# Modeling Stacked Exchangers in PV Elite

## Intergraph CAS

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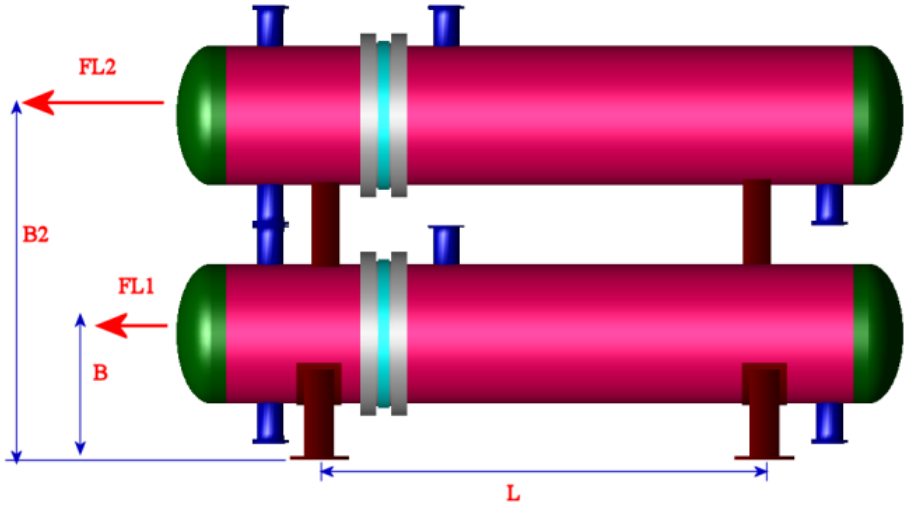
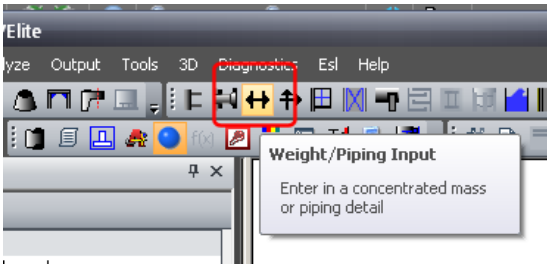
Here is a typical stacked exchanger:



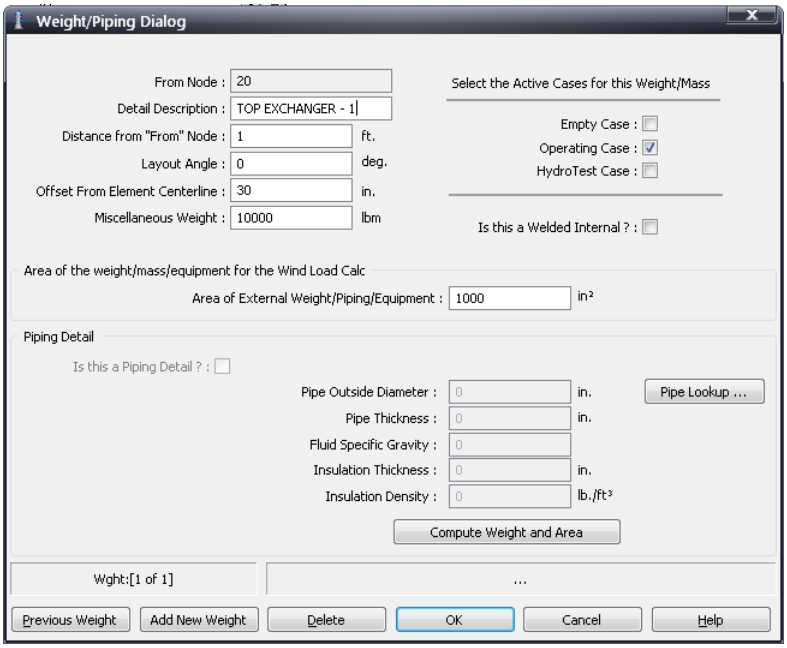

Here are some steps to model stacked exchangers in PV Elite:

1. Model the two exchangers in separate models.

2. If the weight of the top exchanger acts on the bottom exchanger then get the weight of the top exchanger from its output and apply that on the bottom exchanger using the Miscellaneous weight icon.

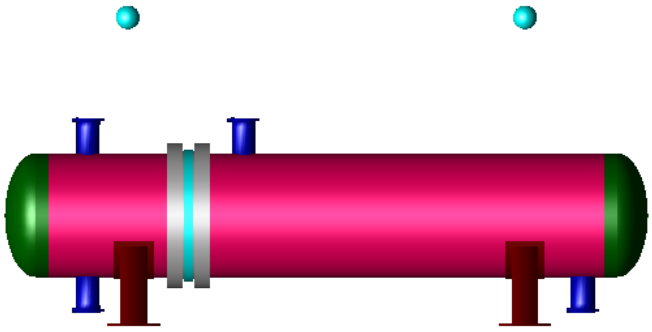



Add miscellaneous weights on the lower exchanger where the weight of the top exchangers acts. So, you may have to distribute the weight among the saddle connection points.

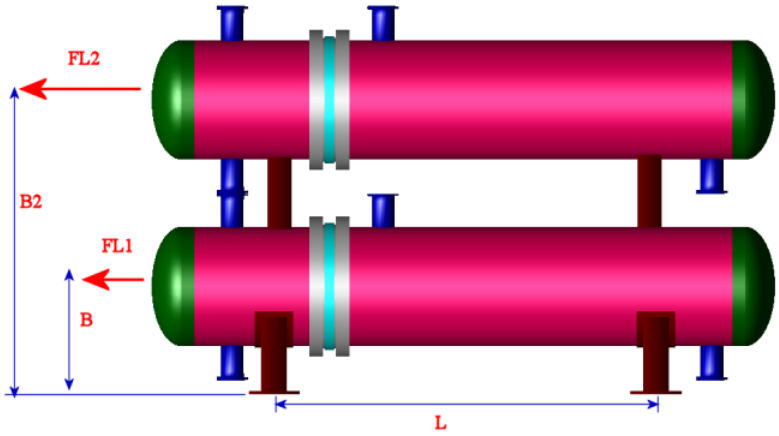



Be sure to offset the weights. This will transfer the weight and wind/seismic load from the top exchanger to the bottom exchanger.

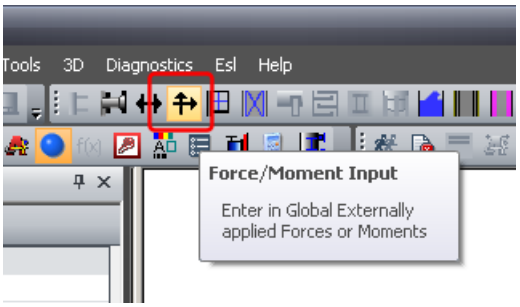
3. The bottom exchanger will look something like this after both weights have been specified.



4. You may have to consider the bundle pullout effect of the top exchanger, as it loads the bottom saddles as well. Let's look at that picture again,




The bundle pullout is specified as load FL1 and FL2 for the lower and upper exchangers. In PV Elite, for the bottom exchanger you will specify bundle pull out load as Miscellaneous Force in X-direction (along the axis of horizontal vessel)




This horizontal force is converted to vertical load acting on the saddle as,

QL1 = FL1 * B / L

Since, at this time PV Elite does not have the option to specify the bundle pullout for the top exchanger; we have to use a *trick*. The vertical reaction due to bundle pullout for the top exchanger would be,

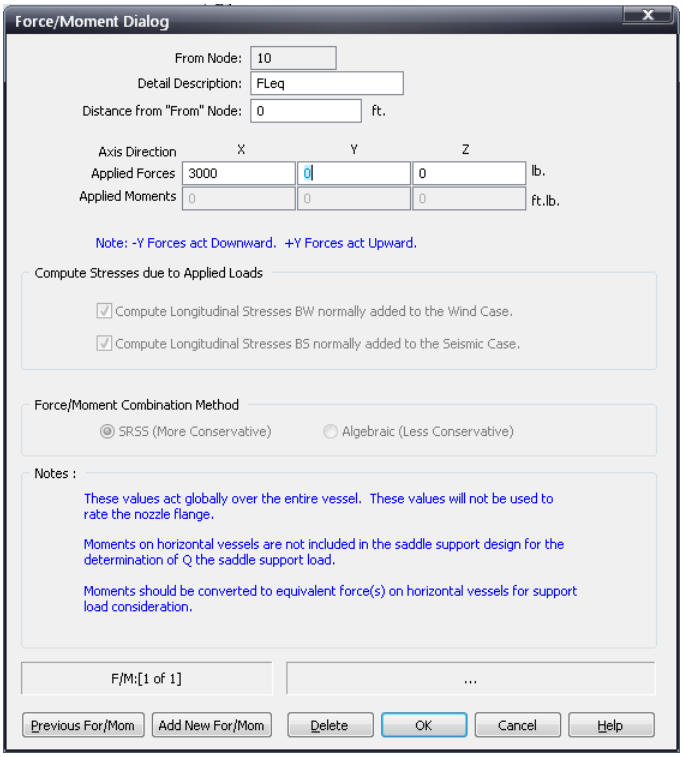
QL2 = FL2 * B2 / L

Since, in PV Elite we specify B (and not B2). Hence, we can back calculate an equivalent bundle pullout load to work with B as,

FLeq = QL2 * L / B = FL2 * B2 / B

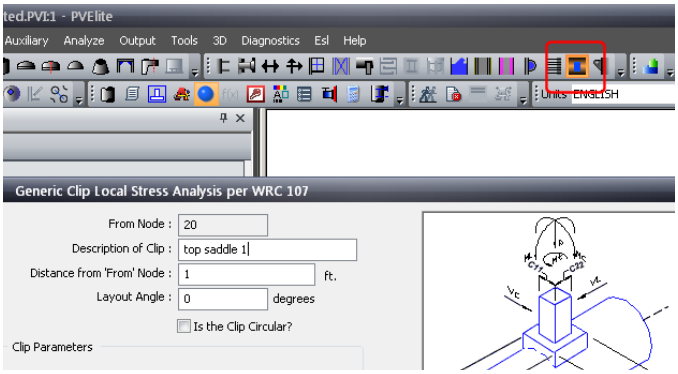
FLeq = ( FL2 * B2 ) / B

Now, specify the FLeq on the bottom exchanger as *Miscellaneous Force*.

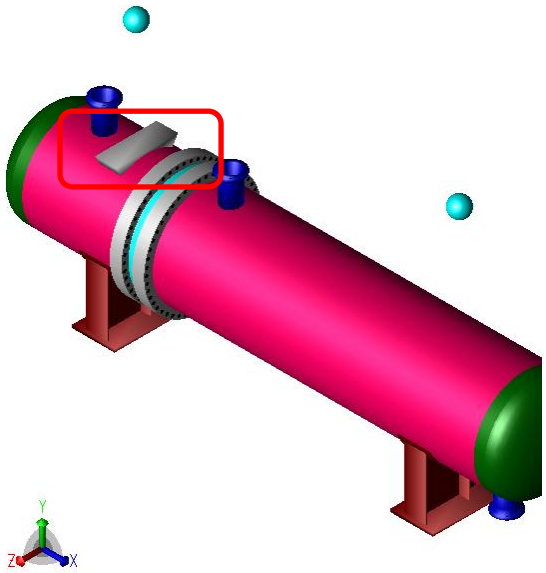



This will produce the correct vertical load on top of the saddle for the bottom exchanger. Moreover, this will also be transferred as shear load to the saddle, saddle base plate and bolts. The program assumes that one of the saddles is sliding and hence the entire longitudinal load is taken by one of the saddles.

5. Additionally, if the saddle of the top exchanger is acting over a small area of the bottom exchanger then you may have to consider the local stress in the shell of the bottom exchanger. In that case you can use the *Clip dialog*.




This is how the bottom exchanger may look like,


Y
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