

PATRICK POTTER & ASSOCIATES

REGISTERED & CHARTERED ENGINEERS



Principal:
PATRICK POTTER, C.Eng., M.I.Mech.E.,
M.I.Mar.E., M.I.P.E.N.Z., M.I.Energy,
Registered Engineer
Phone 8556224 (private)

MICRO FUEL – SEWAGE POTENTIAL ENERGY ADVANCED RECUPERATOR PROCESS (SPEAR)

RENEWABLE ENERGY

INTRODUCTION:

Each person produces an average of 70 grams of solid BOD waste per day. BOD waste passes through the body as a specific energy of 25 MJ's per kg equal to 12,000 BTU's per lb. Sewage energy enters the Treatment Plant at about 4% solids and settles in the plant when it is picked up by a sludge pump and is pumped through a filter system consisting of either a belt press or centrifuge, whereby it is thickened to some 20% solids. At 20% solids, it is passed to a Mill where it is ground and dried in hot gas at some 800°C and reduced to a fine powder. This powder is conveyed in a hot air stream to enter a multi-cyclone separator system where the dried product is removed from the air stream and stored for later use. The hot air stream is passed to a condensing scrubber which is water cooled by means of a coil circulated with cold water which enters the coil at some 15°C and leaves the coil at some 70°C. The moisture picked up in the dryer is condensed out and passes over the coil and the heat from the cooled hot air and condensed moisture is transferred to cooling water which is controlled to leave the coil at 70°C. This recovered hot water at 70°C is stored and may be used for any purposes requiring the use of hot water in large quantities such as food processing plants, hospitals, schools, laundry, and any other requirement for domestic hot water.

The powder fuel collected may be used in the form of pulverised fuel for the direct firing of boilers or heat exchangers. Condensate collected in the condensing scrubber has a high percentage of CO₂, SO₂ and nitrogen and is very valuable for plant irrigation. Hot gas leaving the scrubber may be further cooled before being discharged to atmosphere

Raw sludge entering the Mill at 20% solids will be in the form of total solids. It is conveyed to the Mill by screw conveyor and is discharged directly into the Mill grinding zone. During the grinding process the sludge will be dried and will enter into the dry air where it enters the multi-tubular grit arrestor where the dried fuel is dropped out leaving clean air which is passed into a condensing scrubber and condensed to transfer the heat to the cooling water.

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A lot has been written about renewable energy most of which is obtained from solar heating, and wind energy. However, neither of these two processes can be relied upon to be a continuous supply of energy. On the other hand, sewage energy can. Every person in the world supplies an average of 70 grams of solid BOD energy per day. This energy is continuous and is available daily. Every one thousand people will produce an average of 70 KG's of sewage energy per day having a total of 1.75 MJ's of energy equal to 130 KG's will weigh 154 pounds which at 12,000 BTU's per pound will amount to 1848,000 BTU's per 1,000 capita per day. This supply of energy is continuous. The major portion of it is already being collected in sewage treatment systems and can be dried with an input of 4,800 BTU's per lb to produce 12,000 BTU's per pound of renewable energy. The energy used to dry the fuel can be taken from the 12,000 BTU's per pound dried which is 2.5 times the energy input in the drying process.

We are at present hearing of power stations burning coal being closed because of earth warming brought about by the discharge of nitrogen, CO₂ and SO₂ into the atmosphere. Other fossil fuels such as oil and gas are still being combusted in huge quantities and contributing to earth warming. What is not being brought to our attention is the effect of sewage treatment which is causing one of the greatest problems of the world as all sewage plants contributes heavily to earth warming and it is not possible to reduce the atmospheric discharge of these systems because the sewage left either treated or untreated will continue to oxidise and enter the atmosphere. Therefore, by burning Solid Sewage, it is not adding to the earth's pollution.

Sewage solid energy contains some 50% volatiles in the form of methane which is not combusted and enters the atmosphere and takes some twenty times longer and greatly increases pollution than when it is not combusted. If Sewage Energy is combusted, its pollution is reduced to some 25% if untreated sewage is allowed to oxidise afterwards.

The drying process of solid sewage to convert it into a high grade pulverised fuel as was stated earlier on takes 4,800 BTU's of input and this 4,800 BTU's, up to 90% of it can be recovered in the form of hot water. Therefore, almost all of the sewage energy can be recovered.

A small plant to dry and burn some 5 tonnes per day of sewage material was constructed to determine the advantages of sewage energy. This plant showed conclusively that solid sewage energy settled from the outlet of the Treatment Plant and then dewatered by centrifuge to 20% solids and discharged into a drying system consisting of a centrifuge decanter and then discharged directly into a pulveriser normally fed by coal. The coal treated in this pulveriser had a specific energy of 12,000 BTU's per lb. Whereas the solid sewage sludge when dried, has an energy of 12,000 BTU's per lb and each pound of sludge dried produced three gallons of hot water at 70°C so that the drying process allowed the sewage sludge to be dried to recover some 90% of its energy.

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This high grade powder fuel is an ideal fuel for firing boilers normally fired by pulverised coal. The fuel itself burns much cleaner than coal and so long as the temperature of drying is kept at 1,000°C, no clinker whatsoever is formed. The fuel itself can contain up to 30% ash and was recovered as fine sand. The ash from the powdered sewage energy is in demand for the manufacture of ceramic tiles and in Taiwan for instance, ash from sewage plants is used entirely for the manufacture of roofing tiles.

From observation, the combustion of sewage solid energy, waste is practically eliminated. It is somewhat surprising that little if any advantage has been taken in the combustion of sewage solids. The system is completely enclosed. The drying temperature of the sewage sludge at 1,000°C ensures that all odours are eliminated and the fact that the recovered powdered energy from the drying process is utilised for firing the drying process itself. There is no renewable energy which can approach this system for efficiency.

The fact that sewage solids powdered fuel can be utilised to fire existing coal fired pulverised boilers is a unique advantage. When one realises that every 1,000 capita of the population can produce 1.75 MJ's of renewable energy equal to 154,000 BTU's plus the production of three gallons (15 litres) of hot water then this is indeed a most acceptable method for the elimination of sewage sludge and the recovery of energy which is at present being wasted.

It takes little consideration to see the benefits for the elimination of pollution being produced by coal burning and the advantages to be achieved in the almost total reduction of pollution at present caused by sewage treatment plants. In fact with the world's population being at 8 billion and anticipated to expand to ten billion over the next ten years, then practically all of the fuel required for the generation of power to replace coal burning can be obtained from the combustion of solid sewage energy. A new industry can be created by the production of hot water which is not possible to be piped to the supply zone can be conveyed by insulated tankers such as milk tankers at exceptionally low cost.

Patrick Potter

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All inquiries to Dawood Latif (Director) Mobile: +64(0) 21-765 528

Email: dlatif@3e.co.nz or dlatif@xtra.co.nz