CLAIMS

What is claimed is:

1. An insert valve installed, at least partially, in a safety valve, comprising:
   a flow port disposed on an exterior of the insert valve;
   a poppet configured to control a fluid flow through the flow port, wherein the poppet comprises a convex tapered wall facing in an uphole direction;
   a piston rod, disposed uphole from the poppet, configured to move the poppet past at least part of the flow port, wherein the piston rod is partially retained with respect to the poppet; and
   a hydraulic control port configured to control movement of the piston rod.

2. The insert valve of claim 1, wherein the hydraulic control port is disposed uphole from the flow port.

3. The insert valve of claim 1, wherein the poppet translates along an axis of translation.

4. The insert valve of claim 3, wherein the piston rod translates along the axis of translation.

5. The insert valve of claim 4, wherein the axis of translation is centered within the insert valve.

6. The insert valve of claim 3, wherein the insert valve further comprises a spring that exerts a closing force on the poppet.

7. The insert valve of claim 6, wherein the spring is centered around the axis of translation.

8. The insert valve of claim 6, wherein the insert valve further comprises a centralizing rod affixed to the poppet.

9. The insert valve of claim 8, wherein the spring is centered around the centralizing rod.

10. The insert valve of claim 9, wherein the centralizing rod translates along the axis of translation.

11. The insert valve of claim 1, wherein the insert valve further comprises a poppet seat, and wherein when the poppet is in a closed position, the poppet is pressed against the poppet seat.

12. The insert valve of claim 11, wherein when the poppet is pressed against the poppet seat, a seal is formed to prevent the fluid flow.

13. The insert valve of claim 12, wherein increasing a pressure in the hydraulic control port causes the piston rod to push the poppet into an open position off of the poppet seat and past the flow port to allow the fluid flow.

14. The insert valve of claim 13, wherein reducing the pressure moves the poppet into the closed position.

15. The insert valve of claim 1, wherein the insert valve comprises a plurality of flow ports disposed around a circumference of the exterior of the insert valve, and wherein the plurality of flow ports comprises the flow port.

16. An insert valve installed, at least partially, in a safety valve in a borehole, comprising:
    a plurality of flow ports disposed on an exterior circumference of the insert valve;
    a poppet configured to control a fluid flow through the plurality of flow ports, wherein the poppet comprises a convex tapered wall facing in an uphole direction;
    a poppet seat configured to mate with the poppet;
    a spring, disposed downhole from the poppet, configured to move the poppet against the poppet seat; and
    a piston rod, disposed uphole from the poppet, configured to move the poppet past the plurality of flow ports, wherein the piston rod is partially retained with respect to the poppet.

17. The insert valve of claim 16, wherein the insert valve comprises a hydraulic control port disposed uphole from the plurality of flow ports.

18. The insert valve of claim 17, wherein the piston rod is configured to move based on a pressure within the hydraulic control port.

19. The insert valve of claim 16, wherein the poppet and the piston rod translate along an axis of translation.

20. The insert valve of claim 19, wherein the spring is centered around the axis of translation.