CLAIMS

1. The method of evaluating the fatigue level of the component of the marine diesel engine, the method comprising:

generating, for the component, at least two evaluation points selected from: an operation load evaluation point relating to an operation load of the marine diesel engine; an operation load variation evaluation point relating to variation of the operation load of the marine diesel engine; an operation cycle evaluation point relating to an operation cycle of the marine diesel engine; a fuel property evaluation point relating to a property of fuel of the marine diesel engine; a combustibility evaluation point relating to combustibility of the fuel; and an exhaust gas temperature evaluation point relating to temperature of exhaust gas of the marine diesel engine;

calculating a total evaluation point of the fatigue level of the component by adding at least two of the generated evaluation points; and

evaluating the fatigue level of the component based on the total evaluation point,

wherein the operation load evaluation point includes a product of an average load factor of the marine diesel engine and a fatigue level influence coefficient relating to the operation load set for each component.

2. The method of evaluating the fatigue level of the component of the marine diesel engine, the method comprising:

generating, for the component, at least two evaluation points selected from: an operation load evaluation point relating to an operation load of the marine diesel engine; an operation load variation evaluation point relating to variation of the operation load of the marine diesel engine; an operation cycle evaluation point relating to an operation

cycle of the marine diesel engine; a fuel property evaluation point relating to a property of fuel of the marine diesel engine; a combustibility evaluation point relating to combustibility of the fuel; and an exhaust gas temperature evaluation point relating to temperature of exhaust gas of the marine diesel engine;

calculating a total evaluation point of the fatigue level of the component by adding at least two of the generated evaluation points; and

evaluating the fatigue level of the component based on the total evaluation point,

wherein the operation load variation evaluation point includes:

a product of an accumulated number of starts and stops of the marine diesel engine and a fatigue level influence coefficient relating to the accumulated number of starts and stops set for each component; and

a product of an accumulated number of reciprocating operations that is an accumulated value of number of reciprocating operations between a low load region and a high load region of the marine diesel engine set for each component and a fatigue level influence coefficient relating to the accumulated number of reciprocating operations set for each component.

3. The method of evaluating the fatigue level of the component of the marine diesel engine, the method comprising:

generating, for the component, at least two evaluation points selected from: an operation load evaluation point relating to an operation load of the marine diesel engine; an operation load variation evaluation point relating to variation of the operation load of the marine diesel engine; an operation cycle evaluation point relating to an operation

cycle of the marine diesel engine; a fuel property evaluation point relating to a property of fuel of the marine diesel engine; a combustibility evaluation point relating to combustibility of the fuel; and an exhaust gas temperature evaluation point relating to temperature of exhaust gas of the marine diesel engine;

calculating a total evaluation point of the fatigue level of the component by adding at least two of the generated evaluation points; and

evaluating the fatigue level of the component based on the total evaluation point,

wherein the operation cycle evaluation point includes:

a product of an accumulated number of operation cycles of the marine diesel engine and a fatigue level influence coefficient relating to the accumulated number of operation cycles set for each component; and

a product of an accumulated number of operation cycles with load that is an accumulated number of operation cycles of the marine diesel engine at equal to or more than a load factor set for each component and a fatigue level influence coefficient relating to the accumulated number of operation cycles with load set for each component.

4. The method of evaluating the fatigue level of the component of the marine diesel engine, the method comprising:

generating, for the component, at least two evaluation points selected from: an operation load evaluation point relating to an operation load of the marine diesel engine; an operation load variation evaluation point relating to variation of the operation load of the marine diesel engine; an operation cycle evaluation point relating to an operation cycle of the marine diesel engine; a fuel property evaluation point relating to a property of fuel of the marine diesel

engine; a combustibility evaluation point relating to combustibility of the fuel; and an exhaust gas temperature evaluation point relating to temperature of exhaust gas of the marine diesel engine;

calculating a total evaluation point of the fatigue level of the component by adding at least two of the generated evaluation points; and

evaluating the fatigue level of the component based on the total evaluation point,

wherein the fuel property evaluation point includes a product of concentration of an ingredient contained in the fuel and a fatigue level influence coefficient relating to the concentration of the ingredient set for each component.

5. The method of evaluating the fatigue level of the component of the marine diesel engine according to claim 4, wherein the ingredient is one or more selected from a group consisting of: sulfur; vanadium; sodium; aluminum and silicon; and sediment.

6. The method of evaluating the fatigue level of the component of the marine diesel engine, the method comprising:

generating, for the component, at least two evaluation points selected from: an operation load evaluation point relating to an operation load of the marine diesel engine; an operation load variation evaluation point relating to variation of the operation load of the marine diesel engine; an operation cycle evaluation point relating to an operation cycle of the marine diesel engine; a fuel property evaluation point relating to a property of fuel of the marine diesel engine; a combustibility evaluation point relating to combustibility of the fuel; and an exhaust gas temperature evaluation point relating to temperature of exhaust gas of

the marine diesel engine;

calculating a total evaluation point of the fatigue level of the component by adding at least two of the generated evaluation points; and

evaluating the fatigue level of the component based on the total evaluation point,

wherein the fuel property evaluation point includes a product of a ratio of concentration of two ingredients contained in the fuel and a fatigue level influence coefficient relating to the ratio of concentration set for each component.

7. The method of evaluating the fatigue level of the component of the marine diesel engine according to claim 6, wherein the ratio is a ratio of concentration of sodium with respect to concentration of vanadium.

8. The method of evaluating the fatigue level of the component of the marine diesel engine, the method comprising:

generating, for the component, at least two evaluation points selected from: an operation load evaluation point relating to an operation load of the marine diesel engine; an operation load variation evaluation point relating to variation of the operation load of the marine diesel engine; an operation cycle evaluation point relating to an operation cycle of the marine diesel engine; a fuel property evaluation point relating to a property of fuel of the marine diesel engine; a combustibility evaluation point relating to combustibility of the fuel; and an exhaust gas temperature evaluation point relating to temperature of exhaust gas of the marine diesel engine;

calculating a total evaluation point of the fatigue level of the component by adding at least two of the

generated evaluation points; and

evaluating the fatigue level of the component based on the total evaluation point,

wherein the combustibility evaluation point includes a product of a value of CCAI that is a calculated carbon aromaticity index of the fuel and a fatigue level influence coefficient relating to combustibility set for each component.

9. The method of evaluating the fatigue level of the component of the marine diesel engine according to any one of claims 1 to 8, wherein the exhaust gas temperature evaluation point includes a product of temperature of the exhaust gas being measured and a fatigue level influence coefficient relating to the temperature of the exhaust gas set for each component.

10. A method of diagnosing a remaining lifetime of a component of a marine diesel engine, comprising:

diagnosing a remaining lifetime of the component, based on a fatigue level of the component evaluated by the method of evaluating the fatigue level according to any one of claims 1 to 8.

11. A fatigue level evaluation device for a component of a marine diesel engine, the fatigue level evaluation device being configured to evaluate a fatigue level of the component of the marine diesel engine using the method of evaluating the fatigue level of the component of the marine diesel engine according to any one of claims 1 to 8, and comprising:

a calculation unit configured to calculate, for the component, a total evaluation point of the fatigue level of the component by adding at least two evaluation points

selected from: an operation load evaluation point relating to an operation load of the marine diesel engine; an operation load variation evaluation point relating to variation of the operation load of the marine diesel engine; an operation cycle evaluation point relating to an operation cycle of the marine diesel engine; a fuel property evaluation point relating to a property of fuel of the marine diesel engine; a combustibility evaluation point relating to combustibility of the fuel; and an exhaust gas temperature evaluation point relating to temperature of exhaust gas of the marine diesel engine; and

an evaluation unit configured to evaluate a fatigue level of the component based on the total evaluation point.

12. A remaining lifetime diagnosis device for a component of a marine diesel engine, the remaining lifetime diagnosis device being configured to diagnose a remaining lifetime of the component of the marine diesel engine using the method of evaluating the fatigue level of the component of the marine diesel engine according to any one of claims 1 to 8, and comprising:

a calculation unit configured to calculate, for the component, a total evaluation point of a fatigue level of the component by adding at least two evaluation points selected from: an operation load evaluation point relating to an operation load of the marine diesel engine; an operation load variation evaluation point relating to variation of the operation load of the marine diesel engine; an operation cycle evaluation point relating to an operation cycle of the marine diesel engine; a fuel property evaluation point relating to a property of fuel of the marine diesel engine; a combustibility evaluation point relating to combustibility of the fuel; and an exhaust gas temperature evaluation point

elating to temperature of exhaust gas of the marine diesel engine;

an evaluation unit configured to evaluate a fatigue level of the component based on the total evaluation point; and

a diagnosis unit configured to diagnose the remaining lifetime of the component based on the fatigue level.

13. A system comprising:

the marine diesel engine; and

the fatigue level evaluation device according to claim 11.

14. A system comprising:

the marine diesel engine; and

the remaining lifetime diagnosis device according to claim 12.