[00010] Thus, there is a need in the art for a gate valve system where the actuation means can be replaced without affecting the integrity of the sealed portion of the valve where all the connection to the actuation means are outside of the sealed portions of the gate valve and having a gate and bonnet design that reduces the buildup of particulate matter inside the gate passageway.

SUMMARY OF THE INVENTION

[00010a] In a first aspect, there is provided a gate valve system comprising: a valve body having a bore to allow fluid to pass through the valve body, the valve body further having a cavity defined by substantially parallel valve body innerside walls; a gate operationally disposed within the cavity, wherein the gate has a passage to allow fluid to pass, wherein at least one end of the gate is defined by a radius perimeter; a bonnet removably coupled to a face of the valve body and comprising a connecting end, wherein a portion of an innerside of the bonnet includes a curved surface adapted to mate with the at least one end of the gate defined by the radius perimeter; a first valve stem connected to an upper portion of the gate and a second valve stem connected to a lower portion of the gate; and an actuation mechanism operationally positioned and removably connected to the gate by way of a thru-hole in the bonnet, whereby the actuation mechanism effectuates sufficient translational movement of the gate to substantially permit or to substantially impede fluid flow within the system, wherein the actuation mechanism comprises a ball-screw drive assembly or a hydraulic stem engaged with the first valve stem, and a bearing cap threadedly engaged with the connecting end of the bonnet for removably connecting the actuation mechanism to the connecting end of the bonnet, and wherein the actuation mechanism is configured to be removed and replaced by an operationally different actuation mechanism by detaching the ball-screw drive assembly or the hydraulic stem from the first valve stem, detaching the bearing can from the connecting end of the bonnet, and attaching the first valve stem to the operationally different actuation mechanism.

[00010b] In a second aspect, there is provided a gate valve bonnet for use in a fluid control system comprising: an actuation mechanism comprising a ball-screw drive assembly or a hydraulic stem, and a bearing cap; and a housing having a connecting end for threadably engaging with the bearing cap of the actuation mechanism such that the actuation mechanism

is removably connected to the housing, and a thru-hole to allow passage of a valve stem coupled to a gate having at least one end defined by a radius perimeter such that the thru-hole is sealed to limit leakage of fluid inside the fluid control system, the housing further comprising: an innerside portion within the housing, wherein the innerside portion includes a curved surface adapted to mate with the one end of the gate, wherein the gate has at least one end with a substantially congruent mated radius perimeter for fitment with the curved surface; and a substantially planar face that sealably mates with a congruent face on the valve body of a fluid control system to limit leakage of fluid inside the fluid control system, wherein the ball-screw drive assembly or the hydraulic stem is configured to be attached to the valve stem, and the actuation mechanism is configured to be removed and replaced by an operationally different actuation mechanism by detaching the ball-screw drive assembly or the hydraulic stem from the valve stem, detaching the bearing cap from the connecting end of the bonnet, and attaching the valve stem to the operationally different actuation mechanism.

[00010c] In a third aspect, there is provided a gate valve system comprising: a valve body having a bore to allow fluid to pass through the valve body, the valve body further having a cavity defined by substantially parallel valve body innerside walls; a gate operationally disposed within the cavity, wherein the gate has a passage to allow fluid to pass, wherein at least one end of the gate is defined by a radius perimeter; a bonnet removably coupled to a face of the valve body and comprising a connecting end, wherein a position of an innerside of the bonnet includes a curved surface adapted to mate with the at least one end of the gate defined by the radius perimeter; a first valve stem connected to an upper portion of the gate and a second valve stem connected to a lower portion of the gate; and a mechanical actuation mechanism operationally positioned and removably connected to the gate by way of a thru-hole in the bonnet, whereby the mechanical actuation mechanism effectuates sufficient translational movement of the gate to substantially permit or to substantially impede fluid flow within the system, and the mechanical actuation mechanism comprises a ball-screw drive assembly engaged with the first valve stem, and a bearing cap threadedly engaged with the connecting end of the bonnet for removably connecting the mechanical actuation mechanism to the connecting end of the bonnet, wherein the mechanical actuation mechanism is configured to be removed and replaced by a hydraulic actuation mechanism by detaching the ball-screw drive assembly from the first valve stem,

detaching the bearing cap from the connecting end of the bonnet, and attaching the first valve stem to the hydraulic actuation mechanism.

[00010d] In a fourth aspect, there is provided a gate valve system comprising: a valve body having a bore to allow fluid to pass through the valve body, the valve body further having a cavity defined by substantially parallel valve body innerside walls; a gate operationally disposed within the cavity, wherein the gate has a passage to allow fluid to pass, wherein at least one end of the gate is defined by a radius perimeter; a bonnet removably coupled to a face of the valve body and comprising a connecting end, wherein a portion of an innerside of the bonnet includes a curved surface adapted to mate with the at least one end of the gate defined by the radius perimeter; a first valve stem connected to an upper portion of the gate and a second valve stem connected to a lower portion of the gate; and a hydraulic actuation mechanism operationally positioned and removably connected to the gate by way of a thru-hole in the bonnet, whereby the hydraulic actuation mechanism effectuates sufficient translational movement of the gate to substantially permit or to substantially impede fluid flow within the system, and the hydraulic actuation mechanism comprises a hydraulic stem engaged with the first valve stem, and a bearing cap threadedly engaged with the connecting end of the bonnet for removably connecting the hydraulic actuation mechanism to the connecting end of the bonnet, wherein the hydraulic actuation mechanism is configured to be removed and replaced by a mechanical actuation mechanism by detaching the hydraulic stem from the first valve stem, detaching the bearing cap from the connecting end of the bonnet, and attaching the first valve stem to the mechanical actuation mechanism.

[00011] In accordance with the teachings provided herein for controlling fluid flow within a system, one example provides a gate valve system. The system comprises: a valve body having a bore to allow fluid to pass through the valve body and further having a cavity defined by substantially parallel valve body innerside walls; a gate operationally disposed within the cavity, wherein the gate has a passage to allow fluid to pass, wherein at least one end of the gate is defined by a radius perimeter; a bonnet removably coupled to a face of the valve body, wherein a portion of an innerside of the bonnet includes a curved surface adapted

to mate with the at least one end of the gate defined by the radius perimeter; and an actuation mechanism operationally positioned and removably connected to the gate by way of a thru-hole in the bonnet, whereby the actuation mechanism effectuates sufficient translational movement of the gate to substantially permit or to substantially impede fluid flow within the system.

[00012] In another example, a gate apparatus for use in a fluid control system is provided. The gate apparatus comprises a plate having a passage extending through the plate from a first planar face to a second planar face of the plate, wherein the first planar face and the second planar face are substantially parallel, the plate comprising at least one end defined by a radius perimeter and two substantially parallel opposing side portions, whereby the gate, when translated within the fluid control system between an open and closed position, controls fluid flow within the system.

[00013] In yet another example, a gate valve bonnet for use in a fluid control system is provided. The gate valve bonnet comprises a housing having a thru-hole to allow passage of a stem coupled to a gate having at least one end defined by a radius perimeter such that the thru-hole is sealed to limit leakage of fluid inside the fluid control system, the housing further