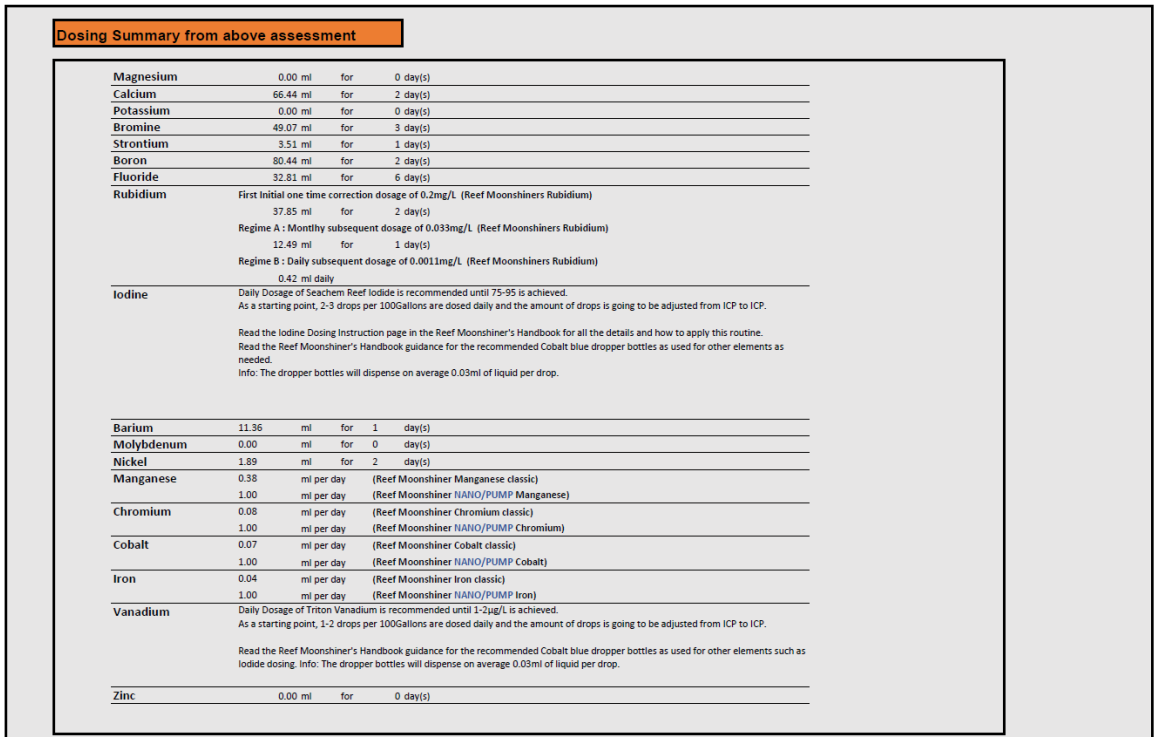
If you are doing an **ICP-MS test as your first time ever test** under the Reef Moonshiners method, then you start with the guideline in the detail comments under the general assumptions, in order to find a starting dosage for your dailies.

In Reeftanks with many Corals, Carbon use or UV/Ozone use, you will find that the dailies are used up much higher, however since every tank is truly unique these estimations can not be predicted. Patience and testing is key here!

Wavemaker after 6 months of increased Selenium dosages.

One of the few minor trace elements that is only accurately tested with the Reef Moonshiner's ICP-MS test kit on the market.

Too low Selenium is also indicated when Reeftanks stop to show healthy Coralline growth, however as shown on this picture, be careful what your wishing for!



Dosing Summary from above assessment

Magnesium	0.00	ml	for	0 day(s)
Calcium	66.44	ml	for	2 day(s)
Potassium	0.00	ml	for	0 day(s)
Bromine	49.07	ml	for	3 day(s)
Strontium	3.51	ml	for	1 day(s)
Boron	80.44	ml	for	2 day(s)
Fluoride	32.81	ml	for	6 day(s)
Rubidium	First Initial one time correction dosage of 0.2mg/L (Reef Moonshiners Rubidium)			
	37.85	ml	for	2 day(s)
	Regime A : Montlhy subsequent dosage of 0.033mg/L (Reef Moonshiners Rubidium)			
	12.49	ml	for	1 day(s)
	Regime B : Daily subsequent dosage of 0.0011mg/L (Reef Moonshiners Rubidium)			
	0.42	ml daily		
Iodine	Daily Dosage of Seachem Reef Iodide is recommended until 75-95 is achieved. As a starting point, 2-3 drops per 100Gallons are dosed daily and the amount of drops is going to be adjusted from ICP to ICP. Read the Iodine Dosing Instruction page in the Reef Moonshiner's Handbook for all the details and how to apply this routine. Read the Reef Moonshiner's Handbook guidance for the recommended Cobalt blue dropper bottles as used for other elements as needed. Info: The dropper bottles will dispense on average 0.03ml of liquid per drop.			
Barium	11.36	ml	for 1	day(s)
Molybdenum	0.00	ml	for 0	day(s)
Nickel	1.89	ml	for 2	day(s)
Manganese	0.38	ml per day	(Reef Moonshiner Manganese classic)	
	1.00	ml per day	(Reef Moonshiner NANO/PUMP Manganese)	
Chromium	0.08	ml per day	(Reef Moonshiner Chromium classic)	
	1.00	ml per day	(Reef Moonshiner NANO/PUMP Chromium)	
Cobalt	0.07	ml per day	(Reef Moonshiner Cobalt classic)	
	1.00	ml per day	(Reef Moonshiner NANO/PUMP Cobalt)	
Iron	0.04	ml per day	(Reef Moonshiner Iron classic)	
	1.00	ml per day	(Reef Moonshiner NANO/PUMP Iron)	
Vanadium	Daily Dosage of Triton Vanadium is recommended until 1-2µg/L is achieved. As a starting point, 1-2 drops per 100Gallons are dosed daily and the amount of drops is going to be adjusted from ICP to ICP. Read the Reef Moonshiner's Handbook guidance for the recommended Cobalt blue dropper bottles as used for other elements such as Iodide dosing. Info: The dropper bottles will dispense on average 0.03ml of liquid per drop.			
Zinc	0.00	ml	for	0 day(s)

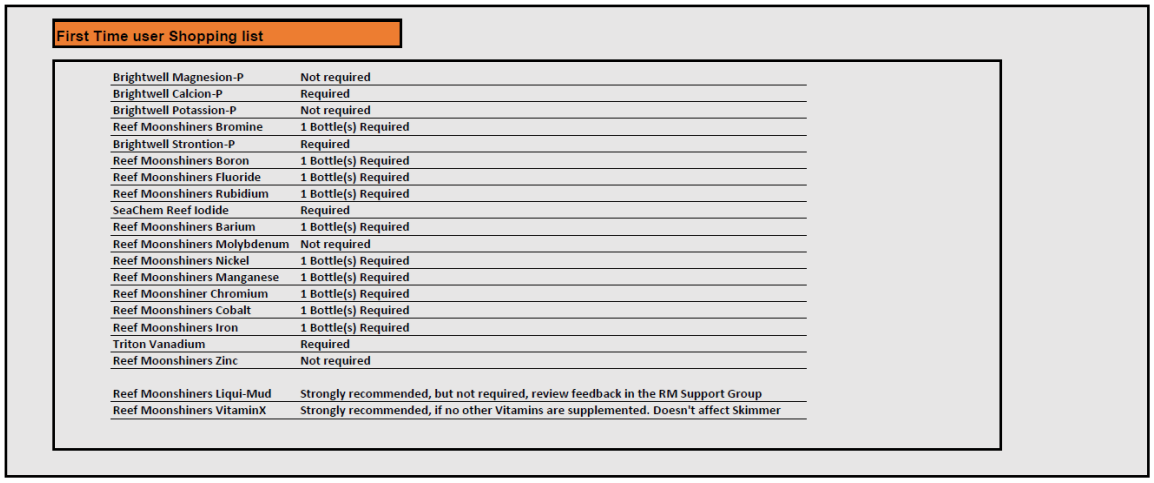
The tool comes with a summary section of all recommended dosing identified by the Test results that have been entered.

This is the perfect overview to print and check off the corrections performed.

If multiple options are given for one Elements such as the daily elements Manganese, Cobalt, Chromium and Iron, that is because there multiple Reef Moonshiner products available with different concentrations. For example, the Manganese is also available as NANO/PUMP version for smaller Aquariums or use on Dosing Pumps. More about this in the Handbook below.

A first-time shoppers list is included as well, to get an idea which elements are required to be purchased and how many bottles are needed for larger tanks. Please read in the next section of this Handbook which particular Elements and Products are recommended to be used.

Bear in mind, the first time corrections are usually the biggest ones!



First Time user Shopping list

Brightwell Magnesion-P	Not required
Brightwell Calcion-P	Required
Brightwell Potassion-P	Not required
Reef Moonshiners Bromine	1 Bottle(s) Required
Brightwell Strontion-P	Required
Reef Moonshiners Boron	1 Bottle(s) Required
Reef Moonshiners Fluoride	1 Bottle(s) Required
Reef Moonshiners Rubidium	1 Bottle(s) Required
SeaChem Reef Iodide	Required
Reef Moonshiners Barium	1 Bottle(s) Required
Reef Moonshiners Molybdenum	Not required
Reef Moonshiners Nickel	1 Bottle(s) Required
Reef Moonshiners Manganese	1 Bottle(s) Required
Reef Moonshiner Chromium	1 Bottle(s) Required
Reef Moonshiners Cobalt	1 Bottle(s) Required
Reef Moonshiners Iron	1 Bottle(s) Required
Triton Vanadium	Required
Reef Moonshiners Zinc	Not required
Reef Moonshiners Liqui-Mud	Strongly recommended, but not required, review feedback in the RM Support Group
Reef Moonshiners VitaminX	Strongly recommended, if no other Vitamins are supplemented. Doesn't affect Skimmer

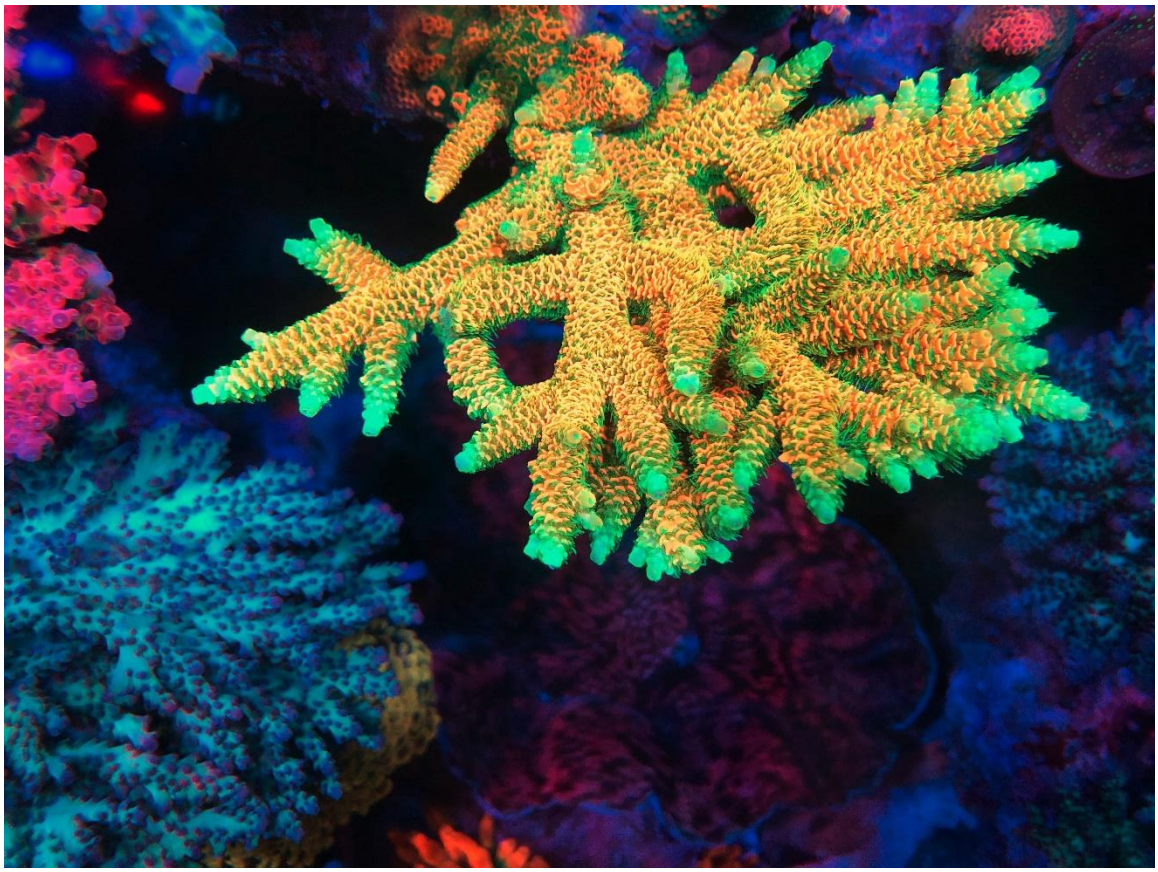
Elements and Solutions needed

As mentioned, the entire method is a mix of Reef Moonshiner Elements and selected products available online or at LFS.

Here is the summary of Elements and Chemicals I recommend to use from experience and from recent analytical testing. In the ICP Assessment tool is a Product Comparison Chart that shows ICP Testing data and Qualification assessments for a variety of Products to support a Full Synthetic Reefing experience with the most possible success, which involves purity and quality of the Products we do supplement into our Aquarium!

The Reef Moonshiner Elements can be found under this link:

https://andremueller.e-junkie.com/



Salinity

To maintain Salinity at the desired levels, I recommend placing a jar filled with dry salt into the sump and let it dissolve slowly until salinity is reached. This is a gentle and simple way to keep salinity corrections done without water changes via high salinity water.

Pro Tip: To maintain Salinity I recommend to use a Tropic Marin High Precision Hydrometer, which is used to read your Specific Gravity at the day of sampling. Then later you can compare the ICP Salinity with your own Hydrometer readings which you collect over time, and you will be able to precisely and hassle free to adjust the tank to your desired Salinity values with the Hydrometer.

Alkalinity

To maintain Alkalinity, in theory any product or any system can be used to maintain this parameter. Either dosing pump systems, Kalkwasser, Calcium reactors or a combination of all can be used. This is really to the personal preference of each Hobbysist.

However, in the ICP Assessment tool is a Product Comparison Chart that shows ICP Testing data and Qualification assessments for a variety of Products on the market. Some Products do contain undesired high amount of known and unknown components which may lead then to elevated elements in some Reef Aquariums.

Please ensure that a 2 part is used that does not contain additional Trace elements, which could interfere with the Moonshiner Method and you may run into overdosing of certain elements if those are insufficiently consumed. Doesn't mean it will, but the risk is high.

Magnesium (Bulk Reef Supply General Adjustment Magnesium Mix)

To maintain Magnesium levels, literally any method is great to use, however in order to perform corrections very easily on Magnesium, I recommend using the Bulk Reef Supply General Adjustments Magnesium Mix which is a granular Magnesium powder that can be mixed with RODI at home. It's a premixed composition of Sulfate and Chlorides in a specific ratio.

The required mix is 400 gram of powder into 1,000ml (1 Liter or 1,000gram of Water) of RODI water. I recommend using a kitchen scale to weigh the RODI water amount, instead of measuring it. A 2 Liter Borosilicate Glass Beaker and the use of a Magnetic Stirrer is recommended to make your DIY Stock solution.

When mixing Magnesium, use appropriate chemical lab supplies and protective equipment while mixing. Safety first!

Please be aware that other Products are not compatible with the Reef Moonshiners Tools!

However, in the ICP Assessment tool is a Product Comparison Chart that shows ICP Testing data and Qualification assessments for a variety of Products on the market. Some Products do contain undesired high amount of known and unknown components which may lead then to elevated elements in some Reef Aquariums.

NOTE: The Brightwell Magnesion-P is still supported in the Calculation tools for a temporary amount of time until the Reef Moonshiner community has moved over to the recommended BRS Product. The Brightwell Magnesion-P Product was disqualified for use on the Reef Moonshiner's method in Summer 2023.

Calcium (Bulk Reef Supply Calcium Chloride)

To maintain Calcium levels, literally any method is great to use, however in order to perform corrections very easily on Calcium, I recommend using the BRS Pharma Grade Calcium Chloride that can be mixed with RODI at home.

The required mix is 200 gram of powder into 1,000ml (1 Liter or 1,000gram of Water) of RODI water. I recommend using a kitchen scale to weigh the RODI water amount, instead of measuring it. A 2Liter Borosilicate Glass Beaker and the use of a Magnetic Stirrer is recommended to make your DIY Stock solution.

When mixing Calcium Chloride, use appropriate chemical lab supplies and protective equipment while mixing. Safety first!

Please be aware that other Products are not compatible with the Reef Moonshiners Tools!

However, in the ICP Assessment tool is a Product Comparison Chart that shows ICP Testing data and Qualification assessments for a variety of Products on the market. Some Products do contain undesired high amount of known and unknown components which may lead then to elevated elements in some Reef Aquariums.

NOTE: The Brightwell Calcion-P is still supported in the Calculation tools for a temporary amount of time until the Reef Moonshiner community has moved over to the recommended BRS Product. The Brightwell Calcion-P Product was disqualified for use on the Reef Moonshiner's method in Summer 2023.

Potassium (Brightwell Potassion-P)

To maintain Potassium levels, literally any method is great to use, however in order to perform corrections very easily on Potassium, I recommend using the Brightwell Potassion-P which is the powdered Potassium salt that can be mixed with RODI at home.

The required mix is 100 gram of powder into 1,000ml (1 Liter or 1,000gram of Water) of RODI water. I recommend using a kitchen scale to weigh the RODI water amount, instead of measuring it. A 2Liter Borosilicate Glass Beaker and the use of a Magnetic Stirrer is recommended to make your DIY Stock solution.

When mixing Potassium, use appropriate chemical lab supplies and protective equipment while mixing. Safety first!

Please be aware that other Products are not compatible with the Reef Moonshiners Tools!

However, in the ICP Assessment tool is a Product Comparison Chart that shows ICP Testing data and Qualification assessments for a variety of Products on the market. Some Products do contain undesired high amount of known and unknown components which may lead then to elevated elements in some Reef Aquariums.

Bromine (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as correction after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Boron (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as correction after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Strontium (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as correction after the ICP results. Use the Moonshiner Dosing calculator to determine the required dosage.

Please be aware that other Products are not compatible with the Reef Moonshiners Tools!

However, in the ICP Assessment tool is a Product Comparison Chart that shows ICP Testing data and Qualification assessments for a variety of Products on the market. Some Products do contain undesired high amount of known and unknown components which may lead then to elevated elements in some Reef Aquariums.

NOTE: The Brightwell Strontium-P is still supported in the Calculation tools for a temporary amount of time until the Reef Moonshiner community has moved over to the recommended Product. The Brightwell Strontion-P Product was disqualified for use on the Reef Moonshiner's method in Summer 2023.

Fluorine (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as correction after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Fluorine and Fluoride is meant in the same way.

Iodine/Iodide (Seachem Reef Iodide)

To maintain element levels for Iodine, this is a bit trickier. Iodine itself is simply said, Iodide that is oxidized to Iodine. Iodine will remain in this form for a short while until further oxidized to Iodate which is as of today's knowledge pretty useless….. so far!

Means, if Iodine is measured low or depleted in the tank, the assumption is that as well Iodide is low since Iodine derives from Iodide. Pretty clear, right? No, probably not.

To avoid confusion and make it simple to cover both elements, we will dose daily drops of Seachem Reef Iodide to maintain a constant amount of Iodide and Iodine. The ICP will only measure the Iodine levels, and hence the oxidation from Iodide to Iodine is depending on a lot of biochemical factors in the tank such as PH, Oxygen levels and skimmer performance etc. means we cannot predict the daily amounts needed!!!

This element is the most challenging element to maintain, however as soon the daily drops needed to maintain the desired target level are found, the continuous supplementation daily will result in a very stable Iodine level.

Patience here, the daily drops will have to be adjusted from ICP to ICP and usually takes 3-4 ICP's on average to find the sweet spot and then barely change if no significant change on the system will be done!

So if Iodine is low, the Reefer starts to dose Iodide daily for example with 2-3 drops per day for each 100 Gallon of system volume. Depending on the subsequent ICP results, the daily drops will be increased or decreased by 2-3 drops per 100 Gallon, and subsequent ICP's will show the effects on the tank.

You may see that when you start the Reef Moonshiner's method first, the Iodine levels did not even increase on the second test, which most likely has to do with the fact that the Reeftank overall increased consumptions on all traces, so don't be discouraged, and keep increasing the dosage.
If after 2 consecutive tests the Iodine levels still hovering below 30-35ug/L then however double your daily dosage.

Do not do single dose corrections as per bottle, since those only cause large spikes in Iodine with subsequent drops in Iodine levels. Daily supplementation is the way for success and stability on this extremely important element!

Ideally give it at least a week of supplementation after adjustments of the daily drops, before sending out a new ICP, since the oxidation process will take a while.

I personally buy from Amazon or other online sources a 2 or 4-ounce Cobalt blue glass dropper bottle, that I use for the Seachem Iodide to allow precise dosing of the daily drops! Some Grocery stores also sell them, but I prefer online stores since the bottles are most likely not been used before.

Also please do not try to substitute the Seachem Reef Iodide. It is from experience the most consistent Iodide I found so far, and I have tried other brands too. Imagine the concentration is extremely important so you won't need to find your sweet spot of daily dosages again when buying the next bottle. Seachem apparently provides a solid and consistent product here.

Consider also to buy rather small bottles than large bottles. As soon the bottle is opened, the oxidation starts, hence I use the small bottles, fill my dropper glass bottle and keep the Seachem bottle closed and stored dark and inside the house.

Barium (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as correction after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Molybdenum (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as correction after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Nickel (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as correction after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Manganese (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as Daily element after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Selenium (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as Daily element after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Chrome/Chromium (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as Daily element after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Cobalt (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as Daily element after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Iron (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as Daily element after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

You will find a variety of Reef Moonshiner's Iron

- Iron (Classic Element)
- Iron NANO/PUMP (less concentrated for Dosing pump and Nano tanks)
- Iron-**X** (10x concentrated Classic Element for very demanding Tank systems)

Vanadium (Reef Moonshiner Element)

If not detected on the ICP, simply use the Reef Moonshiner's Vanadium, to be dosed as a daily at 1-3 drops per 100G each day. Adjust amount from Test to Test. Keep doing daily drops to maintain Vanadium barely detectable only in the range of 1-2 Microgram/L.

Zinc (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as correction after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Tin (Reef Moonshiner Element)

This Element can only be tested sufficiently with a ICP-MS Test, if the ICP Assessment tool does tell you to contact RM via email, please do so.
The need for this element is typically not or extremely rarely required, hence this is not officially on the Reef Moonshiner's store for sale.

Rubidium (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as correction after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Copper (Reef Moonshiner Element)

To maintain element levels, simply use the Reef Moonshiner's Element, to be dosed as Daily element after the ICP results. Use the Moonshiner ICP-Assessment and Dosing tools to determine the required dosage.

Liqui-Mud (Reef Moonshiner Combined Elements)

To maintain element levels, simply use the Reef Moonshiner's Element as per Bottle label at 1ml per 100 Gallon per day.

Please read the whole Product Description and Instruction Guideline on the webstore.

Vitamin-X (Reef Moonshiner Combined concentrated Vitamin complex)

To maintain Vitamins in the Water column, use 5-7 drops per 100 Gallon per day into a high flow area of the tank. Keep all equipment in normal operation during this time.

Exodus (Reef Moonshiner Coral Dip)

This Coral Dip is extremely effective against all common and even more resistant Coral pests especially very resisting Spionid and other worm species are going to be pulled out of their wormholes if correctly applied after minutes of a coral bath in the dip mix with Aquarium water.

Suitable for Soft and Hard Coral, Rocks, and Aquarium equipment disinfection.

Please read the whole Product Description and Instruction Guideline on the webstore.

Phospates/Phosphorus (Reef Moonshiner Element)

Reef Moonshiner's Phosphorus shall be used when the upkeeping of Phosphorus and Phosphate in the Reef Aquaria is not feasible anymore with traditional ways, I normally recommend such as Phytoplankton, frozen algae etc. or Live Phytoplankton products as daily food sources.

Ideally you should not introduce any products in your Tank, however that isn't an option in some cases and tank systems, and it's hard to predict how effective a tank system comes along concerning nutrient management and reduction after the start.

Corals and your microbiology, micro fauna and microflora need Phosphorus sources to grow and fuel their metabolic processes.

A very good and very Reef compatible Phosphorous source is used in this product to allow long term use without accumulating of undesired compound and substances and this product is what I have created and fine tuned over years and used it on tanks that do suffer from insufficient Phosphorous which help Corals to resist bleaching from interruptions in the Photosynthetic processes as well is a Nutrient source for the Coral host itself to build up resistance against diseases etc. which at the end supports coloration of many invertebrates and Corals.

Common known positive effects you will observe typically is much better Polyp extension and an improved fluorescence within a few days usually.

Many Po4 sources and products on the market do fuel your nuisance algae only and provide not effective enough Phosphorous sources to your corals symbiotic algae and the coral host itself. It is also clear in color and doesn't smell. Craving corals will take this up day and night.

Best start performance is reached when dosed in the morning.

If this doesn't do the trick for you and your Phosphorous is in a good range, your Coral may likely benefit from additional Rare earth elements as they are included in the Reef Moonshiner's Liqui-Mud which many of those are part of a functioning Photosynthesis which at the end is what fuel the Coral with what it needs.

Remember the feeding of Corals is a complicated process, partially through the symbiotic algae and as well fat and other sources through the Corals mouth (Polyp).

I do recommend to maintain a Phosphorus level at least of 20-25ppb up to 33-35ppb. That you can deviate from that in both directions, but these are the ideal ranges so far for a home tank, somewhat practical and useful to maintain.

That translates to approx. 0.06ppm (mg/L) to 0.09ppm as minimum level.

A Reeftank system that has difficulties to keep Phosphorous/Phosphates in detectable levels, should evaluate if a Phosphorous product may be the better choice. Here is where this product comes into the Reefing game.

Hanna has a very useful Phosphorus to Phosphate conversion table here:

https://www.hannainst.com/hubfs/006-finished-content/Aquarium/phosphorus-to-phosphate-conversion-table--hanna-instruments.pdf

HOW TO APPLY THE REEF MOONSHINER'S Phosphorus-N

For information, the terms P as Phosphorous and Po4 as Phosphate is used.

I recommend that you buy yourself the Hanna Phosphorous ULR Checker to maintain the P levels at home, especially when dosing it and trying to determine your daily dosing regime.

It's also recommended that you dose P/Po4 sources ideally on a dosing pump.

Phosphate swings from excessive reduction do hurt and bleach Corals, however the same applies to increasing the P/Po4 Levels.

The daily "increase" shall not be more than 7ppb as P, or 0.02ppm as Po4, if you convert mathematically the P to Po4. See the above link to the Hanna conversion Chart.

This means you can dose more during the day on a dosing pump if your tank consumes much more, but only as long the measured level did not increase more than 7ppb P within one day.

It will take daily testing in the first days until you know what your consumption rates are going to be.

One big disadvantage of dosing Nutrients is that you can't leave a dosing routine running without high discipline and measuring it routinely even while it may appear stable.

There are many factors that can interrupt the P/Po4 uptake and you could dose then too much with ease. If you dose too much however, you can pause or reduce the dosing until the you are below the maximum limits and continue dosing then again afterwards. However pay attention to your Nutrients is the message here.

The required amount of Solution you need for let's say a dosage of 7ppb can be determined in the Classic Calculator Rev.8 or higher.

The Reef Moonshiner's Toolset is a single Excel Workbook and it combines the ICP Assessment Tools on the first few tabs, and the Classic Calculator on it's own tab.

Simple open the Toolset easily straight via Mouse click on the RM website here:

https://www.reefmoonshiners.com/handbook-tools

When the file opened, you see the ICP Assessment tool, and you can click the second tab on the bottom which opens the Classic Calculator Rev.9 or higher, so you are ready to go. Revision index is in the upper right corner.

Scroll down in the Classic Calculator until you see the Nutrients section, where the Reef Moonshiner's calculation for Phosphorus and Phosphate can be found.

If you measure Phosphorous in PPB then you use the PPB calculation line, if you use the Phosphate ULR checker, then you can use the Phosphate calculation line in PPM. This is right below the Phosphorus calculation.

It really depends if you measure P/Po4 in PPB or PPM. These 2 formulas allow to use either one or the other way of measurement without using a conversion table.

Easy Example to follow:

First, you need to enter the tank volume at the top of the calculator!!! Let's for example enter 100 gallons of water volume.

Let's say you measure 15ppb P in your tank and you know you want to be 25ppb.

That means you would need to increase the P level by 10ppb, but your maximum you should do in a single dose is 7ppb.

So we leave the "current" value at 0 and as "target" we enter 7.

In this case the 7 ppb will result in 8.12ml solution to be dosed.

You can now decide if you want to dose the full 7ppb of Phosphorus in a single shot or be more gentle and dose the 8.12ml over the day.

Next day you repeat this step until your tank is close to your desired target.

Notes to bear in mind!

Every tank is different, and you have to experiment next with the tool and Phosphorous solution what will work best for you to maintain P in your particular tank.

In some case small corrections every few days will do the job where P drops slowly over the course of a few days.

Certain tanks consume a lot more than 7ppb and you will have to spread an hourly dose throughout the day.

Even if the P/Po4 level gets over the desired levels, only dialing down the daily dosage and let the system adjust slowly will do a nice job.

Nitrate (Sodium/Potassium Nitrate)

If desired to be dosed, the Reef Moonshiner calculator has a calculation and mixing recipe in the note section. Either Sodium Nitrate (NOT NITRITE!!!) or Potassium Nitrate is supported by mixing one of the 2 choices with RODI water. I recommend discarding Nitrate solutions after 3-6 months due to potential micro bacterial growth inside the bottles. Bacteria will be introduced from RODI systems and can grow a significant amount of pathogens in worst case.

"Classic Elements" versus "NANO/PUMP Elements"

On the Webstore and Calculator, you will find Manganese, Iron, Cobalt, Chromium, Selenium and Copper available in 2 different product configurations each.

The Elements are for the same purpose but are different in concentration.

The NANO/PUMP elements are defined in it's Product name on the webstore and within the calculator so there is a clear difference in the name.

So depending on your choice of Product, ensure later that you select the right dosing instructions from the Calculator output.

Classic Elements

The above-mentioned classic elements, that are not shown as NANO/PUMP elements are higher in concentration. The benefit is that those will last longer since there is less liquid required, however in smaller tanks it will be much more difficult to dose these very small amounts, especially on Nano tanks. You can open the calculator and look between the different amounts required between the 2 types as soon you entered the tank volume into the calculator.

On larger tanks of 100 gallon and larger, and if no dosing pump is available, and manual dosing is preferred anyways, the classic elements are the ideal choice and will last for long time.

You may find that 0.05ml to 0.1ml for example is difficult to dose on your tank, which on request I offer now as well the NANO/PUMP elements which are concentrated to be dosed more easily as well can be used on most dosing pump systems.

NANO/PUMP Elements

NANO/PUMP elements are lower in concentration and will allow more liquid to be dosed as part of the daily routine and is very convenient for tanks below 100Gallon and are recommended for Nano tanks!

The concentrations are aligned to match the daily recommended dosage of 1ml per 100G per day, which comes very useful, if the daily elements are being used on automated tanks that utilize dosing pump systems.

Means a 10 Gallon Nano tank would need 0.1ml solution daily which is easily done with the Syringes that come with each bottle of Daily elements when purchased from the Reef Moonshiner's webstore.

You can open the calculator and look between the different amounts required between the 2 types as soon you entered the tank volume into the calculator. Then you can see how much liquid is required in your particular case and can make a decision which Element form is better for you.

Another alternative to the Nano elements is to use the classic elements and utilize those in small 2oz (60ml) Dropper bottles that you can buy in grocery stores or Amazon.

1 drop of liquid out of these Dropper bottles is considered 0.03ml.

Dosing and handling the Elements

With the elements on hand now and the required solutions been determined with the Moonshiner calculator, here some guideline about the Solutions and how to dose them.

Weigh the solutions

Instead of measuring solution amounts, I prefer to simply weigh the required amounts of solutions if the amount is more than the 1ml Syringe can handle.

For that, a simple kitchen scale with dual units will do best. Make sure the digital scale shows grams, means metric units.

1gram of solution is considered 1ml. Means if a correction of 54ml has to be dosed, you will place the empty dosing container on the scale, zero it out and measure 54grams, and you have the required amount ready without the hassle to deal with measuring cups or syringes which is less accurate and more complicated.

Dosing the "correction" solutions into the system

Corrections dosages I recommend to ideally dose into the Overflows, or slowly into the first sump section to allow the solution to be as diluted as possible before the return pump will bring it into the tank again.

All corrections can be dosed right after each other with a minute between.

Pay attention to the calculator output for how many days the correction is spread out to. It will show if it is a single day or spread out over multiple days.

Dosing the "daily" solutions into the system

Daily dosages can be dosed directly into the display tank right after each other.

All dosages can be dosed right after each other.

It has not been identified at which time the dosing shall occur best, so at this point whatever the most convenient time is, should be used.

Elements that are considered to be dosed daily will come with a medical grade Bottle sealer and a 1ml sterile Syringe.

The Sealer will help to reduce spillages and reduces contamination of the liquids with bacteria or other contaminants.

Dosing during vacation or absence

I strongly recommend to simply skip the dosing for vacation or short-term absence from Reefing duties. The risk of someone else doing the daily dosages for you incorrectly, and the potential unpredictable results, is much higher than the week or two of not dosing the daily elements.

A great alternative however was a pre-filled set of 1ml Syringes of all dailies, pre filled and packed in a Ziploc bag for each day, so the substitute Reefer simply had only to empty all Syringes per bag on a daily basis. 1ml Syringes are around $10 for a pack of 100 on Amazon.

Dosing in advance

In certain case, the users are in the situation of work life is not allowing them to be home all week to do the daily corrections, hence I would recommend to account for the required solutions per day to be dosed in advance for up to 5 days. This is less effective than the daily dosages, but still more beneficial than not to dose.

Iodine dosing and readings very likely fluctuate then more on the ICP test results, just account for this fact.

Mixing Elements and Handling

Under no circumstance pre-mix the elements with each other!

That would cause chemical reactions and oxidizing processes and the purpose of the dosing would not be achieved since elements would oxidize likely to unusable states of oxidation.

To keep a theoretical shelf life of many years if kept separate and not contaminated with each other, please use individual Syringes and don't contaminate with each other or Tank water.

Ideally use the Syringes that come with the Reef Moonshiner Elements for each bottle and use for example Rubber bands to attach the Syringe, so they won't get mixed up.

In case they got contaminated with each other or tank water, ….. buy them all new! Just kidding, the impact and contamination is not a deal breaker, but will affect the elements on the long run if done this way.

Store the elements at Room Temperature, no need for any Elements to be refrigerated.

Shelf life is theoretically for many years if unopened. After opening and first use, the approximate shelf life is about 2 years if not contaminated.

Compability with other Trace element Products

In order to make this method and system a success, it must be understood, that while applying the Reef Moonshiner's method, along with other Products that contain Trace elements other than Alk, Calcium and Magnesium, Potassium and Strontium may interfere with this method. I would recommend avoiding any other Brands coloration programs and supplements.

Also, it need to be understood, that the Reef Moonshiner calculator only supports the listed Products since every Brand maintains its own concentrations on supplements.

Compability with Calcium Reactors

The Reef Moonshiners method is supported by the application of calcium reactors since a calcium reactor with good grade media also supplements specific trace elements, depending on the media used. A calcium reactor usually can't keep up with the elements in the desired target levels, but it compensates certain elements and therefore reduces the required corrections after ICP. However, it is not required to be used in conjunction with calcium reactors.

Compability with other Nutrient reducing methods

The Moonshiner method is intended to manage the Reef Chemistry with the focus on Trace elements and can be used along with any method that is applied to manage nutrients.

The daily elements by the way, do significantly support Refugium systems, since many of the Trace elements are needed by all Refugium algae types. Typically, the Refugium performance improves shortly after applying the method.

Next steps

Testing cycle for subsequent tests

After a correction being performed, and daily elements started to be supplemented, the usual timeframe for taking the next sample and sending the sample out for next the ICP is 2 weeks.

With a considered 2 weeks turnaround, the ICP testing cycle will end up in a routine of 4-6 weeks of ICP testing cycle, which can be extended if only minor corrections are required after the ICP results.

The cycle looks like this: ICP results received, corrections performed, 2 weeks later sending the next sample. That usually leads to the monthly ICP routine in the beginning. After a few ICP's and monthly corrections, the Reefer will then see how the consumption characteristic from the tank is and can extend the ICP cycle.

I recommend in general to try to get to a monthly ICP sampling cycle, it depends a bit on the mail forwarding service in your area and you individual case how much corrections are needed per Test cycle.

After stabilization, the Reefer will get a picture of the needed corrections from month to month and can almost predict the monthly corrections needed and will dose "assumed corrections" (a bit less) in order to extend the testing cycle. I recommend not to do so in the first 3-4 months, since the tank will need to wake up first to show its real growth and element consumption.

Most users will be able to switch to bimonthly testing or longer after a few rounds of corrections.

Typically, the first time test does indicate the largest corrections, subsequent tests are usually performed with results of much lower corrections.

Watch out for Alk, Calcium and Magnesium consumption after starting the method. You still should use good test kits for those 3 parameter since as soon the trace elements are corrected, usually the corals start to boost in their metabolism and will consume much more major elements such as Alk and Ca as a result, and if these are not been monitored, they will drop too low and may cause a limitation, so watch out for these and adjust to new tank consumptions after measuring and observing these.

This method will basically manage the Trace element chemistry only, the Reefkeeper should use his own preferred Nutrient management system he feels most comfortable with. I recommend reading my e-Book "Andre's Reef Guide Part 1" if you have issues with your bacteria biology, good info in there and a lot of hints on the hobby. Low nutrient systems are perfectly fine as long the tank doesn't starve from nutrients over a longer period.

PH

You should bear in mind that it is important to keep a healthy PH in the tank. I recently explored a lot of tanks where the excessive carbonic acids in form of Co2 caused the PH to be lower than 7.80-7.85 in the morning. If you have low PH in the morning you need to work on the Co2 introduction/degassing balance. In many cases it turned out that it was not just the case that excessive levels of room Co2 were introduced into the tank, also the degassing of Co2 out of the tank became an issue due to reduced water agitation, low noise overflows, enclosed furniture and at the end resulted in high Co2 levels in the water. If the PH is that low, you need to resolve this situation, otherwise even the Reef Moonshiner method can't help to get healthy and colorful growing corals in the tank. See the Troubleshooting section in this Handbook for more guidance.

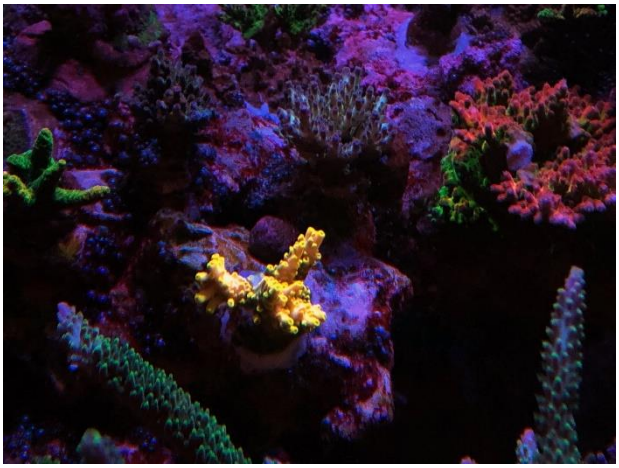
Amino Acid Products

I recommend generally prior using Amino Acids or Vitamins of any kind to run the tank without these additional supplements to identify the real progress you can achieve without those products. I say that because many people still think if the tank has some nutrients available, and corals won't color up, its all because Amino acids are missing which is a big misconception.

Amino acids are supplemented with foods and pale corals are not because the Aminos are missing. You can use the Amino acids later on to enhance the existing coral coloration carefully, but not to fix pale and bleached corals, that won't work. Amino acids do fuel and populate pathogenic bacteria and diseases in the tank, so a situation of sick Coral would made end up worse with the use of Amino Acids.

Please remain patient and focus on biology and chemistry and feed multiple times a week your corals with good grade food and start to apply the use of Amino acids when you have already achieved great coloration to further experiment with addition of Vitamins or Amino acids. Don't believe that Aminos only will fix your pale colors.

Safety precautions



Handling of all chemicals in general, which also applies to any other household chemicals shall be performed with care and attention and appropriate Safety equipment such as gloves and safety glasses.

Accidental exposure on skin wash hands and any exposed skin thoroughly after handling.

Wear eye protection/face protection such as safety glasses.

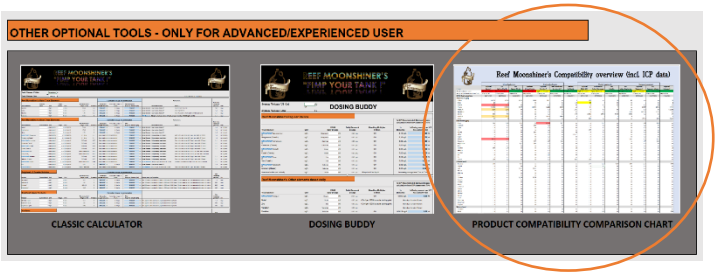
Elements are not suitable for Human consumptions or Pets.

If exposed to eyes, rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

Relationship to any of the mentioned Brands/Products/Vendors

I'm personally use the recommended brands and products because of the very positive experience, and I have not, and even will not in future accept any form of compensation from Vendors and Brands I'm recommending in any of my articles or publications.

However, in the ICP Assessment tool is a Product Comparison Chart that shows ICP Testing data and Qualification assessments for a variety of Products on the market. Some Products do contain undesired high amount of known and unknown components which may lead then to elevated elements in some Reef Aquariums.



Dosing individual Trace elements

Benefits

No limitation on Livestock such as the most sensitive SPS species after the corrections, that require high level maintenance normally. This method brings the tank to highest level standards, without having a Master's degree in Chemistry or Biology!

Apparently, the myth, that sensitive Shrooms, Zoa and Soft Corals can't thrive together in SPS dominated tanks can be put to an end. From the last years experiences, the daily dosages of metals and maintenance of the other trace elements, clearly indicate that there are no more issues with keeping all these species in a mixed Reef environment even under low nutrient conditions.

As mentioned earlier, the individual dosing of these important elements with the Reef Moonshiner method just does not make sure the required trace elements are maintained in sufficient levels to make sure the calcification process will not be limited by any of those, it also will provide constantly all relevant metals that are needed for the metabolism of corals and their tissue to avoid any limitations for unfolding their fluorescent proteins.

This method will also avoid the overdosing of certain elements. Keep in mind that each tank is indeed different, and the elements are consumed individually in different amounts. A lot of trace element products are literally combinations of Traces and the supplementation ratio is fixed by the mix of the associated product. However, the consumption ratio is always individual for each tank as it's supplemented, hence a lot of times certain elements will be less consumed and literally creep up over time into undesired levels if not careful.

This method actually does allow to create and really finetune the existing Saltwater to any desired configuration.

Freedom for experimental controlled dosing is now also be possible for experienced Reefkeeper since the Moonshiner calculator and Elements allow precisely to dose to intended and specific levels.

With this method and flexibility to replenish any of the most important trace elements, many tank systems can switch to a Water change free system without the disadvantage of Trace Element depletion over time, since those are supplemented in a very controlled fashion.

The ICP test result routine will be the Reefkeeper's dashboard, to see if there is anything wrong with the water chemistry, therefore no more questioning if anything is depleted or maybe excessive. It usually also indicates early enough signs when something may go into the wrong direction by slowly increasing Aluminum levels or sudden signs of copper which can indicate equipment failure.

A much more relaxed Reefer life, no more chasing of numbers when it comes to Trace elements.

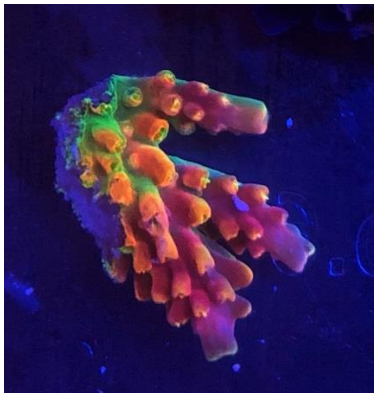
Probably the most economic method to maintain the entire Reef Chemistry.

Long term stability of the tank system, when going Water change free, with no weekly shocks of the tank parameter.

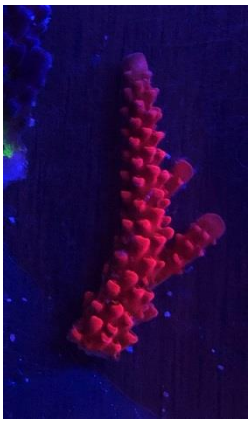
Disadvantages

Reefkeeper may need a bigger tank system, frag tank systems and more Frag racks! Sounds really funny, however most of the long term Reef Moonshiner users that applied the full method ended up with additional Frag tank systems or Tank upgrades. So that may become a real issue!

The initial costs are a bit higher, depending on the first time ICP results. Hence spread the word about the results of this method and your tank progress ;-)



I recommend most people, to split the initial cost for the investment into 2 steps. Tanks that do not use any color or trace programs from other brands, can usually start to dose the daily elements and Rubidium already even without the ICP results, and will buy the remaining elements for corrections after the ICP provides clarity what is really needed. That usually splits the initial investment into the method.



The ICP results may also indicate issues we like to keep under the carpet, however in order to be successful in the hobby, we have to be honest with ourselves sometimes!

Reef Moonshiner's Support Group

Reef Moonshiner's Support Group

Stay in touch concerning new Elements and updates on the Calculator and this Guideline, chat with other Reef Moonshiner users, or share your progress or concerns via the Reef Moonshiner support group on Social Media Platform Facebook at this link :

https://www.facebook.com/groups/1755992217822887/

This group is also a wealth of Reef Moonshiner's users feedback and success stories, problems and hints and tricks in the Hobby.

If you like access to that group, make sure you do correctly/honestly answer the 3 questions, otherwise you will be declined.
We keep the Group clean as far as we can and focused on and around the Reef Moonshiner's method and products.

Shipping

Shipment of Elements will be processed through UPS Ground as default, or Pickup if local.

Your order will be processed and shipped on the next business day, many times on the same day however.

The Tracking data will be uploaded into the Paypal system under your transaction when the Order is shipped, you may have turned on or off the Shipment notification settings in Paypal.

US domestic is the standard, if you like to inquire Shipment into other countries please contact me via email or via webstore contact form.

International Shipments are shipped via expedited UPS Airfreight and usually take about a week to it's destination country and custom clearance.

Reef Moonshiner's landed already in very exotic places already, such as Dubai, New Zealand, Africa, Hong Kong, Singapore but also Australia, Canada, United Kingdom and many others are on the to do list, please inquire a Shipping quote with your address via email to psxerholic@gmail.com

The typical Shipping costs are in the ballpark range of $35-$40 for Canada, $80-$100 for Middle Eastern and Central Asia Pacific.

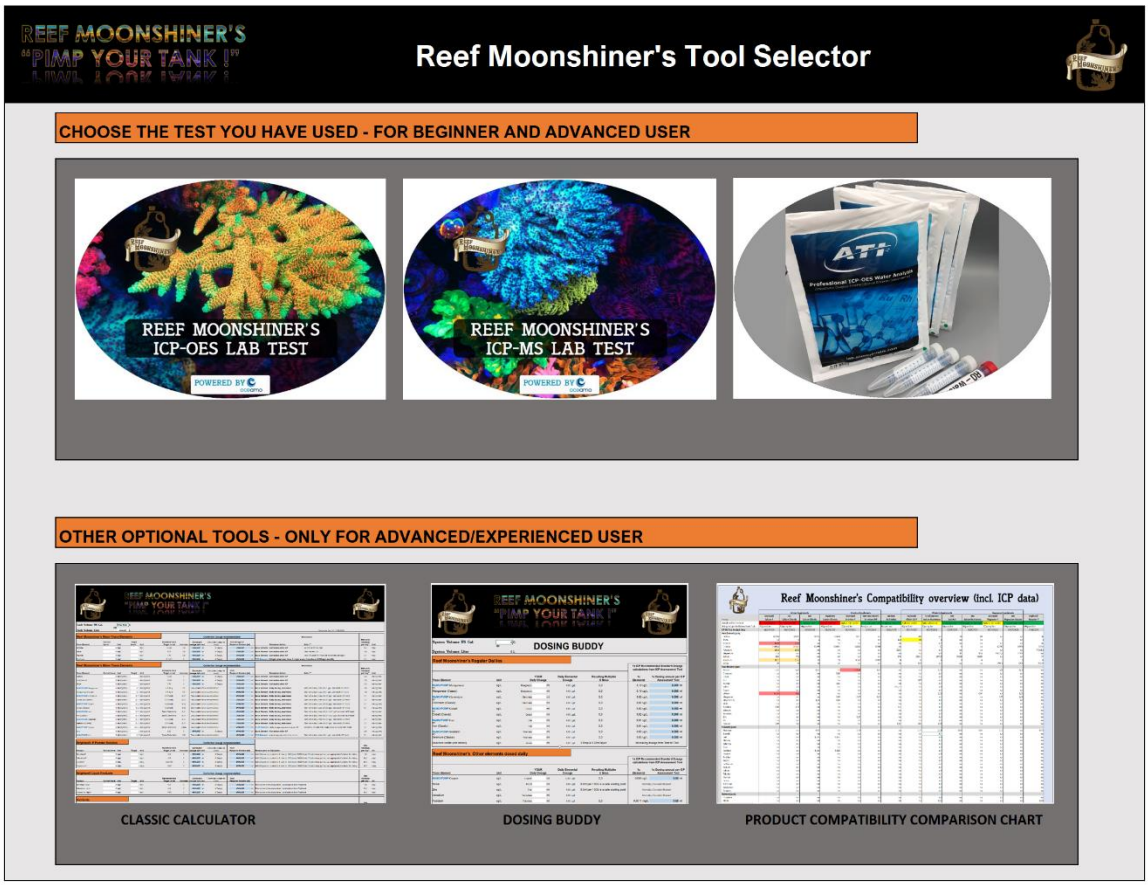
Reef Moonshiner ICP-Assessment and Dosing Calculation Toolset

The additional optional Tools for advanced Reef Moonshiner's users

As mentioned earlier in this Handbook the ICP-Assessment Tool is actually a combined set of Tools that does include the 3 ICP assessment sections for the recommended tests.

However there are also other optional Tools and Information included for advanced Reef Moonshiner users and Aquarists that may come very useful at some point.

As a new Beginner in this Methodology you can simply ignore the advanced Tools and apply first what you learned and read in the previous sections of that Handbook.



The Classic calculator

This is the old manual way of how the dosing amounts were calculated. As a newbie in this Method do not use this calculator and us the assessment tools.

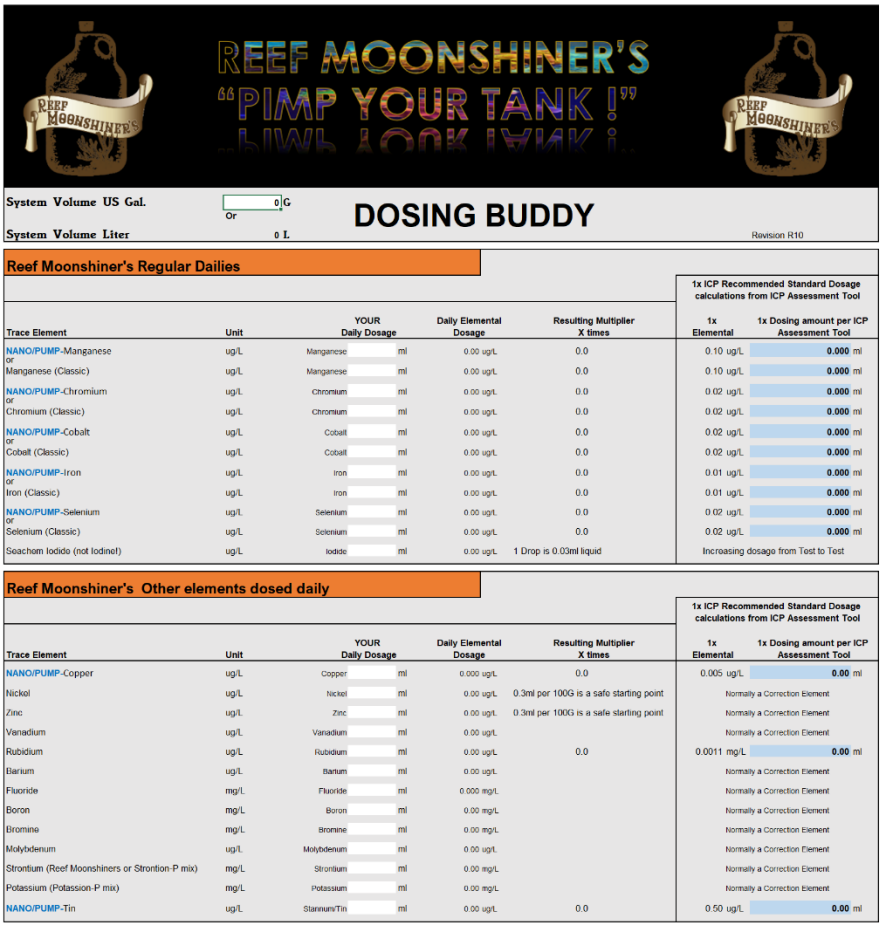
This calculator is more in detail explained how it works in the next chapter, since it does allow to dose the Reef Moonshiner's elements to your own defined levels and not to the preset target values.

The Dosing buddy

This Tool does benefit very experienced Reef Moonshiner's to track their daily dosings, and as well calculates other elements dosed and transfers that into the daily multiplier as well as the mg/L or ug/L dosed per day to quantify their dosages in numbers.

For example if you want to find out how much ug/L of Iron you actually dose per day.

It can also be used to find out how much of a specific Element was dosed by accident.



Reef Moonshiner's Regular Dailies

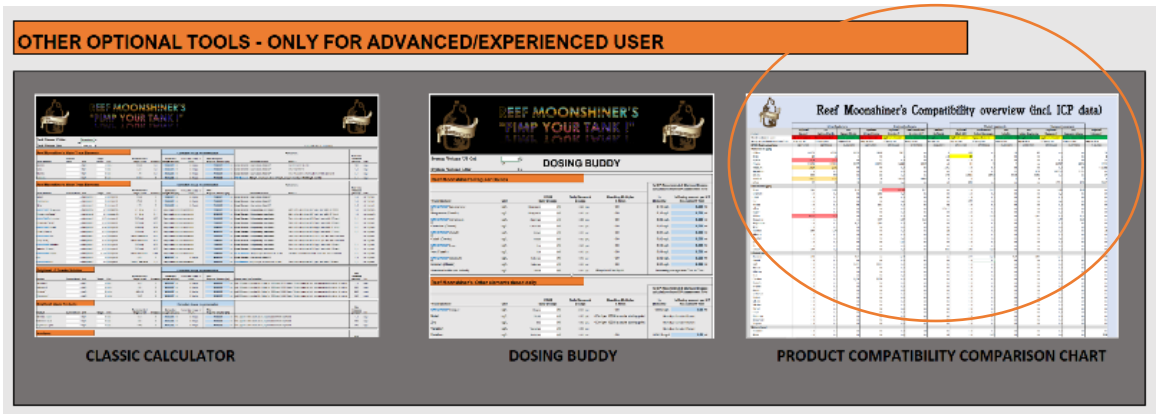
Trace Element	Unit	YOUR Daily Dosage		Daily Elemental Dosage	Resulting Multiplier X times	1x ICP Recommended Standard Dosage calculations from ICP Assessment Tool: 1x Elemental	1x Dosing amount per ICP Assessment Tool
NANO/PUMP-Manganese or Manganese (Classic)	ug/L	Manganese	ml	0.00 ug/L	0.0	0.10 ug/L	0.000 ml
NANO/PUMP-Chromium or Chromium (Classic)	ug/L	Chromium	ml	0.00 ug/L	0.0	0.02 ug/L	0.000 ml
NANO/PUMP-Cobalt or Cobalt (Classic)	ug/L	Cobalt	ml	0.00 ug/L	0.0	0.02 ug/L	0.000 ml
NANO/PUMP-Iron or Iron (Classic)	ug/L	Iron	ml	0.00 ug/L	0.0	0.01 ug/L	0.000 ml
NANO/PUMP-Selenium or Selenium (Classic)	ug/L	Selenium	ml	0.00 ug/L	0.0	0.02 ug/L	0.000 ml
Seachem Iodide (not Iodine!)	ug/L	Iodide	ml	0.00 ug/L	1 Drop is 0.03ml liquid	Increasing dosage from Test to Test	

Reef Moonshiner's Other elements dosed daily

Trace Element	Unit	YOUR Daily Dosage		Daily Elemental Dosage	Resulting Multiplier X times	1x ICP Recommended Standard Dosage calculations from ICP Assessment Tool: 1x Elemental	1x Dosing amount per ICP Assessment Tool
NANO/PUMP-Copper	ug/L	Copper	ml	0.000 ug/L	0.0	0.005 ug/L	0.00 ml
Nickel	ug/L	Nickel	ml	0.00 ug/L	0.3ml per 100G is a safe starting point	Normally a Correction Element	
Zinc	ug/L	Zinc	ml	0.00 ug/L	0.3ml per 100G is a safe starting point	Normally a Correction Element	
Vanadium	ug/L	Vanadium	ml	0.00 ug/L		Normally a Correction Element	
Rubidium	ug/L	Rubidium	ml	0.00 ug/L	0.0	0.0011 mg/L	0.00 ml
Barium	ug/L	Barium	ml	0.00 ug/L		Normally a Correction Element	
Fluoride	mg/L	Fluoride	ml	0.000 mg/L		Normally a Correction Element	
Boron	mg/L	Boron	ml	0.00 mg/L		Normally a Correction Element	
Bromine	mg/L	Bromine	ml	0.00 mg/L		Normally a Correction Element	
Molybdenum	ug/L	Molybdenum	ml	0.00 ug/L		Normally a Correction Element	
Strontium (Reef Moonshiners or Strontion-P mix)	mg/L	Strontium	ml	0.00 mg/L		Normally a Correction Element	
Potassium (Potassion-P mix)	mg/L	Potassium	ml	0.00 mg/L		Normally a Correction Element	
NANO/PUMP-Tin	ug/L	Stannum/Tin	ml	0.00 ug/L	0.0	0.50 ug/L	0.00 ml

The Product Compatibilty Comparison Chart

In this Table you will find Product comparisons and ICP data and Reef Moonshiner's Assessment results. Some Products do contribute to undesired levels of certain trace elements and may or may not be recommended to be used as part of the Reef Moonshiner's Full Synthetic Reefing methodology, which with no Water Changes requires high quality and high purity supplements.



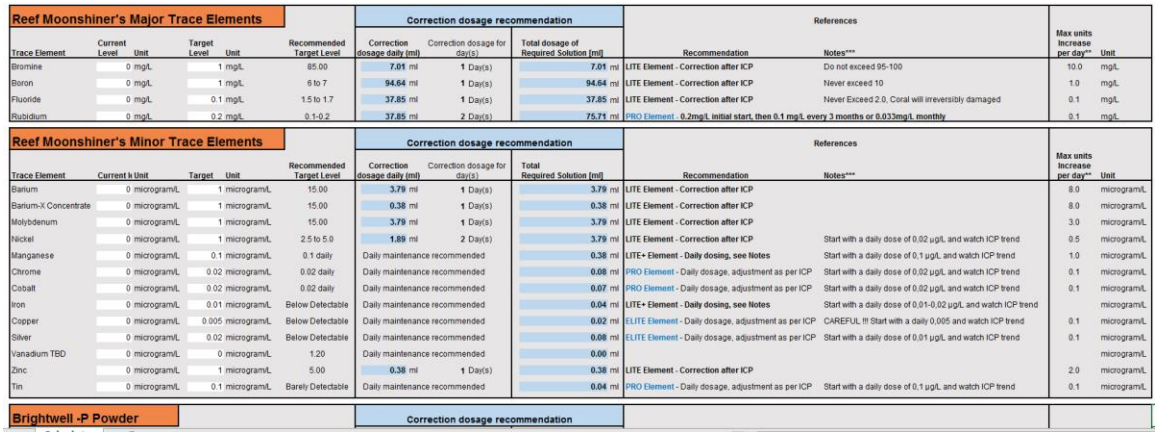
Reef Moonshiner Classic Dosing Calculator

Calculate and perform the Corrections with the classic Calculator (not recommended for beginners)

With the knowledge of the current measured levels from the ICP test and the Target levels we want to achieve, it's now easy to identify which elements need correction! Basically, all elements that are below the target levels!

I will explain on more depth how the calculator works, but here the quick and easy summary with an example.

First thing is to download the Reef Moonshiner from the Website.



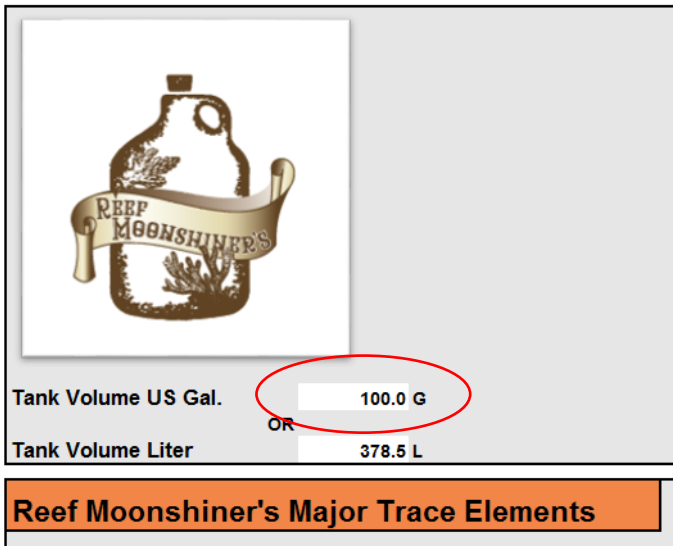
Reef Moonshiner's Major Trace Elements					Correction dosage recommendation			References			
Trace Element	Current Level	Unit	Target Level	Unit	Recommended Target Level	Correction dosage daily (ml)	Correction dosage for day(s)	Total dosage of Required Solution [ml]	Recommendation	Notes***	Max units Increase per day**	Unit
Bromine	0	mg/L	1	mg/L	85.00	7.01 ml	1 Day(s)	7.01 ml	LITE Element - Correction after ICP	Do not exceed 95-100	10.0	mg/L
Boron	0	mg/L	1	mg/L	6 to 7	94.64 ml	1 Day(s)	94.64 ml	LITE Element - Correction after ICP	Never exceed 10	1.0	mg/L
Fluoride	0	mg/L	0.1	mg/L	1.5 to 1.7	37.85 ml	1 Day(s)	37.85 ml	LITE Element - Correction after ICP	Never Exceed 2.0, Coral will irreversibly damaged	0.1	mg/L
Rubidium	0	mg/L	0.2	mg/L	0.1-0.2	37.85 ml	2 Day(s)	75.71 ml	PRO Element - 0.2mg/L initial start, then 0.1 mg/L every 3 months or 0.033mg/L monthly		0.1	mg/L

Reef Moonshiner's Minor Trace Elements					Correction dosage recommendation			References			
Trace Element	Current le	Unit	Target	Unit	Recommended Target Level	Correction dosage daily (ml)	Correction dosage for day(s)	Total Required Solution [ml]	Recommendation	Notes***	Max units Increase per day**	Unit
Barium	0	microgram/L	1	microgram/L	15.00	3.79 ml	1 Day(s)	3.79 ml	LITE Element - Correction after ICP		8.0	microgram/L
Barium-X Concentrate	0	microgram/L	1	microgram/L	15.00	0.38 ml	1 Day(s)	0.38 ml	LITE Element - Correction after ICP		8.0	microgram/L
Molybdenum	0	microgram/L	1	microgram/L	15.00	3.79 ml	1 Day(s)	3.79 ml	LITE Element - Correction after ICP		3.0	microgram/L
Nickel	0	microgram/L	1	microgram/L	2.5 to 5.0	1.89 ml	2 Day(s)	3.79 ml	LITE Element - Correction after ICP	Start with a daily dose of 0.02 µg/L and watch ICP trend	0.5	microgram/L
Manganese	0	microgram/L	0.1	microgram/L	0.1 daily	Daily maintenance recommended		0.38 ml	LITE+ Element - Daily dosing, see Notes	Start with a daily dose of 0.1 µg/L and watch ICP trend	1.0	microgram/L
Chrome	0	microgram/L	0.02	microgram/L	0.02 daily	Daily maintenance recommended		0.08 ml	PRO Element - Daily dosage, adjustment as per ICP	Start with a daily dose of 0.02 µg/L and watch ICP trend	0.1	microgram/L
Cobalt	0	microgram/L	0.02	microgram/L	0.02 daily	Daily maintenance recommended		0.07 ml	PRO Element - Daily dosage, adjustment as per ICP	Start with a daily dose of 0.02 µg/L and watch ICP trend	0.1	microgram/L
Iron	0	microgram/L	0.01	microgram/L	Below Detectable	Daily maintenance recommended		0.04 ml	LITE+ Element - Daily dosing, see Notes	Start with a daily dose of 0.01-0.02 µg/L and watch ICP trend		microgram/L
Copper	0	microgram/L	0.005	microgram/L	Below Detectable	Daily maintenance recommended		0.02 ml	ELITE Element - Daily dosage, adjustment as per ICP	CAREFUL !!! Start with a daily 0.005 and watch ICP trend	0.1	microgram/L
Silver	0	microgram/L	0.02	microgram/L	Below Detectable	Daily maintenance recommended		0.08 ml	ELITE Element - Daily dosage, adjustment as per ICP	Start with a daily dose of 0.01 µg/L and watch ICP trend	0.1	microgram/L
Vanadium TBD	0	microgram/L	0	microgram/L	1.20	Daily maintenance recommended		0.00 ml				microgram/L
Zinc	0	microgram/L	1	microgram/L	5.00	0.38 ml	1 Day(s)	0.38 ml	LITE Element - Correction after ICP		2.0	microgram/L
Tin	0	microgram/L	0.1	microgram/L	Barely Detectable	Daily maintenance recommended		0.04 ml	PRO Element - Daily dosage, adjustment as per ICP	Start with a daily dose of 0.1 µg/L and watch ICP trend	0.1	microgram/L

Brightwell -P Powder	Correction dosage recommendation

I recommend downloading the latest version and save it on your Personal computer. It is Excel based, and MAC computer would use Google sheets to open the Excel sheet.

Most important is now to enter the correct amount of system water volume in the top area. Consider the Water volume only, with no rocks and no substrate. The more accurate the better.



Correction dosages :

There are 2 fields that the Reefer would need to fill out for each element that need a correction. The current value that is measured and provided as part of the ICP result, as well as the Target value.

By default, I kept the field where the target value will be entered, intentionally empty to avoid an accidental incorrect dosing and to force the Reefkeeper to be familiar with the target values.

For example, the Barium level in the ICP measured 8.20 microgram/L. You will later see in this guide that the Reef Moonshiner target level is 15 microgram/L.

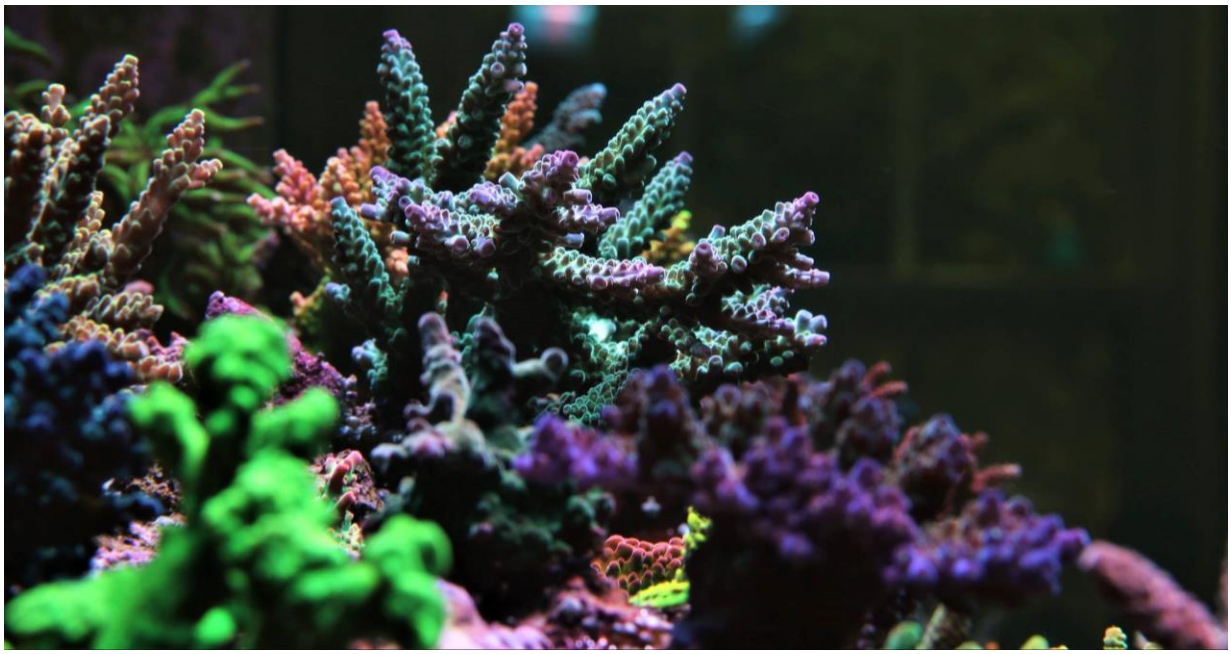
The cell with the current value will be filled with 8.20, and the cell with the Target entry will be filled with the value of 15. That's it! The Calculator will then show you the required amount of Reef Moonshiner solution, that need to be dosed to correct this deficit. Depending on the Tank size and required correction, the calculator will also tell you for how many days a certain element need to be dosed in case the daily maximal correction is exceeded which spreads the total amount of solution into multiple days. If the calculator only requires you to dose for 1 day, the correction is immediately done after the first dosage.

Reef Moonshiner's Minor Trace Elements					Correction dosage recommendation		
Trace Element	Current I Unit	Target	Unit	Recommended Target Level	Correction dosage daily (ml)	Correction dosage for day(s)	Total Required Solution [ml]
Barium	8.2 microgram/L	15	microgram/L	15.00	**25.74** ml	**1** Day(s)	**25.74** ml

FOR INFO

To minimize a mix up of the Target levels and incorrect entry in the target field, the recommended Target levels are shown for info right next to the cell where the targets are to be entered. However, attention is required when using the calculator.

This procedure will now be performed for all Trace elements that need correction.

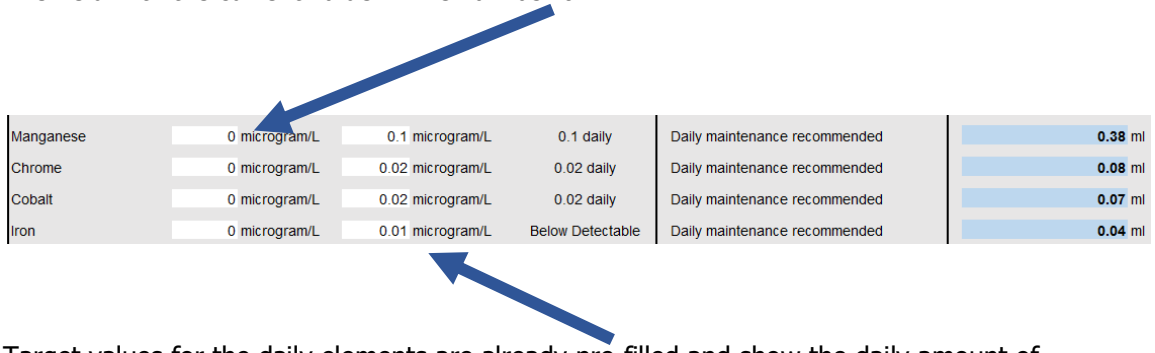


Daily Elements dosages :

For daily elements, and only if not detected on the ICP results, the following will be done to determine the daily dosages.

For the daily elements, no entries will need to be done!!! The daily amounts of Traces are pre-defined and won't need editing. Just simply read out the daily amount of liquid to be dosed if the System Water Volume on the top is correctly entered.

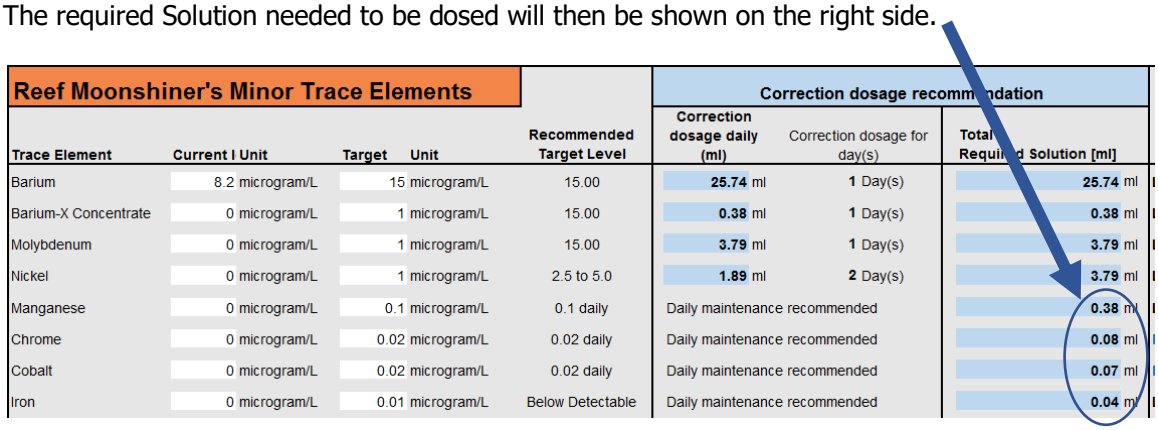
The field with the current value will remain as "0".



Manganese	0 microgram/L	0.1 microgram/L	0.1 daily	Daily maintenance recommended	0.38 ml
Chrome	0 microgram/L	0.02 microgram/L	0.02 daily	Daily maintenance recommended	0.08 ml
Cobalt	0 microgram/L	0.02 microgram/L	0.02 daily	Daily maintenance recommended	0.07 ml
Iron	0 microgram/L	0.01 microgram/L	Below Detectable	Daily maintenance recommended	0.04 ml

Target values for the daily elements are already pre-filled and show the daily amount of elemental trace, that we will dosed per day. Unless you want to experiment with higher dosages of the daily amounts, there is no need to change these.

The required Solution needed to be dosed will then be shown on the right side.



Reef Moonshiner's Minor Trace Elements					Correction dosage recommendation		
Trace Element	Current I Unit	Target Unit		Recommended Target Level	Correction dosage daily (ml)	Correction dosage for day(s)	Total Required Solution [ml]
Barium	8.2 microgram/L	15 microgram/L		15.00	25.74 ml	1 Day(s)	25.74 ml
Barium-X Concentrate	0 microgram/L	1 microgram/L		15.00	0.38 ml	1 Day(s)	0.38 ml
Molybdenum	0 microgram/L	1 microgram/L		15.00	3.79 ml	1 Day(s)	3.79 ml
Nickel	0 microgram/L	1 microgram/L		2.5 to 5.0	1.89 ml	2 Day(s)	3.79 ml
Manganese	0 microgram/L	0.1 microgram/L		0.1 daily	Daily maintenance recommended		0.38 ml
Chrome	0 microgram/L	0.02 microgram/L		0.02 daily	Daily maintenance recommended		0.08 ml
Cobalt	0 microgram/L	0.02 microgram/L		0.02 daily	Daily maintenance recommended		0.07 ml
Iron	0 microgram/L	0.01 microgram/L		Below Detectable	Daily maintenance recommended		0.04 ml

Example is the daily Manganese. We intend to dose daily an amount of 0.1microgram/L of Manganese as a default, which is 0.0001ppm Manganese daily. Doesn't sound much, however you will see a big difference in your macroalgae and coral fluorescence if applied.

IMPORTANT

If a user like to double the amount of daily Manganese, he would enter 0.2microgram/L in the target cell, to see how much ml of dosing solution will be required daily.

Iodine and Vanadium are daily elements as well,

but are handled in a different way which is explained in more details in this guide.

Dosing monthly/quarterly - Rubidium

Make sure you have entered the correct system water volume in the top of the Moonshiner calculator!

Dosing Rubidium is basically a correction dosage, but on either a quarterly or monthly basis. The initial dosage when the system is started is the assumption that Rubidium is depleted which is usually the case in almost all tanks.

The initial dosage is 0.2mg/L and then 0.1mg/L quarterly or 0.033mg/L on a monthly basis.

In order to identify how much Rubidium solution is required, the current value cell is filled with "0" and the target level cell is filled with the desired supplementation of the element, means 0.2 at the first time, then 0.1 if you do it quarterly or 0.033 if you do it monthly.

The calculator will tell you if you can do the correction on a single day or if you need to spread it out.

I recommend performing the maintenance dose on monthly basis.

Initial dosage on a 100G system

Reef Moonshiner's Major Trace Elements						Correction dosage recommendation		
Trace Element	Current Level	Unit	Target Level	Unit	Recommended Target Level	Correction dosage daily (ml)	Correction dosage for day(s)	Total dosage of Required Solution [ml]
Rubidium	0	mg/L	0.2	mg/L	0.1-0.2	**37.85** ml	**2** Day(s)	**75.71** ml

Quarterly dosage on a 100G system

Reef Moonshiner's Major Trace Elements						Correction dosage recommendation		
Trace Element	Current Level	Unit	Target Level	Unit	Recommended Target Level	Correction dosage daily (ml)	Correction dosage for day(s)	Total dosage of Required Solution [ml]
Rubidium	0	mg/L	0.1	mg/L	0.1-0.2	**37.85** ml	**1** Day(s)	**37.85** ml

Monthly dosage on a 100G system

Reef Moonshiner's Major Trace Elements						Correction dosage recommendation		
Trace Element	Current Level	Unit	Target Level	Unit	Recommended Target Level	Correction dosage daily (ml)	Correction dosage for day(s)	Total dosage of Required Solution [ml]
Rubidium	0	mg/L	0.033	mg/L	0.1-0.2	**12.49** ml	**1** Day(s)	**12.49** ml

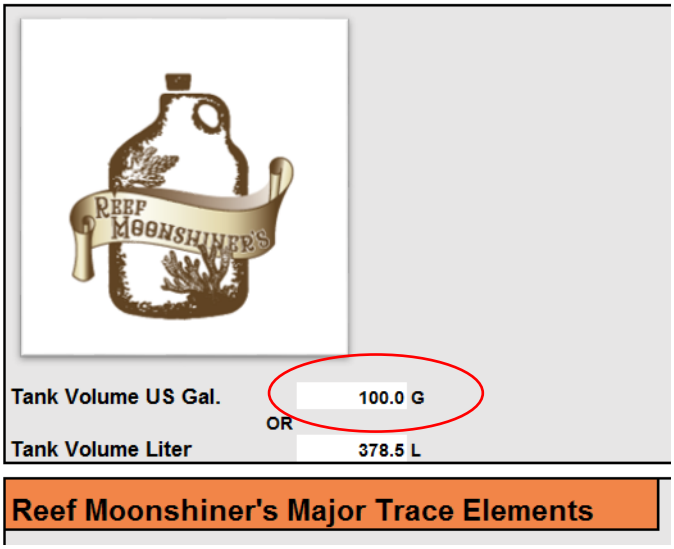
Here are some more details about the calculator and how it works.

It's actually easy to use, even while it looks pretty complex at the first sight.

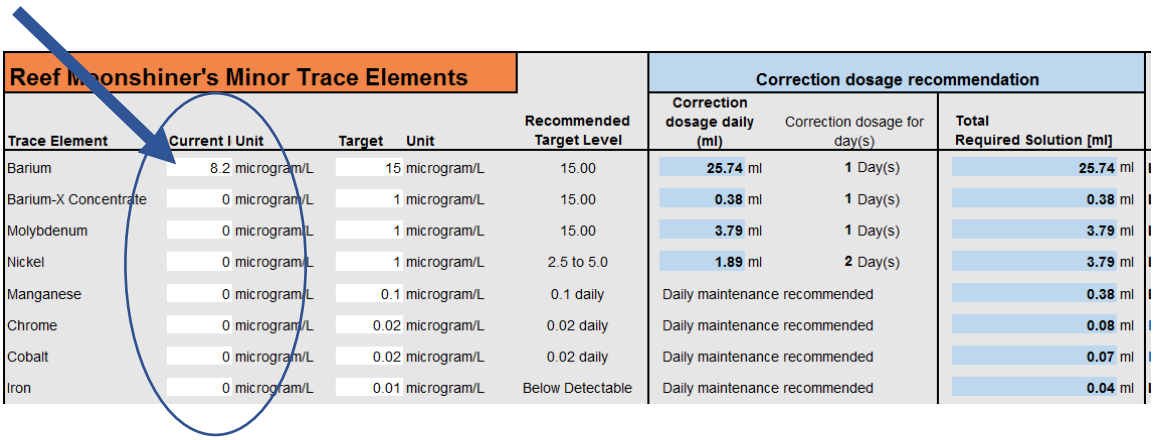
Data entry

Most important is to enter the correct system volume at the top of the calculator. Deduct all rocks and sand and try to estimate as good as possible the Water volume of the tank.

Enter the Volume in the top.



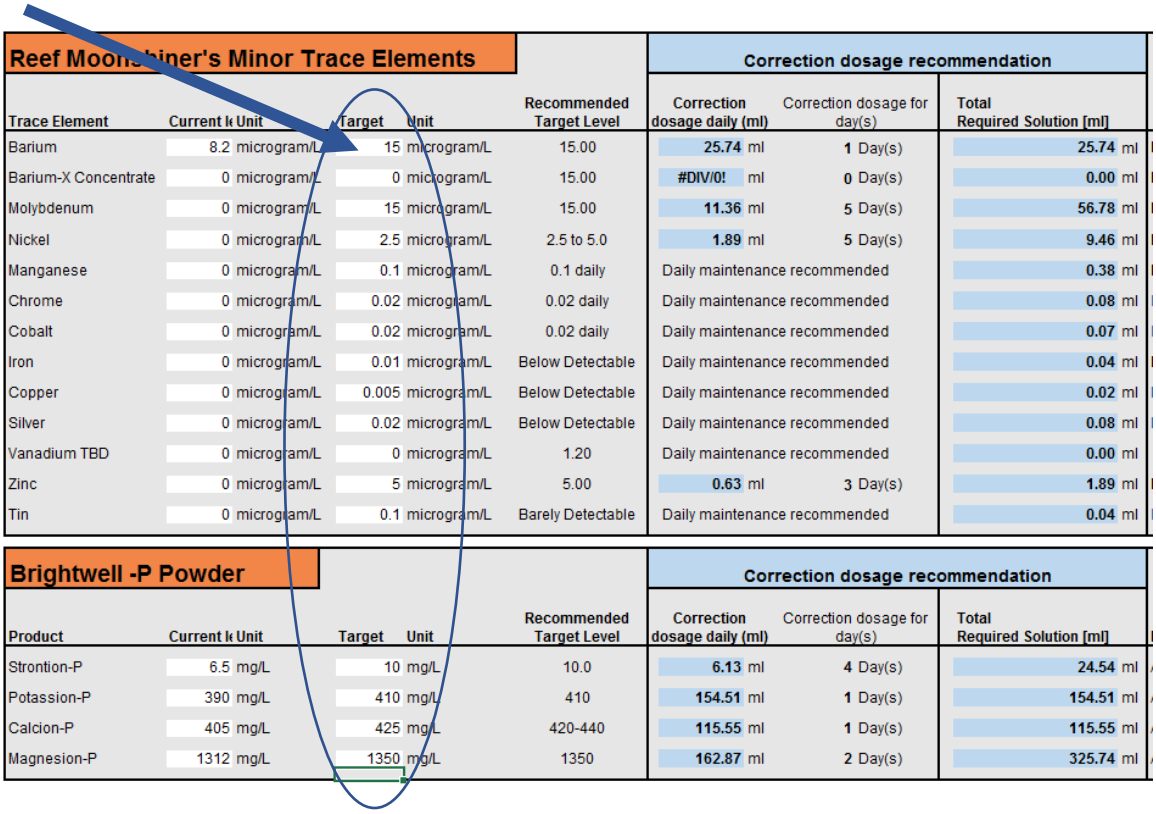
Simply add the measured value from the ICP result into the cell in the column E, "Current level". Only do this for the elements that need correction, basically the elements that have been measured below the recommended target levels.



Reef Moonshiner's Minor Trace Elements					Correction dosage recommendation		
Trace Element	Current l Unit	Target Unit	Recommended Target Level	Correction dosage daily (ml)	Correction dosage for day(s)	Total Required Solution [ml]	
Barium	8.2 microgram/L	15 microgram/L	15.00	25.74 ml	1 Day(s)	25.74 ml	
Barium-X Concentrate	0 microgram/L	1 microgram/L	15.00	0.38 ml	1 Day(s)	0.38 ml	
Molybdenum	0 microgram/L	1 microgram/L	15.00	3.79 ml	1 Day(s)	3.79 ml	
Nickel	0 microgram/L	1 microgram/L	2.5 to 5.0	1.89 ml	2 Day(s)	3.79 ml	
Manganese	0 microgram/L	0.1 microgram/L	0.1 daily	Daily maintenance recommended		0.38 ml	
Chrome	0 microgram/L	0.02 microgram/L	0.02 daily	Daily maintenance recommended		0.08 ml	
Cobalt	0 microgram/L	0.02 microgram/L	0.02 daily	Daily maintenance recommended		0.07 ml	
Iron	0 microgram/L	0.01 microgram/L	Below Detectable	Daily maintenance recommended		0.04 ml	

Now fill the column H, "Target level" with the required value which is the recommended target level. The recommended target level is shown in the Self-Assessment section as well shown for information in the Calculator column K, "Recommended Target level".

The target level field is kept empty on purpose to minimize errors on the dosing routine.



Reef Moonshiner's Minor Trace Elements

Trace Element	Current le	Unit	Target	Unit	Recommended Target Level	Correction dosage daily (ml)	Correction dosage for day(s)	Total Required Solution [ml]
Barium	8.2	microgram/L	15	microgram/L	15.00	25.74 ml	1 Day(s)	25.74 ml
Barium-X Concentrate	0	microgram/L	0	microgram/L	15.00	#DIV/0! ml	0 Day(s)	0.00 ml
Molybdenum	0	microgram/L	15	microgram/L	15.00	11.36 ml	5 Day(s)	56.78 ml
Nickel	0	microgram/L	2.5	microgram/L	2.5 to 5.0	1.89 ml	5 Day(s)	9.46 ml
Manganese	0	microgram/L	0.1	microgram/L	0.1 daily	Daily maintenance recommended		0.38 ml
Chrome	0	microgram/L	0.02	microgram/L	0.02 daily	Daily maintenance recommended		0.08 ml
Cobalt	0	microgram/L	0.02	microgram/L	0.02 daily	Daily maintenance recommended		0.07 ml
Iron	0	microgram/L	0.01	microgram/L	Below Detectable	Daily maintenance recommended		0.04 ml
Copper	0	microgram/L	0.005	microgram/L	Below Detectable	Daily maintenance recommended		0.02 ml
Silver	0	microgram/L	0.02	microgram/L	Below Detectable	Daily maintenance recommended		0.08 ml
Vanadium TBD	0	microgram/L	0	microgram/L	1.20	Daily maintenance recommended		0.00 ml
Zinc	0	microgram/L	5	microgram/L	5.00	0.63 ml	3 Day(s)	1.89 ml
Tin	0	microgram/L	0.1	microgram/L	Barely Detectable	Daily maintenance recommended		0.04 ml

Brightwell -P Powder

Product	Current le	Unit	Target	Unit	Recommended Target Level	Correction dosage daily (ml)	Correction dosage for day(s)	Total Required Solution [ml]
Strontion-P	6.5	mg/L	10	mg/L	10.0	6.13 ml	4 Day(s)	24.54 ml
Potassion-P	390	mg/L	410	mg/L	410	154.51 ml	1 Day(s)	154.51 ml
Calcion-P	405	mg/L	425	mg/L	420-440	115.55 ml	1 Day(s)	115.55 ml
Magnesion-P	1312	mg/L	1350	mg/L	1350	162.87 ml	2 Day(s)	325.74 ml

Simply go through the list of corrections and ideally print out the sheet at the end to tick off the dosages that you have performed. Please read in the Dosing section of this guide, how to enter and handle the difference between "Correction Dosage" and "Daily dosage" described in greater detail earlier in this Guide.

For the daily elements, no entries will need to be done!!! The daily amounts of Traces are pre-defined and won't need editing. Just simply read out the daily amount of liquid to be dosed if the System Water Volume on the top is correctly entered.

The field with the current value will remain as "0".

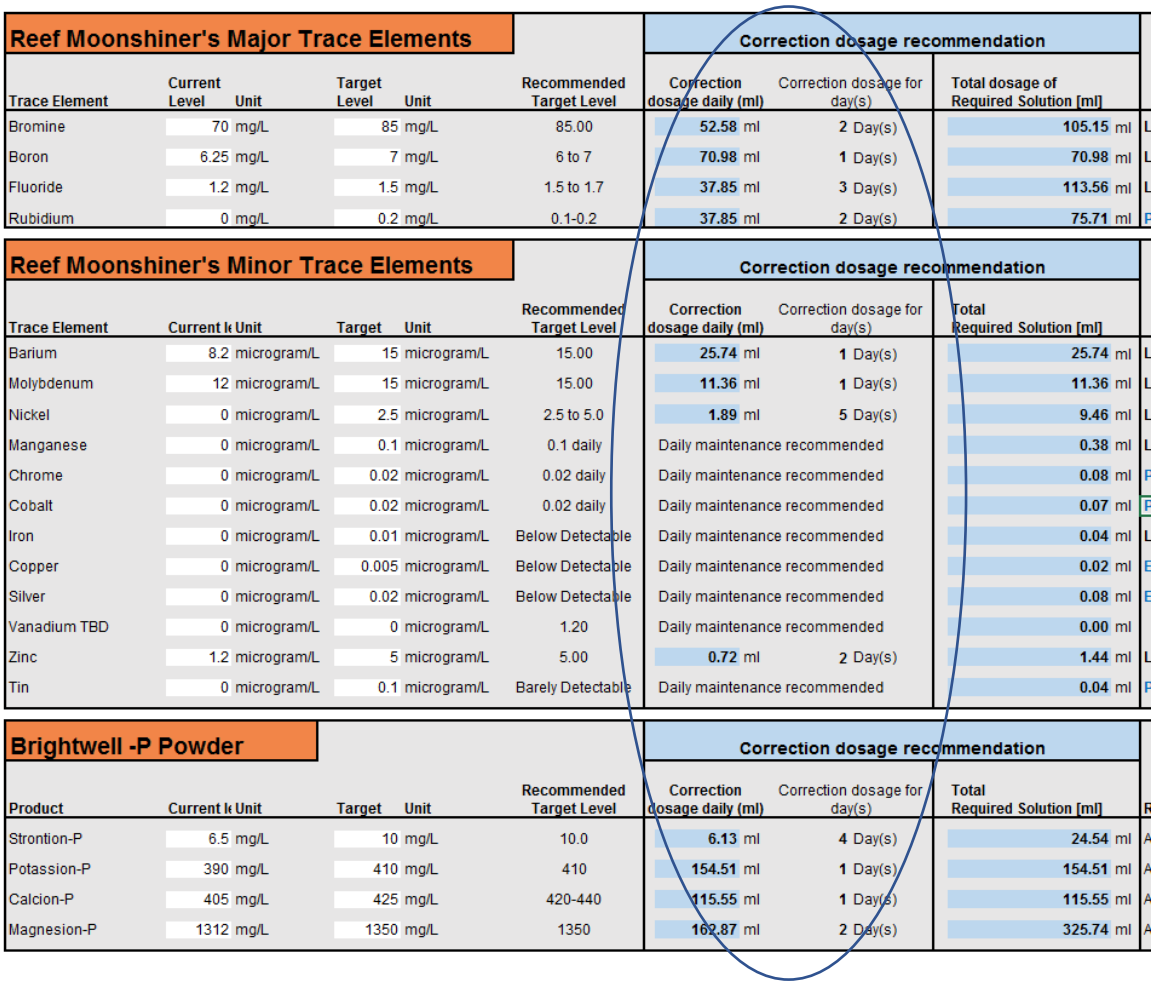
Reef Moonshiner's Minor Trace Elements

Trace Element	Current le	Unit	Target	Unit	Recommended Target Level	Correction dosage daily (ml)	Correction dosage for day(s)	Total Required Solution [ml]
Manganese	0	microgram/L	0.1	microgram/L	0.1 daily	Daily maintenance recommended		0.38 ml
Chrome	0	microgram/L	0.02	microgram/L	0.02 daily	Daily maintenance recommended		0.08 ml
Cobalt	0	microgram/L	0.02	microgram/L	0.02 daily	Daily maintenance recommended		0.07 ml
Iron	0	microgram/L	0.01	microgram/L	Below Detectable	Daily maintenance recommended		0.04 ml
Tin	0	microgram/L	0.1	microgram/L	Barely Detectable	Daily maintenance recommended		0.04 ml

Target values for the daily elements are already pre-filled and show the daily amount of elemental trace, that we will dose per day. **Unless you want to experiment with higher dosages of the daily amounts, there is no need to change these.**

Read out dosing amounts needed

The Calculator output data is relatively easy to understand.



Reef Moonshiner's Major Trace Elements

Trace Element	Current Level	Unit	Target Level	Unit	Recommended Target Level	Correction dosage recommendation: Correction dosage daily (ml)	Correction dosage for day(s)	Total dosage of Required Solution [ml]
Bromine	70	mg/L	85	mg/L	85.00	52.58 ml	2 Day(s)	105.15 ml
Boron	6.25	mg/L	7	mg/L	6 to 7	70.98 ml	1 Day(s)	70.98 ml
Fluoride	1.2	mg/L	1.5	mg/L	1.5 to 1.7	37.85 ml	3 Day(s)	113.56 ml
Rubidium	0	mg/L	0.2	mg/L	0.1-0.2	37.85 ml	2 Day(s)	75.71 ml

Reef Moonshiner's Minor Trace Elements

Trace Element	Current l	Unit	Target	Unit	Recommended Target Level	Correction dosage recommendation: Correction dosage daily (ml)	Correction dosage for day(s)	Total Required Solution [ml]
Barium	8.2	microgram/L	15	microgram/L	15.00	25.74 ml	1 Day(s)	25.74 ml
Molybdenum	12	microgram/L	15	microgram/L	15.00	11.36 ml	1 Day(s)	11.36 ml
Nickel	0	microgram/L	2.5	microgram/L	2.5 to 5.0	1.89 ml	5 Day(s)	9.46 ml
Manganese	0	microgram/L	0.1	microgram/L	0.1 daily	Daily maintenance recommended		0.38 ml
Chrome	0	microgram/L	0.02	microgram/L	0.02 daily	Daily maintenance recommended		0.08 ml
Cobalt	0	microgram/L	0.02	microgram/L	0.02 daily	Daily maintenance recommended		0.07 ml
Iron	0	microgram/L	0.01	microgram/L	Below Detectable	Daily maintenance recommended		0.04 ml
Copper	0	microgram/L	0.005	microgram/L	Below Detectable	Daily maintenance recommended		0.02 ml
Silver	0	microgram/L	0.02	microgram/L	Below Detectable	Daily maintenance recommended		0.08 ml
Vanadium TBD	0	microgram/L	0	microgram/L	1.20	Daily maintenance recommended		0.00 ml
Zinc	1.2	microgram/L	5	microgram/L	5.00	0.72 ml	2 Day(s)	1.44 ml
Tin	0	microgram/L	0.1	microgram/L	Barely Detectable	Daily maintenance recommended		0.04 ml

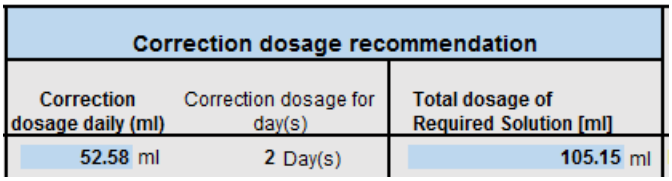
Brightwell -P Powder

Product	Current l	Unit	Target	Unit	Recommended Target Level	Correction dosage recommendation: Correction dosage daily (ml)	Correction dosage for day(s)	Total Required Solution [ml]
Strontion-P	6.5	mg/L	10	mg/L	10.0	6.13 ml	4 Day(s)	24.54 ml
Potassion-P	390	mg/L	410	mg/L	410	154.51 ml	1 Day(s)	154.51 ml
Calcion-P	405	mg/L	425	mg/L	420-440	115.55 ml	1 Day(s)	115.55 ml
Magnesion-P	1312	mg/L	1350	mg/L	1350	162.87 ml	2 Day(s)	325.74 ml

For corrections, the Calculator is giving the required amount of solution in ml per day, as well as for how many days this amount is required to be dosed to complete the Correction.

In certain cases, the required corrections are so large, that the correction need to be spread out over multiple days. In the below example you can see that a few element corrections are done over the period of a few days.

On the right side of this section, "Total Required Solution", this field is calculating the amounts per day multiplied by the duration to give an overview how much solution is required in total for the correction. This helps in advance to determine how much solution and hence bottles are required on larger tank system.



Correction dosage recommendation

Correction dosage daily (ml)	Correction dosage for day(s)	Total dosage of Required Solution [ml]
52.58 ml	2 Day(s)	105.15 ml

For **Corrections** you see:

- Amount per day
- Days to be dosed
- Total solution dosage needed for the correction (for evaluation how much Liquid is required)

Correction dosage recommendation		
Correction dosage daily (ml)	Correction dosage for day(s)	Total Required Solution [ml]
18.93 ml	2 Day(s)	37.85 ml
0.38 ml	1 Day(s)	0.38 ml
9.46 ml	2 Day(s)	18.93 ml
1.89 ml	5 Day(s)	9.46 ml
Daily maintenance recommended		0.38 ml
Daily maintenance recommended		0.08 ml
Daily maintenance recommended		0.07 ml
Daily maintenance recomm		0.04 ml

Daily element dosages are shown in the table "Total Required Solution" and will be dosed daily as described earlier in this guide if not detected in the ICP results.

Even some simple Orange Ricordea can look insane when supplemented with metals and daily routine under this method.

Bonus and Troubleshooting

The below section may be expanded in future revisions and has some useful information for mainly applying this method along with Water change free systems and very common trouble that prevents the Tank system to thrive.

Water Change free Tanks

Take time to read this completely.

I want to take a moment to inform a bit about the results and would like to give a bit personal recommendation to further improve colors and growth for the Moonshiner users that do not perform Water changes anymore with extreme great results.

The midterm experience generally from going Water change free, while applying the Reef Moonshiner's method, and in certain cases the addition of advanced Trace Elements such as Chromium, Zinc, Rubidium, Cobalt etc. is, that these systems thriving even better and look even more colorful compared to systems that still perform Water changes on a routine basis.

So why may that be and why is that a good thing???

Well, the facts we can clearly identify is that first at all, the WC does shock the tank in some way no matter what.

We may not notice it, but with most salts we cause with every Water change a chemical change in the ALK level, impact on Trace Elements and also an instantly happening chemical oxidation process of the new introduced chemicals since many folks do not really let the fresh saltwater settle for 2 days or so. This will have a small effect on the biology as well.

That said, it most likely won't really harm the tank, but it seems that WC free systems enjoy the fact of even more stability by not having this change on a weekly or biweekly basis. Stability is higher for sure. To be fair, first larger correction dosages when starting the Reef Moonshiner's method, do a similar thing at least on the Trace Elements. However, tank systems that run on Calcium reactors usually do require much smaller corrections once a month or bimonthly to maintain the Moonie Target levels, hence the change in the chemistry is reasonable lower that I personally don't see a throwback for a short period as I do saw it with WC's.

The most avoidable change on the water is the change in ALK, and that you can't really avoid with WC's.

You may be able to match the ALK level, however the ratio of sodium carbonate and bicarbonate within the water, we can't match to the tank.

In a nutshell, higher stability is the first benefit. Second is the fact of less maintenance and cost.

Salt is costly, RODI water costs since it depletes your RODI resin and wears out the RODI system faster when doing WC's.

Time to do the preparation and all the spills and trouble we usually experience when doing the WC, we all know that for the most part, lol. Even while some folks have an extremely well-established process for the WC, there is once a while always something that goes wrong while work or family life comes across. So for many a WC is still a pain in the bun!

Personally, I enjoy the fact of not doing a Water change anymore, I rather use the time for fragging ;-)

A third considerable fact is that with no more WC, and that is a big argued fact, we do not introduce certain elements that can be considered as not as beneficial elements or impurities! Means these impurities such as copper, titanium, selenium, arsenic or certain other chemical elements, that are a trace element on one end, but an undesired trace for our purpose. On the other side while leaving these undesired elements out of the supply chain, we have natural consumption or oxidation going on in the tank at the same time. So the way I see it, similar to heavy detoxifying filtration methods such as Zeolite methods, we stop the introduction and consume whatever is in the tank at the same time, causing a depletion of the undesired minor elements!

Well, as a matter of fact some of these traces likely have a need in the biology and micro fauna in our Mini Reefs which we likely almost eradicate by not doing a WC, and many scientists claim that all these elements are needed as well in a healthy reef tank! Agree, I do believe this too! For example, some good salts, which are artificially blended, have at the end about 70-80 measured chemical elements in the final water sample. That sounds a lot, however these "side" traces are not necessarily intentionally blended into the salts, more likely these are brought in as impurities as part of the used chemicals to mix and blend the final salt mix! At this point, I can assure you that there are impurities in the Moonshiners ingredients as well, however these are so extremely low that it will probably take another decade to have ICP's that will be able to detect elements in these low ranges, due to the fact of using very high purity ingredients ;-)

Anyways, there are many overseen ways, these mostly undesired elements but likely needed elements, find their way into our tanks in the desired amounts! Number one factor for this is the daily food we put in our tanks. You won't believe how many traces are included in fish and coral food which will partially being released in the water directly after feeding due to decomposition or will be released into water after digestion by fish and other microorganism at the end. That is actually the theory and purpose of many advanced reefer to feed their tanks a lot while doing no water change. However, for me the uncontrolled addition of elements via food is not the optimal solution but work in many cases to some extent.

Summary of this third fact and message is I like the benefit of natural reduction of undesired elements but maintain these somewhat via addition of minor traces via foods rather than through WC's and we can assume this will take care of all the unconsidered elements we can't and don't dose via a Trace element addition.

What is the culprit of a Water change free tank???

With all these advantages and maybe more which I haven't mentioned above, there are certain benefits from WC's that we don't have if we avoid WC's.

The major advantage is the partial export of certain "impurities and compounds" in the matured reef tank we cannot remove and cause issues long term.

Remember a Water change is still the best way to remove "stuff" out of our tank that our Biology, Filtration System or any absorbing media cannot remove!

To name a few, here a short listing of the most concerning ones to me:

- Medications

- Artificial introduced chemicals that normally do not belong ideally in a marine environment from equipment materials and household chemicals we use

- Gelbstoffe (yellowing compounds in water)
- Accumulation of numerous Acids
- Toxins
- Large Organic compounds

Medications come into the tank through treatments and even coral dips we do in our Reefer life.

Not to mention medications the Reefer takes as human, and introduces those to the tank through sweat and skin contact, this by the way works in both directions!

Chemicals from equipment, pipes and pumps will find its way via natural or chemical oxidation processes, as well the Reefers hand that has been exposed to household chemicals are unavoidable. In theory they may never become a problem, but realistically it's a clock that is ticking.

Gelbstoffe, the stuff that is causing the yellow tint for example requires some sort of exportation either via WC or Absorption or via oxidation which can be achieved partially via UV or Ozonization. Ozonization and UV require still some sort of export via a secondary media in one or the other way and can fill a book ;-)

Anyways, these yellow compounds accumulate and will for sure shift the light spectrum we pay so much for, and will reduce the amount of light, that our corals need, and we pay so much attention to, via PAR meter measurement and spend tons of money for bulbs and light fixtures. A skimmer alone will not be able to remove these yellow compounds, hence some sort of export is required on the long run. Gelbstoff(e) btw. is a german word that is even used in the English speaking world of science a lot.

Acids in the water are mostly a result of amino acids and large variety of biological processes as well as a waste product from supplements, Co2 systems and many more ways. There is only an effective way of exporting those, since natural breakdown isn't fast enough, and skimming doesn't reduce these efficient enough if at all anyways.

Reduced acids in the water usually cause much better PE and better and stable PH, as well a more stable ORP level.

The result is at the end a healthier coral in our favor. Exporting acids is somewhat counterproductive, since while we are exporting excessive acids, we partial remove as well the fresh introduced Amino Acids or Humic Acids for detoxification treatments. But the greater benefit of reducing excessive acids should prevail.

Toxins, these can cause a lot of headache (actually literally), specifically in mixed reefs where you keep Acros and certain Softies all together.

I do see also SPS growing into each other and fighting for room, encrusting bases sliming off at the border of the encrusting base, making space by toxifying and killing the surrounding area to make room for expansion.

All these toxins itself we can't measure and do not really take them into account. Especially Zoas are known for their strong toxins, we all heard the stories and about the issues those toxins have caused. And every owner of a Gold Torch has seen the destruction when the coral reached out to their SPS neighbors. This is a great point of improvement when removing these toxins that accumulate in our tank.

Large organic compounds are partially not been able to be skimmed out and bacteria are usually can only breakdown larger organic compounds after a long time of degradation, means they will accumulate in a tank usually since the breakdown of these larger organics will take longer to be able to be available/consumed by bacteria. Larger organics can be either mechanically filtered, absorbed or broken down to small organics via Ozonization.

So how to remove them effectively???

I have done testing for a while now and came to the conclusion that for Reef systems that do apply the Reef Moonshiner's Trace element supplementation method, the use of specific activated carbon in a fluidized reactor is a great addition and provides even better results to tackle the above problems in WC free tanks.

With the known Pros and Cons of using activated carbon use, and using the Moonshiner's, the most concerning issue of Trace Element absorption and depletion by the carbon is very little and reasonable, considering the benefits it brings along.

I was never a fan of long term activated carbon use, but with the now continuous monitoring of Trace elements in a Reef System and the effect of activated carbon on those, it brought a big amount of clarity on this subject and what to look out for to make it work.

How to apply this???

Well, I recommend utilizing "Pelletized" activated carbon such as from Polyp Lab or Korallenzucht which I have made the best experience with. Other brands will work too, but I haven't tested those. I simply use in the beginning a smaller amount (for the below described reasons to avoid bleaching) of activated carbon in a fluidized reactor in bypass of the sump system. The pellets should not tumble to avoid grinding and carbon particles to get into the tank system as much as possible.

The carbon will remain for now for a month in the system until fully replaced with a new batch.

How much to use???

In the beginning and depending on how much yellow you see in the water, I use 150ml carbon for ea 100Gallon tank system water for a week and add another 150ml pellets after the first week. This will help to slowly adjust the corals to the improved light conditions.

I recommend watching the corals closely in the first few days and even reduce light intensity and photo period to be safe.

After a month, when you replace the carbon, you would replace all carbon with the final amount of 300ml pellets for every 100Gallon of system water volume.

The slower you start to initiate the carbon the better…., does apply to the first use and introduction of activated carbon!

Flow in the reactor shall not be too less, better higher flow, to reduce the contact time which will help to prevent light shock and slows down the absorption, however, avoid tumbling. A good measure is to stick a white paper on one end of the tank and watch daily how the yellow starts to disappear and to become less.

What are the disadvantages of Carbon use???

A few things being said honestly is that good quality carbon pays out, hence the maintenance cost of carbon to be used must be considered. Using pelletized carbon on the long run, it is beneficial and cost effective to buy the larger quantities offered by certain vendors.

A big issue is the initial potential for bleaching due to the light shock. I really warn you not to underestimate this effect.

Take it slow and the mentioned steps here should allow to avoid this effect.

Since activated carbon is known to absorb certain trace elements, which is true, you will find out that certain Reef Moonshiner elements, but mostly Nickel, Zinc and Iodine will decrease faster than normal. I did not find it necessary to perform a shorter testing cycle and the reductions were not really concerning high, hence corrections on most traces were not high, some did not seem to be affected at all. Iodine is one of the elements that dropped most and hence the daily drops the Moonie have to supplement, will have to be increased based on the carbon brand, batch and system behavior. Means you likely have to readjust the Iodide dosing routine after the ICP.

Certain activated carbon Brands will release some Phosphates, one more one less. That may not be a problem, maybe even a more welcome effect on ULN systems, but depending on the Po4 levels, this need to be accounted for. In my cases the Po4 release was slightly noticeable, however the increased bacteria biology adapted pretty fast to it, so it wasn't something I had to worry about. However, I mention this here. I used for comparison a cheap pelletized activated carbon with the results of increasing Po4 about 0.1ppm, which is a lot! The brand really counts.

Another welcome effect for ULN systems is that the activated carbon reactor in a fluidized reactor becomes bioactive and will release and produce some nitrates after a week or two. Systems with elevated nitrates may not like that fact too much.

On the other side, in certain systems that have issues with Nitrate reductions, high nitrates and the tank biology, it may be that some of the earlier listed problems are contributing to a non-well-functioning biology. The increase of Nitrates is comparable to a filter sock that is not been washed out monthly ;-)

What to expect after introducing the carbon???

Ok, so if you have followed the directions and slowly applied the carbon in the described way, the results should show from day to day an improvement on the overall appearance of the corals!

If they do not look better from that point on, something is considerable going into the wrong direction.

That can be the result of depletion of Iodine, which in theory could happen if your iodine level was very low to begin with.

Bleaching of Corals and tips, from Light shock is issue number one. By the way, Corals in low levels of Iodine do react quicker with Light shock than in tanks with moderate to high Iodine levels.

If a tank, and you can check your last ICP trending, with less than 30microgram/L starts the carbon, I would be careful since it may drop your tank into the depletion range.

Polyp extension will improve within a few days, if no Light Shock did happen.

Overall shimmer of Corals will improve, certain corals will have a bolder look in the blue and red colorations.

The overall tank appearance will improve, the water will look more crisp, however this should not happen instantly and ideally should take a few days to look really crisp. The final results on clarity you will see after the second week, when the carbon amount reached its full amount in the reactor.

When to start???

Tanks with lower Iodine levels as mentioned above, need to tackle Iodine levels first to be in the 45-60microgram/L range and use daily Iodide as described in the Reef Moonshiner method.

Recommendation is to introduce the activated carbon with the earlier mentioned and recommended Brands to be started 2 weeks prior taking the sample to send out the ICP. The time line would be then, introduction 50% carbon for a week, add 50% carbon for a week, taking the sample after total of 2 weeks, 2 weeks until results. Means the next ICP will tell you the effect on the tank after 2 weeks of carbon use and you can adjust from there and take correction as needed.

However, I leave it to you guys when to start, a tank with moderate to high Iodine levels and following the descriptions will most likely experience a smooth transition into a cleaner and healthier tank ;-)

When to replace???

Generally, I would say on a monthly basis, but you will see the discoloration on the tank water which will indicate that the carbon is exhausted. In reality, the first-time use is the worst for the carbon so the first fill in the first month, does have to absorb the most loading.

Another indication is the PH a lot of times. Due to less acids, the PH will start to increase over a few days. Saturation of the activated carbon can then also be noticed when the PH starts to drop from day to day, indicating raising acids again.

Can granulated carbon been used???

I would recommend sticking with pellets for the above mentioned risks and reasons for pellets.

Also be aware some carbons on the market are made out of coconut shell and absorb many more trace elements from what I have seen and increase the risk for bleaching. Avoid those types of Carbon.

Can we use pelletized carbon in bags???

Yes, it will be less effective and will take longer, but taking it slow is a benefit here.

I'm unsure if that will be able to be as effective on subsequent weeks as we like it to be.

Feedback is appreciated if you do it!

Can I do this even while continuing WC's???

Sure you can!

Low PH issues in Reef Tanks

Unfortunately, I do see recently a lot more tanks of the new Reefkeeper's generation that literally suffer from low PH, mostly due to excessive carbonic acids in the Water.

This effect is usually noticeable when the PH in the morning is below 7.8-7.85

Under consideration of a normal salinity range and average Alk level the normal Reefkeeper maintains, this indicates a high amount of trapped Co2 in the water.

As a result, the overall Reeftank biology and calcification processes are negatively impacted. Even worse, the majority of Corals will not be able to appear in the colors and beauty which they could show if they would be healthy, due to be in a Saltwater with lower carbonic acids.

Reason for this situation is that there is a significant imbalance of Co2 introduction versus degassing. The Co2 household is simply out of whack.

There are many ways how the Co2 will be introduced into the tank:

- Micro fauna, Algae and Corals itself will contribute to this effect during and after the Photoperiod, which there is nothing we can do about and it's part of the biological process of the Reef.
- Co2 rich Air Introduction into the Reeftank via Surface Agitation, Baffling, Waterfalls, Durso pipes, Surface movement wherever Water and Air is in contact with each other.
- Co2 Rich Air Introduction via Skimmer, Air Pump and Stones etc.
- Co2 as a utility used on Calcium Reactors
- Co2 as a waste gas from Biofilter systems
- Lot more ways to get it in …….

On the other side, and under normal circumstances, these are the ways the Co2 will be taken out of the Tank:

- Surface agitation on water surface, Overflows, Baffles, Skimmer – Gas exchange to environmental air.
- Absorption of Co2 from Algae and micro fauna
- Absorption from substrate – chemical reaction of carbonate with acids
- Minor consumption of Co2 from biological processes

Overall there are many more ways to introduce the Co2 into the tank, than ways to get it out.

The major and most beneficial way to reduce the Co2 out of the water is with surface agitation, waterfalls and overflows etc. However, these techniques have been reduced in the recent years to make Reeftank almost silent leading to a long term issue.

It must be understood, that the biggest issue on the Water to Air gas exchange is, that it can only work effectively if the environmental air for the Gas exchange is not supersaturated with Co2!!! You will see in a moment where this is going to.

The higher the used Room air Co2 concentration is, the less Co2 will be exchanged out of the water! Means low Co2 concentration in the air, big Co2 exchange and vice versa with high Co2 levels in the surrounding area, very little Co2 Gas exchange will happen.

Here some data:

Outside Air Co2 concentration is usually around 400ppm.

Your house will have likely a Co2 concentration of 600-800ppm of Co2 which is considered normal and a reasonable good gas exchange should be possible to maintain good tank PH with some additional measures I will detail out later.

Here the things we don't want to know! When I investigated the last 15-20 tanks with low PH issues where the classic way of Skimmer Air Co2 scrubbing did not help, including my own house, the Co2 concentration was in almost all cases measured in the range of 1,200ppm-1,500ppm !!!

This level is absolute not healthy for the Reeftank, and even worse, it also makes the people ill that have to live in this environment. Not to mention, these concentrations are inacceptable to any codes and conducts for safe work environments!!! Take this matter really serious!!!

First is to find out if the environmental Room air is really the big issue here. From experience I can say, that if the PH can be normalized into the daily range of 7.9 in the morning to 8.3 in the peak time of the day, the Co2 concentration might likely be in acceptable limits, in case the PH can be increased with these below corrections to increase the Tank PH. If not, you should invest in Co2 Handheld meter which is usually around $120-$150 from common online vendors. This will provide sufficient clarity if your house needs a corrective action on the Ventilation system.

Back to the balance of Co2 introduction and Degassing. Here are a few realistic actions than can be used to increase the PH on most tank systems.

PH Scrubbing of Skimmer Inlet air

Install a reasonable sized media reactor with Soda Lime on the Skimmer inlet. This will result in a very high efficient gas exchange in the Skimmer body, since the Air is now very low in Co2. Simple heh?

I personally recommend using the TLF Phosban 550 Reactor with Soda Lime from Shopmedvet.com available in single bags or canisters. If your media exhausts quicker than in two weeks, your room air may be supersaturated with Co2.

Use large diameter reactors to allow longer air/media reaction time, due to reduced velocity of airflow in the reactor itself.

Remove any silencers, which basically only drop the airflow through the system and with a reactor, there is no need for a silencer anymore.

If you want to increase the time the media will last, run an outside air supply to the scrubber, remember the outside concentration of Co2 is even lower than inside the house.

Running an outside air hose to the skimmer inlet can do the job in many cases even without scrubbing, however it's mostly not feasible to do so, and keep windows open all day long does not work either but may be a temporary solution.

Skimmer efficiency increase

Run as much air as possible through the skimmer with air inlet wide open.

Clean the Skimmer water/air diffusor as often as possible from salt creep. In air flow measurement on air inlets on a variety of skimmers, it's been found that the salt creep inside the diffusor reduces the air flow after 2-3 days by 30-40%.

Keep the diffusor clean or do one of these:

- Stop the Skimmer operation every 8 hours for a minute through a timer. In that minute the salt creep in the diffusor will melt due to the rising water and been flushed clean automatically when the skimmer turns back on.
- Install the Top off system water into the Air inlet right before the Diffusor. That will flush the salt creep away every time the ATO turns on. But watch the operation, the RODI water may affect the skimmer and does cause overflowing or extremely wet skimming for a period of time.
- Venturi skimmers can use the ATO water as well but you would need to turn off the skimmer pump automatically when the Venturi is being flushed to avoid overflowing the skimmer.

Enhance the Calcium Reactor system

Additional effluent chambers with calcium reactor media will reduce the introduction of fresh Co2 into the tank coming from the Co2 reactor.

Add a second Calcium Reactor with Calcium Reactor media but no Co2. This will increase the alkalinity levels of the effluent, increase the efficiency of the reactor system in a way that less effluent is needed than before due to higher alkalinity concentrations, hence less effluent needed to maintain tank Alkalinity.

Add a DIY aeration chamber where the effluent is aerated with scrubbed air and a wooden air stone. Tricky to build, since it requires overflow and degassing/emergency vent line.

Keep the Refugium on 24/7

Utilize the Co2 absorption from Chaeto and let the Refugium run 24/7.

Aerate the Overflow

Use a Hydroponic Air pump and use scrubbed Air and a few Wooden air stones such as used for Micro-nano-bubbling and aerate the Overflow chamber if you have one.

This will drive out a lot of Co2 out of the tank very efficiently.

Can also be done in the sump, but the higher the water column is the better.

Micronanobubbling

Apply Micro-nano-bubbling in the night. Search up Cruz Arias and his MBN method.

Utilization of higher ALK or Kalkwasser is not the ultimate resolution or fix !!!

Do **not** artificially use Kalkwasser or more Alk into the tank for higher PH, that does not remove the Co2 really out of the tank! Long story why. It's a workaround but can bring other issues up.

Just increasing the PH with KW, Soda ash or other elements is just hiding the Co2 issue! Hope that makes sense to you.

The culprit is the Co2 balance in the system.

To be continued……