The Production Allocation Utility in Aspentech HYSYS and the "myth" of production allocation

Introduction

It is common in the oil & gas industry for a processing facility to handle inlet production from different owners. Production allocation, sometimes referred to as allocation accounting, is an important task for the oil & gas producers to determine the contribution of each inlet stream to the product stream(s) and pay (or "allocate") the corresponding contribution to the various owners.

There are various simulation-based methods for Production Allocation. One example, the built-in Production Allocation Utility in Aspentech HYSYS™, enables users to track the contribution of selected streams to other down-flowsheet streams. The contribution is tracked on a compositional flow or percentage basis. As mentioned above, the utility is used particularly in scenarios where a model depicts an allocation system that relies on multiple suppliers for inlet feeds and the individual supplier contributions to the resulting products need to be tracked.

The Production Allocation Utility in HYSYS™

Let's consider the Process Flow Diagram shown in Figure 1 as a simple example to understand the production allocation problem and to use the Utility in order to determine the contributions. Both of these two streams are gas streams where the stream "Well A" has a specific gravity of 0.75 while the stream "Well B" has a specific gravity of 0.70.

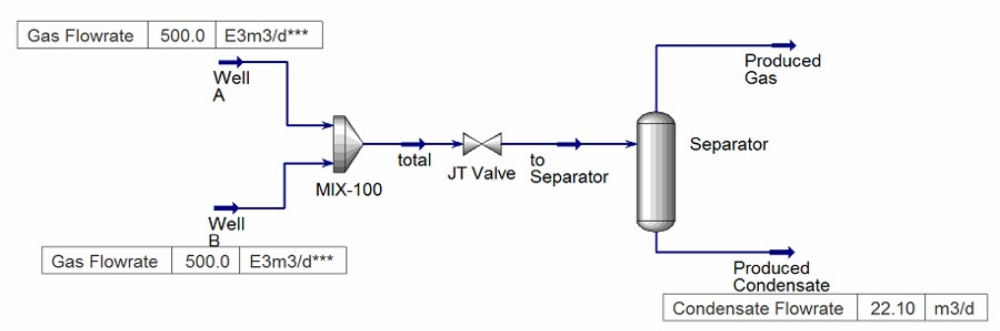

Figure 1: Condensate Production from Gas Well A and Gas Well B

The general steps for using the Production Allocation Utility are as follows:

1.The user select the contribution streams;

2.Then select the desired report stream (the output stream);

3.After calculation, the user can then choose the report type (percentage, gas volume flow, or liquid volume flow).

The Production Allocation Utility in HYSYS™ applies compositional tracking to each component of the resulting (output) stream from each of the contribution streams. In this example, adding up each of the components to determine a stream liquid volume flowrate results in the following allocation:

Condensate from Well A	Condensate from Well B	Total Condensate
13 m3/d	9 m3/d	22 m3/d
55%	45%	100%

The Myth of Production Allocation…

For the process setup in Figure 1, the Utility calculates that Well A contributes 55% of the condensate and Well B contributes the remaining 45% of the total condensate production. But is this the best way to think about the contributions?

Let's consider a small change in the system: Let Well B be shut in, so only Well A is fed to the processing facility. This is shown in Figure 2:

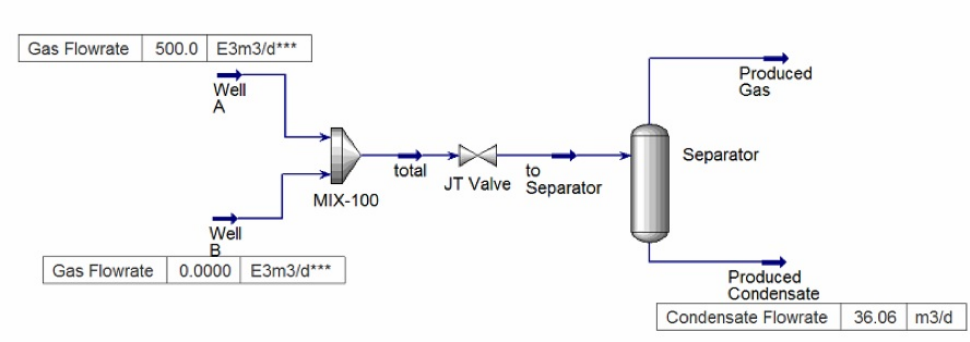

Figure 2: A new scenario with Well B shut in

It is somewhat surprising to find that this new setup is actually producing more condensate now (with Well B shut in), and that of course 100% of that is coming from Well A. Why is this?

The main reason is because Well A is producing a rich gas and Well B is producing a lean gas, and thermodynamically, introducing the lean gas to the mixture will re-establish the phase equilibrium, and the result is that a lean gas stream will suppress condensate liquid volume. If the inlet streams have similar properties (like composition, molecular weight, HC dew point etc.), this utility will provide “fair” allocation information. But in the case of different compositional inlet streams (like the case in this study), a sensitivity analysis is recommended to further assess the impact of individual inlet streams on each other.

Process simulators like HYSYS^{TM} are a reliable and efficient way to assess the impact without actual operation changes in the field. If the sensitivity analysis shows one stream is suppressing another stream on the product, it is practical to suggest that the owner transfer some of the allocated product to another owner.

Conclusions

In short, while process simulators bring significant benefits and convenience to operating and engineering companies, the assumptions and calculation methods must be fully understood, and results must always be carefully evaluated.

For the Production Allocation Utility in HYSYS, we believe it provides fair allocation information on individual streams contributions if the inlet streams are similar. In the case of different compositional inlet streams going to the same facility, a process simulator sensitivity study is a reliable and efficient way to assess the impact of inlet streams on each other, thus helping the producers to make a better decision on the product

allocation.

Do you have questions or comments regarding this article? Click here to contact us.