Sizing a Minimum Flow Recirculation Line

For most pumps, there is a minimum flow rate that they should not operate below. The pump manufacturer provides this value. Typical problems that can occur with sustained operation below the minimum flow are: an excessive temperature rise of the pumped fluid, higher radial bearing loads, higher axial thrust, and excessive noise and vibration all of which can greatly reduce the life of the pump. 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.
3. Click the Open/Close button and close the line leading out to the system.
4. Now specify a diameter size for the orifice through the property grid in the diameter field until the minimum flow rate is calculated.
   "Sizing an Orifice in PIPE-FLO 12" is Knowledge Base # 479 and the link is under Related Articles below.
5. Click the Calculate button.

For reference to older versions of PIPE-FLO see attachments below.

Sizing a Minimum Flow Recirculation Line old.pdf