

THE UTILIZATION OF STEAM POWER

When one considers the installation of a steam plant as a source of energy in a situation where grid electricity is unavailable and there is an abundant supply of solid fuel like coal or wood there are some considerations that must be taken into account.

We do not recommend people use them as their primary and only source of supply in that they should integrate it with some other system such as solar photovoltaic, a wind generator or micro hydro as in climates like Australia running a boiler constantly during the summer would become very tedious..

Firstly the system will require an adequate supply of water of a reasonable quality for initially filling the boiler and keeping it topped up and if you are going to condense the exhaust steam after it leaves the engine so the feedwater is recycled it will need cooling water, as the unit has the ability to heat approximately 200 liters of water from ambient to near boiling per hour.

Secondly, it must be understood that the boilers we manufacture are very much hands on units as they require stoking every hour or so and apart from a float control bypass system on the feedwater circuit to keep the water level in the boiler stable there are no other automatic controls.

They don't require watching constantly but every time the fire is topped up one should check the lubrication of the engine, the water level and charging rate of the batteries.

Thirdly if you are going to use the engine power directly in a workshop as a prime power source similar to how it was done in the 1800s with overhead line shaft then the layout of the system must be set up so the generator can be disengaged as 5 horsepower will only go so far.

You must consider where the unit should be sited as you don't want to have to walk too far on a cold winters night should you have to stoke it nor do you want to waste money on long runs of pipe work if you are going to utilize hydronic heating for your house and domestic hot water supply and if you are going to use low voltage lighting systems then you want to keep your cabling runs as light and as short as possible to cut down voltage drop.

If the steam engine is running with a condensing system they are very quiet and some people who live in colder places set there plants up in a room under the main roof of there house to make use of the radiant heat from the boiler but most of the time the engine and boiler are in a separate building a short distance from their dwelling.

A Liberty engine will produce approximately 2000 watts running flat which will happily supply a couple of homes although we recommend they be run at about half that pace because the engine will live a lot longer and so will you and you will still burn the same amount of wood.

THE LIBERTY STEAM ENGINE

Due to a known and serious lack of new “off the shelf” commercial steam engines in Australia, Strath Steam was

set up in late 1988 to investigate this need and then design, tool up and begin manufacturing a range of marine, stationary and automotive engine systems.

This brochure covers our stationary engine which is classified as a 4 - 5 horsepower horizontal mill type, having a 3 inch bore by 4 inch stroke (76mm by 100mm). It can be used in many applications to drive a generator, pump, saw, sheep shearing plant, air compressor, winch or even as a paddle steamer engine.

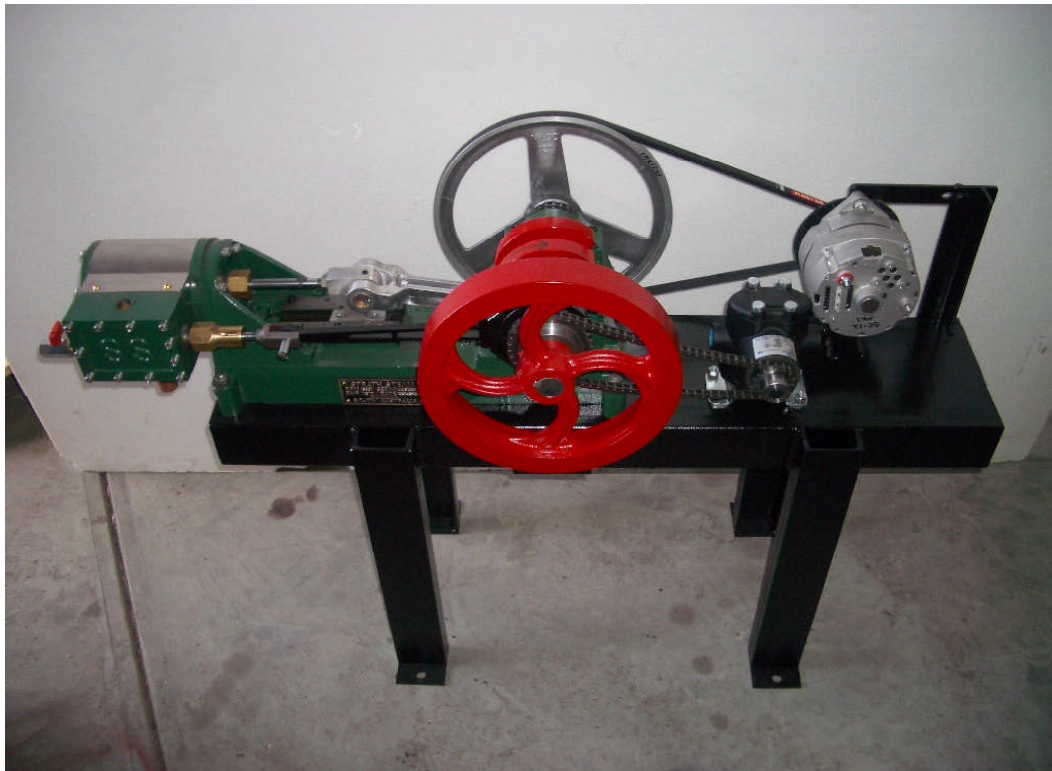
Primarily it was designed to generate power in remote areas where there was no grid electricity and an abundance of renewable biomass fuel, which in Australia is fallen eucalyptus trees.

The engine is of the older traditional style with its cylinder lying horizontal and having a double acting piston which can be operated with a slide or piston valve system with Stephenson's link reverse if required.

The major parts of the engine are made from high quality grade 12 iron castings while the crankshaft is made up of two SG iron castings with a hardened steel crankpin and while the main bearings are sealed twin ball races the big end bearing is a greaseable needle roller.

The conrod is cast in aluminium with bronze bushes in the cross head end which incorporates a hollow hardened steel wrist pin with an internal oil gallery for lubrication

The valve gear eccentrics run on a sealed ball race and the rod end is a bronze bush. They rely on a woven graphited teflon gland packings running on hard chromed rods. The appropriate drain cocks come fitted to the engine.



ENGINE SPECIFICATIONS

Boiler heating surface..... 5 square metres
Boiler pressure..... 750 kpa
Engine weight.....80kgs
Boiler weight400kgs
Drive shaft diameter 30mm

Bedplate length.....570mm
Overall length 725mm
Bedplate width.....200mm
Overall width.....300mm
Overall height300mm

AN EXPLANATION

Thanks for your inquiry regarding our products, I would firstly like to point out that you must consider, if you can get the grid power connected for around the same price or even a little more than the cost of one of our systems then it I a lot less hassle to flick a switch on at any time of the day or night and pay the bill at the end of the month. I know this may sound a little strange coming from some one who is keen to sell steam plants but is an important and fairly big step to undertake producing you own power.

The info contained in this lot of text attempts to cover most of the basic questions asked by people taking a closer look at utilizing the concept of a steam plant for a self sufficiency power supply and energy centre.

The first thing we shall cover is the area encompassing the boilers, which with our multi tubular under fired unit we can offer a boiler far more suitable for the requirements of the stationary engine, it having bigger capacities in all departments. Primarily the major plus is it has a much bigger firebox, which allows one to feed it with bigger chunks of wood, so the unit does not have to be stoked as often, along with the fact it is a more efficient boiler than our previous vertical fire tube boilers.

Depending on how hard you are running the engine and the quality of your fuel, you should not have to stoke it more than once an hour and if you get the feed water set correctly, then the water level should only need checking occasionally as it is set up to run as a semi sealed loop. Again, this depends on the firing rate and the quality of the fuel it will consume, approximately a good barrow load in about six hours.

We would also like to point out that our boilers are very much hand fired units, and with the exception of being able to offer a low water level alarm. They have no other automatic features, although there are ways of fitting such things as pressure stats and thermostats .

While, we are on the subject of boilers it is important to note that in the Australia, fire tube boilers are built to the AS 1797. Standard, which is really meant for big boilers, like those used in hospitals, meat works and milk processing factories but just because ours are only little guys they must still conform, so consequently are very overbuilt. If they are looked after properly, you would probably get at least 50 years plus out of one, although the fire grates would not last that long, nor the fire tubes but they can be fairly easily replaced.

As far as we're concerned, there is nothing tricky to setting up a boiler and engine, one of our early clients who did it, is a clinical psychologist in Canberra, and he had no major problems as we supply a comprehensive set of instructions for installation and operation.

While we are on the subject of system life I would hope you could get at least 10 years of trouble-free operation from the steam engine before you were faced with any replacements, which may be piston rings or a valve providing of course the engine was properly maintained.

In regard to the water supply it is best if it can be initially filled with rainwater and a condensing system so the water can be recycled continuously.

It is important to keep the quality of the water in the boiler free of oxygen and slightly alkaline so as not to cause corrosion or internal rusting, this is done by using water treatment chemicals.

The major benefit to be gained from condensing is the spent steam from the engine has the ability to heat 50 gallons of water from ambient to near boiling every hour, which is an enormous amount of hot water that can be utilised for house heating and domestic hot water or any number of jobs.

In Australia, you do not require any special training or licence to operate, one of our units as they are under 50 ft.² or five square metres of heating surface area.

To ascertain your needs, when it comes to a plant. First up, you must ask yourself, how often you are going to be willing to fire up the boiler to generate some power or perhaps heat some water for your domestic supply or just house heating, then, how long you will want to run it for when you do.

When people look at running a solar panel bank they usually consider having to have enough battery bank capacity to see them through approximately 4 to five days, depending on their geographic location, which as you can imagine requires a huge amount of battery reserve when you begin to talk amp hours. So if you're running a 500 amp hour bank of deep cycle PV stores that may last for 4 to 5 days in very cloudy conditions you need a hefty charging system.

You should be better off if you are able to recharge the bank of half that size every two days with the steam engine as during the wintertime you're going to light your combustion heater every afternoon, at say 4 p.m. and then quit for bed at 10 p.m. you have been burning a heap of wood just to heat your house where as if it was burnt in the boiler you can still heat your house, your domestic hot water supply and generate your electricity to cover the peak power usage time i.e. lighting, television and kitchen aids etc and recharge your system to cover the next day's requirements.

By the same token, if some washing or ironing must be done on particular days then the system can always be fired up especially and it doesn't matter if it's cloudy for your solar panels or if there is no winds for the wind generator.

Now, what we are trying to highlight without rambling on too much is one must look at exactly what your requirements are power wise.

I would assume you would use all D. C. low voltage dichroic lighting throughout your house, as this is by far the cheapest and most cost-effective system, and then use an inverter to charge a DC battery bank and power an inverter to provide the 240 VAC to run your television, microwave, radio and etc.

So the system would appear in this sequence, a boiler with a free fuel supply and a source of reasonably good quality water, hooked up to a steam engine driving a generator to produce the electricity, which is using the condenser heat exchanger for water heating, in turn, hooked up to a battery bank, big enough for your requirements, hooked up to your household lighting circuit and a DC inverter to give 240 V AC.

The size of the generator doesn't matter too much as the engine will only give you the power it can, but a Liberty will put out about 2 KVA max. i.e. running flat out, but will run quietly at around 1 KVA, although this depends on the wood quality and the conditions of the day along with a number of other factors.

THE HORIZONTAL UNDERFIRED BOILER

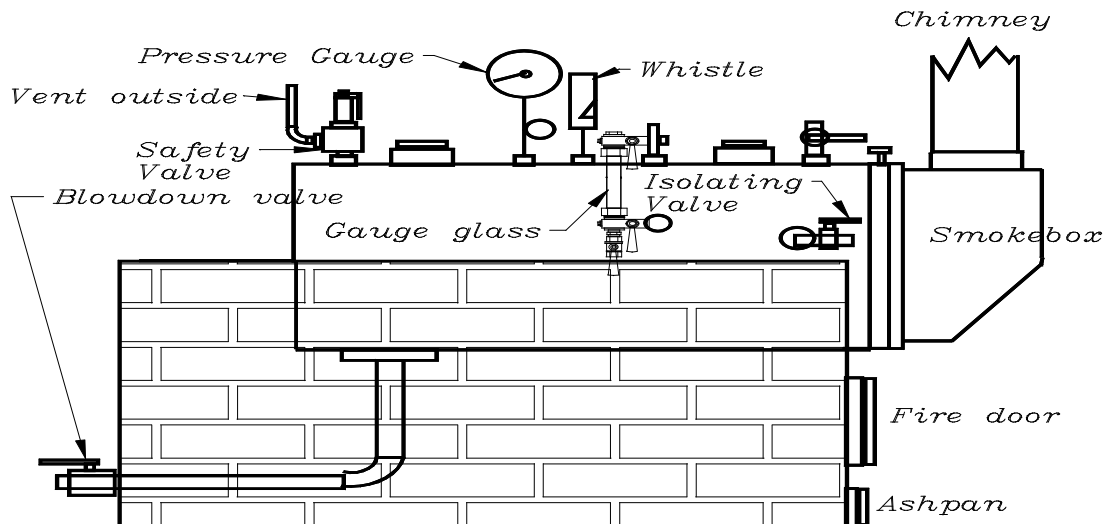
STRATH STEAM manufactures two styles of fire tube boiler and this brochure covers our horizontal multi tubular under fired which in the early days of steam was referred to as a colonial, it is rated at around 6 horsepower. It is primarily designed for a solid fuel firing system, the unit can be adapted to run on liquid fuels or gas if it were to be used for a commercial application where process steam is required by beekeepers or for eucalyptus oil distillation etc.

The pressure vessel consists a 24 inch (600mm) outer shell with tube plates at either end supporting 20 fire tubes. A number of sockets are welded into the shell to allow for purpose of inspection and cleaning while the smaller ones are for inlets and outlets. At the back of the shell and down the bottom is a flanged pad which is used to fit the blow down pipe for draining the boiler and blowing it down.

The front plate of the fire box is welded to the shell and the fire door and its cast frame along with the ash pan air control door are bolted to this plate which then has castable refractory poured into it on sight before it is set up in its fire brick enclosure. The hood at the back of the boiler directs the flames and smoke through the fire tubes and out to the removable smoke box at the front of the boiler.

The pressure vessel is of an all welded steel construction and are built to conform to the Australian standard AS1797-1986.

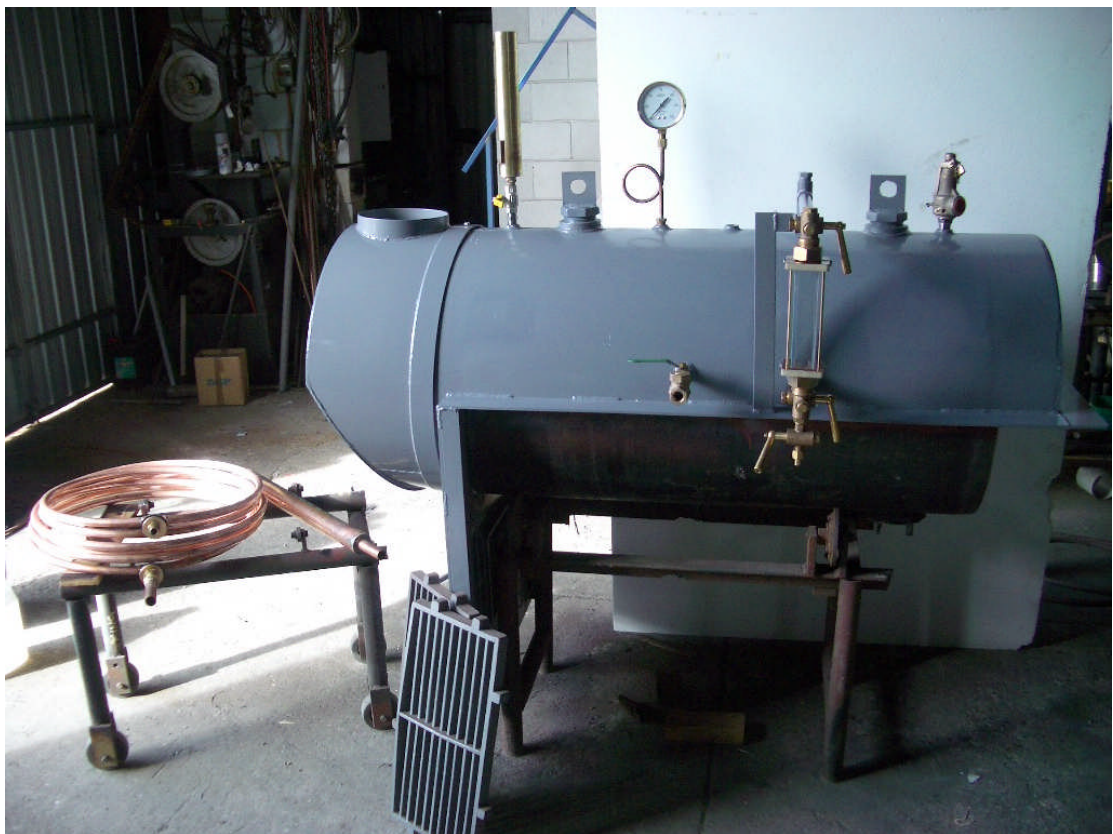
A set of engineering drawings are available for a fee should they be required by a government inspecting authority, but as each boiler is shipped with its own compliance certificate to confirm it has been hydraulically tested, inspected and stamped by a licensed inspector and we have reciprocal agreements between all states in Australia and New Zealand so this should not be needed.



Stack Diameter.....	200mm	Weight.....	450kgs
Fire door.....	250mmX200mm	Shell diameter.....	610mm
Blowdown.....	40mm	Height.....	1100mm
Grate area.....	500mmX500mm	Length.....	1500mm
Operating pressure.....	750kpa	Width.....	760mm



A boiler set up in a working situation



A new boiler showing the condenser coil and feedwater heater and fire grates