supply and/or demand, in order for example to achieve economic advantages. At the same time, it should be possible for the plant to be used for storing or providing electrical energy even over relatively long periods of a high or low electricity supply.

Furthermore, the security of supply should be improved by the present invention.

The plant and the method should also have the highest possible efficiency. Furthermore, the method according to the invention should allow itself to be carried out using infrastructure that is conventional and widely available.

In addition, the method should allow itself to be carried out with the fewest possible method steps, but they should be simple and reproducible.

Further objects that are not explicitly mentioned arise from the overall context of the following description and the claims.

Summary

In ~~a first aspect~~an embodiment, there is provided an integrated plant, comprising a plant for the electrothermic production of ethyne and a plant for electricity generation, characterized in that the plant for the electrothermic production of ethyne is connected to the plant for electricity generation via a conduit and the conduit feeds a product gas obtained in the plant for the electrothermic production of ethyne to the plant for electricity generation.

In an ~~second~~ aspect, there is provided a method for the flexible use of electricity~~, characterized in that,~~ in an integrated plant as disclosed above, comprising a plant for the electrothermic production of ethyne and a plant for electricity generation, where the plant for the electrothermic production of ethyne is connected to the plant for electricity generation via a conduit and the conduit feeds a product gas obtained in the plant for the electrothermic production of ethyne to the plant for electricity generation, characterized in that, at times of a high electricity supply, the plant for the electrothermic production of ethyne is operated and at least some of the hydrogen and/or gaseous hydrocarbons obtained in addition to ethyne is stored and, at times of a low electricity supply, stored hydrogen and/or gaseous hydrocarbons are fed to the plant for electricity generation.

Detailed Description

These and further objects that are not expressly mentioned and arise from the circumstances discussed at the beginning are achieved by an integrated plant, which integrates a plant for the electrothermic production of ethyne and a plant for electricity generation by connecting the plants via a conduit, so that a product gas that is obtained in the plant for the electrothermic production of ethyne can be used in the plant for electricity generation for the generation of electricity.

The subject matter of the present invention is accordingly an integrated plant which comprises a plant for the electrothermic production of ethyne and a plant for electricity generation and is characterized in that

Patent claims:

1. A method for the flexible use of electricity in an integrated plant, comprising a plant for the electrothermic production of ethyne and a plant for electricity generation, where the plant for the electrothermic production of ethyne is connected to the plant for electricity generation via a conduit and the conduit feeds a product gas obtained in the plant for the electrothermic production of ethyne to the plant for electricity generation, characterized in that, at times of a high electricity supply, the plant for the electrothermic production of ethyne is operated and at least some of the hydrogen and/or gaseous hydrocarbons obtained in addition to ethyne is stored and, at times of a low electricity supply, stored hydrogen and/or gaseous hydrocarbons are fed to the plant for electricity generation.

2. The method according to Claim 1, characterized in that the plant for the electrothermic production of ethyne comprises an arc reactor.

3. The method according to Claim 2, characterized in that the gas mixture obtained from the arc reactor is mixed with a hydrocarbon-containing gas or a hydrocarbon-containing liquid for cooling.

4. The method according to Claim 3, characterized in that the type and/or amount of the gas and/or the liquid is chosen in dependence on the expected electricity supply.

5. The method according to any one of Claims 1 to 4, characterized in that the electricity supply is

calculated in advance from the data of a weather forecast.

6. The method according to any one of Claims 1 to 5, characterized in that the plant for electricity generation comprises a fuel cell.

7. The method according to any one of Claims 1 to 6, characterized in that the plant (14) for electricity generation comprises a power generating plant with a turbine.

8. The method according to Claim 7, characterized in that the power generating plant with a turbine comprises a gas turbine that can be operated with hydrogen and/or hydrocarbon-containing gases.

9. The method according to Claim 7, characterized in that the power generating plant with a turbine is a gas-and-steam turbine power plant.

10. The method according to Claim 9, characterized in that, when there is a high electricity supply, the plant for the electrothermic production of ethyne is operated with an output of over 80% of the rated capacity and the plant for electricity generation is operated at 0-50% of the rated electrical capacity and, when there is a low electricity supply, the plant for the electrothermic production of ethyne is operated with an output of 0-50% of the rated capacity and the plant for electricity generation is operated at over 80% of the rated electrical capacity.

11. The method according to any one of Claims 1 to 10, comprising the steps of

a) setting a first threshold value and a second threshold value for an electricity supply,

b) determining the electricity supply,

c) changing the electrical power output of the plant for electricity generation in dependence on the electricity supply if the electricity supply exceeds the first threshold value and changing the output of the plant for the electrothermic production of ethyne in dependence on the electricity supply if the electricity supply is below the second threshold value, and

d) repeating steps b) and c).

12. The method according to Claim 11, characterized in that the first threshold value and the second threshold value are the same.

13. The method according to any one of Claims 1 to 12, characterized in that the plant for the electrothermic production of ethyne comprises at least one arc reactor and, within a calendar year, the arc reactors are operated on average for at least 2500 full-load hours, with preference at least 4000 full-load hours and with particular preference at least 5000 full-load hours.

14. The method according to any one of Claims 1 to 13, characterized in that, within a calendar year, the plant for electricity generation is operated for at least 4000 full-load hours, with preference at least 5000 full-load hours and with particular preference at least 5500 full-load hours.

15. The method according to any one of Claims 1 to 14, characterized in that the ethyne produced in the plant for the electrothermic production of ethyne is converted in at least one further process into a further product and a byproduct from this process is used in the plant for electricity generation for the generation of electricity.

16. The method according to any one of Claims 1 to 15, characterized in that the ethyne produced in the plant for the electrothermic production of ethyne is converted in at least one further process into a further product and heat generated during this process is used in the plant for electricity generation for the generation of electricity.

17. The method according to any one of Claims 1 to 16, characterized in that the plant for the electrothermic production of ethyne has a device for separating the gas mixture obtained in the electrothermic production and the device for separating the gas mixture obtained in the electrothermic production is connected to the plant for electricity generation.

18. The method according to any one of Claims 1 to 17, characterized in that the integrated plant has at least one reservoir for hydrogen and/or hydrocarbon-containing gases separated from ethyne, which is connected via a conduit to the plant for the electrothermic production of ethyne and via a conduit to the plant for electricity generation.

19. The method according to any one of Claims 1 to 18, characterized in that the plant for the electrothermic

production of ethyne comprises a steam generator, with which steam is generated from the waste heat of the electrothermic process, the plant for electricity generation comprises a device in which electricity is generated from steam, and the integrated plant comprises a steam conduit, with which steam generated in the steam generator is fed to the device in which electricity is generated from steam.

Patent claims:

1. Integrated plant, comprising a plant for the electrothermic production of ethyne and a plant for electricity generation, characterized in that the plant for the electrothermic production of ethyne is connected to the plant for electricity generation via a conduit and the conduit feeds a product gas obtained in the plant for the electrothermic production of ethyne to the plant for electricity generation.

2. Integrated plant according to Claim 1, characterized in that the plant for electricity generation comprises a fuel cell.

3. Integrated plant according to Claim 1 or 2, characterized in that the plant for electricity generation comprises a power generating plant with a turbine.

4. Integrated plant according to Claim 3, characterized in that the power generating plant with a turbine comprises a gas turbine that can be operated with hydrogen and/or hydrocarbon-containing gases.

5. Integrated plant according to Claims 3 and 4, characterized in that the power generating plant with a turbine is a gas-and-steam turbine power plant.

6. Integrated plant according to any one of the preceding claims, characterized in that the plant for the electrothermic production of ethyne comprises an arc reactor.

7. Integrated plant according to any one of the preceding claims, characterized in that the plant for the electrothermic production of ethyne has a device for separating the gas mixture obtained in the electrothermic production and the device for separating the gas mixture obtained in the electrothermic production is connected to the plant for electricity generation.

8. Integrated plant according to any one of the preceding claims, characterized in that the integrated plant has at least one reservoir for hydrogen and/or hydrocarbon-containing gases separated from ethyne, which is connected via a conduit to the plant for the electrothermic production of ethyne and via a conduit to the plant for electricity generation.

9. Integrated plant according to any one of the preceding claims, characterized in that the plant for the electrothermic production of ethyne comprises a steam generator, with which steam is generated from the waste heat of the electrothermic process, the plant for electricity generation comprises a device in which electricity is generated from steam, and the integrated plant comprises a steam conduit, with which steam generated in the steam generator is fed to the device in which electricity is generated from steam.

10. Integrated plant according to any one of the preceding claims, characterized in that it is connected to a weather forecasting unit.

11. Method for the flexible use of electricity, characterized in that, in an integrated plant according to one of Claims 1 to 10, at times of a

high electricity supply, the plant for the electrothermic production of ethyne is operated and at least some of the hydrogen and/or gaseous hydrocarbons obtained in addition to ethyne is stored and, at times of a low electricity supply, stored hydrogen and/or gaseous hydrocarbons are fed to the plant for electricity generation.

12. Method according to Claim 11, characterized in that the plant for the electrothermic production of ethyne has an arc reactor, and the gas mixture obtained from the arc reactor is mixed with a hydrocarbon-containing gas or a hydrocarbon-containing liquid for cooling.

13. Method according to Claim 12, characterized in that the type and/or amount of the gas and/or the liquid is chosen in dependence on the expected electricity supply.

14. Method according to any one of Claims 11 to 13, characterized in that the electricity supply is calculated in advance from the data of a weather forecast.

15. Method according to any one of Claims 11 to 14, characterized in that the plant for electricity generation is a gas-and-steam turbine power plant and, in the integrated plant, when there is a high electricity supply, the plant for the electrothermic production of ethyne is operated with an output of over 80% of the rated capacity and the plant for electricity generation is operated at 0-50% of the rated electrical capacity and, when there is a low electricity supply, the plant for the electrothermic production of ethyne is operated with an output of 0-50% of the rated capacity and the plant for electricity generation is

operated at over 80% of the rated electrical capacity.

16. Method according to any one of Claims 11 to 15, comprising the steps of

a) setting a first threshold value and a second threshold value for an electricity supply,

b) determining the electricity supply,

c) changing the electrical power output of the plant for electricity generation in dependence on the electricity supply if the electricity supply exceeds the first threshold value and changing the output of the plant for the electrothermic production of ethyne in dependence on the electricity supply if the electricity supply is below the second threshold value, and

d) repeating steps b) and c).

17. Method according to Claim 16, characterized in that the first threshold value and the second threshold value are the same.

18. Method according to any one of Claims 11 to 17, characterized in that the plant for the electrothermic production of ethyne comprises at least one arc reactor and, within a calendar year, the arc reactors are operated on average for at least 2500 full-load hours, with preference at least 4000 full-load hours and with particular preference at least 5000 full-load hours.

19. Method according to any one of Claims 1 to 18, characterized in that, within a calendar year, the plant for electricity generation is operated for at least 4000 full-load hours, with preference at least 5000 full-load hours and with particular preference at least 5500 full-load hours.

20. Method according to one of Claims 11 to 19, characterized in that the ethyne produced in the plant for the electrothermic production of ethyne is converted in at least one further process into a further product and a byproduct from this process is used in the plant for electricity generation for the generation of electricity.

21. Method according to any one of Claims 11 to 20, characterized in that the ethyne produced in the plant for the electrothermic production of ethyne is converted in at least one further process into a further product and heat generated during this process is used in the plant for electricity generation for the generation of electricity.