

DESCRIPTION

TITLE OF INVENTION: INFORMATION PROCESSING SYSTEM AND
INFORMATION PROCESSING METHOD

5 TECHNICAL FIELD

[0001]

The present disclosure relates to an information processing system and an
information processing method.

Priority is claimed on Japanese Patent Application No. 2023-175281, filed
10 October 10, 2023, the content of which is incorporated herein by reference.

BACKGROUND ART

[0002]

Patent Document 1 discloses a computation device that creates an operation
schedule of a crane that transports waste in a pit (waste pit). The computation device
15 generates a gene group consisting of genes indicating an operation pattern of movement
and opening and closing of the crane in a predetermined period, and repeatedly performs
evaluation of fitness of each gene included in the gene group and update of the gene
group based on the evaluation. With such a configuration, it is possible to automatically
create an operation schedule of the crane that can bring a state of the waste in the pit to a
20 predetermined state or bring the state close to the predetermined state without relying on
the experience or intuition of an operator of the crane.

Citation List

Patent Document

[0003]

25 Patent Document 1: Japanese Patent No. 6632490

SUMMARY OF INVENTION

Technical Problem

[0004]

However, in an incineration facility including a pit in which incineration target
5 objects are accumulated, the incineration target objects are fed into the pit from a
delivery vehicle that delivers the incineration target objects. When the incineration
target objects from the delivery vehicle are received at a location at which a gripping
operation is performed by the crane, the incineration target objects received from the
delivery vehicle collide with the crane or the like, and the operation by the crane is
10 hindered. Therefore, in the incineration facility, it is preferable that the gripping
operation by the crane and the receiving operation of the incineration target objects by
the delivery vehicle do not interfere with each other.

[0005]

In this case, it is conceivable to acquire an assignment of a receiving destination
15 of the incineration target objects from the delivery vehicle and to determine the gripping
destination at which the crane grips the incineration target objects based on the
assignment. However, in such a configuration, when the number of delivery vehicles is
large, the gripping of the incineration target objects by the crane may not proceed
smoothly, and operating efficiency of the entire incineration facility may decrease.

20 [0006]

The present disclosure has been made to solve the problems described above,
and an object of the present disclosure is to provide an information processing system
and an information processing method capable of increasing operating efficiency of an
entire incineration facility while suppressing interference between a gripping operation
25 by a crane and a receiving operation by a delivery vehicle.

Solution to Problem

[0007]

In order to solve the problems described above, according to the present disclosure, there is provided an information processing system for an incineration facility including a pit in which incineration target objects are accumulated, the information processing system including: an information acquisition unit configured to acquire receiving destination information indicating a location in the pit, which is a receiving destination of the incineration target object from a delivery vehicle that delivers the incineration target object and gripping destination information indicating a location in the pit, which is the gripping destination of a crane that grips the incineration target object; a receiving destination determination unit configured to, in a case where a time for determining the receiving destination has arrived, determine the receiving destination, based on the gripping destination information indicating the location that is the gripping destination of the crane, which is determined at the time; and the gripping destination determination unit configured to, in a case where a time for determining the gripping destination has arrived, determine the gripping destination, based on the receiving destination information indicating the location that is the receiving destination of the incineration target object from the delivery vehicle, which is determined at the time. The information acquisition unit further acquires height information indicating a height of the incineration target object at each location in the pit. The receiving destination determination unit determines, based on the gripping destination information and information indicating a length of a waiting time occurring in the delivery vehicle in a relationship with another delivery vehicle or the crane, the receiving destination from among a plurality of locations in the pit, to reduce a difference in height of the incineration target objects between adjacent locations and to shorten the length of the

waiting time for the plurality of locations, by comparing results obtained from a function in which both the difference in height of the incineration target objects between the adjacent locations and the length of the waiting time are reflected.

[0008]

5 According to the present disclosure, there is provided an information processing method for an incineration facility including a pit in which incineration target objects are accumulated, the information processing method for causing one or more computers to: acquire receiving destination information indicating a location in the pit, which is a receiving destination of the incineration target object from a delivery vehicle that delivers
10 the incineration target object; acquire gripping destination information indicating a location in the pit, which is the gripping destination of a crane that grips the incineration target object; acquire height information indicating a height of the incineration target object at each location in the pit; determine, in a case where a time for determining the receiving destination has arrived, the receiving destination, based on the gripping
15 destination information indicating the location that is the gripping destination of the crane, which is determined at the time; and determine, in a case where a time for determining the gripping destination has arrived, the gripping destination, based on the receiving destination information indicating the location that is the receiving destination of the incineration target object from the delivery vehicle, which is determined at the
20 time; and determine. In the determination of the receiving destination, based on the gripping destination information and information indicating a length of a waiting time occurring in the delivery vehicle in a relationship with another delivery vehicle or the crane, the receiving destination is determined from among a plurality of locations in the
25 locations and to shorten the length of the waiting time for the plurality of locations, by

comparing results obtained from a function in which both the difference in height of the incineration target objects between the adjacent locations and the length of the waiting time are reflected.

Advantageous Effects of Invention

5 [0009]

According to an information processing system and an information processing method of the present disclosure, it is possible to increase operating efficiency of an entire incineration facility while suppressing interference between a gripping operation by a crane and a receiving operation by a delivery vehicle.

10 BRIEF DESCRIPTION OF DRAWINGS

[0010]

[FIG. 1] A schematic configuration diagram showing an incineration facility according to an embodiment of the present disclosure.

15 [FIG. 2] A longitudinal cross-sectional view showing the incineration facility shown in FIG. 1.

[FIG. 3] A diagram showing the configuration of a control system according to the embodiment of the present disclosure.

[FIG. 4] A diagram showing an example of a process by the gripping destination determination unit of the present disclosure.

20 [FIG. 5A] A diagram showing an example of a work plan according to the embodiment of the present disclosure.

[FIG. 5B] A diagram showing another example of the work plan according to the embodiment of the present disclosure.

25 [FIG. 5C] A diagram showing still another example of the work plan according to the embodiment of the present disclosure.

[FIG. 5D] A diagram showing still another example of the work plan according to the embodiment of the present disclosure.

[FIG. 5E] A diagram showing still another example of the work plan according to the embodiment of the present disclosure.

5 [FIG. 5F] A diagram showing still another example of the work plan according to the embodiment of the present disclosure.

[FIG. 6] A flowchart showing a process of an information processing method in the embodiment of the present disclosure.

[FIG. 7] A flowchart showing another process of the information processing
10 method in the embodiment of the present disclosure.

DESCRIPTION OF EMBODIMENTS

[0011]

Hereinafter, an information processing system and an information processing method according to an embodiment of the present disclosure will be described with
15 reference to the drawings. In the following description, the same reference numerals are assigned to configurations having the same or similar functions. The description of the configurations may be omitted in a case where the configurations overlap. In the present disclosure, the phrase "based on XX" means "based on at least XX" and may include a case based on another element in addition to XX. In addition, the phrase
20 "based on XX" is not limited to a case where XX is directly used, and may include a case where the basis is obtained by performing an operation or processing on XX. In the present disclosure, the phrase "XX or YY" is not limited to a case of either XX or YY, and may include a case of both XX and YY. The same applies to a case where there are three or more selective elements. "XX" and "YY" are any elements (for example, any
25 information).

[0012]

In the present disclosure, the term "acquire" is not limited to a case of actively acquiring by transmitting a transmission request, and may include a case of acquiring by passively receiving information transmitted from another device. In addition, the term "acquire" is not limited to a case of directly acquiring target information (information to be acquired) from the outside, and may include a case of acquiring target information by generating the target information by performing an operation, processing, or the like on information obtained from the outside.

[0013]

Here, first, a +X direction, a -X direction, a +Y direction, a -Y direction, and a Z direction are defined. The +X direction, the -X direction, the +Y direction, and the -Y direction are directions along a horizontal plane. The +X direction is a direction from a pit 21, which will be described later, toward a hopper 31 (see FIG. 1). The -X direction is a direction opposite to the +X direction. In a case where the +X direction and the -X direction are not distinguished from each other, the +X direction and the -X direction are simply referred to as an "X direction". The +Y direction and the -Y direction are directions intersecting (for example, orthogonal to) the X direction. The +Y direction is a direction from a first hopper 31A toward a second hopper 31B, which will be described later (see FIG. 1). The -Y direction is a direction opposite to the +Y direction. In a case where the +Y direction and the -Y direction are not distinguished from each other, the +Y direction and the -Y direction are simply referred to as a "Y direction". The Z direction is a direction intersecting (for example, orthogonal to) the X direction and the Y direction. The Z direction is, for example, a vertical direction (see FIG. 2).

[0014]

<Overall Configuration of Incineration Facility>

FIG. 1 is a schematic configuration diagram showing an incineration facility 1 according to the embodiment of the present disclosure. FIG. 2 is a longitudinal cross-sectional view of the incineration facility 1 in FIG. 1. As shown in FIGS. 1 and 2, the incineration facility 1 is, for example, a facility that incinerates municipal waste, industrial waste, biomass, or the like as an incineration target object G. The incineration facility 1 receives the incineration target object G collected outside by a delivery vehicle P. In the following, for convenience of description, the term "incineration target object" may be referred to as "waste". The incineration facility 1 includes, for example, a storage portion 2, an incinerator 3, a platform 5, and a control system 100 (see FIG. 3). The control system 100 is an example of an "information processing system".

[0015]

The storage portion 2 stores the incineration target object G received from the delivery vehicle P that delivers the incineration target object G to the incineration facility 1. The storage portion 2 accumulates the incineration target object G that is sequentially received from a plurality of delivery vehicles P. The incineration target object G stored in the storage portion 2 is fed into the incinerator 3 by a crane 25 to be described later. The storage portion 2 will be described in detail later.

[0016]

The incinerator 3 incinerates the incineration target object G. The incinerator 3 includes, for example, the hopper 31 and a furnace body (not shown). The hopper 31 is a temporary storage portion provided to supply the incineration target object G into an inside of the furnace body. The hopper 31 is open upward. The incineration target object G is fed into the hopper 31 by the crane 25 of the storage portion 2 to be described later. The hopper 31 is provided with a feeder (not shown). The feeder moves the

incineration target object G stored inside the hopper 31 toward the inside of the furnace body. The furnace body is a furnace that combusts the incineration target object G supplied from the hopper 31 while transporting the incineration target object G. The furnace body is, for example, a stoker furnace. The furnace body is not limited to the stoker furnace, and may be a different type of incineration facility.

[0017]

In the present embodiment, each incinerator 3 includes a plurality of hoppers 31 and a plurality of furnace bodies. As shown in FIG. 1, for example, the incinerator 3 includes a first incinerator 3A disposed on the -Y direction side and a second incinerator 3B disposed on the +Y direction side, as the plurality of incinerators 3. The number of the incinerators 3 is not limited to two, and may be one or three or more.

[0018]

<Configuration of Storage Portion>

The storage portion 2 includes, for example, a pit 21, a plurality of receiving doors 23, and a plurality of cranes 25.

[0019]

The pit 21 is an accommodation unit in which the incineration target object G is stored before being fed into the incinerator 3. In the present embodiment, the pit 21 is provided adjacent to the incinerator 3 in the -X direction. In other words, the hopper 31 (first hopper 31A) of the first incinerator 3A and the hopper 31 (second hopper 31B) of the second incinerator 3B are open to the outside of the pit 21 in the +X direction. The pit 21 has, for example, a rectangular shape having a long side along the Y direction and a short side along the X direction when viewed from above.

[0020]

The plurality of receiving doors 23 are provided adjacent to an end portion of the pit 21 in the -X direction. The plurality of receiving doors 23 are provided between the pit 21 and the platform 5 to be described later. The plurality of receiving doors 23 are disposed side by side in the Y direction. In the present embodiment, for example, five receiving doors 23 are provided. Here, the number of the receiving doors 23 is not limited to five, and may be another number as appropriate. Each of the receiving doors 23 can be opened and closed independently. The receiving door 23 is opened in a case where the delivery vehicle P that delivers the incineration target object G arrives at a predetermined position on the -X direction side of the receiving door 23.

10 [0021]

The pit 21 is provided with a measurement device 27 that measures a height of the incineration target object G accumulated in the pit 21. The measurement device 27 is, for example, a light detection and ranging (LiDAR), and irradiates a surface of the incineration target object G accumulated in the pit 21 with laser light to detect the height of the incineration target object G based on the reflected light. The measurement device 27 transmits the detection result to the control system 100 to be described later. The measurement device 27 is not limited to the LiDAR, and another measurement device may be used as appropriate.

[0022]

20 The crane 25 is a so-called overhead crane provided above the pit 21. The crane 25 grips a part of the incineration target object G stored in the pit 21, delivers the gripped incineration target object G to the hopper 31 of the incinerator 3, and feeds the incineration target object G into the hopper 31. As shown in FIG. 2, the crane 25 is configured to be movable to any position in a space above the pit 21 by, for example, a

rail 26X provided below a ceiling and extending in the X direction and rails 26Y extending in the Y direction.

[0023]

As shown in FIG. 1, in the present embodiment, as the plurality of cranes 25, a
5 first crane 25A disposed on the -Y direction side and a second crane 25B disposed on the
+Y direction side are provided. The first crane 25A and the second crane 25B operate
independently of each other. The plurality of cranes 25 provided in the storage portion
2 are not limited to two, and may be only one or may be three or more.

[0024]

10 <Configuration of Platform>

The platform 5 is a region in which the delivery vehicle P that delivers the
incineration target object G collected from the outside arrives. The platform 5 is
provided adjacent to the pit 21 on the -X direction side. The platform 5 includes an
inbound route 51, an outbound route 52, a plurality of receiving sections 53, a weight
15 measurement unit 55, and a guidance device 56.

[0025]

The inbound route 51 is a passage through which the delivery vehicle P that
delivers the incineration target object G passes when the delivery vehicle P heads for any
one of the plurality of receiving sections 53. The outbound route 52 is a passage
20 through which the delivery vehicle P passes when the delivery vehicle P exits from any
one of the plurality of receiving sections 53 after feeding the incineration target object G
into the pit 21. The plurality of receiving sections 53 are provided adjacent to the
storage portion 2 on the -X direction side. Each of the plurality of receiving sections 53
is provided adjacent to each of the plurality of receiving doors 23 of the storage portion 2

on the -X direction side. The plurality of receiving sections 53 are disposed side by side in the Y direction. In the present embodiment, five receiving sections 53 are provided.

[0026]

The delivery vehicle P passes through the inbound route 51 to reach each of the plurality of receiving sections 53. Each delivery vehicle P feeds the incineration target object G loaded thereon into the pit 21 when the receiving door 23 provided in the receiving section 53 is opened in a state in which the delivery vehicle P is stopped in any one of the plurality of receiving sections 53. The delivery vehicle P that has fed the incineration target object G into the pit 21 passes through the outbound route 52 and exits to the outside of the incineration facility 1.

[0027]

The weight measurement unit 55 is provided in the inbound route 51. The weight measurement unit 55 measures a total weight of the delivery vehicle P. The weight measurement unit 55 measures a total of a vehicle weight W_p of the delivery vehicle P and a weight W_g of the incineration target object G loaded on the delivery vehicle P as a total weight W of the delivery vehicle P.

[0028]

In one aspect, based on the following Equation (1), the weight measurement unit 55 may calculate the weight W_g of the incineration target object G loaded on the delivery vehicle P from the measured total weight W of the delivery vehicle P based on data of the vehicle weight W_p of the delivery vehicle P registered in advance, and may output the calculated weight W_g of the incineration target object G to the control system 100 to be described later.

[0029]

$$W_g = W - W_p \dots (1)$$

[0030]

In another aspect, an approximate expression may be generated from a correlation between the measurement result of the total weight W in the weight measurement unit 55 for the plurality of delivery vehicles P delivered to the incineration facility 1 in the past and the weight Wg of the incineration target object G actually received from each delivery vehicle P, the weight Wg of the incineration target object G may be calculated based on the measured total weight W of the delivery vehicle P and the approximate expression, and the calculated weight Wg of the incineration target object G may be output to the control system 100 to be described later.

10 [0031]

The guidance device 56 is a device that guides a driver of the delivery vehicle P to the receiving section 53 assigned to the delivery vehicle P. For example, the guidance device 56 is a display device that displays a number of the receiving door 23 corresponding to the receiving section 53 assigned to each delivery vehicle P. The assignment of the receiving section 53 to each delivery vehicle P is performed based on a determination content of the receiving destination determination unit 130 of the control system 100 to be described later.

[0032]

<Area in Pit>

20 In such an incineration facility 1, a location at which the crane 25 performs a gripping operation (location to be the gripping destination) in the pit 21 and a location at which the incineration target object G to be fed from the delivery vehicle P into the pit 21 is received (location to be a receiving destination) are automatically assigned by a process of the control system 100 to be described later. Since such a process is
25 performed by the control system 100, the inside of the pit 21 is divided into a plurality of

virtual sections R set in advance. The plurality of sections R are disposed in a lattice shape, for example, when viewed from above. Each of the sections R is not limited to a square shape and may have a rectangular shape. In addition, sizes of the sections R do not need to be the same in all regions in the pit 21, and the sections R having different sizes may be present. In addition, the size and the number of the sections R set in the pit 21 are not limited in any way. In addition, the section R may be set for each of one or more coordinates set in the pit 21 to move the crane 25.

[0033]

Each of the term "location to be the gripping destination" and the term "location to be the receiving destination" in the present disclosure is not limited to the section R. For example, the term "location to be the gripping destination" may be designated by coordinates instead of the section R. In the present disclosure, the phrase "determining a certain section R as the gripping destination" is not limited to a case where the section R itself is determined as the gripping destination, and may also correspond to a case where a certain coordinate included in the section R is determined as the gripping destination.

[0034]

In the incineration facility 1, the incineration target objects G that are sequentially delivered by the plurality of delivery vehicles P are fed from each delivery vehicle P into the pit 21. That is, the pit 21 receives the incineration target objects G delivered by the plurality of delivery vehicles P. The incineration target object G received in the pit 21 is gripped by the crane 25 and moved to another location in the pit 21. The movement of the incineration target object G by the crane 25 in the pit 21 is performed to level the incineration target objects G by suppressing the incineration target objects G from being highly accumulated in a specific location, to stir the incineration

target objects G, and the like. In addition, the incineration target object G in the pit 21 is gripped by the crane 25 and fed into the hopper 31.

[0035]

In response to this, a receiving area A1, an outbound destination area A2, and a feeding area A3 are set in the pit 21. The receiving area A1 is set in some of the sections R included in the plurality of sections R described above, the outbound destination area A2 is set in other some of the sections R, and the feeding area A3 is set in still other some of the sections R.

[0036]

The receiving area A1 is an area in which the incineration target object G fed from the delivery vehicle P is received. The receiving area A1 is set over the plurality of sections R adjacent to the plurality of receiving sections 53 (receiving doors 23) in the +X direction side, in the pit 21. In the present embodiment, the receiving area A1 is set over ten sections R01 to R10 adjacent to the plurality of receiving sections 53 (receiving doors 23) in the +X direction side. In the embodiment of the present disclosure, two sections R arranged in the Y direction are set on the +X direction side, for each of the receiving doors 23.

[0037]

The outbound destination area A2 is an area that is an outbound destination (movement destination) of the incineration target objects G moved by the crane 25 from the receiving area A1. The feeding area A3 is an area in which the incineration target object G is fed into the hopper 31 in a case where the incineration target objects G in the hopper 31 are reduced. The outbound destination area A2 and the feeding area A3 are set in the sections R at positions different from the receiving area A1.

[0038]

In the present embodiment, the outbound destination area A2 and the feeding area A3 are disposed side by side in the Y direction. The outbound destination area A2 and the feeding area A3 are set over, for example, the plurality of sections R arranged in each of the X direction and the Y direction. In the outbound destination area A2 and the feeding area A3, the assigned functions are alternately switched at predetermined time intervals (for example, daily) while the incineration target objects G stored in each of the areas A2 and A3 remain unchanged.

[0039]

<Configuration of Control System>

FIG. 3 is a block diagram showing a functional configuration of the control system 100.

The control system 100 shown in FIG. 3 automatically assigns a receiving destination indicating a location at which the incineration target object G fed from the delivery vehicle P is to be received and a gripping destination indicating a location at which a gripping operation is to be performed by the crane 25. The control system 100 assigns the receiving destination and the gripping destination such that the section R that is the receiving destination of the incineration target objects G from the delivery vehicle P and the section R that is the gripping destination of the crane 25 do not overlap at the same time. Here, in the present embodiment, the sections R that can overlap with each other are the sections R01 to R10 in the receiving area A1, which are the section R that is the receiving destination of the incineration target objects G from the delivery vehicle P and the section R that is the gripping destination of the crane 25.

[0040]

The control system 100 automatically assigns at least the receiving destination indicating the location at which the incineration target object G fed from the delivery

vehicle P is to be received and the gripping destination indicating the location at which the gripping operation is to be performed by the crane 25 to generate a work plan by the plurality of delivery vehicles P and the crane 25. The control system 100 may control opening and closing of the receiving door 23, the operation of the crane 25, and the incinerator 3, in addition to generating the work plan by the plurality of delivery vehicles P and the crane 25.

[0041]

The control system 100 can be configured using a computer such as a microcomputer or a central processing unit (CPU), and hardware such as a peripheral circuit or a peripheral device of the computer. The control system 100 may be configured using a custom large scale integrated circuit (LSI) such as a programmable logic device (PLD). Examples of the PLD include a programmable array logic (PAL), a generic array logic (GAL), a complex programmable logic device (CPLD), and a field programmable gate array (FPGA). In this case, a part or all of the functions realized by the processor may be realized by the integrated circuit.

[0042]

The control system 100 has a functional configuration with a combination of hardware and software such as a program executed by a computer, and includes an information acquisition unit 110, a storage unit 120, a receiving destination determination unit 130, a gripping destination determination unit 140, a plan generation unit 150, and a control unit 160. The functional units included in the control system 100 may be provided separately in a plurality of devices.

[0043]

The information acquisition unit 110 acquires various types of information required for the control system 100. The information acquisition unit 110 acquires

receiving destination information indicating a location (for example, the section R that is a receiving destination) that is the receiving destination of the incineration target object G from the delivery vehicle P and gripping destination information indicating a location (for example, the section R that is a gripping destination) that is the gripping destination of the crane 25 that grips the incineration target object G, based on the work plan for the plurality of delivery vehicles P and the cranes 25 generated by the plan generation unit 150 to be described below. The receiving destination is determined by the receiving destination determination unit 130 to be described below. The receiving destination information indicates a receiving destination (scheduled receiving destination) that is determined from the present time to the future. The gripping destination is determined by the gripping destination determination unit 140 to be described below. The gripping destination information indicates a gripping destination (scheduled gripping destination) that is determined from the present time to the future.

[0044]

15 In the present embodiment, one information acquisition unit 110 that acquires the receiving destination information and the gripping destination information has been described, but an information acquisition unit (first information acquisition unit 110a) that acquires the receiving destination information and an information acquisition unit (second information acquisition unit 110b) that acquires the gripping destination information may be provided separately. In addition, for example, the information acquisition unit 110 acquires the measurement result by the weight measurement unit 55, the height information indicating the height of the incineration target objects G at each location in the pit 21 by the measurement device 27, and the like.

[0045]

The storage unit 120 stores various types of information required for the control system 100. For example, the storage unit 120 stores the vehicle weights W_p of the plurality of delivery vehicles P. In addition, the storage unit 120 stores a constraint condition or the like in a case of determining the receiving destination of the incineration target objects G from the delivery vehicle P.

[0046]

(Configuration of Receiving Destination Determination Unit)

In a case where a time for determining a receiving destination has arrived, the receiving destination determination unit 130 determines the section R that is the receiving destination of the incineration target object G from the delivery vehicle P, from among the plurality of sections R. For example, in a case where the delivery vehicle P loaded with the incineration target objects G reaches a predetermined position, the receiving destination determination unit 130 determines that the time for determining the receiving destination has arrived. For example, the weight measurement unit 55 can be exemplified as the predetermined position. The predetermined position may be a position other than the weight measurement unit 55 as long as the predetermined position is in front of the plurality of receiving sections 53.

[0047]

The receiving destination determination unit 130 determines the section R that is the receiving destination, based on gripping destination information indicating the section R that is the gripping destination of the crane 25 determined at that time, which is acquired by the information acquisition unit 110. More specifically, the receiving destination determination unit 130 specifies the section R different from the section R of the determined gripping destination of the crane 25 in the pit 21 at that time, from among the sections R (R01 to R10) of the receiving area A1. For example, in a case where

there is the section R determined as the gripping destination of the crane 25 among the sections R (R01 to R10) of the receiving area A1, the receiving destination determination unit 130 specifies the section R other than the determined section R, and determines any one of the other sections R as the section R that is the receiving destination. In addition, for example, in a case where there is no section R determined as the gripping destination of the crane 25 among the sections R (R01 to R10) of the receiving area A1, the receiving destination determination unit 130 determines any one of the sections R of the receiving area A1 as the section R that is the receiving destination. In addition, in a case where there is the section R determined as the receiving destination of the other delivery vehicle P among the sections R (R01 to R10) of the receiving area A1 at that time, the receiving destination determination unit 130 determines any one of the section R other than the determined section R as the section R that is the receiving destination.

[0048]

Further, the receiving destination determination unit 130 determines the section R that is the receiving destination based on height information of the incineration target objects G in each section R acquired by the information acquisition unit 110 in a location different from the determined gripping destination. In a case where there are a plurality of sections R that can be the receiving destination specified based on the gripping destination information, the receiving destination determination unit 130 determines the section R that is the receiving destination from among the sections R (R01 to R10) of the receiving area A1, based on the height information of the incineration target objects G in each section R.

[0049]

For example, the receiving destination determination unit 130 may determine the section R in which the height of the incineration target objects G is equal to or lower than

the maximum height set in advance, from among the sections R (R01 to R10) of the receiving area A1, as the section R that is the receiving destination. In addition, the receiving destination determination unit 130 may determine the section R in which the height of the incineration target objects G is the smallest from among the sections R (R01 to R10) of the receiving area A1, as the section R that is the receiving destination.

[0050]

In addition, the receiving destination determination unit 130 may determine, for example, the section R in which the height of the incineration target objects G between the adjacent sections R is reduced by receiving the incineration target objects G that are fed from the delivery vehicle P from among the sections R (R01 to R10) of the receiving area A1 as the receiving destination. For example, the receiving destination determination unit 130 may determine, from among the sections R (R01 to R10) of the receiving area A1, the section R in which a difference in the height of the incineration target objects G between the adjacent sections R is equal to or lower than a predetermined criterion by receiving the incineration target objects G that are fed from the delivery vehicle P, as the receiving destination. For example, the receiving destination determination unit 130 may determine, from among the sections R (R01 to R10) of the receiving area A1, the section R in which the difference in the height of the incineration target objects G between the adjacent sections R is minimized by receiving the incineration target objects G that are fed from the delivery vehicle P, as the receiving destination. In the present embodiment, the receiving destination determination unit 130 determines, based on the gripping destination information and the height information, a location (for example, adjacent sections R) in which the difference in the height of the incineration target objects G between the adjacent locations is reduced by

receiving the incineration target objects G in a location different from the scheduled gripping destination, as the receiving destination.

[0051]

In this case, in a case where the incineration target objects G that are fed from the delivery vehicle P are received, the receiving destination determination unit 130
5 calculates a height H of the incineration target objects G after the reception in each of the sections R (R01 to R10) of the receiving area A1 by the following Equations (2) and (3).

[0052]

$$H = H_0 + \Delta H_1 \dots (2)$$

$$10 \quad \Delta H_1 = W_g / (d \times S) \dots (3)$$

[0053]

Here, H₀ is the height of the incineration target objects G in each section R before receiving the incineration target objects G that are fed from the delivery vehicle P, which is acquired by the information acquisition unit 110. H₀ is, for example,
15 information indicating the height of the incineration target objects G measured by the measurement device 27. ΔH₁ is an increase amount of the height of the incineration target objects G in each section R, by receiving the incineration target objects G that are fed from the delivery vehicle P. In a case where a receiving destination of a certain delivery vehicle P is to be determined, ΔH₁ is an increase amount of the height of the
20 incineration target objects G by another delivery vehicle P (another delivery vehicle P for which the receiving destination has already been determined) that feeds the incineration target objects G between a measurement time by the measurement device 27 and a feeding time of the incineration target objects G by the delivery vehicle P. In addition, W_g is a weight of the incineration target objects G calculated by the above Equation (1).

In addition, d is a density of the incineration target objects G. In addition, S is an area of each section R.

[0054]

A density d of the incineration target objects G can be calculated, for example,
 5 based on the weight W_c of the incineration target objects G in a case where the incineration target objects G are gripped once by the crane 25, a decrease amount of the height of the incineration target objects G in a case where the incineration target objects G are moved from one section R by gripping the incineration target objects G once by the crane 25, and the area S of each section R. In addition, as the density d of the
 10 incineration target objects G, for example, a numerical value statistically acquired in the incineration facility 1 may be used.

[0055]

In addition, in a case where the incineration target objects G are gripped by the crane 25 in the section R for which the gripping destination has been determined among
 15 the sections R (R01 to R10) of the receiving area A1 and are moved to another section R, the receiving destination determination unit 130 calculates the height H of the incineration target objects G in the section R by the following Equations (4) and (5).

[0056]

$$H = H_0 - \Delta H_2 \dots (4)$$

20
$$\Delta H_2 = W_c / (d \times S) \dots (5)$$

[0057]

Here, ΔH_2 is a decrease amount of the height of the incineration target objects G in each section R by the incineration target objects G gripped by the crane 25 being moved to another section R. In a case where a receiving destination of a certain
 25 delivery vehicle P is to be determined, ΔH_2 is a decrease amount of the height of the

incineration target objects G by the crane 25 (crane 25 for which the gripping destination has already been determined) that grips the incineration target objects G between a measurement time by the measurement device 27 and a feeding time of the incineration target objects G by the delivery vehicle P.

5 [0058]

Meanwhile, in the sections R (R01 to R10) of the receiving area A1, a minimum value H_m of the difference in the height H of the incineration target objects G between the adjacent sections R (locations) is represented by the following Equation (6). Here, the height H of the incineration target objects G in each of the sections R01 to R10 of the receiving area A1 is denoted by $R01(t)$, $R02(t)$, $R03(t)$, $R04(t)$, $R05(t)$, $R06(t)$, $R07(t)$, $R08(t)$, $R09(t)$, and $R10(t)$. t is a variable indicating a time. t may be a present time or a future time at which the incineration target objects G are fed into the receiving destination.

[0059]

15
$$H_m = |R01(t) - R02(t)| + |R02(t) - R03(t)| + |R03(t) - R04(t)| + |R04(t) - R05(t)| + |R05(t) - R06(t)| + |R06(t) - R07(t)| + |R07(t) - R08(t)| + |R08(t) - R09(t)| + |R09(t) - R10(t)| + |R10(t) - R01(t)| + P_e \dots (6)$$

[0060]

In the present embodiment, the receiving destination determination unit 130 selects the section R in which H_m of the above Equation (6) is minimized, from among the sections R01 to R10 of the receiving area A1.

[0061]

In the above Equation (6), P_e is a penalty term. The penalty term P_e can be based on, for example, a difference between a feeding-available start time (T_{ui}) of the receiving door 23 of the receiving section 53 that is the receiving destination of the

delivery vehicle P and a waiting start time (ts) of the delivery vehicle P, as represented by the following Equation (7). By minimizing such a penalty term Pe, a waiting time of the delivery vehicle P can be shortened. A coefficient ap in Equation (7) is a coefficient that can adjust a size of the penalty term Pe. The coefficient ap is, for example, 0.05, but is not limited thereto. The coefficient ap can be optionally determined. For example, the coefficient ap can be optionally determined according to a situation of the incineration facility 1 or the like.

[0062]

$$Pe(m) = ap(m/s) * (Tui(s) - ts(s)) \dots (7)$$

10 [0063]

In addition, the penalty term Pe may be calculated, for example, based on the presence or absence of the delivery vehicle P that delivers the incineration target object G collected in the same area during a certain period of time. For example, in a case where the delivery vehicle P that delivers the incineration target object G collected in the same area as the delivery vehicle P that has previously performed the feeding in the same receiving section 53 is used, "1" may be set as Pe(m). This is because it is assumed that the incineration target objects G collected in the same area have the same waste quality, and the incineration target objects G having the same waste quality are not concentrated in the specific section R.

20 [0064]

The receiving destination determination unit 130 determines the section R that is the receiving destination based on the gripping destination information, the height information of the incineration target object G, and the information indicating the length of the waiting time generated in the delivery vehicle P, as described above. The receiving destination determination unit 130 determines the receiving section 53 located

on the -X direction side of the section R that is the determined receiving destination, as the receiving destination of the delivery vehicle P.

[0065]

(Configuration of Gripping Destination Determination Unit)

5 In a case where a time for determining a gripping destination has arrived, the gripping destination determination unit 140 determines the section R that is the gripping destination for gripping the incineration target object G accumulated in the pit 21 by the crane 25, from among the plurality of sections R in the pit 21. For example, in a case where the crane 25 that has gripped and moved the incineration target object G at the
10 previously determined gripping destination has arrived at a movement destination (for example, the outbound destination area A2), the gripping destination determination unit 140 determines that the time for determining the gripping destination has arrived. However, the time for determining the gripping destination is not limited to the above example, and may be a time at which the incineration target object G is gripped at the
15 previously determined gripping destination, or a time at which the incineration target object G is dropped into the outbound destination area A2.

[0066]

 The gripping destination determination unit 140 determines the section R that is the gripping destination based on receiving destination information indicating the section
20 R that is the receiving destination of the delivery vehicle P determined at that time, which is acquired by the information acquisition unit 110. More specifically, the gripping destination determination unit 140 specifies the section R different from the section R of the receiving destination of the delivery vehicle P determined in the pit 21 at that time, from among the sections R (R01 to R10) of the receiving area A1. For example, in a
25 case where there is the section R that is determined as the receiving destination of the

delivery vehicle P among the sections R (R01 to R10) of the receiving area A1, the gripping destination determination unit 140 specifies the section R other than the determined section R, and determines any one of the other sections R, as the section R that is the gripping destination. In addition, for example, in a case where there is no
5 section R that is determined as the receiving destination of the delivery vehicle P among the sections R (R01 to R10) of the receiving area A1, the gripping destination determination unit 140 determines any one of the sections R of the receiving area A1, as the section R that is the receiving destination. In addition, in a case where there is the section R that is determined as the gripping destination of the other crane 25 among the
10 sections R (R01 to R10) of the receiving area A1 at that time, the gripping destination determination unit 140 determines any one of the section R other than the determined section R, as the section R that is the gripping destination.

[0067]

Here, the gripping destination determination unit 140 determines that the time
15 for determining the gripping destination has arrived in a case where the crane 25 satisfies a predetermined condition, independently of the arrival of the time for determining the receiving destination of the delivery vehicle P. For example, in a case where a gripping operation by the crane 25 in the section R that is the previously determined gripping destination is completed, the gripping destination determination unit 140 determines that
20 the time for determining the gripping destination has arrived since the gripping operation is to be performed in the next section R.

[0068]

Further, the gripping destination determination unit 140 determines the section R that is the gripping destination based on height information of the incineration target
25 object G in each section R, which is acquired by the information acquisition unit 110, in a

location different from the determined receiving destination. The height information used by the gripping destination determination unit 140 is, for example, the measurement result itself by the measurement device 27.

[0069]

5 In a case where there are a plurality of sections R that can be the gripping destination, which are specified based on receiving destination information, the gripping destination determination unit 140 determines the section R that is the gripping destination from among the sections R (R01 to R10) of the receiving area A1 based on the height information of the incineration target object G in each section R. For
10 example, the gripping destination determination unit 140 may determine the section R having the largest height H of the incineration target object G from among the sections R different from the receiving destination determined in the pit 21, as the gripping destination. In the present embodiment, the gripping destination determination unit 140 determines, as the gripping destination, a location at which a difference in height of the
15 incineration target objects G between adjacent locations (for example, adjacent sections R) is reduced by gripping the incineration target object G by the crane 25, in a location different from the scheduled receiving destination, based on the receiving destination information and the height information.

[0070]

20 In addition, the gripping destination determination unit 140 may collectively determine two sections R in which the gripping operation is continuously performed by one crane 25 (each of the first crane 25A and the second crane 25B), as the gripping destination. That is, in a case where the time for determining the gripping destination has arrived, the gripping destination determination unit 140 collectively determines (for
25 example, determines as one set) a first gripping destination at which the crane 25 grips

the incineration target object G as a first operation and a second gripping destination at which the crane 25 grips the incineration target object G as a second operation performed after the first operation, from among the sections R different from the section R that is the receiving destination determined in the pit 21, based on the receiving destination information of the delivery vehicle P. In this case, for example, in a case where the gripping operation by the crane 25 in the first operation and the second operation in the two sections R that are the previously determined gripping destination is completed, the gripping destination determination unit 140 determines that the time for determining the next gripping destination has arrived. Instead of the above, in a case where the time for determining the gripping destination has arrived, the gripping destination determination unit 140 may determine only one operation (turn 1) of the crane 25 to be performed next.

[0071]

In addition, in a case where the time for determining the gripping destination has arrived, the gripping destination determination unit 140 may collectively determine the section R that is the gripping destination at which the gripping operation is to be performed by the first crane 25A and the section R that is the gripping destination at which the gripping operation is to be performed by the second crane 25B. That is, the gripping destination determination unit 140 collectively determines (for example, determines as one set) the section R that is the gripping destination at which the first crane 25A grips the incineration target object G and the section R that is the gripping destination at which the second crane 25B different from the first crane 25A grips the incineration target object G, from among the sections R different from the section R that is the receiving destination determined in the pit 21, based on the receiving destination information of the delivery vehicle P. In this case, the section R that is the gripping destination at which the first crane 25A grips the incineration target object G is different

from the section R that is the gripping destination at which the second crane 25B grips the incineration target object G. In this case, the gripping destination determination unit 140 determines that the time for determining the gripping destination has arrived in a case where the first crane 25A satisfies a predetermined condition and the second crane 25B satisfies the predetermined condition. The gripping destination determination unit 140 is not limited to collectively determining the operations of the plurality of cranes 25. For example, in a case where the time for determining the gripping destination has arrived, the gripping destination determination unit 140 may determine only one operation of one crane 25. For example, in a case where the time for determining the gripping destination has arrived, the gripping destination determination unit 140 may determine only one operation (turn 1) of one crane 25.

[0072]

FIG. 4 is a diagram showing an example of a process by the gripping destination determination unit 140. In the present embodiment, the gripping destination determination unit 140 determines the section R that is the gripping destination of a first operation (turn 1) of the first crane 25A and the section R that is the gripping destination of a second operation (turn 2) of the first crane 25A at a certain time t_1 . In addition, the gripping destination determination unit 140 determines the section R that is the gripping destination of the first operation (turn 1) of the second crane 25B and the section R that is the gripping destination of the second operation (turn 2) of the second crane 25B at the same time t_1 . The gripping destination determination unit 140 waits until the slower one of the second operation of the first crane 25A and the second operation of the second crane 25B is completed. At a time t_2 when the second operation of the first crane 25A and the second operation of the second crane 25B are completed, the gripping destination determination unit 140 determines the section R that is the gripping destination of the

first operation (turn 1) of the first crane 25A and the section R that is the gripping destination of the second operation (turn 2) of the first crane 25A again, and determines the section R that is the gripping destination of the first operation (turn 1) of the second crane 25B and the section R that is the gripping destination of the second operation (turn 2) of the second crane 25B. The gripping destination determination unit 140 repeats this operation.

[0073]

(Configuration of Plan Generation Unit)

FIGS. 5A to 5F are diagrams showing an example of a work plan generated by the control system 100 according to the embodiment of the present disclosure. In the plan generation unit 150, in a case where the section R that is a receiving destination and the section R that is the gripping destination are determined by each of the receiving destination determination unit 130 and the gripping destination determination unit 140, for example, a table 200 showing a work plan by the plurality of delivery vehicles P and the crane 25 in the sections R (sections R01 to R10) of the receiving area A1 as shown in FIGS. 5A to 5F is generated.

[0074]

For example, FIG. 5A shows a state in which a time for determining the gripping destination has arrived at a time t_{11} , and the gripping destination of a first operation (turn 1) and a second operation (turn 2) of the first crane 25A and the gripping destination of the first operation (turn 1) and the second operation (turn 2) of the second crane 25B are determined.

[0075]

FIG. 5B shows a state in which one delivery vehicle (No. 3456) arrives at a time t_{12} after the time t_{11} , and a receiving destination of one delivery vehicle is determined.

[0076]

FIG. 5C shows a state in which three delivery vehicles (No. 1232, No. 6368, and No. 3155) arrive at a time t13 after the time t12, and receiving destinations of the three delivery vehicles are determined.

5 [0077]

FIG. 5D shows a state in which two delivery vehicles (No. 9899 and No. 7759) arrive at a time t14 after the time t13, and receiving destinations of the two delivery vehicles are determined.

[0078]

10 FIG. 5E shows a state in which three delivery vehicles (No. 1159, No. 3952, and No. 1389) arrive at a time t15 after the time t14, and receiving destinations of the three delivery vehicles are determined.

[0079]

FIG. 5F shows a state in which the time for determining the gripping destination has arrived at a time t16 after the time t15, and the gripping destination of the first operation (turn 1) and the second operation (turn 2) of the first crane 25A and the gripping destination of the first operation (turn 1) and the second operation (turn 2) of the second crane 25B are determined.

[0080]

20 As shown in FIGS. 5A to 5F, the table 200 includes receiving destination information Ip indicating positions of the receiving sections 53 at which the incineration target objects G are received from the delivery vehicles P from among the five receiving sections 53, and gripping destination information Ic indicating the section R in which the crane 25 performs the gripping operation among the sections R01 to R10 located below
25 the receiving doors 23 of the five receiving sections 53.

[0081]

The receiving destination information I_p indicating the positions of the receiving sections 53 at which the incineration target objects G are received from the delivery vehicles P includes the positions (for example, No. 1 to No. 5) of the receiving sections 53 at which the incineration target objects G are received from the delivery vehicles P, identification information of the delivery vehicle P assigned to the receiving section 53 (for example, an identification number assigned to each delivery vehicle P), and time information (start time, end time, and the like) for performing the receiving operation. Here, the time information for performing the receiving operation by each delivery vehicle P is set, for example, based on a standard time (for example, 60 seconds) required for moving from the weight measurement unit 55 to each of the receiving sections 53 and a standard time (for example, 250 seconds) required for feeding the incineration target objects G from the delivery vehicle P into the pit 21 in each receiving section 53.

[0082]

In addition, the gripping destination information I_c indicating the section R in which the gripping operation is performed by the cranes 25 includes position information indicating the section R in which the gripping operation is performed by each crane 25 and time information (start time, end time, and the like) for performing the gripping operation.

[0083]

(Configuration of Control Unit)

The control unit 160 controls the cranes 25. In the present embodiment, the control unit 160 controls the operations of the first crane 25A and the second crane 25B based on the work plan (for example, the table 200) created by the plan generation unit 150.

[0084]

(Configuration of Information Output Unit)

The information output unit 170 transmits information indicating the receiving section 53 assigned to the delivery vehicle P to the guidance device 56 to display the receiving section 53 assigned to the delivery vehicle P on the guidance device 56. For example, the information output unit 170 transmits information indicating the receiving section 53 assigned to the delivery vehicle P to the guidance device 56 based on a work plan (for example, the table 200) created by the plan generation unit 150.

[0085]

The control unit 160 may be omitted, instead of the above configuration. In this case, an operator guidance device that guides the gripping destination of the cranes 25 may be provided for an operator who manually operates the cranes 25. In this case, the information output unit 170 may output information indicating the gripping destinations of the first crane 25A and the second crane 25B to the operator guidance device based on the work plan (for example, the table 200) created by the plan generation unit 150.

[0086]

<Flow of Process by Control Method>

FIG. 6 is a flowchart showing a process of a control method (information processing method) in the embodiment of the present disclosure. FIG. 7 is a flowchart showing another process of the control method in the embodiment of the present disclosure. As shown in FIGS. 6 and 7, in a control method in the embodiment of the present disclosure, the control system 100 performs a process S10 of determining a receiving destination of the delivery vehicle P and a process S20 of determining the gripping destination of the crane 25 in parallel.

[0087]

As shown in FIG. 6, in the process S10 of determining the receiving destination of the delivery vehicle P, the process is started in a case where a time for determining the receiving destination has arrived. In the embodiment of the present disclosure, for example, the process is started in a case where the delivery vehicle P reaches the weight measurement unit 55 and the total weight W of the delivery vehicle P is measured.

[0088]

First, the information acquisition unit 110 acquires the weight W_g of the incineration target object G that has been delivered, based on the total weight W of the delivery vehicle P measured by the weight measurement unit 55 (S11). Next, the information acquisition unit 110 refers to the table 200 and checks the presence or absence of the gripping destination information I_c of the crane 25 and the presence or absence of the receiving destination information I_p by the other delivery vehicle P, for the sections R (R01 to R10) in the receiving area A1 (S12). In addition, the information acquisition unit 110 acquires height information of the incineration target object G in each section R in the receiving area A1 (S13). In this case, it is preferable that the information acquisition unit 110 acquires the latest height information of the incineration target object G by the above equations (2) and (4).

[0089]

Subsequently, the receiving destination determination unit 130 performs an optimization calculation for the section R in which the incineration target object G is received by the delivery vehicle P (S14). For this, the receiving destination determination unit 130 extracts the section R in which the gripping destination information I_c of the crane 25 and the receiving destination information I_p by the other delivery vehicle P are not registered, from the sections R (R01 to R10) in the receiving

area A1. Further, in the embodiment of the present disclosure, the receiving destination determination unit 130 selects the section R in which the height H of the incineration target object G is equal to or lower than a preset maximum height and a difference in the height H of the incineration target object G between the adjacent sections R is

5 minimized, from the sections R01 to R10 of the receiving area A1 as described above.

The receiving destination determination unit 130 determines the section R selected in this manner as the receiving destination for receiving the incineration target object G from the delivery vehicle P (S15).

[0090]

10 Thereafter, the plan generation unit 150 registers the determined section R as the receiving destination in the table 200 indicating a work plan (S16). In addition, the control system 100 notifies the delivery vehicle P of the receiving section 53 corresponding to the determined section R (S17). As a method of notifying the delivery vehicle P of the receiving section 53, for example, an information display on the

15 guidance device 56 may be used, and an information display on a display screen of a communication terminal mounted on the delivery vehicle P or an information display on an information display device installed on the platform 5 via a communication network such as a wireless LAN, Wi-Fi, or a public wireless communication network can be exemplified. As a result, a driver of the delivery vehicle P visually recognizes the

20 notification content, moves to the determined receiving section 53, and performs work of feeding the incineration target object G into the pit 21.

[0091]

As shown in FIG. 7, in the process S20 of determining the gripping destination of the crane 25, the process is started in a case where a time for determining the gripping

25 destination has arrived. In the embodiment of the present disclosure, for example, in a

case where the crane 25 has finished a gripping operation registered in the table 200, it is determined that the time for determining the gripping destination has arrived, and the process is started.

[0092]

5 First, the information acquisition unit 110 refers to the table 200 and checks the presence or absence of the receiving destination information Ip by the delivery vehicle P for the sections R (R01 to R10) in the receiving area A1 (S21).

 In addition, the information acquisition unit 110 acquires height information of the incineration target object G in each section R in the receiving area A1 (S22).

10 [0093]

 Subsequently, the gripping destination determination unit 140 performs an optimization calculation for the section R in which the incineration target object G is to be gripped by the crane 25 (S23). For this, in the gripping destination determination unit 140, the section R without the receiving destination information Ip by the delivery
15 vehicle P is selected from the sections R (R01 to R10) in the receiving area A1. The gripping destination determination unit 140 determines the section R selected in this manner as the gripping destination for gripping the incineration target object G by the crane 25 (S24).

[0094]

20 Thereafter, the plan generation unit 150 registers the determined section R of the gripping destination in the table 200 indicating the work plan (S25). In addition, the control system 100 notifies the control unit 160 of the crane 25 of the section R determined as the gripping destination, as an operation instruction for the crane 25 (S26). The crane 25 that has received the operation instruction performs the gripping operation
25 of the incineration target object G in the notified section R.

[0095]

(Actions and Effects)

In the present embodiment described above, in a case where the time for determining the receiving destination of the incineration target object G from the delivery vehicle P has arrived, with the control system 100 and the control method, the receiving destination is determined from locations different from the gripping destination of the crane 25, which have been determined in the pit 21, based on the gripping destination information acquired by the information acquisition unit 110. With such a configuration, it is possible to perform the receiving operation for the incineration target object G from the delivery vehicle P while avoiding interference with the gripping destination at which the gripping operation is performed by the crane 25.

[0096]

In addition, in a case where the time for determining the gripping destination of the crane 25 has arrived, the control system 100 determines the gripping destination from the locations different from the receiving destination of the delivery vehicle P, which have been determined in the pit 21, based on the receiving destination information acquired by the information acquisition unit 110. With such a configuration, it is possible to perform the gripping operation for the incineration target object G by the crane 25 while avoiding interference with the receiving destination of the delivery vehicle P. In this manner, it is possible to improve operating efficiency of the entire incineration facility 1 while suppressing interference between the gripping operation by the crane 25 and the receiving operation by the delivery vehicle P.

[0097]

In addition, in the present embodiment, the information acquisition unit 110 acquires the height information of the incineration target object G at each location in the

pit 21. The receiving destination determination unit 130 determines the receiving destination, based on the gripping destination information and the height information. With such a configuration, for example, it is possible to select a location at which the crane 25 is not performing the gripping operation and the height of the incineration target object G is low, and determine the receiving destination. In addition, the gripping destination determination unit 140 determines the gripping destination based on the receiving destination information and the height information, and thus it is possible to select a location at which the delivery vehicle P is not performing the receiving operation and the height of the incineration target object G is high, and determine the gripping destination.

[0098]

In addition, in the present embodiment, the receiving destination determination unit 130 determines, as the receiving destination, a location at which the difference in height of the incineration target objects G between adjacent locations is reduced by receiving the incineration target object G among the locations different from the determined gripping destination, based on the gripping destination information and the height information. With such a configuration, by receiving the incineration target object G from the delivery vehicle P at the determined receiving destination, the difference in height of the incineration target objects G between adjacent locations is reduced, and thus, when the gripping operation is performed by the crane 25 at the location thereafter, it is easy to grip the incineration target object G.

[0099]

In addition, in the present embodiment, the height of the incineration target object G measured by the measurement device 27 provided in the incineration facility 1 is used as the height information. As a result, the height information is corrected to

reflect the height of the incineration target object G that is increased by receiving the incineration target object G at the determined receiving destination or the height of the incineration target object G that is decreased by gripping the incineration target object G at the determined gripping destination. With such a configuration, the latest height
5 information of the incineration target object G can be obtained. Therefore, it is possible to appropriately determine the receiving destination or the gripping destination based on the latest height information of the incineration target object G.

[0100]

In addition, in the present embodiment, the receiving destination determination
10 unit 130 determines the receiving destination based on the gripping destination information and information indicating the length of the waiting time generated in the delivery vehicle P. With such a configuration, it is possible to perform the receiving operation of the incineration target object G from the delivery vehicle P by using a location at which a waiting time generated in the delivery vehicle P is small as the
15 receiving destination, while avoiding interference with the gripping destination at which the gripping operation is being performed by the crane 25.

[0101]

In addition, in the present embodiment, in a case where the delivery vehicle P loaded with the incineration target object G reaches a predetermined position, it is
20 determined that the time to determine the receiving destination has arrived, and the receiving destination is determined from among the locations different from the determined gripping destination of the crane 25 in the pit 21, based on the gripping destination information acquired by the information acquisition unit 110. With such a configuration, it is possible to determine the receiving destination, in accordance with the
25 timing at which the delivery vehicle P reaches the predetermined position.

[0102]

In addition, in a case where the crane 25 satisfies a predetermined condition, it is determined that the time to determine the gripping destination of the crane 25 has arrived, and the gripping destination is determined from among the locations different from the determined receiving destination of the delivery vehicle P in the pit 21, based on the receiving destination information acquired by the information acquisition unit 110. As a result, it is possible to determine the gripping destination of the crane 25, in accordance with the timing at which the predetermined condition is satisfied on the crane 25 side, regardless of the timing at which the delivery vehicle P reaches the predetermined position. In this manner, for example, in a time band where the number of delivery vehicles P is large, the number of assignments of the receiving destinations to the delivery vehicles P is increased, and on the other hand, in a time band where the number of delivery vehicles P is small, the number of assignments of the gripping destinations to the cranes 25 is increased. Therefore, it is possible to improve the operating efficiency of the entire incineration facility 1.

[0103]

In addition, in the present embodiment, the gripping destination at which the crane 25 performs the gripping operation of the incineration target object G is collectively determined as a first gripping destination for performing a first operation and a second gripping destination for performing a second operation performed after the first operation. With such a configuration, it is possible to suppress the gripping operation by the crane 25 from being unable to be performed due to the reception of the incineration target object G from the delivery vehicle P that arrives at the incineration facility 1 in succession.

25 [0104]

(Modification Examples)

In the embodiment described above, in the process of determining the receiving destination of the delivery vehicle P, the measurement result by the measurement device 27 is corrected to reflect an increase amount by $\Delta H1$ and a decrease amount by $\Delta H2$, and the receiving destination of the delivery vehicle P is determined based on the corrected height information. On the other hand, in the process of determining the gripping destination of the crane 25, the measurement result by the measurement device 27 is used as it is. Instead of this, in the process of determining the gripping destination of the crane 25, the measurement result by the measurement device 27 may be corrected to reflect the increase amount or the decrease amount corresponding to $\Delta H1$ and $\Delta H2$, and the gripping destination of the crane 25 may be determined based on the corrected height information. In this case, in the process of determining the receiving destination of the delivery vehicle P, the measurement result by the measurement device 27 is used as it is.

[0105]

15 (Other Embodiments)

The embodiments of the present disclosure have been described in detail with reference to the drawings, but the specific configuration is not limited to the embodiments, and design changes and the like within the concept of the present disclosure are also included. For example, in the embodiments described above, the procedure of the information processing method is shown, but the procedure can be changed as appropriate. In addition, a part or all of the program executed by the computer in the embodiments described above can be distributed via a computer-readable recording medium or a communication line.

[0106]

25 <Supplementary Notes>

The control system 100 and the information processing method described in the embodiments are understood as follows, for example.

[0107]

(1) According to a first aspect, there is provided a control system 100 for an
5 incineration facility 1 including a pit 21 in which incineration target objects G are
accumulated, the control system 100 including: an information acquisition unit 110
configured to acquire receiving destination information indicating a location in the pit 21,
which is a receiving destination of the incineration target object G from a delivery
vehicle P that delivers the incineration target object G and gripping destination
10 information indicating a location in the pit 21, which is the gripping destination of a
crane 25 that grips the incineration target object G; a receiving destination determination
unit 130 configured to, in a case where a time for determining the receiving destination
has arrived, determine the receiving destination, based on the gripping destination
information; and a gripping destination determination unit 140 configured to, in a case
15 where a time for determining the gripping destination has arrived, determine the gripping
destination, based on the receiving destination information. With such a configuration,
in a case where the time for determining the receiving destination of the incineration
target object G from the delivery vehicle P has arrived, the receiving destination is
determined based on the gripping destination information acquired by the information
20 acquisition unit 110. In addition, in a case where the time for determining the gripping
destination of the incineration target object G by the crane 25 has arrived, the gripping
destination is determined based on the receiving destination information acquired by the
information acquisition unit 110. As a result, it is possible to improve operating
efficiency of the entire incineration facility 1 while avoiding interference with the
25 gripping destination at which the gripping operation is performed by the crane 25.

[0108]

(2) In a control system 100 according to a second aspect, in the control system 100 according to (1), the information acquisition unit 110 further includes height information indicating a height of the incineration target object G at each location in the pit 21. The receiving destination determination unit 130 determines, as the receiving destination, a location at which the incineration target object G is received to reduce a difference in height of the incineration target objects G between adjacent locations, among locations different from the scheduled gripping destination, based on the gripping destination information and the height information. With such a configuration, it is possible to select a location at which the height of the incineration target object G is low and determine the receiving destination while suppressing interference with the crane 25.

[0109]

(3) In a control system 100 according to a third aspect, in the control system 100 according to (2), the gripping destination determination unit 140 determines, as the gripping destination, a location at which the incineration target object G is gripped by the crane 25 to reduce the difference in height of the incineration target objects G between the adjacent locations, among locations different from the scheduled receiving destination, based on the receiving destination information and the height information. With such a configuration, it is possible to select a location at which the height of the incineration target object G is high and determine the gripping destination while suppressing interference with the delivery vehicle P.

[0110]

(4) In a control system 100 according to a fourth aspect, in the control system 100 according to (2) or (3), the height information indicates the height of the incineration target object G measured by a measurement device 27 provided in the incineration

facility 1, and at least one of the receiving destination determination unit 130 and the gripping destination determination unit 140 corrects the height information such that the height information reflects the height of the incineration target object G increased by receiving the incineration target object G at the determined receiving destination or the height of the incineration target object G decreased by gripping the incineration target object G at the determined gripping destination, and determines the receiving destination or the gripping destination, based on the corrected height information. With such a configuration, it is possible to obtain the latest height information of the incineration target object G by correcting the height information to reflect the height of the incineration target object G that is increased by receiving the incineration target object G at the determined receiving destination or the height of the incineration target object G that is reduced by gripping the incineration target object G at the determined gripping destination. Therefore, it is possible to appropriately determine the receiving destination or the gripping destination based on the latest height information of the incineration target object G.

[0111]

(5) In a control system 100 according to a fifth aspect, in the control system 100 according to any one of (2) to (4), the receiving destination determination unit 130 determines the receiving destination, based on the gripping destination information and information indicating a length of a waiting time occurring in the delivery vehicle P. With such a configuration, it is possible to perform the receiving operation of the incineration target object G from the delivery vehicle P by using a location at which the waiting time occurring in the delivery vehicle P is small as the receiving destination while avoiding interference with the gripping destination at which the gripping operation is performed by the crane 25.

[0112]

(6) In a control system 100 according to a sixth aspect, in the control system 100 according to any one of (1) to (5), the receiving destination determination unit 130 determines that the time for determining the receiving destination has arrived in a case where the delivery vehicle P loaded with the incineration target object G reaches a predetermined position, and the gripping destination determination unit 140 determines that the time for determining the gripping destination has arrived in a case where the crane 25 satisfies a condition, independently of the arrival of the time for determining the receiving destination. With such a configuration, it is possible to determine the gripping destination of the crane 25, in accordance with a timing at which the predetermined condition is satisfied on the crane 25 side, regardless of a timing at which the delivery vehicle P reaches the predetermined position.

[0113]

In this manner, for example, in a time band where the number of delivery vehicles P is large, the number of assignments of the receiving destinations to the delivery vehicles P is increased, and on the other hand, in a time band where the number of delivery vehicles P is small, the number of assignments of the gripping destinations to the cranes 25 is increased. Therefore, it is possible to improve the operating efficiency of the entire incineration facility 1.

[0114]

(7) In a control system 100 according to a seventh aspect, in the control system 100 according to any one of (1) to (6), in a case where the time for determining the gripping destination has arrived, the gripping destination determination unit 140 determines both a first gripping destination at which the crane 25 grips the incineration target object G as a first operation and a second gripping destination at which the crane

25 grips the incineration target object G as a second operation performed after the first operation, based on the receiving destination information. With such a configuration, it is possible to suppress the gripping operation by the crane 25 from being unable to be performed due to the reception of the incineration target object G from the delivery vehicle P that arrives at the incineration facility 1 in succession.

[0115]

(8) In a control system 100 according to an eighth aspect, in the control system 100 according to any one of (1) to (7), in a case where the time for determining the gripping destination has arrived, the gripping destination determination unit 140 determines both the gripping destination at which a first crane 25A grips the incineration target object G and the gripping destination at which a second crane 25B different from the first crane 25A grips the incineration target object G, based on the receiving destination information. With such a configuration, it is possible to suppress the gripping operation by the first crane 25A and the second crane 25B from being unable to be performed due to the reception of the incineration target object G from the delivery vehicle P that arrives at the incineration facility 1 in succession.

[0116]

(9) In a control system 100 according to a ninth aspect, in the control system 100 according to (8), the gripping destination determination unit 140 determines that the time for determining the gripping destination has arrived in a case where the first crane 25A satisfies the predetermined condition and the second crane 25B satisfies the predetermined condition. With such a configuration, it is possible to determine both the gripping destination at which the first crane 25A grips the incineration target object G and the gripping destination at which the second crane 25B grips the incineration target object G.

[0117]

(10) According to a tenth aspect, there is provided an information processing method for an incineration facility 1 including a pit 21 in which incineration target objects G are accumulated, the information processing method for causing one or more computers to: acquire receiving destination information indicating a location in the pit 21, which is a receiving destination of the incineration target object G from a delivery vehicle P that delivers the incineration target object G; acquire gripping destination information indicating a location in the pit 21, which is the gripping destination of a crane 25 that grips the incineration target object G; determine, in a case where a time for determining the receiving destination has arrived, the receiving destination, based on the gripping destination information; and determine, in a case where a time for determining the gripping destination has arrived, the gripping destination, based on the receiving destination information. With such a configuration, it is possible to improve the operating efficiency of the entire incineration facility 1 while suppressing interference between the gripping operation by the crane 25 and the receiving operation by the delivery vehicle P.

INDUSTRIAL APPLICABILITY

[0118]

According to an information processing system and an information processing method of the present disclosure, it is possible to increase operating efficiency of an entire incineration facility while suppressing interference between a gripping operation by a crane and a receiving operation by a delivery vehicle.

REFERENCE SIGNS LIST

[0119]

25 1 Incineration facility

	2 Storage portion
	3 Incinerator
	3A First incinerator
	3B Second incinerator
5	5 Platform
	21 Pit
	23 Receiving door
	25 Crane
	25A First crane
10	25B Second crane
	26X, 26Y Rail
	27 Measurement device
	31 Hopper
	31A First hopper
15	31B Second hopper
	51 Inbound route
	52 Outbound route
	53 Receiving section
	55 Weight measurement unit
20	100 Control system
	110 Information acquisition unit
	120 Storage unit
	130 Receiving destination determination unit
	140 Gripping destination determination unit
25	150 Plan generation unit

200 Table

A1 Receiving area

A2 Outbound destination area

A3 Feeding area

5 G Incineration target object

H Height

Ic Gripping destination information

Ip Receiving destination information

P Delivery vehicle

10 R, R01 to R10 Section

CLAIMS

[Claim 1] An information processing system for an incineration facility including a pit in which incineration target objects are accumulated, the information processing system comprising:

- 5 an information acquisition unit configured to acquire receiving destination information indicating a location in the pit, which is a receiving destination of the incineration target object from a delivery vehicle that delivers the incineration target object and gripping destination information indicating a location in the pit, which is a gripping destination of a crane that grips the incineration target object;
- 10 a receiving destination determination unit configured to, in a case where a time for determining the receiving destination has arrived, determine the receiving destination, based on the gripping destination information indicating the location that is the gripping destination of the crane, which is determined at the time; and
- a gripping destination determination unit configured to, in a case where a time
- 15 for determining the gripping destination has arrived, determine the gripping destination, based on the receiving destination information indicating the location that is the receiving destination of the incineration target object from the delivery vehicle, which is determined at the time,
- wherein the information acquisition unit further acquires height information
- 20 indicating a height of the incineration target object at each location in the pit, and
- the receiving destination determination unit determines, based on the gripping destination information and information indicating a length of a waiting time occurring in the delivery vehicle in a relationship with another delivery vehicle or the crane, the receiving destination from among a plurality of locations in the pit, to reduce a difference
- 25 in height of the incineration target objects between adjacent locations and to shorten the

length of the waiting time for the plurality of locations, by comparing results obtained from a function in which both the difference in height of the incineration target objects between the adjacent locations and the length of the waiting time are reflected.

[Claim 2] The information processing system according to Claim 1,

5 wherein the receiving destination determination unit determines, as the receiving destination, a location at which the incineration target object is received to reduce the difference in height of the incineration target objects between the adjacent locations, among locations different from the scheduled gripping destination, based on the gripping destination information and the height information.

10 [Claim 3] The information processing system according to Claim 2,

 wherein the gripping destination determination unit determines, as the gripping destination, a location at which the incineration target object is gripped by the crane to reduce the difference in height of the incineration target objects between the adjacent locations, among locations different from the scheduled receiving destination, based on
15 the receiving destination information and the height information.

[Claim 4] The information processing system according to Claim 3,

 wherein the height information indicates the height of the incineration target object measured by a measurement device provided in the incineration facility, and
 at least one of the receiving destination determination unit and the gripping
20 destination determination unit corrects the height information such that the height information reflects the height of the incineration target object increased by receiving the incineration target object at the scheduled receiving destination or the height of the incineration target object decreased by gripping the incineration target object at the scheduled gripping destination, and determines the receiving destination or the gripping
25 destination, based on the corrected height information.

[Claim 5] The information processing system according to Claim 1 or 2,

wherein the receiving destination determination unit determines that the time for determining the receiving destination has arrived in a case where the delivery vehicle loaded with the incineration target object reaches a predetermined position, and

5 the gripping destination determination unit determines that the time for determining the gripping destination has arrived in a case where a condition independent of the arrival of the time for determining the receiving destination is satisfied.

[Claim 6] The information processing system according to Claim 1 or 2,

wherein in a case where the time for determining the gripping destination has arrived, the gripping destination determination unit determines both a first gripping destination at which the crane grips the incineration target object as a first operation and a second gripping destination at which the crane grips the incineration target object as a second operation performed after the first operation, among locations different from the scheduled receiving destination, based on the receiving destination information.

15 [Claim 7] The information processing system according to Claim 1 or 2,

wherein a first crane and a second crane different from the first crane are present as the crane, and

in a case where the time for determining the gripping destination has arrived, the gripping destination determination unit determines both a gripping destination at which the first crane grips the incineration target object and a gripping destination at which the second crane grips the incineration target object among locations different from the scheduled receiving destination, based on the receiving destination information.

[Claim 8] The information processing system according to Claim 7,

wherein the gripping destination determination unit determines that the time for determining the gripping destination has arrived in a case where an operation of the first

crane associated in advance with the determination of the arrival of the time for determining the gripping destination is completed and an operation of the second crane associated in advance with the determination of the arrival of the time for determining the gripping destination is completed.

5 [Claim 9] An information processing method for an incineration facility including a pit in which incineration target objects are accumulated,

the information processing method for causing one or more computers to:

acquire receiving destination information indicating a location in the pit, which is a receiving destination of the incineration target object from a delivery vehicle that

10 delivers the incineration target object;

acquire gripping destination information indicating a location in the pit, which is a gripping destination of a crane that grips the incineration target object;

acquire height information indicating a height of the incineration target object at each location in the pit;

15 determine, in a case where a time for determining the receiving destination has arrived, the receiving destination, based on the gripping destination information indicating the location that is the gripping destination of the crane, which is determined at the time; and

determine, in a case where a time for determining the gripping destination has
20 arrived, the gripping destination, based on the receiving destination information indicating the location that is the receiving destination of the incineration target object from the delivery vehicle, which is determined at the time,

wherein in the determination of the receiving destination, based on the gripping destination information and information indicating a length of a waiting time occurring in
25 the delivery vehicle in a relationship with another delivery vehicle or the crane, the

receiving destination is determined from among a plurality of locations in the pit, to reduce a difference in height of the incineration target objects between adjacent locations and to shorten the length of the waiting time for the plurality of locations, by comparing results obtained from a function in which both the difference in height of the incineration target objects between the adjacent locations and the length of the waiting time are reflected.