[0011] In some implementations, the gate valve can be configured as a part of the manway or vice versa. For example, the construction of the tank can include the gate valve permanently fixed to or integrated with the manway. The launcher can be installed on the gate valve as part of the manway. The gate valve can be coupled with a lid. The lid can provide protection against leakage and exposure to external conditions in addition to the gate valve.

[0012] In some implementations, the launcher may be a part of the gate valve or vice versa. The construction of the launcher can include the gate valve permanently fixed to the launcher. The launcher can include a first side and a second side. The first side of the launcher can be configured to couple with a lid. The second side of the launcher can include the gate valve integrated with the launcher. The launcher can be installed on the manway via the second side, such that the gate valve separates the launcher from the tank. The lid can be opened and closed for passing the autonomous vehicle.

[0013] At least one aspect is directed to a method of inspecting a tank containing a flammable fluid. The method can include providing a launcher having a first end and a second end distal from the first end, coupling, via a gate valve, the second end of the launcher to a vertical side of the tank containing the flammable fluid, the launcher comprising a lid at the first end. The method can include removing the lid from the first end of the launcher. The method can include loading, via the first end of the launcher, an autonomous vehicle into the launcher. The method can include replacing, subsequent to loading the autonomous vehicle, the lid on the first end of the launcher. The method can include increasing a pressure within the launcher having the autonomous vehicle by releasing the flammable fluid into the launcher. The method can include opening the gate valve. The method can include launching the autonomous vehicle from the launcher into the tank to perform a tank inspection process.

[0014] The autonomous vehicle can be in a power off state upon the loading into the launcher. The method can include triggering, a pressure switch of the autonomous vehicle responsive to an increase in pressure above a threshold caused by releasing the flammable fluid into the launcher,

the autonomous vehicle to enter a power on state. The method can include

navigating, by the autonomous vehicle, responsive to entering the power on state, from the launcher into the tank to perform the tank inspection process.

launcher via the one or more drainer of the launcher. The launcher can include a plurality of wheels to maneuver the launcher for coupling to the vertical side of the tank. The autonomous vehicle can include at least one sensor, at least one propeller, at least one ranging device, and at least one inspection device.

[0019] There is disclosed a method of recovering a vehicle from a tank containing a flammable fluid. The method can include loading, via a second side of a launcher, an autonomous vehicle into the launcher. The autonomous vehicle executing an exit procedure in response to terminating tank inspection procedures. The method can include closing, subsequent to loading the autonomous vehicle into the launcher, a gate valve to seal the autonomous vehicle in the launcher. The method can include releasing, by a drainer of the launcher, the flammable fluid from the launcher. The method can include triggering, by a pressure switch of the autonomous vehicle responsive to a decrease in pressure below a threshold caused by the release of the flammable fluid from the launcher, the autonomous vehicle to enter a power off state. The method can include removing a lid from a first side of the launcher subsequent to releasing the flammable fluid from the launcher. The method can include recovering the autonomous vehicle from the first side of the launcher.

[0020] The vehicle can exit the tank containing a flammable fluid via a manway of the tank. The vehicle can be loaded into the launcher subsequent to exiting the tank. The launcher, the gate valve, or the tank may include at least one source to indicate the location of the manway. The vehicle can identify the location of the manway by detecting the at least one source using one or more sensors of the vehicle. The vehicle can position and move through the manway using one or more sensors. The vehicle can be terminated or shutdown in response to the vehicle entered the launcher. The instruction to terminate tank inspection can be responsive to the vehicle completing the tank inspection, a timeout, or an indication to abort operation. The indication to abort operation may be received from an external device.

[0021] The vehicle can be cleaned prior to being removed from the launcher. The launcher may include the one or more vents to provide additional substance to the launcher. The additional substance can further remove remaining flammable fluid from the vehicle and the launcher. The

launcher can include the drainer to remove the additional substance and the remaining flammable fluid from the launcher. The vehicle may be retrieved from the launcher subsequent to removing the remaining flammable fluid from the launcher.

[0021A] At least one aspect is directed to a system for inspecting a tank containing a flammable fluid. The system can include a launcher comprising a lid at a first end. The launcher is coupled, via a gate valve at a second end of the launcher, to a vertical side of the tank containing the flammable fluid. The system can include an autonomous vehicle loaded into the launcher via the first end of the launcher subsequent to the lid being removed from the first end of the launcher. Subsequent to the autonomous vehicle being loaded into the launcher, the lid is replaced at the first end of the launcher and the flammable fluid is released into the launcher to increase a pressure within the launcher having the autonomous vehicle. The system can include one or more processors programmed to launch the autonomous vehicle from the launcher into the tank to perform a tank inspection process.

[0022] There is disclosed a system of inspecting a tank containing a flammable fluid. The system can include a launcher comprising a first side having a lid and a second side configured to couple, via a manway adapter, to a vertical side of the tank containing the flammable fluid. The system can include an autonomous vehicle comprising a data processing system and a memory, the autonomous vehicle loaded into the launcher via the first side of the launcher subsequent to removing the lid. The autonomous vehicle can detect, subsequent to the manway adapter at the second side of the launcher being opened to release the flammable fluid into the launcher, a pressure within the launcher greater than a pressure threshold. The autonomous vehicle can initiate, responsive to the detection of the pressure greater than the pressure threshold, a launching sequence stored in the memory. The autonomous vehicle can navigate, responsive to initiating the launching sequence, from the launcher into the tank to perform the tank inspection process.

[0023] The autonomous vehicle can be in a power off state upon the loading into the launcher. The autonomous vehicle can enter, via triggering of a pressure switch of the autonomous vehicle responsive to an increase in pressure above a threshold caused by releasing the flammable fluid into the launcher, a power on state. The autonomous vehicle can navigate, responsive to entering the power on state, from the launcher into the tank to perform the tank inspection process. The manway adapter can include a first side configured to couple with the launcher, a second side installed to the vertical side of the tank, and a first gate valve located between the first side and the second side of the manway adapter. The autonomous vehicle can include at least one sensor, at least one propeller, at least one ranging device, and at least one inspection device.

[0024] The manway can be located at the vertical side of the tank that may not contain the flammable fluid, where the manway having a removed lid. The manway adapter can be configured to be installed to the manway to seal the tank, the manway adapter having a closed gate, and the tank can be loaded with the flammable fluid subsequent to the tank sealed with the closed gate. The autonomous vehicle can receive a command to terminate the tank inspection process. The autonomous vehicle can identify the launcher located at the vertical side of the tank. The autonomous vehicle can navigate, responsive to identifying the launcher, from the tank to the launcher for retrieval.

[0025] These and other aspects and implementations are discussed in detail below. The foregoing information and the following detailed description include illustrative examples of

What is claimed is:

1. A method of inspecting a tank containing a flammable fluid, comprising:

providing a launcher having a first end and a second end distal from the first end;

coupling, via a gate valve, the second end of the launcher to a vertical side of the tank containing the flammable fluid, the launcher comprising a lid at the first end;

removing the lid from the first end of the launcher;

loading, via the first end of the launcher, an autonomous vehicle into the launcher;

replacing, subsequent to loading the autonomous vehicle, the lid on the first end of the launcher;

increasing a pressure within the launcher having the autonomous vehicle by releasing the flammable fluid into the launcher;

opening the gate valve; and

launching the autonomous vehicle from the launcher into the tank to perform a tank inspection process.

2. The method of claim 1, further comprising:

navigating the autonomous vehicle from the tank to the launcher for retrieval;

subsequent to the autonomous vehicle navigating from the tank to the launcher for retrieval, closing the gate valve at the second end of the launcher to seal the tank from the launcher;

draining, via one or more drainers of the launcher, the flammable fluid from the launcher; and

removing the lid at the first end of the launcher to retrieve the autonomous vehicle from the launcher.

3. The method of claim 1, wherein increasing the pressure comprises increasing the pressure within the launcher to above a threshold by releasing the flammable fluid into the launcher, the pressure within the launcher increasing to above a threshold triggering a pressure switch of the autonomous vehicle to cause it to enter a powered state.

4. The method of claim 1, further comprising:

navigating, by the autonomous vehicle, from the launcher into the tank to perform the tank inspection process; or

filling the launcher with inert gas prior to releasing the flammable fluid.

5. The method of claim 1, further comprising:

removing a lid from a manway located at the vertical side of the tank;

coupling the gate valve, while closed, to the manway of the tank, and loading the tank with the flammable fluid.

6. The method of claim 1, further comprising:

providing a manway adapter having a first side comprising a first gate valve, and a second side coupled to the vertical side of the tank.

7. The method of claim 1, further comprising:

receiving, by the autonomous vehicle, a command to terminate the tank inspection process;

identifying, by the autonomous vehicle, an indicator located in a portion of the launcher; and

navigating, by the autonomous vehicle responsive to identifying the indicator, from the tank to the launcher.

8. The method of claim 1, further comprising:

closing the gate valve subsequent to the autonomous vehicle navigating from the tank to the launcher;

removing the flammable fluid from the launcher; and

removing the lid on the first end of the launcher to retrieve the autonomous vehicle from the launcher.

9. The method of claim 7, wherein when the method further comprises removing the flammable fluid from the launcher, this removing step comprises:

refilling the tank with the flammable fluid from the launcher.

10. The method of claim 7, wherein when the method further comprises removing the flammable fluid from the launcher, the method further comprises:

releasing, subsequent to removing the flammable fluid from the launcher , a cleaning solution into the launcher via a vent of the launcher; and

draining the cleaning solution from the launcher.

11. The method of claim 1, wherein loading comprises:

loading into the launcher, via the first end of the launcher, a plurality of autonomous vehicles.

12. A system for inspecting a tank containing a flammable fluid, comprising:

a launcher comprising a lid at a first end, wherein the launcher is coupled, via a gate valve at a second end of the launcher, to a vertical side of the tank containing the flammable fluid;

an autonomous vehicle loaded into the launcher via the first end of the launcher subsequent to the lid being removed from the first end of the launcher, wherein subsequent to the autonomous vehicle being loaded into the launcher, the lid is replaced at the first end of the launcher, and wherein the flammable fluid is released into the launcher to increase a pressure within the launcher having the autonomous vehicle; and

one or more processors programmed to launch the autonomous vehicle from the launcher into the tank to perform a tank inspection process.

13. The system of claim 12, wherein the launcher comprises one or more drainers, responsive to the autonomous vehicle navigating from the tank to the launcher for retrieval and the gate valve at the second end of the launcher being closed to seal the tank from the launcher, the flammable fluid is drained from the launcher via the one or more drainers, wherein the autonomous vehicle is retrieved from the launcher by removal of the lid at the first end of the launcher.

14. The system of claim 12, wherein the autonomous vehicle is launched from the launcher into the tank to perform the tank inspection process subsequent to the gate valve being opened.

15. The system of claim 12, wherein the autonomous vehicle comprises a pressure switch, responsive to detecting that the flammable fluid being released into the launcher causes the pressure within the launcher increasing to above a threshold, the autonomous vehicle is triggered to enter a powered state.

16. The system of claim 12, wherein the one or more processors are programmed to:

navigate the autonomous vehicle from the launcher into the tank to perform the tank inspection process.

17. The system of claim 12, further comprising:

a manway adapter having a first side comprising a first gate valve, and a second side coupled to the vertical side of the tank.

18. The system of claim 12, wherein responsive to receiving a command to terminate the tank inspection process, the autonomous vehicle identifies an indicator located in a portion of the launcher and navigates from the tank to the launcher.

19. The system of claim 12, wherein the launcher further comprises:

a vent, subsequent to removing the flammable fluid from the launcher, a cleaning solution is released into the launcher via the vent of the launcher and drained from the launcher.

20. The system of claim 12, wherein the launcher comprises a plurality of wheels to maneuver the launcher to couple to the vertical side of the tank.