

English Translation of
WO 2008/052787 A2

Method for Production of Mixed Vapour

Description

The invention relates to a method for production of mixed vapour.

The physical processes described below refer to the thermal engines, which are run in cyclic process by mixed vapour. The applicable physical phenomena and statutory positions are sufficiently known from the thermodynamics. Their basics need not be explained in more detail here.

Thermal engines are normally driven by vapour. For the generation of steam liquids are impacted in a vapour generator under high pressure and vapour is produced by adding energy. This vapour can then be converted in mechanical energy.

It has revealed itself that the efficiency of the thermal engines can be increased by running the same with mixed vapours. In the AT 155744 the generation of mixed vapour from two or more polar and non-polar liquids has been described, which segregate themselves again in the liquid phase.

The mixed vapour is partly or fully liquefied through one or several directly consequent expansions and compressions

under delivery of work. Thereafter, the mixed vapour is again evaporated by thermal feed and is returned back in the work process. The work being released in the process can be used the generation of electrical energy.

Also methods for the production of mixed vapours and thermal engines are known, with which mixed vapours can be converted in mechanical energy. In the document DE 103 56 738 A1 this kind of a method for the production of mixed vapours has been described.

The document US 4,729,226 discloses a method for the production of mechanical energy under assistance of mixed vapours.

In the document US 4,448,025 a method has been described, in which the exhaust heat is used for heating of the working medium.

Further, in the document WO 2005/054635 A2 a method has been revealed for the generation of mechanical energy in a cyclic process with a working medium, which consists of two components of extremely different boiling points.

In this, disadvantageous are the high mixed vapour temperatures and working pressures in the vapour generators and feeding and discharge pipelines. From this result special requirements about the materials used. To ensure operational safety of this kind of plants, these are made of high yield special steels. Also, these require an intensive and regular checks by experts. All this is time consuming and fraught with high costs.

Further, the production of a mixed vapour, with which it is possible to run a thermal engine with sufficiently high efficiency, requires a considerable energy input.

The energy required for evaporation is almost exclusively gained from fossile energy sources.

Task of the present invention is to create a method for the generation of mixed vapour, with which the deployed volume of energy, the operating temperature and the operating pressure can be reduced and the efficiency can be improved.

This task is resolved through a method according to claim 1, especially through the following steps of the method:

- Generation of a mixed vapour from a non-polar fluid and a polar fluid at low temperature;
- Introduction of the mixed vapour in an in-line enrichment tank and enrichment with polar fluid at marginally higher temperatures;
- Compression of the enriched mixed vapour by means of a thermal engine;
- adiabatic expansion of the mixed vapour to wet vapour, wherein the polar fluid condenses and the released heat is passed on to the non-polar fluid;
- Transfer of work released during adiabatic expansion of the mixed vapour to the thermal energy machine for generating electrical energy;
- Return of the expanded wet vapour to the first pressure chamber.

Through these measures a method is made available, with which it is possible, to deploy especially renewable energies for running thermal engines economically and cost-effective with simultaneous increase in the efficiency. With this, for example, electrical current can be generated, which can be profitably fed in to the public power grid. A thermal engine can be run with it cost-effectively, with energy efficiency, saving resources and profitably.

Other advantageous measures are described in the sub-claims.

The invention based method is schematically represented in the enclosed drawing on the basis of a fixture suitable for its execution. The fixture in the example is described in detail here below.

The fixture 10 represented in the lone figure consists mainly of at least one mixed vapour generator 11, which is provided with a low pressure boiler 12. The low pressure boiler 12 has a first pressure chamber 13, in which a first polar fluid 14, for example water, and at least one non-polar fluid 15, for example benzene, are available in liquid form. In this the polar fluid 14 is preferably in a higher volume proportion than the non-polar fluid 15.

To the mix vapour generator 11 a schematic represented heat exchanger 16, for example any kind of heating boiler system is allocated. With this heat exchanger 16 the fluids 14 and 15 can be impacted with thermal energy and evaporated.

It is foreseen, to run the heat exchanger 16 with solar energy or geo thermal energy. Also the use of reproductive energy sources like wood, for example, in the form of wooden

chips from forest assortment of woods. Similarly any other type of bio mass is theoretically possible as long as it is available in suitable quality and quantity, to enable its conversion in thermal energy.

The mixed vapour generator 11 is run at a temperature in the range of 50°C to 75°C and a pressure in the range of 0.5 to 1.5 bar. In this a mixed vapour 17 is produced from the polar fluid 14 and the non-polar fluid 15. The mixed vapour 17 produced in this manner is collected in a steam pressure chamber 18 of the mixed steam generator 11.

The collected mixed vapour 17 is, thereafter, guided through a mixed vapour outlet 19 via a pipeline 20 in an in-line enrichment tank 21. The enrichment tank 21 has a second pressure chamber 22, which is filled partially with a second polar fluid 23. The second polar fluid 23 is chemically identical with the first polar fluid 14, it shows in comparison with the introduced mixed vapour 17 merely a higher temperature.

The second polar fluid 23 has preferably a temperature in the range of 70°C to 95°C, wherein in the enrichment tank 21 there is a pressure in the range of 0.5 to 1.5 bar. Preferably the pressures in the pressure chambers 13 and 22 are identical. The mixed vapour 17 is guided in the second pressure chamber 22 by the second polar fluid 23 occurring in the liquid form.

While carrying by the higher temperature second polar fluid 23 the mixed vapour 17 is enriched with polar fluid and is collected as enriched, dry mixed vapour 24 in a second steam pressure chamber 25.

The dry mixed vapour 24 enriched in this manner is guided via a mixed vapour outlet 26 and a pipeline 27 to a thermal engine 28. The enriched, dry mixed vapour 24 present in the

pipeline 27 is introduced for compression via an inlet 29 in the working chamber 30 of a thermal engine 28.

Through the compression the dry mixed vapour 24 is brought to a considerably higher temperature, preferably about 180°C. After reaching this temperature the enriched, dry mixed vapour 24 adiabatic expanded to wet vapour. The expanded wet vapour reaches through an outlet 31 in a return flow pipeline 32 and is returned via return flow stop valve 33 and a return flow inlet 34 in the first pressure chamber 13. Here the vapour circulation can begin afresh.

Reference symbols

10	Fixture
11	Mixed vapour generator
12	Low pressure boiler
13	first Pressure chamber
14	first polar fluid
15	Non-polar fluid
16	Heat exchanger
17	Mixed vapour
18	First steam pressure chamber
19	Mixed vapour outlet
20	Pipeline
21	Enrichment tank
22	second Pressure chamber
23	Second polar fluid
24	enriched Mixed vapour
25	second steam pressure chamber
26	Mixed vapour outlet
27	Pipeline
28	Thermal engine
29	Inlet
30	Working chamber
31	Outlet
32	Return flow pipeline
33	Return flow stop valve
34	Return flow inlet

Patent claims

1. Method for production of mixed vapour for running thermal engines as per following steps:

- Production of a mixed vapour from a non-polar fluid and polar fluid at low temperature;
- Enriching the mixed vapour with polar fluids at marginally higher temperatures in an in-line enrichment tank;
- Compress the enriched mixed vapour by means of a thermal engine;
- Adiabatic expansion of mixed vapour to wet vapour, wherein the polar fluid condensates and the energy released is transferred to the non-polar fluid;
- Transferring work being freed during adiabatic expansion of the mixed vapour to the thermal engine for the generation of electrical energy;
- Returning the expanded wet vapour to the first pressure chamber.

2. Method as per claim 1 characterized by the fact that the mixed vapour in an enrichment tank is enriched with polar fluid.

3. Method as per claims 1 and 2 characterized by the fact that as polar fluid water and as non-polar fluid benzene is used.

4. Method as per one of the above claims characterized by the fact that the mixed vapour is produced from such polar and non-polar fluids, which evaporate at low temperature.

5. Method as per one of the above claims characterized by the fact that the mixed vapour is produced in a close mixed vapour circuit.

6. Method as per one of the above claims characterized by the fact that the evaporation temperature for the mixed vapour is produced by solar energy, geo-thermal energy or combustion of bio mass.

7. Method as per one of the above claims characterized by the fact that the mixed vapour preferably covers a temperature from 50°C to 75°C.

8. Method as per one of the above claims characterized by the fact that the enriched mixed vapour preferably covers a temperature from 70°C to 95°C.

9. Method as per one of the above claims characterized by the fact that the mixed is enriched dry.

10. Method as per one of the above claims characterized by the fact that the work being released is transferred to a crank drive producing a rotary motion.

11. Method as per one of the above claims characterized by the fact that the produced rotary motion is transferred to a 3-phase generator for producing electrical energy.