

CLAIMS

1. A risk assessment device for calculating a probability of malfunction of a process device that is provided in a piping system of a steam plant, the risk assessment device comprising:

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.

2. The risk assessment device according to claim 1,

wherein the parameter storage unit calculates the parameters by performing survival time analysis based on the piping system-related items and the number of years passed before malfunction of each process device, and assessing influence of the piping system-

related items on the number of years passed before malfunction.

3. The risk assessment device according to claim 1 or 2,
wherein the piping system-related items include an item that relates to a usage state of the piping system.
4. The risk assessment device according to any one of claims 1 to 3,
wherein the device-related items include an item that relates to an additional configuration that is provided to the target process device.
5. The risk assessment device according to any one of claims 1 to 4,
wherein the device-related items include either or both of an item that relates to an installation state of the target process device in relation to the piping system and an item that relates to performance of the target process device in relation to the piping system.
6. The risk assessment device according to any one of claims 1 to 5,
wherein the calculation condition acquisition unit also acquires operation-related items that relate to operations performed on the target process device,
the target malfunction curve calculation unit includes a malfunction curve correction unit that corrects, based on the operation-related items, the target malfunction curve calculated by the malfunction curve calculation unit, and
the malfunction probability calculation unit calculates the probability of malfunction of the target process device based on the target malfunction curve corrected by the malfunction curve correction unit.
7. The risk assessment device according to any one of claims 1 to 6,
wherein, with respect to the target process device, the target malfunction curve calculation unit calculates a target malfunction curve for each type of malfunction, and
the malfunction probability calculation unit calculates the probability of malfunction of the target process device for each type of malfunction based on the calculated target malfunction curve.
8. A risk assessment method for causing a computer to calculate a probability of malfunction of a process device that is provided in a piping system of a steam plant, the risk assessment method comprising:
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.

9. A risk assessment program for causing a computer to calculate a probability of malfunction of a process device that is provided in a piping system of a steam plant, the risk assessment program causing the computer to realize:

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.