Assembling a water fuel cell and an HHO electric generator

Edited by Brendan J. Darrer – 3^{rd} edit

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This document was taken from Patrick J. Kelly's Practical Guide to 'Free-Energy' Devices: the introduction and chapter 10 [1]. A more recent version can be found here [3]. E-mail: brendan.darrer.12@ucl.ac.uk

Contents

1 Introduction

The following is an expert from Patrick Kelly, 2008, on his introduction to Free-Energy Devices [2].

"I am just an ordinary person who became interested in "free-energy" as a result of a television programme entitled 'It Runs on Water' shown in the 1980s by a UK television company called 'Channel 4'. From my point of view, the content of this documentary seemed to be rather unsatisfactory as it suggested quite a number of very interesting things but gave no real hard and fast specifics for the viewer to follow up on to investigate the subject further. However, it had the enormous benefit of making me aware that there was such a thing as "free-energy".

"My attempts to find out more were not very successful. I bought paper copies of several of Stan Meyer's HHO gas patents from the Patent Office in 1986 but while they were interesting, they did not provide much in the way of additional information. Searching on the internet at that time did not produce much more in the way of practical information. Things have changed dramatically since then and there has been an enormous increase in available information. But, even today, it is relatively difficult to find much in the way of direct, useful and practical information on free-energy systems and techniques. Much of the information consists of chatty, lightweight articles describing people, events and inventions in vague, broad outline terms which are almost completely lacking in specifics.

"These articles have the style of saying "There is a new invention called a 'bus' which is used to carry passengers from place to place. We saw one the other day, it was painted green and blue and looked most attractive. It is driven by Joe Bloggs who wears an engaging smile and a hand-knitted sweater. Joe says that even his children could drive a bus as it is so easy to do. Joe expects to retire in six months time as he is going to take up gold prospecting." While I'm sure that an article like that is interesting, the sort of description which I would, want would be: "There is a new invention called a 'bus' which is used to carry passengers from place to place. We saw one the other day, and were very impressed as it has seats for some forty-five people. It has bodywork made of pressed aluminium, a wheel at each corner of its considerable 40' × 10' structure, a five litre diesel engine made by the Bosworth Engineering Company of Newtown, and has power-assisted steering, hydraulic brakes and ......".

“There are also many articles, scientific papers and books, some of which, quite frankly, I am not able to understand as the authors think mathematically and express themselves in equations (where they frequently do not define the terms which they use in their equations, making them effectively meaningless). I do not think in mathematical equations, so I do not share in this much higher level of thinking and analysis, though I do have some of these papers on my web site for the benefit of visitors who do have the ability to understand them easily.

“After a long period of searching and investigating I was beginning to gather enough information to be fairly confident of what was being done, what had already been achieved, and some of the possible background reasons for the effects which were being observed. Early in 2005 I decided that as I had encountered so much difficulty and had to put in so much effort to find out the basics of “free-energy” that it could be helpful to others if I shared what I had found out. So I wrote the first edition of this presentation and created a simple web site to make it available to others. Of course, this body of information is not static – on the contrary, it is very fast-moving. Consequently, this information digest is updated and refined typically many times each year. The present form of presentation is the third style of layout which has been used as the volume of material has increased.”

—Patrick Kelly, April 2008.

“This eBook contains most of what I have learned about this subject after researching it for a number of years. I am not trying to sell you anything, nor am I trying to convince you of anything. When I started looking into this subject, there was very little useful information and any that was around was buried deep in incomprehensible patents and documents. My purpose here is to make it easier for you to locate and understand some of the relevant material now available. What you believe is up to yourself and is none of my business. Let me stress that almost all of the devices discussed in the following pages, are devices which I have not personally built and tested. It would take several lifetimes to do that and it would not be in any way a practical option. Consequently, although I believe everything said is fully accurate and correct, you should treat everything as being “hearsay” or opinion.

“...Some years ago, Stanley Meyer, a very talented man living in America, found a very energy-efficient way of breaking water into a mixture of hydrogen gas and oxygen gas. He pushed on further and found that a vehicle engine could be run on quite a small amount of this “HHO” gas if it was mixed with air, water droplets and some of the exhaust gas coming from the engine. He got funding to allow him to start manufacturing retro-fit kits which would allow any car to run on water alone and not use any fossil fuel at all. You can imagine how popular that would have been with the oil companies and the government. Just after getting his funding, Stan was eating a meal at a restaurant when he jumped up, said “I’ve been poisoned !”, rushed out into the car park and died on the spot. If Stan was mistaken, and he died of ‘natural causes’, then it was remarkably convenient timing for the oil companies and the government, and his retro-fit kits were never manufactured.

“Even though Stan left behind many patents on the subject, until recently nobody managed to replicate his very low-power electrolyser, then Dave Lawton in Wales achieved the feat and many people have since replicated it by following Dave’s instructions. More difficult still is getting an engine to run on no fossil fuel as Stan did, but recently, three men in the UK achieved just that by getting a standard petrol-engined electrical generator to run with water as the only fuel. Interestingly, this is not something which they want to pursue as they have other areas which appeal more to them. Consequently, they have no objections to sharing the practical information on what they did and the details are in chapter 10.

“In very brief outline, they took a standard 5.5 kilowatt generator and delayed the spark timing, suppressed the ‘waste’ spark and fed the engine a mix of air, water droplets and just a small amount of HHO gas (which they measured at a flow rate of just three litres per minute (lpm)). They test-loaded the generator with four kilowatts of electrical equipment to confirm that it worked well under load, and then moved on to a larger engine. This is the general style of generator which they used, shown in figure 1.

“And their arrangement for running it without petrol, is shown in outline, in figure 2, the full details being in chapter 10, including how to make your own high-performance electrolyser.

“Conventional science says that it can prove mathematically that it is quite impossible to do this. However, the calculation is massively flawed in that is not based on what is actually happening and worse still, it makes initial assumptions which are just plain wrong [The hypothesis of subquantum kinetics by Dr. Paul LaViolette, could explain this over unity effect of the HHO fuel system, by a violation of the laws of thermodynamics predicted by the model [4] [5] [6] [7]. See links @ Starburst Foundation]. Even if we were not aware of these calculations, the fact that it has

Figure 1: Generator tested to run on water via HHO gas

been done is quite enough to show that the current engineering theory is out of date and needs to be upgraded.

"In passing, it might be remarked that an isolated, almost self-sufficient commune in Australia has been supplying their electrical needs by running ordinary electrical generators on water as the only (apparent) fuel for many years now."

2 Water Fuel Cell

Pulsed Water-Splitters: There is a much more efficient way of converting water into a HHO gas mix. Unlike the electrolysis devices already described, this method does not need an electrolyte. Pioneered by Stanley Meyer, pulse trains are used to stress water molecules until they break apart, forming the required gas mix. Henry Puharich also developed a very successful system with a somewhat different design. Neither of these gentlemen shared sufficient practical information for us to replicate their designs as a routine process, so we are in a position today where we are searching for the exact details of the methods which they used.

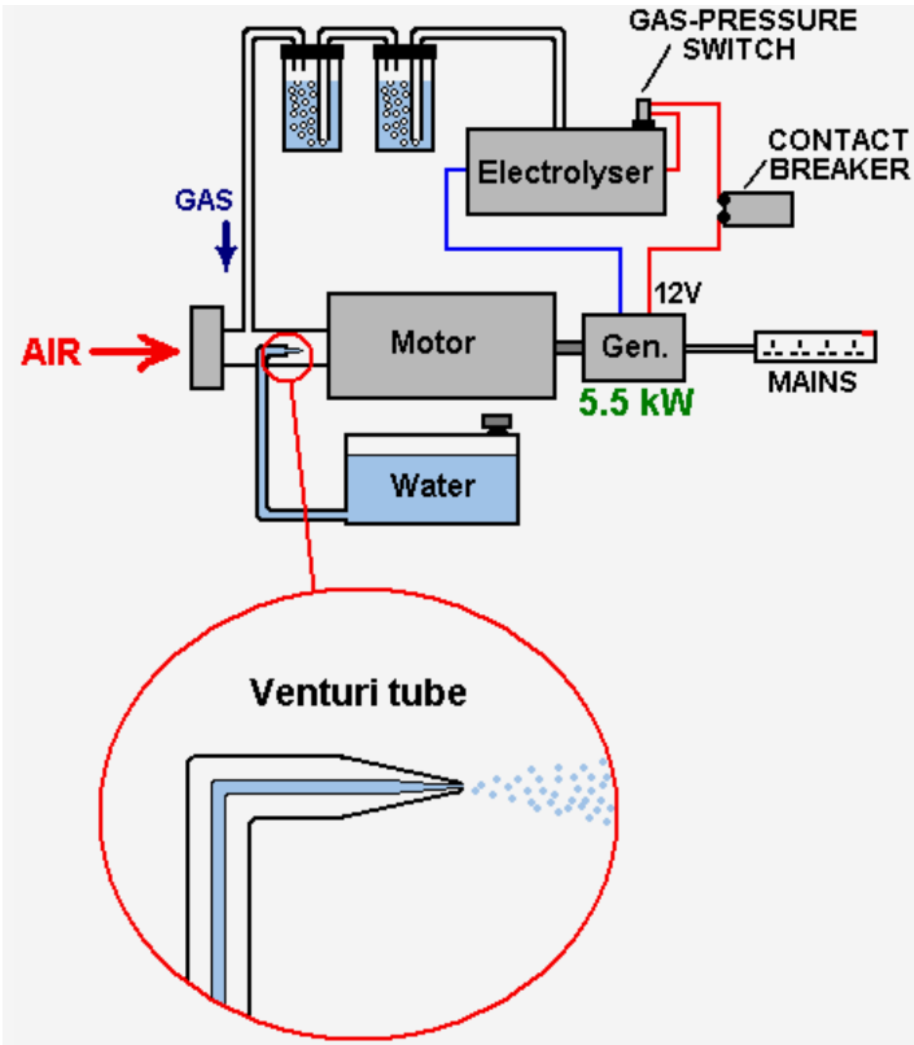


Figure 2: Arrangement for running a generator without petrol i.e. on HHO gas.

Figure 3: Dave Lawton

2.1 Dave Lawton's Replication of Stan Meyer's "Water Fuel Cell"

The first significant replication of which I am aware, came from Dave Lawton of Wales (figure 3). By using very considerable tenacity, he discovered the practical details of how to replicate one of Stan Meyer's early designs which is called by the rather confusing name of the "Water Fuel Cell". Dave's work was copied and experimented with by Ravi Raju of India who had considerable success and who posted videos of his results on the web. More recently, Dr Scott Cramton of the USA has adapted the design construction slightly and achieved very satisfactory rates of electrical efficiency, producing some 6 lpm of HHO gas for just 3 amps of current at 12 volts. The video of Dave Lawton's replication of Stanley Meyer's demonstration electrolyser (not Stan's production system), as seen here, has caused several people to ask for more details. The electrolysis shown in that video was driven by an alternator, solely because Dave wanted to try each thing that Stan Meyer had done. Dave's alternator and the motor used to drive it are shown in figure 4.

The technique of DC pulsing requires the use of electronics, so the following descriptions contain a considerable amount of circuitry. If you are not already familiar with such circuits, then you would be well advised to read through Chapter 12 which explains this type of circuitry from scratch.

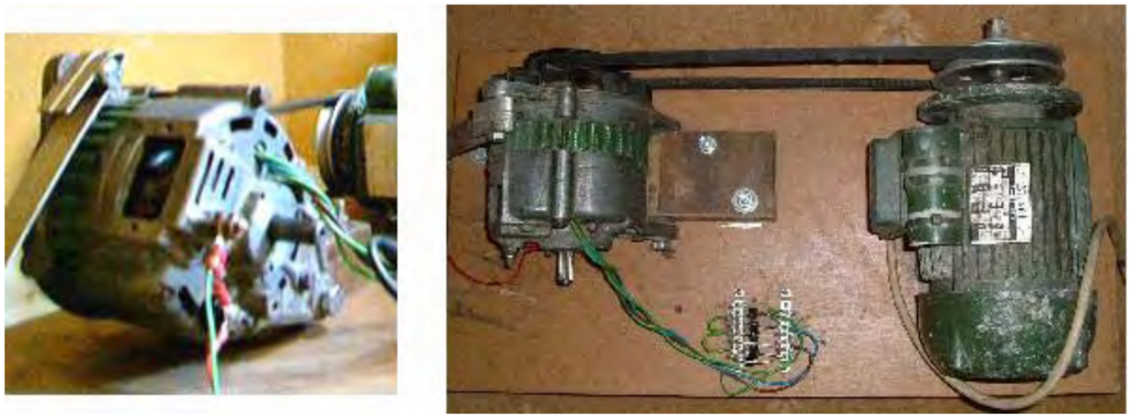


Figure 4: Dave's alternator and the motor used to drive it.

The field coil of Dave's alternator is switched on and off by a Field-Effect Transistor (a "FET") which is pulsed by a dual 555 timer circuit. This produces a composite waveform which produces an impressive rate of electrolysis. The tubes in this replication are made of 316L grade stainless steel, five inches long although Stan's tubes were about sixteen inches long. The outer tubes are 1 inch in diameter and the inner tubes 3/4 inch in diameter. As the wall thickness is 1/16 inch, the gap between them is between 1 mm and 2 mm. The inner pipes are held in place at each end by four rubber strips about one quarter of an inch long.

The container is made from two standard 4 inch diameter plastic drain down-pipe coupler fittings connected to each end of a piece of acrylic tube with PVC solvent cement. The acrylic tube was supplied already cut to size by Wake Plastics, 59 Twickenham Road, Isleworth, Middlesex TW7 6AR Telephone 0208-560-0928. The seamless stainless steel tubing was supplied by: metalsontheweb.co.uk

It is not necessary to use an alternator - Dave just did this as he was copying each thing that Stan Meyer did. The circuit without the alternator produces gas at about the same rate and obviously draws less current as there is no drive motor to be powered. A video of the non-alternator operation can be downloaded using this link: http://www.free-energy-info.co.uk/WFCrep2.wmv .

Dave's electrolyser has an acrylic tube section to allow the electrolysis to be watched, as shown in figure 5.

Figure 5: Dave Lawton's electrolyser with acrylic tube section to allow the electrolysis to be observed.

The electrolysis takes place between each of the inner and outer tubes. The picture above shows the bubbles just starting to leave the tubes after the power is switched on. The picture below shows the situation a few seconds later when the whole of the area above the tubes is so full of bubbles that it becomes completely opaque (figure 6).

The mounting rings for the tubes can be made from any suitable plastic, such as that used for ordinary food-chopping boards, and are shaped as shown in figure 7. The 316L grade stainless steel, seamless tubes are held as shown in figure 8.

Here is the assembly ready to receive the inner tubes (wedged into place by small pieces of rubber) (figure 9).

The electrical connections to the pipes are via stainless steel wire, running between the stainless steel bolts tapped into the pipes and stainless steel bolts, running through the base of the unit (figure 10).

The bolts tapped into the inner tubes should be on the inside. The bolts going through the base of the unit should be tapped in to give a tight fit and they should be sealed with Sikaflex 291 or marine GOOP bedding agent, which should be allowed

Figure 6: The image shows the area above the tubes full of bubbles, so that it becomes completely opaque.

Figure 7: The mounting rings for the tubes made from a suitable plastic, i.e. a chopping board.

Figure 8: 316L grade stainless steel, seamless tubes.

Figure 9: Assembly ready to receive the inner tubes.

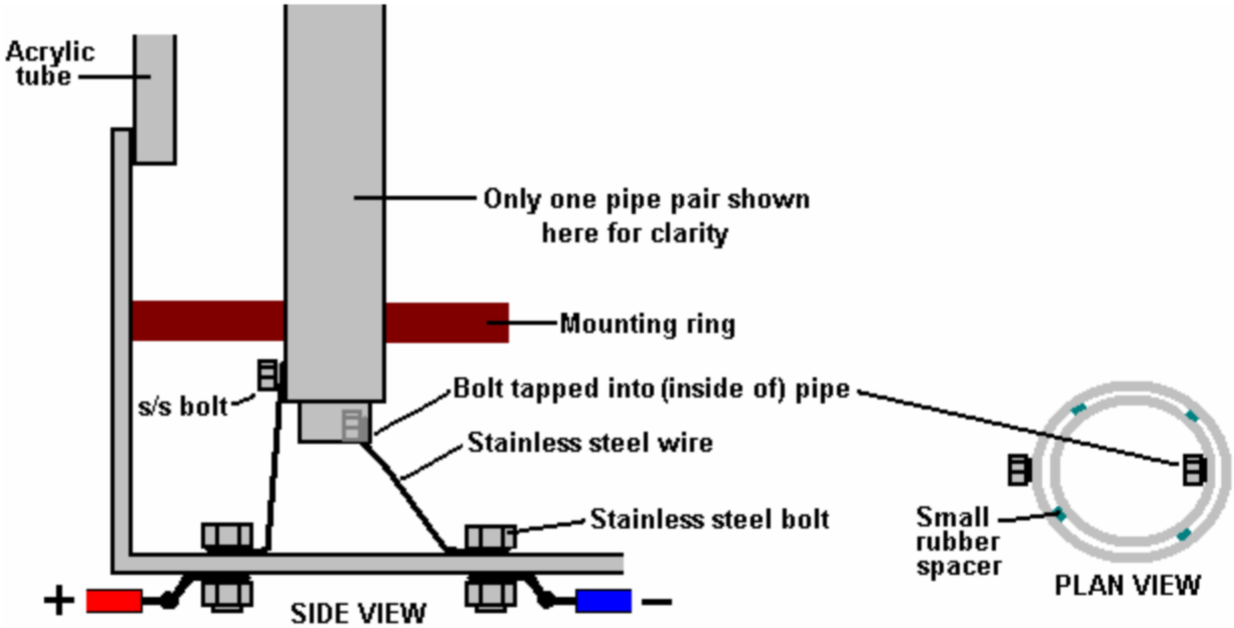


Figure 10: Electrical connections to the pipes are via stainless steel wire.

to cure completely before the unit is filled for use. An improvement in performance is produced if the non-active surfaces of the pipes are insulated with any suitable material. That is, the outsides of the outer tubes and the insides of the inner tubes, and if possible, the cut ends of the pipes.

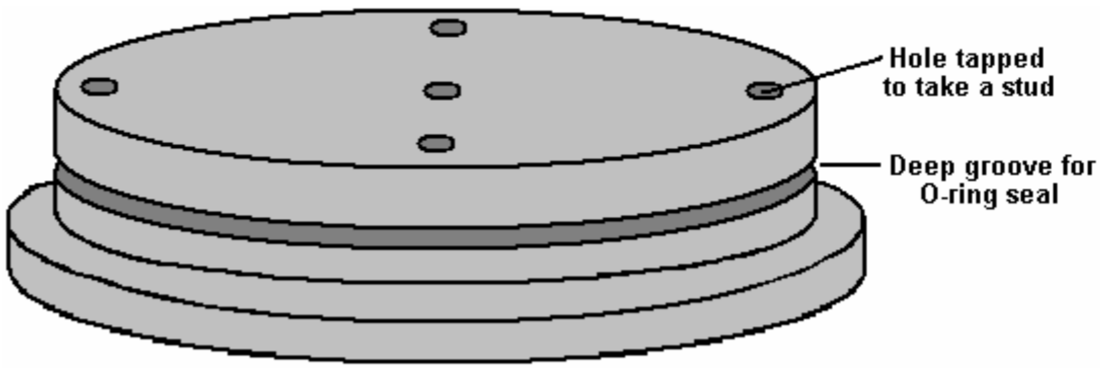


Figure 11: A piece of plastic is shaped as a disc, whose size is matched exactly to the piece of clear acrylic tube, used for the body of the housing.

2.2 Stan Meyer's Style of Construction

While Dave's style of construction is simple and straightforward, recently, a copy of one of Stan Meyer's actual construction drawings has surfaced. The image quality of this copy is so low that much of the text can't be read, so the replication presented here may not be exact or might be missing some useful item of information. Stan's construction is unusual. First, a piece of plastic is shaped as shown in figure 11.

The size of this disc is matched exactly to the piece of clear acrylic used for the body of the housing. The drawing does not make it clear how this disc is attached to the acrylic tube, whether it is a tight push fit, glued in place or held in position with bolts which are not shown. The implication is that a ring of six bolts are driven through the top and tapped into the acrylic tube, as these are shown on one of the plan views, though not on the cross-section. It would also be reasonable to assume that a similar ring of six bolts is also used to hold the base securely in position. There is a groove cut in the plastic base to take an O-ring seal which will be compressed tightly when the disc is in place. There are either two or three threaded stud recesses plus two through holes to carry the electric current connections. The pipe support arrangement is unusual, shown in figure 12.

A ring of nine evenly-spaced inner pipes are positioned around the edge of a steel disc which is slightly smaller than the inside dimension of the acrylic tube. The pipes appear to be a tight push-fit in holes drilled very accurately through the disc. These holes need to be exactly at right-angles to the face of the disc in order for the pipes

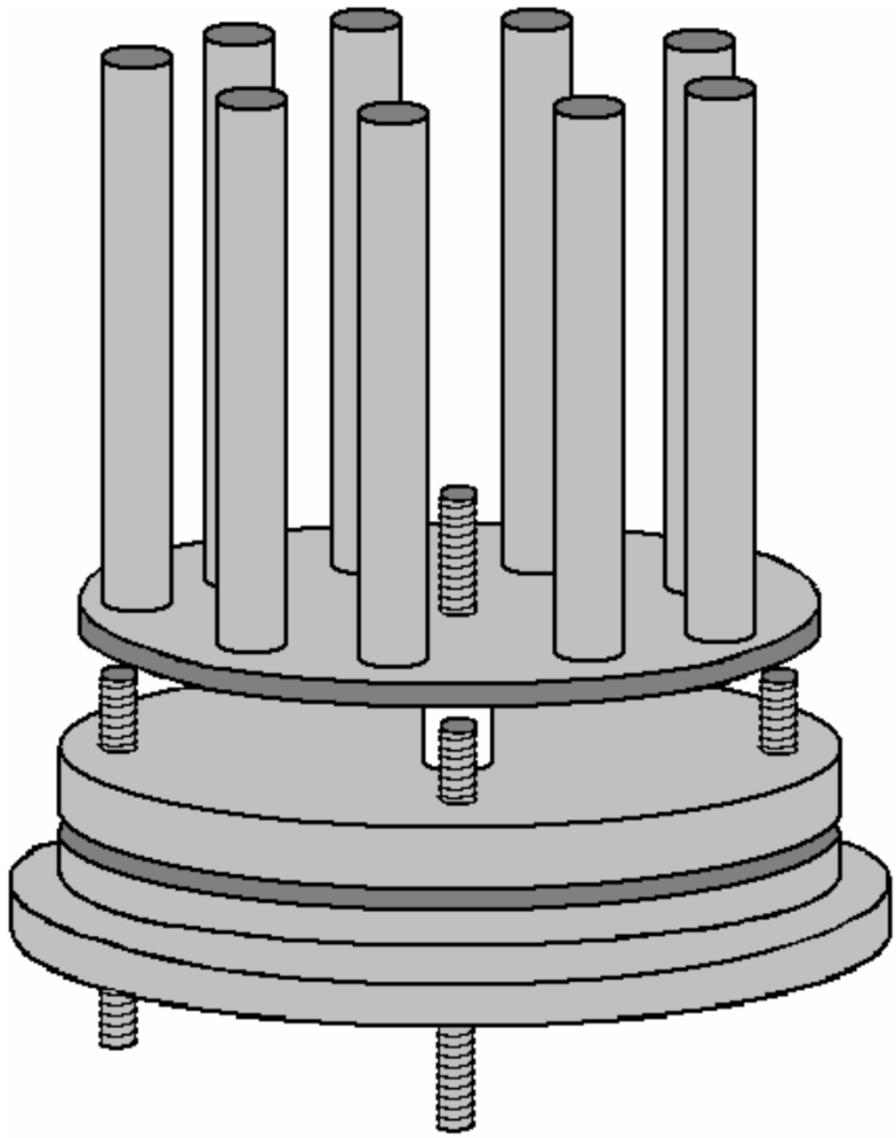


Figure 12: Pipe support arrangement.

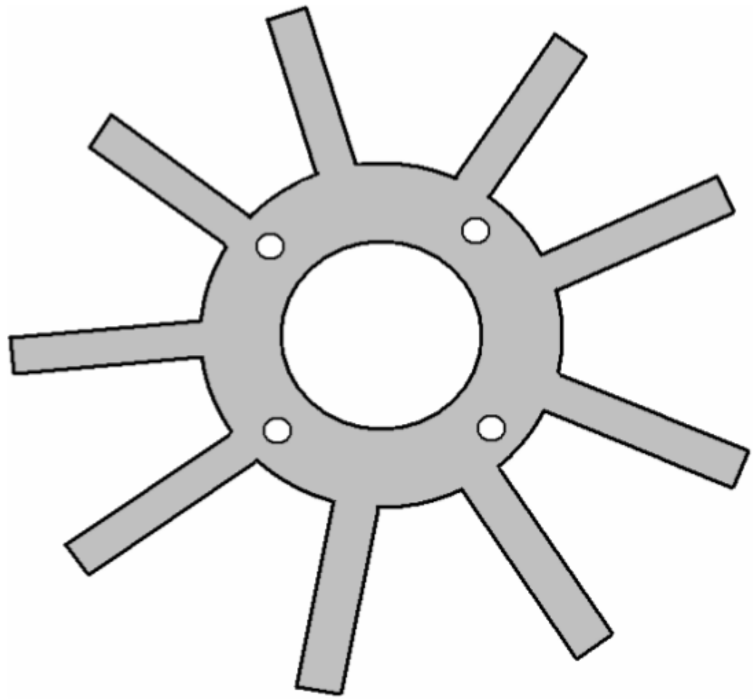


Figure 13: Mounting for the outer tubes is a piece of steel plate is cut with nine projecting arms.

to be exactly aligned with the acrylic tube – definitely a drill-press job. The disc is mounted on a central threaded rod which projects through the plastic base disc, and a plastic spacer is used to hold the disc clear of the studs positioned at ninety degrees apart around the outer edge of the base disc.

The mounting for the outer tubes is also most unusual. A piece of steel plate is cut with nine projecting arms at evenly-spaced positions around a circular washer shape as shown in figure 13.

This piece has four holes drilled in it to match the stud positions of the plastic base piece. The number of studs is not specified and while I have shown four, the plate resonance might be helped if there were just three. The size is arranged so that when the arms are bent upwards at right-angles, they fit exactly against the inner face of the acrylic tube.

These arms get two bends in them in order to kink them inwards to form mounts for the outer tubes. The degree of accuracy needed her is considerable as it appears that there are no spacers used between the inner and outer tubes.

This means that the very small gap of 1.5 mm or so has to be maintained by the accuracy of these mounts for the outer tubes. It should be noted that the inner tubes are much longer than the outer tubes and that the outer tubes have a tuning slot cut in them. All of the inner tubes are mechanically connected together through their steel mounting disc and all of the outer tubes are connected together through the ring-shaped steel disc and its kinked arm mounts. It is intended that both of these assemblies should resonate at the same frequency, and they are tuned to do just that. Because the inner tubes have a smaller diameter, they will resonate at a higher frequency than a larger diameter pipe of the same length. For that reason, they are made longer to lower their natural resonant frequency. In addition to that, the slots cut in the outer tubes are a tuning method which raises their resonant pitch. These slots will be adjusted until every pipe resonates at the same frequency.

Looking initially at the mechanical design, suggests that the assembly is impossible to assemble, and while that is almost true, as it will have to be constructed as it is assembled and it appears that the inner and outer pipe assembly can't be taken apart after assembly. The way they are put together is shown in figure 14.

The ring support for the outer pipes is not bolted securely to the plastic base but instead it is spaced slightly above it and mounted on just the stud points. This ring is underneath the slightly smaller diameter disc which holds the inner pipes. This makes it impossible for the two components to be slid together or apart, due to the length of the pipes. This suggests that either the inner pipes are pushed into place after assembly (which is highly unlikely as they will have been assembled before for tuning) or that the outer pipes are welded to their supports during the assembly process (which is much more likely).

One of the "studs" is carried right through the plastic base in order that it can become the positive connection of the electrical supply, fed to the outer pipes. The central threaded rod is also carried all the way through the plastic base and is used to support the steel plate holding the inner pipes as well as providing the negative electrical connection, often referred to as the electrical "ground".

Another plastic disc is machined to form a conical lid for the acrylic tube, having

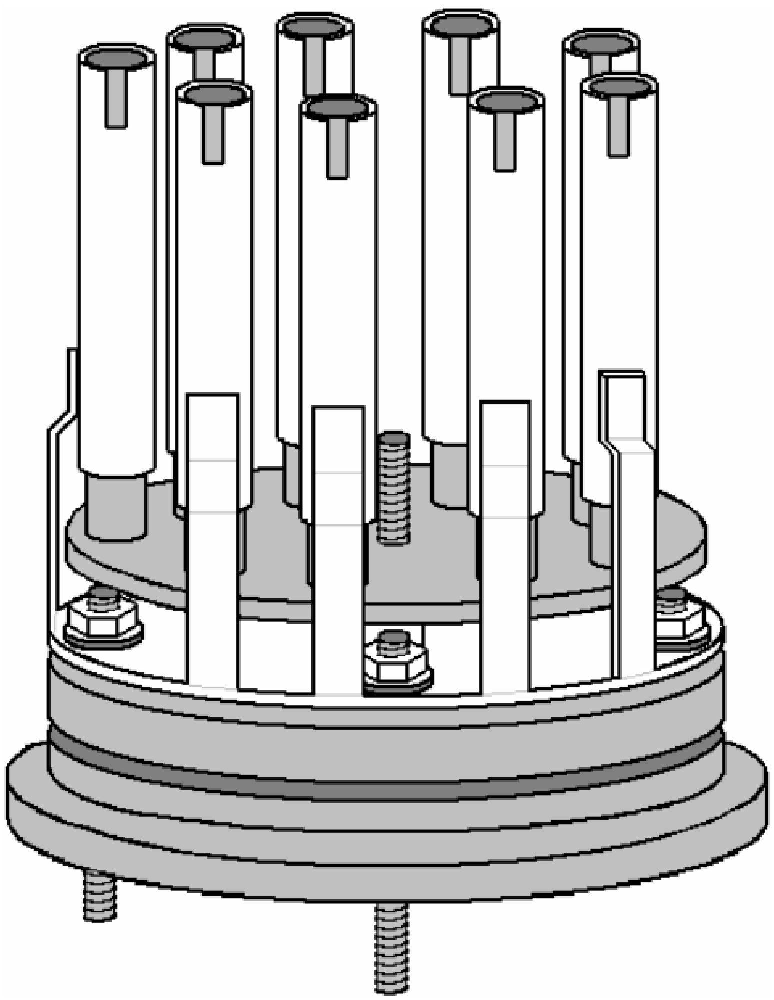


Figure 14: Putting together pipe support assembly, with steel plate mounting for outer tubes. The arms of the steel plate are given two bends in them, in order to kink them inwards to form mounts for the outer tubes.

a groove to hold an O-ring seal and the water inlet for refilling and the gas output tube. The drawing mentions the fact that if tap water is used, then the impurities in it will collect in the bottom of the electrolyser when the water is removed by being converted to HHO gas. This means that the cell would have to be rinsed out from time to time. It also draws attention to the fact that the gasses dissolved in the tap water will also come out during use and will be mixed with the HHO gas output.

When these various components are put together, the overall cell construction is shown figure 15.

This cross-sectional view may be slightly misleading as it suggests that each of the nine outer pipes has its own separate bracket and this is probably not the case as they are connected together electrically through the steel ring-shaped disc and should vibrate as a single unit. It is tempting to use separate brackets as that would allow the assembly to be taken apart quite easily, but the electrical contacts of such a system would be much inferior and so it is not to be recommended.

Because of the way that all of the inner pipes are connected together and all of the outer pipes are connected together electrically, this form of construction is not suited to the three-phase alternator drive shown below, where the nine pipes would have to be connected in separate sets of three. Instead, the solid-state circuit is used, which is very effective and which does not have the size, weight, noise and increased current of the alternator arrangement.

If accuracy of construction is a problem, then it might be possible to give the outer pipes a deliberate slope so that they press against the inner pipes at the top, and then use one short spacer to force them apart and give the desired spacing. It seems clear that Stan worked to such a degree of constructional accuracy that his pipes were perfectly aligned all along their lengths.

Dave Lawton points out that the connection point of the brackets for the outer pipes is highly critical as they need to be at a resonating node of the pipes. The connection point is therefore at 22.4% of the length of the pipe from the bottom of the pipe. Presumably, if a slot is cut in the top of the pipe, then the resonant pipe length will be measured to the bottom of the slot and the connection point set at 22.4% of that length.

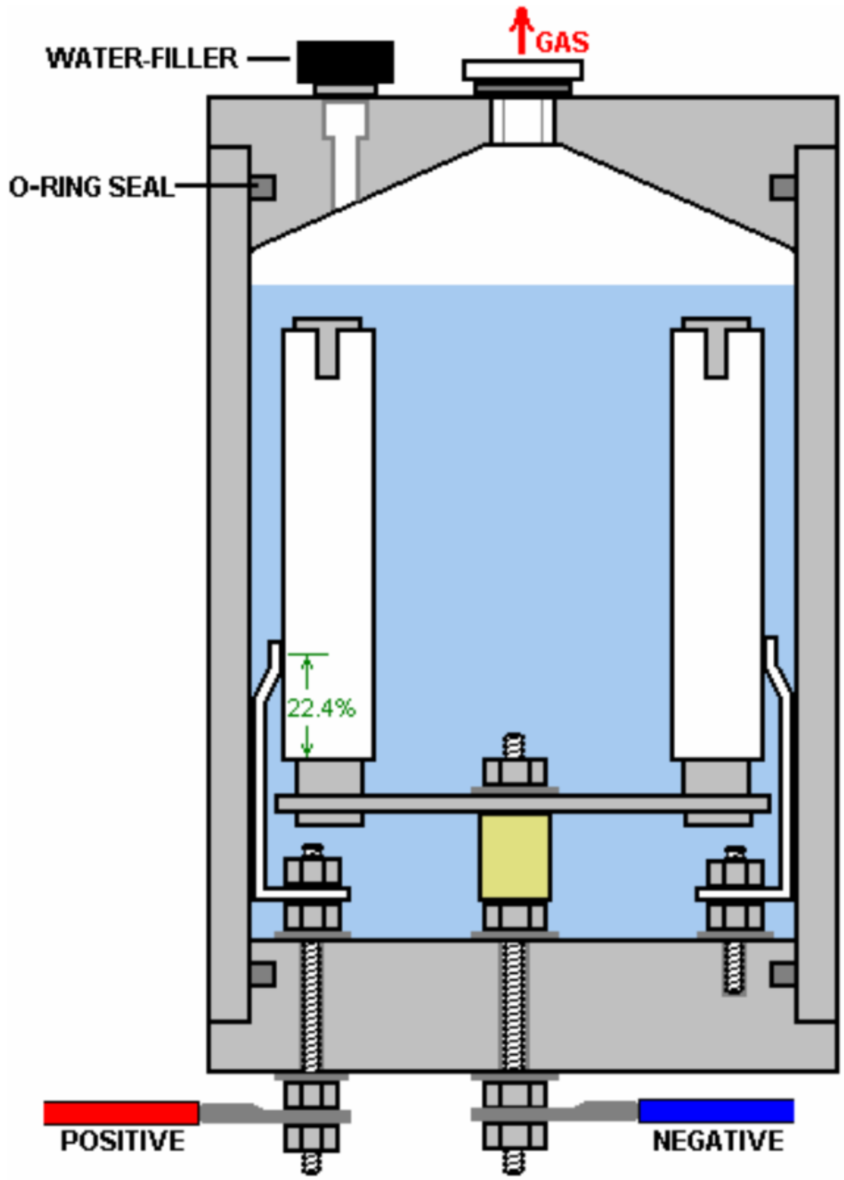


Figure 15: Cross section of overall cell construction, after the various components are put together.

2.3 Dave Lawton's 3-Phase Circuit

Dave Lawton's pipe arrangement can be driven either via an alternator or by an electronic circuit. A suitable circuit for the alternator arrangement is shown in figure 16.

In this rather unusual circuit, the rotor winding of an alternator is pulsed via an oscillator circuit which has variable frequency and variable Mark/Space ratio and which can be gated on and off to produce the output waveform shown below the alternator in the circuit diagram. The oscillator circuit has a degree of supply decoupling by the 100 ohm resistor feeding the 100 microfarad capacitor. This is to reduce voltage ripple coming along the +12 volt supply line, caused by the current pulses through the rotor winding. The output arrangement feeding the pipe electrodes of the electrolyser is copied directly from Stan Meyer's circuit diagram.

It is not recommended that you use an alternator should you decide to build a copy of your own. But if you decide to use one and the alternator does not have the windings taken to the outside of the casing, it is necessary to open the alternator, remove the internal regulator and diodes and pull out three leads from the ends of the stator windings. If you have an alternator which has the windings already accessible from the outside, then the stator winding connections are likely to be as shown in figure 17.

The motor driving Dave's alternator draws about two amps of current which roughly doubles the power input to the circuit. There is no need for the size, weight, noise, mechanical wear and current draw of using a motor and alternator as pretty much the same performance can be produced by the solid-state circuit with no moving parts.

Both circuits have been assessed as operating at anything from 300% to 900% of Faraday's "maximum electrical efficiency", it should be stressed that the inductors used in this circuit, form a very important role in altering and amplifying the voltage waveform applied to the cell. Dave uses two "bi-filar wound" inductors, each wound with 100 turns of 22 SWG (21 AWG) enamelled copper wire on a 9 mm (3/8") diameter ferrite rod. The length of the ferrite rod is not at all critical, and a ferrite toroid could be used as an alternative, though that is more difficult to wind. These bi-filar coils are wound at the same time using two lengths of wire side by side. The solid-state circuit is shown in figure 18 in the next section.

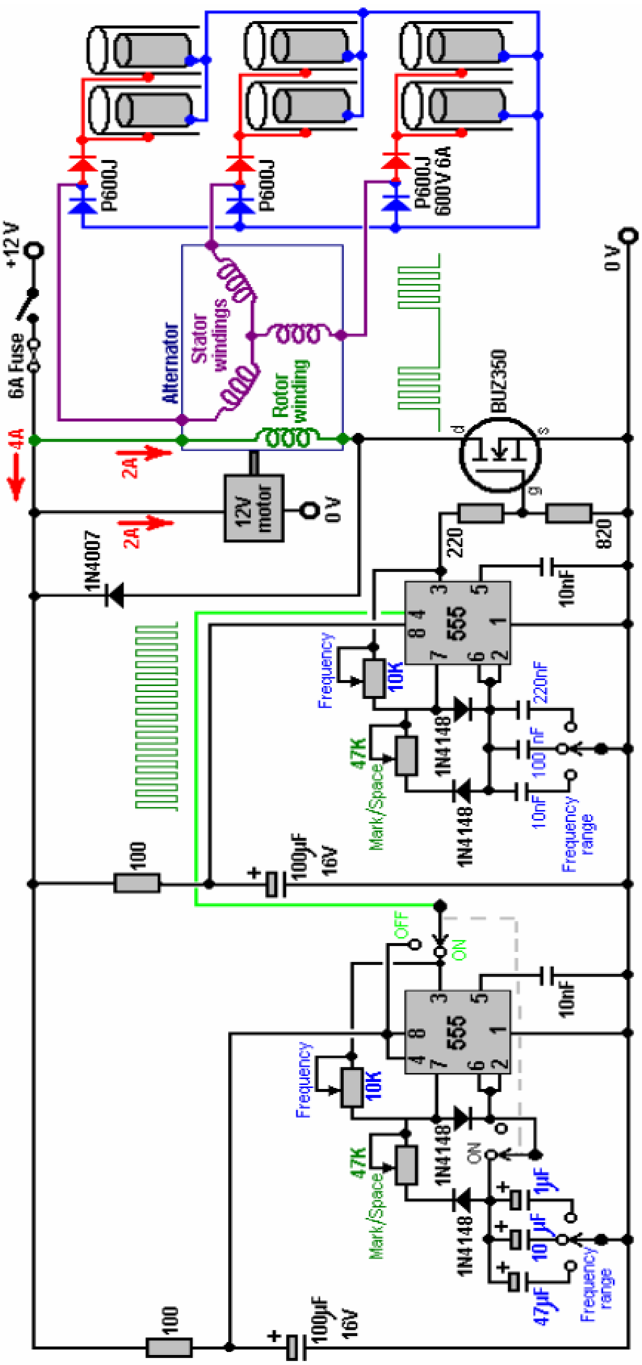


Figure 16: Circuit for Dave Lawton's pipe arrangement driven by an alternator.

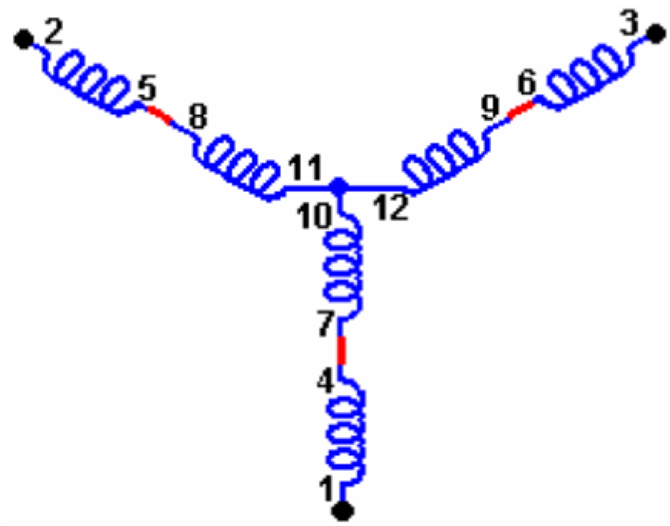


Figure 17: If the alternator has windings already accessible from the outside, then the stator winding connections are likely to be as shown here.

2.4 Dave Lawton's Single-Phase Circuit

Circuit operation:

The main part of the circuit is made up of two standard 555 chip timers. These are wired to give an output waveform which switches very rapidly between a high voltage and a low voltage. The ideal waveform shape coming from this circuit is described as a "square wave" output. In this particular version of the circuit, the rate at which the circuit flips between high and low voltage (called the "frequency") can be adjusted by the user turning a knob. Also, the length of the ON time to the OFF time (called the "Mark/Space Ratio") is also adjustable.

The following schematic is the section of the circuit which does this, shown in figure 19.

The 100 ohm resistor and the 100 microfarad capacitor are there to iron out any ripples in the voltage supply to the circuit, caused by fierce pulses in the power drive to the electrolysis cell. The capacitor acts as a reservoir of electricity and the resistor prevents that reservoir being suddenly drained if the power supply line is suddenly, and very briefly, pulled down to a low voltage. Between them, they keep

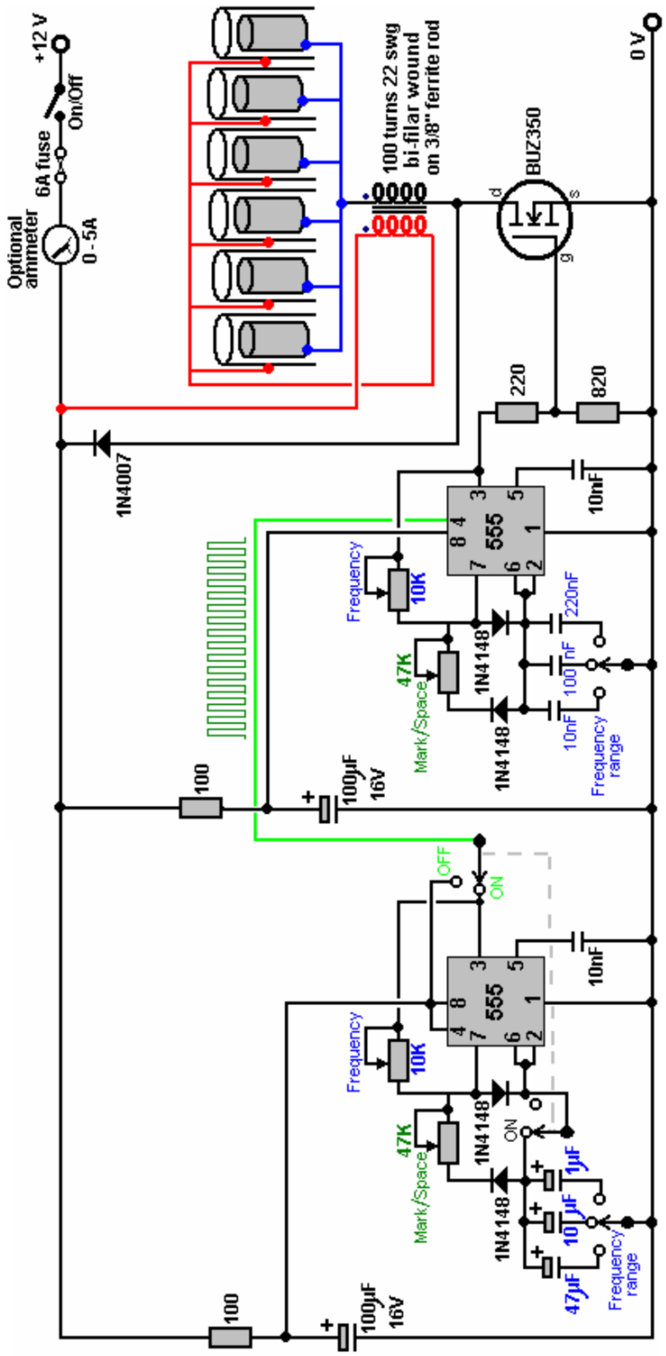


Figure 18: Dave Lawton's Single-Phase Circuit. These bi-filar coils are wound at the same time using two lengths of wire side by side. The solid-state circuit is shown here.

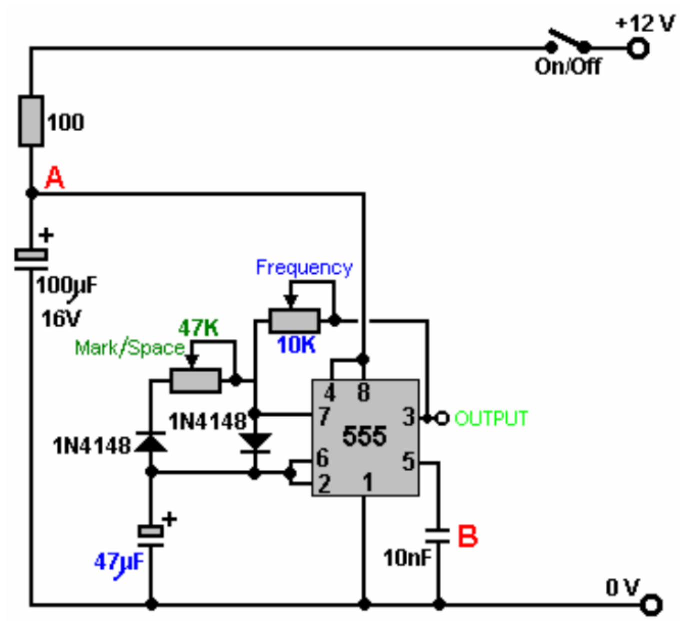


Figure 19: The main part of the circuit, made up of a standard 555 chip timer. In this particular version of the circuit, the rate at which the circuit flips between high and low voltage (called the "frequency") can be adjusted by the user turning a knob.

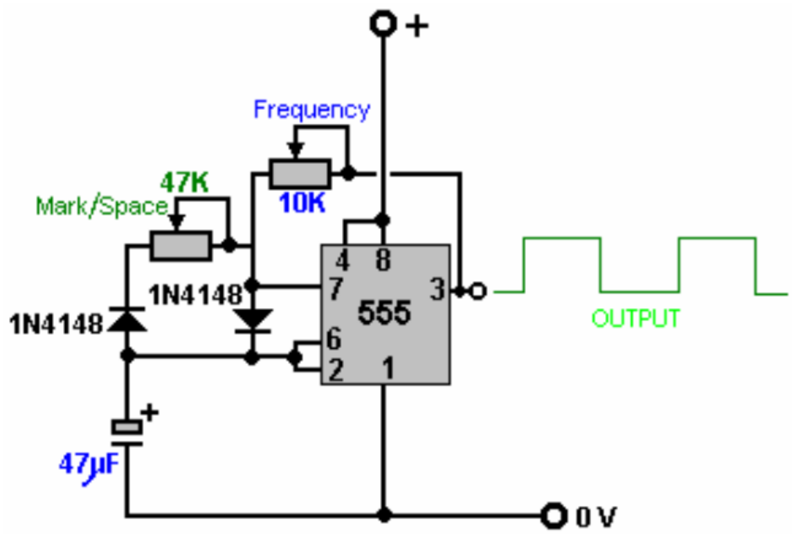


Figure 20: The main part of the circuit, made up of a standard 555 chip timer shown without capacitors at "A" and "B" in figure 19.

the voltage at point "A" at a steady level, allowing the 555 chip to operate smoothly.

The very small capacitor "B" is wired up physically very close to the chip. It is there to short-circuit any stray, very short, very sharp voltage pulses picked up by the wiring to the chip. It is there to help the chip to operate exactly as it is designed to do, and is not really a functional part of the circuit. So, for understanding how the circuit works, we can ignore them and see the circuit like it is shown in figure 20.

This circuit generates output pulses of the type shown in green with the voltage going high, (the "Mark") and low (the "Space"). The 47K variable resistor (which some people insist on calling a "pot") allows the length of the Mark and the Space to be adjusted from the 50 - 50 shown, to say, 90 - 10 or any ratio through to 10 - 90. It should be mentioned that the "47K" is not at all critical and these are quite likely to be sold as "50K" devices. Most low cost components have a plus or minus 10% rating which means that a 50K resistor will be anything from 45K to 55K in actual value.

The two "1N4148" diodes are there to make sure that when the Mark/Space 47K variable resistor is adjusted, that it does not alter the frequency of the output waveform in any way. The remaining two components: the 10K variable resistor and the 47 microfarad capacitor, both marked in blue, control the number of pulses produced

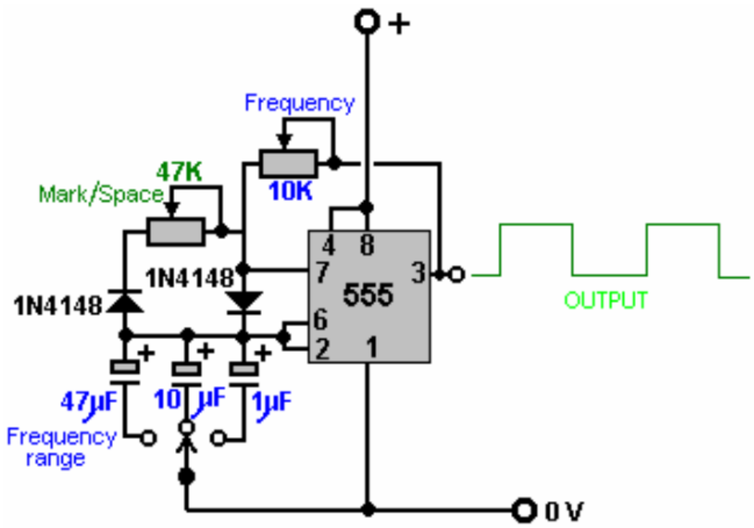


Figure 21: The main part of the circuit, made up of a standard 555 chip timer shown without capacitors at "A" and "B" in figure 19; but with an additional switch and 2 capacitors.

per second. The larger the capacitor, the fewer the pulses per second. The lower the value of the variable resistor, the larger the number of pulses per second.

The circuit can have additional frequency tuning ranges, if the capacitor value is altered by switching in a different capacitor. So the circuit can be made more versatile by the addition of one switch and, say, two alternative capacitors, as shown in figure 21.

The capacitors shown here are unusually large because this particular circuit is intended to run relatively slowly. In the almost identical section of the circuit which follows this one, the capacitors are very much smaller which causes the switching rate to be very much higher. Experience has shown that a few people have had overheating in this circuit when it is switched out of action, so the On/Off switch has been expanded to be a two-pole changeover switch and the second pole used to switch out the timing elements of the 555 chip. The complete version of this section of the circuit is shown in figure 22.

This circuit just has one additional switch to allow the output to be stopped and the 12-volt supply line to be fed instead. The reason for this is that this part of the

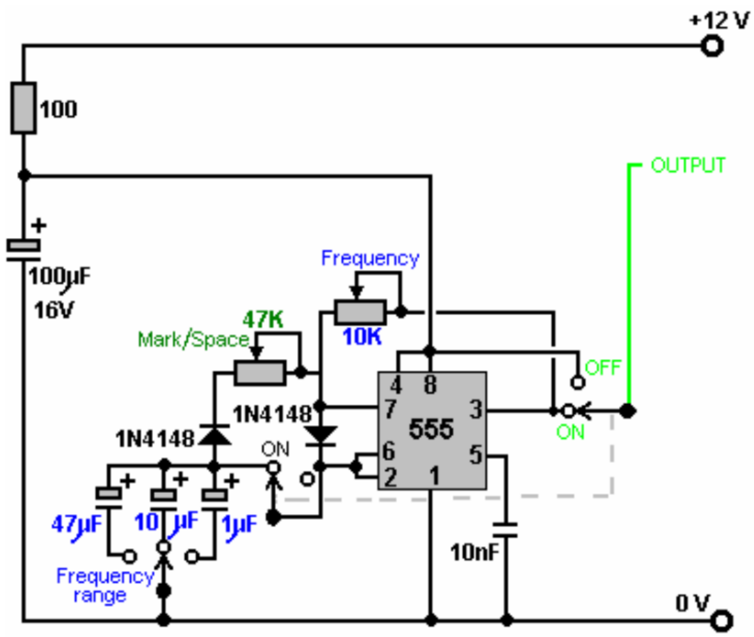


Figure 22: The main part of the circuit, made up of a standard 555 chip timer shown without capacitors at "A" and "B" in figure 19; but with an additional switch and 2 capacitors. Experience has shown that a few people have had overheating in this circuit when it is switched out of action, so the On/Off switch has been expanded (as shown here) to be a two-pole changeover switch and the second pole used to switch out the timing elements of the 555 chip.

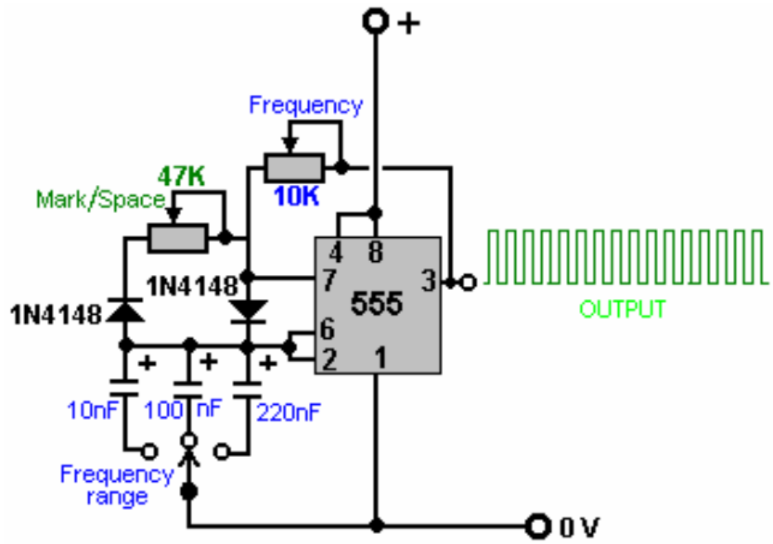


Figure 23: The second part of the 555 chip timer circuit, is shown above. It is intended to run at much higher speeds, so it uses much smaller capacitors.

circuit is used to switch On and Off an identical circuit. This is called “gating” and is explained in Chapter 12 (see full document [1]) which is an electronics tutorial. The second part of the circuit is intended to run at much higher speeds, so it uses much smaller capacitors, as shown in figure 23.

So, putting them together, and allowing the first circuit to switch the second one On and Off, we get the ciruit shown in figure 24.

The final section of the circuit is the power drive for the electrolyser cell. This is a very simple circuit. Firstly, the output of the second 555 chip is lowered by a basic voltage-divider pair of resistors, and fed to the Gate of the output transistor which while it can run on the 12 volts which the pulse-generation circuit needs, Dave does prefer to run on 24 volts as that generates a greater gas flow (figure 25).

Here, the 555 chip output voltage is lowered by 220 / 820 or about 27%. When the voltage rises, it causes the BUZ350 transistor to switch on, short-circuiting between its Drain and Source connections and applying the whole of the 12-volt supply voltage across the load, which in our application, is the electrolyser cell, shown as follows in figure 26.

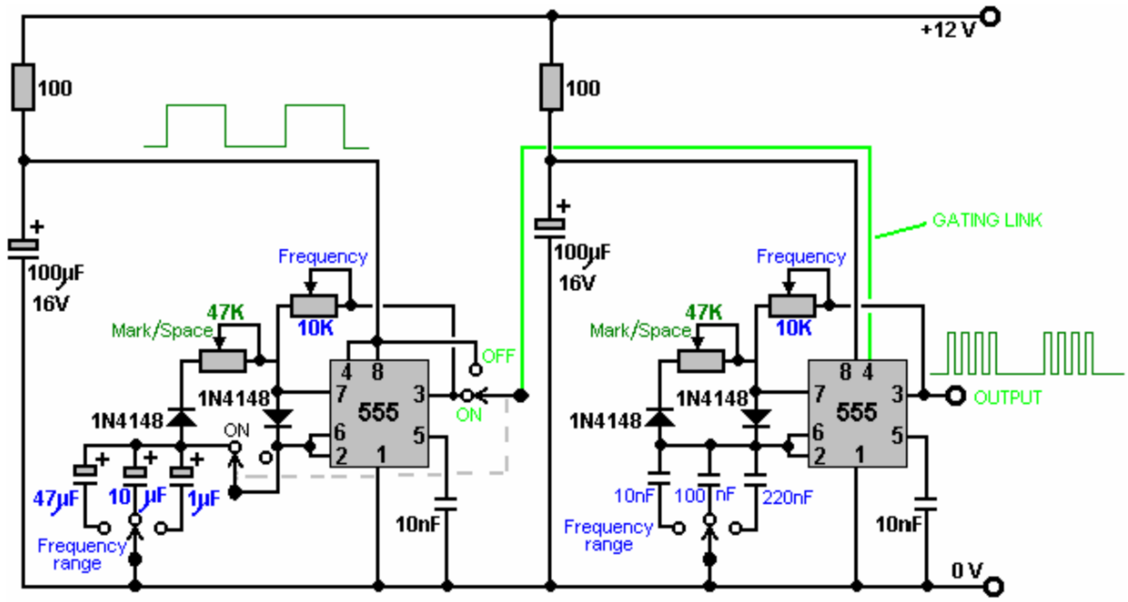


Figure 24: Putting both parts of the 555 circuit together, allows the first circuit to switch the second one On and Off.

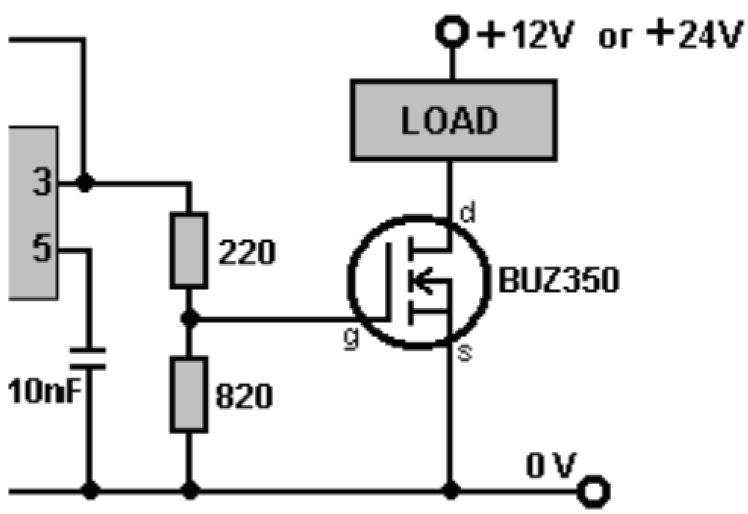


Figure 25: The final section of the circuit is the power drive for the electrolyser cell. While it can run on the 12 volts which the pulse-generation circuit needs, Dave Lawton prefers to run on 24 volts as that generates a greater gas flow.

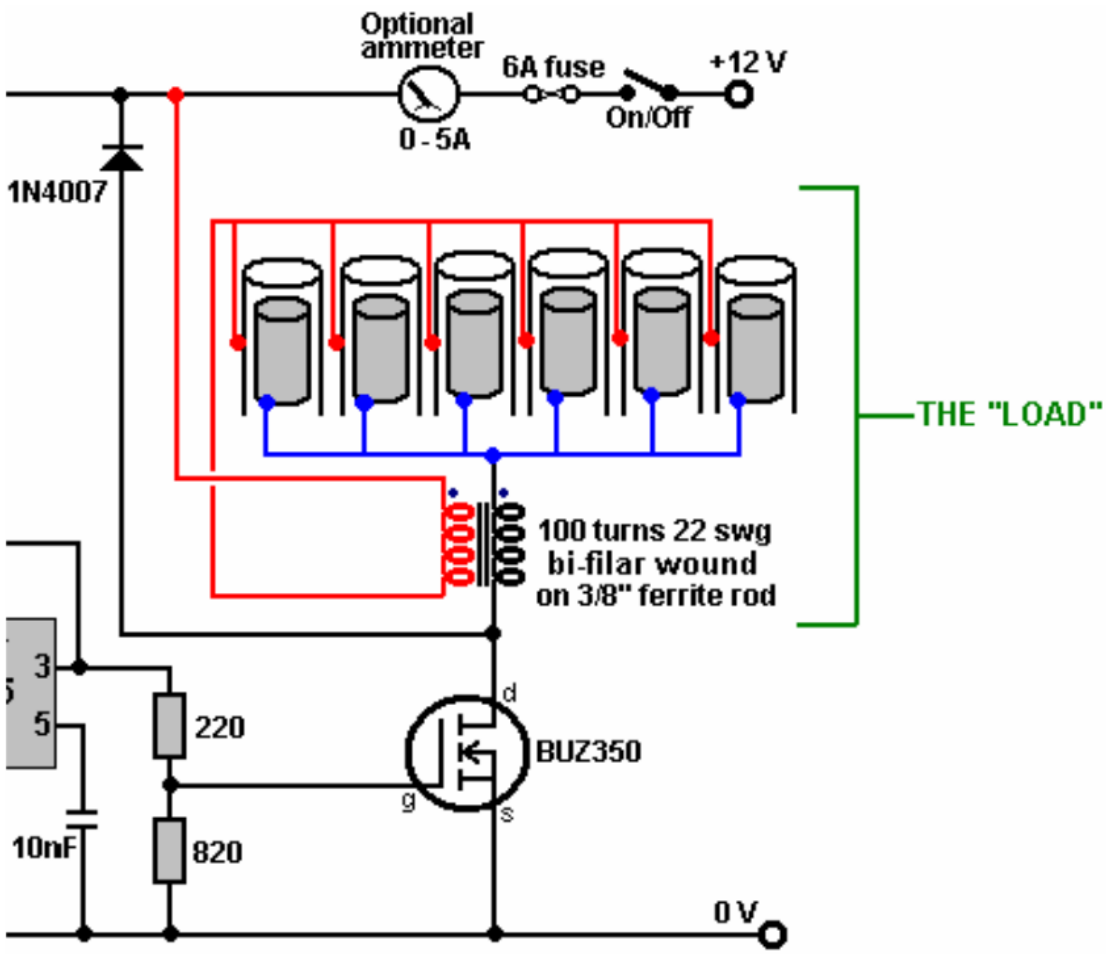


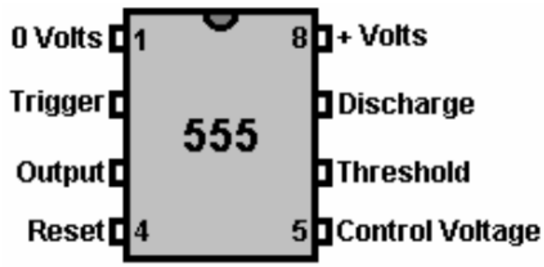
Figure 26: Electrolyser cell with 12-volt supply voltage across its load.

The transistor drives the electrolysis electrodes as shown above, applying very sharp, very short pulses to them. What is very important are the wire coils which are placed on each side of the electrode set. These coils are linked magnetically because they are wound together on a high-frequency ferrite rod core and although a coil is such a simple thing, these coils have a profound effect on how the circuit operates. Firstly, they convert the 555 chip pulse (figure 27) into a very sharp, very short, high-voltage pulse which can be as high as 1,200 volts. This pulse affects the local environment, causing extra energy to flow into the circuit. The coils now perform a second role by blocking that additional energy from short-circuiting through the battery, and causing it to flow through the electrolysis cell, splitting the water into a mix of hydrogen and oxygen, both gases being high-energy, highly charged atomic versions of those gases. This gives the mix some 400% the power of hydrogen being burned in air.

When the transistor switches off, the coils try to pull the transistor Drain connection up to a voltage well above the +12-volt battery line. To prevent this, a 1N4007 diode is connected across the cell and its coils. The diode is connected so that no current flows through it until the transistor Drain gets dragged above the +12-volt line, but when that happens, the diode effectively gets turned over and as soon as 0.7 volts is placed across it, it starts to conduct heavily and collapses the positive-going voltage swing, protecting the transistor. You can easily tell that it is the environmental "cold" electricity which is doing the electrolysis as the cell stays cold even though it is putting out large volumes of gas. If the electrolysis were being done by conventional electricity, the cell temperature would rise during the electrolysis. A John Bedini pulser circuit can be used very effectively with a cell of this type and it adjusts automatically to the resonant frequency as the cell is part of the frequency-determining circuit.

The BUZ350 MOSFET (figure 27) has a current rating of 22 amps so it will run cool in this application. However, it is worth mounting it on an aluminium plate which will act as both the mounting and a heat sink but it should be realised that this circuit is a bench-testing circuit with a maximum current output of about 2 amps and it is not a Pulse-Width Modulation circuit for a high-current DC electrolyser. The current draw in this arrangement is particularly interesting. With just one tube in place, the current draw is about one amp. When a second tube is added, the current increases by less than half an amp. When the third is added, the total current is under two amps. The fourth and fifth tubes add about 100 milliamps each and the sixth tube causes almost no increase in current at all. This suggests that the efficiency could be raised further by adding a large number of additional tubes, but this is actually not the case as the cell arrangement is important. Stan Meyer ran his VolksWagen car for four years on the output from four of these cells with 16-inch (400 mm) electrodes, and Stan would have made a single larger cell had that been feasible.

Although the current is not particularly high, a five or six amp circuit-breaker, or fuse, should be placed between the power supply and the circuit, to protect against accidental short-circuits. If a unit like this is to be mounted in a vehicle, then it is essential that the power supply is arranged so that the electrolyser is disconnected if the engine is switched off. Passing the electrical power through a relay which is



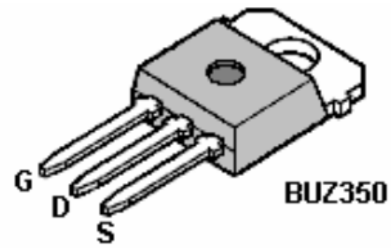


Figure 27: The circuit converts the 555 chip (1st image) pulse into a very sharp, very short, high-voltage pulse which can be as high as 1,200 volts. The BUZ350 MOSFET (2nd image) has a current rating of 22 amps so it will run cool in this application.

powered via the ignition switch is a good solution for this. It is also vital that at least one bubbler is placed between the electrolyser and the engine, to give some protection if the gas should get ignited by an engine malfunction.

Although printed circuit boards have now been produced for this circuit and ready-made units are available commercially, you can build your own using stripboard if you want to. A possible one-off prototype style component layout for is shown in figure 28.

The underside of the strip-board (when turned over horizontally) is shown in figure 29, that includes the electronics box. Figure 30 shows how it is placed into the box; with associated connections to electrionic input/output —control/display components, such as the ammeter and electrical sockets.

Although using a ferrite ring is probably the best possible option, the bi-filar coil can be wound on any straight ferrite rod of any diameter and length. You just tape the ends of two strands of wire to one end of the rod and then rotate the rod in your hands, guiding the strands into a neat side-by-side cylindrical winding as shown in figure 31. A list of components for 555 chip switch circuit and power drive for the electrolyser cell are shown in Tables 1 & 2

Dave, who built this replication, suggests various improvements. Firstly, Stan Meyer used a larger number of tubes of greater length. Both of those two factors should increase the gas production considerably. Secondly, careful examination of video of Stan's demonstrations shows that the outer tubes which he used had a rectangular

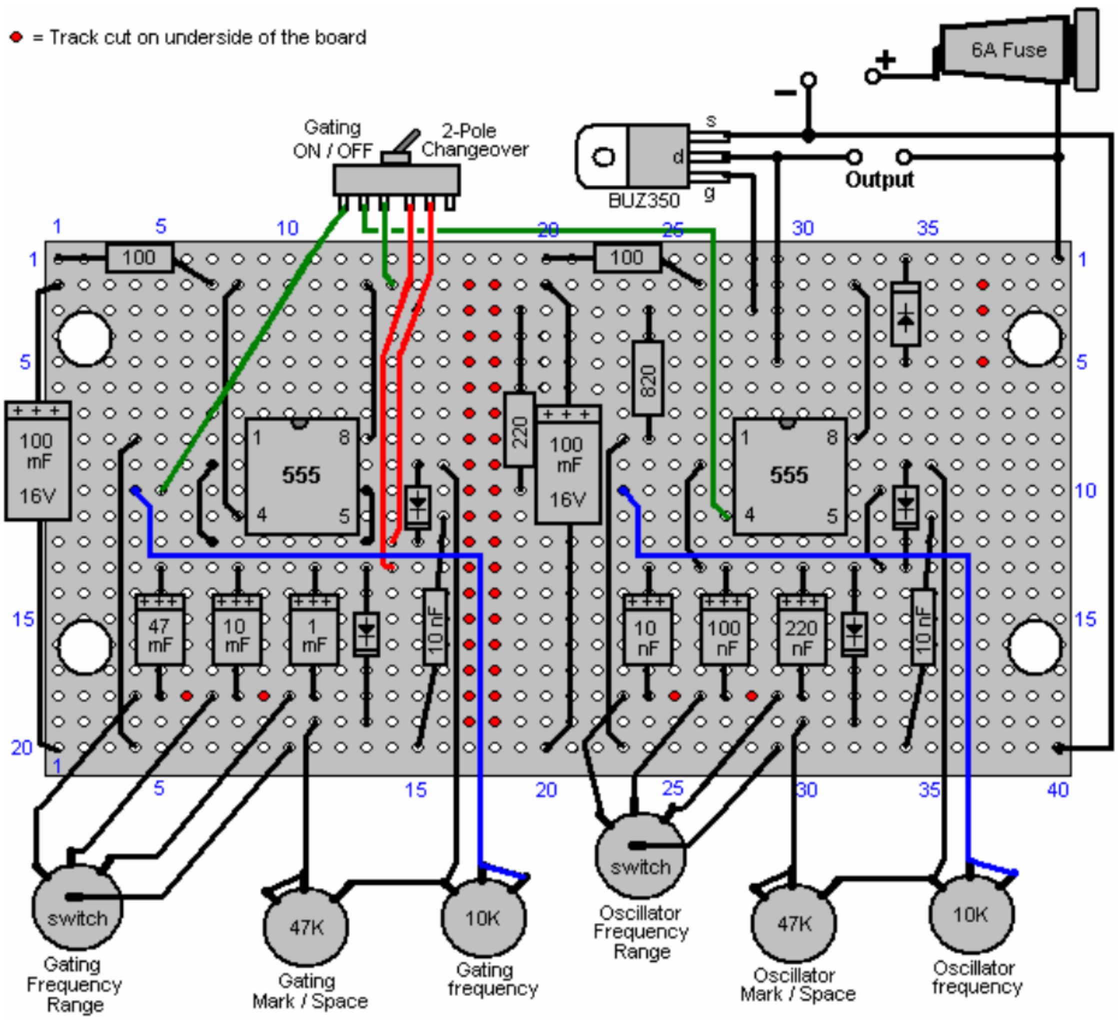


Figure 28: A possible one-off prototype style component layout for 555 chip timer circuit.

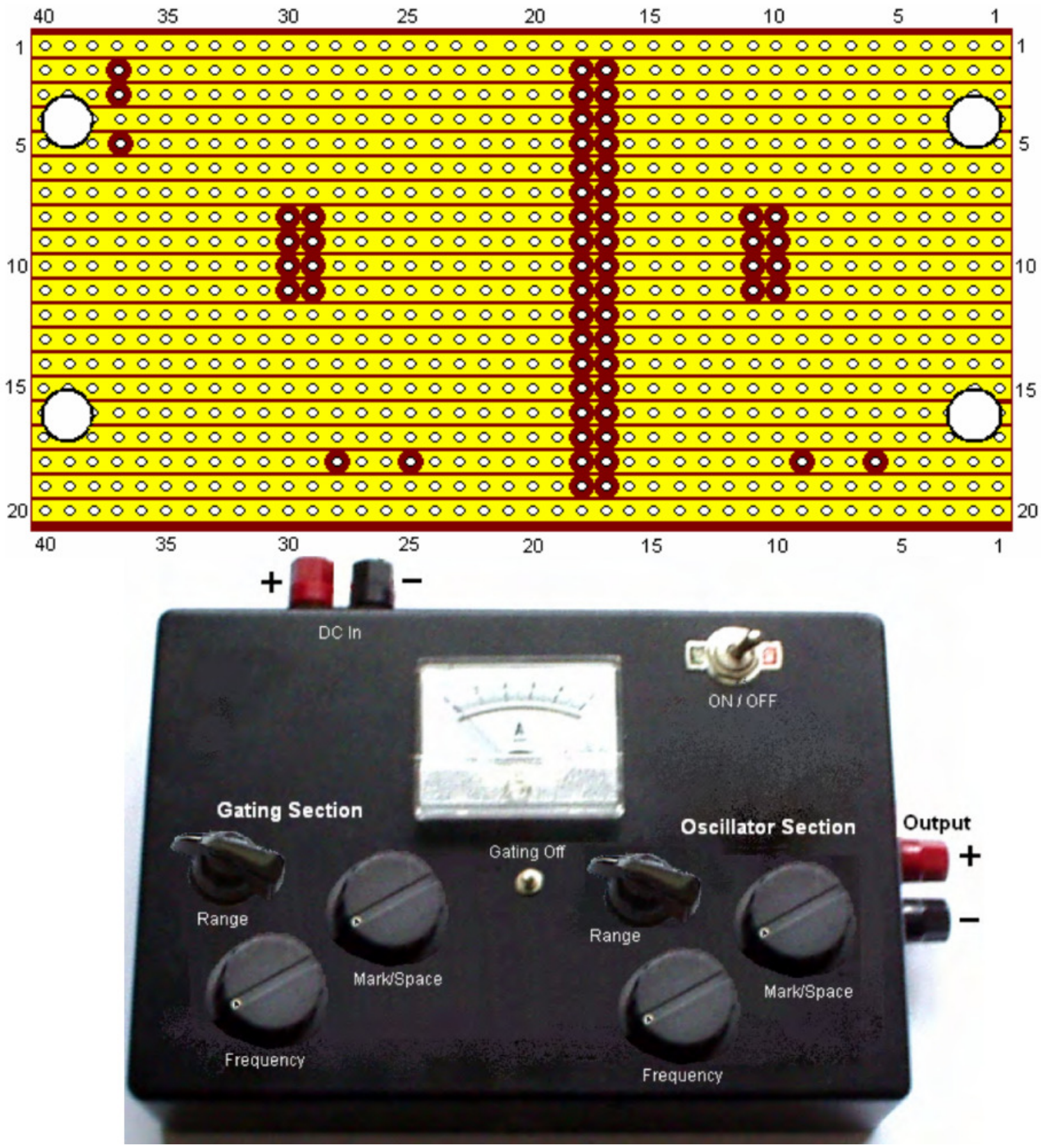


Figure 29: Top: underside of the strip-board, when turned over horizontally, for possible prototype style component layout, of 555 chip timer circuit. Bottom: the electronics box is also shown.

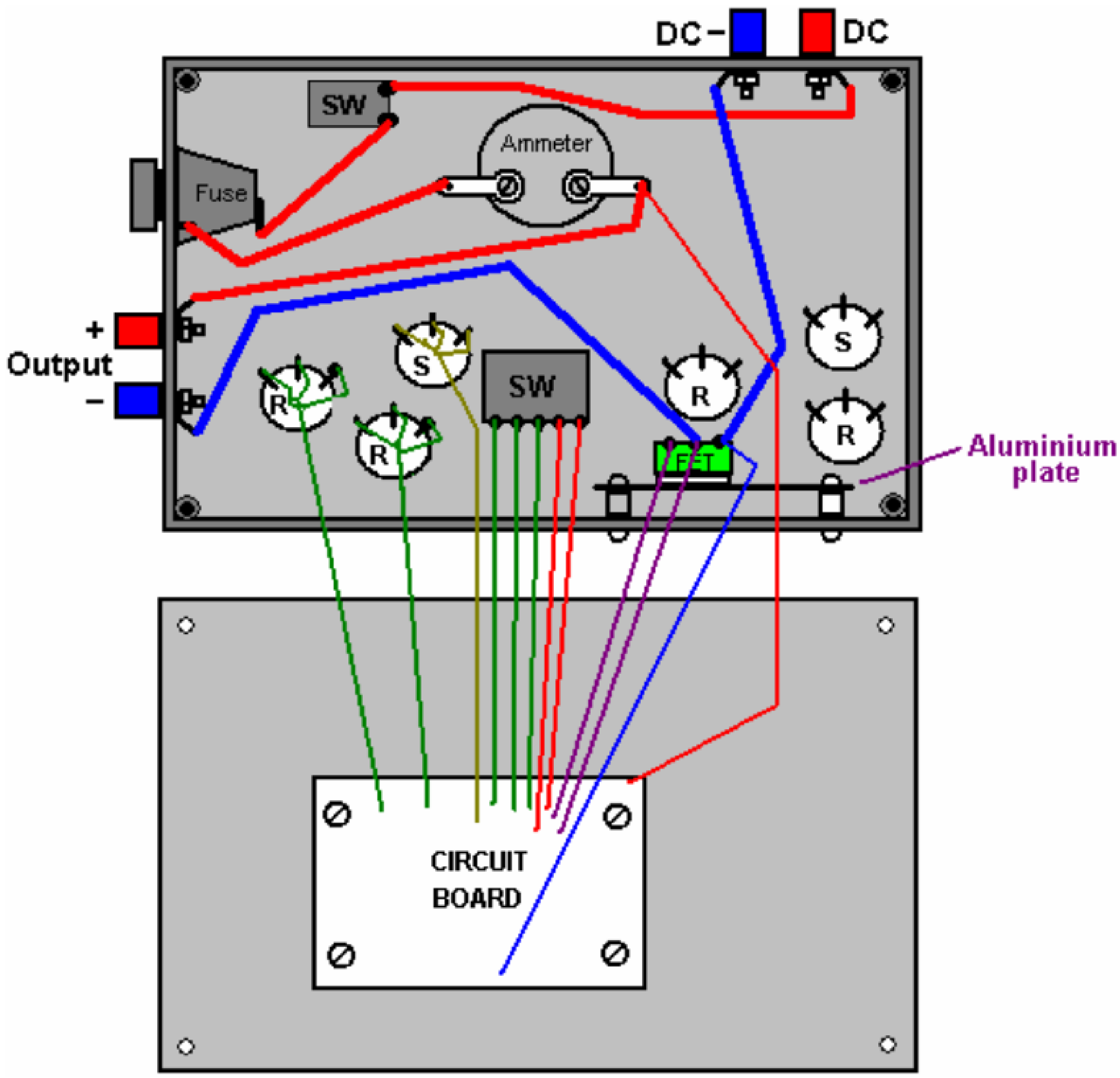


Figure 30: Diagram showing the placement of the 555 circuit into the electronics box, with associated connections to electrionic input/output control components

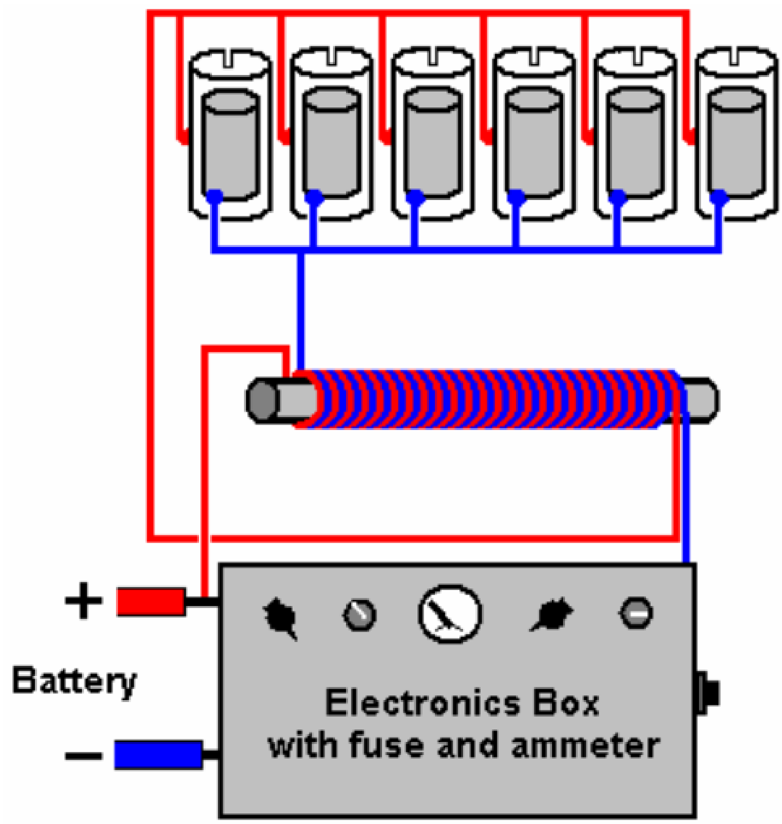


Figure 31: The bi-filar coil wound on straight ferrite rod of any diameter and length. Also shown are the electrolyser cells and the electronics box.

Component	Quantity	Description	Comment
100 ohm resistors 0.25 watt	2	Bands: Brown, Black, Brown	—
220 ohm resistor 0.25 watt	1	Bands: Red, Red, Brown	—
820 ohm resistor 0.25 watt	1	Bands: Gray, Red, Brown	—
100 μF 16 V capacitor	2	Electrolytic	—
47 μF 16 V capacitor	1	Electrolytic	—
10 μF 16 V capacitor	1	Electrolytic	—
1 μF 16 V capacitor	1	Electrolytic	—
220 nF capacitor (0.22 mF)	1	Ceramic or polyester	—
100 nF capacitor (0.1 mF)	1	Ceramic or polyester	—
10 nF capacitor (0.01 mF)	3	Ceramic or polyester	—
1N4148 diodes	4	—	—
1N4007 diode	1	—	FET protection
NE555 timer chip	2	—	—
BUZ350 MOSFET	1	Or any 200V 20A n-channel MOSFET	Any style will do
47K variable resistors	2	Standard carbon track	Could be screw track
10K variable resistors	2	Standard carbon track	Could be screw track

Table 1: Components for 555 chip switch circuit and power drive for the electrolyser cell. See table 2 for continuation.

Component	Quantity	Description	Comment
4-pole, 3-way switches	2	Wafer type	Frequency range
1-pole changeover switch	1	Toggle type, possibly sub-miniature	Any style will do
1-pole 1-throw switch	1	Toggle type rated at 10 amps	Overall ON / OFF switch
Fuse holder	1	Enclosed type or a 6A circuit breaker	Short-circuit protection
Veroboard	1	20 strips, 40 holes, 0.1 inch matrix	Parallel copper strips
8-pin DIL IC sockets	2	Black plastic, high or low profile	Protects the 555 ICs
Wire terminals	4	Ideally two red and two black	Power lead connectors
Plastic box	1	Injection moulded with screw-down lid	—
Mounting nuts, bolts and pillars	8	Hardware for 8 insulated pillar mounts	For board and heatsink
Aluminium sheet	1	About 4 inch x 2 inch	MOSFET heatsink
Rubber or plastic feet	4	Any small adhesive feet	Underside of case
Knobs for variable resistors etc.	6	1/4 inch shaft, large diameter	Marked skirt variety
Ammeter	1	Optional item, 0 to 5A or similar	—
Ferrite rod 1-inch long or longer	1	For construction of the inductors	bi-filar wound
22 SWG (21 AWG) wire	1 reel	Enamelled copper wire, 2 oz. reel	—
Sundry connecting wire	4 m	Various sizes	—

Table 2: Continued from Table 1. Components for 555 chip switch circuit and power drive for the electrolyser cell.

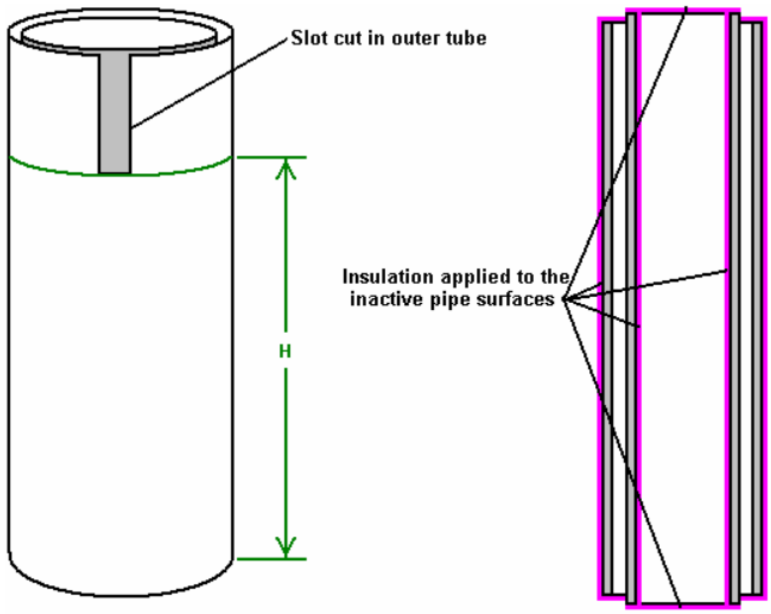


Figure 32: Pipe electrodes of the electrolyser with rectangular slot cut in the top of each tube. Careful examination of video of Stan's demonstrations shows that the outer tubes which he used had a rectangular slot cut in the top of each tube. Some organ pipes are fine-tuned by cutting slots like this in the top of the pipe, to raise it's pitch, which is it's frequency of vibration.

slot cut in the top of each tube, as in figure 32.

Some organ pipes are fine-tuned by cutting slots like this in the top of the pipe, to raise it's pitch, which is it's frequency of vibration. As they have a smaller diameter, the inner pipes in the Meyer cell will resonate at a higher frequency than the outer pipes. It therefore seems probable that the slots cut by Stan are to raise the resonant frequency of the larger pipes, to match the resonant frequency of the inner pipes. If you want to do that, hanging the inner tube up on a piece of thread and tapping it, will produce a sound at the resonant pitch of the pipe. Cutting a slot in one outer pipe, suspending it on a piece of thread and tapping it, will allow the pitch of the two pipes to be compared. When one outer pipe has been matched to your satisfaction, then a slot of exactly the same dimensions will bring the other outer pipes to the same resonant pitch. It has not been proved, but it has been suggested that only the part of the outer pipe which is below the slot, actually contributes to the resonant frequency of the pipe. That is the part marked as "H" in the diagram above. It is also suggested that the pipes will resonate at the same frequency if the area of the inside face of the outer pipe ("H" × the inner circumference) exactly matches the area of the outer surface of the inner pipe. It should be remembered that as all of the pipe pairs will be resonated with a single signal, that each pipe pair needs to resonate at the same frequency as all the other pipe pairs.

It is said that Stan ran his VolksWagen car for four years, using just the gas from four of these units which had pipe pairs 16-inches long. A very important part of the cell build is the conditioning of the electrode tubes, using tap water. Ravi in India suggests that this is done as follows:

1. Do not use any resistance on the negative side of the power supply when conditioning the pipes.
2. Start at 0.5 Amps on the signal generator and after 25 minutes, switch off for 30 minutes.
3. Then apply 1.0 Amps for 20 minutes and then stop for 30 minutes.
4. Then apply 1.5 Amps for 15 minutes and then stop for 20 minutes.
5. Then apply 2.0 Amps for 10 minutes and afterwards stop for 20 minutes.
6. Go to 2.5 Amps for 5 minutes and stop for 15 minutes.
7. Go to 3.0 Amps for 120 to 150 seconds. You need to check if the cell is getting hot...if it is you need to reduce the time.

After the seven steps above, let the cell stand for at least an hour before you start all over again.

You will see hardly any gas generation in the early stages of this conditioning process, but a lot of brown muck will be generated. Initially, change the water after every cycle, but do not touch the tubes with bare hands. If the ends of the tubes need to have muck cleaned off them, then use a brush but do not touch the electrodes!! If the brown muck is left in the water during the next cycle, it causes the water to heat up and you need to avoid this.

Over a period of time, there is a reduction in the amount of the brown stuff produced and at some point, the pipes won't make any brown stuff at all. You will be getting very good gas generation by now. A whitish powdery coat of chromium oxide dielectric will have developed on the surfaces of the electrodes. Never touch the pipes with bare hands once this helpful coating has developed.

Important: Do the conditioning in a well-ventilated area, or alternatively, close the top of the cell and vent the gas out into the open. During this process, the cell is left on for quite some time, so even a very low rate of gas production can accumulate a serious amount of gas which would be a hazard if left to collect indoors.

3 Further Developments

When producing HHO gas from water, it is not possible to exceed the Faraday maximum unless additional energy is being drawn in from the surrounding environment. As this cell runs cold and has substantial gas output, there is every indication that when it is running, it is drawing in this extra energy.

This idea is supported by the fact that one of the key methods of tapping this extra energy is by producing a train of very sharply rising and sharply falling electrical pulses. This is exactly the objective of Dave's circuit, so it would not be too surprising if that effect were happening.

The additional energy being accessed is sometimes referred to as "cold" electricity, which has very different characteristics to normal conventional electricity. Where normal electrical losses cause local heating as a by-product, "cold" electricity has exactly the opposite effect, and where a normal electrical loss would take place, an extra inflow of useful "cold" energy enters the circuit from outside. This flow causes the temperature of the circuitry to drop, instead of increase, which is why it is called "cold" electricity.

This remarkable occurrence has the most unusual effect of actually reducing the amount of conventional power needed to drive the circuit, if the output load is increased. So, increasing the load powered by the circuit causes additional energy to flow in from the environment, powering the extra load and as well, helping to drive the original circuit. This seems very strange, but then, "cold" electricity operates in an entirely different way to our familiar conventional electricity, and it has its own set of unfamiliar rules, which are generally the reverse of what we are used to.

To test his cell system further, Dave connected an extra load across the electrodes of his cell. As the inductors connected each side of the cell generate very high-value, sharp voltage spikes, Dave connected two large value capacitors (83,000 microfarad, 50-volt) across the cell as well. The load was a 10-watt light bulb which shines brightly, and interestingly, the current draw of the circuit goes down rather than up, in spite of the extra output power. The gas production rate appears undiminished.

This is the alteration to that part of the circuit which was used is shown in figure 33.

It has also been suggested that if a BUZ350 can't be obtained, then it would be advisable to protect the output FET against damage caused by accidental short-circuiting of wires, etc., by connecting what is effectively a 150-volt, 10 watt zener diode across it as shown in the above diagram. While this is not necessary for the correct operation of the circuit, it is helpful in cases where accidents occur during repeated testing and modification of the cell components.

3.1 Dr Scott Cramton's Cell Construction

Dr. Cramton and his team of Laesa Research and Development scientists have been investigating and advancing this technology and they have reached an output of six litres per minute for an electrical input of 12 watts (1 amp at 12 volts). In addition, Dr. Cramton's cell has stable frequency operation and is being run on local well water. The objective is to reduce the amount of diesel fuel needed to run a large capacity standard electrical generator.

The style of design is similar to Stan Meyer's original physical construction although the dimensions are slightly different. The cell body is transparent acrylic tube with end caps top and bottom. Inside the tube are nine pairs of pipes, electrically connected as three sets of three interspersed pipe pairs. These are driven by a three-phase pulsed supply based on a replication of Stan Meyer's original cell. It consists of a Delco Remy alternator driven by a 1.5 horsepower 220 volt AC motor. This arrangement is, as was Stan Meyer's, for demonstration purposes. In a working application, the alternator is driven by the engine being supplied with the HHO gas. The 120 degree phase separation is the critical component for maintaining the resonant frequency. It should be noted that the alternator must maintain a rate of 3,600 rpm while under load.

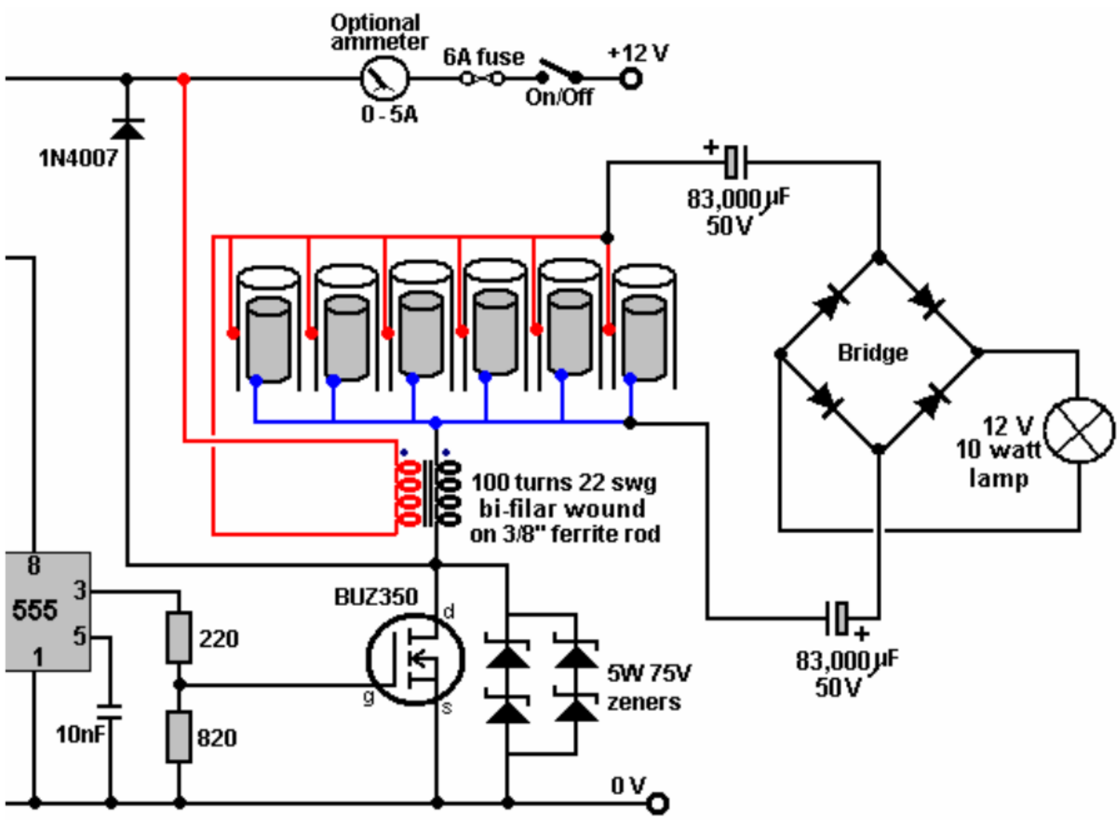


Figure 33: The alteration to part of Dave's circuit is shown here. The additional energy being accessed is sometimes referred to as "cold" electricity, which has very different characteristics to normal conventional electricity. To test his cell system further, Dave connected an extra load (10 watt light bulb) across the electrodes of his cell. As the inductors connected each side of the cell generate very high-value, sharp voltage spikes, Dave connected two large value capacitors (83,000 microfarad, 50-volt) across the cell as well.

Figure 34: Dr. Scott Cramton.

It needs to be stressed that Dr. Cramton's cell is very close in construction principles to Dave Lawton's cell and the quality of construction is very important indeed. The first and foremost point which can be easily missed is the absolutely essential tuning of all of the pipes to a single, common frequency. This is the equivalent of tuning a musical instrument and without that tuning, the essential resonant operation of the cell will not be achieved and the cell performance will not be anything like the results which Dr. Cramton and his team are getting.

Dr. Cramton is using 316L-grade stainless steel pipes 18 inches (450 mm) long. The outer pipes are 0.75 inches in diameter and the inner pipes 0.5 inches in diameter. This gives an inter-pipe gap of 1.2 mm. The first step is to get the pipes resonating together. First, the frequency of an inner pipe is measured. For this, a free internet frequency-analyzer program was downloaded and used with the audio card of a PC to give a measured display of the resonant frequency of each pipe. The download location is:

http://www.softpedia.com/get/Multimedia/Audio/Other-AUDIO-Tools/Spectrum-Analyzer-pro-Live.shtml

The method for doing this is very important and considerable care is needed for this. The quarter-inch stainless steel bolt is pressed into the inner pipe where it forms a tight push-fit. It is very important that the head of each nut is pressed in for exactly the same distance as this alters the resonant frequency of the inner pipe. The steel connecting strip is then bent into its Z shape and securely clamped to the bolt with a stainless steel nut. The assembly of pipe, steel strip, nut and bolt is then hung up on a thread and tapped gently with a piece of wood and its resonant frequency measured with the frequency analyzer program. The frequency is fed into the program using a microphone. All of the inner pipes are tuned to exactly the same frequency by a very slight alteration of the insertion length of the bolt head for any pipe with a resonant frequency which is slightly off the frequency of the other pipes in the set of nine inner pipes.

Next, the outer tubes are slotted to raise their resonant frequency to match that of the inner pipes. Their frequency is also measured by hanging them up and tapping them gently with a piece of wood. If the frequency needs additional raising, then the tube length is reduced by a quarter of an inch (6 mm) and the testing continued as before. Adjusting the width and length of the slot is the best method for adjusting the resonant frequency of the tube. A small file can be used to increase the slot dimensions. This procedure is time consuming and tedious but it is well worth the effort. The average finished length of the outer pipes is 17.5 inches (445 mm) and the slot dimensions 0.75 inch long and 0.5 inch wide (19 mm x 13 mm). When setting the resonant frequency of the outer pipes, it is important to have the clips in place. These “hosepipe”, “jubilee” or “Terry” clips are used to make electrical connections to the outer pipes as shown in the diagrams and they do have an effect on the resonance of the pipes, so fit them before any tuning is done. The pipe arrangement is shown in figure 35.

The outer pipes are drilled and tapped to take either a 6/32” nylon bolt available from Ace hardware stores in the USA, or alternatively, drilled and tapped to take a 4 mm nylon bolt. Three of these bolt holes are evenly spaced around the circumference of each end of all of the outer pipes, as shown in figure 36.

These nylon bolts are used to adjust and hold the inner pipe gently in the exact centre of the outer pipe. It is very important that these bolts are not over tightened as that would hinder the vibrations of the inner pipe. The bolts are adjusted so that a feeler gauge shows that there is exactly the same 1.2 mm gap all round, both top and bottom. The weight of the inner pipe is carried by a 3/4 inch (18 mm) wide strip of stainless steel bent into a Z-shape, and none of the weight is carried by the nylon bolts. Dr Cramton describes this Z-shaped steel strip as a “spring” and stresses its importance in constructing a set of resonating pipe pairs. The arrangement is shown

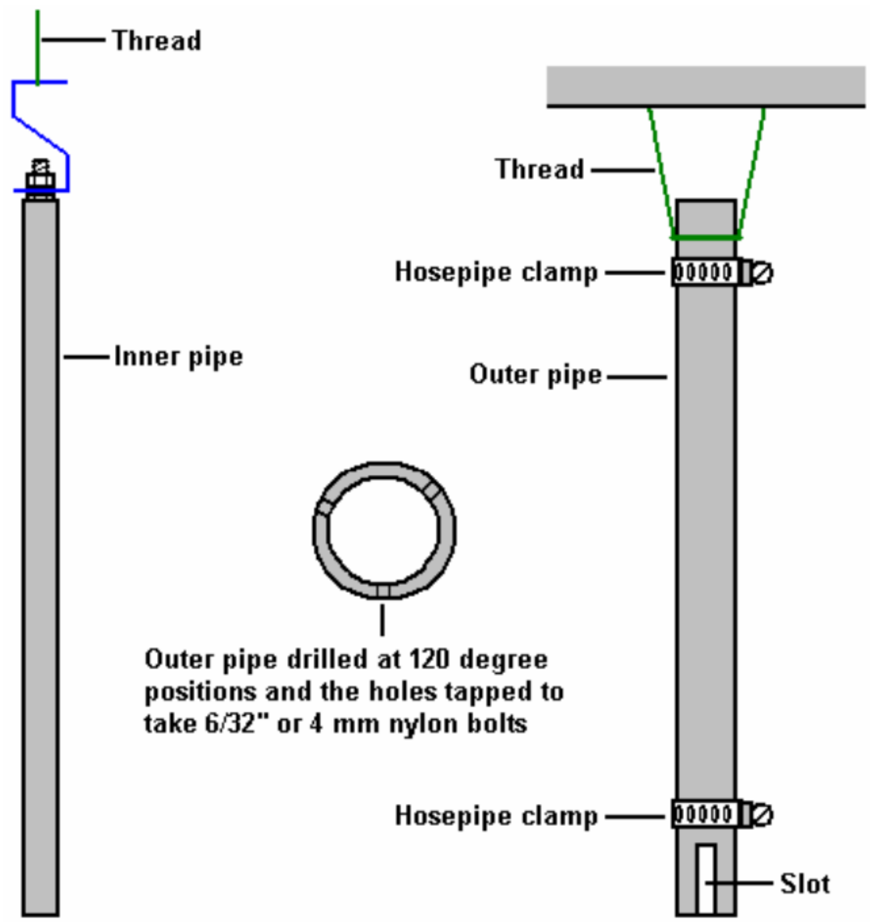


Figure 35: Setting the resonant frequency of the outer pipes. These "hosepipe" clips are used to make electrical connections to the outer pipes, as shown in the diagrams and they do have an effect on the resonance of the pipes. The pipe arrangement is shown here.

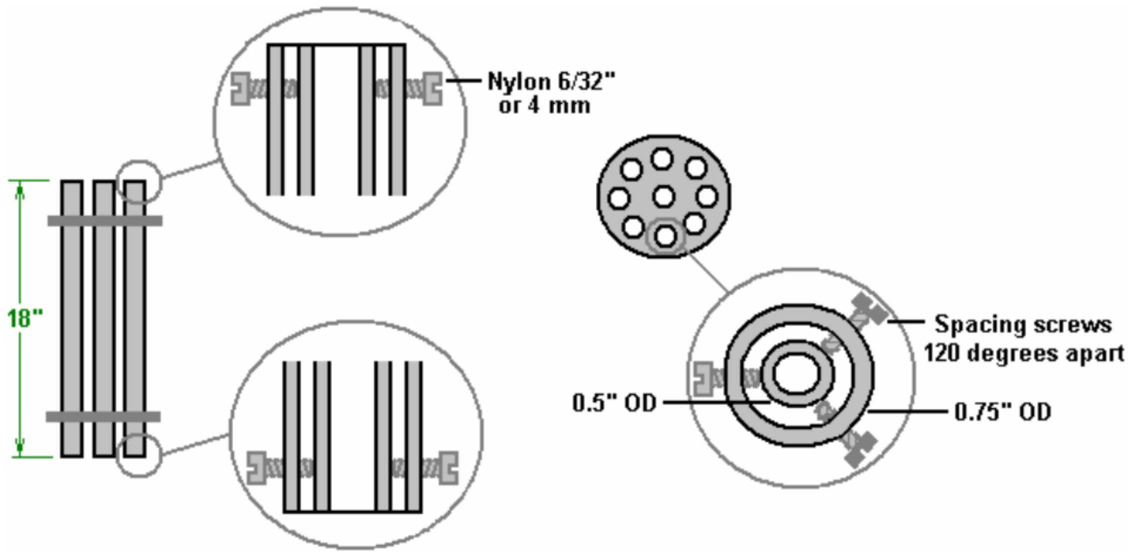


Figure 36: Three bolt holes, evenly spaced around the circumference of each end of all of the outer pipes.

in figure 37.

The supporting springy strip of steel is shown in blue in the above diagram as it also forms the electrical connection for the inner tubes. The outer tubes are held securely in position by two plastic discs which form a tight push-fit inside the 6" (150 mm) diameter acrylic tube which forms the body of the cell. The cell is sealed off with plastic caps (ideally, the upper one being screw threaded for easy maintenance) and the electrical connections are carried through the lower cap using 1/4" (6 mm) × 20 stainless steel bolts. The bolts are sealed using washers and rubber O-rings on both sides of the cap.

For clarity, the diagram above shows only the electrical connections for the inner pipes. The electrical connections for the outer pipes are shown in the following diagram in figure 38. The connections are made at both the top and the bottom of each outer pipe by attaching a stainless steel hose clamp with a stainless steel bolt attached to each clamp. The wiring is then carried across inside the cell so that all six connection points (three at the top plus three at the bottom) for each set of three pipes are carried out through the base of the cell with just one bolt, again, sealed with washers and rubber O-rings. The nine pipe pairs are electrically connected in three sets of three, and each set is fed with a separate phase of a 3-phase waveform. This

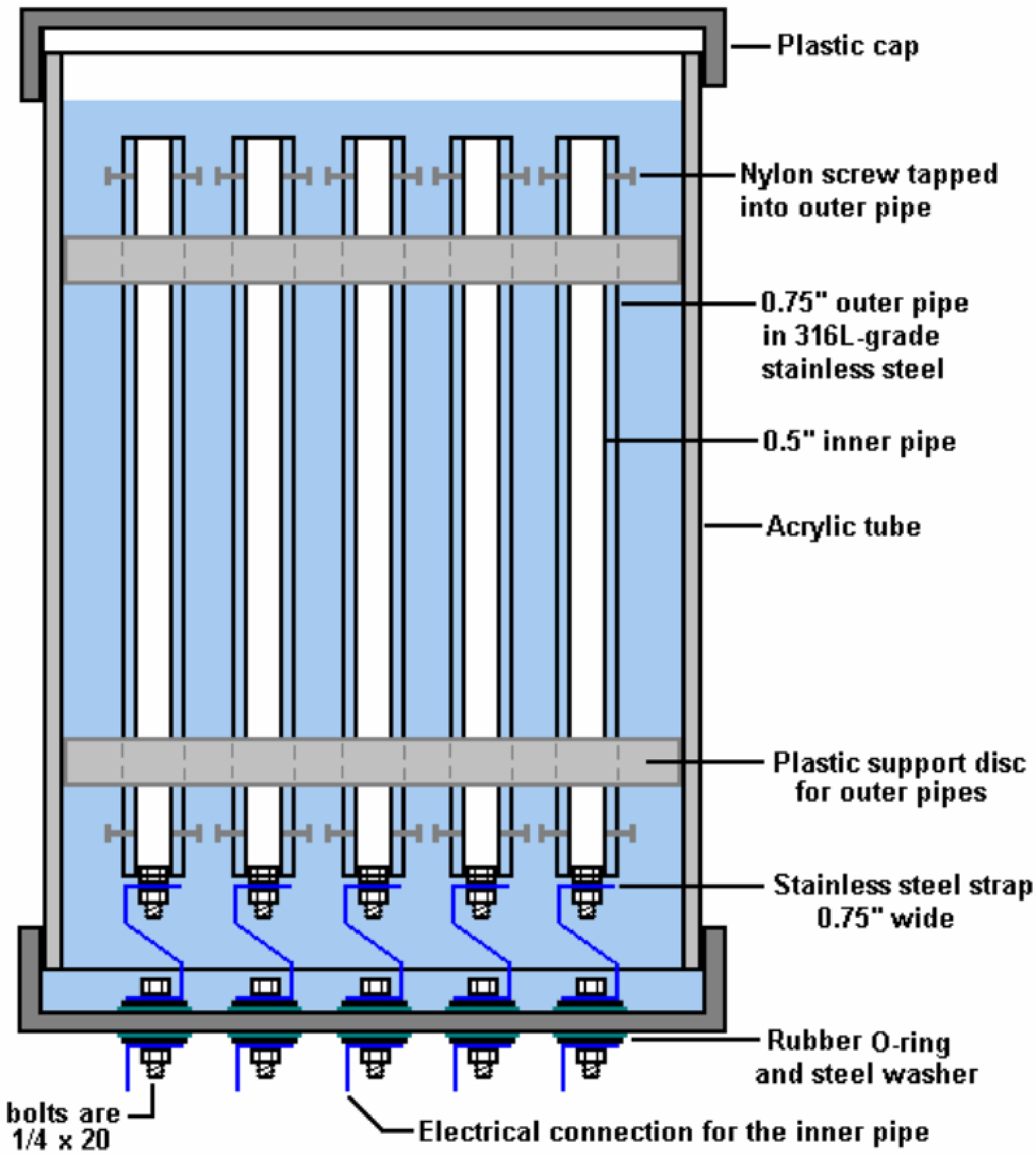


Figure 37: The nylon bolts are used to adjust and hold the inner pipe gently in the exact centre of the outer pipe. Dr Cramton's arrangement of Z-shaped steel strip as a "spring" is importance in constructing a set of resonating pipe pairs.

sets up an interaction through the water and produces a complex pulsing waveform with each set of pipes interacting with the other two sets. The sets are arranged so that the individual pipes of each set are interspersed with the pipes of the other two sets, making the sets overlap each other as shown in the next diagram. For clarity, the diagram does not show the electrical connections for the inner pipes and it omits the pipes of the other two groups of three, the water-level sensor, the gas take off pipe and the gas-pressure sensor.

At this time, Dr. Cramton is driving the pipe arrays with the circuit shown below. It uses an AC sinewave generated by a pulsed alternator. The current fed to the motor driving the alternator accounts for about 24 watts of power while the current drive to the alternator winding is just 12 watts. It should be realised that the alternator can easily drive many cells, probably without any increase in power required. Dr. Cramton is investigating methods of producing the same waveform without the need for an alternator and while that would be useful, it should be realised that a gas output of six litres per minute for a power input of only 36 watts is a very significant result. Others have shown that it is possible to power a 5.5 kilowatt electrical generator on HHO gas alone with a flow rate of this sort of magnitude, and obviously, the 36 watts can very easily be provided from that 5.5 kilowatt output.

It is absolutely essential that the pipe pairs are "conditioned" as there will be very little gas production until the white conditioning layer is built up on the active surfaces of the pipes. As has already been described, one method is by powering the cell up for a few minutes, and then letting it rest unused for a time before repeating the process. Dr. Cramton emphasises that at least a hundred hours of conditioning will be needed before the gas output volume starts to rise, and it will be three months before the white conditioning layer reaches its full thickness and the gas production rate increases dramatically.

Dr Cramton stresses that it is the mechanical construction which will make the difference in the gas production rate. The inner and outer pipes must be tuned to a common frequency. It is vital that the pipe pairs must be conditioned, which can be done through repeated use over a period of time. A very important alternative to this long conditioning process is coating the whole of the pipe surfaces with the insulating material "Super Corona Dope" (http://www.mgchemicals.com/products/4226.html) as this gives immediate conditioning of the pipes. When a complete set of tuned tubes has been achieved, then the electronics must be built and tuned to the resonant frequency of the tube sets. Voltage builds up on the pipes from the repeated pulsing

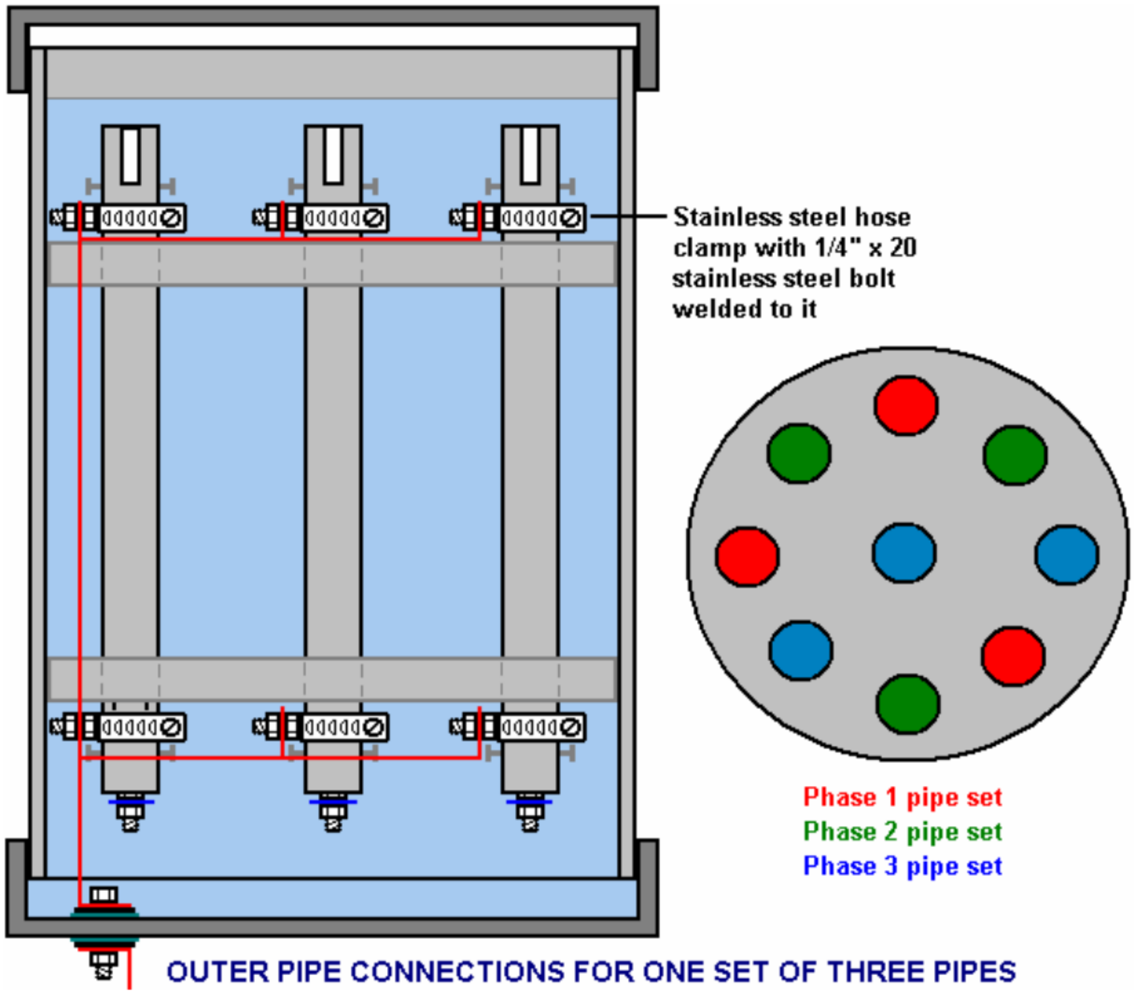


Figure 38: The electrical connections for the outer pipes are shown here. The connections are made at both the top and the bottom of each outer pipe by attaching a stainless steel hose clamp with a stainless steel bolt attached to each clamp. The wiring is then carried across inside the cell so that all six connection points (three at the top plus three at the bottom) for each set of three pipes are carried out through the base of the cell with just one bolt, again, sealed with washers and rubber O-rings. The nine pipe pairs are electrically connected in three sets of three, and each set is fed with a separate phase of a 3-phase waveform.

of the low voltage circuit and the action of the bi-filar wound coils each side of each pipe set and allowed by the insulation of the pipes. With Super Corona Dope this voltage has been measured at 1,480 volts but with the insulating layer from a local water supply, that voltage is around 1,340 volts.

It should be understood that the bi-filar wound coil (that is, wound with two strands of wire side by side) generates very sharply rising, very short voltage spikes, typically in excess of 1,000 volts in spite of the electrical supply being less than fourteen volts. The coils used by Dr Cramton are wound on ferrite rods, 300 mm (11.8") long and 10 mm (3/8") in diameter. As only 100 mm long rods were available, these were constructed by placing three inside a plastic tube. The coil winding is of enamelled copper wire and to allow sufficient current carrying capacity, that wire needs to be 22 swg (21 AWG) or a larger diameter, that is, with a lower gauge number such as 20 swg. These coils are wound to give an inductance of 6.3 mH on each of the two windings.

The circuit below in figure 39 is the one being used at this time. You will notice that an additional pole has been added to the Gating On/Off switch so that the timing components are switched out when the gating signal is turned off. This gives added protection for the Gating 555 chip in the circuit, preventing overheating when it is running but not being used. The frequency used with Dr. Cramton's cell is 4.73 kHz although this is not the optimum frequency for the cell. The alternator imposes a certain limitation on the highest possible frequency, but the frequency used has been shown to be the most effective and it is a harmonic of the optimum frequency. This is a bit like pushing a child on a swing and only pushing every third or fourth swing, which works quite well.

Dr Cramton says: "I would like people to know that the scientific community is working on these projects and this technology is now a fact of science and not conjecture".

Dr Cramton has performed repeated performance tests on a 40 kilowatt diesel generator and the results were highly consistent, coming in within 1% each time on ten successive tests. Figure 40 shows a graph of the results of his preliminary work.

The gains at full 40 kW load are about 35%, representing a reduction of 1.4 gallons of diesel per hour. As the generator is part of the equipment of a major power supplier, it is likely that the number of generators will be manipulated in relation to the demand and so the continuous overall gain is likely to be about 33% even with

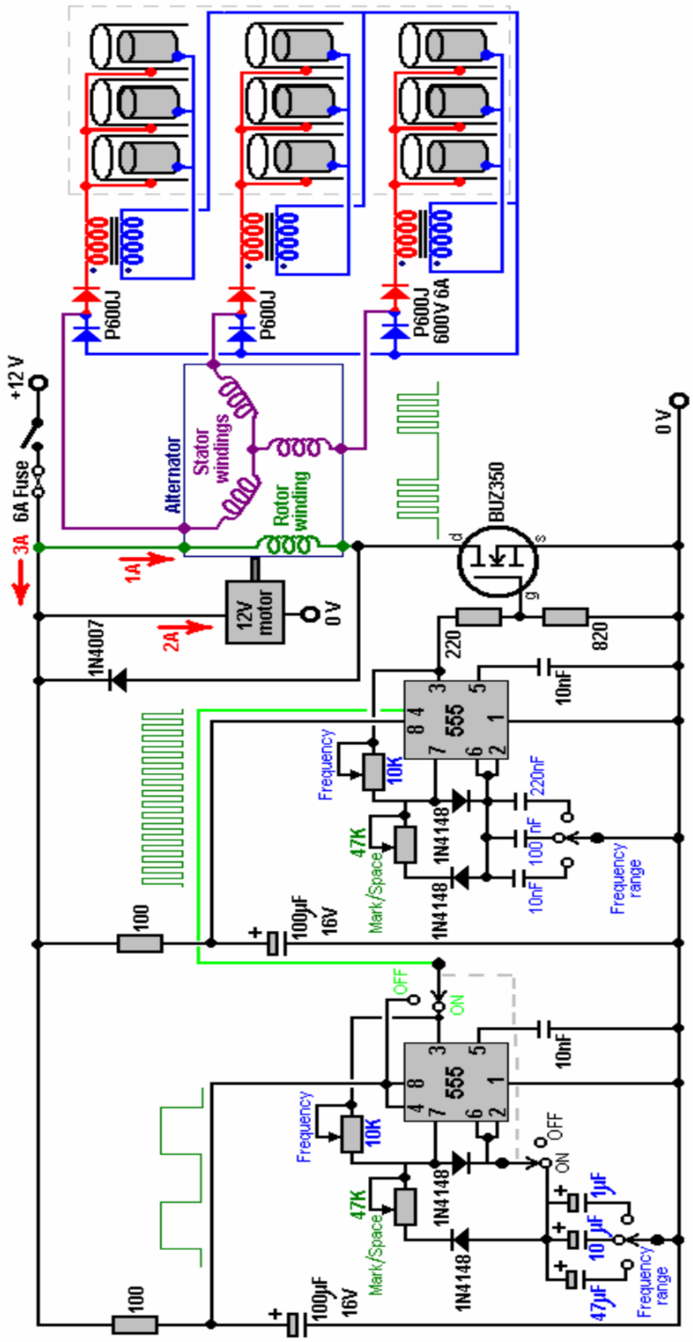


Figure 39: The circuit shown here is the one being used at this time. You will notice that an additional pole has been added to the Gating On/Off switch, so that the timing components are switched out when the gating signal is turned off.

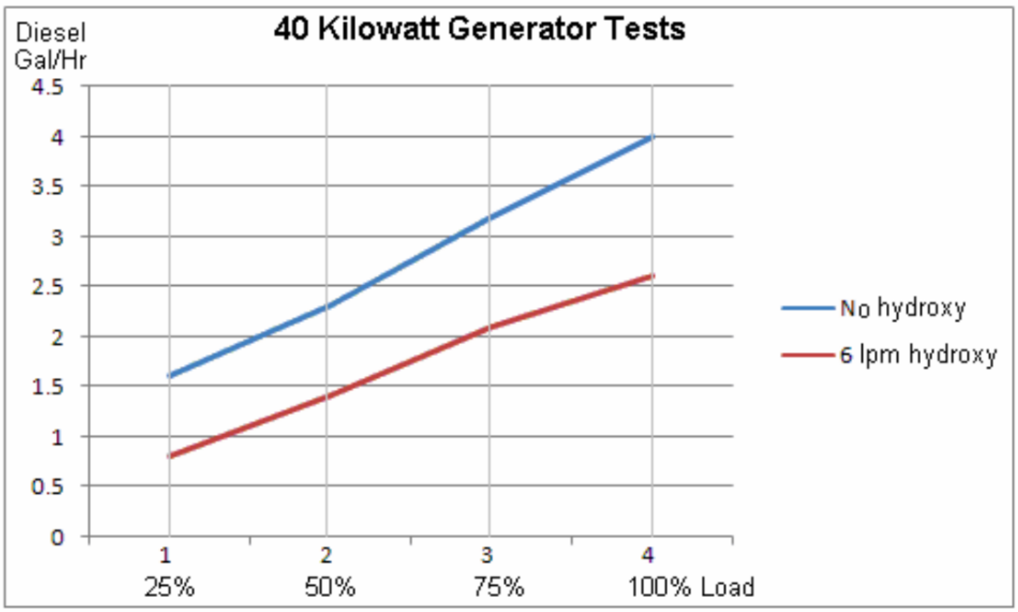


Figure 40: Plot results for above circuit (figure 39) performance tests on a 40 kilowatt diesel generator. The y axis is gallons per hour (Gal/Hr). The x axis is the percentage load. Engine load factor is defined as a portion of the rated engine power that is utilized during work process.

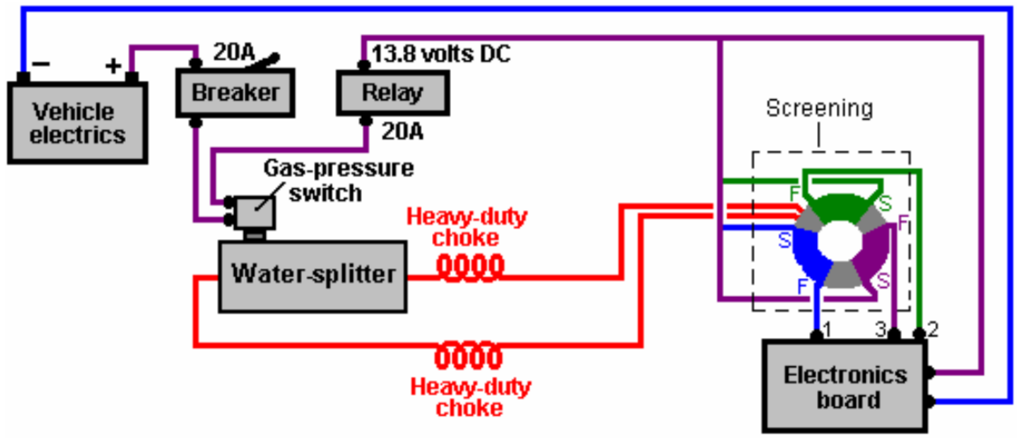


Figure 41: Bob Boyce's method for water-splitting using a flat-plate electrolyser-style construction and pulsed with twelve volts.

such a low HHO input as 6 lpm. The investigation and development is continuing.

3.2 Bob Boyce's High-Gain Toroidal System

Bob Boyce has recently released a different method for water-splitting using his flat-plate electrolyser-style construction and pulsed with just twelve volts as in the above water-splitter designs. Bob's circuit is shown in figure 41.

Here, the electronics board produces three separate, tuneable, very sharp square waveforms as described in the D9.pdf document mentioned earlier (used to be here: http://www.free-energy-info.tuks.nl/D9.pdf ; but not any more). These three waveforms are integrated into a single complex waveform when each is fed into a separate high-precision, high-specification winding on an iron-dust toroidal transformer core. This signal is stepped up to a higher voltage in the secondary coil of the transformer and then applied to the electrode plates via a choke coil on each side of the unit in exactly the same way as in the previous designs.

3.3 Resonance

Water-splitters only operate properly if are held on their resonant frequency. Stan Meyer has a patent on his electronics system which would locate, lock on to and maintain the electronic pulsing at the resonant frequency of his cell. Unfortunately,

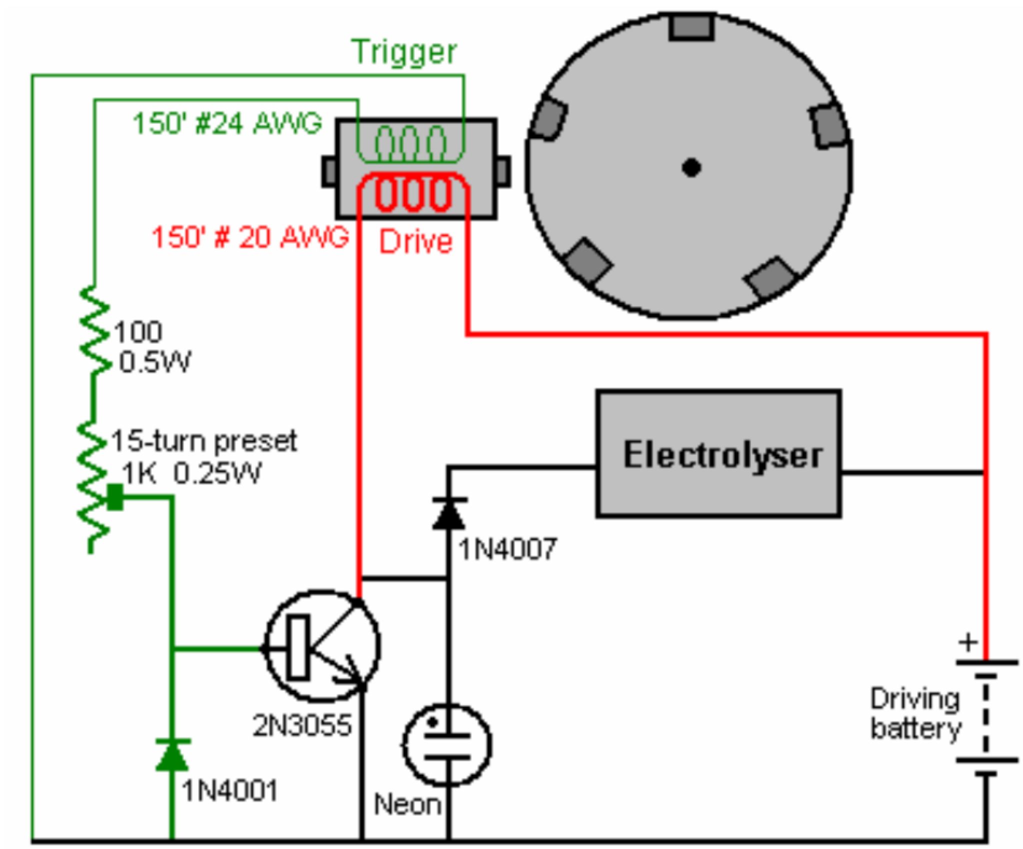


Figure 42: The John Bedini battery-charging pulse circuits applied to water-splitter cells. The cell itself is part of the frequency control of the oscillator circuit.

Stan's patent just gives broad outlines for the methods used.

The John Bedini battery-charging pulse circuits have been very successfully applied to water-splitter cells. Here, the cell itself is part of the frequency control of the oscillator circuit and the arrangement might look like figure 42.

This idea is advocated on a YouTube video put up by a user whose ID is "TheGuru2You" where this arrangement is suggested in figure 43.

'TheGuru2You' states that he has built this circuit using a capacitor instead of the water-splitter and he says that he can confirm that it is self-powering, something which conventional science says is impossible (unless perhaps, if the circuit is picking

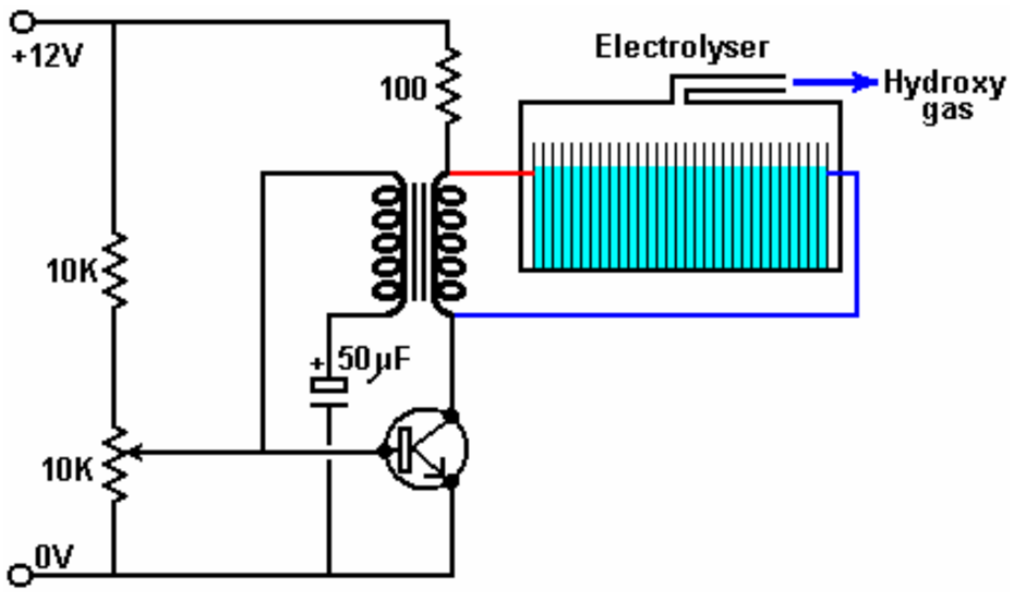


Figure 43: The YouTube user 'TheGuru2You' states that he has built this circuit, in figure 42, using a capacitor instead of the water-splitter and that it is self-powering.

up radiated power through the wiring of the circuit). Once a twelve volt supply is connected briefly to input terminals, the transistor switches on powering the transformer which feeds repeating pulses to the base of the transistor, sustaining the oscillations even when the twelve volt supply is removed. The rate of oscillation is governed by the resonant frequency of the water-splitter unit. Consequently, as the resonant frequency of the cell alters because bubbles form, the pressure changes, the temperature changes, or whatever, the circuit automatically tracks and maintains that optimum frequency.

3.4 Dave Lawton's Auto-Tune Circuit

Dave Lawton uses a different method as he has designed and built a Phase-Lock Loop ("PLL") circuit which does the same thing that Stan Meyer's automatic circuit did. This is Dave's circuit in figure 44.

This circuit has been used very successfully by a number of people. One experimenter had the circuit built by a friend, as he is not very confident with building electronic circuits. The construction looks like figure 45.

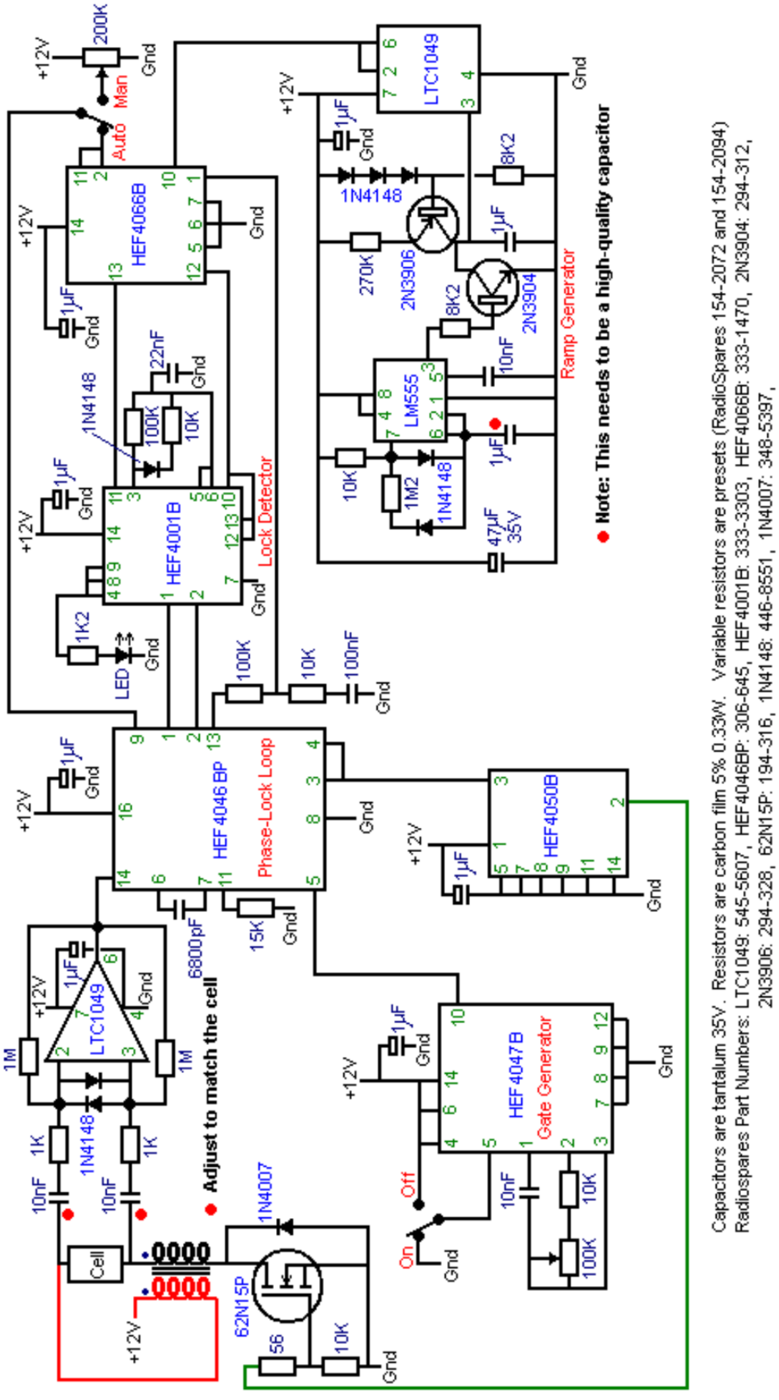


Figure 44: Dave Lawton's Auto-Tune Circuit. It uses a method of a built a Phase-Lock Loop ("PLL") circuit, which does the same thing as Stan Meyer's automatic circuit.

Figure 45: Photograph of construction of Dave Lawton's auto-tune circuit.

The two air-core coils are wound separately rather than bi-filar wound, and some experimentation with different types will be undertaken to see the effect on overall gas production. This circuit is shown in the following video, driving a 2.6 inch long pair of electrodes with a 2 mm gap between them, sitting in a test cell. The electrodes have seams and are made of an unknown quality of stainless steel and can be seen at the top of the photograph above. The video: http://youtu.be/XMizRAYdGwA shows considerable gas production with almost no current draw and the cell staying completely cool.

3.5 Running Electrical Generators on Water Alone

After many decades of being lied to, most people believe that it is necessary to burn a fuel (typically, a 'fossil fuel' such as petrol or diesel) in order to make an engine run. 'Scientific experts' demonstrate their ignorance by proclaiming that their calculations show that there is just not enough energy in hydrogen released through electrolysis, to provide enough power to run an engine which can provide sufficient electrical energy to perform the electrolysis in the first place.

Their calculations are completely wrong as they are based on a major level of ignorance of the real facts:

1. Ignoring HHO altogether, engines can run extremely well on environmental energy channelled through a Joe Cell as shown in chapter 9, and when doing that, no fuel at all is consumed..

2. They are not aware that properly made HHO has typically four times the energy content of hydrogen gas.

3. They are not aware that a properly built electrolyser running on DC has more than double the efficiency that Faraday considered to be the maximum possible production rate of HHO for any given current flow.

4. They are not aware that resonant pulsed electrolysis has several times the water-to-HHO conversion efficiency that straight DC can produce, resulting in more than ten times the Faraday 'maximum' conversion rate.

5. They are not aware that the majority of the energy produced by HHO being converted back into water does not come from the hydrogen but instead comes from charged water clusters. It is likely that they have never even heard of charged water clusters.

6. They are probably not aware that introducing cold water mist to the air entering an internal combustion engine, makes that engine operate as an internal combustion steam engine as the mist gets converted into flash-steam, raising the pressure inside the cylinder and boosting the engine efficiency very considerably.

Because of these things, the calculations of the 'scientific experts' produce completely wrong results due to lack of knowledge and the flawed assumptions on which the calculations are based.

Interestingly, quite apart from the fact that generators running on water as the only visible fuel, have been powering off-grid locations 24 × 7 for many years now, and ignoring that little detail, check out this newspaper comment in figure 46.

US Navy will turn seawater into fuel

THE US Navy claims it has found a way to turn seawater into fuel, having spent decades conducting scientific experiments.

If true, the development could see military ships developing their own fuel and staying operational 100% of the time. Navy scientists say they have already used the new fuel to fly a model aircraft.

Calling it "a huge milestone", Vice Admiral Philip Cullom pointed out that "in the Navy, we have some pretty unusual kinds of challenges."

One of these is the need at present to refuel from an oil-tanker. But "developing a game-changing technology like seawater-to-fuel reinvents a lot of the way we can do business when you think about logistics, readiness," said Cullom.

The US Navy has 289 vessels and most rely on oil-based fuel, apart from some aircraft carriers and 72 submarines that use nuclear power.

The breakthrough came after scientists found a way to extract carbon dioxide and hydrogen gas from seawater. The gasses are then turned into a fuel with the help of catalytic converters.

"We are in challenging times where we have to think in new ways to look at how we create energy, how we value energy and how we consume it," said Cullom.

"We need to challenge the assumptions that of the last six decades of constant access to cheap, unlimited amounts of fuel."

Figure 46: Newspaper story of US Navy powering ships using sea water as a fuel.

This is a very interesting comment from Vice Admiral Cullom. Firstly, he confirms that the Navy's massive engines can be powered by gas produced by electrolysis. Second, he implies very strongly that refuelling with oil-based consumables is no longer needed, and that means that the electrolysis is well in excess of 100% efficient, making those massive engines self-powered. Third, it seems reasonable to presume that if those massive engines can be self-powered through electrolysis, that the very much smaller engines in cars could also be run on electrolysis, even if the same method of electrolysis were not used. Anyway, we have to deal with the tiny, very inefficient motors which are used in generators which normally use petrol as the fuel:

In the UK, three men managed to run a generator on water alone, using just simple things which are within the scope of the average handyman in his workshop. They bought a standard petrol-driven electrical generator off eBay and managed to run it without using any petrol. They used a HHO gas flow which they measured at just 3 lpm and they test loaded the 5.5 kilowatt generator with 4 kilowatts of equipment. Afterwards they abandoned the generator and moved on to a much bigger engine as their plans are to sell electricity to the local power company. Their representative said:

"The equipment was put together by my associate, who supplied the water/electrolyte (not a standard electrolyte, 0.4% by volume). It was a 5 kW petrol generator (about 300 cc). We attached a Chevrolet alternator which constantly charges a 12-volt 55 Amp-Hour battery, which in turn powers six HHO tubes, each of which draws 6 watts, for a total of 30 watts. The outputs of these electrolysers are connected in series and they feed the gas into a low-pressure butane gas "camping" tank which has an 18 psi pressure ('psi' → Pounds per Square Inch) release valve. This tank feeds the air intake of the generator which is adjustable with a choke. We loaded the 30-amp socket of the generator with various drills, heaters etc. working, for more than four hours. The maximum load which we tried was 4 kilowatts, being a bar heater, a kettle and two drills. The electrolyser tubes are heavy-duty plastic (rated for 80 psi pressure). Inside are 4 tubes of stainless steel (3 positive and 1 negative). Each tube created 1 litre of gas every two minutes which is a total of 3 litres per minute. They eventually become warm to the touch, but they do not get hot."

Figure 47: Photograph of electrical generator powered by petrol or diesel for conversion to HHO fuel.

4 Running an Electrical Generator without Fossil Fuel

The type of generator to be converted from petrol/diesel to HHO fuel is shown in figure 47.

4.1 In Broad Outline

In order to achieve this objective, very much like Stan Meyer, we need to feed the engine three things:

1. Air —this is fed in as normal through the existing air filter.
2. HHO gas —how to make this has already been explained in considerable detail.
3. A mist of very small water droplets, sometimes called "cold water fog".

Also, we need to make two adjustments to the engine:

1. The spark timing needs to be retarded by about eleven degrees.

2. If there is a "waste" spark, then that needs to be eliminated.

To summarise then, a good deal of work needs to be done to achieve this effect:

1. An electrolyser needs to be built or bought, although the required gas production rate is not particularly high.
2. A generator of cold water fog needs to be made or bought.
3. Pipes need to be installed to carry these two items into the engine.
4. The engine timing needs to be retarded.
5. Any waste spark needs to be suppressed.
6. Water tanks are needed for the cold water fog and to keep the electrolyser topped up.
7. Ideally, some form of automatic water refill for these water tanks should be provided so that the generator can run for long periods unattended.

If we omit the electrical safety equipment which has already been explained in detail, and omit the HHO gas safety equipment which has already been explained in detail, and skip the automated water supply details and the starting battery, then, a generalised sketch of the overall arrangement is shown in figure 48.

4.2 Creating the cold water fog

There are three different ways to generate the spray of very fine water droplets which are a key feature of the success of this way of running the engine. One way is to use a Venturi tube, which, while it sounds like an impressive device, is actually very simple in construction, as shown in figure 49.

It is just a pipe which tapers to a point and which has a very small nozzle. As the engine draws in the air/HHO mix on it's intake stroke, the mixture rushes past the nozzle of the Venturi tube. This creates an area of lower pressure outside the nozzle and causes water to exit through the nozzle in a spray of very fine droplets. Some perfume spray bottles use this method as it is both cheap and effective.

An alternative method of making the cold water fog is to use one or more "pond foggers". These are small ultrasonic devices which are maintained at the optimum

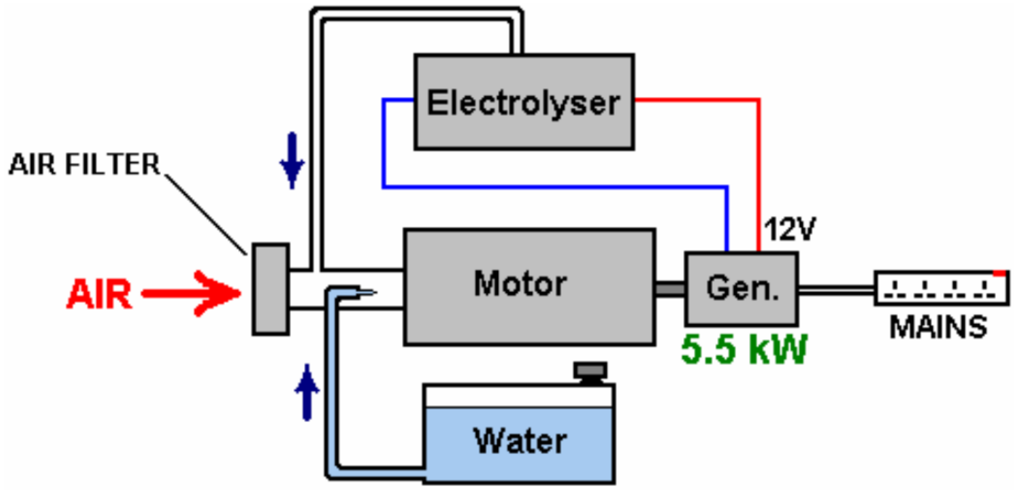


Figure 48: Generalised sketch of HHO generator, with electrical safety and HHO gas safety equipment ommited, and without automated water supply details and the starting battery.

operating depth in the water by a float. They produce large amounts of cold water fog which can be fed into the engine as shown in figure 50.

A third method is to use a small carburettor of the type used with model aircraft. This does the same job as a regular engine carburettor, feeding a spray of tiny water droplets into the engine air intake. The physical arrangement of this option depends on the construction of the air filter of the generator being modified. You will notice that the people in the UK who did this, used a small gas tank with an eighteen pounds per square inch pressure release valve. This is not possible with the highest quality of HHO gas as it cannot be compressed that much. However, with a lower grade of HHO which has some water vapour mixed in with it, it is possible to have a gas reservoir with that sort of pressure in it. In this case, except possibly for starting, their gas production rate is probably not high enough to allow much raised pressure inside the tank. Obviously, the gas-pressure switch on the electrolyser and the one on the gas storage tank will have similar operational pressures.

4.3 Some Safety Features

Up to this point, the electrolyser has been shown in bare outline. In practice, it is essential that some safety features are incorporated, as shown in figure 51.

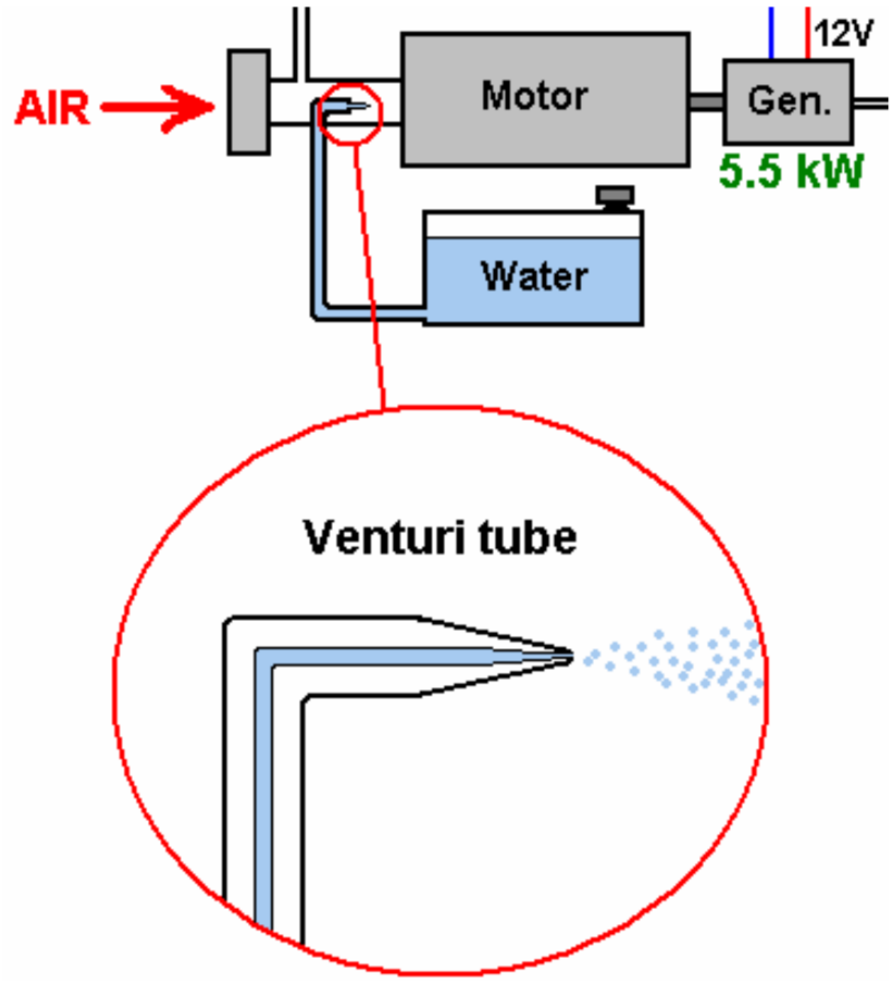


Figure 49: Generating the spray of very fine water droplets, for the successful running of the engine, using a Venturi tube.

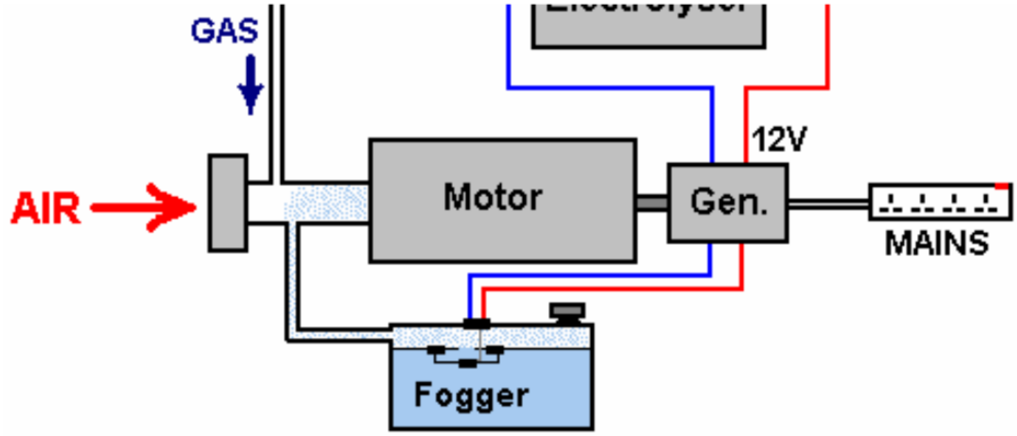


Figure 50: An alternative method of making the cold water fog, using one or more "pond foggers". These produce large amounts of cold water fog which can be fed into the engine.

These safety devices should be familiar to you by now as they have already been explained earlier in this document (see [3]).

4.4 The Reason for Changing the Timing

The fuels used with most internal combustion engines are either petrol (gasoline) or diesel. If you are not interested in chemistry, then you are probably not aware of the structure of these fuels. These fuels are called "hydrocarbons" because they are composed of hydrogen and carbon. Carbon has four bonds and so a carbon atom can link to four other atoms to form a molecule. Petrol is a long chain molecule with anything from seven to nine carbon atoms in a chain. See figure 52.

Diesel has the same structure but with eleven to eighteen carbon atoms in a chain. In a petrol engine, a fine spray of petrol is fed into each cylinder during the intake stroke. Ideally, the fuel should be in vapour form but this is not popular with the oil companies because doing that can give vehicle performances in the 100 to 300 mpg (Miles Per Gallon) range and that would cut the profits from oil sales.

The petrol in the cylinder is compressed during the compression stroke and that reduces its volume and raises its temperature substantially. The air/fuel mix is then

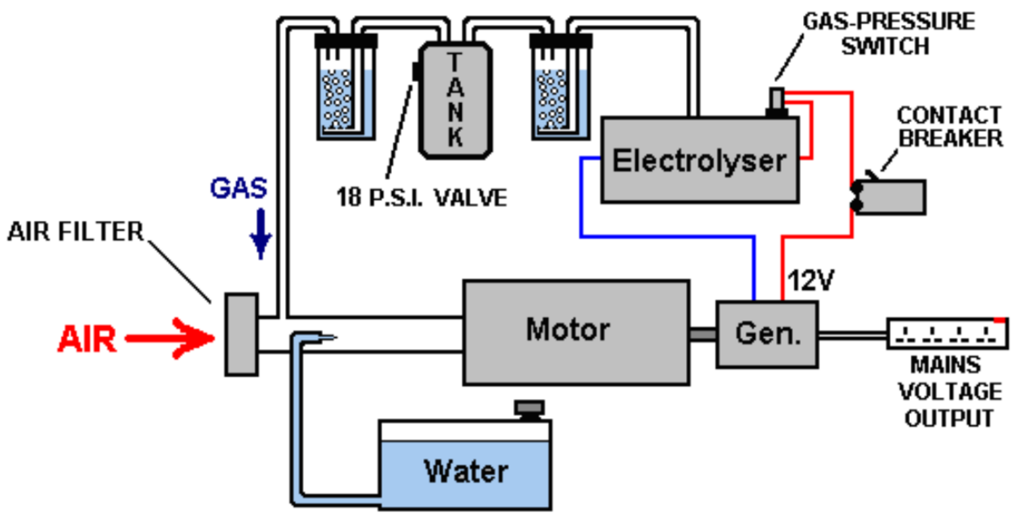


Figure 51: Diagram showing some safety features incorporated into the electrolyser.

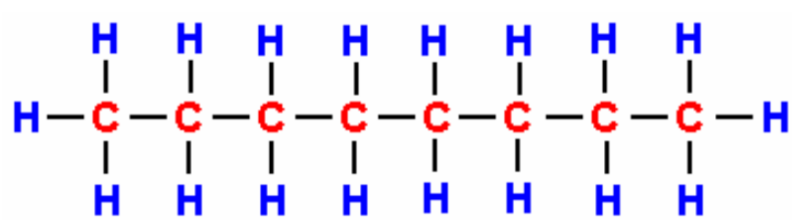


Figure 52: Chemical structure of "hydrocarbons" (hydrogen H and carbon C) that compose the petrol (gasoline) or diesel fuels.

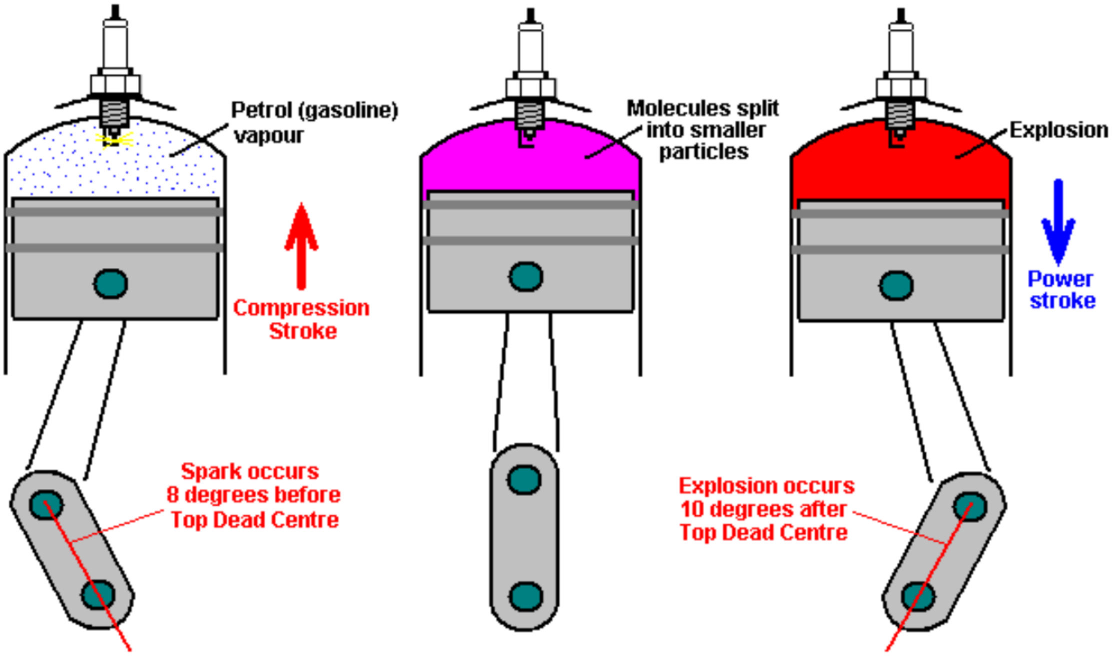


Figure 53: Diagram of combustion process in engine pistons, showing the slight delay between the spark and the combustion of the fuel. The combustion needs to happen a few degrees after Top Dead Centre when the piston is about to start its downward movement in the power stroke.

hit with a powerful spark and that provides enough energy to start a chemical reaction between the fuel and the air. Because the hydrocarbon chain is such a large molecule, it takes a moment for that chain to break up before the individual atoms combine with the oxygen in the air. The main engine power is produced by the hydrogen atoms combining with oxygen, as that reaction produces a large amount of heat. The carbon atoms are not particularly helpful, forming carbon deposits inside the engine, not to mention some carbon monoxide (CO) and some carbon dioxide (CO_2) as well.

The key factor here is the slight delay between the spark and the combustion of the fuel. The combustion needs to happen a few degrees after Top Dead Centre when the piston is about to start its downward movement in the power stroke. Because of the delay caused by the hydrocarbon chain breaking down, the spark occurs a few degrees before Top Dead Centre. This is shown in the spark/combustion process of figure 53.

If you were to replace the petrol vapour with HHO gas, then there would be a major problem. This is because HHO gas has very small molecule sizes which do not need any kind of breaking down and which burn instantly with explosive force. The result would be an explosion which occurs far too soon and which opposes the movement of the rising piston, as shown in figure 54.

The forces imposed on the piston's connecting rod would be so high that it would be quite liable to break and cause additional engine damage.

In the case of our electrical generator, we will not be feeding it a mix of air and HHO gas, but instead, a mix of air, HHO gas and cold water fog. This delays the combustion of the HHO gas by a small amount, but it is still important to have the spark occur after Top Dead Centre, so the ignition of the generator needs to be retarded by eleven degrees.

Engine design varies considerably in ways which are not obvious to a quick glance at the engine. The timing of the valves is a big factor here. In the smallest and cheapest engines, the engine design is simplified by not having the spark timing taken off the cam-shaft. Instead, production costs are cut by taking the spark timing off the output shaft. This produces a spark on every revolution of the engine. But, if it is a four-stroke engine, the spark should only occur on the power stroke which is every second revolution of the output shaft. If the fuel is petrol, then this does not matter as the extra spark will occur near the end of the exhaust stroke when only burnt gasses are present in the cylinder.

Some people are concerned when they think of HHO gas burning and producing water inside the engine. They think of hydrogen embrittlement and rusting. However, because of the nature of the hydrocarbon fuel already being used, the engine runs primarily on hydrogen anyway and it always has produced water. The water is in the form of very hot vapour or steam and the engine heat dries it out when the engine is stopped. Hydrogen embrittlement does not occur as a result of using a HHO gas booster.

Anyway, if we were to delay the spark until after Top Dead Centre as we must, then the situation is quite different as the waste spark will also be delayed by the same amount. With most engines, at this point in time the exhaust valve will have closed and the intake valve opened. Our very flammable gas mix will be being fed into the engine on it's intake stroke. This means that our gas supply system is openly

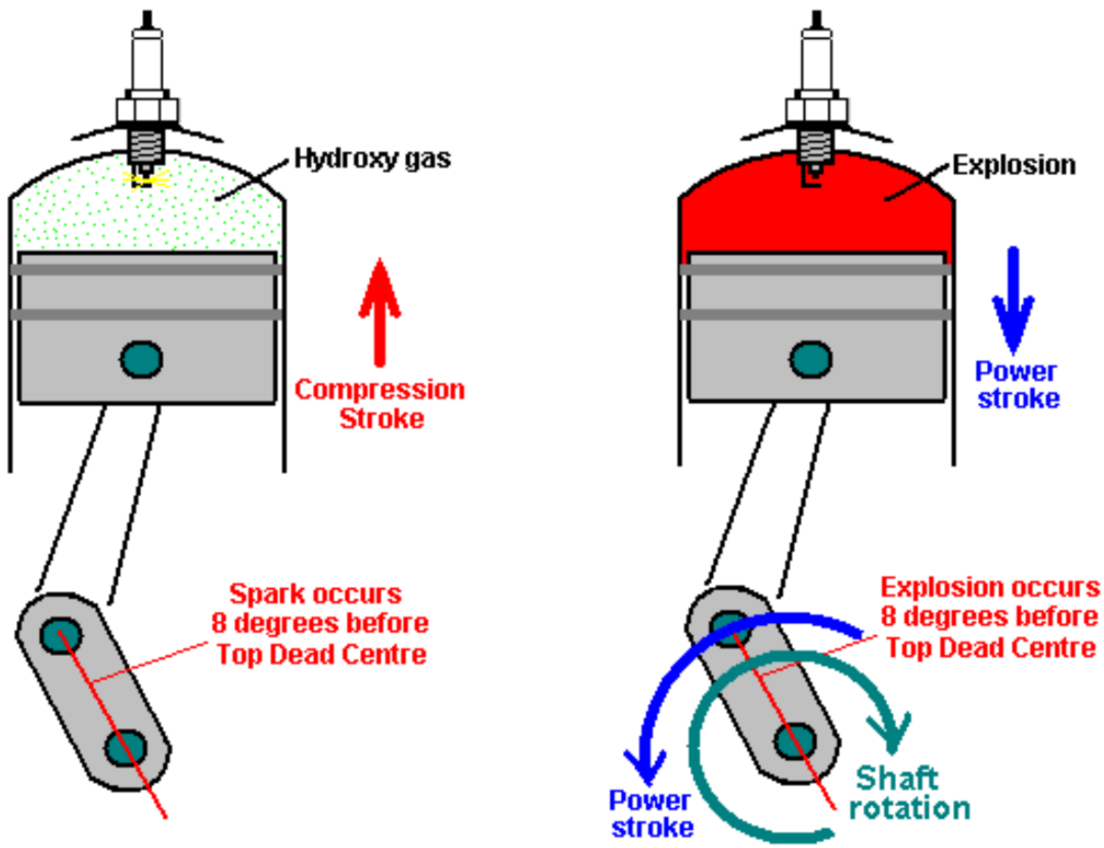


Figure 54: If you were to replace the petrol vapour with HHO gas, then there would be a major problem. This is because HHO gas has very small molecule sizes which do not need any kind of breaking down and which burn instantly with explosive force. The result would be an explosion which occurs far too soon and which opposes the movement of the rising piston as shown.

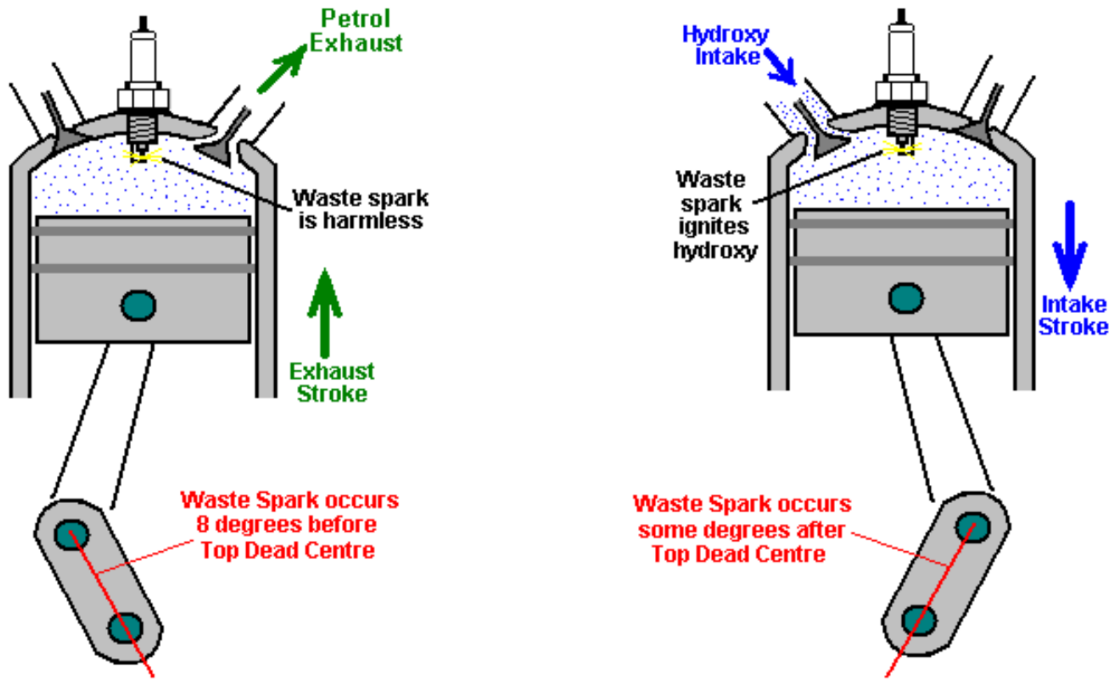


Figure 55: Delaying the spark until after Top Dead Centre. Our very flammable gas mix will be being fed into the engine on it's intake stroke. This means that our gas supply system is openly connected to the cylinder through the open intake valve, and so, the waste spark would ignite our gas supply system.

connected to the cylinder through the open intake valve, and so, the waste spark would ignite our gas supply system (as far as the bubbler which would smother the flashback). The situation is shown in figure 55.

We definitely do not want that to happen, so it is very important that we suppress that additional "waste" spark. So, this leaves us with two engine adjustments: timing delay and waste spark elimination. There are various ways in which these can be done and as each engine design is different, it is difficult to cover every possibility. However, there is a technique which can be used with many engines and which deals with both issues at the same time. Most engines of this type are four-stroke engines with intake and exhaust valves, perhaps something like figure 56.

The intake valve (shown on the right in this illustration —figure 56) is pushed down by a cam shaft, compressing the spring and opening the inlet port. The exact ar-

Figure 56: Suppressing the additional “waste” spark. So, this leaves us with two engine adjustments: timing delay and waste spark elimination. There is a technique which can be used with many engines and which deals with both issues at the same time. Most engines of this type are four-stroke engines with intake and exhaust valves, perhaps something like this.

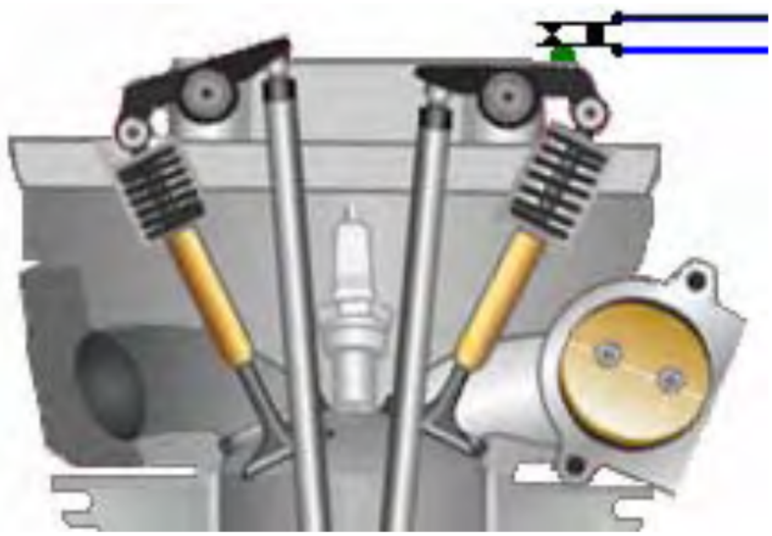


Figure 57: Suppressing the additional "waste" spark. So, this leaves us with two engine adjustments: timing delay and waste spark elimination. There is a technique which can be used with many engines and which deals with both issues at the same time. Most engines of this type are four-stroke engines with intake and exhaust valves, perhaps something like this.

rangement will be different from one engine design to the next. What is fixed is the movement of the valve itself and that movement only takes place every second revolution. There are various ways of using this movement to eliminate the waste spark and retard the timing. If a switch were mounted so that it opens when the intake valve opens and closes when the intake valve closes, then the switch closure shows when the piston starts upwards on its compression stroke and a simple electronic circuit can then give an adjustable delay before firing the coil which produces the spark. This, of course, involves disconnecting the original electrical circuit so that no waste spark is generated. The current flowing through the switch contacts can be arranged to be so low that there will be no sparking at the contacts when the circuit is broken again. The switch positioning might be like figure 57.

An alternative is to attach a strong permanent magnet to the rocker arm, using epoxy resin, and then position a solid state "Hall-effect" sensor so that it triggers the delay before the spark is generated.

If the engine did not have a waste spark, then in theory, the timing mechanism of the

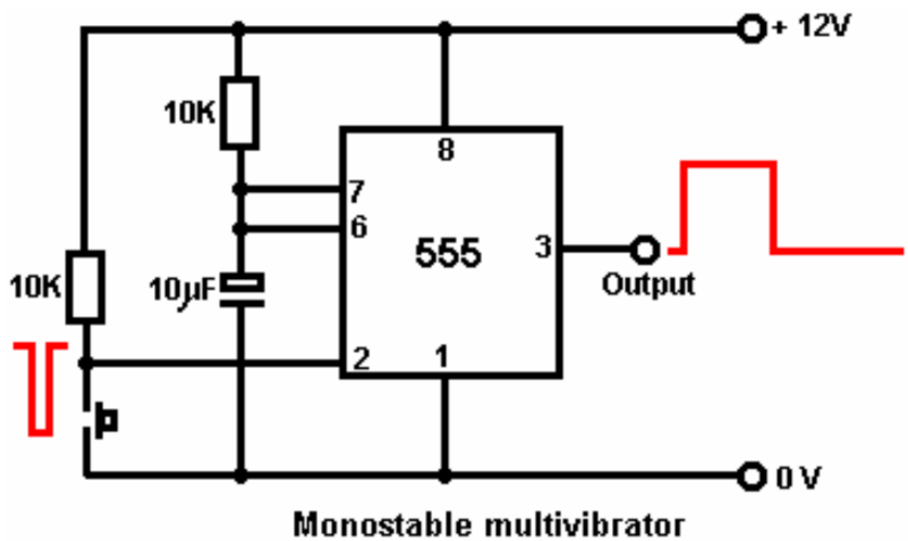


Figure 58: In practice, the timing mechanism is almost never capable of retarding the spark to the position that is needed for running without fossil fuel, and so, some kind of delay circuit will be needed anyway. The sort of delay circuit needed is called a "monostable" as it has only one stable state. A basic circuit of that type is shown here.

engine could be used to retard the spark. However, in practice, the timing mechanism is almost never capable of retarding the spark to the position that is needed for running without fossil fuel, and so, some kind of delay circuit will be needed anyway.

The sort of delay circuit needed is called a "monostable" as it has only one stable state. A basic circuit of that type is shown in figure 58.

If you are not at all familiar with electronic circuits, then take a look at the beginner's electronics tutorial found in the Chapter12.pdf document on the http://www.free-energy-info.co.uk website as that explains how circuitry works and how to build any simple circuit from scratch. We can use two of these circuits, the first to give the adjustable delay and the second to give a brief pulse to the ignition circuit to generate the spark, as in figure 59.

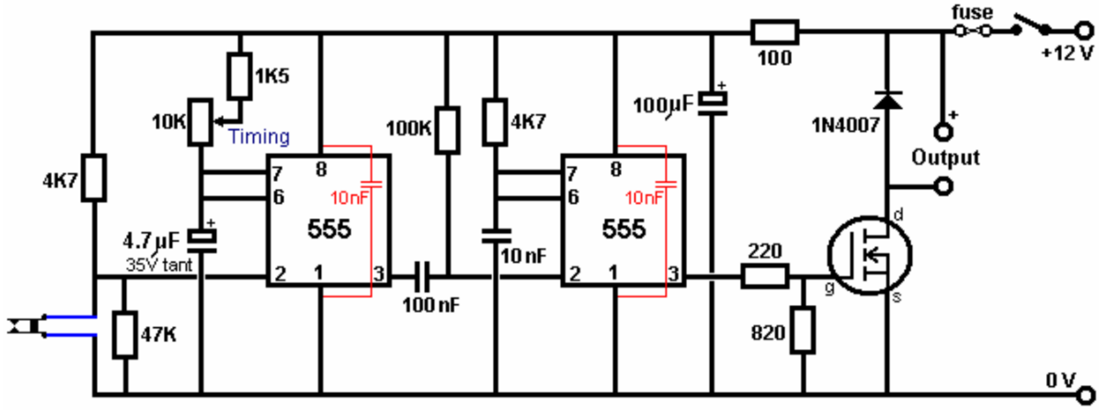


Figure 59: Design of two circuits. Firstly to give the adjustable delay, and secondly to give a brief pulse to the ignition circuit, to generate the spark.

4.5 Making the HHO gas

When the generator is running, we have a ready supply of electrical energy, coming from a piece of equipment which has been specifically designed to supply large quantities of electricity for any required application. We are not dealing with the spare capacity of some low-grade alternator in a car, but we have substantial electrical power available.

Having said that, the electrolysers described at the start of this document are efficient and it is unlikely that an excessive amount of power would be needed when using one of those designs. Another convenient factor is that this is a stationary application, so the size and weight of the electrolyser is not at all important, and this gives us further flexibility in our choices of dimensions.

As this is an application where it is highly likely that the electrolyser will be operated for long periods unattended, an automated water supply system should be provided. The main details of such a system have already been covered, but what has not yet been dealt with is the switching for the water pump. The water pump itself can be an ordinary windscreen-washer pump, and we need some form of switch which operates on the electrolyte level inside the electrolyser. It is sufficient to sense the level in just one of the cells inside the electrolyser as the water usage will be pretty much the same in every cell. If you make the electrolyser in a suitable size or shape, then a simple off-the-shelf miniature float switch can be used. If you prefer, an electronic level sensor can be operated, using two bolts through the side of the

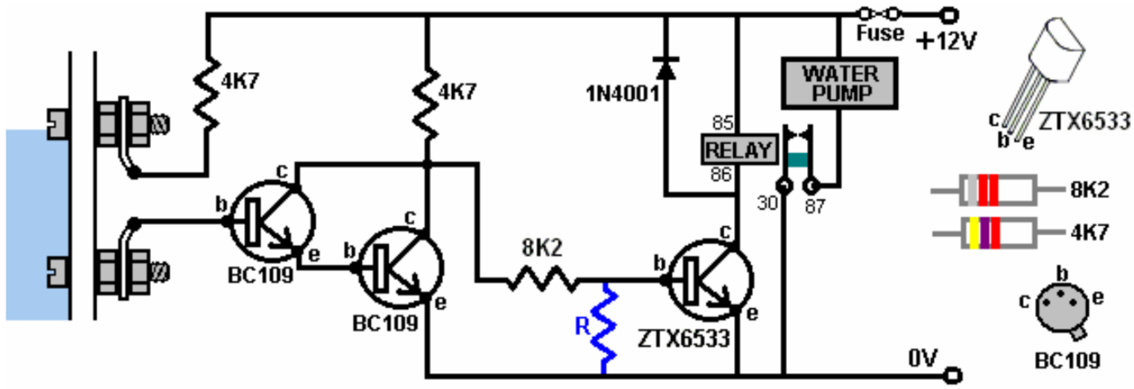


Figure 60: Swiching device for electrolyser. As this is an application where it is highly likely that the electrolyser will be operated for long periods unattended, an automated water supply system should be provided. An electronic level sensor can be operated, using two bolts through the side of the electrolyser as the level sensor. A suitable circuit for this simple switching task could be as shown here.

electrolyser as the level sensor. A suitable circuit for this simple switching task could be as in figure 60.

When the electrolyte level inside the electrolyser is in contact with the upper bolt head, the circuit is switched off and the water pump is powered down. The electrolyte has a low resistance to current flow, and so it connects the 4.7K resistor through to the base of the BC109 Darlington pair (as described in Chapter 12, see [3]). This keeps the two transistors switched fully on which keeps the 8.2K resistor connection well below the 0.7 volts needed to switch the ZTX6533 transistor on. If you are concerned about the ZTX6533 transistor being partially on, then resistor "R" could be added, although the prototype did not need one. The value would be about 2K. When the electrolyte level falls below the upper bolt head, the first two transistors switch off, and the ZTX6533 transistor is then powered fully on by the 4.7K resistor and the 8.2K resistor in series, providing the 150 mA needed for the relay to be switched fully on. The circuit draws about 5 mA in it's standby state. The numbers on the relay symbol correspond to the numbers on a typical automotive 12 volt relay. Using two BC109 transistors as the front end allows this circuit to be used with tap water if you wish. However, the water-level control for the water supply to the pond fogger or Venturi tube misting device does not need any form of fancy mechanism. The standard ball-cock valve mechanism which is used with toilets is quite adequate,

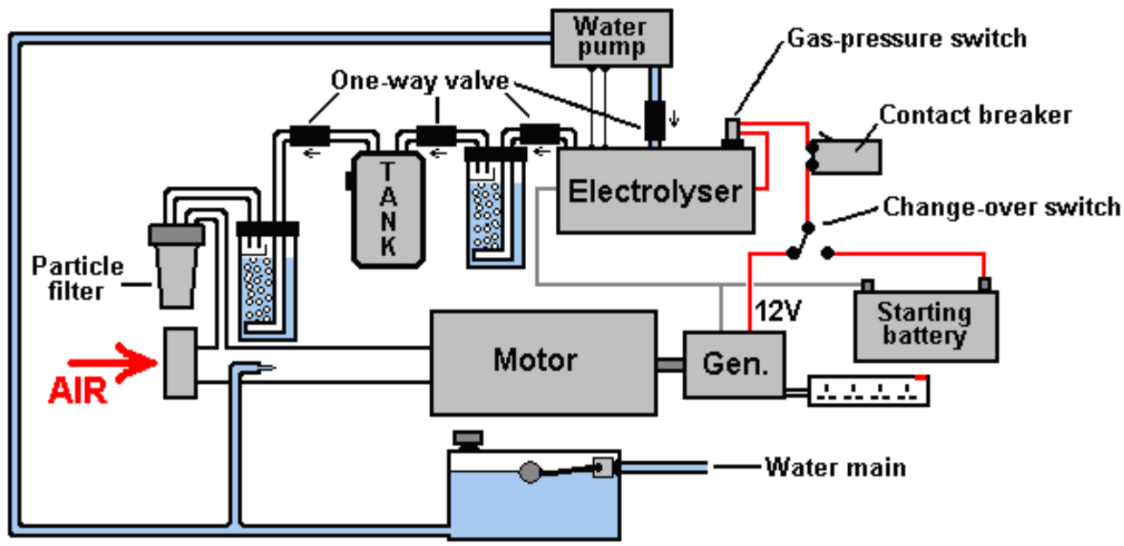


Figure 61: Battery switching arrangement. When gas pressure inside the electrolyser drops there will not be sufficient HHO gas available to start the engine. So, to deal with this situation, a lead-acid car battery is included so that it can be switched in to replace the generator for a brief period before the engine is started.

especially if a floating pond fogger is being used as it maintains its own optimum depth below the surface and so the overall depth is not in any way critical provided, of course, there is sufficient depth for the fogger to float correctly.

4.6 Starting Engine

When left for any length of time, the gas pressure inside the electrolyser will drop because the nature of the HHO gas alters. This means that there will not be sufficient HHO gas available to start the engine and no more gas will be generated until the engine drives the generator. So, to deal with this situation, a lead-acid car battery is included so that it can be switched in to replace the generator for a brief period before the engine is started. That inclusion gives this overall arrangement, in figure 61.

This arrangement is perfectly capable of running a standard generator without the use of any fossil fuel. It should be noted that while no fossil fuel needs to be bought to run this generator system, the electrical output is far from free and is actually quite expensive as there is the purchase cost of the generator, the electrolyser and the minor additional equipment. Also, generators have a definite working life and so will need to be refurbished or replaced.

It might also be remarked that if a generator of this type is going to be used in an urban environment, then the addition of sound-reducing baffles and housing would be very desirable. At this point in time I am aware of nine different electric generators which have been adapted to run on water. At least four of these are from different manufacturers. The method of altering the timing and dealing with the waste spark is different from one adaption to the next. One user has altered the spark timing of his generator to after Top Dead Centre by rotating the timing disc to a position not envisaged by the manufacturer. The timing disc is held in place by a locking ("key") bar which fits into a channel cut in the shaft of the engine, matching it to a similar channel cut in the disc. The alteration was achieved by cutting a new channel in the shaft, allowing the timing disc to be positioned further around the shaft, producing the required timing delay. This arrangement also makes the waste spark ineffective and so it can be ignored. While this method requires the cutting of a slot, it does away with the need for any electronics and it is a very simple solution.

If you feel that the construction of a suitable electrolyser would be a problem or that the amount of electric current needed to operate it would be excessive, let me show you the actual figures involved:

Michael Faraday was an exceptional and highly respected researcher who investigated the electric current needed to convert water into hydrogen gas and oxygen gas by electrolysis. His results are accepted by pretty much every scientist everywhere. While he expressed the results of his work in terms which would be meaningless to the average person, his result is that an electrical input of 2.34 watts produces one litre of HHO gas in one hour.

In practical terms, that means that a current of 0.195 amps at 12 volts will produce 1 litre of HHO gas in one hour. In passing, only a nearly discharged lead-acid battery would have a voltage of 12 volts as the fully charged state is 12.85 volts and a vehicle alternator produces about 14 volts in order to charge the battery.

It is easier then, to compare the gas output of electrolysers directly to the figures produced by Faraday as shown here, based on a gas output of 15 litres per minute which is 900 litres per hour:

- Faraday: 900 litres in one hour, takes 2,106 watts or 100% Faraday
- Boyce: 900 litres in one hour, takes 998 watts or 211% Faraday without pulsing
- Boyce: 900 litres in one hour, takes 180 watts or 1,170% Faraday with pulsing
- Cramton: 900 litres in one hour, takes 90 watts or 2,340% Faraday

Much of this is not very important as it has been demonstrated that a gas production rate of around 3 lpm (180 lph) is sufficient to run a generator which produces 5,500 watts. Let us assume that the measured figure is 100% wrong and that it takes 360 lph of HHO gas, plus cold water fog, plus air, to run the generator, then:

- Faraday would need 843 watts
- Boyce would need 400 watts without pulsing
- Boyce would need 72 watts with pulsing
- Cramton would need 36 watts

None of these figures are important for running a generator because with an electrolyser efficiency of only 50% Faraday still leaves a massive generator excess of nearly 4 kilowatts on a 5.5 kilowatt generator. The gain is in running a generator as an internal combustion steam engine and not in the great efficiency of the electrolyser. It is distinctly possible that the pessimistic figures shown above are twice what is actually needed, but who cares? —the facts speak for themselves, with several people scattered around the world, already running generators on water. Many different generator designs have been adapted, typically, by modifying the flywheel, filling in the keyway and cutting another one to give a spark 2 degrees after TDC (Top Dead Centre). Experience has shown that the 6.6 kVA Honda V-twin petrol motor generator and the Vanguard V-twin work very well long-term when adapted to run on water only.

4.7 Wear and Tear Issues

A man who lives in Alaska is very experienced in the use of renewable energy sources and unconventional fuel systems. His experiences are likely to be helpful for anyone who intends to use an electrical generator, whether running on water or on a fossil fuel. He recalls the experiences of a friend:

He decided to live off-the-grid because it was going to cost him $20,000 to get connected to the grid and as his house was not that large, he decided to go the alternative route. We designed a system which would use a 4 kW inverter and have an 8 kW Briggs & Stratton generator with a 13 kW surge capacity, for back up. The system has 6 solar panels and a 24 volt battery bank with 400 amp capacity. Having long summer days here in Alaska, the solar panels have more than enough capacity for charging the battery bank on sunny days. However, but when the day is overcast or when it is winter when there are only six hours of sunlight, the battery bank does not get charged fully. At these times, the generator is used to top up the battery bank.

American generators normally have either two or four 120-volt outputs each rated at 15 amps, plus one 240-volt output rated at 33 amps. If one of the two 120-volt outputs is used to charge the battery bank, then you get left with just the other 120-volt output for any other power needs during the time when the battery bank is being charged. This is not a satisfactory arrangement as operating with one field at maximum power and the other one lightly loaded or unused, causes a field imbalance in the generator, engine crank imbalance and ring or regulator failure within six months. It also causes noisy running and excessive fuel consumption.

Run in this way, providing a 60-amp charge rate, the generator ran hard and loud for two to two and a half hours per day, and running it was costing $350 per month for gasoline. The generator failed after four months.

In order to balance the loading on the replacement generator, a 15 kVA step-down transformer costing less than $1000 was purchased so that the 240-volt output could be used to drive 120-volt equipment. A transformer to be used for this needs to have a power-handling capacity which is greater than the surge capacity of the generator. A major advantage is that the generator current is halved for any given level of equipment current drawn because the equipment is running at only half of the generator voltage.

Using this transformer made a massive difference, giving a balanced output and providing a 90-amp charging rate for the battery bank as well as having ample power to run other household equipment when the battery bank was being charged. The result was a charge time of just one hour twenty minutes per day, with the generator

Figure 62: Photograph of GX4000i generator.

running quietly and smoothly. The fuel consumption also dropped to just $70 per month which is just one fifth of what it was, covering the cost of the transformer in under four months. This generator has been running now for two years without any problems at all.

5 The Step-by-Step Conversion of a Generator

Selwyn Harris of Australia has kindly agreed to share detailed information on how he performs the conversion of a standard electrical generator to enable it to run on water alone. The generator which he uses as an example for this tutorial is a GX4000i generator, shown in figure 62.

The supplier is AGR Machinery which is an Australian company on eBay which buys up stock from collapsed companies and resells the equipment. The supplier says:

“ GX4000i portable type generators have smoother output power, comparable to public utility sources. Ideal for powering medium loads such as:

- Power tools —Both Single & 3 Phase
- Game consoles, Digital Cameras
- Laptops, Camcorders
- Lighting and Microwave Ovens
- Drills, Grinders
- Resistive Load Kitchen Appliances (i.e. Coffee Maker, Toaster)
- Emergency Home Back up power where 240V power is required

Also, these units are significantly quieter than others due to refined engine technology Features:

- Commercial Grade Engine: 196 cc 4-stroke, 7 horsepower, overhead camshaft, T.D.I. ignition
- Maximum output 4.0 kVA at 240 or 415V AC (Rated output: 2.7 kilowatts)
- Quality Heavy-Duty Construction
- AVR (Auto Voltage Regulator)
- Three 240V and one 415V Protected Outlets
- 100% Pure Copper Core
- Gearless direct drive
- Robust Square frame Design
- Easy —Recoil Start
- Oil capacity: 0.7 litres
- Powder Coated Finish
- Light and Compact for easy manoeuvrability (38.5 Kg)
- Noise level: 69 dB ”

Figure 63: Fuel tank to be removed in GX4000i generator, held in place with four bolts.

Figure 64: Once the fuel tank is removed in the GX4000i generator, it allows access to the carburettor, which must also be removed as it is not used. See comparison of this figure and figure 63.

The first step of the conversion is to remove the fuel tank which is held in place with four bolts, as in figure 63.

This allows access to the carburettor which is then removed as it will not be used. See figure 64.

The next step is to construct a pressure-release valve mechanism which will protect the equipment from damage in the unlikely event of a major, sudden rise in pressure caused by the unwanted ignition of the HHO gas mix used to power the generator. For this, parts are purchased from the local hardware store. The brass fittings are a 12 mm barrel, a 12 mm female T-fitting and a 12 mm to 9 mm hose reducer, as shown here in figure 65.

The PVC plastic fittings are a 1/2" to 1-1/4" reducer and a 1-1/4" End Cap, along with the roller ball from an old-fashioned mouse and a relatively weak compression

Figure 65: Constructing a pressure-release valve mechanism to protect the equipment from damage. For this, the parts consist of brass fittings: 12 mm barrel, 12 mm female T-fitting and a 12 mm to 9 mm hose reducer.

Figure 66: The PVC plastic fittings: 1/2” to 1-1/4” reducer and a 1-1/4” End Cap, along with the roller ball from an old-fashioned mouse and a relatively weak compression spring.

spring to hold the ball in place during normal operation where the gas pressure is low (figure 66).

These components are then assembled to produce the pressure-release valve (figure 67).

The inside of the flash-arrestor looks like figure 68.

The ball is held in place by the spring allowing the HHO to flow past it, but if a sudden increase in pressure should occur, then the ball is forced upwards, opening a path to the many holes drilled in the plastic fittings. Shown in figure 69.

When the gas pressure drops again, the spring pushes the roller ball down to seal off the pressure-release holes (figure 69).

However, Selwyn adds an additional spring-loaded valve to the arrangement. This one is there in case the electrolyser fails to produce a sufficient volume of gas in the

Figure 67: Components of figure 65 and figure 66, assembled to make the pressure-release valve.

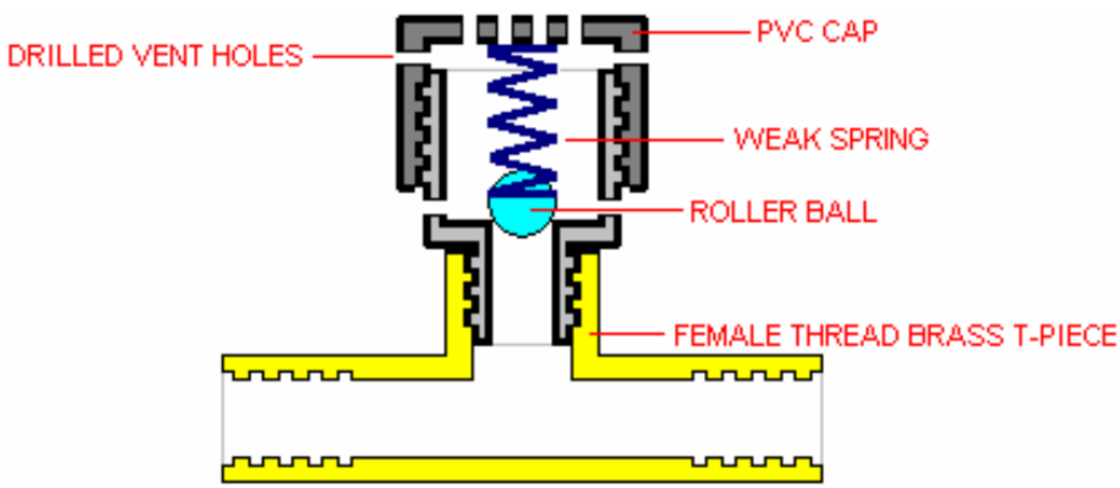


Figure 68: Inside of the flash-arrestor from the components of figure 65 and figure 66.

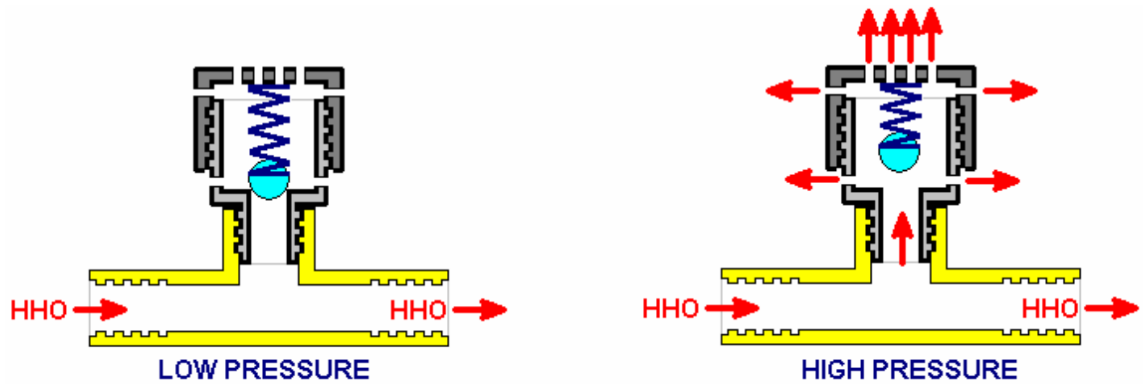


Figure 69: Two diagrams showing the ball held in place, in the flash arrester. The spring allows the HHO to flow past it. A sudden increase in pressure forces the ball upwards, opening a path to the many holes drilled in the plastic fittings.

event of a sudden increase in demand. This valve is marked as a "vacuum-relief" valve although, strictly speaking, it deals with reduced pressure rather than an actual vacuum. The arrangement is shown below. Please take note of the fact that Selwyn uses the Hogg style of electrolyser and that design has a bubbler built into it, so if you are using some other design of electrolyser, please be very sure to use at least one bubbler between the electrolyser and the engine, in spite of the fact that there is very little chance of the engine mis-firing and igniting the HHO gas in the electrolyser. For an engine of this size, an electrolyser which produces 4.5 or 5 lpm of HHO should be adequate.

The addition of cold water mist through a Venturi tube as shown, both lowers the engine temperature and increases the engine power as the mist converts instantly to flash-steam when the HHO gas ignites, raising the pressure inside the cylinder and boosting the power output (figure 70).

Next, a piece of 1/4" (6 mm) thick aluminium plate is cut and shaped to the size of the carburettor gasket which is not a symmetrical item. This is done by tracing the gasket and transferring it on to the aluminium plate, drilling the holes and then cutting out the outline shape. The edges are then filed to create a nice fit on the engine port (figure 71).

The pipes, backing plate, pressure-relief, vacuum-relief, gaskets, nuts and bolts are then assembled as shown in figure 72. Most of the pressure-relief valve components

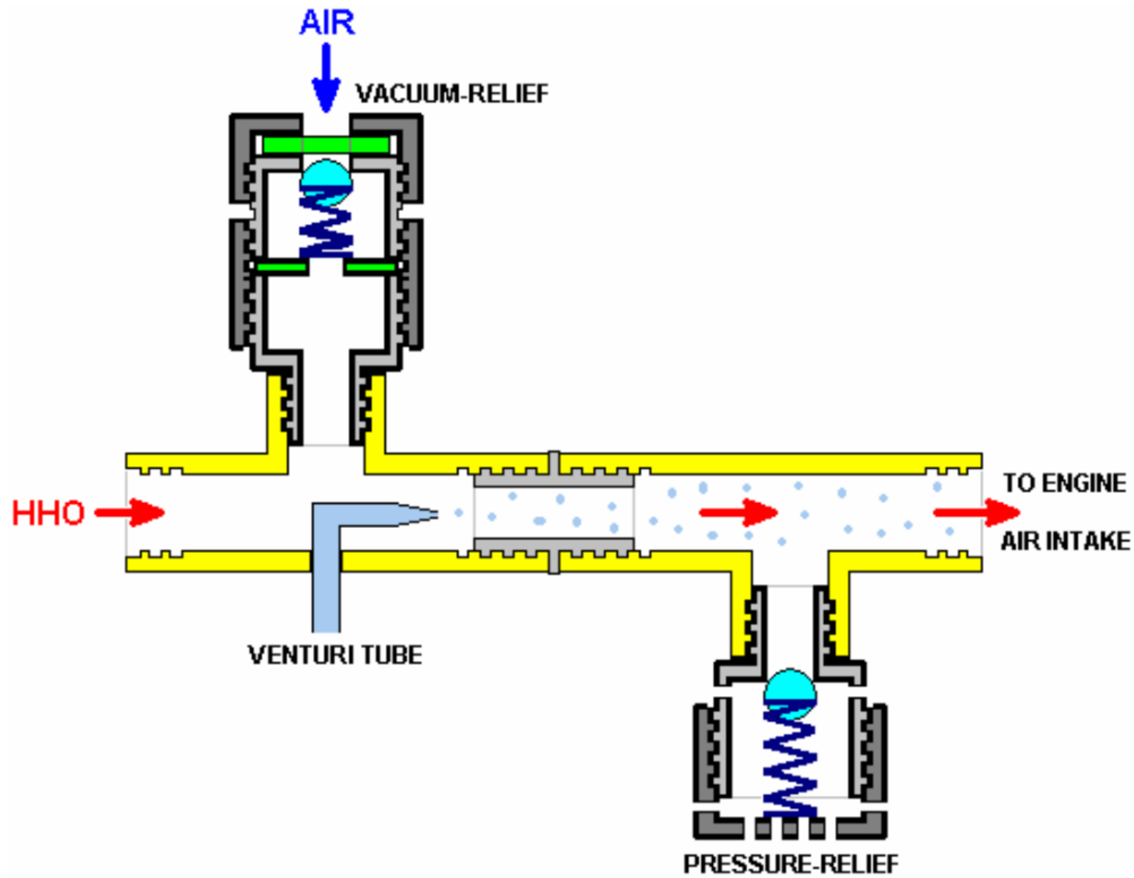


Figure 70: Diagram showing the addition of cold water mist through a Venturi tube, in relation to the vacuum and pressure relief valves, with HHO intake flowing to the engine, as described above.

Figure 71: A piece of 1/4" (6 mm) thick aluminium plate, cut and shaped to the size of the carburettor gasket. The edges are then filed to create a fit on the engine port.

shown in the photograph have been painted, which happens to conceal the different materials being used.

At this point an electrolyser of any design which can produce at least 4.5 litres of HHO gas mix per minute is connected to the intake. The electrolyser most often used by Selwyn is the Hogg design disclosed by him earlier in this chapter.

The manual Pull-start and the generator cover are now removed (figure 73). It is only necessary to remove four of the bolts to take the cover off.

This is the engine with the starter pull and the blower cover removed (figure 74). At "A" you can see the magnetic pulse type Transistor Discharge Ignition (TDI) pick-up in it's original position, bolted in place at 8 degrees before Top Dead Centre. This needs to be removed and an aluminium plate inserted to allow the TDI to be mounted in it's new position. Because of the new fuel, it is necessary to retard the ignition system. This can be done in one of two ways, neither of which is particularly easy, so you may need the help of an engineering shop. The easiest way is to modify the installed ignition to Top Dead Centre. This is Selwyn's aluminium TDI adaptor plate which he made from 2 mm thick aluminium sheet (figure 75).

In this picture, the outline of the fuel intake port is obscured due to it having been temporarily blocked off during the construction. The tools required for constructing these components are a drill press and a jig saw fitted with a metal blade. Sel-

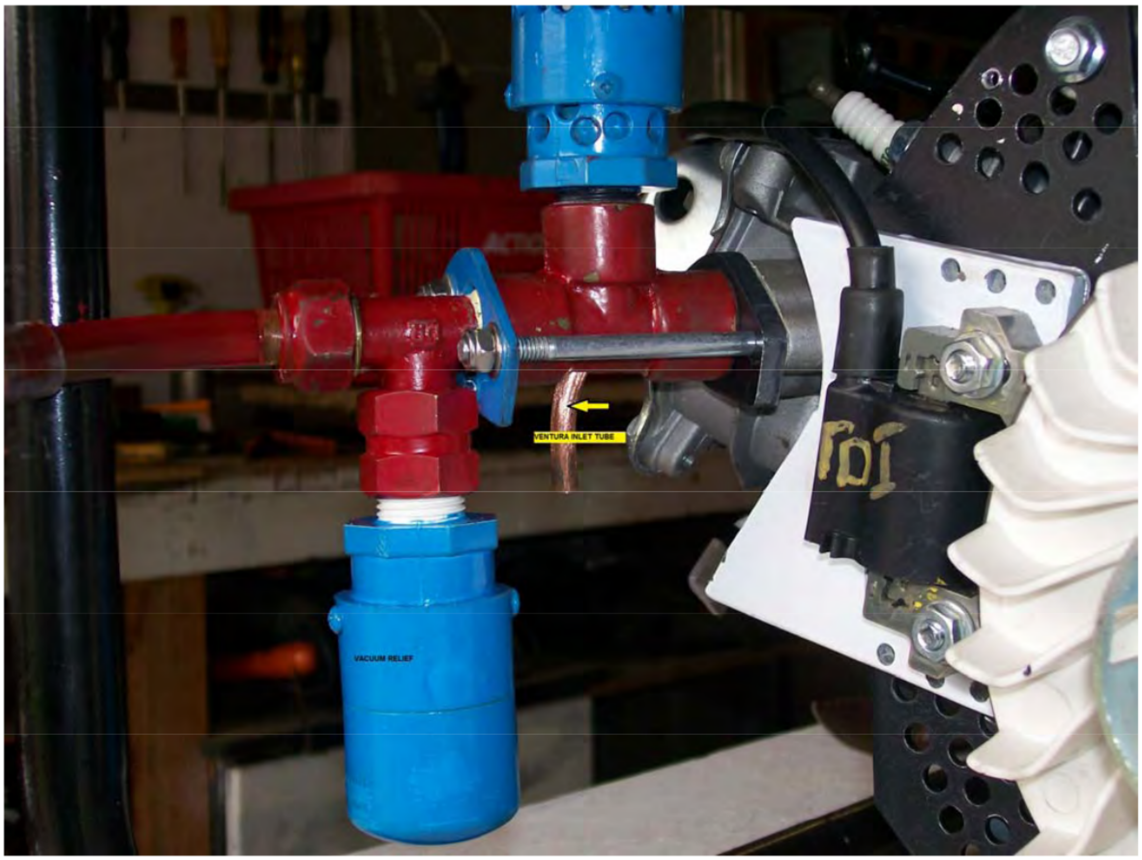


Figure 72: Assembly of pipes, backing plate, pressure-relief, vacuum-relief, gaskets, nuts and bolts.

Figure 73: Two photographs showing manual Pull-start generator cover on and then removed.

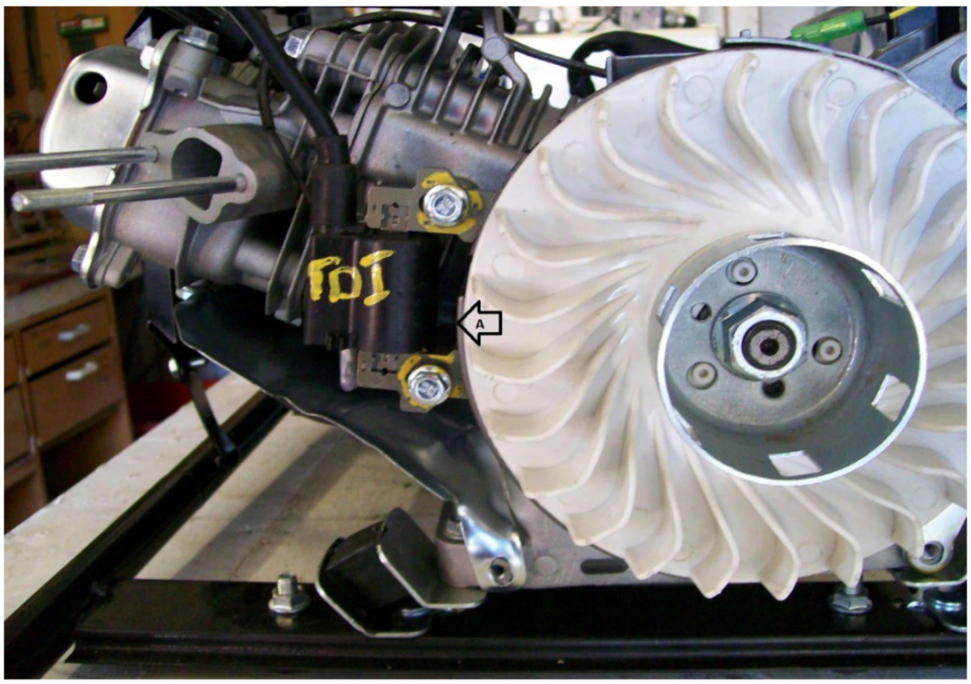


Figure 74: This is the engine with starter pull and blower cover removed. At “A” you can see the magnetic pulse type Transistor Discharge Ignition (TDI) pick-up in it’s original position, bolted in place at 8 degrees before Top Dead Centre.

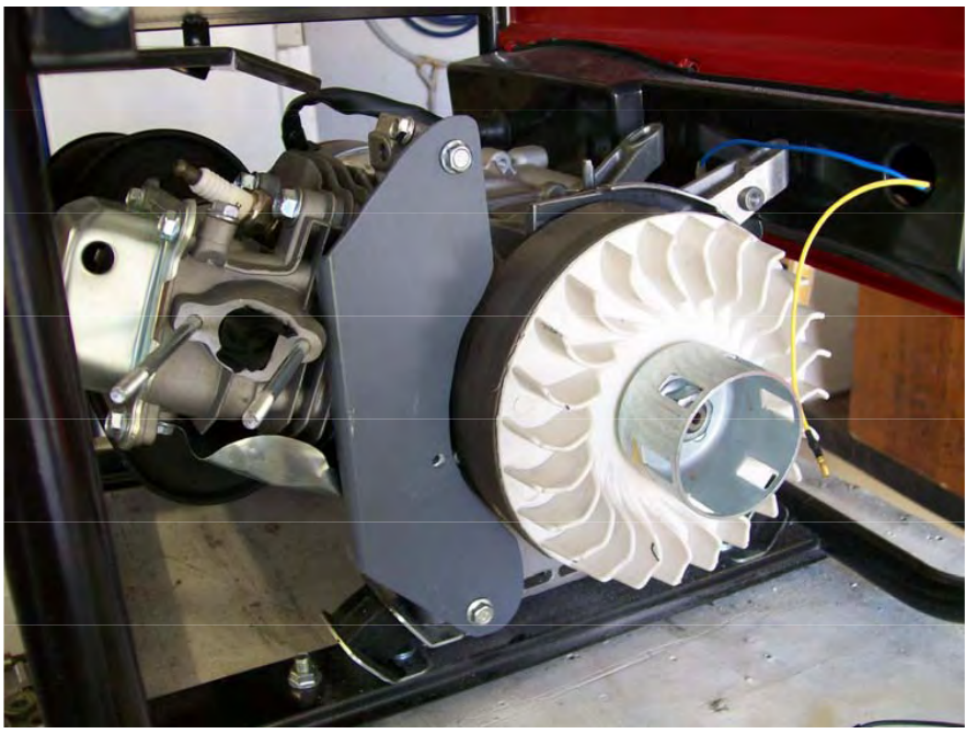


Figure 75: Selwyn's aluminium TDI adaptor plate which he made from 2 mm thick aluminium sheet.

Figure 76: Selwyn's aluminium TDI adaptor plate which he made from 2 mm thick aluminium sheet.

wyn used this timing alteration method on his own smaller generator which has run trouble-free for a year. The objective is to delay the ignition spark from 8 degrees before Top Dead Centre to either Top Dead Centre or to 1 degree after TDC. This allows for a good spark on the compression stroke and when the waste spark occurs, the inlet valve has not yet opened and so there is no HHO is in the ignition area. That is to say, the exhaust valve has just closed and the inlet valve has not yet opened. This results in a good compression stroke for the HHO and does not try to send the piston backwards due to premature ignition of the gas mix. The above picture (figure 75) shows the aluminium plate mounted and ready to accept the pick-up. This plate needs to have air holes drilled in it in order to allow cooling air to flow over the engine fins behind it.

The TDI adaptor plate looks like figure 76.

And as shown below (figure 77), the support plate is drilled with the ventilation holes. In this photograph the adaptor plate is just resting on the support plate. Later, when the TDC timing position is established, the adaptor plate will be bolted to it using the three holes top and bottom on the white plate. This locks the timing to that setting and the timing is never changed. In 2010, when adapting a previous generator, an experienced mechanic was asked to establish the TDI plate position and he charged sixty Australian dollars for doing that.

Finally, the covers and the Starter handle need to be bolted back in place.

Instead of paying somebody else to set the new spark timing, it is perfectly possible to do that yourself. One effective method is as follows:

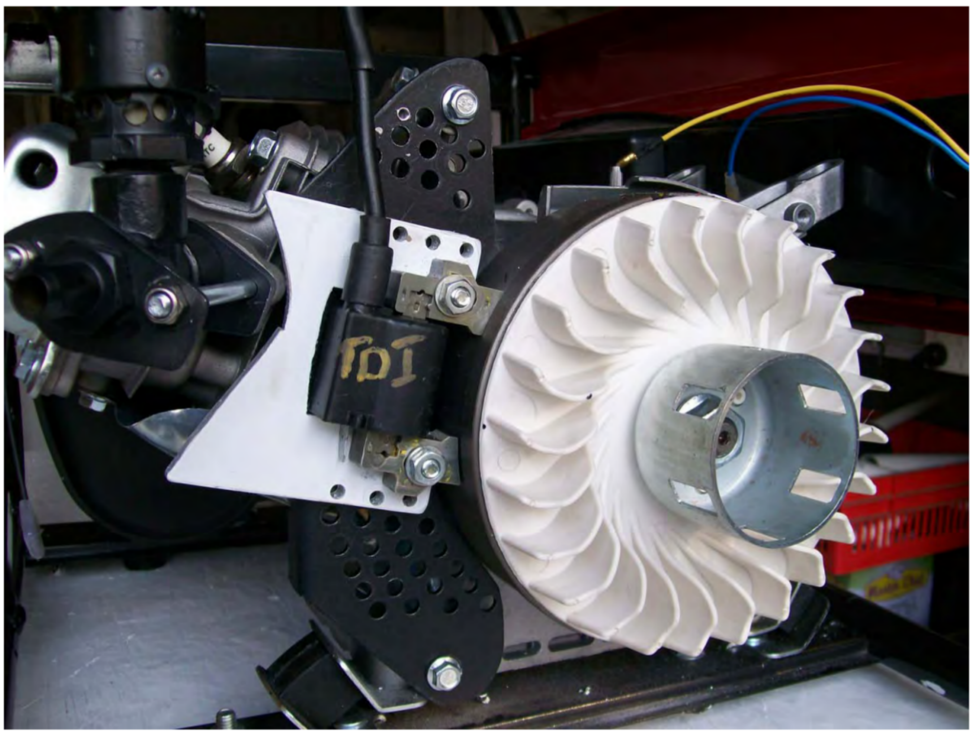


Figure 77: The support plate is drilled with the ventilation holes. In this photograph the adaptor plate is just resting on the support plate.

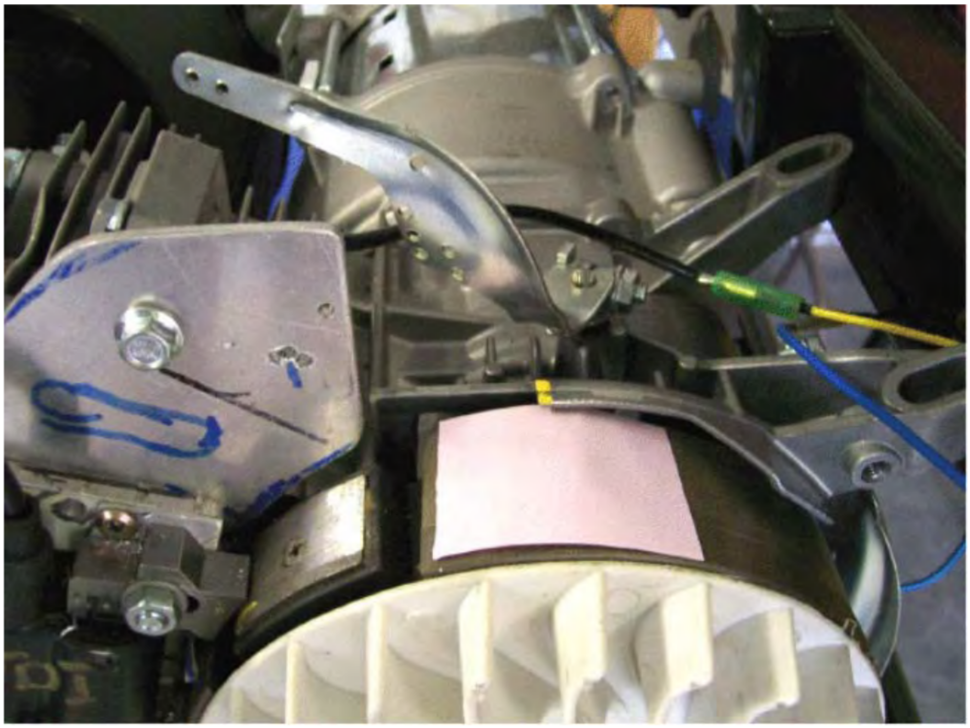


Figure 78: Marking the casing of the engine in a convenient location as shown in yellow, as first step to setting the new spark timing.

1. Mark the casing of the engine in a convenient location as shown in yellow in this photograph (figure 78).

2. Remove the spark plug and insert a long screwdriver until the top of the piston is felt. Manually rotate the engine (clockwise for this generator as can be seen from the curved fan pieces on the flywheel) until the screwdriver is no longer pushed upwards. It may take more than one rotation to find this point accurately. When that point is found, mark the flywheel directly in line with the casing mark which you just made. This marking needs to be very accurate.

3. Continue rotating the flywheel very slowly until the screwdriver starts to go down again and mark that point on the flywheel. Again, this marking needs to be very accurate.

4. Measure the distance along the flywheel between the two flywheel marks which

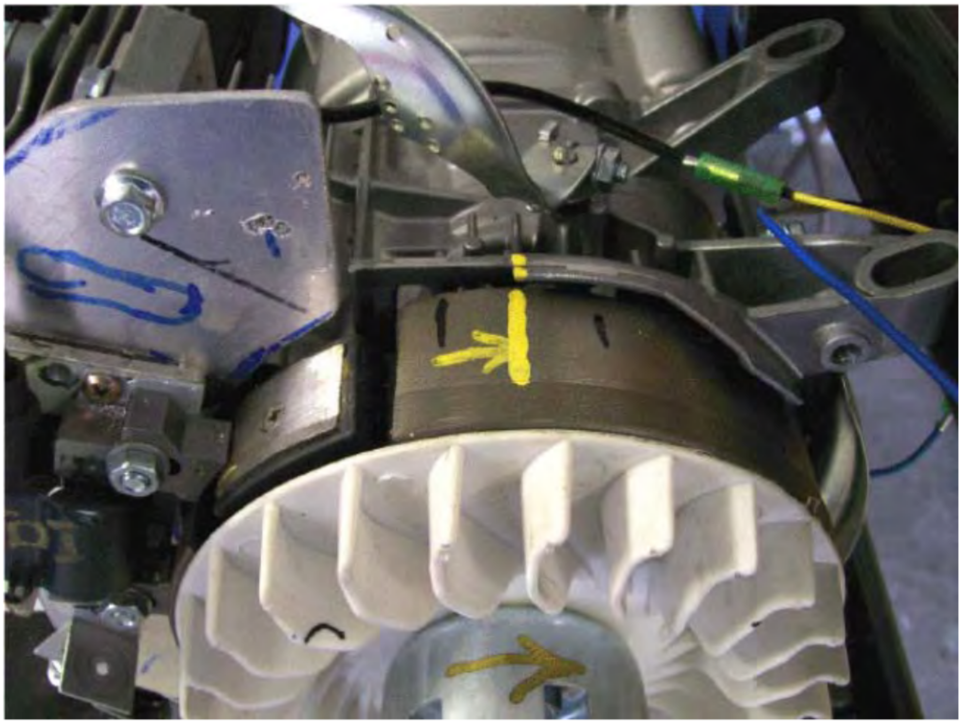


Figure 79: Making a large mark on the flywheel exactly half way between two marks. If accurately done, this new point is where the flywheel is when the piston is exactly at Top Dead Centre, which is where we want the spark to occur.

you have just made and then make a larger mark on the flywheel exactly half way between your two marks. If accurately done, this new point is where the flywheel is when the piston is exactly at Top Dead Centre, which is where we want the spark to occur. This marking on Selwyn's flywheel is like in figure 79.

5. Next comes a bit of arithmetic. The diameter of the flywheel is 180 mm which means that it's circumference is 3.14159 × 180 = 565.5 mm and as there are 360 degrees in each rotation of the flywheel, then the outside edge of the flywheel will move 1.57 mm for each of those degrees.

The engine specification states that the spark timing is 8 degrees before Top Dead Centre and we want the spark to occur exactly at TDC, which means that we want 8 × 1.57 = 12.5 mm of the flywheel circumference to have passed by before the spark occurs.

6. To achieve this delay in the spark timing, the TDI needs to be moved 12.5 mm in the direction which the flywheel rotates. You will notice that for this major timing change, the TDI adjustment is very small, only half an inch.

7. When the TDI adjustment has been made, the timing can be checked using an automotive timing light connected to the spark plug lead. The engine can be spun using an electric drill. As the flywheel is spinning fast and the flash of light from the timing light is very short, it makes the flywheel mark appear to be stationary in spite of the fact that it is passing by very rapidly. If the TDI adjustment is correct, then the central mark made on the flywheel will appear to be stationary and exactly aligned with the mark made on the casing.

This is exactly what happened when Selwyn's motor had it's timing adjusted, but the important factor is to have the spark close to the Top Dead Centre point to make sure that the inlet valve is fully closed before the spark occurs. Two degrees after Top Dead Centre is a popular point for the spark with many of the existing generator conversions which I have been told about, possibly to reduce the loading on the piston's connecting rod. Here is a photograph of Selwyn's latest generator conversion having it's new spark timing checked out, in figure 80.

8. Most small petrol engines have the spark timing set between 8 degrees and 10 degrees before Top Dead Centre. If it so happens that you do not know what the timing of your particular generator is, then complete the flywheel marking procedure of step 4 above, but make three additional marks on each side of the TDC mark. Space those marks 1.5 mm apart as they will then make a scale which shows each degree from 3 degrees before TDC to 3 degrees after TDC. When the timing light is used, it then shows exactly where the spark occurs and if the engine had an original spark timing which was not 8 degrees before TDC, then the scale shows immediately how much further the TDI needs to be moved to set the spark exactly where you want it to occur.

5.1 The Cold Water Mist

Getting the fine droplets of water into the engine can be done two different ways. The first way is to use a Venturi tube which generates a fine spray of droplets when air moves rapidly past a small water-filled hole. You may not have noticed, but this method has been used extensively in perfume sprays and it is very effective. Selwyn

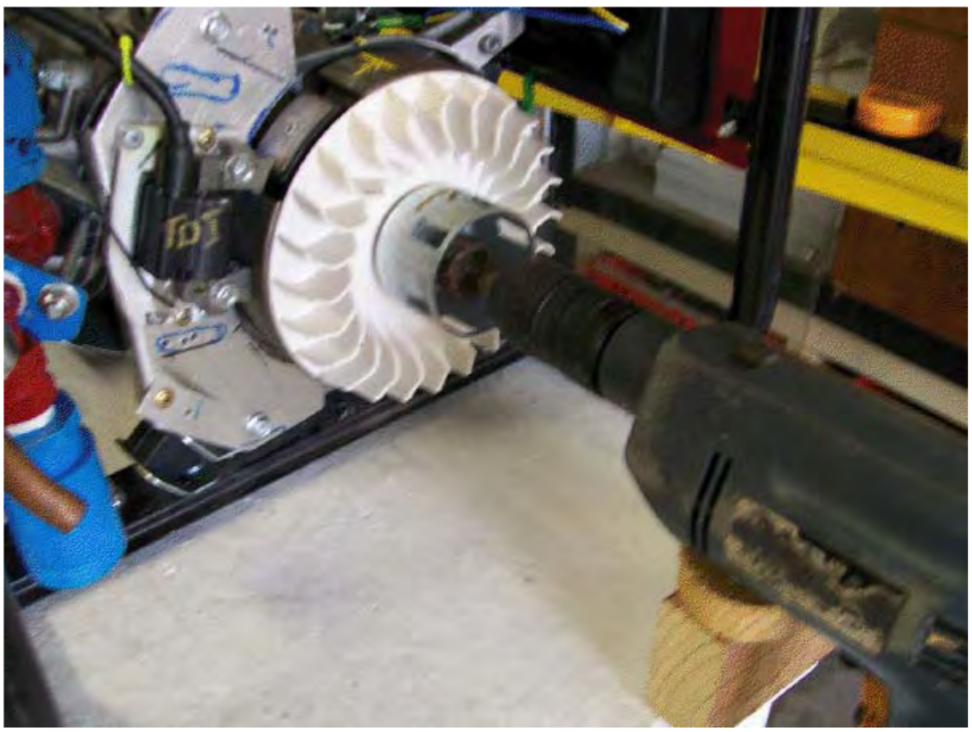


Figure 80: Photograph of Selwyn's latest generator conversion having it's new spark timing checked out.

Figure 81: Selwyn's construction of a Venturi tube. A short length of 1/4" (5 or 6 mm) diameter copper tubing is used.

describes how he constructs a Venturi tube:

A short length of 1/4" (5 or 6 mm) diameter copper tubing is used (figure 81). This is generally available as central heating supplies and if there is any difficulty in finding some, then your local garage can probably direct you to a supplier (if they don't just give you a short length from their own supply).

The copper pipe is then heated with a plumber's gas torch and bent very slowly and carefully to the shape shown above. Some people find it helpful to insert a length of suitable flexible material into the pipe before starting the bending —something like the coiled steel spring material used to support net curtains —as that helps to keep the copper pipe from kinking when being bent.

Next, the end of the copper pipe which will form the nozzle, is filled with silver solder and the end filed flat (figure 82). Then, a small hole is drilled through that

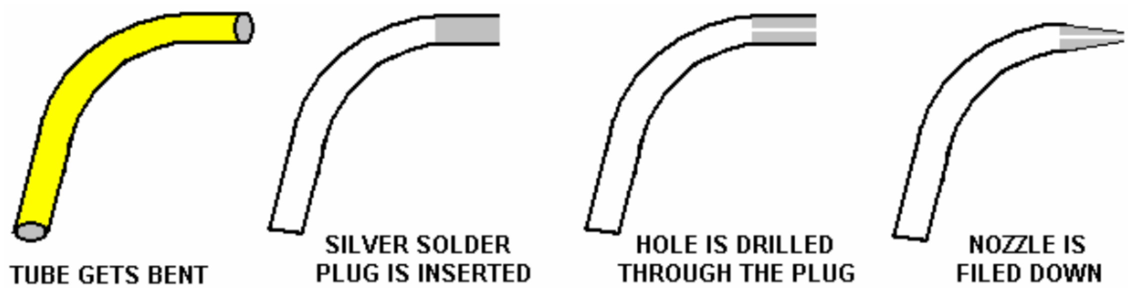


Figure 82: The end of the copper pipe which will form the nozzle, is filled with silver solder and the end filed flat.

silver solder plug. The smallest possible drill bit should be used for this, although the hole may need to be drilled out to a slightly larger diameter, depending on what the engine requires (which is found by successive trials).

This Venturi tube is to be inserted into the last brass fitting before the engine, so a 1/4" hole is drilled through the brass and then the drill is removed very slowly at a slight angle, the angle of drag being down the axis length of the brass fitting. The copper Venturi tube is then inserted through the hole and positioned so that the Venturi hole is aligned up exactly with the centreline of the brass fitting and positioned exactly in the middle of the cross-section of the brass fitting and then soldered in place (figure 83).

The method which Selwyn uses to block off the end of the copper tube with silver solder is to seal the far end of the tube with tape and fill the tube with fine-grained sand as in figure 84.

And then the tube is heated with the gas torch flame and the solder run into the top part of the tube. When the solder has cooled, the tape is removed and the sand removed by tapping the tube. When the hole has been drilled through the solder, air is blown through it to dislodge any remaining sand, and then water is forced through the hole. As the tube is short, any remaining sand can be removed with a pipe-cleaner or any similar slender cleaning device. The installed Venturi tube can be seen in figure 85.

The second way to introduce cold water mist into the airstream entering the engine is to use a commercial "pond fogger" which can be bought at pet supplies out-

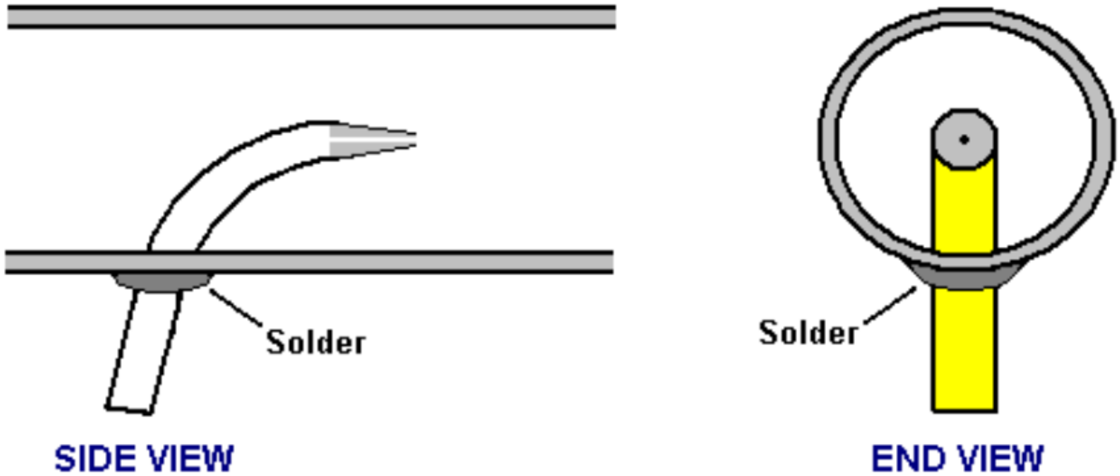


Figure 83: The Venturi tube is inserted into the last brass fitting before the engine, and a 1/4" hole is drilled through the brass.

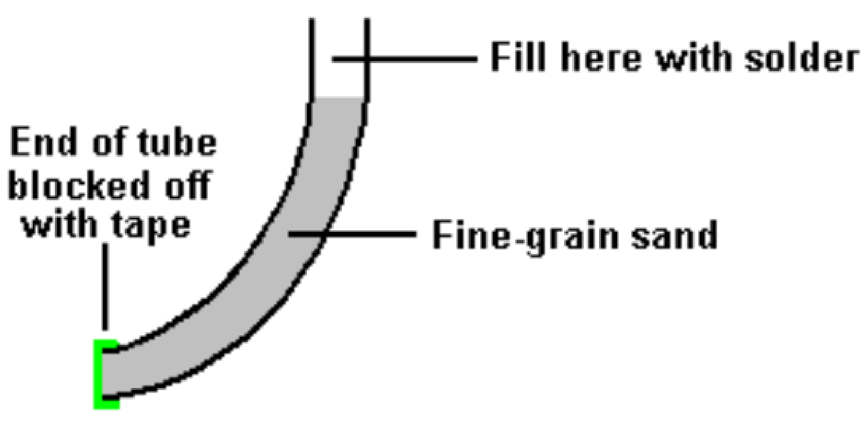


Figure 84: Method used to block off the end of the copper tube with silver solder, is to seal the far end of the tube with tape, and fill the tube with fine-grained sand.

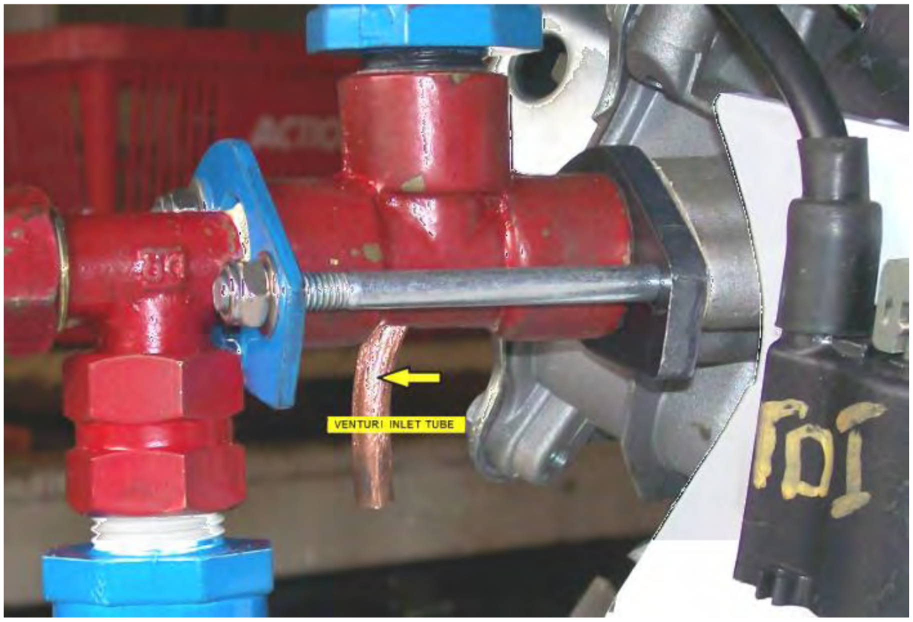


Figure 85: Photograph of the installed Venturi tube.

lets. These have to be powered electrically and housed in their own water container. Some of the more advanced versions float on the surface of the water so that the fog-generating section is always submerged to the ideal operational depth below the surface of the water.

The generator should run well with 5 lpm of HHO gas plus cold water mist. Any design of electrolyser can be used. However, when used with rainwater, the Hogg electrolyser will draw about 1.4 amps per cell, giving a total input of about 115 watts when run on a 12-volt electrical supply. While rainwater is supposedly pure, the reality is that it seldom is and it's ability to carry a current varies dramatically from place to place and even more widely from country to country. However, regarding the water, Selwyn says:

"The water I use is treated in a special way to make sure that the electrolyser runs at the lowest temperature and amperage possible. For this, using rain water is a must and the rain water coming off a steel roof is the best. The water is then treated by inserting a double coil of stainless steel wire into a volume of about 5 litres of water. A supply of 12-volts DC is applied to the coils, and the resulting current allowed to run through the coils for about 5 hours. This results in hot and very dirty water.

Figure 86: Treating and cleaning the Hogg electrolyser using add 1 packet of citric acid, shown in the photograph, for each 3 litres of water used to fill the electrolyser.

The water is then filtered using a 0.5 micron filter making the water ready for use in the electrolyser. If more water is needed, say 30 litres, then leave the coils running for at least 24 hours.

“I use an old 35 litre beer keg and prepare 30 litres at a time. A major reason for doing this is to remove all the solids suspended in the water so that they will not clog up the stainless steel mesh inside the electrolyser.

“After the construction of the Hogg electrolyser is completed, then the stainless steel mesh electrodes need to be treated and cleaned. For this I use distilled water and fill the electrolyser enough to cover all the plates, and then add 1 packet of citric acid for each 3 litres of water used to fill the electrolyser. I got the citric acid from www.hho-research.com.au which is an Australia-only supplier and each packet has about 22 grams of citric acid in it (figure 86).

“The pumps are then run for about an hour after which the Hogg tubes are washed out completely with distilled water and then allowed to dry completely. This removes any residue from the stainless steel mesh electrodes, making the gas production rate much greater.

“I use an ordinary car battery to generate the HHO gas needed to start the generator running, after which, a standard battery charger powered by the generator output is used to keep the starting battery topped up."

<u>Please Note:</u> **This document has been prepared for information purposes only and must not be construed as an encouragement to build any new device nor to adapt any existing device. If you undertake any kind of construction work, then you do so entirely at your own risk. You, and only you, are responsible for your own actions. This document must not be seen as an endorsement of this kind of generator adaption nor as providing any kind of guarantee that an adaption of this kind would work for you personally. This document merely describes what has been achieved by other people and you must not consider it as being a foolproof blueprint for replication by anyone else.**

There are YouTube videos which show generators being operated on what appears to be just HHO gas alone and while the operation does not appear to be anywhere close to full power, the addition of cold water mist would probably make a major difference to the performance, but it does demonstrate that a generator can certainly be run without using any fossil fuel. The spark circuit in the first video appears to be powered by a small mains unit, but as the generator is lighting a powerful lamp, that electrical input could almost certainly be met by the output from the generator when it is running. See [3] for further details on this.

6 Running an Unmodified Generator on HHO

The reason for the modification of standard generators as shown above is due to the fact that the HHO gas mix produced by an electrolyser, ignites about a thousand times faster than a hydrocarbon fuel, and because of that, the spark which ignites the fuel needs to be delayed. That mechanical adaption of the generator can be avoided if the HHO gas mix is modified so that it ignites more slowly. This can, and has been done.

David Quirey of New Zealand has been operating an unmodified generator and a welding torch on the HHO output from his 6 lpm own-design of electrolyser, for many years now. Henry Paine's US Letters Patent No. 308,276 dated 18th November 1884, states that HHO gas can be converted into a more convenient gas which is much easier to handle, by the simple process of bubbling it through a suitable liquid such as turpentine or linseed oil. Although unaware of Henry Paine's patent, David discovered the technique independently and he has extended the technology further

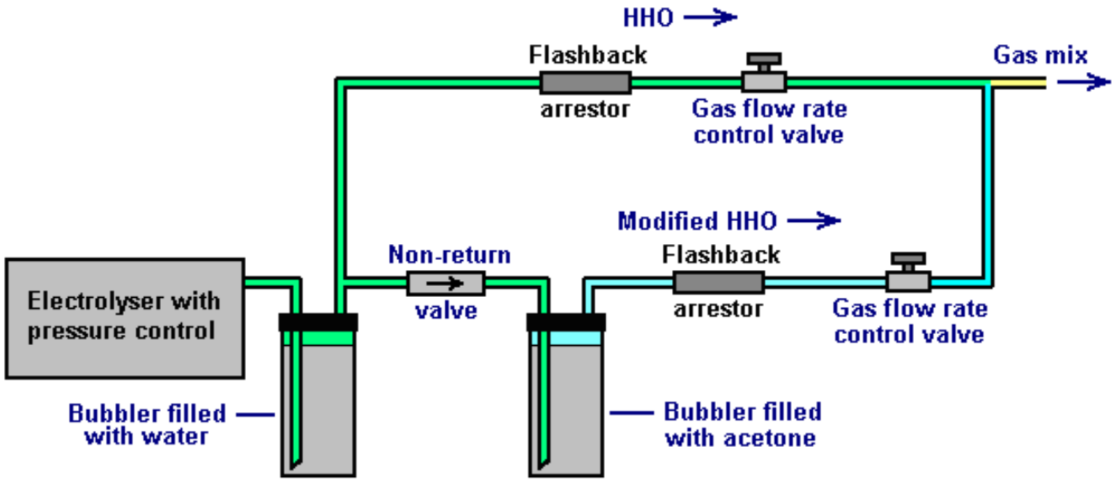


Figure 87: Running an Unmodified Generator on HHO. This Diagram shows that the mechanical adaption of the generator (described earlier) can avoided if the HHO gas mix (i.e. with acetone) is modified so that it ignites more slowly. David Quirey has further modified the characteristics of the output gas by adding in a percentage of the unmodified HHO gas, as described above and below.

so that the gas ignition speed can be set manually.

One important point which David stresses is that it is essential that the HHO coming from the electrolyser is passed through an ordinary bubbler containing water, before it passes through the second bubbler containing the modifying liquid. David finds that the lighter liquid, acetone, works better than the liquids suggested by Henry Paine although white spirit, carbon tetrafluoride, aviation fuel, hexane or even petrol can be used and any of them will slow the flame speed right down to that of butane. If the flame is being used for a specialist task such as jewellery making or glass blowing, then there may be an advantage in using one particular modifying liquid. Please note that the bubbler holding the acetone needs to be made of stainless steel as acetone can dissolve some plastics.

David has further modified the characteristics of the output gas by adding in a percentage of the unmodified HHO gas. Although it is actually, subtle and sophisticated, David's overall system is easy to understand. The ratio of the two gasses is adjusted by the settings of the two control valves, as shown in figure 87.

Figure 88: Four horsepower Honda generator run using this system, i.e. unmodified generator on HHO.

Adjusting the ratio of modified HHO to unmodified HHO allows a high degree of control over the characteristics of the resulting gas mix. Added to that, David has developed an electronic control system which oversees and manages the gas flow rate according to the user's needs at any given moment. The result is a system which allows water and electricity to be the means of supplying a gas which can be used as a safe, general purpose fuel. If it is used to run a generator, then the system appears to become self-powered if part of the generator output is used to drive the electrolyser. It should be possible to substitute the modified gas mix for propane or butane and so operate a wide range of existing equipment for heating, cooking and/or lighting.

David runs a 4 horsepower Honda generator using this system (figure 88).

The generator runs very well for David, however, I suspect that if cold water mist were introduced into the incoming air, then the power output would be increased due to the mist turning into flash-steam and providing greater pressure on the piston during it's power stroke. Alternatively, it might be possible to match the present performance with a lesser gas flow rate, possibly powering a much larger generator if that were a requirement.

It needs to be understood that David uses electronics which manages and controls the gas flow volume, suiting it to whatever the needs are at any given moment. Consequently, it is probable that the six litres per minute which David's electrolyser can produce, is not actually used for most of the time. David also does welding, brazing and cutting with the same modified electrolyser gas mix which can provide adjustable flame heat and a flame length of anything up to two feet in length (figure 89).

It is a good idea to use a proven design with full control electronics. David can help here with detailed step by step construction plans and instructional videos (figure 90).

You can contact David at dahq@clear.net.nz for information on what is available to help you at the present time.

When using the system for welding, David uses the mains to power the electrolyser, the arrangement being as in figure 91.

The flashback arrestors are a sand-filled design and so are mounted vertically. The gas production rate is knob controlled using this circuit, as shown in figure 92.

The first part of David Quirey's circuit acts very much like a dimmer light switch. The 230-volt AC mains is fed through an On/Off switch and then an ordinary mains fuse. The current flow on through the circuit is blocked by the BT139 triac until it receives a pulse from the db3 diac (which is a component specifically designed to feed pulses to a triac).

As the voltage builds up on the 68 nanofarad capacitor it eventually reaches the point at which it triggers the triac, which then switches on and remains on until the mains voltage drops down to zero again. The 500K variable resistor sets the rate at which the capacitor charges up, and so it controls the length of time that the triac is on in any given second (and so, the level of power fed onwards to the rest of the circuit). This happens on both the positive-going half of the AC waveform and the negative-going half of the mains sinewave voltage supply. Both the diac and the triac operate with AC and trigger either 100 or 120 times per second depending on the frequency at which the local mains runs.

Figure 89: David also does welding, brazing and cutting with the same modified electrolyser gas mix, which can provide adjustable flame heat and a flame length of anything up to two feet in length.

Figure 90: Photograph of David Quirey's HHO welder.

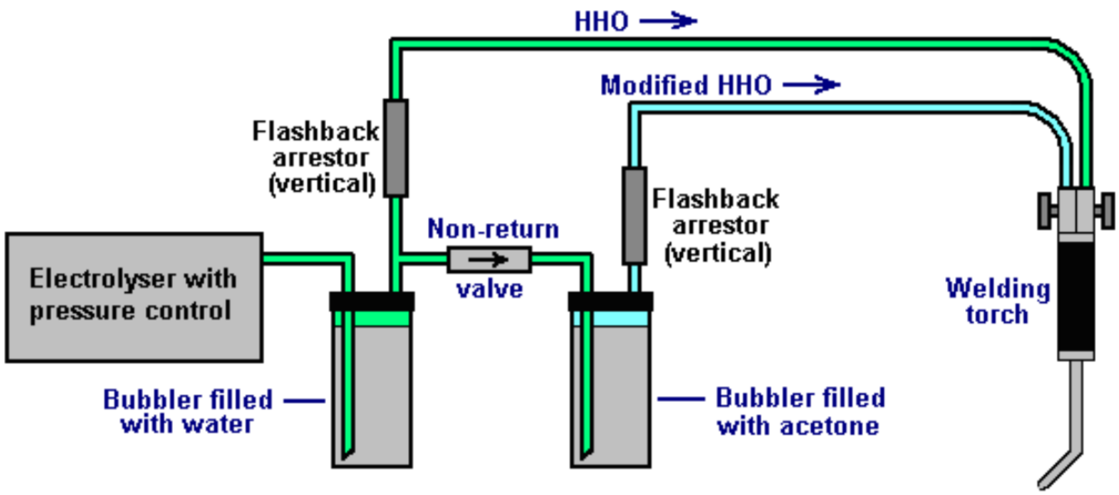


Figure 91: Schematic of David Quirey's HHO welder. When using the system for welding, David uses the mains to power the electrolyser.

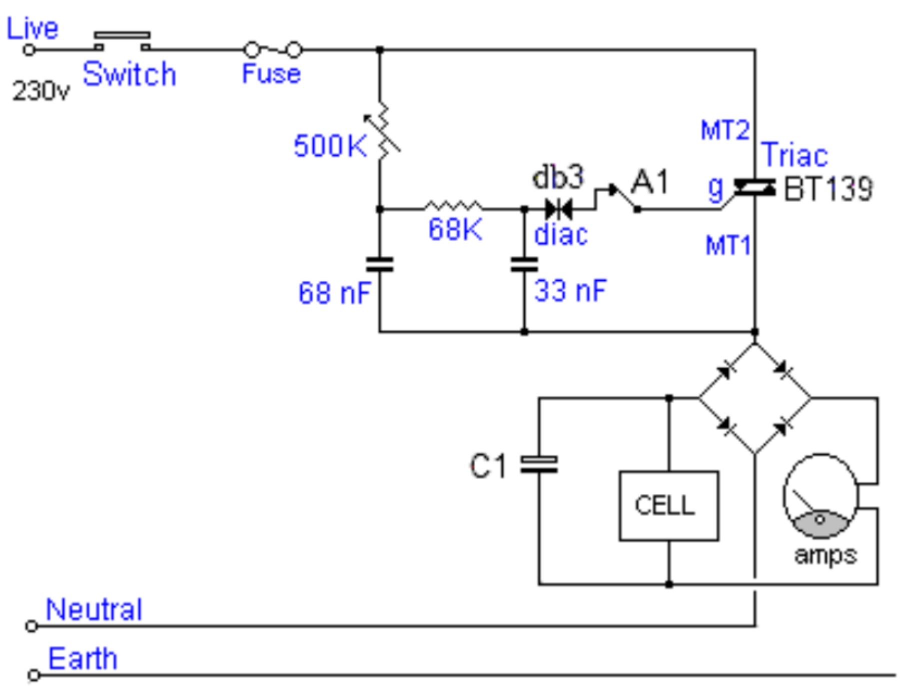


Figure 92: For David Quirey's HHO welder, the flashback arrestors are a sand-filled design and so are mounted vertically. The gas production rate is knob controlled using this circuit.

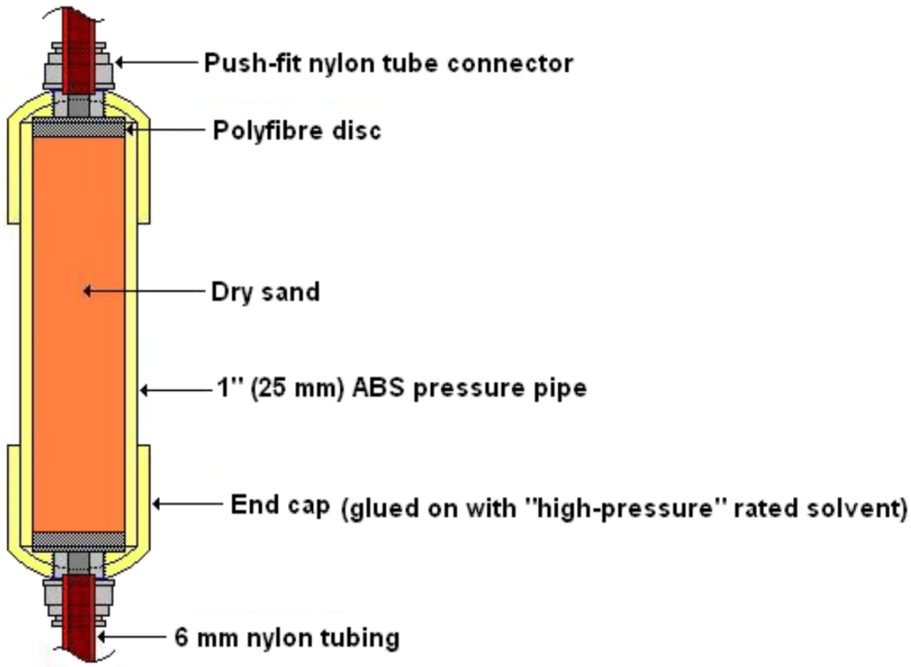


Figure 93: Design of flashback arrestors for HHO welding.

The current flow is then passed to a bridge rectifier in order to convert the AC into pulsing DC and the capacitor C1 which is 400-volt rated, smoothes the resulting DC. David's cell has a large number of plates and so, operates off the 300 volts produced by this system. The ammeter between the diode bridge and the cell indicates the current flow and so, the amount of gas being produced at any given moment.

The flashback arrestors are constructed as shown in figure 93.

Sincere thanks are due to David Quirey for freely sharing his design and experiences, and for his willingness to provide direct additional support and further details should they be needed.

6.1 Stan Meyer's Water Injection System

While the above simple adaption will work for an electrical generator which is stationary and which is designed to provide large amounts of electrical power, some of which can be used for producing HHO gas from water, it is much more difficult to run a large capacity petrol/gasoline engine continuously with just water as the

Figure 94: Stan Meyer.

"fuel". Figure 94, shows a picture of Stan Meyer.

For larger engines aimed at producing mechanical output, we need a more powerful system, such as that developed by Stan Meyer of America. Although many years have passed since the sudden, highly suspicious death of Stan Meyer, as far as I am aware, his design has not been replicated, mainly because people do not understand the information which he left behind. However, recently, a man whose forum ID is "H2Opower" has helped explain what Stan meant, and much of the following description is down to his sharing his understanding publicly and freely.

Stan's Canadian patent 2,067,735 has an arrangement where the injector schematic shows the injection into the engine of three separate components (figure 95).

One component is described as ionised gas and ambient air is mentioned. The second component is part of the exhaust gas which is hot water vapour fed through a limiting valve, referred to as "inert gas". The third injection component is a very fine spray of water droplets or cold water "mist". This three-component mixture is passed between high voltage electrodes and if the mix does not ignite spontaneously, then it is ignited with a spark.

One version of Stan's recommended injectors for an existing engine are shown in figure 96.

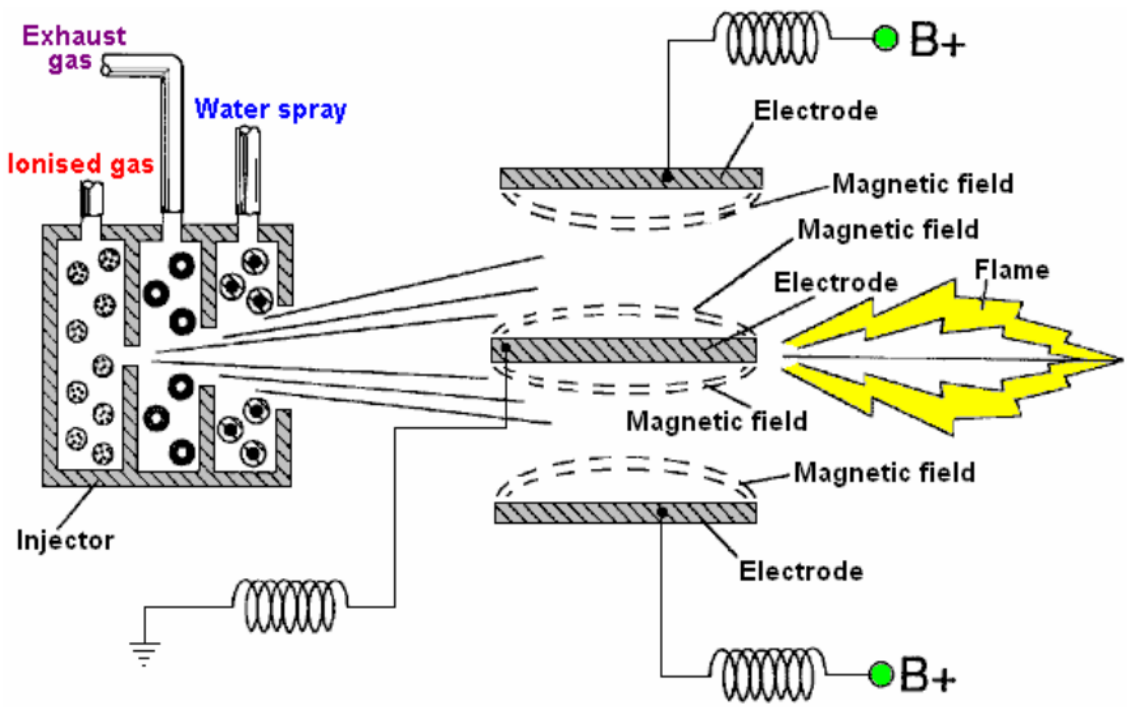


Figure 95: Stan Meyer's injector schematic shows the injection into the engine of three separate components.

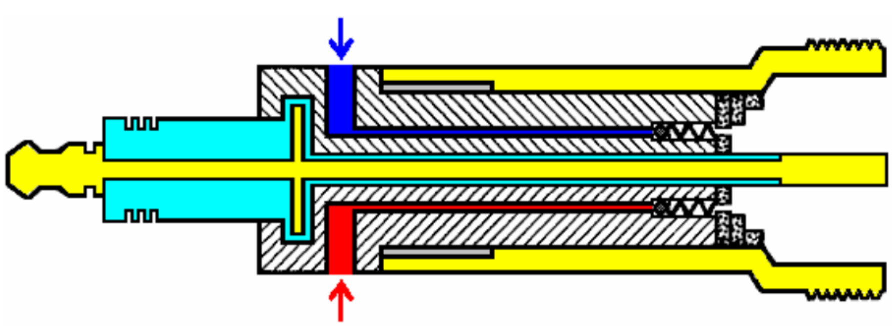


Figure 96: One version of Stan's recommended injectors for an existing engine.

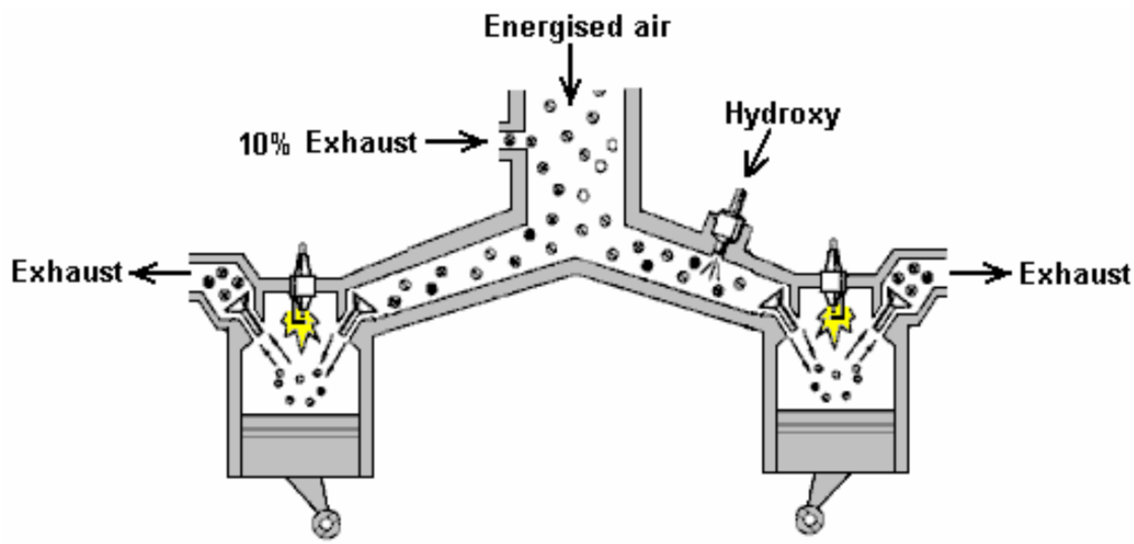


Figure 97: Stan's diagram for a two cylinder engine fuel input.

This is a cross-section which only shows two of the three gas inputs flowing through this injector/spark plug. Each gas input has it's own feed passage which leads out between the central electrode and the circular outer electrode, and each feeder tube has it's own one-way valve to prevent the power stroke from forcing the incoming fuel back up it's feed tube.

This is only one of the ways that Stan shows that it can be done. Here is his diagram for a two cylinder engine fuel input, although it applies equally as well to any number of cylinders (figure 97).

Let me stress that this is just an explanatory diagram and you do not have the intake and exhaust valves open when the spark plugs fire. Also, the pistons do not go up and down together but their movement is staggered to give a less uneven drive to the crankshaft. The point to note here is that the fuel intake is through standard valves and ordinary spark plugs are shown. However, this diagram for US Patent 5,293,857 is based on the use of an electrolyser and Stan found a way to avoid the need for an electrolyser.

For this, Stan's "Gas Processor" is a really key device in spite of it being what appears to be a fairly simple construction. It operates by pumping light energy into the fuel components. This may not sound like a big deal but it most definitely is,

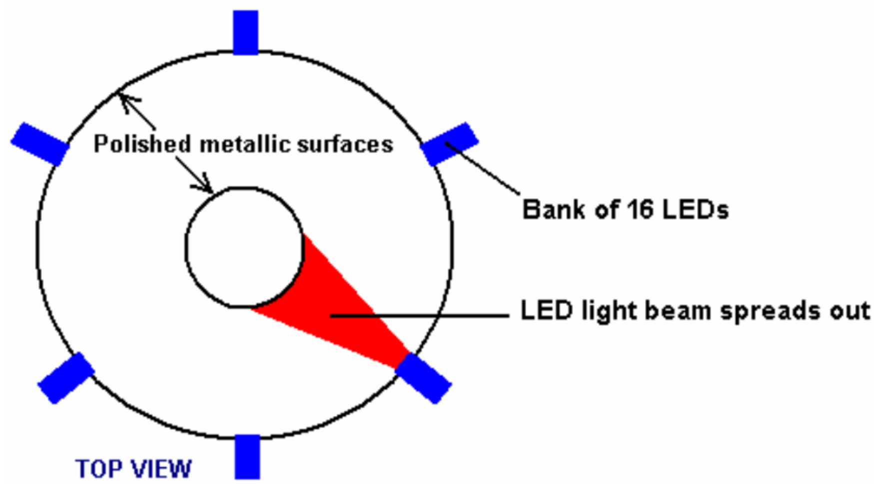


Figure 98: Considering just one LED on it's own, shown here, as part of six banks of sixteen LEDs, that are installed in the outer cylinder. Where, the Gas Processor is constructed from two highly reflective metal cylinders.

in fact, it is the heart of Stan's system. In addition to the extra energy, the fuel components are also stressed by high-voltage pulsed DC applied in such a way that it tends to pull the molecules apart as they flow past into the engine.

The Gas Processor is constructed from two highly reflective metal cylinders, 96 Light-Emitting Diodes ("LEDs") and a carefully adjusted high-voltage pulsed DC source. The reflecting tubes are used to make the light bounce backwards and forwards indefinitely until it is absorbed by the passing molecules. The choice of LEDs is very important as the wavelength of the light needs to be matched to the resonant frequencies of the fuel components passing by. Laser LEDs can be used but they need to be angled slightly in order for them to bounce and completely fill a section of the Gas Processor gas passage.

The operation is simple in concept. Six banks of sixteen LEDs are installed in the outer cylinder which has a polished inner surface. To see the effect of each LED, consider just one LED on it's own (figure 98).

The LED light shines on to the inner tube which has a highly polished outer surface. In the diagram above, the light is shown in red, and the uppermost LEDs of the six columns of LEDs can be seen. The light is then reflected back to the outer cylinder

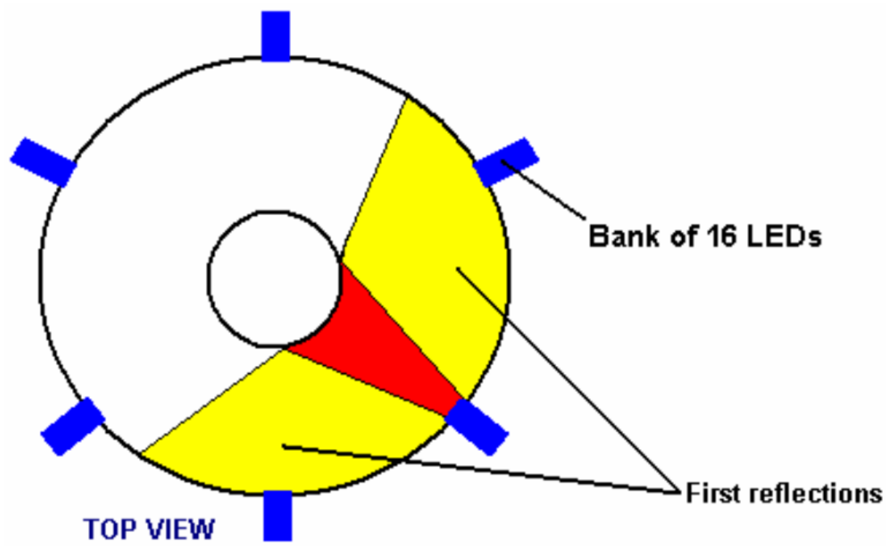


Figure 99: Diagram showing the light of LEDs reflected back to the outer cylinder again.

again (figure 99).

The reflected light is shown here (figure 99) in yellow although it is identical in wavelength to the section shown in red. This reflected light is again reflected by the outer tube and that repeats over and over again until the whole of the area between the two tubes is completely filled with the light. This will happen with just one LED, and that light will continue to be reflected backwards and forwards indefinitely if it does not collide with a gas molecule. That is the effect of just one LED, but there are six LEDs at that level, each producing light of the same frequency and reinforcing the power of each of the other five LEDs, producing a very powerful overall band of light.

The same thing happens in the vertical plane with the light bouncing all the way down the tubes, and as the LEDs at different levels generate different wavelengths, there is a powerful interaction between the different frequency waves, producing intermediate frequencies by a process with the technical name of "heterodyning" (figure 100).

In this diagram (figure 100) it has not been possible to show the way in which the reflected light from each LED interacts with the light from all of the other LEDs, but there is a complete intermixing of the beams. The LEDs are shown with greatly

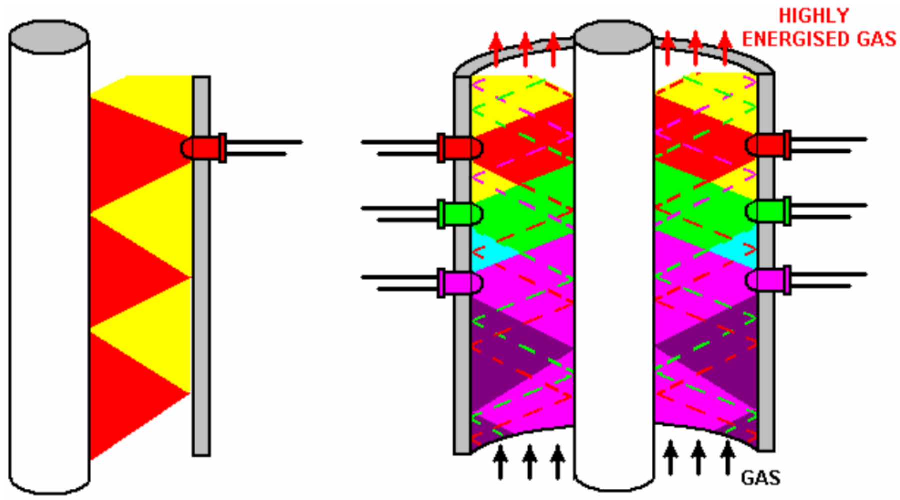


Figure 100: The same thing happens in the vertical plane, as in figure 99. LEDs at different levels of the cylinders generate different wavelengths, there is a powerful interaction between the different frequency waves, producing intermediate frequencies by a process with the technical name of “heterodyning”.

exaggerated size and spacing in order to give a reasonably understandable diagram.

The diagram above (figure 100), barely indicates the level of light intensity inside the Gas Processor, and that is from only six of the ninety six LEDs actually installed. It is a little difficult to visualise this device, but the gas (of whatever type) flows up through a circular doughnut-shaped space between two pipes and is hammered by a very high level of light energy of the appropriate frequency. Forum user “H2Opower” believes that the optimum LED frequencies are as shown in figure 101.

And while, not surprisingly, I have not been able to find an LED supplier for these exact frequencies, most LEDs emit a band of frequencies rather than just a single frequency, so the working LEDs need to include the frequencies shown here (figure 101).

The operation of the Gas Processor is further enhanced by applying a pulsed high-voltage between the inner and outer metal cylinders. This voltage stresses the molecules of the gas flowing between the two cylinders and because it is pulsed, it applies a tugging action on the molecules, tending to pull them apart (figure 102).

As with all high-power free-energy systems, having the device operate in resonance is

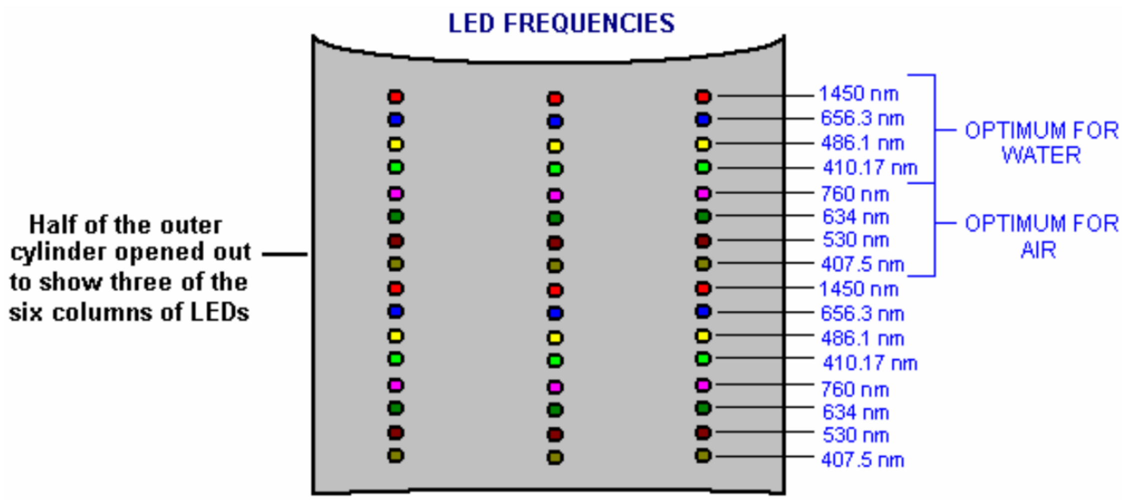


Figure 101: Forum user "H2Opower" believes that the optimum LED frequencies are as shown in this diagram.

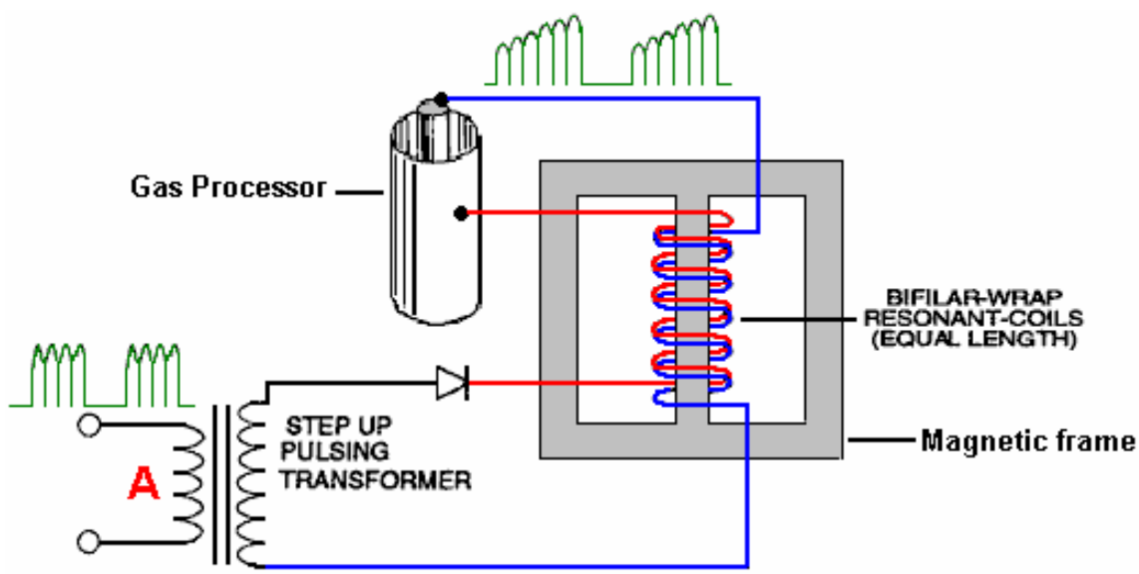


Figure 102: Operation of the Gas Processor is further enhanced by applying a pulsed high-voltage between the inner and outer metal cylinders.

very important. If it is still available, the excellent video: http://www.youtube.com/watch?v=kQdcwDCBoNY shows what resonant circuit operation is all about. Briefly, the frequency of the driving waveform passing through winding "**A**" in the diagram above, is adjusted until almost no current flows through that winding. This is the same as tuning a radio to a particular radio station —in both cases, the signal at that frequency finds it almost impossible to drive any current through the winding. This would make you suspect that almost no current would flow in the output winding, but that is not the case because that current flows into the secondary winding from the local environment (after all, here is no electrical connection between the two windings, so common sense tells you that the electrons flowing in winding "**A**" do not flow out of the other winding). This resonant operation gives you a major energy gain courtesy of the local environment.

The objective of the Gas Processor is to modify whatever gas is flowing through it, air, water vapour, HHO, or whatever, to one of it's highly charged, highly energetic states. The high voltage applied to the metal cylinders of the Gas Processor does not flow through the gas between the cylinders. Instead, it provides a very high electrostatic Plus charge on the outer cylinder and a very high Minus charge on the inner cylinder, and these two opposing charges pull the charged parts of each molecule towards themselves. The positively charged gas ions get pulled towards the Negative inner cylinder and the negatively charged gas ions get pulled towards the Positive outer cylinder. Stan uses this technique on the incoming air when he uses an electrolyser to power an engine (figure 103).

However, Stan's preference is to use air, water mist and some of the exhaust gas from the previous power stroke to power his engines. This is an effective method as "H2Opower" states that he has blown part of a car engine clean through the bonnet of the car, and that indicates that there is plenty of power available from those three components (although, ideally, you want to get the timing right and not over-stress the engine!!).

One thing that "H2Opower" points out is that the injectors supplied for converting any car to run on alternative fuels such as natural gas, can be adapted to be the equivalent of Stan's specialised injectors, if a pair of high-voltage electrodes are added to each injector and fed from a pulsed circuit such as Stan's "Voltage Intensifier Circuit". The arrangement would then be like figure 104.

A 220-page "Technical Brief" from Stan Meyer at http://www.free-energy-info.co.uk/

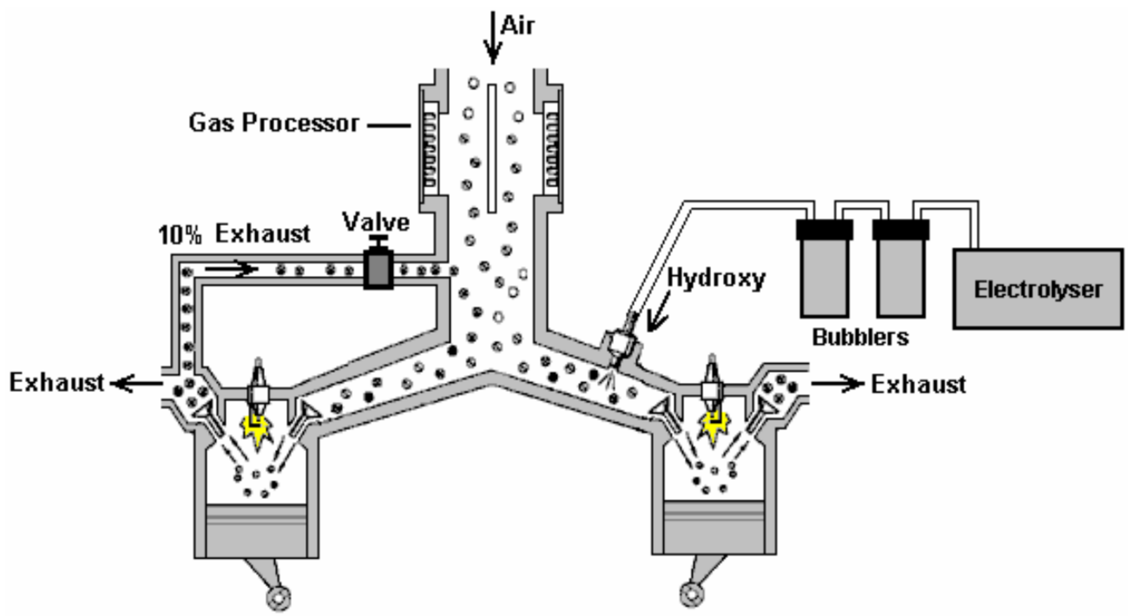


Figure 103: The Gas Processor modifies whatever gas is flowing through it, air, water vapour, HHO, or whatever, to one of it's highly charged, highly energetic states. Stan uses the technique, described above, on the incoming air when he uses an electrolyser to power an engine.

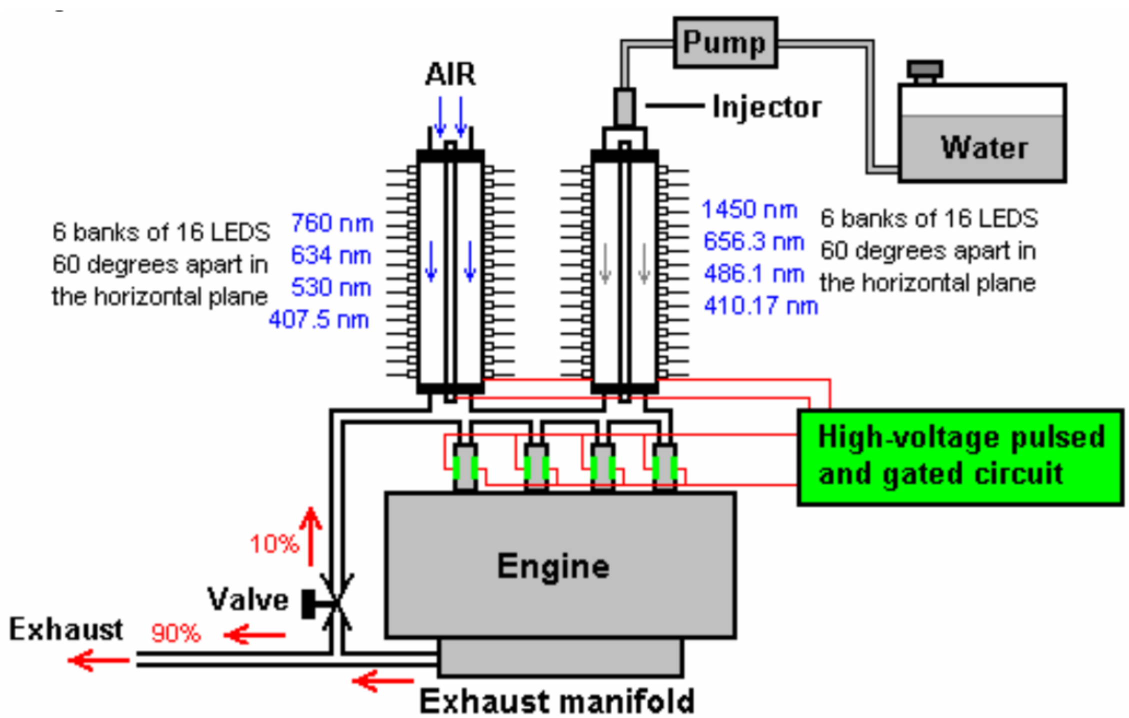


Figure 104: Alternative fuels such as natural gas, can be adapted to be the equivalent of Stan's specialised injectors, if a pair of high-voltage electrodes are added to each injector and fed from a pulsed circuit, such as Stan's "Voltage Intensifier Circuit".

MeyerData.pdf can be downloaded free, although it may well provide you with more information than you ever wanted to know about the subject.

6.2 Peter Lindemann's Lawnmower Running on Water Alone

Peter Lindemann has shown that a much simplified version of Stan's injection system can operate small engines directly on water alone. Let me suggest that it is not the water which causes the explosion, but instead, that the high-power spark causes dis-association of some of the water vapour, producing hydrogen and oxygen which then ignite, turning the remainder of the water vapour into flash-steam, making the engine operate as an internal combustion steam engine. The http://www.youtube.com/watch?v=p3NE8P0sPS8 video shows a lawnmower engine operating on a spark which occurs ten or eleven degrees before Top Dead Centre. Also see figure 105.

Developed in conjunction with the EnergeticForum, the technique is based on the Aaron/Gotoluc style of operation with the circuitry shown in this video: http://www.youtube.com/watch?v=vOhNtRhJ5Rw although the "DirectHits" spark-booster shown at http://www.pulstar.com/directhits.cfm might well make the circuitry easier. Obviously, using this technology to operate a standard electric generator would be a major objective, especially since there appears to be little need to adjust the existing spark timing much.

6.3 Peter Lowrie's High-Current Electrolyser System

Peter Lowrie of New Zealand developed an electrolysis system for use with internal combustion engines. Like the previous systems, Peter feeds a spray of fine water droplets into the engine, using a carburettor, supplied by a water tank. He also feeds in some exhaust gas and heated HHO gas, which is a technique which is almost identical to Stan Meyer's method.

Peter also produces a very large volume of HHO gas with a most unusual method. He uses a delta-wound, GEC marine alternator (though he says that the alternator from a truck would do). He modifies the alternator by removing the diodes inside it and leading each of the three phase-windings out to his electronics. He uses each of the three phase-windings to power one electrolysis cell. He applies only 2 volts or so, to the DC winding of the alternator, which is about the minimum which allows the alternator to work.

Figure 105: Peter Lindemann's HHO powered lawnmower.

The DC current supplied is less than one amp while the pulsed current to the electrolysis cells is much higher. When a snap-on ammeter surrounds the wires to the cells, a current of at least 800 amps is displayed. A point of particular interest is the inductor (coil) placed between the electrolysis cells and the windings of the alternator. Peter describes this as a choke out of a 3-phase industrial power supply. It is comprised of a laminated steel core with a sheet of copper wound around it. This is remarkably like the arrangement used by Stan Meyer and already described earlier in this document.

Peter has run a 1,600 cc car engine at 5,500 rpm with the gas output from his cells. He believes that his method of cascading the gas output from the cells through each other, produces a more active form of HHO gas. He also uses a heat-exchanger which allows the exhaust to pre-heat the HHO gas before it is passed to the engine (a method also used by Stan Meyer for running a car on water alone). Peter also uses impulse-operated valves to control the flow of gas to the engine as shown in figure 106.

6.4 The Use of Water in Engines.

I can fully understand someone having difficulty with accepting the idea that water can be used as part of the fuel inside an internal combustion engine. However, there is an old saying that "fact is stranger than fiction" and that certainly appears to apply in this case. First, it is essential to accept the fact that it can be an important component inside the engine, as this has been demonstrated by several different people who do not know each other and who live in different countries around the world. Second, having accepted that fact, the next step is to ask what exactly happens with the water.

I have come across an interesting document dated May 2009. I have been unable to trace its origin in order to ask permission to reproduce it here, so if you know how to contact the author, then please let me know. This is a report on an actual experimental tests on an internal combustion engine:

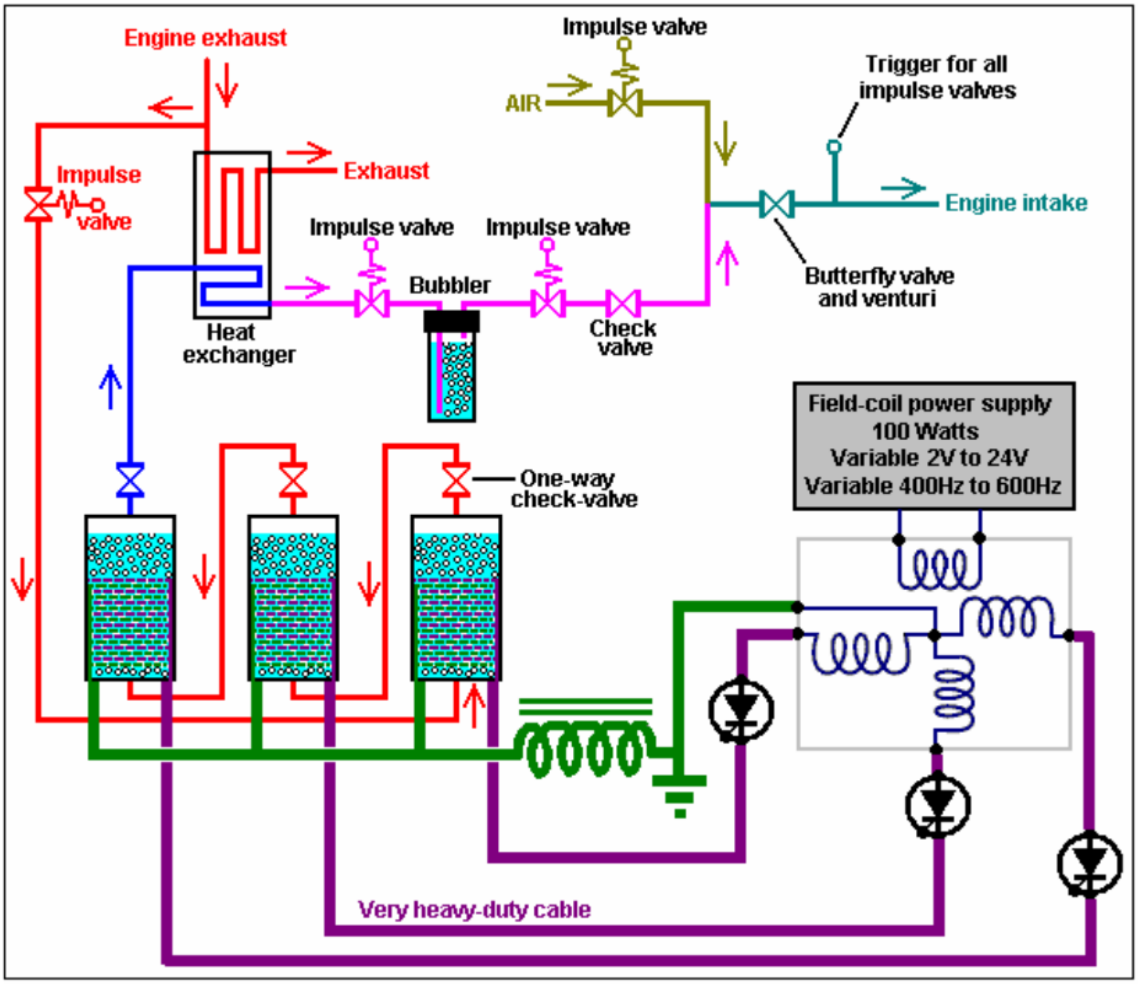


Figure 106: Peter Lindemann has run a 1,600 cc car engine at 5,500 rpm, with the gas output from electrolysis cells. The method of cascading the gas output from the cells through each other, produces a more active form of HHO gas. He also uses a heat-exchanger and also impulse-operated valves to control the flow of gas to the engine.

Figure 107: KAZ 5520 ultrasonic humidifier.

——————start report——————-

Ambient heat into work conversion

Water-steam car, simple concept: simple Otto engine running from water mist using standard off-the-shelf ultrasonic humidifier, shown in figure 107, (4 stroke diesel engine will work as well...could even perform better).

http://home.howstuffworks.com/humidifier4.htm

Replication log: Ultrasonic humidifier 0.25 litre water vaporisation per hour was set to 1/3 of its power. Use the water humidifier at air intake. Remove carburettor (or injection stuff if any) and filter for first. The way from duster to the engines air intake should be as short as possible to avoid the micro water droplets created by the humidifier collecting on the inside of the tube which feeds the water mist to the engine air intake. The engine used was a 1-cylinder 200 cc electrical generator. The engine ran very slowly at first. In the case of a 4-stroke Otto engine, it is possible to speed it up using a propane cartridge. The engine then tends to "lock" into a higher rpm band, where the propane can be cut off permanently. The air going into the engine has a temperature of 22°C, while on average the air temperature leaving the engine was −16°C (a 38°C drop).

This is amazing – but this concept really does work!

You can make the car engine idle using this method. The water may need to be a bit warm. Ignition is not needed but it does facilitate the engine running. You may need to "turn the key" several times (based on this replication test). In the case of a diesel engine, you may need to replace the injectors with some kind of spark plug like on an A.E.R.O.P.S engine or use Firestorm plugs or any other stuff which is able to give the water an additional blast via plasma discharge, to increase performance further. You can make a gasoline generator work with water steam, also a lawn mower, etc.

Now —when it idles you have gone 'over the edge' so you need to add some more power, possible options are: adding hydrogen or HHO, preheating the water (possibly with solar energy), adding some fuel or spirit, powerful ignition or maybe some magnetic polarisation. This concept is now public and you can experiment with it on your own. Follow safety precautions and use common sense.

Do not expect high rpm results on the very first test run. Its a very basic concept which shows just one kind of transformation of environment heat into pressure and usable work. Also, do not pre-heat the engine before using it. The engine must not be hot!

A bit of physical background:

During the first stroke of a 4-stroke Otto engine, the piston moves down and sucks ambient air into the cylinder. During the second stroke, the piston moves up and compresses this air to a pressure of 25 bar (atmospheres). According to the "ideal gas law":

$$p \times V = n \times R(m) \times T \tag{1}$$

the temperature rises due to compression above its initial ambient temperature. The compression ratio of the engine will boost the temperature, typically up to 450°C to 500°C . This second stroke of an Otto engine NEEDS ENERGY FOR COMPRESSION! Now consider what will happen to microscopic water droplets contained in the air inside the cylinder. If the water converts instantly to flash-steam, then its volume increases dramatically, boosting the pressure inside the cylinder and powering the piston during its power stroke and storing energy in the flywheel.

Please note, that the water mist isn't water vapour...it's not a gas! It is still a liquid! The important DIFFERENCE becomes evident during the compression stroke! As the piston starts to move upwards to compress air which contains the water droplets, pressure AND HEAT, as described before, start to rise.

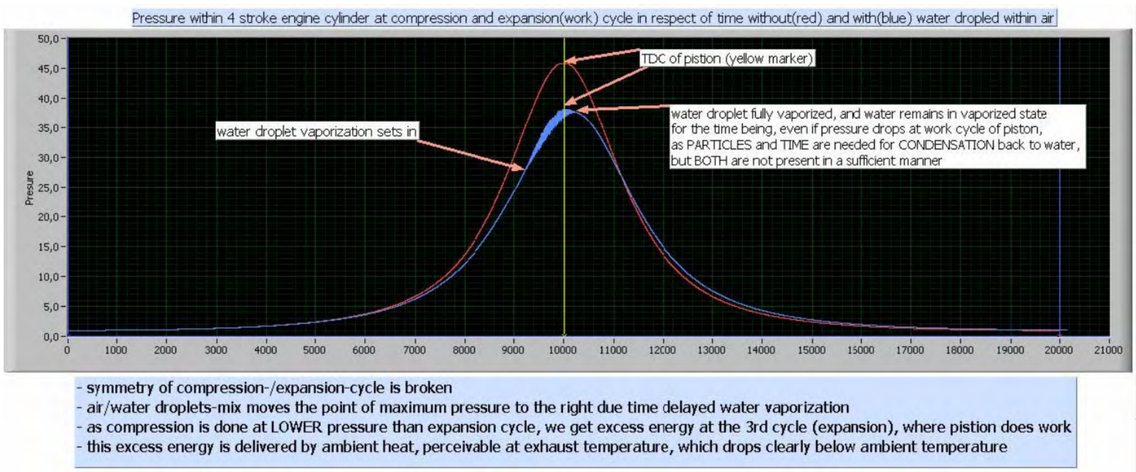


Figure 108: The graph shows the pressure within a 4-stroke engine cylinder with respect of time, starting from the beginning of the compression stroke (second one), ending with the end of the power stroke (third one).

BUT the compression itself is NOT able to raise the water temperature directly, as the water is still a LIQUID and therefore the temperature of the water isn't affected from higher pressure! So initially, only the air temperature rises due to compression. But tiny water droplets are present inside the cylinder, and as the air temperature gets greater and greater than the temperature of the water droplets, heat starts to flow from the air into the water droplets, heating them up! But as long the water temperature does not reach its boiling point, the droplets will not expand due to this rise in temperature and they will simply keep the same volume.

So the water droplets acting as a heat-absorber during the compression stroke! Lower heat implies lower pressure, and lower pressure during the compression stroke implies ENERGY SAVING DURING THE COMPRESSION STROKE!

Please have a look at the following graph in figure 108 (no losses are included in the calculation).

The graph shows the pressure within a 4-stroke engine cylinder in respect of time, starting from the beginning of the compression stroke (second one), ending with the end of the power stroke (third one). The work that is needed for the compression stroke is represented by the integral of the graph, from the very left to the yellow marker. The work which is done by the piston during the power stroke is represented by the integral of the graph from the yellow marker to the very right of the graph (20,000 at the time scale).

Let's assume that engine is an ideal one (loss-less). The red graph line represents the pressure within engine cylinder, if no water is present, and no ignition occurs. The graph is symmetrical to the Top Dead Centre (the yellow marker in the middle), so we put in energy at compression and we get the same amount back during the 3 stroke (power stroke). No loss, no gain. We get plus and minus zero.

The blue graph line shows what happens, if microscopic water droplets are present. The pressure does not rise as much as in case without water droplets, because the water works as a heat absorber during the compression stroke, and this lowers the pressure as well. The shape of the graph changes, so that symmetry of the compression and power strokes isn't there any longer, resulting in a gain of energy.

Factors which affect this process include the water droplet diameters, droplet distribution, the engine's rpm which controls the length of time, the ambient air temperature, the engine's compression ratio and even the water hardness and it's physical properties. It is certainly not a simple case where you can say "more water, means higher revs giving more power". For example, if the water droplets are too large, then there will be too little conversion to steam and insufficient power will be produced. Alternatively, if there are too few water droplets, then there may be no effect at all or the conversion to steam may take place too early to provide useful power.

The theory given here is a very simplified one, but should suffice for the first steps towards a better technology and a better understanding of the concepts of "energy from the environment".

——————end report——————-

It is tempting to conclude that the power gained from water droplets inside an engine cylinder are caused by the water turning into flash-steam and nothing else. However, that is probably not the case, nor is it the case that energy placed in the water by the sun heating it is extracted (which does happen) and that is the only additional source of energy.

In the scientific paper entitled "Possibility of Liberating Solar Energy via Water Arc Explosions" by George Hathaway and Peter Graneau, they discovered that when they produced an electric arc discharge in cold water fog:

"The principal discovery made in the past two years was that it is a collection of fog droplets in the water which explodes and not the liquid water itself. The term 'fog' is meant to include not only the tiny droplets which float in air but also larger droplets which fall in the atmosphere and would be more correctly described as 'mist'. The sole explanation of the explosions so far put forward contends that the intermolecular bonding energy in fog is less than 540 callg, the latent heat of bulk water. The bonding energy difference is then liberated in a quantum jump when the fog is formed in micro-seconds."

Summing up their experiments, they conclude that:

"Virtually all the kinetic energy developed by the explosion must be internal water energy."

In the earlier scientific paper "The Anomalous Strength of Cold Fog Explosions Caused by High-Current Water Arcs" by N. Graneau, he comments:

"The unusual strength of explosions caused by a pulsed current flowing through water plasma was first noticed in 1907 by Trowbridge in his early high-voltage laboratory at Harvard University. When he passed as arc through a spray of water, the resulting explosion was louder than in ordinary laboratory air. During the Second World War, Frungel measured the strength of water arc explosions and published his results in 1948. He concluded that they were not caused by heat and steam and freely admitted that he was unable to explain the phenomenon. In 1969, the US Bureau of Mines issued a long report on their investigation into using water arc explosions for rock fragmentation. In one experiment, the investigators at the Twin City Mining Research Centre noticed that the energy output was apparently 156% of the input. This result was reported but treated as an experimental error."

The bottom line appears to be that using cold water mist droplets in an internal combustion engine has a minimum of the following energy additions:

1. Reduction of the energy required during the compression stroke due to the water droplets absorbing some of the heat generated by the compression and so reducing the increase in air volume during the compression.

2. On ignition, the very rapid conversion of the droplets to steam, caused by their massive surface area, produces a very rapid rise in pressure inside the cylinder.

3. The internal energy of the water caused by absorbing energy from the sun before entry into the engine may well be contributed to the power generation process.

4. Surprisingly, it has been shown that under these conditions, at the moment of explosion, the water itself contributes energy, and this process is one which most people are at a loss to explain, in spite of observing and measuring it happening.

The conclusion has to be that it appears possible that an internal combustion engine could be made to operate using cold water mist as the fuel, if a sufficiently powerful ignition plasma spark is provided using something like one of Robert Krupa's "FireStorm" spark plugs described below. Alternatively, with a lesser spark from an ordinary spark plug and the addition of quite a modest amount of a gas mix of hydrogen and oxygen from the electrolysis of water, the same effect can be produced. Consequently, although it appears so unlikely to a quick glance, that an internal combustion engine could be run on a mix of HHO gas, air and cold water mist, the reality is that the process is actually based on sound scientific principles and readily understood processes.

There is at the present time, a video of a car that runs effectively on just water, using aluminium plates: http://www.youtube.com/watch?v=g_2tlnf6y_k .

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