

PROCESSING PLANT

DESCRIPTION

Technical Field

[0001]

The present invention relates to a technique for reducing the influence of a fluid including combustible substances and flowing out to the outside in a processing plant which processes the fluid.

Background Art

[0002]

It is necessary to design a processing plant which processes a fluid including combustible substances such as a liquefied natural gas plant and a petroleum refining plant in consideration of safety measures in the unlikely event that the fluid flows out to the outside to ignite the combustible substances.

Examples of such safety measures to be taken include a measure in which a region where no apparatus is arranged (safety gap) is provided between apparatus arrangement regions to suppress an increase in a blast pressure, and a measure of increasing the strengths of a main body of the apparatus and a frame holding the apparatus, to provide explosion resistance.

[0003]

At this time, when restrictions on a site area where the processing plant is installed, and the like make it difficult to provide a sufficiently large safety gap, it is necessary to further improve the explosion resistances of the apparatus and the frame in order to compensate for this effect, which causes an increase in the construction cost of the processing plant. In particular, a processing plant such as a liquefied natural gas plant provided in a floating body part arranged on the ocean has a largely restricted site area because the floating body part itself in which the processing plant is installed is also a structure.

[0004]

For example, Patent Literature 1 describes a technique for arranging a wall part having explosion resistance such that a module (explosion source) which may be exploded and is provided on the upper surface of a marine structure as a floating liquefied natural gas (FLNG) or a floating production, storage and offloading system (FPSO) is partitioned from a module adjacent thereto.

A plurality of openings each having a fan are formed in the surface of the wall part facing the explosion source. When a combustible gas leaks in the explosion source, the combustible gas is sucked by the fan, and discharged to an outlet provided in the upper end of the

wall part through a discharge path formed in the wall part.
The blast pressure is also guided to the discharge path
through these openings and discharged to the outlet.

[0005]

However, in many cases, a processing plant includes
an extremely large number of apparatuses which handle a
fluid including combustible substances. Even if these
apparatuses are collectively arranged to provide the wall
part described in Patent Literature 1, sufficient safety
cannot be secured unless a large number of huge wall parts
are installed, which may cause an increase in construction
cost.

Citation List

Patent Literature

[0006]

Patent Literature 1: KR-2017-0061261 A

Summary of Invention

Technical Problem

[0007]

The present invention has been made under such a
background, and provides a technique for reducing the
influence of the outflow of a fluid including combustible
substances by using a simple method.

Solution to Problem

[0008]

A processing plant of the present invention is a processing plant provided outdoors and processing a fluid including combustible substances, the processing plant including:

an apparatus arrangement region in which an apparatus group including a plurality of apparatuses for handling the fluid is arranged;

a gas discharge region set to discharge a gas of the combustible substances toward the outside of the processing plant when the fluid flows out from the apparatuses and the gas is generated; and

an exhaust fan provided in the gas discharge region for pushing out the gas.

[0009]

The processing plant may have the following features:

(a) A plurality of apparatus arrangement regions are arranged next to each other in a state where an apparatus non-arrangement region in which the apparatuses are not arranged is interposed between the apparatus arrangement regions in the processing plant; and the gas discharge region is provided in the apparatus non-arrangement region.

At this time, the exhaust fan is provided in the apparatus non-arrangement region, and is set to push out the gas from a lower side toward an upper side and discharge the gas toward a space above the apparatus non-arrangement region. The exhaust fan is provided at a lateral position facing the apparatus non-arrangement region; and when the processing plant is viewed in plan view, the exhaust fan is set to push out the gas in a direction facing the lateral position, and discharge the gas toward a space outside the processing plant.

(b) A module constituted by arranging the apparatus group in a frame is provided in the apparatus arrangement region; and the gas discharge region is provided in the module.

(c) The processing plant is a liquefied natural gas plant or an FPSO provided in a floating body part arranged on the ocean; and the apparatus arrangement region is provided on the floating body part. Alternatively, the processing plant is any one of a liquefied natural gas plant, a petroleum refining plant, and a chemical plant; and the apparatus arrangement region is provided on the ground.

Advantageous Effects of Invention

[0010]

In the present invention, a gas discharge region in which a gas of combustible substances is discharged when a fluid including combustible substances flows out is set in a processing plant, and an exhaust fan for pushing out the gas toward the outside of the processing plant is provided on the upstream side of the flow of the gas. This simple constitution can efficiently discharge the gas from the processing plant.

Brief Description of Drawings

[0011]

Fig. 1 is a plan view of an FLNG according to an embodiment.

Fig. 2 is a schematic view of the FLNG viewed from the side of a side surface.

Fig. 3 is an enlarged side view of a safety gap in which an exhaust fan is provided.

Fig. 4 is an enlarged plan view of the safety gap.

Fig. 5 is a schematic view showing a condition in which an exhaust fan is used to discharge a gas.

Fig. 6 is a plan view showing an example in which an exhaust fan is arranged in a liquefied natural gas plant provided on the ground.

Fig. 7 is an explanatory diagram showing simulation results according to Example.

Fig. 8 is an explanatory diagram showing simulation results according to Comparative Example.

Fig. 9 is an explanatory diagram showing a change over time in the volume of a combustible gas.

Fig. 10 is a distribution chart showing a change in a blast pressure when a combustible gas is ignited.

Description of Embodiments

[0012]

First, an example in which an exhaust fan 41 is provided for an FLNG producing a liquefied natural gas (LNG) from a natural gas (NG) on the ocean which is outdoors will be described with reference to Figs. 1 to 5. First, the schematic overall constitution of an FLNG 1 will be described with reference to Fig. 1 which is a plot plan for facilities arranged in the FLNG 1.

[0013]

The FLNG 1 includes a hull 10 which is a floating body part arranged on the ocean, and a turret 12 which is a mooring facility is provided on the bow side of the hull 10. The turret 12 is connected to a mooring line to moor the hull 10, and is connected to a riser which transports a mined natural gas (NG) underwater (the mooring line and riser are not shown). Hereinafter, a direction in which the turret 12 is provided will be described as the front of

the hull 10.

[0014]

For example, on the bow side of the hull 10, a flare stack is provided to burn an excess gas generated in an LNG plant 2 and an LNG tank formed in the main body of the hull 10, and the like (the LNG tank and the flare stack are not shown).

When the hull 10 is viewed from the side of the upper surface, a pipe rack 22 is provided in a central region in a ship width direction so as to extend along the length direction of the hull 10. The pipe rack 22 is a frame structure which holds a pipe group through which various fluids handled in the LNG plant 2 flow.

[0015]

On both the left and right sides of the pipe rack 22, a plurality of modules 21 constituting the LNG plant 2 which is the processing plant of the present example are provided side by side in the front-back direction. For example, the module 21 is a division unit in which an apparatus group constituting a process part or the like which performs various processes for a NG is incorporated in a common frame 211.

[0016]

Examples of the process part constituting the LNG plant 2 include a gas-liquid separation part which

separates a liquid contained in the NG received from the riser, a preprocessing part which removes acidic gases (carbon dioxide and hydrogen sulfide and the like), moisture, and mercury, a distillation separation part which subjects the NG from which impurities have been removed to distillation separation to obtain methane, and a liquefaction part which liquefies methane.

[0017]

In each module 21, a large number of apparatus groups are arranged, which include static apparatuses such as a column, a tank, and a heat exchanger, dynamic apparatuses such as a pump, and connection pipes which connect the static apparatuses and the dynamic apparatuses to each other and connect the apparatuses and pipes on the side of the pipe rack 22 to each other. As described above, the module 21 has a complicated inner structure in which a large number of apparatuses are arranged, but for the convenience of illustration, in Figs. 1, 2, and 4 to 8, the inner structure is simply represented by a rectangle.

A region where the module 21 on the hull 10 is arranged corresponds to an apparatus arrangement region of the present example.

[0018]

It is not essential to arrange the various apparatus groups in the frame 211 to constitute the module 21. For

example, the apparatus groups may be arranged on a pallet-shaped base to constitute the module 21, or apparatuses constituting the LNG plant 2 may be individually arranged on the hull 10. In these cases, the apparatus arrangement region is set for each base or for each partition region partitioned by passages through which occupants pass.

[0019]

Furthermore, at a position on the rear side of the region where the module 21 and the pipe rack 22 are provided, a utility facility 31 for supplying utilities such as cooling water, steam, and electric power, a laydown area 11 which stores apparatuses to be maintained during maintenance, a living part 13 where the occupants of the FLNG 1 live, and a heliport 14 where a helicopter arrives and departs are provided in this order from the front side.

[0020]

In the FLNG 1 having the above-described schematic configuration, a fluid including combustible substances such as a natural gas (NG), an LNG, and an LPG (such as C3 or C4) is handled in the LNG plant 2.

In the unlikely event that these fluids flow out from the LNG plant 2, the ignition of the combustible substances may cause explosion to occur. Therefore, for the FLNG 1, various safety measures in consideration of such a situation are taken.

[0021]

As one of the above safety measures, a region in which the apparatuses constituting the LNG plant 2 are not arranged between the adjacent modules 21 (apparatus non-arrangement region) is set when the plurality of modules 21 provided side by side along the front-back direction of the hull 10 are viewed.

The apparatus non-arrangement region is referred to as a safety gap 23, and functions to prevent the formation of a large combustible substance gas cloud which extends between the modules 21, or functions to prevent an increase in a blast pressure due to explosion in the unlikely event that the gas cloud is ignited.

[0022]

In the example shown in Fig. 1, the two modules 21 are collectively arranged along the ship length direction of the hull 10, and one safety gap 23 is provided between the arrangement regions of the two modules 21 and 21.

When the length of one module 21 viewed along the ship length direction of the hull 10 is L , the safety gap 23 is provided so as to secure a separation distance of, for example, $L/2$ to L .

[0023]

The arrangement layout of the safety gap 23 is not limited to the example of Fig. 1, and for example, the

modules 21 and the safety gaps 23 may be arranged alternately one by one. Also, regarding the arrangement relationship between the module 21 and the pipe rack 22, instead of the example shown in Fig. 1, the pipe rack 22 may be arranged so as to extend in the front-back direction toward the ship length direction, for example, along one ship edge side of the hull 10, the module 21 being arranged in the remaining region.

[0024]

Furthermore, the FLNG 1 of the present example includes an exhaust fan 41 for forcibly discharging a gas toward the outside of the FLNG 1 in order to further reduce the risk of the explosion occurrence when the fluid including combustible substances flows out from the apparatuses in the module 21 (Fig. 2).

Here, Fig. 2 is a further simplified schematic view of a condition in which the FLNG 1 described with reference to Fig. 1 is viewed from the side of a side surface. In Fig. 2, the descriptions of the turret 12, the utility facility 31, and the laydown area 11 and the like are omitted, and the modules 21 and the safety gaps 23 are alternately arranged one by one from the bow side toward the stern side.

[0025]

As shown in Fig. 2, in the FLNG 1 of the present

example, the exhaust fan 41 is provided on the side of the floor surface of the safety gap (apparatus non-arrangement region) 23. As the exhaust fan 41, a known fan provided in an air cooled heat exchanger (ACHE) or the like can be used, but unlike the case of the ACHE, a tube in which a fluid to be cooled flows is not arranged on the side of the upper or lower surface of the exhaust fan 41.

[0026]

Figs. 3 and 4 are enlarged side and plan views of the periphery of the region where the exhaust fan 11 is installed. As shown in Fig. 3, in the FLNG 1 of the present example, the module 21 is installed on a deck which is the upper surface of the hull 10 with a column base 102 interposed therebetween. A plate deck 101 forming the floor surfaces of the module 21 and the safety gap 23 is provided at a height position corresponding to the vicinity of the upper end part of the column base 102.

[0027]

A recessed part 421 is formed in the plate deck 102 located in the safety gap 23. The recessed part 421 is an exhaust fan installation region 4 in which a plurality of exhaust fans 41 are housed. In the recessed part 421 shown in Fig. 4, two rows of exhaust fans including five exhaust fans 41 are arranged side by side from the side of the pipe rack 22 toward the side of the ship edge of the hull 10.

An inlet 423 is provided on each of both sides of the exhaust fan installation region 4 to trap a gas.

[0028]

As shown in Fig. 3, a grating 422 is arranged on the side of the upper surface of the exhaust fan 41 housed in the recessed part 421 and the inlets 423 located on both sides thereof.

The exhaust fan installation region 4 may be constituted by causing the recessed part 421 to penetrate to the side of the hull 10 and arranging the exhaust fan 41 on the upper surface (hull deck) of the hull 10.

[0029]

When the exhaust fan 41 is operated, an airflow which flows into the safety gap 23 via the grating 422 is formed, and the airflow flows from the lower side toward the upper side in a space constituting the safety gap 23 (Fig. 2). When the fluid including combustible substances flows out from the module 21 adjacent to the safety gap 23, and the gas of the combustible substances flows into the safety gap 23, the gas is pushed out on the flow of the airflow formed by the exhaust fan 41. From the viewpoint, the safety gap 23 constitutes a gas discharge region 40 for discharging the gas of the combustible substances.

[0030]

Fig. 5 schematically shows the flow (i) of the gas

of the combustible substances which is pushed out by the action of the exhaust fan 41. For example, a case where the fluid including combustible substances leaks in the module 21 located on the front side of the pipe rack 22 toward Fig. 5 and arranged on the left side of the safety gap 23 is considered. The airflow is formed from the lower side toward the upper side in the safety gap 23 (gas discharge region 40), whereby, when the combustible substances become a gas (combustible gas), and the gas flows into the safety gap 23, the gas is discharged toward the space above the FLNG 1 on the flow.

[0031]

For example, the exhaust fan 41 may be always operated during a period during which the fluid including combustible substances flows in the LNG plant 2 such as during the operation of the LNG plant 2, or during a start-up or shutdown period. By always forming the airflow in the safety gap 23, the pressure in the safety gap 23 becomes relatively negative as compared with the space in the module 21. As a result, even when the fluid flows out in the module 21, the gas of the combustible substances can be drawn toward the side of the safety gap 23 (gas discharge region 40).

It is not essential to always operate the exhaust fan 41. For example, a gas detector may be provided in the

module 21 to operate the exhaust fan 41 if the gas detector detects the combustible gas.

[0032]

Fig. 5 also shows an arrangement example other than the case where the exhaust fan installation region 4 is provided on the side of the floor surface of the safety gap 23.

For example, an exhaust fan installation region 4a has a constitution in which the exhaust fan 41 is provided at a lateral position on the side of the pipe rack 22 facing the safety gap 23. In this case, the gas of the combustible substances flowing into the safety gap 23 forms a flow (ii) pushed out in the lateral direction in the safety gap 23 (gas discharge region 40) from the central side (the side of the pipe rack 22) of the hull 10 toward the outer side (the side of the ship edge), and is discharged toward the outer space of the FLNG 1.

[0033]

An exhaust fan installation region 4b has a constitution in which the exhaust fan 41 is provided in the frame 211 of the module 21, for example, in the bottom part of the module 21. In this case, a gap between the apparatuses arranged in the module 21 becomes the gas discharge region 40. The gas of the combustible substances forms a flow (iii) pushed out in the module 21 (gas

discharge region 40) from the lower side toward the upper side, and is discharged toward the space above the FLNG 1. When the exhaust fan installation region 4b is provided, the exhaust fan 41 can be held by using, for example, the frame of the pipe rack 22.

[0034]

Although not shown in Fig. 5 in order to avoid the complication of the drawing, the exhaust fan 41 may be provided at a lateral position on the side of the pipe rack 22 facing the module 21, to form the flow of the gas of the combustible substances pushed out in the lateral direction in the module 21 (gas discharge region 40), and discharge the flow toward the outer space of the FLNG 1. In this case, the exhaust fan 41 can be held by using the frame of the pipe rack 22 or the module 21.

[0035]

The FLNG 1 according to the present embodiment has the following effects. The gas discharge region 40 (safety gap 23) where the gas of the combustible substances is discharged when the fluid including combustible substances flows out in the LNG plant 2 (module 21) is set, and the exhaust fan 41 for pushing out the gas toward the outside of the LNG plant 2 (FLNG 1) is provided on the upstream side of the gas flow. This simple constitution can efficiently discharge the gas from the processing plant 2.

[0036]

In particular, as shown in simulation results to be described later, the exhaust fan 41 is provided to perform forced exhaust, whereby a region where the gas of the combustible substances spreads can be suppressed to a limited range. As a result, it is also possible to reduce the separation distance of the safety gap 23 provided for the purposes of preventing the formation of the large combustible substance gas cloud and preventing the increase in the blast pressure when the gas cloud is ignited.

[0037]

As described above, the case where the separation distance of about $L/2$ to L is set in the safety gap 23 when the length of one module 21 is L is exemplified, but the exhaust fan 41 is provided, which provides a possibility that the separation distance can be further shortened. For example, when compared with the case where the exhaust fan 41 is not provided, the separation distance of $L/2$ to L described above can also be reduced by 20% or more, and in an ideal example, about 50%. In this case, it is also possible to shorten the ship length of the hull 10 as compared with the conventional one, which contributes to reductions in the material and construction cost of the FLNG 1.

[0038]

In the present technique, a constitution is adopted, in which the exhaust fan 41 is provided on the upstream side of the flow, and the gas of the combustible substances is pushed out and discharged. A comparison is made between the case where the constitution is adopted and the case where, for example, the exhaust fan 41 is provided at a gas discharge position to suck and exhaust the gas of the combustible substances.

In the suction-exhaust, a motor of the exhaust fan 41, which is an ignition source, is located in the gas discharge region, so that the motor increases the possibility of occurrence of fire and explosion, and the exhaust fan 41 further increases the congestion degree in the gas discharge region, which also increases the influence of the blast pressure. From this result, it can be said that extrusion-exhaust are safer than the suction-exhaust. Furthermore, for the purpose of the exhaust, it is more efficient to discharge the gas to the wide gas exhaust region 40 than to suck the gas into the narrow space, i.e., the exhaust fan 41.

[0039]

In the example in which the safety gap 23 is the gas discharge region 40, it is not necessary to provide a wall-shaped structure for holding the exhaust fan 41 on the side of the upper surface or ship edge of the safety gap 23,

which is the discharge position. As a result, the gas of the combustible substances can be efficiently discharged while an increase in the construction cost of the FLNG 1 is suppressed.

[0040]

In the example in which the inside of the module 21 is the gas discharge region 40, it is not necessary to provide the exhaust fan 41 on the upper surface of the frame 211 or the side surface on the side of the ship edge, whereby an extra load may not be applied to the frame 211. As a result, it is possible to suppress increases in sizes of columns and horizontal members constituting the frame 211, to suppress an increase in the construction cost of the FLNG 1.

Furthermore, if the exhaust fan 41 is arranged on each of the above-described surfaces of the module 21, the exhaust fan 41 may interfere with the removal of the apparatuses in the module 21 during maintenance or the like and the transportation thereof to the laydown area 11. In this respect, the FLNG 1 of the present example in which the exhaust fan 41 is not arranged on these surfaces can efficiently discharge the gas of the combustible substances while maintaining the maintainability of the module 21.

[0041]

Furthermore, the processing plant provided in the

hull 10 is not limited to the LNG plant 2 which produces an LNG from a NG. For example, in an FPSO in which a processing plant for the gas-liquid separation of a crude oil and a natural gas produced in the sea is provided on the hull 10, the exhaust fan 41 similar to that in each example described with reference to Figs. 1 to 5 (exhaust fan installation regions 4, 4a, 4b) may be installed.

[0042]

Next, a plan view shown in Fig. 6 shows an example in which an exhaust fan 41 (exhaust fan installation regions 4, 4c) is provided for a module 21 constituting an LNG plant 5 provided on the ground which is outdoors.

In the LNG plant 5 shown in Fig. 6, the LNG plant 5 is constituted by arranging a plurality of modules 51 along the long side direction of a pipe rack 52 including a large number of ACHEs 521 provided on the side of the upper surface.

[0043]

Similarly to the case of the FLNG 1 described with reference to Figs. 1 to 5, in the LNG plant 5, the exhaust fan installation region 4 may be arranged on the ground side of the space between the modules 51 arranged next to each other (corresponding to the safety gap 23 in the FLNG 1).

In the case of the LNG plant 5 provided on the

ground, there may be a margin in the installation space of the exhaust fan 41. Therefore, so as shown in Fig. 6, an exhaust fan installation region 4c may be arranged at a position which is not sandwiched between the adjacent modules 21 to form a flow flowing from the lower side toward the upper side in the region 4c, thereby discharging the gas of the combustible substances toward the space above the LNG plant 5.

[0044]

Similarly to the case of the exhaust fan installation region 4a described with reference to Fig. 5, the exhaust fan 41 may be provided in the space between the modules 51 arranged next to each other and at the lateral position on the side of the pipe rack 52 facing the module 51, to laterally push out the gas of the combustible substances.

Furthermore, focusing on an apparatus which handles a relatively large amount of combustible substances such as an LNG or LPG distillation column, the exhaust fan 41 may be arranged at a position adjacent to the apparatus or at a lateral position facing the apparatus to push out the gas of the combustible substances generated by the outflow from the apparatus.

[0045]

The processing plant extruding the gas of the

combustible substances using the exhaust fan 41 for exhausting is not limited to the example of the LNG plant 5 shown in Fig. 6. Also in various petroleum refining plants which perform treatments such as distillation, desulfurization, decomposition, and reforming of a crude oil and fractions obtained from the crude oil, and chemical plants which produce petrochemical products, intermediate chemicals, and polymers and the like, the exhaust fan 41 of the present example may be provided to discharge the gas of the combustible substances.

Examples

[0046]

(Simulation)

The difference in the diffusion state of a gas of combustible substances depending on the presence or absence of an exhaust fan 41 installed on the floor surface of a safety gap 23 (gas discharge region 40) was analyzed by a computational fluid dynamics (CFD) model.

A. Simulation Conditions

(Example) As shown in Fig. 7, a CFD model in which an exhaust fan 41 was installed on the side of the floor surface of a safety gap 23 was created, and the diffusion state of a propane gas when propane leaked from a module 21 at 12 kg/s was simulated. The flow velocity of an airflow formed by the exhaust fan 41 was set to 6.7 m/s. CFD

analysis software used was FLACS (US registered trademark) v10.5 Dispersion model manufactured by GEXCON.

(Comparative Example) A CFD model similar to that of Example was created except that the exhaust fan 41 was not provided, and the diffusion state of a propane gas was simulated.

[0047]

B. Simulation Results

Figs. 7 and 8 show the simulation results of Examples and Comparative Examples. These simulation results show the distribution of a propane concentration at each position in the CFD model at a time point after a predetermined time has elapsed from the start of propane outflow. Actually, the figure is a color drawing in which different colors are assigned to the concentration range of the propane, but due to the limitation of the illustration, a gray scale pattern is shown here.

[0048]

According to the results according to Example shown in Fig. 7, it could be confirmed that the propane gas is swiftly pushed out on the airflow flowing from the lower side toward the upper side in the safety gap 23 and formed by the exhaust fan 41, and discharged to the space on the upper side of the FLNG 1.

On the other hand, according to the results of

Comparative Example shown in Fig. 8, a large amount of propane gas passed through the safety gap 23, and flowed into the adjacent module 21, so that a large combustible substance gas cloud extending between the modules 21 was formed.

[0049]

Fig. 9 is a graph showing a change over time in the volume of a gas existence region in an explosion limit region based on the simulation results of Example and Comparative Example. A horizontal axis of Fig. 9 shows an elapsed time [s] from a time point when propane starts to flow out, and a vertical axis shows the volume [m^3] of the gas (combustible gas) in the explosion limit region. In the graph, Example is shown by a solid line, and Comparative Example is shown by a short broken line.

Comparing Example with Comparative Example after 30 seconds from the start of the outflow, the volume of the gas in the explosive limit region was suppressed to 130 m^3 in Example. By contrast, the volume of the gas in Comparative Example was 2200 m^3 , which was nearly 17 times that in Example.

[0050]

Fig. 10 is a distribution chart of a blast pressure when the gas is ignited at the outflow position at a time point after 30 seconds from the start of the outflow of the

propane. A horizontal axis shows a distance [m] from an explosion source, and a vertical axis shows a blast pressure [barg]. In the graph, Example is shown by a solid line, and Comparative Example is shown by a short broken line.

According to the graph shown in Fig. 10, the region where the blast pressure reaches 2 barg in Example is suppressed to a radius of about 5 m. Meanwhile, in Comparative Example, the region where the blast pressure reached 2 barg expanded to a radius of nearly 17 m.

Reference Signs List

[0051]

1	FLNG
10	Hull
2	LNG plant
21	Module
211	Frame
22	Pipe rack
23	Safety gap
4, 4a to 4c	Exhaust fan installation region
40	Gas discharge region
41	Exhaust fan
5	LNG plant
51	Module

52 Pipe rack

CLAIMS

1. A processing plant provided outdoors and processing a fluid including combustible substances, the processing plant comprising:

an apparatus arrangement region in which an apparatus group including a plurality of apparatuses for handling the fluid is arranged;

a gas discharge region set to discharge a gas of the combustible substances toward the outside of the processing plant when the fluid flows out from the apparatuses and the gas is generated; and

an exhaust fan provided in the gas discharge region for pushing out the gas.

2. The processing plant according to claim 1, wherein

a plurality of apparatus arrangement regions are arranged next to each other in a state where an apparatus non-arrangement region in which the apparatuses are not arranged is interposed between the apparatus arrangement regions in the processing plant, and

the gas discharge region is provided in the apparatus non-arrangement region.

3. The processing plant according to claim 2, wherein the exhaust fan is provided in the apparatus non-arrangement region, and is set to push out the gas from a lower side toward an upper side and discharge the gas

toward a space above the apparatus non-arrangement region.

4. The processing plant according to claim 2, wherein the exhaust fan is provided at a lateral position facing the apparatus non-arrangement region, and

when the processing plant is viewed in plan view, the exhaust fan is set to push out the gas in a direction facing the lateral position, and discharge the gas toward a space outside the processing plant.

5. The processing plant according to claim 1, wherein a module constituted by arranging the apparatus group in a frame is provided in the apparatus arrangement region, and

the gas discharge region is provided in the module.

6. The processing plant according to claim 1, wherein the processing plant is a liquefied natural gas plant or a floating production, storage and offloading system (FPSO) provided in a floating body part arranged on the ocean, and

the apparatus arrangement region is provided on the floating body part.

7. The processing plant according to claim 1, wherein the processing plant is any one of a liquefied natural gas plant, a petroleum refining plant, and a chemical plant, and

the apparatus arrangement region is provided on the

ground.