Sizing a Minimum Flow Recirculation Line

Most pumps have a minimum flow rate that they should not operate below. The pump manufacturer provides this value. Operating a pump below the specified minimum flow rate can greatly reduce a pump's life. Typical problems that can occur with sustained operation below the minimum flow are excessive temperature rise of the pumped fluid, higher radial bearing loads, higher axial thrust, and excessive noise and vibration. Care should be taken to ensure that the pump manufacturer's minimum flow recommendations are always met.

The minimum flow line (which flows back to the pump sump or suction tank) should be located between the pump discharge and the pump isolation line. The pipeline should be directed to the sump in order to avoid turbulence in the pump suction line. The minimum flow recirculation line should never be directed back to the pump suction. This will cause overheating of the recirculation fluid and excessive turbulence in the pump suction. The figure below shows a minimum flow recirculation line modeled in PIPE-FLO:

To size the minimum flow recirculation line:

1. Draw and design the minimum flow recirculation line from the pump discharge to the pump supply tank as shown in the figure above.
2. Install an orifice in the minimum flow recirculation line and set it to the pump's minimum flow value.

**NOTE:** The pump's minimum flow rate can be obtained from the Design Notes dialog box in the pump selection module. If a value is not listed in the dialog box, you should consult the manufacturer.
3. Click the Open/Close button and close the line leading out to the system.
4. Click the Calculate button.
5. Size the orifice by double-clicking on the orifice and clicking on the size button in the lower right hand side of the dialog box. Click OK and PIPE-FLO places the calculated size in the Size box.