

Version

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GATHERX ANALYTICS

Midstream Gas Gathering Data Analytics

GatherX Natural Gas User Guide

MIDSTREAM GAS GATHERING DATA ANALYTICS

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Introduction to GatherX

Natural Gas

GatherX Natural Gas is a data analytics software designed to perform specific out-of-the-box cost saving optimizations.

GatherX Natural Gas is a data analytics software with three primary cost saving and production optimization use cases. First, wellhead pressure and flow can be calculated to show the user an ideal case for their system operations. Second, when combined with field wellhead pressures the efficiency of the flow through pipes can be determined to isolate issues like liquid build in a system. Finally, pipe size can be optimized for a given flow in order to design additions to existing systems or new systems to minimize cost. This product is also a visual data analytics platform that allows the user to display system data in conjunction with the physical structure of the system. The various user interface panels referenced throughout this document are labeled on page four under the “user interface navigation” section.

Creating a Model

To build a model two different types of objects are used: nodes and pipes. Nodes abstractly represent various pieces of midstream equipment, including wells, compressors, control valves, and outlets. Pipes connect nodes and represent physical pipes of various diameter and lengths that connect this equipment. To place objects on the **Canvas Panel** in the center of the screen go to the **Insert Tab** on the top menu and select an object to begin placing.

To edit the properties of objects in your system there are two options. The first option is to click on the object and enter the information on the right-hand **Data Panel** that appears when the object is selected. The second option is to use the left-hand **Calculation Panel** to quickly set the properties of all pipes in the system. Nodes do not hold gas and ambient data like specific gravity, base pressure, and temperature and must have their parameters set individually.

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Node Descriptions and Usage:

- **Inlet Node:** This node can be used to represent a wellhead or other location at which gas enters the system.
- **Outlet Node:** This node can be used to represent a compressor station before sending gas to a long-distance pipeline or other location at which gas exits the system.
- **Tee Node:** This node can be used to represent an intersection between pipes or other location with no gas entering or exiting the system.
- **Compressor Node:** This node can be used to represent a compressor or other location where a positive pressure differential is a controlled and known quantity.
- **Control Valve Node:** This node can be used to represent a control valve or other location where a negative pressure differential is a controlled and known quantity.

Pipe Properties and Usage:

To place a pipe, navigate to the **Inset Tab** and click the **Pipe** icon. Next, click the first node you want to connect with a pipe, and then click the second node. A pipe will then appear between the two nodes. Pipes may only be placed between two already placed nodes.

- * **Pipe Pressures:** The pipe inlet and outlet pressure are the pressures at the ends of the pipe and are calculated based on flow through the pipe and environmental properties such as base pressure and temperature.
- * **Pipe Diameter:** The pipe diameter is an inner diameter and any calculated diameter is drawn from standardized pipe sizes based on a user input pressure differential.
- * **Pipe Efficiency:** The pipe efficiency is a decimal value that represents the predicted flow based on user input node pressures divided by the flow resulting from the user input values at inlet nodes.

Global Properties and Usage:

To set gas and ambient properties for an entire system, navigate to the **Calculation Panel** and click the **Save System Values** button. It is recommended to set system wide values before performing a pipe sizing calculation in order to get a consistent pressure differential across the system.

Analyzing a Model

To analyze a model for pressures, pipe sizes, or efficiencies, navigate to the **Home Tab** and click the **New Calculation** icon and then select a calculation type. Next, navigate to the **Calculation Panel** and enter the desired system gas and ambient

properties. Please note that running a calculation or saving system values will overwrite previous user specified values. To preserve the results of a previous calculation, see the managing files section on how to save a file. Finally, press the **Calculate** button in the **Calculation Panel**. Due to the products highly optimized algorithms, calculation take less than a second, but if you have a system with more than 1,000 nodes on a old computer it is recommended that the user wait three to five seconds before trying to use the software after clicking the **Calculate** button.

Note: Running a calculation will overwrite previous values specified.

Calculation Descriptions and Usage:

- * **Pressures Calculation:** This calculation determines pipe and node inlet and outlet pressures and pressure differentials based on flow rates, and gas and ambient properties. It is most commonly used to predict wellhead pressure. This calculation may fail if a control valve or compressor node describes a pressure differential that would result in a vacuum in the system.
- * **Pipe Size Calculation:** This calculation determines pipe size based on user specified pipe pressure differentials, flow rates, and gas and ambient properties. It is most commonly used to find the most cost-efficient pipe size for a desired pressure differential when designing systems.
- * **Efficiency Calculation:** This calculation determines pipe flow rate efficiency based on user specified node pressures, flow rates, and gas and ambient properties. It is most commonly used to locate potential issues such as liquid buildup in a system and to then adjust operations accordingly.
- * *Calculation Descriptions and Usage:*
- * *Calculation Description*

Equation Selection:

To select the proper equation for the system piping and flow, navigate to the **Calculation Panel** and click the **Equation** drop down below **Save System Values** and select one of five equation types. All five of the equations are made to model **Single Phase Flow** and have minor differences in strengths and weaknesses when modeling turbulent flow, with the **Weymouth** equation as the most general and well-rounded of the five.

Displaying a Model

To visually display a single property across a system, navigate to the **View Tab** in the top menu. The **View Tab** has the ability to both list node and pipe properties on the left-hand **List Panel** as well as display node properties next to the nodes themselves on the center **Canvas Panel**.

To visually display all the properties of a pipe or node, navigate to the **View Tab** in the top menu. The **View Tab** has the ability to both list node and pipe properties on the left-hand **List Panel** as well as display node properties next to the nodes themselves on the center **Canvas Panel**.

Managing Files

To save, create, or open a file, navigate to the **File Tab** in the top menu. Multiple files can be opened at a time, and it is recommended to duplicate an existing file before performing a calculation as the calculation will overwrite previous data. It is not possible to have open files with the same name, and so it is recommended to select the **New** icon and then choose the **Duplicate** option from the drop-down menu.

User Interface Navigation

FIGURE 1. User Interface Labeled by Panel

