What is claimed is:

1. A butterfly valve comprising:

a body including a valve opening; and

a flapper rotatably mounted about a rotation axis so as to be movable relative to the valve opening;

wherein the flapper is rotatable at least 180° about the rotation axis so that the flapper is movable to at least one fully opened position, at least one fully closed position 90° apart from the fully opened position, and a third position, either fully opened or fully closed, 180° from the other like position..

2. A butterfly valve according to claim 1, wherein the flapper is rotatable at least 360° about the rotation axis so that the flapper is movable to each of two fully opened positions 180° apart from each other, and two fully closed positions 180° apart from each other and 90° and 270° apart form each of the fully opened positions.

3. A butterfly valve according to claim 2 wherein the flapper can be selectively moved to either of the opened positions and to either of the closed positions so that any material deposited on the flapper during use will be distributed on both sides and on all of the edges of the flapper during use so as to reduce the affect of such deposited material on valve conductance and flapper movement so as to extend service life.

4 A butterfly valve according to claim 2, wherein deposited material that may accumulate on either side and around the edges of the flapper and along the interior portion of the opening adjacent the edges of the flapper as the flapper moves into and out of either closed position can be dislodged by (a) rotating the flapper so as to expose each side of the flapper and the various edges of the flapper to a fluid flowing through the valve so that the fluid flowing through the valve can dislodge the deposited material exposed to the flowing fluid, and (b) moving the flapper into, through and out of either or both of the closed positions in either or both rotational

directions so that the edge of the flapper can help dislodge deposited material on interior portions of the valve opening.

5. A butterfly valve according to claim 1, wherein the flapper is rotatable at least 360° in either of two directions.

6. A butterfly valve according to claim 1, further including a shaft rotatably supporting the flapper, and wherein the flapper is centered with the shaft, and the valve opening is an untapered bore formed in a valve housing.

7. A butterfly valve according to claim 6, wherein the flapper is shaped as a disk and is rotatably mounted about the rotation axis in either direction between a fully opened position wherein the disk of the flapper is substantially oriented 90° or 270° relative to the opening so as to allow maximum flow through the valve opening, and a fully closed position wherein the disk of the flapper is oriented 0° or 180° to close the valve opening so as to provide minimum flow through the valve opening.

8. A butterfly valve according to claim 6, further including a shaft rotatably mounted relative to the valve opening, wherein the flapper is fixedly secured relative to the shaft so as to rotate with the shaft relative to the valve opening.

9. A butterfly valve according to claim 1, wherein shaft is rotatably driven by a reversible stepper motor.

10. A butterfly valve according to claim 1, wherein the flapper is shaped as a disk, and the disk is tapered.

11. A butterfly valve according to claim 10, wherein the valve opening is tapered.

12. A butterfly valve according to claim 10, wherein the flapper is shaped as a disk, and the disk is untapered.

13. A system comprising:

a tool for utilizing a material during a process;

a valve comprising:

a body including a valve opening; and

a flapper rotatably mounted about a rotation axis so as to be movable relative to the valve opening;

wherein the flapper is rotatable at least 180° about the rotation axis so that the flapper is movable to at least one fully opened position, at least one fully closed position 90° apart from the fully opened position, and a third position, either fully opened or fully closed, 180° from the other like position...

14. A system according to claim 13, wherein the flapper is rotatable at least 360° about the rotation axis so that the flapper is movable to each of two fully opened positions 180° apart from each other, and two fully closed positions 180° apart from each other and 90° and 270° apart form each of the fully opened positions.

15. A system according to claim 14, wherein the flapper can be selectively moved to either of the opened positions and to either of the closed positions so that any material deposited on the flapper during use will be distributed on both sides and on all of the edges of the flapper during use so as to reduce the affect of such deposited material on valve conductance and flapper movement so as to extend service life.

16 A system according to claim 14, wherein deposited material that may accumulate on either side and around the edges of the flapper and along the interior portion of the opening adjacent the edges of the flapper as the flapper moves into and out of either closed position can be dislodged by (a) rotating the flapper so as to expose each side of the flapper and the various edges of the flapper to a fluid flowing through the valve so that the fluid flowing through the valve can dislodge the deposited material exposed to the flowing fluid, and (b) moving the flapper into, through and out of either or both of the closed positions in either or both rotational

directions so that the edge of the flapper can help dislodge deposited material on interior portions of the valve opening.

17. A system according to claim 13, wherein the flapper is rotatable at least 360° in either of two directions.

18. A system according to claim 13, further including a shaft rotatably supporting the flapper, and wherein the flapper is centered with the shaft, and the valve opening is a untapered bore formed in a valve housing.

19. A system according to claim 13, wherein the flapper is shaped as a disk and is rotatably mounted about the rotation axis in either direction between a fully opened position wherein the disk of the flapper is substantially oriented 90° or 270° relative to the opening so as to allow maximum flow through the valve opening, and a fully closed position wherein the disk of the flapper is oriented 0° or 180° to close the valve opening so as to provide minimum flow through the valve opening.

20. A system according to claim 19, further including a shaft rotatably mounted relative to the valve opening, wherein the flapper is fixedly secured relative to the shaft so as to rotate with the shaft relative to the valve opening.

21. A system according to claim 13, wherein shaft is rotatably driven by a reversible stepper motor.

22. A system according to claim 13, wherein the flapper is shaped as a disk, and the disk is tapered.

23. A system according to claim 13, wherein the valve opening is tapered.

24. A system according to claim 13, wherein the flapper is shaped as a disk, and the disk is untapered.

25. A system according to claim 13, wherein deposited material that may accumulate on either side and around the edges of the flapper and along the interior portion of the opening adjacent the edges of the flapper as the flapper moves into and

out of either closed position can be dislodged by (a) rotating the flapper so as to expose each side of the flapper and the various edges of the flapper to a fluid flowing through the valve so that the fluid flowing through the valve can dislodge the deposited material exposed to the flowing fluid, and (b) moving the flapper into, through and out of either or both of the closed positions in either or both rotational directions so that the edge of the flapper can help dislodge deposited material on interior portions of the valve opening.

26 A method of maintaining a flapper valve clean of material deposited on both sides and all of the edges of the flapper and in a valve opening during use, comprising:

exposing the flapper to a cleaning material flowing through the valve while operating the flapper so as to (a) expose each side of the flapper and the various edges of the flapper to the cleaning material flowing through the valve so that the fluid flowing through the valve can dislodge the deposited material exposed to the flowing fluid, and (b) move the flapper into, through and out of either or both of the closed positions in either or both rotational directions so that the edge of the flapper can help dislodge deposited material on interior portions of the valve opening.

CLAIMS:

1. A butterfly valve comprising:

a valve body including a valve opening; and

a flapper rotatably mounted within the valve body about a rotation axis so as to be rotatable to any desired valve opening amount between and including either of two possible angular positions that are 180 degrees apart;

a flapper positioner having a configuration that, in response to a command to rotate the flapper to a desired angular position, can rotate the flapper to the desired angular position; and

a flapper controller having a configuration that causes the flapper controller to:

receive a command to move the flapper to a desired valve opening amount; and

for each desired valve opening amount:

determine by measuring valve slip which of the two possible angular positions that are 180 apart for that desired valve opening amount the flapper should be positioned based on a goal of cleaning deposited debris from the flapper and the valve body; and

command the valve positioner to rotate the flapper to the determined angular position.

2. A butterfly valve according to claim 1, wherein the flapper is rotatable at least substantially 360° in either of two directions.

3. A butterfly valve according to claim 1, further including a shaft rotatably supporting the flapper, and wherein the flapper positioner comprises a reversible stepper motor.

4. A butterfly valve according to claim 3, wherein the flapper is shaped as a disk and is rotatably mounted about the rotation axis in either direction between a fully opened position wherein the disk of the flapper is oriented substantially 90° or 270° relative to the opening so as to allow maximum flow through the valve opening, and a fully closed position wherein the disk of the flapper is oriented substantially 0° or 180° to close the valve opening so as to provide minimum flow through the valve opening.

5. A butterfly valve according to claim 1, wherein the flapper is shaped as a disk, and the disk is tapered.

6. A butterfly valve according to claim 5, wherein the valve opening is tapered.

7. A butterfly valve according to claim 1, wherein the flapper is shaped as a disk, and the disk is untapered.

8. A system comprising:

a conduit for conveying material from a tool;

a valve comprising:

a valve body including a valve opening;

a flapper rotatably mounted within the valve body about a rotation axis so as to be rotatable to any desired valve opening amount at either of two possible angular positions that are 180 degrees apart;

a flapper positioner having a configuration that, in response to a command to rotate the flapper to a desired angular position, can rotate the flapper to the desired angular position; and

a flapper controller having a configuration that causes the controller to:

receive a command to move the flapper to a desired valve opening amount; and

for each desired valve opening amount:

determine by measuring valve slip which of the two possible angular positions that are 180 degrees apart for that desired valve opening amount the flapper should be positioned based on a goal of cleaning deposited debris from the flapper and the valve body; and

command the flapper positioner to rotate the flapper to the determined angular position.

9. A system according to claim 8, wherein the flapper is operative to be selectively moved to either of the opened positions and to either of the closed positions so that any material deposited on the flapper during use will be distributed on both sides and on all of the edges of the flapper during use so as to reduce the effect of such deposited material on valve conductance and flapper movement so as to extend service life.

10. A system according to claim 8, wherein the flapper is rotatable at least substantially 360° in either of two directions.

11. A system according to claim 8, further including a shaft rotatably supporting the flapper, and wherein the flapper positioner comprises a reversible stepper motor.

12. A system according to claim 8, wherein the flapper is shaped as a disk and is rotatably mounted about the rotation axis in either direction between a fully opened position wherein the disk of the flapper is oriented substantially 90° or 270° relative to the opening so as to allow maximum flow through the valve opening, and a fully closed position wherein the disk of the flapper is oriented substantially 0° or 180° to close the valve opening so as to provide minimum flow through the valve opening.

13. A system according to claim 12, further including a shaft rotatably mounted relative to the valve opening, wherein the flapper is fixedly secured relative to the shaft so as to rotate with the shaft relative to the valve opening.

14. A system according to claim 8, wherein the flapper is shaped as a disk, and the disk is tapered.

15. A system according to claim 8, wherein the valve opening is tapered.

16. A system according to claim 8, wherein the flapper is shaped as a disk, and the disk is untapered.