Q&A SESSION FROM:
Aerospace Fuel System Modeling with Flowmaster – Part 1
25th February 2016, Arlie Nuetzel

Q. I have seen issues with fuel temperature fluctuations when using Check Valves (so used Loss Discretes instead): Has this been addressed at all?
A. I assume you are referring to the compressible check valve, as the incompressible valves are not enabled for heat transfer use. As this component was not a focus of this presentation, I encourage you to seek help from our global support and services resources available on support net: supportnet.mentor.com

Q. Hello and thank you very much for this really good presentation. I am concerned about using a tank model during Steady State simulations, is it appropriate for this kind of simulation?
A. A tank component will change its liquid level in a transient analysis only. If you want to seek a steady state position, say for simultaneous filling and emptying, you'd have to run a transient simulation. If you run steady state only, the tank will lock to the initial liquid level and always stay there.

Q. Putting a restriction at the entrance of the tank increases the unbalance when refueling from the other side. Is there another solution to get a symmetrical response of the network?
A. That is exactly right. If we balance for filling, say, from the left, the asymmetry becomes worse when filling from the right hand side. There is a solution to this, and that is to use a variable restriction like a valve, ideally combined with an active control. This will be the subject of the second instalment of this webinar series.

Q. If you put a restriction at the entrance of one tank, you will balance fuel flow and pressure when refueling on the same side only, but the unbalance will be increased when refueling from the other side. Is there another way to get a symmetrical response of the fuel system network?
A. Great question. That’s exactly right. If we use passive restrictions like orifice plates or restrictive filters to balance flow, we could lock ourselves into a design that only allows for fueling from the side we balanced. We’re going to cover a method to avoid that in the second presentation. We’ll add active flow control valves at the inlets to the tank that can change their restriction dynamically to hit a flow (or pressure) set point that we desire. To do this in Flowmaster, we’ll make use of the proportional, integral, derivative controller. We could also use script based methods to periodically open and close the valves on each side or fill each tank individually, but this is obviously problematic. We’ll look at both cases next time. I encourage you to sign up for the next session where we will talk about this in detail.

Q. Can Flowmaster simulate an outflow of Halon from a vessel that is rapidly opened? Halon is liquid when pressurized to 40bar and becomes gradually gaseous when released to ambient pressure.
A. This is a two phase problem. If you are willing to accept some error, you can treat the Halon as a compressible gas the entire time, or an incompressible fluid depending on the problem you are trying to investigate. Flowmaster has a two phase solver and may be capable of analysing this situation at some point in the future, but thus far, our solver has only been validated for water/steam.
Q. We are happy to send demonstration models. Feel free to reach out directly to my email address arlie_nuetzel@mentor.com

Q. The pumps in this model... they were off for these simulations?
A. The transfer portion of the model, including pumps and engine boundary conditions were all off and isolated. This portion of the model will get attention in the second instalment.

Q. Tank model validation? How did you do?
A. Our tanks were kept simple for the sake of this presentation. Input and output losses were set to nominal values, and they were assumed to have a constant cross sectional area. It is possible to input a customized relationship either between volume and height or cross sectional area and height in order to accommodate complex tank shapes. Additionally, entrance and exit losses can be customized with any value of loss coefficient that you want. We will address the capabilities of the Flowmaster advanced tank model in detail in the third instalment in the series.

Q. When is the next presentation?
A. 17th March …