

Use the flow multiplier to simulate a variety of plant situations

In ProTreat®, it is possible to adjust the flowrate of a stream by using a Flow Multiplier. This block is classified as a stream manipulator block, because in the physical world there can be no such thing as a Flow Multiplier. The purpose of the Flow Multiplier is straightforward – take an existing inlet stream and change its flow rate without altering its composition and physical properties. Note that because this block is a stream *manipulator*, it will not be in material balance. The Flow Multiplier block has a wide range of uses. For instance, a gas plant may be anticipating additional feed because some additional wells are coming online. It is then necessary to determine the additional capacity available in the upstream sweetening unit while still treating the gas satisfactorily. This may easily be achieved by using a Flow Multiplier before the absorber (see Figure 1). By changing the Multiplier Value, the flow of the incoming sour gas can be increased manually to determine the maximum additional capacity that will still meet the treated gas specification.

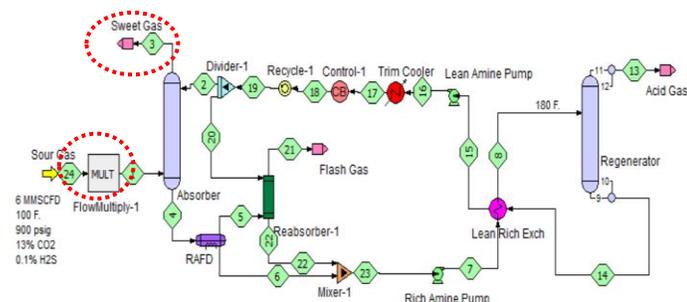


Figure 1 – Determining additional capacity

One of the more widely used applications of the Flow Multiplier is in conjunction with the Solver block. An important and popular combination of the Flow Multiplier and Solver can be used to model an air demand analyser (ADA) in a sulphur recovery unit (SRU) (see Figure 2). The Solver block alters the Multiplier Value of the air stream going into the reaction furnace to determine the amount of air required to maintain a user set $H_2S:SO_2$ ratio in the tail gas. This is similar in function to a real world ADA that provides feedback to the front end air flow controllers.

A third useful modelling application for the Flow Multiplier is setting the outlet of the Multiplier to be a Flow Ratio of a reference stream. Some SRU configurations have direct-fired reheating for the first converter. In such cases, the air to fuel gas ratio may be set by using the Flow Ratio option of the

Flow Multiplier (see Figure 3). In this example, the molar flow rate of air in stream 27 is set at 2.2 times the amine acid gas flow rate in stream 23. Both streams then enter the inline acid gas burner. In principle using the Flow Ratio option is akin to modelling a ratio controller or a feed forward controller.

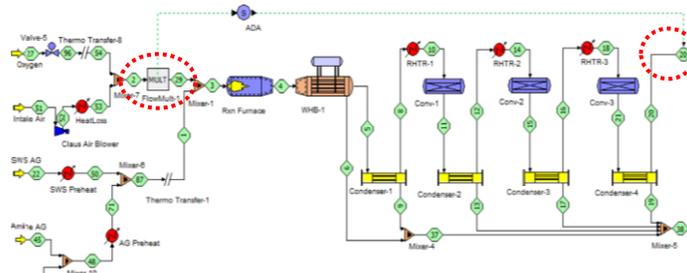


Figure 2 – Modelling an ADA in a sulphur recovery unit

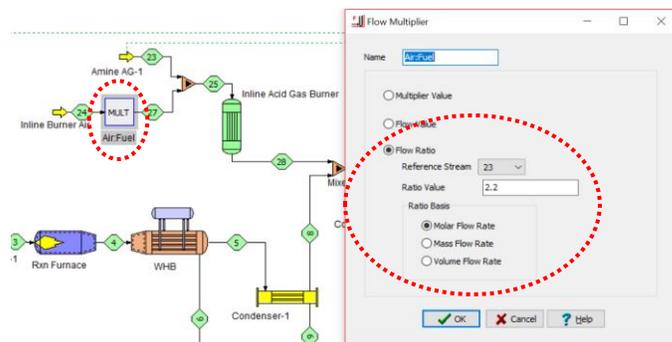


Figure 3 – Setting the air to fuel ratio going into the inline acid gas burner

PROTIP: The input options to the Flow Multiplier block include a Multiplier Value, an actual Flow Value, or a Flow Ratio. The Multiplier Value and Flow Value options are straightforward – they affect only the output of the Flow Multiplier. However, when using the Flow Ratio option, it is important to specify a reference stream that is upstream of the Flow Multiplier and not downstream. For instance, in Figure 3, if the reference stream was chosen as stream 28, ProTreat® will provide you with an error message and abort when you run the simulation. This is because ProTreat® does not know the flowrate of stream 28 until the upstream blocks have been solved, so there is no solution for this sequence.

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