wherein the drilling fluid pump has an inlet connected to the discharge piping and has an outlet connected to bypass piping;

determining that a target pressure parameter of the drilling fluid in the discharge piping is not satisfied;

in response to determining that the target pressure parameter is not satisfied, adjust a pressure control device to modify the pressure of the pressure of the drilling fluid in the discharge piping to approach the target pressure parameter by at least partially opening the pressure control device and releasing drilling fluid into a bypass piping at a selected flow rate, wherein the pressure control device is connected at an inlet to the discharge piping and at an outlet to bypass piping;

determining the selected flow rate at which the at least partially open pressure control device releases the drilling fluid by:

identifying one or more data pairs, each data pair including a flow rate of drilling fluid through the bypass piping and a pressure in the bypass piping;

providing the flow rate of drilling fluid through the bypass piping and the pressure in the bypass piping included in each data pair of the identified one or more data pairs as an input to a curve fit function; and

executing the curve fit function to determine the selected flow rate at which the at least partially open pressure control device releases the drilling fluid; and modifying the drilling fluid flow rate in the discharge piping based on the pressure represented by the pressure measurement signals and the selected flow rate in the bypass piping such that the target pressure parameter of the drilling fluid in the discharge piping is satisfied.

wherein the drilling fluid pump has an inlet connected to the discharge piping and has an outlet connected to bypass piping;

determining that a target pressure parameter of the drilling fluid in the discharge piping is not satisfied;

in response to determining that the target pressure parameter is not satisfied, adjust a pressure control device to modify the pressure of the drilling fluid in the discharge piping to approach the target pressure parameter by at least partially opening the pressure control device and releasing drilling fluid into a bypass piping at a selected flow rate, wherein the pressure control device is connected at an inlet to the discharge piping and at an outlet to bypass piping;

determining the selected flow rate at which the at least partially open pressure control device releases the drilling fluid by:

identifying one or more data pairs, each data pair including a flow rate of drilling fluid through the bypass piping and a pressure in the bypass piping;

providing the flow rate of drilling fluid through the bypass piping and the pressure in the bypass piping included in each data pair of the identified one or more data pairs as an input to a curve fit function; and

executing the curve fit function to determine the selected flow rate at which the at least partially open pressure control device releases the drilling fluid; and modifying the drilling fluid flow rate in the discharge piping based on the pressure represented by the pressure measurement signals and the selected flow rate in the bypass piping such that the target pressure parameter of the drilling fluid in the discharge piping is satisfied.