Biodiesel

A free Earth4Energy gift

An Alternative Gas Solution For Your Car and Home

Home and Vehicle Edition

> Run Your Diesel Vehicle for 48 cents a gallon!

> Heat your Home substituting Bio Diesel for Home Heating Oil

> Run your Diesel Generator on Bio Diesel

> Solve the problems of global warming and pollution

> Transform your Life using clean renewable

> Energy Easy Step by Step Guide to make your own Bio Diesel

> 15 years experience using Renewable Energy for my home

My Mission - Your Purpose

I envision a World where every family can choose to run their life with renewable energy-not just their home either, but their entire existence including their business and their vehicle.

After 15 years of research… Today, I can finally tell you that this goal is achievable in very practical terms. You can create a home that is run on renewable energy- whether you choose to install solar panels, wind generators, micro hydro or a bio diesel system is up to you. You will learn how to power your home and heat it too, all with renewable energy.

A special challenge for me was to search out ways that business could be conducted with renewable energy. I have come up with some very viable Renewable Energy Solutions you can implement for your business.

Lately, with fuel prices going through the roof most of my research has been in the area of using renewable energy sources to run your vehicle. Yes, it can be done and I will show you how.

It has taken me 15 years of research, trial and error and just plain sweat to come up with this revolutionary system to run your life with renewable energy. I encourage you to take your time and implement only one part at a time-take baby steps. It does take time and persistence to implement this plan.

You will be taking action for your family, your neighborhood and this planet I call home – Action that will make a big difference.

This book is intended to be easy to read and easy to navigate.

My purpose is to provide you with the very best guidance setting up your own Renewable Energy Solution.

This text is designed to be read from cover to cover, step by step in order to achieve that goal. You can bookmark later for your own reference, but for now read the whole thing.

Your Own Renewable Energy Solution

A Guide for Change

Today is the day for change. This is your action plan for change.

In this book you will not find dry, boring scientific claims that global warming and climate change will be the end of us all.

Instead, this book is intended to inspire you to action- take action to make your family life better by implementing a system of renewable energy usage that I will explain and illustrate fully.

As a result of helping your family, you will also be helping your community and this planet I call home.

This is a book designed to help you do something about the problem of global warming, and you can make a difference… if you start now.

The solution really lies in my own backyard. The actions I take and the decisions I make everyday can affect change. How do I know this?

No, I don't have a fancy science degree from a famous university, and I don't support fancy name brand foundations that line their own pockets in the name of marketing 'Green' choices.

I have simply made the choice to implement a lifestyle

that would no longer contribute to global warming and climate change. The truth is that I have been doing this for 21 years and I see it working.

That's the important part in all of this. I all have to take personal responsibility or there will be no change.

Back in the 1960's I grew up we all thought I could keep consuming the Earth's resources without any consequences.

We were wrong

There are consequences involved in overuse of our resources. Those consequences could be devastating on a global level.

But the solution lies at Home! Yes, it is the Renewable Energy Solution that I am providing for you right here.

If I wait for industry and government to make changes I will soon feel even more devastating effects from climate change. I may already be seeing those effects in the form of more severe weather patterns affecting the growing of my food.

The choices I make as a family will affect the quickest change for the better. As I mentioned, this is no doom and gloom guide to the end of the world, this is a guide to change.

What can you do?

There are many positive steps that you can take, and the good news is that most of them can be started today. This

guide is your starting point.

Enjoy the journey.

This book is not intended as a quick reference guide, designed for skimming from one subject to another.

My purpose is to take you, the normal grid connected family and transform your life. I will take you from an ordinary urban existence to living off the grid in just a few easy steps. That is my goal. Specifically in this book I will show you how to make bio diesel fuel that you can run your diesel vehicle, your home oil furnace or your diesel generator.

This text is designed to be read from cover to cover, step by step in order to achieve that goal. You can bookmark later for your own reference, but for now read the whole thing.

RENEWABLE ENERGY AND OUR LIFE

How I got started

Back in 1985, when I was first married the term global warming was just beginning to be recognized as a possible threat to my way of life. I remember the first time I heard

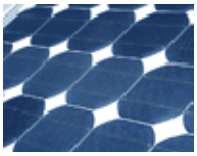
about global warming, and what I decided to do. I decided to make some changes. It turns out that the lifestyle I had been pursuing since then was well on its way to helping stop global warming, or at least lessening my impact on it.

I chose Renewable Energy as my main solution for many reasons. Here is the story of how I got started. You can read about my story of getting started building my home late in this book.

I purchased my first piece of renewable energy equipment in 1993- a very small 1.4 watt solar panel. It was purchased at a local department store for about 20$, the panel being sold as a vehicle battery charging system. It was intended that the solar panel be mounted on your dashboard to charge your battery. I used it in my newly built timber frame home to power a DC car radio. I hooked it up directly from the tiny solar panel without a battery because I simply could not afford a battery after building the house.

In my new home that first winter of 1993 that little radio would crackle to life at about 9:30 in the morning most days.

That is if the Sun was shining. In light cloud cover it would still work, but heavy clouds would interrupt my radio reception because not enough solar energy was reaching the tiny solar panel. In the afternoon, as the Sun started to set, the radio would crackle and fade to silence once again. It was my first step toward my Renewable Energy Solution.



In 1995 I purchased a slightly larger 15 watt solar panel and a single deep cycle marine battery. I figured at the time, although wrongly, that this would at least provide us with lights.

I installed a single fluorescent bulb and it would last exactly one hour on a daily charge from my solar panel. The marine deep cycle battery was soon ruined as well. I discovered my cheap department store charge controller we had installed came with defective wiring instructions, ruining my battery by allowing it to charge too full, and drain down too much. Back to square one. As a side note, this same company, one of Canada's largest retailers, continues to sell this same charge controller with the same faulty wiring diagram, even though I informed them of the problem (and they acknowledged receiving the advice).

At this point, after lengthy discussions I decided I just didn't know enough about renewable energy. More research was necessary. It was about this time that I decided to do complete research on running my entire life-home, business and vehicle on renewable energy only.

We read everything I could on solar panels, wind turbines, and possible hydro power from my stream, as well as bio diesel sources of fuel for my vehicles.

We also read every plan for running a vehicle on renewable energy sources. I started with my goal of energy self-sufficiency and worked backwards to identify the best possible means for achieving that goal.

After over 12 years of mind numbing research I can finally bring this information to you with the complete

guarantee that it will work for anyone, anywhere in the world.

I didn't want any more false starts or mistakes. It was just too important to me.

What follows in the following chapters is the method I have researched and used (many others too) to go from a totally energy dependent lifestyle to using renewable energy exclusively to power my life.

Now, realistically I don't expect everyone to live as I do. You can take this to any level that you wish, from simple backup power when the grid is down; to a grid-tie system selling your excess back to the utility, to living completely off the grid. The choice is up to you. That is the real purpose of this book, to help you make those choices.

You can use this method to discover exactly the right Renewable Energy choices you need to make. Whole subdivisions are being designed to be run off of wind farm energy, or even huge solar installations capable of running small towns are being built. This manual will help you see what the right choice is for you.

Let's Get Started Today!

Bio Diesel

Even before you begin to install a solar panel array or wind generator in your home you can start right now and produce Bio Diesel to heat your home and run your vehicle.

The Answer to my search for an alternative fuel to run

my home and my truck happened quite by accident. Here is the story of how I found bio diesel and what I use it for. I also detail a very simple system for making your own bio diesel fuel.



You see I ran a summer French fry stand in a popular vacation destination for over a year and every time that the fryer oil had to be changed I stored the old vegetable oil in the 5 gallon pails that the new oil came in. It seemed like a good way to store it for later use. Being the conserver type I didn't want to throw it away either, but what could I use it for? At this point I didn't know what bio diesel was.

In this photo I had begun to store the 5 gallon pails in 55 gallon drums that made it easier to manage. I put a tap on the bottom so the potential bio diesel could be easily taken out.

There are lots of restaurants out there just begging to get rid of this stuff too. All you have to do is ask for your own free source of veggie oil. You don't have to own your own French fry stand to make this work.

When I reached 10 pails of used veggie oil and I had to start storing it in 55 gallon drums in the garage my wife demanded that I either find a use for it or get rid of it.

I used that old veggie oil for everything!

It worked well for a wood preservative for tools and outdoor furniture just like boiled linseed oil.

I used it for chain oil in my chainsaw thereby eliminating the petroleum products going out into the woods every time I cut firewood.

I discovered I could convert it into bio diesel fuel to heat my home and run my truck too.

But I still needed a way to use larger amounts of the oil. I knew at this point that the oil would burn, maybe that would hold the answer. I looked into ways to burn the oil and get a productive result for my family. I just knew there was a way to use the oil for good. When I searched around I discovered that I could convert the old vegetable oil into bio diesel and use it for home heating oil and to run my diesel truck. I was excited because then I could use this waste product for the benefit of my family.

My first attempt at making bio diesel did not turn out very well. I bought a bio diesel plant that came with some rather simple instructions on how to make bio diesel at home and set to work making bio diesel. I say it didn't turn out very well because the plant I bought was expensive and didn't work very well.

I decided to learn how to make my own bio diesel at home and build my own bio diesel plant to solve the problem. I wanted a system that was inexpensive and worked every time!

<u>And I found it.</u>

That worked much better as I were able to make bio diesel much cheaper and much better that way. I have always felt that a bit of knowledge saves a lot more than the cost of obtaining it. my fuel costs are down to about 48 cents a gallon now!

Finally I had solved my problem of what to do with the waste oil, how to heat my home cheaper and run my vehicle on bio diesel. I had actually solved 3 problems in one. And don't be discouraged if you don't happen to own a French fry stand either.

There are lots of restaurants and small shops that would just love to give away all the free old fryer oil you can take away, just for the asking.

Make Your Own Bio Diesel – Step by Step Plans

Easy step by step plans
Build your own bio diesel plant at home
Run your vehicles cheaper and cleaner
Heat your home
Run your home backup generator on bio diesel

The price of fuel getting you down?

Here is the answer.

Do you want to help clean up the planet I live on and recycle all at the same time? Bio Diesel is the Answer and part of your complete renewable energy solution.

There are a lot of other benefits too. I was always tired of ever increasing gas and oil prices. As consumers we just had no control over this expense- bio diesel lets you take control. I have got my fuel cost down to about 48 cents a gallon right now! It does vary slightly from month to month, but over the last 12 months that is my cost per gallon. Does that sound good?

I really got tired of supporting the big gas and oil companies. I wanted to keep more of the money that I spent too.

Now I'm not a mechanic by any means, but I did notice that my vehicle does run better on bio diesel too. Friends of mine who are more mechanically inclined tell me that bio diesel has great lubricating properties.

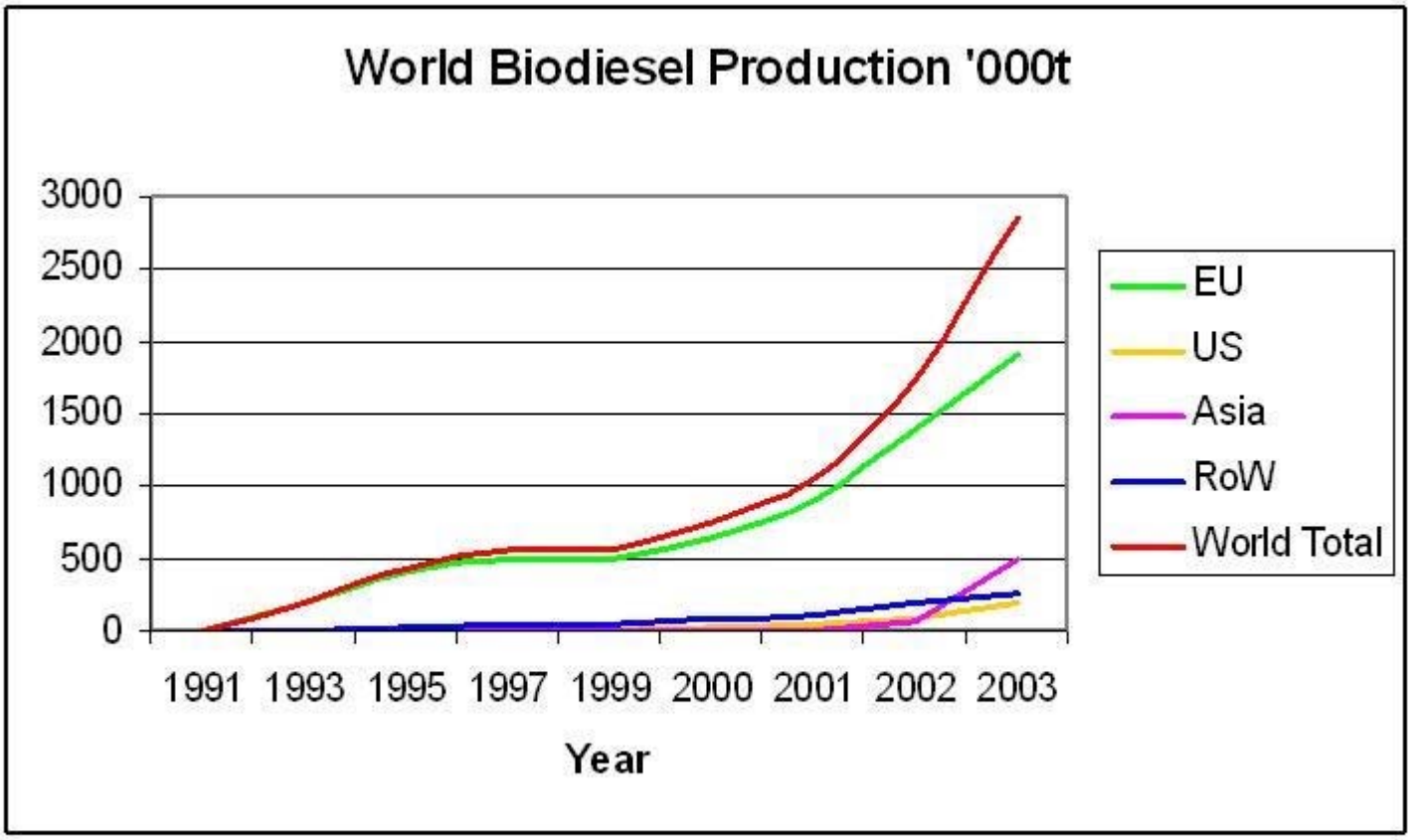
We run a diesel generator from bio diesel too and my neighbors are using it in their oil furnace (we burn wood,

another renewable energy resource).

The first diesel fuel was actually made from peanut oil- yes the first diesel was actually bio diesel. There really is nothing new here, just revisiting a really old way of doing things again and finding new uses for bio diesel.

Mr. Rudolf Diesel (yes that really was his name) used peanut oil to develop a clean burning fuel for farm use. The Bio Diesel that he created burns very clean in fact, producing hardly any smoke or solids in the air.
This leads to significantly reduced emissions from your vehicles too.

Bio Diesel has been used for nearly 100 years now and is in fact making a comeback because of the increasing price of petroleum products. You can see by the following graph that usage continues to grow.



Bio Diesel has been extensively researched and has been used across the World for a long time. It is completely safe for your diesel vehicle, oil furnace or diesel generator. Diesel fuel and bio diesel are not explosive either-like gasoline, propane, natural gas or hydrogen. Yes, it does burn but the fumes will not ignite as easily.

Another benefit is that bio diesel does not evaporate as readily as gasoline, so it can be stored for longer periods of time. This is nice because large batches can be made and then stored for future use. This is what I do with my generator fuel.

Mixing Bio Diesel with Regular Diesel Fuel-

Since I live in a cold climate I cannot run pure bio diesel in the winter. Luckily Bio Diesel can be mixed with regular diesel to solve the problem in the cold times. If you live in warmer climes (be thankful) you can run your equipment on pure 100% bio diesel year round.

Some clouding and gelling occurs that makes the fuel not flow properly and clogs up the engines until they are warm.

The fuel can be mixed in any ratio that you desire. The mixture itself is referred to as the BXX ratio where XX is the % of bio diesel used. Obviously B stands for Bio Diesel.

As an example I run B50 in the winter, which is 50% bio diesel and 50% regular petroleum diesel.

If you were using B70 that would be a 70% bio diesel mixture and so on… Regular diesel fuel additives are also quite compatible with bio diesel.

Basically, anything you can do with diesel you can do with bio diesel.

Mr. Diesel designed and built the first Compression Ignition Engine, and he designed it to be run on any fuel source including vegetable oil (peanut oil in this case). After reading his research, he was acting like a lot of great inventors, taking a common problem and coming up with an uncommon result.

Too Much Peanut Oil ?

There was simply an oversupply of peanut oil where he lived and he wanted to find a practical use for it. It made sense to him to run the farm equipment with it that was used to produce the peanuts in the first place. What Mr. Diesel did not envision was that even in the next century people would be using his invention for good.

There are literally thousands of restaurants all over the world just dumping their used vegetable oil. I could take this over abundance, just like Mr. Diesel did and use it to power a vehicle, or your furnace or a generator.

How does a Diesel (Bio Diesel) Engine Work?

Let me tell you first, how a regular gasoline engine works and show you why Rudolf Diesel's revolutionary engine differs from that. The gasoline engine has been promoted mainly because big oil companies have promoted that product to the exclusion of all others.

In a regular gasoline engine, since gasoline fumes are explosive, the engine first compresses an air-fuel mix and

then this mixture is ignited in the individual cylinders with a spark plug.

The diesel engine works a little differently. It took the inventor many tries before he got it right. There is no accurate record of how many experiments he conducted, only that it was substantial. The persistence of some inventors is truly amazing-for instance, it is reported that Alexander Graham Bell actually tried over 10,000 experiments before he got the incandescent light bulb to work? Amazing.

The diesel engine works by first compressing the air inside of the cylinder. The air is actually compressed to a pressure that is almost 3 times that of a gasoline engine.

Under this terrific pressure there is a lot of heat created and high temperatures are maintained within the cylinder. At precisely the right time a small amount of fuel is injected into the cylinder.

The fuel ignites in this high pressure, high temperature environment and thus power is created.

Because the diesel engine operates under substantially higher pressures it is constructed a little differently too, different from your gasoline engine. They are constructed of very strong materials and therefore from the very beginning they are designed to outlast your gasoline engine.

Why should you buy a diesel engine vehicle?

Why do you think that diesel engines are put in transport

trucks? They frequently log 2 million miles in a lifetime, that is why. I know of several diesel cars that are approaching 700,000 miles on the same engine. They are built to last a very long time.

What if you can run it on a fuel that is environmentally friendlier, that you can produce for 48 cents a gallon and your vehicle will last 2 or 3 or even 4 times as long as a gasoline engine ?

That sounds like a ‘Complete Renewable Energy Solution’

I grew up in farm country and I remember diesel engines on huge trucks and huge tractors that belch black smoke into the air and smell like, well... like smelly old diesel. Who would want that? Not us for sure.

That same engine run on Bio Diesel, smells like you are cooking something good, French fries or some think it smells like a barbecue. Your only problem would be that you would have to stop and eat more often I figure, it might make you hungry, although I haven’t found this to be true.

Now, as I mentioned, I am not a mechanic. When I look under the hood of a modern gas powered car I don’t know where to start if something goes wrong.

The engine that Mr. Diesel designed has no wiring system- no sparkplugs or wires all over the place. For this reason they just look less complicated and they are.

Recent research has shown that bio diesel contains only slightly less power or energy per unit when compared to

regular diesel. Researchers tell us that it does lubricate better though and it is naturally oxygenated. What does all that mean? Well, it burns cleaner which will reduce emissions by up to 60% in most cases.

Either way you can expect about the same fuel mileage ratings as from regular diesel.

What I like best is that bio diesel has a higher flash point rating, which means it is slightly less flammable and much safer in storage. I like that because I can make large batches and store it for later use.

We make our own

All over North America and other parts of the world you can buy commercially available Bio Diesel for about the same price as regular diesel fuel-in the $3 per gallon range, but why? Yes, you would be helping the environment, doing your part, but why not make your own Bio Diesel?

Don’t even think about buying one of those commercially available Bio Diesel plants either

These units sure are pretty but they don't do any better job than the Bio Diesel Processor Unit I are going to show you how to make. They cost a whopping $2500 too. That seems like a lot of money to us and the return on investment would take to long for us do-it-yourselfers.

We have always preferred to make my own- whether it is building my own home, building a wind generator or building my own solar panels- there is just a satisfaction that is found in making your own.

Oh, and the price of making your own is about $150 or less depending on how much of the materials you can scrounge up or you have on hand.

This guide book is intended to be used to produce Bio Diesel for personal use on a family scale. I want you to be able to run your home, business and vehicle with this renewable resource. The plans that follow are scaled to that undertaking.

That brings us to my next section, what exactly are you going to need to build your Bio Diesel Processor Unit.

Building Your Bio Diesel Processor

Parts Needed Approximate Cost

55 gallon steel oil drum - Free or up to $10
3 cement blocks Free - $2
5 gallon plastic paint bucket with lids Free - $4
Cordless drill $12 - $30
Candy Thermometer - $3
12 volt DC trolling motor - $25 - $75
Propane heater - $10

Long handle Paint Mixer - $3 - $5

Hopefully you have on hand some of these items to

lower your initial costs. You should be on the look out for several large 55 gallon drums and several of the 5 gallon pails. These are usually available for free from the restaurants that you will get the used veggie oil from.

Ask them to save a few pails with lids and use them to store the oil in. Tell them you will do a weekly run to pickup the oil, or bi-weekly as needed. I find that going out and doing this about every 2 weeks is right, I can buy supplies while I are in town and pick up enough used veggie oil to make a decent batch of Bio Diesel for later use.

You will have to experiment with timing and schedules and see what works best for your suppliers and you. Remember to be courteous and thankful. You are doing the restaurant owner a service by taking away this waste product for them.

We don’t go into a lot of detail about the chemical processes involved in making Bio Diesel in this guide. This book is designed to be practical and instead show you what you need to do to succeed with making Bio Diesel. This practical guide is based on the premise that vegetable oil is plentiful and available free from restaurants just for the asking. If someone wants to charge you for taking away their waste then go down the street and ask somewhere else. There are lots of folks willing to co-operate with someone trying to do this, more than enough.

After you have secured a reliable source of vegetable oil

and built your Bio Diesel Processor you will only need to invest very small amounts of money to get started. Each batch will require some household lye, and a small amount of methanol. I will show you exactly what that is and where to get it once I have built the processor.

Are you ready to make Bio Diesel for around $48 cents a gallon? Let's get started making your Processor unit.
You need to understand only a bit of basic chemistry before I start. The process you need to understand is called – Transesterification. I know, big word scare. Don't worry. Wikipedia Defines Transesterification as- In organic chemistry, transesterification is the process of exchanging the alkoxy group of an ester compound by another alcohol. These reactions are often catalyzed by the addition of an acid or base. Wo, what was that?

Here is how it works.

In simple terms, vegetable oils, like the oil you get from the restaurants consists of triglycerides. These are fatty acids that naturally occur in the product. When heat is added to the oil, such as when cooking more free fatty acids form. Since this is an acid the oil after it is used heavily will have a very low PH reading. Just like garden soil can become acidic and not grow good plants this oil needs the addition of a strong base product (lye) to raise the PH.

The chemicals that you mix with the used veggie oil, the lye and the methanol tend to break up these triglycerides. The methanol-lye (sodium methoxide) bonds with the oil and forms Bio Diesel. It really isn't that complicated when you see it work.

The impurities, excess methanol, and glycerin all eventually settle to the bottom of your mixing tank after your batch is properly mixed.

You will have to make precise calculations and measurements to successfully turn used veggie oil and the added ingredients into Bio Diesel. I show you the right proportions in the following section.

If you use too much lye you will end up with a big batch of soap, and if you don't use enough you are left with inferior Bio Diesel with too much glycerin in it. Just be careful with your measuring.

When done properly you will end up with B100, or pure Bio Diesel and a bit of crude glycerin left over. Please note that I have never ruined a batch of Bio Diesel and I are sure you won't either. Just be careful.

A word of Caution before I begin

In case you haven't figured it out by now, you will also need a diesel vehicle to use the Bio Diesel in. If you own a diesel generator that will work too, or you can use straight Bio Diesel for home heating oil too. Just remember that you can not use Bio Diesel in a regular gasoline engine.

Remember that I outlined the tremendous advantages to using a diesel earlier in this guide book, what I didn't tell you was the price. Surprisingly diesel vehicles are available rather inexpensively in most of North America. That's right a diesel Volkswagen or Mercedes might just be the ticket. They are available at ebay or locally. Just check the prices. We found a great old diesel van made by Chrysler for $100. It still runs great. Friends of ours bought newer

vehicles but I like fixer uppers so that is my choice. You will have to do what suits you.

Disclaimer-
As mentioned above, I use older vehicles that are well past their warranty stage. I have had great results, but I can not guarantee you will too. I have never known anyone who didn't have great results though.

This process could nullify your new car warranty.

Also, you will be dealing with some toxic chemicals in this process be careful, as I warned you in the beginning. Please wear safety gear for your entire body especially your eyes, and the author's assume no liability for accidents.

You are also responsible for paying any related fuel taxes for your fuel produced, although I have not heard of this being enforced in North America or anywhere else.

This guide is written for information purposes to help you. If any of this procedure is beyond your abilities then please ask for help. And be careful. Hope I didn't scare you there. Just want to make sure you are observing safe procedures.

Now lets' get to making the Processor.

Bio Diesel Processor

First you will find a place that is safe for working and place the 55 gallon drum on the 3 cement blocks so it is resting in a stable safe position. Set up the heater underneath of this setup.

Next, clamp the trolling motor to the top of the barrel. These little 12V DC motors come with little clamps that are meant to be fastened to your boat. This setup works great.

We happen to live in good fishing country and I picked up an old trolling motor for free, well I traded a bit of computer advice. You can usually pick them up at garage sales etc. pretty cheap. Look around.

I have seen complicated setups and much more expensive ones too, but I run that little 12VDc motor with a solar panel. You can boost it from your vehicle if you have to, it does work good.

And remember that if you have some other form of mixer on hand then use that. I actually used a washing machine for a while, but found that the 55 gallon drum with trolling motor was easier to manage.

You do need to mix this stuff rather vigorously to get the desired results. It's not like mixing up paint, you have to stir it for the chemical reactions to take place.

Alcohol Mixer.

This is where you use the 5 gallon pail with the lid and your paint mixer. Drill a small hole in the lid of the 5 gallon pail. Gently push the long paint mixer through the hole and attach it to the cordless drill. Leave it off of the pail for now. You will want to close the pail with the lid and mix with the cordless drill later.

Mixing up a 20 Gallon Batch of Bio Diesel

Use the same proportions exactly when making smaller

or larger batches of Bio Diesel, 20 Gallons of Used Veggie Oil 4 Gallons of Methanol- exactly 20% of the total of veggie oil you can get this from a chemical supply store, auto parts outlet or a race track, or even from junk yard suppliers.

1 bottle of lye (hardware or pharmacy)
1 bottle of Isopropyl Alcohol (pharmacy)
1 PH test paper package (garden supply)
1 Chemical scale (ebay)
1 eye dropper with scale for measuring (pharmacy)
3 Graduated test tubes

Assorted safety gear for eyes, hands, everywhere

Once you have assembled all of the products you need you can begin to Make Bio Diesel

We want to begin by straining your used vegetable oil. I usually set up a strainer on top of my storage tanks (other 55 gallon drums). When the old veggie oil is poured in it is strained to remove any debris. You can use a metal cooking filter specially made for the purpose and available at restaurant supply places (we had one of these), or you can filter it through a pair of pantyhose.

Put 20 Gallons of used vegetable oil that has been strained into the 55 gallon drum you have set up on blocks. Hook up your mixer unit, the trolling motor in my case and start getting that stuff moving a bit.

Turn on your heater underneath and get the oil to 110 degrees F. That won't take long especially in hot weather. Use the candy thermometer to check the temperature. Heating the oil will melt any partially hydrogenated

vegetable oil in the batch and will allow for a more thorough chemical reaction to take place. When the batch of oil is heated to that temperature turn off the heater and remove it from under the 55 gallon drum. It should be stored a safe distance away and be careful not to burn yourself.

Titration

You will need to determine the PH of the oil at this point, a process usually known as titration. Do you remember high school chemistry class, well this isn't much different. It may seem complicated but it is not.

You are aiming for a PH of 8.5 and you will need to add varying amounts of lye and methanol to bring it to that level. As I mentioned before, the more the restaurants used the oil the lower the PH will be.

Repeat the PH test until you get the PH reading right. Here is how you get the right mixture. We have to convert the gallons to liters first because all of the measuring devices measure in grams or metric measurement. So my 20 gallons actually equals 75.7 liters. Since you need 3.5 grams of lye per liter of oil I will need

3.5 x 75.7 liters = 264.95 grams of lye for my batch. That measurement would hold true if I were using fresh oil, but since you are using free used oil you will need a bit more. That is fine because you will not have put in too much with the 264.95 grams that is for sure.

Some oil you get will be overcooked and have high free

fatty acid content. If you have a supplier that cooks the oil to the max then you should maybe mix that oil with that of another supplier. The oil should be liquid when it is at room temperature. Use this as your guide.

This process of titration is very important since if you don't add enough lye you won't remove the glycerin from the Bio Diesel, and use too much lye and you will end up with a big batch of soap. Well, at least your hands will be clean.

Make a solution with the lye first- put 1 gram of lye in 1 liter of distilled water. You can make a small batch of this because you will need it every time you make a batch of Bio Diesel- but you only need a bit each time.

Here is how you check the PH (the titration process).

Measure out 10 ml of the isopropyl alcohol and put it in a clean glass bowl or beaker.

Add 1 ml of the used vegetable oil. Then add 1 ml of the mixed lye solution. Mix it very well and then test the PH of the mixture with your PH test kit.

It comes with a little piece of paper called litmus paper. It changes color as the PH changes. Just match the color with the chart provided in the kit. It is pretty simple.

The PH will be somewhere around the 6.5 mark.

Remember that you are aiming for a PH of 8. So you will have to add more lye solution to your test bowl or jar to get it there. Take your eye dropper and only add 1 ml of the lye solution at a time.

Keep track of how many ml of the lye solution you have added in total. When your test mixture reaches about PH 8.5 stop for a minute.

We need to do a bit of math now to figure out how much I need to add to the 20 gallon mix. I just do little test batches to make sure I get the mix just right. Remember I told you I had never ruined a batch?

A bit of Math, but it won't hurt

You recorded how many ml of lye solution you added to the test mix. Take this number and add 3.5 to that number. Write the new number down. Let's call this the Test Batch Ratio.

Each batch of used veggie oil will be slightly different so I will have to do this preliminary testing for each batch. Take your Test Batch Ratio Number, this is the number of grams of lye you will need per liter of oil. Let's say it is 3 for my example.

Remember that the acid level will be different for every batch you make and you must do this test phase each time for consistent results.

Example-

Test Batch Ratio (3) x Number of Liters (75.7) = Total amount of Lye to be added to this batch.

3 x 75.7 = 227.1 grams of lye for the batch. Always double check your math.

The next step is to mix the Methanol and Lye

Methanol is highly toxic and explosive. This is probably the most dangerous part of making Bio Diesel, so extra caution should be taken at this point. Wear your protective gear, don't touch it and don't breathe the fumes. We usually keep a water hose running and leave the big garage door open for extra ventilation.

Now pour 4 gallons of Methanol into the 5 gallon bucket with the lid. Remember I have the cordless drill and paint mixer ready to go. The 4 gallons of Methanol is a constant number. Remember I calculated it based on the fact I were using 20 gallons of oil.

Now add the lye to the bucket (227.1 grams for my example). Put the lid on tightly. Mix the Methanol-Lye mixture with the cordless drill not too vigorously, just on low speed for about a minute. Make sure it mixes properly. Move the drill around a bit.

Ok, at this point you will notice that the bucket is getting warm. There is a chemical reaction taking place called an exothermic reaction. Do not put your nose or eyes over the bucket when you are mixing. Be careful.

Add the Methanol-Lye Mixture to the 20 gallons of oil

Do not breathe the fumes or touch the mixture to your skin. It is very toxic and will burn. Do be careful at this point.

Turn on your trolling motor and mix vigorously for about an hour. You should turn it to face in different directions occasionally. This is the point that I liked the washing machine idea- it had a timer.

Don’t sit too close to the mixing of the stuff either. Try not to get any splashing occurring, but the mix should move around good.

You just about have Bio Diesel, Pretty Easy Eh !

Look at your watch and let the Bio Diesel settle for exactly 24 hours. If you have done everything right you will have 20 gallons of Bio Diesel on top and 4 gallons of thick brown glycerin at the bottom of the barrel.

We use a small DC pump to pump the beautiful light amber colored Bio Diesel into 5 gallon fuel cans. Leave the Glycerin right where it is for now. I have installed a metal tap at the bottom of my 55 gallon drum to drain the glycerin off.

Use an inline or funnel style filter on the pump line to filter out any chunks of stuff before you put the Bio Diesel into your 5 gallon cans. You can of course pump the fuel into large tanks for convenient pumping into your vehicle later too.

Try and design this set up to make everything as simple and convenient as possible. Remember to think about what your end use will be. I use my for my vehicle and my

generator so 5 gallon fuel cans work well for me. Just take the time and design an efficient set up first.

What do I do with all of that Glycerin?

When I got to this part in my own program of discovering how to make Bio Diesel I said- Oh Boy, here I go, some toxic stuff that I will have to deal with. But that

is not the case with Glycerin. It is completely Bio Degradable and can be composted or it makes a good cleaner, or you can do what I do, make Glycerin Soap.

How to Make Glycerin Soap

Things You Will Need:

Food Coloring
Fragrant Essential Oils
Rubbing Alcohol
Candy Thermometer
Double Boiler
Stir Spoons.

Melt 1 pound of glycerin in a double boiler. The temperature should be about 155 degrees F. Remove from heat and stir in food cosmetic-grade coloring. Add 1 tablespoon of essential oil if desired.

Mix well. Pour into a soap, candle or candy mold. Spray the mold lightly with rubbing alcohol to help prevent bubbles. Let any bubbles in the soap base rise to the top.

We also make soap in large pails for use in the work shop. I have even give the soap away to friends who work in the trades. Mechanics, chimney installers and furnace installers get dirty and they appreciate the gift. Be careful not to give it to someone who might take offense. A present of soap may not be taken the right way, so be careful. Spray the soap tops with rubbing alcohol to make the bubbles disappear. Let the soap set up for ½ hour, then put the soap molds in the freezer for 30 minutes.

Remove from the freezer and allow the molds to sit for 10 minutes. The soap should pop right out.

Glycerin

Do not put any of the glycerin in your fuel tank as it is very thick and will clog your injectors and your fuel filters. If you use the glycerin as a cleaner you should let it sit outside for about a week as it has a peculiar odor. The excess Methanol will evaporate in that time.

Your Bio Diesel Vehicle

Bio Diesel burns very clean but it is also a very mild solvent. You will notice that your vehicle will run better, but
Bio Diesel will also clean out all of the old gunk in your engine and fuel tank. It is a good idea to change the fuel filter after the first 300 miles or so and then you will be fine.

Some folks have reported that their older rubber fuel lines also corroded using bio diesel but I have not found that to be the case. If you encounter swelled fuel lines or some gasket wear just replace them with a synthetic

rubber part which will not wear down. If you notice any starting or irregular engine running troubles always remember to check your filters first. In colder weather as I mentioned the bio diesel will cloud up and gel so it will have to be mixed with petroleum diesel for the winter.

Remember not to get any glycerin in your fuel system as it will clog it up fast.

Should you Wash your Bio Diesel?

Some people claim that a final step is necessary to insure that you are producing a good product for your vehicle. Most agree that most problems in my vehicles are caused by bad fuel. Washing your bio diesel has the effect of making it that much more clean burning. Injectors and internal engine parts can get clogged up with these compounds which you used to make bio diesel

Some experts argue that some glycerin, methanol and lye are left in the fuel if it is not water washed. All commercial processors who sell Bio Diesel wash their fuel before it is sold.

All of the above products that were added to make bio diesel are soluble in water.

This means that if you add water to your mix the impurities will be removed. Sounds reasonable. Please note that I have never water washed my fuel and have had no problems in years.

The other side of the argument is that you will end up

having trace amounts of water in your fuel which are bad for your engine. You decide, or do your own research- the answer remains unclear and inconclusive.

If you decide to wash your bio diesel here is how you do it. There is the mix washing method first. You will need another 55 gallon drum for a mix station. Put your entire 20 gallon batch in the washing drum, being careful not to put any glycerin in it.

Add 5 gallons of water and stir gently with a broom or other stick. Do not stir vigorously or you will have a mess of soap on your hands. Just let the mixture settle overnight and drain the water from the bottom drain, as it is heavier than the bio diesel which will float. You will have to repeat the process 3 times until the water comes out clear with a PH of nearly 7.

Or you can use the mist method. Get a mist watering attachment for watering your lawn and mist the top of the bio diesel until you have about 5 gallons of water in the mix. Let is stand for 4 hours and drain it off. Rinse and repeat 3 times until the water is clear with a PH of 7.

You can also Use an aquarium air stone to filter your bio diesel. Add the air stone to the bottom of your washing tank.

Add the 5 gallons of water and let the air pump run gently for 4 hours. Drain off the water and repeat 3 times until the water is clear with a PH of 7.

Remember to filter the fuel before you put it in your vehicle.

Home Heating Oil

You can also use your Bio Diesel for home heating oil.

Bio diesel, the clean-burning, renewable fuel is making its way into a growing number of American homes as a substitute for residential heating oil.

Prices for conventional heating oil have doubled since 2001. Recent World events have pushed heating oil prices through the roof. The answer is to use Bio Diesel.

Bio Diesel Heat has several advantages over conventional heating oil-it burns cleaner and releases fewer harmful emissions, and it relies on domestic sources of renewable energy -- mostly soybeans.

The only problem is that the tank should be where it is warm, since pure bio Diesel tends to gel when it is cold. You can mix it in any ratio just like petroleum diesel-B50 works well. Just fill your tank half way with Bio Diesel and fill it the rest of the way with commercial heating oil with it’s non freezing properties.

Those people with the inclination, but not the money can mix or blend their own bio diesel heating oil. or retrofitting their furnaces with oil burners designed for burning waste vegetable oil that can be obtained for free from local restaurants.

Bio Diesel could be the answer to your home heating problems. Just look into the possibilities.