A stabilizing assembly for a poppet valve in a regenerative thermal oxidizer comprises a plurality of rigid bars, spanning a poppet valve gap, arranged circumferentially around a chamber outlet.
POPPET VALVE STABILIZER

CROSS REFERENCE TO RELATED APPLICATION


FIELD OF THE INVENTION

[0002] The invention relates to regenerative thermal oxidizers (RTO) for converting solvent laden gases to CO₂ and H₂O.

BACKGROUND

[0003] RTOs typically have multiple chambers separated by one or more poppet valves. A poppet valve controls the flow of gas in and out of the chambers. Examples of RTOs are shown in U.S. Pat. No. 6,039,927 and U.S. Pat. No. 6,129,139, each of which is hereby incorporated by reference in its entirety.

[0004] Proper and efficient operation of the RTO depends on the ability of a poppet valve to maintain a tight seal around a chamber opening. However, with repeated forceful opening and closing, the valves tend to deteriorate over time. The high force with which the valves close, or "slam" shut, typically tends to cause premature wear of valve seats. Lack of constant air pressure in the RTOs, and temperature variability of many hydraulic fluids, and ambient variances all cause inconsistent strains and stresses on the poppet valve.

THE DRAWINGS

[0005] FIG. 1 is a perspective view of an RTO.

[0006] FIG. 2 is a partial perspective view of a stabilized poppet valve in an RTO.

DESCRIPTION

[0007] FIG. 1 shows RTO unit 20. Oxidizer 20 has separate chambers 22 and 24 separated by a poppet valve (not visible in FIG. 1). Door 26 is provided on the side of RTO 20. FIG. 2 shows the view seen when door 26 is open.

[0008] In FIG. 2, poppet valve 30 includes shaft 32 which is driven left and right (axially) by pneumatic cylinder 33 (FIG. 1). When shaft 32 moves left, poppet blade 34 also moves left opening chamber 22, allowing gas to flow in and/or out.

[0009] The apparatus shown in FIG. 2 employs stabilizing bars 38 across gap 36. A significant problem with prior poppet valves in RTOs is that the seal around poppet blade 34 becomes flawed or degraded, especially after extended use. The quality of the seal around poppet blade 34 is important for oxidizer performance. Stabilizing bars 38 rigidify the relative positions of structures on opposite sides of the poppet valve resulting in superior poppet valve performance over time.

[0010] In the example shown in FIG. 2, bars 38 rigidly connect frame components around the chamber opening. Specifically, frame component 50 is a rigid structural annular component circumscribing the opening to the chamber. As shown, eight stabilizing bars are used to support the poppet valve. However, other similar structures, or numbers of bars may also be used, provided the gap space remains relatively open while the gap space and poppet valve mechanics are substantially stabilized.

[0011] The disclosure set forth above may encompass multiple distinct inventions with independent utility. Although each of these inventions has been disclosed in its preferred form(s), the specific embodiments thereof as disclosed and illustrated herein are not to be considered in a limiting sense, because numerous variations are possible. The subject matter of the inventions includes all novel and nonobvious combinations and subcombinations of the various elements, features, functions, and/or properties disclosed herein. Inventions embodied in other combinations and subcombinations of features, functions, elements, and/or properties may be claimed in applications claiming priority from this or a related application. Such claims, whether directed to a different invention or to the same invention, and whether broader, narrower, equal, or different in scope to the original claims, also are regarded as included within the subject matter of the inventions of the present disclosure.

We claim:

1. A regenerative thermal oxidizer comprising
   a first chamber having an inlet for receiving contaminated process effluent gas, and an outlet in a first wall for allowing gas to exit the chamber,
   a second wall located outside the first chamber substantially parallel to the first wall, a gap being defined between the first and second walls,
   a poppet valve assembly operatively installed between the first and second walls to control opening and closing of the outlet, the poppet valve having a shaft oriented centrally relative to the outlet and perpendicularly relative to the first and second walls, and a disc member connected to the shaft, the disc member being dimensioned to cover the outlet,
   a drive mechanism connected to the shaft configured to move the shaft back and forth along an axis perpendicular to the plane of the outlet so that the disc moves between an open position in which gas can pass through the outlet and a closed position in which the disc substantially seals the outlet preventing gas from escaping the first chamber,
   a plurality of rigid rod structures spanning the gap and connecting the first and second walls, arranged circumferentially around the outlet.

2. The oxidizer of claim 1, wherein the outlet in the first chamber is circular.

3. The oxidizer of claim 1, wherein the rod structures are made of steel.

4. The oxidizer of claim 1, wherein the there are at least eight rods evenly spaced around the outlet.

5. The oxidizer of claim 1, wherein the first wall includes an annular rigid structure circumscribing the outlet.

6. A regenerative thermal oxidizer comprising
   a first chamber having an inlet for receiving contaminated process effluent gas, and an outlet in a first wall for allowing gas to exit the chamber,
a second wall located outside the first chamber substantially parallel to the first wall, a gap being defined between the first and second walls,

a poppet valve assembly operatively installed between the first and second walls to control opening and closing of the outlet, the poppet valve having a shaft oriented centrally relative to the outlet and perpendicularly relative to the first and second walls, and a disc member connected to the shaft, the disc member being dimensioned to cover the outlet,

a drive mechanism connected to the shaft configured to move the shaft back and forth along an axis perpendicular to the plane of the outlet so that the disc moves between an open position in which gas can pass through the outlet and a closed position in which the disc substantially seals the outlet preventing gas from escaping the first chamber,

a rigid support structure spanning the gap and connecting the first and second walls, arranged circumferentially around the outlet.

7. The oxidizer of claim 6, wherein the rigid support structure includes a plurality of rigid connecting the first and second walls, evenly spaced around the outlet.

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