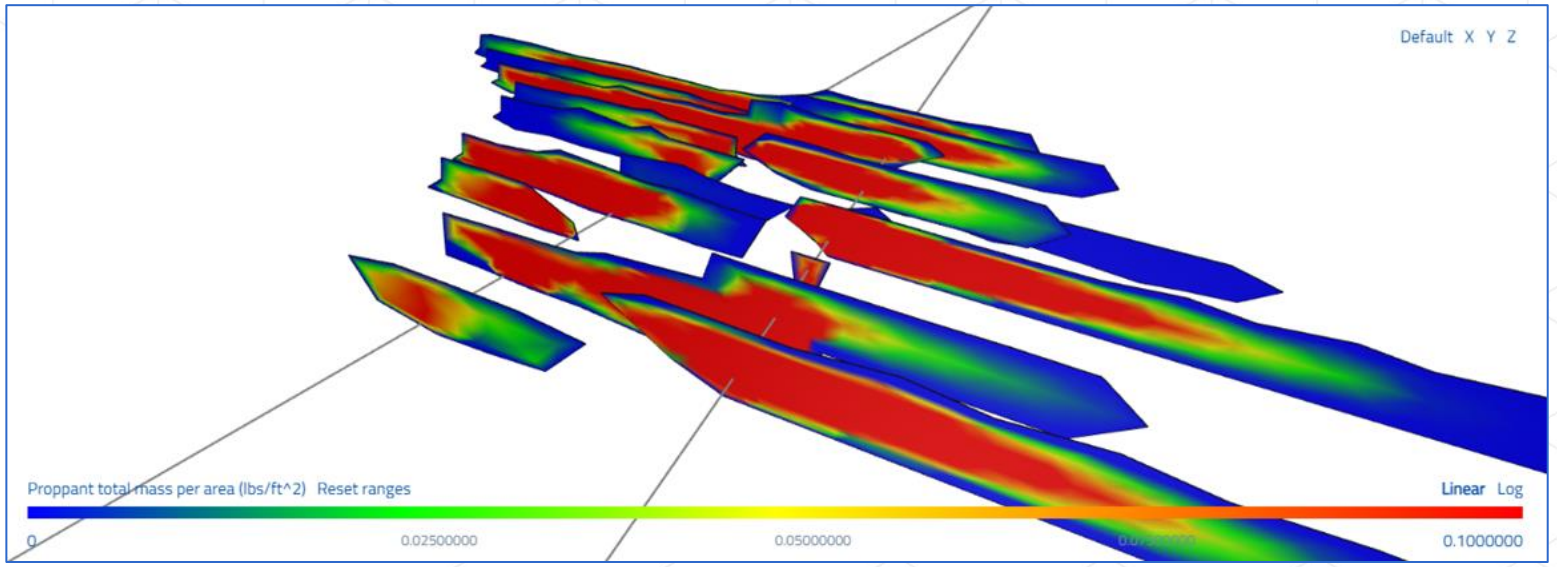
ResFrac

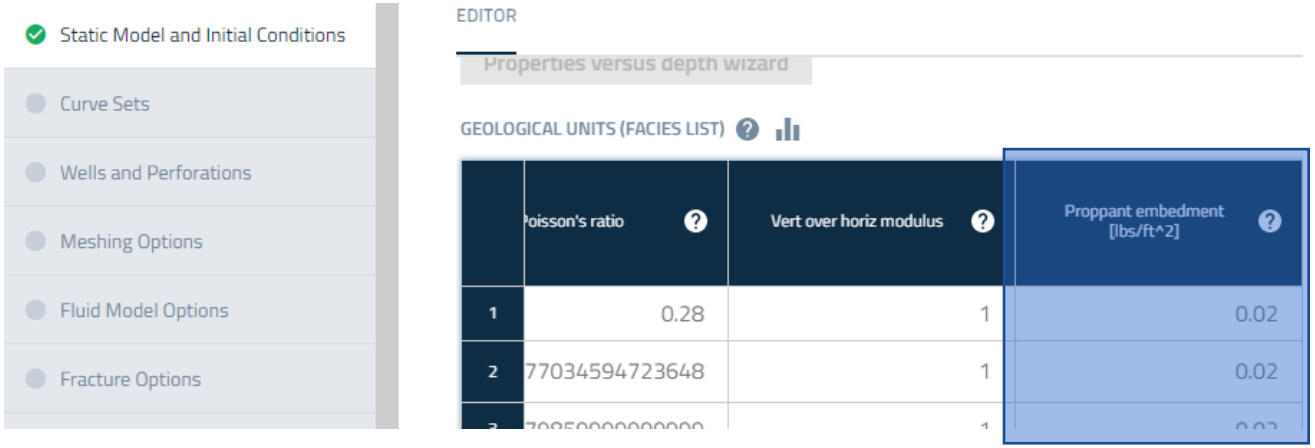


Proppant Embedment

The amount of proppant that does not contribute to conductivity enhancement due to embedment.

Proppant Embedment

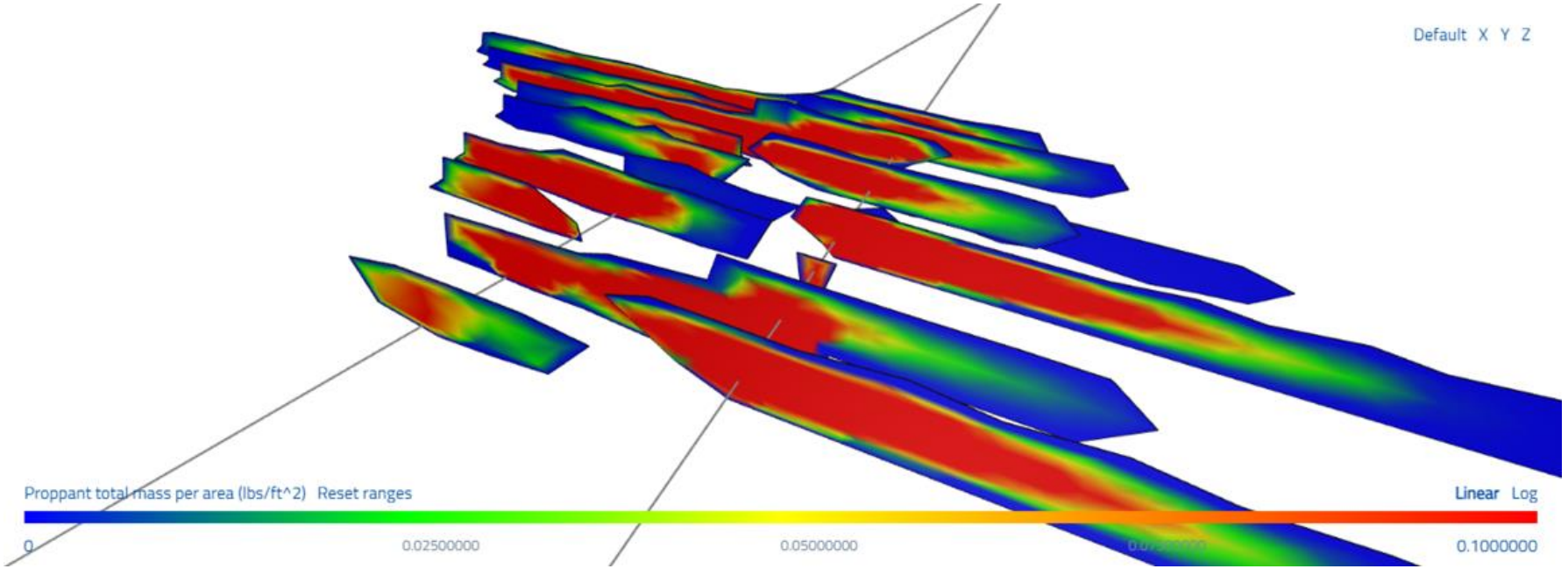
Refers to the proppant that does not contribute to production due to embedment of the proppant into the formation at a specific stress.



It is entered on a per layer basis into the static model as a function of mass per area, which is how proppant is reported in the UI.

You will also specify the embedment reference stress in the advanced section of the proppant tabs. Additionally, you can specify if the embedment is reversible or irreversible with the effective normal stress.

Proppant Embedment Visualization



The max scale for proppant has been set to 0.1 lbs/ft^2.

If the proppant embedment is set to 0.1 lbs/ft^2, then anywhere where the shading is not red the proppant will be fully embedded and not contribute to production once the embedment reference stress has been reached.

ResFrac

Proppant Embedment Calculations

Proppant embedment values from core are reported in lengths, while ResFrac requires embedment values to be reported in lbs/ft^2.

US Mesh*	Microns	Inches	Millimeters
35	500	0.0197	0.5
40	400	0.0165	0.4
45	354	0.0138	0.354
50	297	0.0117	0.297
60	250	0.0098	0.25
70	210	0.0083	0.21
80	177	0.007	0.177
100	149	0.0059	0.149
120	125	0.0049	0.125
140	105	0.0041	0.105
170	88	0.0035	0.088
200	74	0.0029	0.074
230	63	0.0025	0.063
270	53	0.0021	0.053
325	44	0.0017	0.044
400	37	0.0015	0.037
450	32	0.0013	0.032
500	25	0.0010	0.025
635	20	0.0008	0.020

https://www.industrialspec.com/resources/mesh-and-micron-sizes

Let's assume that we are pumping 40/70 mesh. Core data suggest that the proppant has been embedded approximately 50% at a net effective stress. 50% embedment is also a good rule of thumb when actual values are not known. Use the following steps to calculate the embedment to enter into ResFrac

1. 40/70 Mesh is approximately equivalent to 50 Mesh, so look up the grain diameter size of 50 Mesh in the chart to the left = 0.0117".
2. Calculate 50% of the grain diameter = 0.00585".
3. Multiply the density of the proppant (155 lbs/ft^3 for our example) by the length.

Embedment (lbs/ft^2) = 0.00585 in* (1 ft / 12 in)*155 lbs/ft^3
= 0.075 lbs/ft^2

This is what will be entered into the ResFrac static model.

ResFrac

Thank You!

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Last updated Feb 2026