[0060]

A seal handling management system 20 is a computer system that performs support processes of personnel information, sealing information, seal handling information, training information, related information, etc. in the seal handling system 2 described above by using a computer. The seal handling management system 20 includes a sealing material selection system for selecting a sealing material and a seal handling training system 34 (Fig. 9) for conducting a training described later for the contractor 6 performing the seal handling etc.

[0061]

This seal handling management system 20 includes, for example, a personal computer (hereinafter simply referred to as "PC") 24 as a client computer for the client 4, a PC 26 as a contractor computer for the contractor 6, a PC 28 as a support center computer and a training server computer (hereinafter simply referred to as "training server") 30 for the support center 8. The seal handling training system 34 acquires sensor output of a sensor included in each device of a seal handling means or training information related to the device, generates simulation information related to the devices included in the seal handling means in response to the sensor output or the training information, and presents information for presenting a process output that is output from a processing means as either or both of character information and graphic information.

[0062]

For example, the PCs 24, 26, and 28 are linked through Internet 32. The training server 30 is wired or wirelessly connected to the PC 28.

[0063]

The processing of the PC 24 includes an instruction for seal handling, an instruction for training, an instruction for selection of sealing material, an instruction for procurement, and issuance of seal handling permission.

[0064]

worker in charge of the seal handling of the sealing contractor 6 may participate in the training program.

[0076]

The PC 28 monitors the execution of the seal handling training program (S215), and when the seal handling training program is completed (S215:YES), a completion notification of the seal handling training program is issued from the PC 28 to the PCs 24, 26 (S216). In response, a training attendance report is issued from the PC 26 to the PCs 24, 28 (S217). At this point, if the contractor 6 has completed the procurement of the sealing material, a sealing material procurement report is issued from the PC 26 to the PCs 24, 28 (S218). The sealing material procurement report may be issued before completion of the seal handling training program.

[0077]

An instruction for permission of the seal handling is issued from the PC 24 to the PC 26 at least on the condition of the seal handling training, and the PC 28 is notified of the instruction for permission of the seal handling from the PC 24 (S219). This permission of the seal handling is given at least on the condition of participation in the seal handling training program. The PC 26 receiving the instruction for permission of the seal handling issues a seal handling start notification to the PCs 24, 28 (S220). The PC 26 monitors the seal handling (S221), and when the seal handling is completed (S221:YES), a seal handling completion notification is issued from the PC 26 to the PCs 24, 28 (S222).

[0078]

The PC 28 decides whether the support is to be continued (S223). If the support is to be continued (S223:YES), the PC 28 issues a support continuation notification to the PCs 24, 26 (S224). If the support is not continued (S223:NO), a support termination notification is issued from the PC 28 to the PCs 24, 26 (S225).

[0079]

<Sealing Material Selection System>

[0080]

Each of the PCs 70 includes a monitor 74 and an input apparatus 76. The monitor 74 may include a touch panel on a display screen to enable touch input. The input apparatus 76 includes a keyboard and a mouse and may include a barcode reader.

[0092]

Trainees 78 are persons in charge of seal handling such as employees of the contractor 6. In this case, an instructor may use any of the PCs 70 to explain contents of a teaching material.

[0093]

According to the lecture system 34-1 as described above, the trainees 78 gathering in the training room 69-1 can learn from a common lecture training material developed on the monitors 74 of the PCs 70. In some cases, the network 72 can be opened to the Internet 32 for performing supplementary lectures through e-learning, for example.

[0094]

As shown in Fig. 10, the practical training system 34-2 includes multiple practical training equipments, such as a flange tightening practical training equipment 80-1, a creep relaxation practical training equipment 80-2, a sealability practical training equipment 80-3, as examples of the seal handling means. The flange tightening practical training equipment 80-1, the creep relaxation practical training equipment 80-2, and the sealability practical training equipment 80-3 are disposed in a second training room 69-2 and individually include PCs 82. The PCs 82 are connected to the training server 30 through the network 72 and can give and receive information. Although this embodiment includes the first and second training rooms 69-1, 69-2, a single training room may be included, or three or more training rooms may be included so that the equipment is disposed in a distributed manner.

[0095]

Each of the PCs 82 is provided with a data logger 84 and a monitor 86. The data logger 84 takes a sensor output from a sensor on the apparatus body side and inputs the sensor output to the

information acquisition function, a simulation information generation function, and a simulation information presentation function. The device selection function includes, for example, a function of selectin a device required for the training from the seal handling devices including a device for simulating piping alignment, a device for simulating tightening, a device for simulating a sealing state, a device for simulating flange tightening, a device for simulating creep, a device for simulating compression failure, and a device for simulating a heat exchanger. The simulation information generation function includes a function of generating simulation information related to a device included in the seal handling devices with the acquired sensor output or the acquired training information, and the simulation information presentation function includes a function of presenting the simulation information as either or both of character information and graphic information.

[0166]

<Effects of Second Embodiment>

[0167]

According to the second embodiment, the following effects can be obtained.

[0168]

(1) In response to the issuance of seal handling promotion issued from the PC 28 and the seal handling instruction issued from the PC 24, the sealing material selection, the sealing material procurement, and the seal handling training can be unified, so that the seal handling can be made highly precise and more efficient.

[0169]

(2) In response to the seal handling instruction from the PC 24, the contractor 6 can receive the seal handling training at the support center 8, can procure a currently required sealing material for the seal handling from the support center 8, and can practice the training for the sealing material selection.

[0170]

[0175]

The practical training using this flange tightening practical training equipment 80-1 allows the trainee to recognize variations in tightening with the seal handling tool, a relationship between a tightening force and an axial force of an adjacent bolt due to elastic interaction and occurrence of uneven tightening due to an inappropriate tightening procedure, and allows the trainee to learn important matters such as the tightening force and the tightening procedure for implementing a gasket function. A result of this training is stored in the seal handling training information table 112 in correlation with the trainee.

Example 2

[0176]

A of Fig. 26 shows the creep relaxation practical training equipment 80-2 according to Example 2. In A of Fig. 26, the common portions with Fig. 25 are denoted by the same reference signs. In this creep relaxation practical training equipment 80-2, heaters 236-1, 236-2 are respectively disposed in piping portions 235 sandwiching a seal handling portion 224-3. The heaters 236-1, 236-2 may be heat-transfer heaters.

[0177]

The gasket 228 is sandwiched between the flanges 226, and the pluralities of the bolts 230 and the nuts 232 are included. Each of the bolts 230 includes the strain sensor 234 as shown in B of Fig. 26.

[0178]

In the practical training of creep relaxation, operation forms such as high-temperature operation and cycle operation are simulated as operating conditions for gaskets of different materials, and a change in axial force after tightening is detected by each of the strain sensors 234. The high-temperature operation and the cycle operation may be simulated by changing temperature through temperature control of the heaters 236-1, 236-2.

[0179]