

CLAIMS

1. A risk assessment device for displaying a risk matrix in which a probability of malfunction and a degree of influence of malfunction are set as two axes, the risk assessment device comprising:

a malfunction probability calculation processing unit that calculates the probability of malfunction of a target device group;

a malfunction probability acquisition unit configured to acquire, with respect to a target device group, a data group that indicates a temporal change of the probability of malfunction calculated by the malfunction probability calculation processing unit from a current point in time;

an influence degree acquisition unit configured to acquire a degree of influence that corresponds to the target device group; and

an image data creation unit configured to create image data for displaying a plot diagram that is obtained by plotting, with respect to each probability of malfunction that constitutes the acquired data group, a pair of the probability of malfunction and the acquired degree of influence on the risk matrix,

wherein the malfunction probability calculation processing unit includes:

a process device group calculation unit that calculates the probability of malfunction of a process device group that is constituted by one piping system and a plurality of process devices that are provided in the piping system; and

a steam-utilizing device group calculation unit that calculates the probability of malfunction of a steam-utilizing device group that includes a steam utilizing device that utilizes steam and a plurality of process device groups that are associated with the steam utilizing device,

wherein the steam-utilizing device group calculation unit includes:

a process device group acquisition unit that acquires the probabilities of malfunction of the respective process device groups constituting the target steam-utilizing device group;

a steam-utilizing device acquisition unit that acquires the probability of malfunction of a steam-utilizing device in the target steam-utilizing device group; and

a malfunction probability calculation unit that calculates the probability of malfunction of the target steam-utilizing device group using the acquired probabilities of malfunction of the respective process device groups and the acquired probability of malfunction of the steam-utilizing device.

2. A risk assessment device for displaying a risk matrix in which a probability of

malfunction and a degree of influence of malfunction are set as two axes, the risk assessment device comprising:

- a malfunction probability acquisition unit configured to acquire, with respect to a target device group, a data group that indicates a temporal change of the probability of malfunction from a current point in time;

- an influence degree acquisition unit configured to acquire a degree of influence that corresponds to the target device group;

- an image data creation unit configured to create image data for displaying a plot diagram that is obtained by plotting, with respect to each probability of malfunction that constitutes the acquired data group, a pair of the probability of malfunction and the acquired degree of influence on the risk matrix;

- a target malfunction curve calculation unit configured to calculate a target malfunction curve that shows a change of the probability of malfunction over time with respect to a target process device; and

- a malfunction probability calculation unit configured to calculate the probability of malfunction of the target process device based on the calculated target malfunction curve,

 - wherein the target malfunction curve calculation unit includes:

 - a parameter storage unit that calculates, based on data for calculation, one or more parameters for calculating the target malfunction curve and stores the calculated parameters, the parameters relating to piping system-related items, the data for calculation being stored in a storage unit in which the piping system-related items and the number of years passed before malfunction are stored as the data for calculation with respect to each of a large number of process devices, and the piping system-related items relating to a piping system in which the process device is provided;

 - a calculation condition acquisition unit that acquires the piping system-related items with respect to the target process device and device-related items that relate to the target process device itself;

 - a parameter acquisition unit that acquires a calculation parameter for obtaining the target malfunction curve based on the piping system-related items acquired with respect to the target process device and the parameters stored in the parameter storage unit;

 - a correction method storage unit that stores a correction method that corresponds to the device-related items;

 - a parameter correction unit that corrects the calculation parameter acquired by the parameter acquisition unit based on the correction method corresponding to the acquired device-related items; and

 - a malfunction curve calculation unit that calculates the target malfunction

curve based on the calculation parameter corrected by the parameter correction unit.

3. The risk assessment device according to claim 1 or 2, further comprising

a mode switching unit configured to switch the image data creation unit between a device group unit mode, which is for creating display data for displaying a plot diagram that is obtained by performing plotting for each device group, and a constituent element unit mode, which is for creating display data for displaying a plot diagram that is obtained by performing plotting for each constituent element that constitutes the device group,

the malfunction probability acquisition unit is capable of acquiring a whole data group, which is the data group regarding the whole device group, and individual data groups, which are each the data group regarding any of constituent elements constituting the device group,

the influence degree acquisition unit is capable of acquiring a whole influence degree, which is the degree of influence regarding the whole device group, and individual influence degrees, which are each the degree of influence regarding any of the constituent elements constituting the device group, and

the image data creation unit creates,

in the device group unit mode, image data for displaying a plot diagram that is obtained by plotting, with respect to each probability of malfunction that constitutes the acquired whole data group, a pair of the probability of malfunction and the whole influence degree, on the risk matrix, and

in the constituent element unit mode, image data for displaying a plot diagram that is obtained by plotting, for each of the acquired individual data groups, with respect to each probability of malfunction that constitutes the individual data group, a pair of the probability of malfunction and the individual influence degree that corresponds to the individual data group, on the risk matrix.

4. The risk assessment device according to any one of claims 1 to 3,

wherein the malfunction probability acquisition unit acquires the data group for each type of malfunction,

the influence degree acquisition unit acquires a corresponding degree of influence for each type of malfunction, and

the image data creation unit creates image data for displaying a plot diagram that is obtained by plotting, for each type of malfunction, with respect to each probability of malfunction that constitutes the acquired data group, a pair of the probability of malfunction and the corresponding degree of influence, on the risk matrix.

5. The risk assessment device according to any one of claims 1 to 4,
wherein the image data creation unit creates image data for displaying a plot diagram on which a reference line for understanding risks is superimposed.
6. A risk assessment method to be executed by a computer, the risk assessment method being for displaying a risk matrix in which a probability of malfunction and a degree of influence of malfunction are set as two axes, the risk assessment method comprising:
a malfunction probability calculation processing step of calculating the probability of malfunction of a target device group;
a malfunction probability acquisition step of acquiring, with respect to a target device group, a data group that indicates a temporal change of the probability of malfunction calculated in the malfunction probability calculation processing step from a current point in time;
an influence degree acquisition step of acquiring a degree of influence that corresponds to the target device group; and
an image data creation step of creating image data for displaying a plot diagram that is obtained by plotting, with respect to each probability of malfunction that constitutes the acquired data group, a pair of the probability of malfunction and the acquired degree of influence on the risk matrix,
wherein the malfunction probability calculation processing step includes:
a process device group calculation step of calculating the probability of malfunction of a process device group that is constituted by one piping system and a plurality of process devices that are provided in the piping system; and
a steam-utilizing device group calculation step of calculating the probability of malfunction of a steam-utilizing device group that includes a steam utilizing device that utilizes steam and a plurality of process device groups that are associated with the steam utilizing device,
wherein the steam-utilizing device group calculation step includes:
a process device group acquisition step of acquiring the probabilities of malfunction of the respective process device groups constituting the target steam-utilizing device group;
a steam-utilizing device acquisition step of acquiring the probability of malfunction of a steam-utilizing device in the target steam-utilizing device group; and
a malfunction probability calculation step of calculating the probability of malfunction of the target steam-utilizing device group using the acquired probabilities of malfunction of the respective process device groups and the acquired probability of malfunction of the steam-utilizing device.

7. A risk assessment method to be executed by a computer, the risk assessment method being for displaying a risk matrix in which a probability of malfunction and a degree of influence of malfunction are set as two axes, the risk assessment method comprising:

- a malfunction probability acquisition step of acquiring, with respect to a target device group, a data group that indicates a temporal change of the probability of malfunction from a current point in time;

- an influence degree acquisition step of acquiring a degree of influence that corresponds to the target device group;

- an image data creation step of creating image data for displaying a plot diagram that is obtained by plotting, with respect to each probability of malfunction that constitutes the acquired data group, a pair of the probability of malfunction and the acquired degree of influence on the risk matrix;

- a target malfunction curve calculation step of calculating a target malfunction curve that shows a change of the probability of malfunction over time with respect to a target process device; and

- a malfunction probability calculation step of calculating the probability of malfunction of the target process device based on the calculated target malfunction curve,

- wherein the target malfunction curve calculation step includes:

- a parameter storing step of calculating, based on data for calculation, one or more parameters for calculating the target malfunction curve and storing the calculated parameters, the parameters relating to piping system-related items, the data for calculation being stored in a storage unit in which the piping system-related items and the number of years passed before malfunction are stored as the data for calculation with respect to each of a large number of process devices, and the piping system-related items relating to a piping system in which the process device is provided;

- a calculation condition acquisition step of acquiring the piping system-related items with respect to the target process device and device-related items that relate to the target process device itself;

- a parameter acquisition step of acquiring a calculation parameter for obtaining the target malfunction curve based on the piping system-related items acquired with respect to the target process device and the parameters stored in the parameter storing step;

- a correction method storage step of storing a correction method that corresponds to the device-related items;

- a parameter correction step of correcting the calculation parameter acquired in the parameter acquisition step based on the correction method corresponding to the acquired device-related items; and

a malfunction curve calculation step of calculating the target malfunction curve based on the calculation parameter corrected in the parameter correction step.

8. A risk assessment program for displaying a risk matrix in which a probability of malfunction and a degree of influence of malfunction are set as two axes, the risk assessment program causing a computer to realize:

a malfunction probability calculation processing function of calculating the probability of malfunction of a target device group;

a malfunction probability acquisition function of acquiring, with respect to a target device group, a data group that indicates a temporal change of the probability of malfunction calculated by the malfunction probability calculation processing function from a current point in time;

an influence degree acquisition function of acquiring a degree of influence that corresponds to the target device group; and

an image data creation function of creating image data for displaying a plot diagram that is obtained by plotting, with respect to each probability of malfunction that constitutes the acquired data group, a pair of the probability of malfunction and the acquired degree of influence on the risk matrix,

wherein the malfunction probability calculation processing function includes:

a process device group calculation function of calculating the probability of malfunction of a process device group that is constituted by one piping system and a plurality of process devices that are provided in the piping system; and

a steam-utilizing device group calculation function of calculating the probability of malfunction of a steam-utilizing device group that includes a steam utilizing device that utilizes steam and a plurality of process device groups that are associated with the steam utilizing device,

wherein the steam-utilizing device group calculation function includes:

a process device group acquisition function of acquiring the probabilities of malfunction of the respective process device groups constituting the target steam-utilizing device group;

a steam-utilizing device acquisition function of acquiring the probability of malfunction of a steam-utilizing device in the target steam-utilizing device group; and

a malfunction probability calculation function of calculating the probability of malfunction of the target steam-utilizing device group using the acquired probabilities of malfunction of the respective process device groups and the acquired probability of malfunction of the steam-utilizing device.

9. A risk assessment program for displaying a risk matrix in which a probability of malfunction and a degree of influence of malfunction are set as two axes, the risk assessment program causing a computer to realize:

- a malfunction probability acquisition function of acquiring, with respect to a target device group, a data group that indicates a temporal change of the probability of malfunction from a current point in time;

- an influence degree acquisition function of acquiring a degree of influence that corresponds to the target device group;

- an image data creation function of creating image data for displaying a plot diagram that is obtained by plotting, with respect to each probability of malfunction that constitutes the acquired data group, a pair of the probability of malfunction and the acquired degree of influence on the risk matrix;

- a target malfunction curve calculation function of calculating a target malfunction curve that shows a change of the probability of malfunction over time with respect to a target process device; and

- a malfunction probability calculation function of calculating the probability of malfunction of the target process device based on the calculated target malfunction curve,

- wherein the target malfunction curve calculation function causes the computer to realize:

- a parameter storing function of calculating, based on data for calculation, one or more parameters for calculating the target malfunction curve and storing the calculated parameters, the parameters relating to piping system-related items, the data for calculation being stored in a storage unit in which the piping system-related items and the number of years passed before malfunction are stored as the data for calculation with respect to each of a large number of process devices, and the piping system-related items relating to a piping system in which the process device is provided;

- a calculation condition acquisition function of acquiring the piping system-related items with respect to the target process device and device-related items that relate to the target process device itself;

- a parameter acquisition function of acquiring a calculation parameter for obtaining the target malfunction curve based on the piping system-related items acquired with respect to the target process device and the parameters stored by the parameter storage function;

- a correction method storage function of storing a correction method that corresponds to the device-related items;

- a parameter correction function of correcting the calculation parameter

acquired by the parameter acquisition unit based on the correction method corresponding to the acquired device-related items; and

a malfunction curve calculation function of calculating the target malfunction curve based on the calculation parameter corrected by the parameter correction function.