CLAIMS

1. A purification arrangement for a gas pipeline system, the purification arrangement comprising:

a pressure vessel including an interior, a gas inlet, and a gas outlet and defining a gas flow path through the interior of the pressure vessel between the gas inlet and the gas outlet, the pressure vessel having an elongate configuration including a horizontal axis and first and second axial ends and a cover moveably mounted to the first axial end, wherein the cover is movable between a first position wherein the cover is sealed to the first axial end of the pressure vessel and a second position wherein the cover provides an opening at the first axial end of the pressure vessel;

a modular filter assembly removably located in the gas flow path in the interior of the pressure vessel and comprising a plurality of filter elements, each filter element having a filter medium positioned across the gas flow path to filter particulates from gas flowing through the filter element; and

a modular separator assembly removably located in the gas flow path in the interior of the pressure vessel between the filter assembly and the gas inlet, wherein the separator assembly includes one or more separators positioned in the gas flow path to remove particulates from gas flowing along the gas flow path;

wherein the modular filter assembly and modular separator assembly are each removable from and moveable into the pressure vessel as an integral unit, the modular separator assembly being removable from and moveable into the pressure vessel via the opening at the first axial end of the pressure vessel when the cover is in the second position.

2. The purification assembly of claim 1 wherein the modular filter assembly is removable from and moveable into the pressure vessel via the opening at the first axial end of the pressure vessel when the cover is in the second position.

3. The purification assembly of claim 2 wherein the modular filter assembly includes a transit mechanism and wherein the modular filter assembly is removable from and moveable into the pressure vessel via the transit mechanism.

4. The purification arrangement of any preceding claim wherein one or more of the separators includes a cyclone separator.

5. The purification arrangement of claim 1, 2 or 3 wherein the modular separator assembly includes a plurality of stages positioned in the gas flow path and wherein at least one downstream stage includes one or more cyclone separators.

6. The purification arrangement of claim 5 wherein an upstream stage comprises an impact separator.

7. The purification arrangement of any preceding claim wherein the modular separator assembly comprises a frame supporting the modular separator assembly as an integral unit.

8. The purification arrangement of any preceding claim wherein the modular separator assembly further includes a shell mounted to one or more of the separators to contain the particulates removed by the separators.

9. The purification arrangement of claim 8 wherein the shell surrounds all of the separators.

10. The purification arrangement of claim 8 or 9 wherein the shell comprises a liquid-tight enclosure.

11. The purification arrangement of any preceding claim wherein the plurality of filter elements comprises an array of hollow, generally cylindrical filter elements.

12. The purification arrangement of claim 11 wherein the filter elements of the array are arranged for outside-in flow.

13. The purification arrangement of any preceding claim wherein the modular filter assembly comprises a frame supporting the modular filter assembly as an integral unit.

14. The purification arrangement of an preceding claim further comprising an openable/closable barrier positioned in the gas flow path in the interior of the pressure vessel between the modular filter assembly and modular separator assembly, the barrier being moveable between an open position wherein the modular separator assembly and the modular filter assembly fluidly communicate with one another and a closed position wherein the modular separator assembly and the modular filter assembly are fluidly isolated from one another.

15. The purification arrangement of claim 14 wherein the openable/closable barrier is mounted directly to the modular filter assembly.

16. A method for removing particulates from a gas flowing in a gas pipeline system, the method comprising:

establishing a flow of gas through the interior of a horizontal pressure vessel from a gas inlet to a gas outlet, including directing gas through one or more separators of a modular separator and through one or more filter elements of a modular filter assembly to remove particulates from the gas;

terminating the flow of gas through the pressure vessel;

removing the modular separator assembly as an integral unit from the pressure vessel through a opening in the first axial end of the pressure vessel;

installing a cleaned or new modular separator assembly as an integral unit into the pressure vessel through the opening in the first axial end of the pressure vessel; and

restablishing a flow of gas through the interior of the pressure vessel from the gas inlet to the gas outlet and through the cleaned or new modular separator assembly in the interior of the pressure vessel.

17. The method of claim 16 further comprising removing the modular filter assembly as an integral unit from the pressure vessel and installing a cleaned or new modular filter assembly as an integral unit into the pressure vessel after terminating the flow of gas and before restablishing the flow of gas through the interior of the pressure vessel.

18. The method of claim 16 or 17 further comprising containing particulates removed by the separators in a shell that surrounds the separators, wherein removing the modular separator assembly includes removing the shell containing the particulates removed by the separators.

19. The method of claim 16, 17, or 18 further comprising closing an openable/closable barrier located in the interior of the pressure vessel between the modular filter assembly and the modular separator assembly after terminating the flow of gas through the interior of the pressure vessel, wherein closing the openable/closable barrier includes fluidly isolating the modular filter assembly and modular separator assembly from one another.

20. The method of claim 19 further comprising flooding the interior of the pressure vessel around the modular filter assembly with an inert gas after closing the barrier.

CLAIMS

1. A purification arrangement for a gas pipeline system, the purification arrangement comprising:

a pressure vessel including an interior, a gas inlet, and a gas outlet and defining a gas flow path through the interior of the pressure vessel between the gas inlet and the gas outlet, the pressure vessel having an elongate configuration including a horizontal axis and first and second axial ends and a cover moveably mounted to the first axial end, wherein the cover is movable between a first position wherein the cover is sealed to the first axial end of the pressure vessel and a second position wherein the cover provides an opening at the first axial end of the pressure vessel;

a modular filter assembly removably located in the gas flow path in the interior of the pressure vessel and comprising a plurality of filter elements, each filter element having a filter medium positioned across the gas flow path to filter particulates from gas flowing through the filter element; and

a modular separator assembly removably located in the gas flow path in the interior of the pressure vessel between the filter assembly and the gas inlet, wherein the modular separator assembly includes a transit mechanism and one or more separators positioned in the gas flow path to remove particulates from gas flowing along the gas flow path;

wherein the modular filter assembly and modular separator assembly are each removable from and moveable into the pressure vessel as an integral unit, the modular separator assembly being removable from and moveable into the pressure vessel via the opening at the first axial end of the pressure vessel when the cover is in the second position and wherein the transit mechanism includes a plurality of wheels arranged to roll with the modular separator assembly along the interior of the pressure vessel through the opening in the axial end.

2. The purification assembly of claim 1 wherein the modular filter assembly includes a transit mechanism and wherein the modular filter assembly is removable from and moveable into the pressure vessel via the transit mechanism.

3. The purification assembly of claim 2 wherein the transit mechanism of the modular filter assembly includes a plurality of wheels arranged to roll with the modular filter assembly along the interior of the pressure vessel through the opening in the axial end.

4. The purification arrangement of any preceding claim wherein one or more of the separators includes a cyclone separator.

5. The purification arrangement of claim 1, 2 or 3 wherein the modular separator assembly includes a plurality of stages positioned in the gas flow path and wherein at least one downstream stage includes one or more cyclone separators.

6. The purification arrangement of claim 5 wherein an upstream stage comprises an impact separator.

7. The purification arrangement of any preceding claim wherein the modular separator assembly comprises a frame supporting the modular separator assembly as an integral unit.

8. The purification arrangement of any preceding claim wherein the modular separator assembly further includes a shell mounted to one or more of the separators to contain the particulates removed by the separators.

9. The purification arrangement of claim 8 wherein the shell surrounds all of the separators.

10. The purification arrangement of claim 8 or 9 wherein the shell comprises a liquid-tight enclosure.

11. The purification arrangement of any preceding claim wherein the plurality of filter elements comprises an array of hollow, generally cylindrical filter elements.

12. The purification arrangement of claim 11 wherein the filter elements of the array are arranged for outside-in flow.

13. The purification arrangement of any preceding claim wherein the modular filter assembly comprises a frame supporting the modular filter assembly as an integral unit.

14. The purification arrangement of an preceding claim further comprising an openable/closable barrier positioned in the gas flow path in the interior of the pressure vessel

between the modular filter assembly and modular separator assembly, the barrier being moveable between an open position wherein the modular separator assembly and the modular filter assembly fluidly communicate with one another and a closed position wherein the modular separator assembly and the modular filter assembly are fluidly isolated from one another.

15. The purification arrangement of claim 14 wherein the openable/closable barrier is mounted directly to the modular filter assembly.

16. A method for removing particulates from a gas flowing in a gas pipeline system, the method comprising:

establishing a flow of gas through the interior of a horizontal pressure vessel from a gas inlet to a gas outlet, including directing gas through one or more separators of a modular separator assembly and through one or more filter elements of a modular filter assembly to remove particulates from the gas;

terminating the flow of gas through the pressure vessel;

removing the modular separator assembly as an integral unit from the pressure vessel through an opening in the first axial end of the pressure vessel, wherein removing the modular separator assembly includes rolling the modular separator assembly along the interior of the pressure vessel on a plurality of wheels;

installing one of a cleaned modular separator assembly and a new modular separator assembly as an integral unit into the pressure vessel through the opening in the first axial end of the pressure vessel, wherein installing the cleaned or new modular separator assembly includes rolling the cleaned or new modular separator assembly along the interior of the pressure vessel on a plurality of wheels; and

restablishing a flow of gas through the interior of the pressure vessel from the gas inlet to the gas outlet and through the cleaned or new modular separator assembly in the interior of the pressure vessel.

17. The method of claim 16 further comprising removing the modular filter assembly as an integral unit from the pressure vessel and installing a cleaned or new modular filter assembly

as an integral unit into the pressure vessel after terminating the flow of gas and before restablishing the flow of gas through the interior of the pressure vessel.

18. The method of claim 16 or 17 further comprising containing particulates removed by the separators in a shell that surrounds the separators, wherein removing the modular separator assembly includes removing the shell containing the particulates removed by the separators.

19. The method of claim 16, 17, or 18 further comprising closing an openable/closable barrier located in the interior of the pressure vessel between the modular filter assembly and the modular separator assembly after terminating the flow of gas through the interior of the pressure vessel, wherein closing the openable/closable barrier includes fluidly isolating the modular filter assembly and modular separator assembly from one another.

20. The method of claim 19 further comprising flooding the interior of the pressure vessel around the modular filter assembly with an inert gas after closing the barrier.