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PROGRAMA: Ingeniería Mecánica

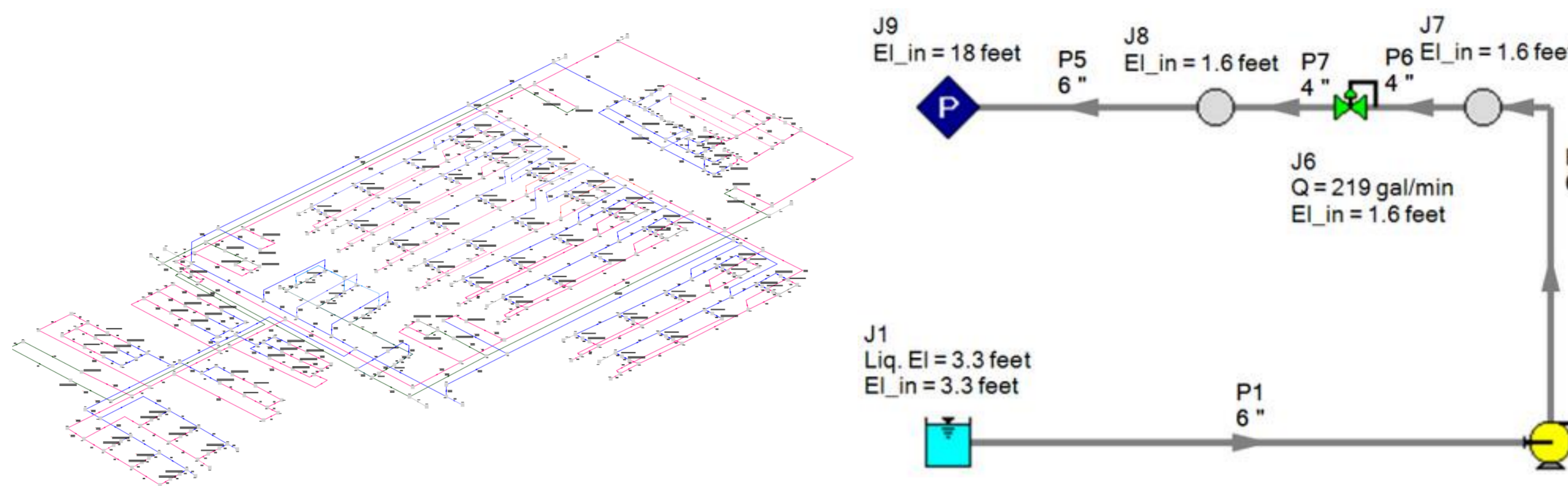
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Introduction

What is the most optimal method for establishing the operating point of a glycol pipeline?
Keywords: Potash, hydraulic, piping, calculations, pump system, Python

This work focuses on optimizing glycol transport for better production and environmental sustainability. It aims to determine ideal pipeline sizing, pump specifications, and pipeline capacity through data collection, coding, simulations, and scenario analysis, adhering to piping standards. The project, conducted by Hatch, a global leader in various industries, addresses the global potash shortage by emphasizing efficient and sustainable piping designs using hydraulic calculations and AFT software simulations. The outcomes include detailed reports and a Python-based desktop application for data management.



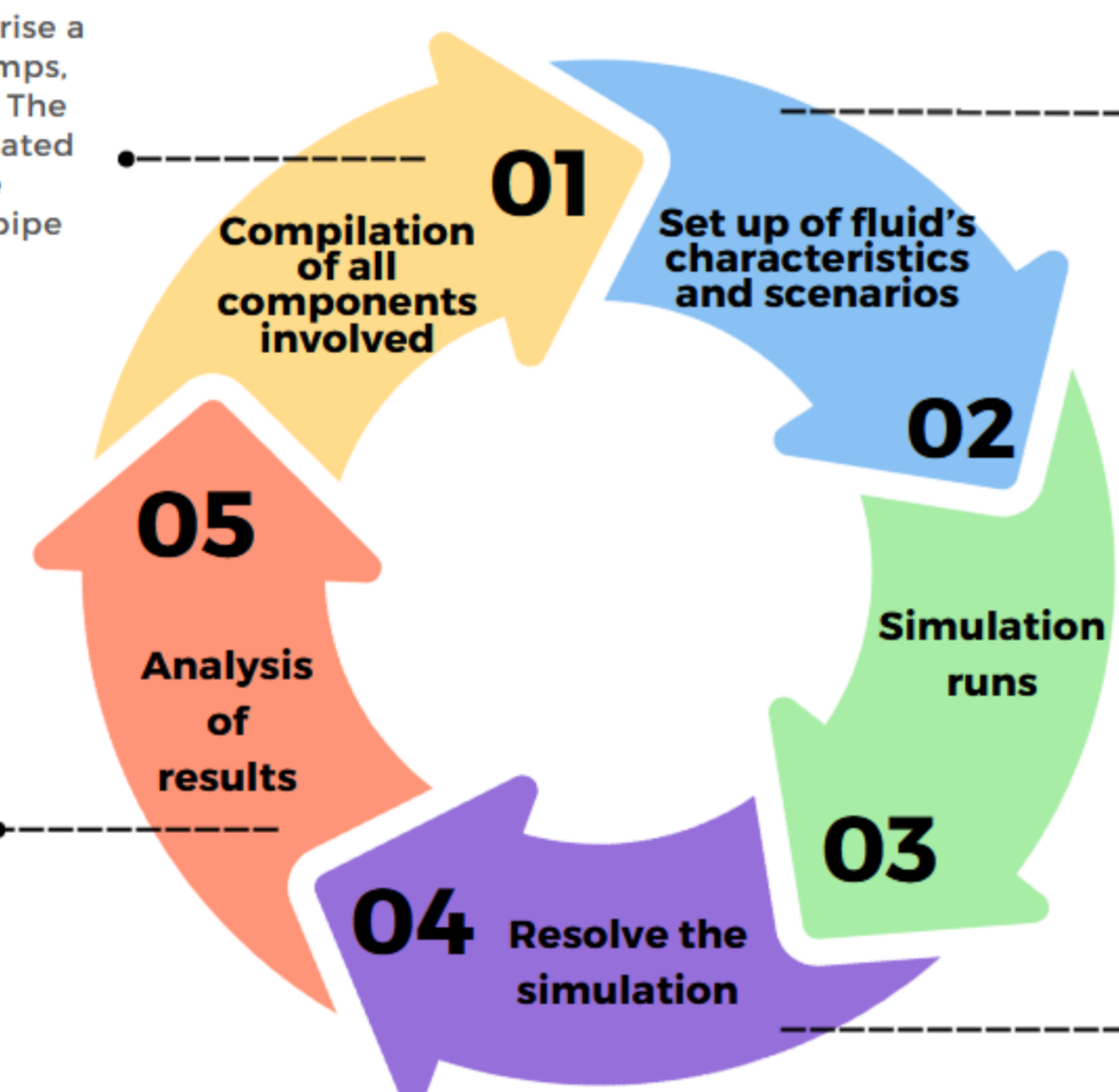
Objectives

- ✓ To establish the most optimal methodology using software simulations and coding.
- ✓ To execute fluid dynamics calculations using software simulations.
- ✓ To develop a desktop application using Python coding.
- ✓ To issue technical and detailed reports.
- ✓ To compare different hydraulic models.
- ✓ To validate vendor information through direct comparisons.



Methodology

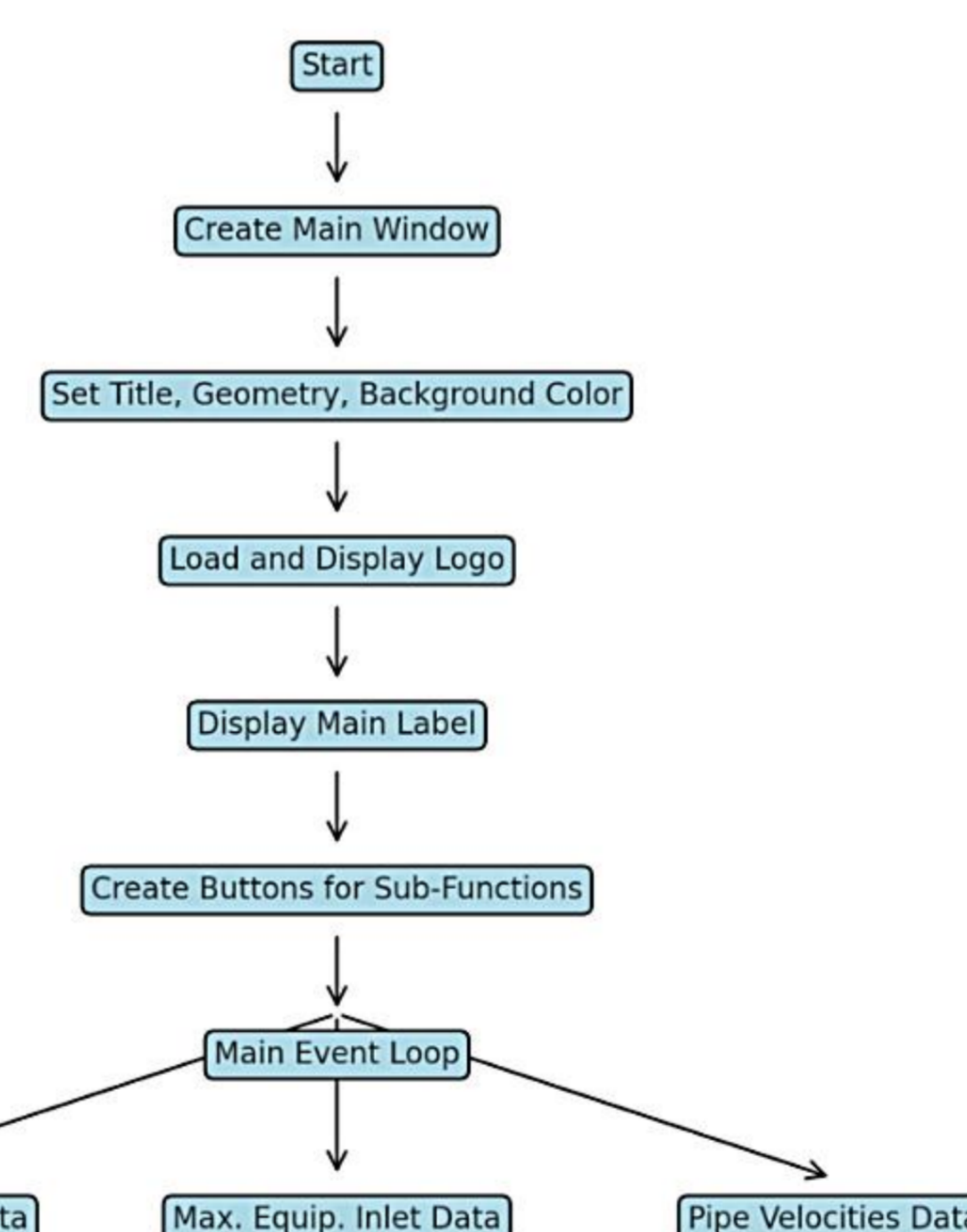
Typically, systems comprise a reservoir, pipelines, pumps, accessories, valves, etc. The fitting and losses associated to the pipelines are considered inside the pipe configuration.



Essentially, density, dynamic viscosity and vapor pressure. And max. min. and nominal scenarios.

Considering the results obtained, i.e., if cavitation can occur, how the fluid is going to behave, what would happen with gravitational flows, etc.

Most cases, some warnings (generally associated to fluids characteristics or geometrical aspects) need to be repaired.



Continuity equation

$$A1 * v1 = A2 * v2$$

Darcy Weisbach equation

$$hf = f \frac{L v^2}{2 g D}$$

Bernoulli's equation

$$P + \frac{1}{2} \rho v^2 + \rho g h = cte$$

Reynolds number

$$Re = \frac{\rho v D}{\mu}$$

Pump power calculation

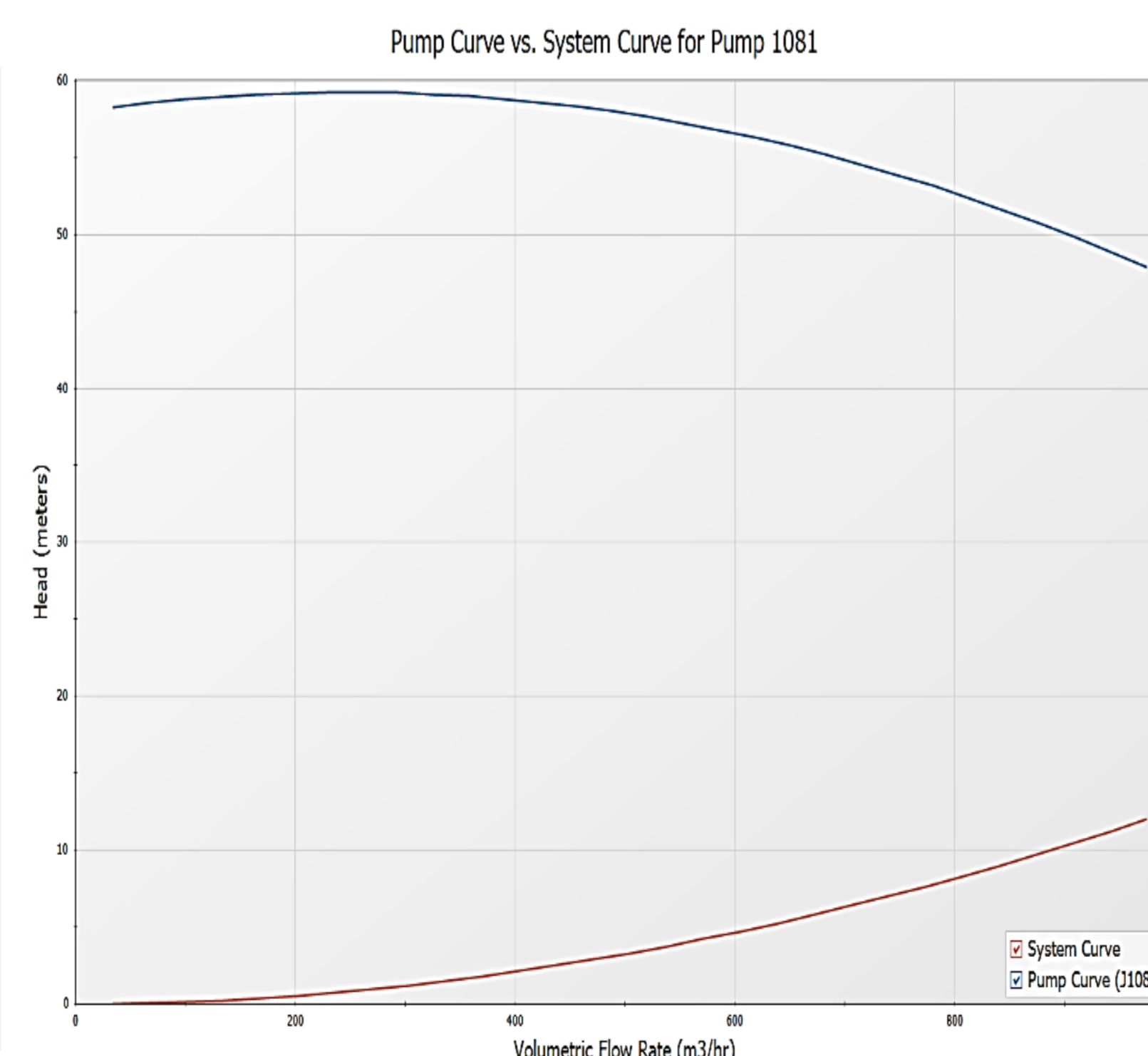
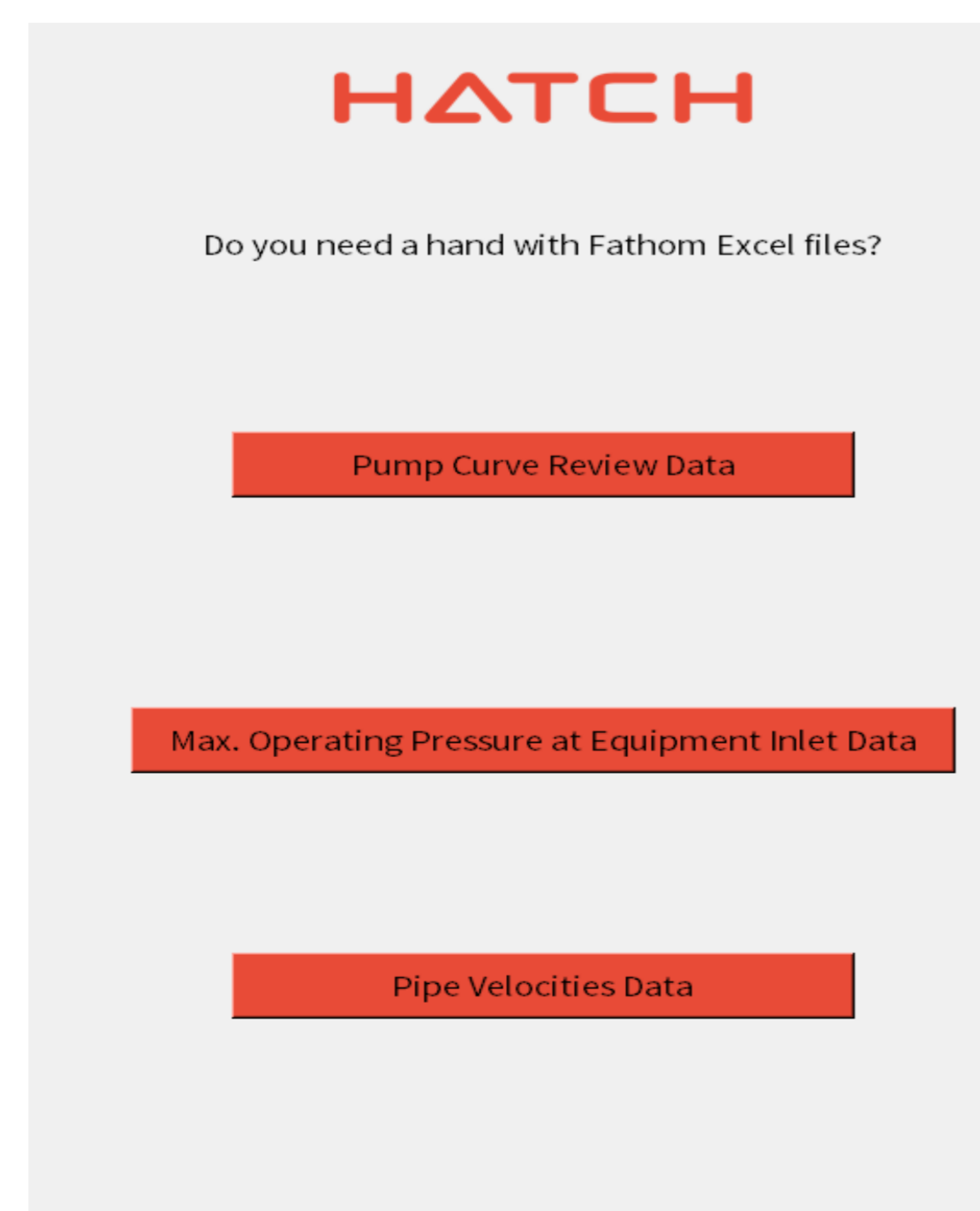
$$\frac{\rho g Q h}{\eta}$$



Results

Pump was suitable for the glycol system with new users. All flows are effectively cover by the pump.

Equipment	Flow [m3/hr]
Air compressors	72.55
Reagent HX	74.5
Slimes tailings centrifuge	5.95
Salt tailings centrifuge	5.95
Product centrifuges	10.5
Control valve balancing	111.76
Product dryer air preheater	129
Product dryer scrubber	61.8
Control valve balancing	191.17
Gear box cooling	6.8
Roller	3.4
Glazing dryer air preheater	55.5



Conclusions

- ✓ Python coding efficiently manages simulation data and provides an easy-to-use, editable interface, streamlining data management tasks.
- ✓ This document emphasizes the importance of analyzing deep questions in industrial processes, which can lead to the development of new processing tools.
- ✓ Simulations confirmed that the current pumps in the glycol system meet system requirements, verifying pump operation, pipe velocities, and pressure drops.

