to one ~~aspect of the present invention~~example, provided is a flange tightening training system in which flanges with a gasket interposed between the flanges are tightened with bolts and nuts, the flange tightening training system including: a flange tightening training unit configured to provide training of flange tightening, the flange tightening training unit being configured to generate flange tightening training information; a tightening feeling training unit configured to provide training of tightening feeling including a torque feeling of flange tightening, the tightening feeling training unit being configured to generate tightening feeling training information; an ability determination unit configured to determine ability of flange tightening, with the flange tightening training information, the ability determination unit being configured to generate ability determination information; and a management unit configured to perform training management, in link with any or at least two of the flange tightening training unit, the tightening feeling training unit, and the ability determination unit.

[0006a] According to an aspect, the present disclosure refers to a flange tightening training system in which flanges with a gasket interposed between the flanges are tightened with bolts and nuts, the flange tightening training system comprising: a flange tightening training unit configured to provide a trainee with explanation training of flange tightening, the flange tightening training unit being configured to generate flange tightening training information after completion of the explanation training; a tightening feeling training unit configured to provide the trainee with practical training of tightening feeling including a torque feeling of flange tightening, the tightening feeling training

unit being configured to generate tightening feeling training information after completion of the practical training; an ability determination unit configured to detect an axial force of each of the bolts to determine ability of flange tightening with a variation of each of the detected axial forces obtained by a difference between each of the detected axial forces of the bolts and a reference value for the detected axial forces, or with a variation of a mean value obtained by a difference between the mean value of the detected axial forces of the bolts and a reference value for the detected axial forces, the ability determination unit being configured to generate ability determination information; and a management unit configured to manage the explanation training and the practical training, in link with the flange tightening training unit, the tightening feeling training unit, and the ability determination unit, the management unit configured to capture the flange tightening training information and the tightening feeling training information to perform a determination of the ability of flange tightening in the ability determination unit after the completion of the explanation training.

[0006b] According to another aspect, the present disclosure refers to a program for causing a computer to perform: a function of providing a trainee with explanation training of flange tightening and generating flange tightening training information after completion of the explanation training; a function of providing the trainee with practical training of tightening feeling of flange tightening and generating tightening feeling training information after completion of the practical training; a function of detecting an axial force of each of bolts, determining ability of flange tightening with a variation of each of the detected axial forces obtained by a difference between each of the detected axial forces of the bolts and a reference value for the detected axial forces,

or with a variation of a mean value obtained by a difference between the mean value of the detected axial forces of the bolts and a reference value for the detected axial forces, and generating ability determination information; and a function of managing the explanation training and the practical training, in link with a flange tightening training unit, a tightening feeling training unit, and an ability determination unit, and capturing the flange tightening training information and the tightening feeling training information to perform a determination of the ability of flange tightening in the ability determination unit after the completion of the explanation training.

[0006c] According to another aspect, the present disclosure refers to a flange tightening training method of tightening flanges with a gasket interposed between the flanges, with bolts and nuts, the flange tightening training method comprising: providing a trainee with explanation training of flange tightening and acquiring flange tightening training information after completion of the explanation training; providing the trainee with practical training of tightening feeling of flange tightening and acquiring tightening feeling training information after completion of the practical training; detecting an axial force of each of the bolts to determine ability of flange tightening with a variation of each of the detected axial forces obtained by a difference between each of the detected axial forces of the bolts and a reference value for the detected axial forces, or with a variation of a mean value obtained by a difference between the mean value of the detected axial forces of the bolts and a reference value for the detected axial forces, and acquiring ability determination information; and managing the explanation training and the practical training, in link with a flange tightening training unit, a tightening feeling training unit, and an ability determination unit, and

capturing the flange tightening training information and the tightening feeling training information to perform a determination of the ability of flange tightening in the ability determination unit after the completion of the explanation training.

[0006d] According to another aspect, the present disclosure refers to an information terminal to be wiredly or wirelessly connected to the management unit of the flange tightening training system according to the above aspects, wherein the information terminal presents, in connection with the management unit, any or at least two pieces of information of the flange tightening training information, the tightening feeling training information, and the ability determination information in association with identification information of the trainee or the identification information.

[0007] In the flange tightening training system, the management unit may further manage any or at least two pieces of information of the flange tightening training information, the tightening feeling training information, and the ability determination information in association with identification information of a trainee.

The flange tightening training system may further include: a storage unit configured to accommodate any or at least two pieces of information of the flange tightening training information, the tightening feeling training information, and the ability determination information in association with identification information of a trainee; and an information presentation unit configured to present any or at least two pieces of information of the flange tightening training information, the tightening feeling training

information, and the ability determination information in association with the identification information.

The flange tightening training system may further include: an information terminal to be connected to the management unit wiredly or wirelessly; and an identification tag accommodating identification information of a trainee, in which based on the identification information read from the identification tag, the information terminal may present the flange tightening training information, the tightening feeling training information, or the ability determination information in association with the identification information.

[0008] In order to achieve the above objective, according to one ~~aspect of the present invention~~example, provided is a flange tightening training device with which flanges with a gasket interposed between the flanges are tightened with bolts and nuts, the flange tightening training device including: a detection unit configured to detect tightening axial forces; and an evaluation unit configured to compare each of the detected axial forces or a mean value of the detected axial forces with a target axial force to calculate a variation of each of the detected axial forces or a variation of the mean value of the detected axial forces, the evaluation unit being configured to calculate a piece of evaluation information indicating whether or not the variation is within a reference value.

The flange tightening training device may further include: a storage unit configured to accommodate any or at least two of a set of the detected axial forces, the mean value, the variation, and the piece of evaluation information in association with identification information of a trainee; and an information presentation unit configured to present any or at least two of the set of the detected axial forces, the mean value, the variation, and the piece of evaluation information, together with the identification information.

[0009] In order to achieve the above objective, according to one ~~aspect of the present invention~~example, provided is a program for causing a computer to perform: a function of providing training of flange tightening and generating flange tightening training information; a function of providing training of tightening feeling of flange tightening and generating tightening feeling training information; a function of determining ability of flange tightening, based on the flange tightening training information and generating ability determination information; and a function of performing training management, in link with any or at least two of a flange tightening training unit, a tightening feeling training unit, and an ability determination unit.

The program may further cause the computer to perform: a function of managing any or at least two pieces of information of the flange tightening training information, the tightening feeling training information, and the ability determination information in association with identification information of a trainee.

In order to achieve the above objective, according to one ~~aspect of the present invention~~example, provided is a program for causing a computer to perform:

a function of capturing detected axial forces; and

a function of comparing each of the detected axial forces or a mean value of the detected axial forces with a target axial force to calculate a variation of each of the detected axial forces or a variation of the mean value of the detected axial forces and calculating a piece of evaluation information indicating whether or not the variation is within a reference value.

[0010] In order to achieve the above objective, according to one ~~aspect of the present invention~~example, provided is a flange tightening training method of tightening flanges with a gasket interposed between the flanges, with bolts and nuts, the

flange tightening training method including: providing training of flange tightening and acquiring flange tightening training information; providing training of tightening feeling of flange tightening and acquiring tightening feeling training information; determining ability of flange tightening, with the flange tightening training information and acquiring ability determination information; and performing training management, in link with any or at least two of a flange tightening training unit, a tightening feeling training unit, and an ability determination unit.

The flange tightening training method may further include: managing any or at least two pieces of information of the flange tightening training information, the tightening feeling training information, and the ability determination information in association with identification information of a trainee.

In order to achieve the above objective, according to one ~~aspect of the present invention~~example, provided is a flange tightening training method of tightening flanges with a gasket interposed between the flanges, with bolts and nuts, the flange tightening training method including:

detecting tightening axial forces;

and comparing each of the detected axial forces or a mean value of the detected axial forces with a target axial force to calculate a variation of each of the detected axial forces or a variation of the mean value of the detected axial forces and calculating a piece of evaluation information indicating whether or not the variation is within a reference value.

[0011] In order to achieve the above objective, according to one ~~aspect of the present invention~~example, provided is an information terminal to be wiredly or wirelessly connected to the management unit of the above flange tightening training system, or to be wiredly or wirelessly connected to any of the flange tightening training devices, in which the information

CLAIMS

1. A flange tightening training system in which flanges with a gasket interposed between the flanges are tightened with bolts and nuts, the flange tightening training system comprising:

a flange tightening training unit configured to provide a trainee with explanation training of flange tightening, the flange tightening training unit being configured to generate flange tightening training information after completion of the explanation training;

a tightening feeling training unit configured to provide the trainee with practical training of tightening feeling including a torque feeling of flange tightening, the tightening feeling training unit being configured to generate tightening feeling training information after completion of the practical training;

an ability determination unit configured to detect an axial force of each of the bolts to determine ability of flange tightening with a variation of each of the detected axial forces obtained by a difference between each of the detected axial forces of the bolts and a reference value for the detected axial forces, or with a variation of a mean value obtained by a difference between the mean value of the detected axial forces of the bolts and a reference value for the detected axial forces, ~~with the flange tightening training information,~~ the ability determination unit being configured to generate ability determination information; and

a management unit configured to manage the explanation training and the practical training~~perform training management~~, in link with ~~any or at least two of~~ the flange tightening training unit, the tightening feeling training unit, and the ability determination unit, the management unit configured to capture the flange tightening training information and the tightening feeling training information to

perform a determination of the ability of flange tightening in the ability determination unit after the completion of the explanation training.

2. The flange tightening training system according to claim 1,

wherein the management unit further manages any or at least two pieces of information of the flange tightening training information, the tightening feeling training information, and the ability determination information in association with identification information of ~~a~~ the trainee.

3. The flange tightening training system according to claim 1, further comprising:

a storage unit configured to accommodate any or at least two pieces of information of the flange tightening training information, the tightening feeling training information, and the ability determination information in association with identification information of ~~a~~ the trainee; and

an information presentation unit configured to present any or at least two pieces of information of the flange tightening training information, the tightening feeling training information, and the ability determination information in association with the identification information.

4. The flange tightening training system according to claim 1, further comprising:

an information terminal to be connected to the management unit wiredly or wirelessly; and

an identification tag accommodating identification information of ~~a~~ the trainee,

wherein based on the identification information read from the identification tag, the information terminal presents the

flange tightening training information, the tightening feeling training information, or the ability determination information in association with the identification information.

~~5. A flange tightening training device with which flanges with a gasket interposed between the flanges are tightened with bolts and nuts, the flange tightening training device comprising:~~

~~a detection unit configured to detect tightening axial forces; and~~

~~an evaluation unit configured to compare each of the detected axial forces or a mean value of the detected axial forces with a target axial force to calculate a variation of each of the detected axial forces or a variation of the mean value of the detected axial forces, the evaluation unit being configured to calculate a piece of evaluation information indicating whether or not the variation is within a reference value.~~

~~6. The flange tightening training device according to claim 5, further comprising:~~

~~a storage unit configured to accommodate any or at least two of a set of the detected axial forces, the mean value, the variation, and the piece of evaluation information in association with identification information of a trainee; and~~

~~an information presentation unit configured to present any or at least two of the set of the detected axial forces, the mean value, the variation, and the piece of evaluation information, together with the identification information.~~

~~7~~5. A program for causing a computer to perform:

a function of providing a trainee with explanation training of flange tightening and generating flange tightening training information after completion of the explanation

training;

a function of providing the trainee with practical training of tightening feeling of flange tightening and generating tightening feeling training information after completion of the practical training;

a function of detecting an axial force of each of bolts, determining ability of flange tightening with a variation of each of the detected axial forces obtained by a difference between each of the detected axial forces of the bolts and a reference value for the detected axial forces, or with a variation of a mean value obtained by a difference between the mean value of the detected axial forces of the bolts and a reference value for the detected axial forces, ~~based on the flange tightening training information~~ and generating ability determination information; and

a function of managing the explanation training and the practical training~~performing training management~~, in link with ~~any or at least two of~~ a flange tightening training unit, a tightening feeling training unit, and an ability determination unit, and capturing the flange tightening training information and the tightening feeling training information to perform a determination of the ability of flange tightening in the ability determination unit after the completion of the explanation training.

68. The program according to claim ~~7~~5, further causing the computer to perform:

a function of managing any or at least two pieces of information of the flange tightening training information, the tightening feeling training information, and the ability determination information in association with identification information of ~~a~~ the trainee.

~~9. A program for causing a computer to perform:~~

~~a function of capturing detected axial forces; and~~

~~a function of comparing each of the detected axial forces or a mean value of the detected axial forces with a target axial force to calculate a variation of each of the detected axial forces or a variation of the mean value of the detected axial forces and calculating a piece of evaluation information indicating whether or not the variation is within a reference value.~~

~~10~~7. A flange tightening training method of tightening flanges with a gasket interposed between the flanges, with bolts and nuts, the flange tightening training method comprising:

providing a trainee with explanation training of flange tightening and acquiring flange tightening training information after completion of the explanation training;

providing the trainee with practical training of tightening feeling of flange tightening and acquiring tightening feeling training information after completion of the practical training;

detecting an axial force of each of the bolts to determine ~~determining~~ ability of flange tightening with a variation of each of the detected axial forces obtained by a difference between each of the detected axial forces of the bolts and a reference value for the detected axial forces, or with a variation of a mean value obtained by a difference between the mean value of the detected axial forces of the bolts and a reference value for the detected axial forces, ~~with the flange tightening training information~~ and acquiring ability determination information; and

managing the explanation training and the practical training~~performing training management~~, in link with ~~any or at least two of~~ a flange tightening training unit, a tightening feeling training unit, and an ability determination unit, and capturing the flange tightening training information and the

tightening feeling training information to perform a determination of the ability of flange tightening in the ability determination unit after the completion of the explanation training.

~~11~~8. The flange tightening training method according to claim ~~10~~7, further comprising:

managing any or at least two pieces of information of the flange tightening training information, the tightening feeling training information, and the ability determination information in association with identification information of ~~a~~ the trainee.

~~12. A flange tightening training method of tightening flanges with a gasket interposed between the flanges, with bolts and nuts, the flange tightening training method comprising:~~

~~detecting tightening axial forces; and~~

~~comparing each of the detected axial forces or a mean value of the detected axial forces with a target axial force to calculate a variation of each of the detected axial forces or a variation of the mean value of the detected axial forces and calculating a piece of evaluation information indicating whether or not the variation is within a reference value.~~

~~13~~9. An information terminal to be wiredly or wirelessly connected to the management unit of the flange tightening training system according to any of claims 1 to 3~~, or to be wiredly or wirelessly connected to the flange tightening training device according to claim 5 or 6~~,

wherein the information terminal

~~presents~~, in connection with the management unit, any or at least two pieces of information of the flange tightening training information, the tightening feeling training information, and the ability determination information in

association with identification information of ~~a~~ the trainee or the identification information~~, or~~

~~presents, in connection with the flange tightening training device, any or at least two of a set of the detected axial forces, the mean value, the variation, and the piece of evaluation information in association with identification information of a trainee or the identification information~~.