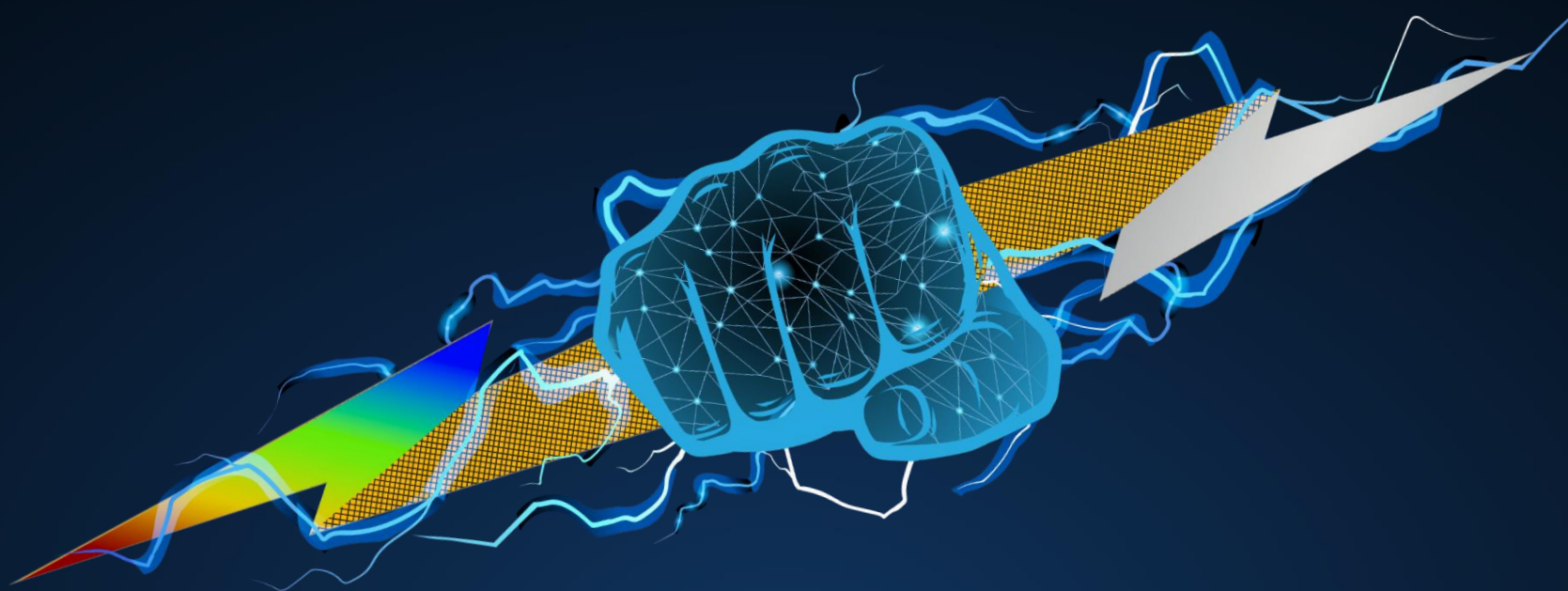
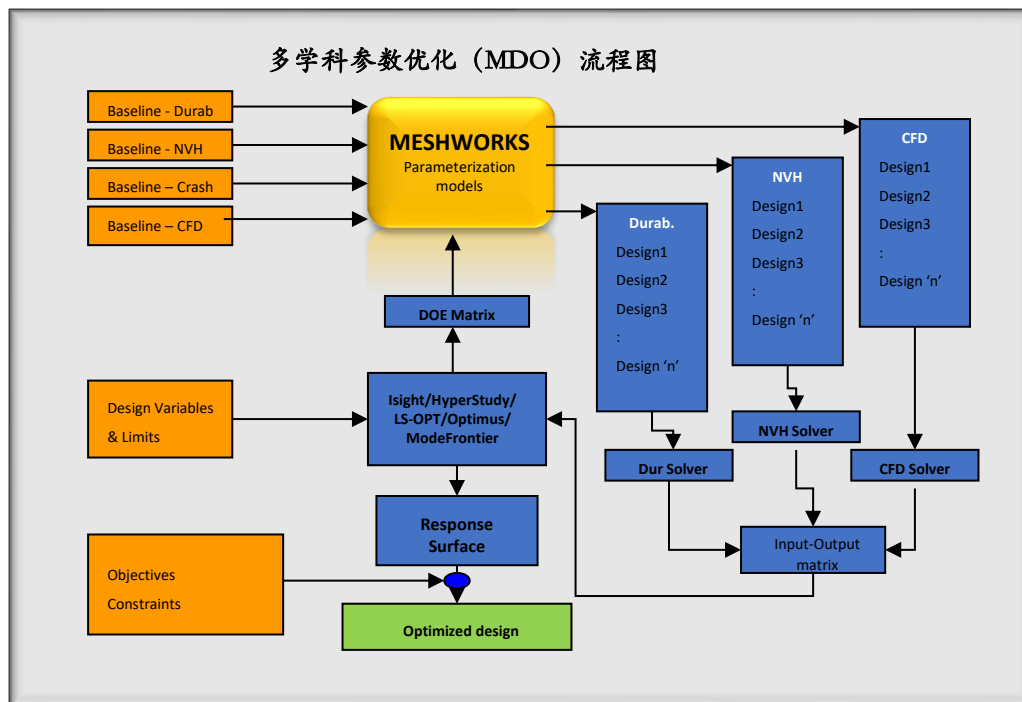




DEP
MeshWorks

The power of CAE to
ACCELERATE. TRANSFORM. AUTOMATE. INNOVATE.



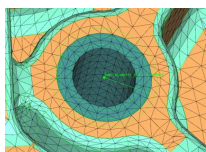
参数优化 Parametrization

全参数化建模尖端技术

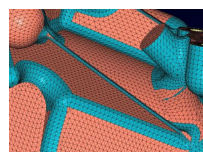
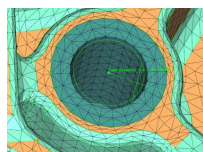
1. MeshWorks拥有一个全面的CAE模型参数化引擎，具有丰富的参数库，可用于产品开发的各个阶段。参数种类包括：料厚、形状、材料、截面、焊点间距、焊缝间距、结构胶长度、拓扑位置（构件平移）、特征（孔、加强特征、肋筋、隔板等的数量），TWB/TRB和通用参数。
2. 常规FE/CFD模型可转换为智能参数化FE/CFD模型。
3. 参数可以一次性执行，也可以与实验设计（DOE）和多学科优化（MDO）方案相连接。
4. 通过使用参数化CAE模型，可自动生成多个不同设计方案的可直接计算的分析模型文件（多达数百个以上）。
5. 利用新一代基于特征和截面的网格变形方法，可以简单直接地创建形状参数。
6. MeshWorks同时提供了封装好的自动“即用型”参数创建工具：包括：a) 加强筋、b) 凸台、c) 撑板、d) 加强特征、e) 孔/槽、f) 零件伸长/缩短、g) 2D肋筋、h) 3D肋筋、i) TWB/TRB等。用户无需手动创建几何、网格或连接关系，就可以非常轻松地创建上述所有参数，只需像设计工程师一样提供熟练的输入操作即可。
7. 封装的参数创建工具是一个完整的解决方案包，里面不仅创建参数，还包括了设置属性、材料、创建连接等。
8. MeshWorks参数化引擎是目前最全面的CAE引擎，可应用于碰撞、NVH、耐久性等多学科多目标参数优化。

MeshWorks的用户价值

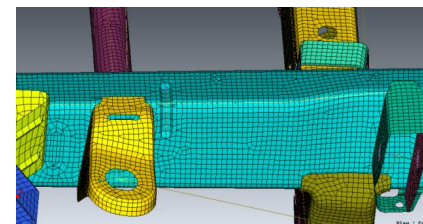
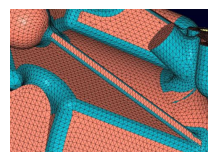
1. MeshWorks中最丰富的参数化功能库提供了最广阔的设计空间，最大限度地发挥了优化潜力。
2. 最广泛的参数化范围与多学科优化（MDO）相结合，可在满足性能目标的同时最大程度地减轻重量。
3. ROM（降阶建模）模块与参数化相结合，实现了真正的快速优化。
4. 参数化功能的易用性大大减少了快速设计迭代和多学科优化MDO的总体时间。
5. 无需设置参数，可自动识别特征并创建参数。



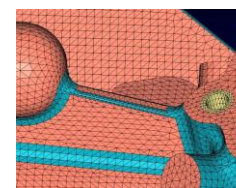
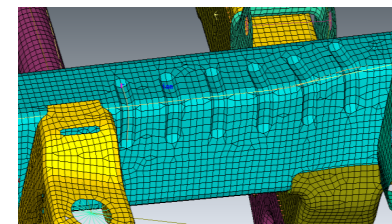
孔直径
参数化



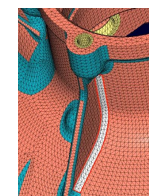
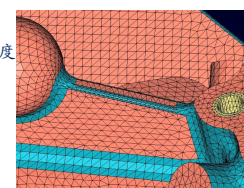
肋筋厚度
参数化



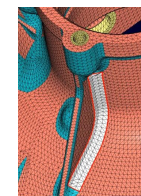
加强特征
数量/间
隔参数化



肋筋高度
参数化



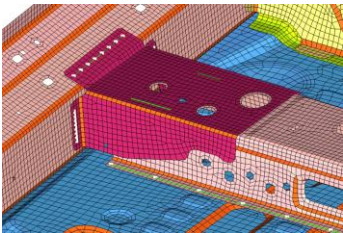
倒角半
径参数化



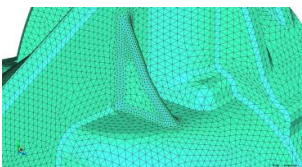
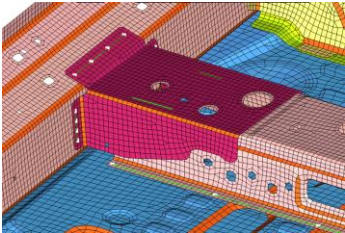
MeshWorks专利技术

- 1. 与市场上的任何CAE软件相比，MeshWorks提供了最全面的参数类别库。
- 2. 轻松创建各种参数是MeshWorks的突出特色。
- 3. MeshWorks的参数化功能深度考虑了料厚变化、干涉调整、焊接对厚度变化的相关性等错综复杂的因素，所有这些都与其他参数变化耦合在一起，这是MeshWorks的独特之处。
- 4. 同时MeshWorks强大的网格变形功能让网格
- 5. MeshWorks中为一个学科创建的参数可以快速移植到其他学科模型上，如碰撞、NVH、Durability、CFD 等。

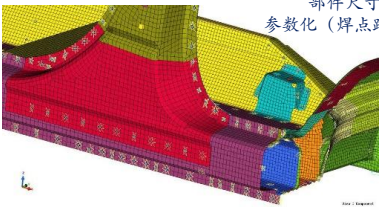
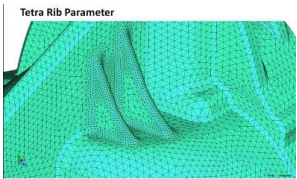
参数化能力变得简单易行，并且结合概念设计ConceptWork功能，让仿真计算更加简单高效的参与到整车从概念设计阶段到量产的整个开发流程中去。



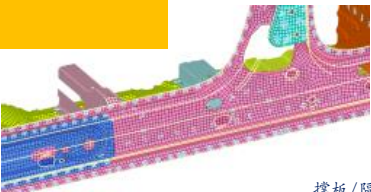
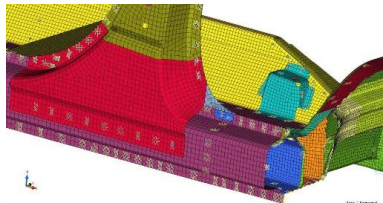
焊点数量/间距参数化



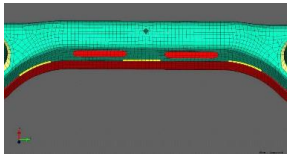
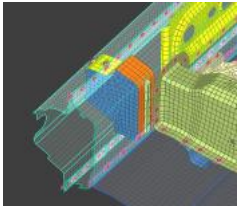
3D肋筋数量参数化



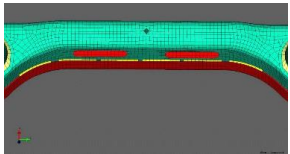
部件尺寸缩短参数化 (焊点跟随减少)



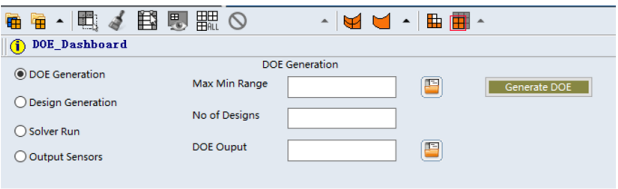
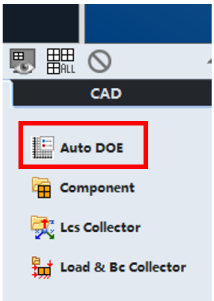
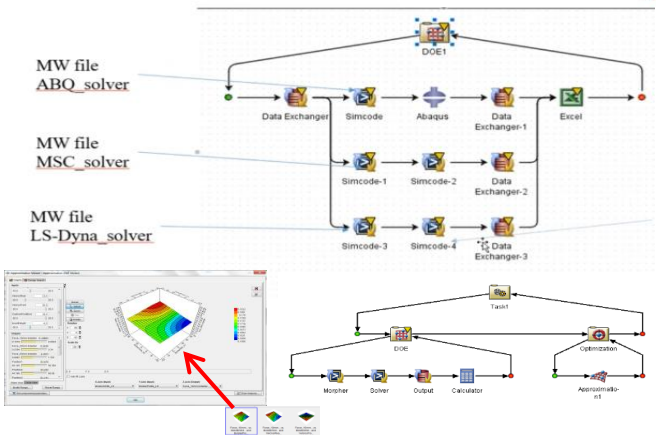
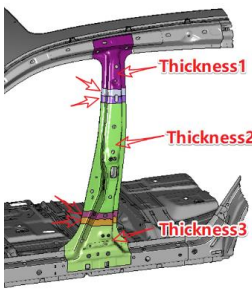
撑板/隔板参数化



缝焊参数化



TWB/TRB参数化

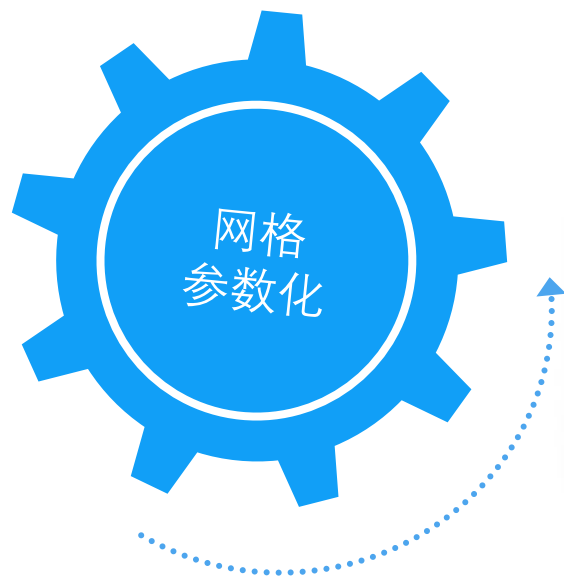


MeshWorks提供生成DOE矩阵工具

导出不同设计方案模型用于分析

Design	0001_Cross_member_Height	0001_CrossMember_Width	LongMember_Height_Offset	LongMember_Width_offset	LongMember_Rear_Height_Offset											
Design_1	-2.23	-6.565	-9.129	-9.79	-6.333	-9.344	2.401	1.951	24.506	3.103	2.787	3.043	3.152	3.075	2.624	3.024
Design_2	-8.358	-8.9	-4.596	-1.577	-2.022	1.893	-8.636	-9.077	7.993	3.029	2.94	3.054	2.921	3.051	3.086	3.881
Design_3	-2.37	-3.015	-8.813	-2.822	5.913	-7.961	-3.773	3.696	6.311	3.096	2.771	2.964	2.757	2.889	2.903	3.808
Design_4	-8.976	-8.37	-0.045	1.935	-9.265	-4.535	3.078	-8.852	15.531	3.148	3.172	2.793	3.021	2.994	2.883	2.844
Design_5	-7.286	-7.958	-2.612	-9.408	-4.698	-5.578	-8.399	-2.087	24.775	2.962	2.834	2.783	2.868	2.85	2.827	3.721
Design_6	-3.456	-3.471	-2.693	-3.273	-7.282	5.209	-1.37	-2.562	20.19	2.84	3.143	3.139	3.156	2.907	2.756	3.542
Design_7	-6.71	-2.627	-3.087	-2.211	0.959	1.184	-6.347	-2.917	9.875	2.873	2.898	2.721	3.041	2.882	3.194	3.17
Design_8	-4.156	-6.188	-3.22	-6.141	-4.246	6.998	0.103	2.952	19.09	2.82	2.672	2.838	2.63	3.059	2.76	3.399
Design_9	-9.395	-6.624	-1.592	-1.051	-0.282	-6.566	-7.895	-5.089	11.2	2.962	3.036	2.947	2.786	2.971	3.049	3.506
Design_10		-7.91	-2.774	-8.297	-8.587	-5.517	-3.541	-6.71	8.162	8.967	2.628	2.89	2.949	3.012	3.189	2.712





PARAMETRIZATION

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

Part Extension/Contraction

Feature Repetition

Tailor Welded Blank

Topology

etc....

形状参数化

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

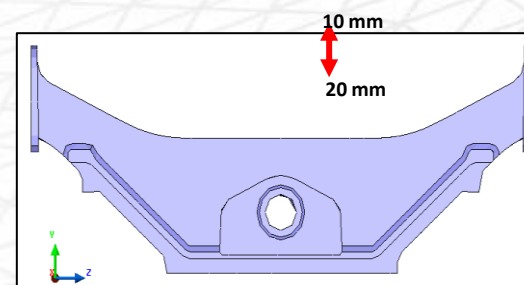
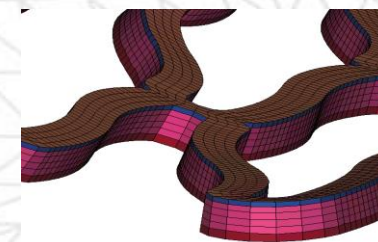
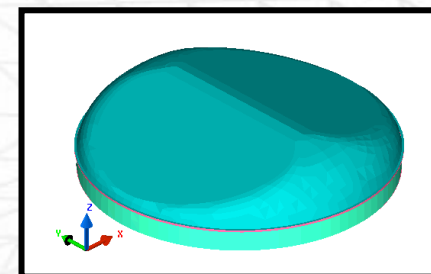
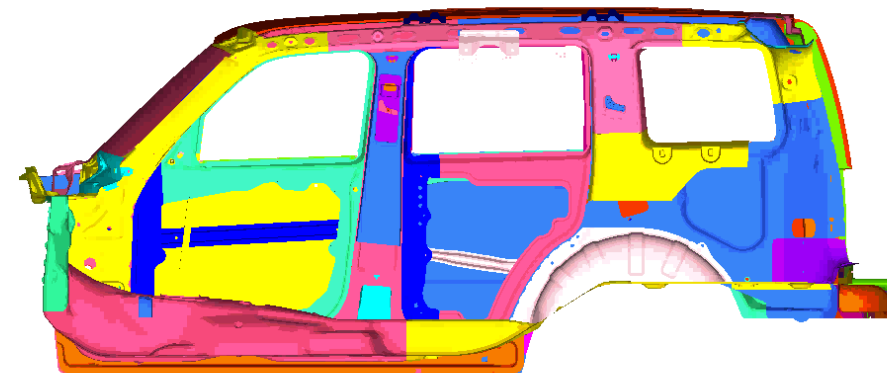
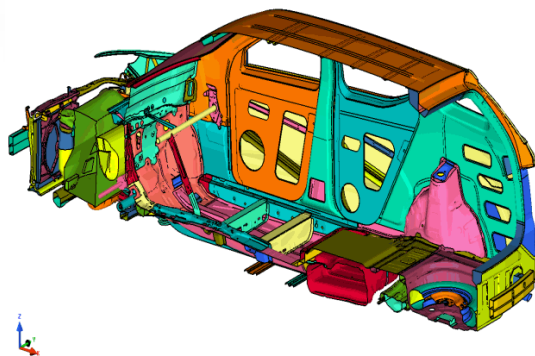
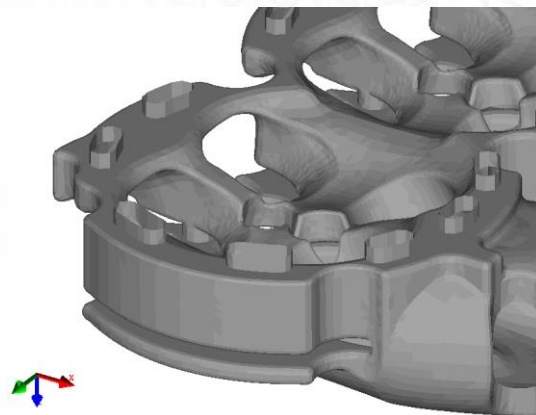
Extension/Contraction

Feature Repetition

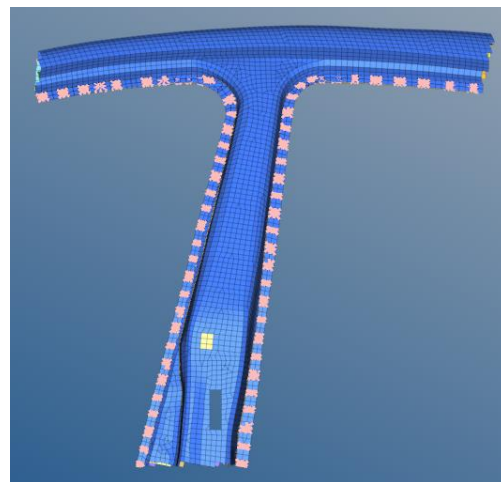
Tailor Welded Blank

Topology

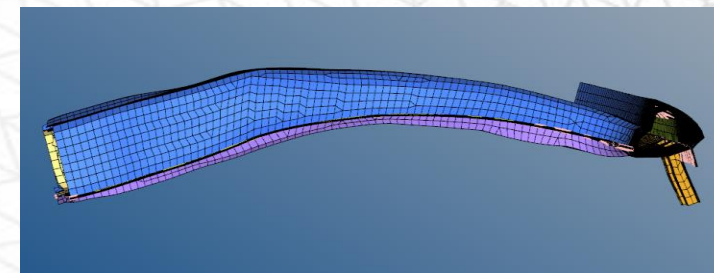
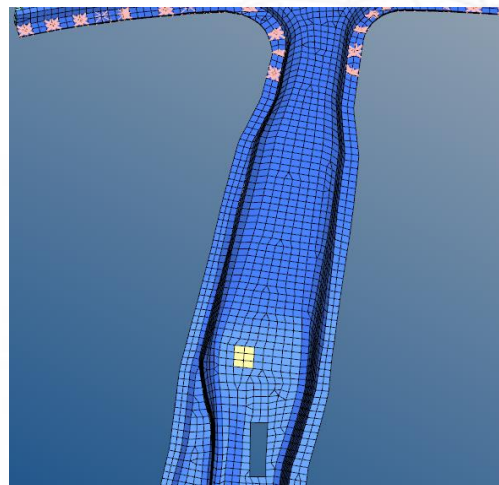
etc....



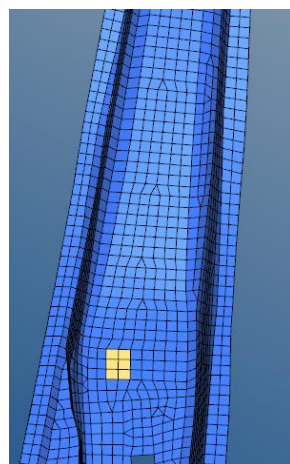
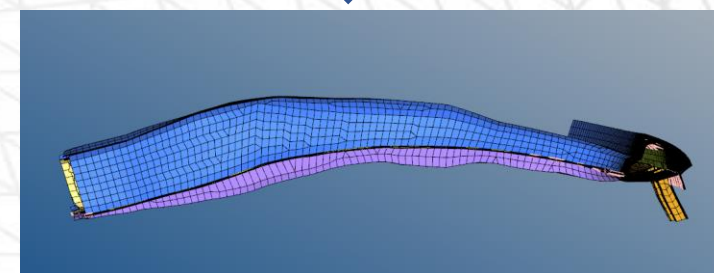
钣金件自动参数化



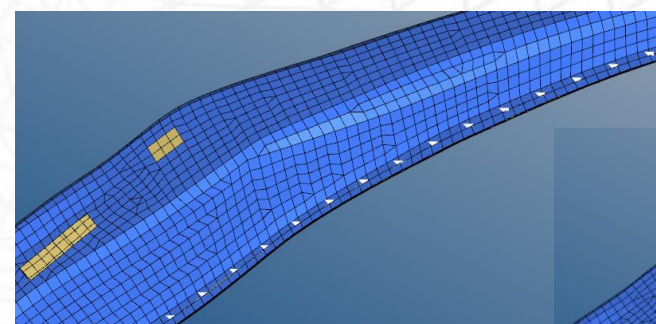
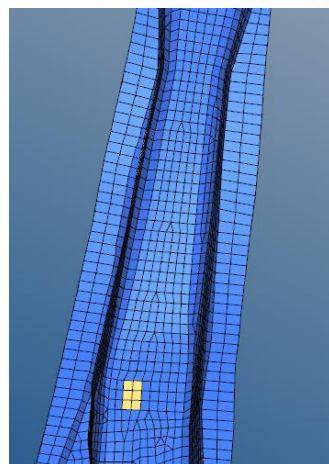
宽度参数化



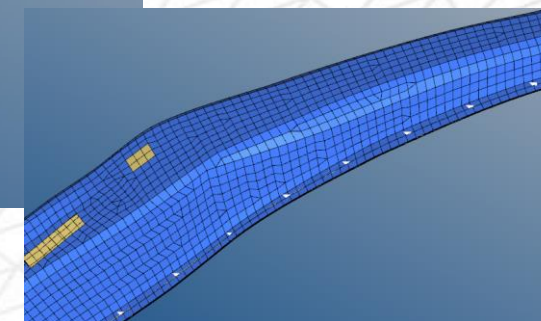
高度参数化



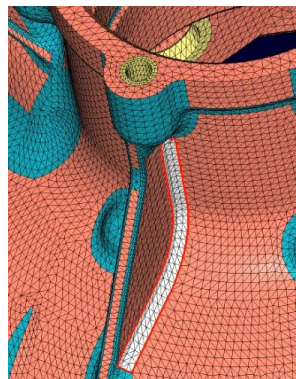
翻边宽度参数化



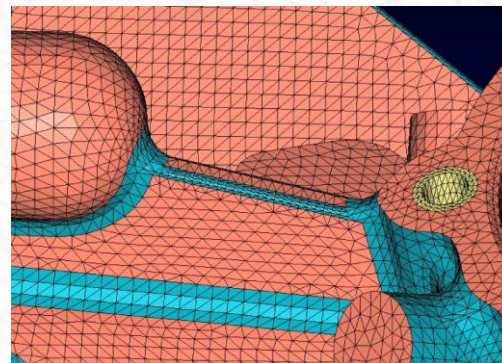
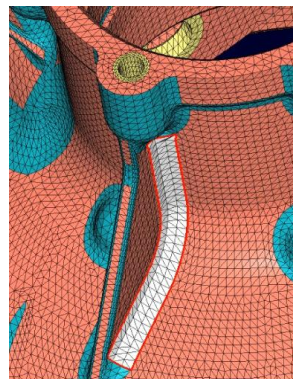
焊点间距参数化



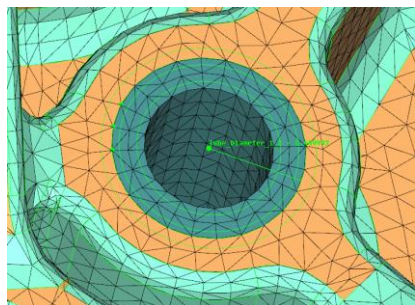
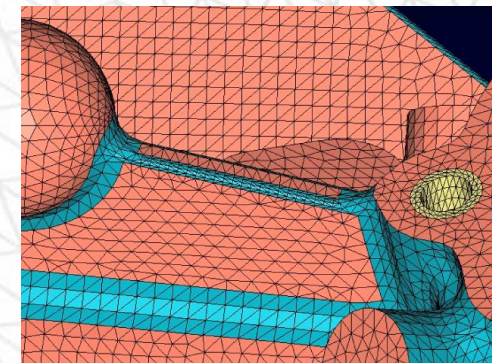
铸件快速参数化



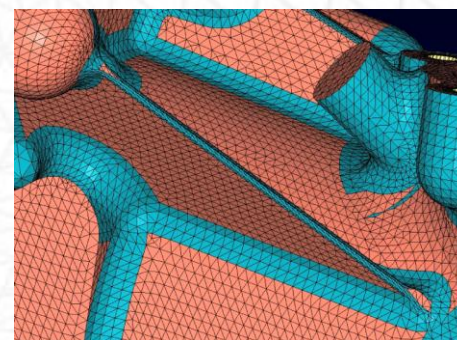
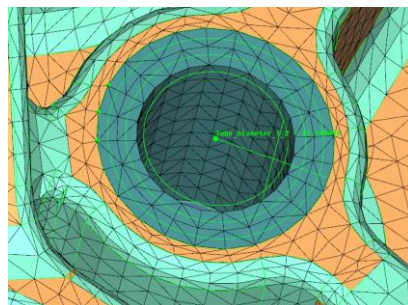
倒角半径参数化



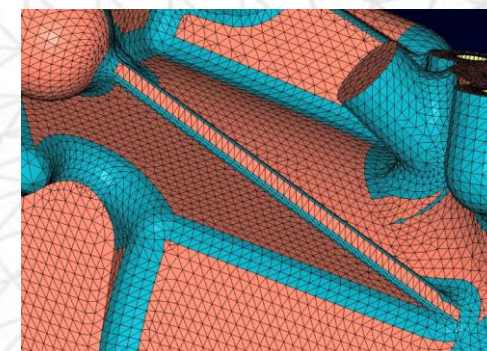
肋筋高度参数化



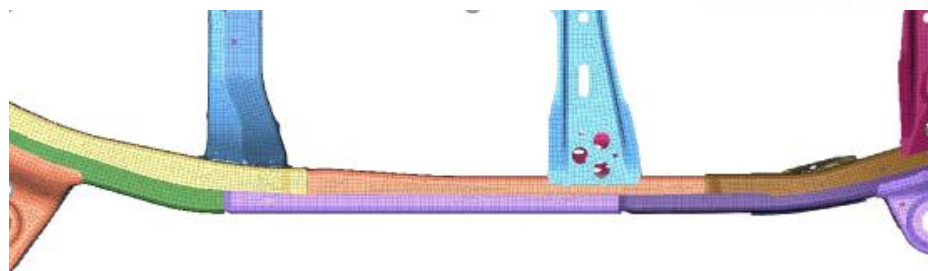
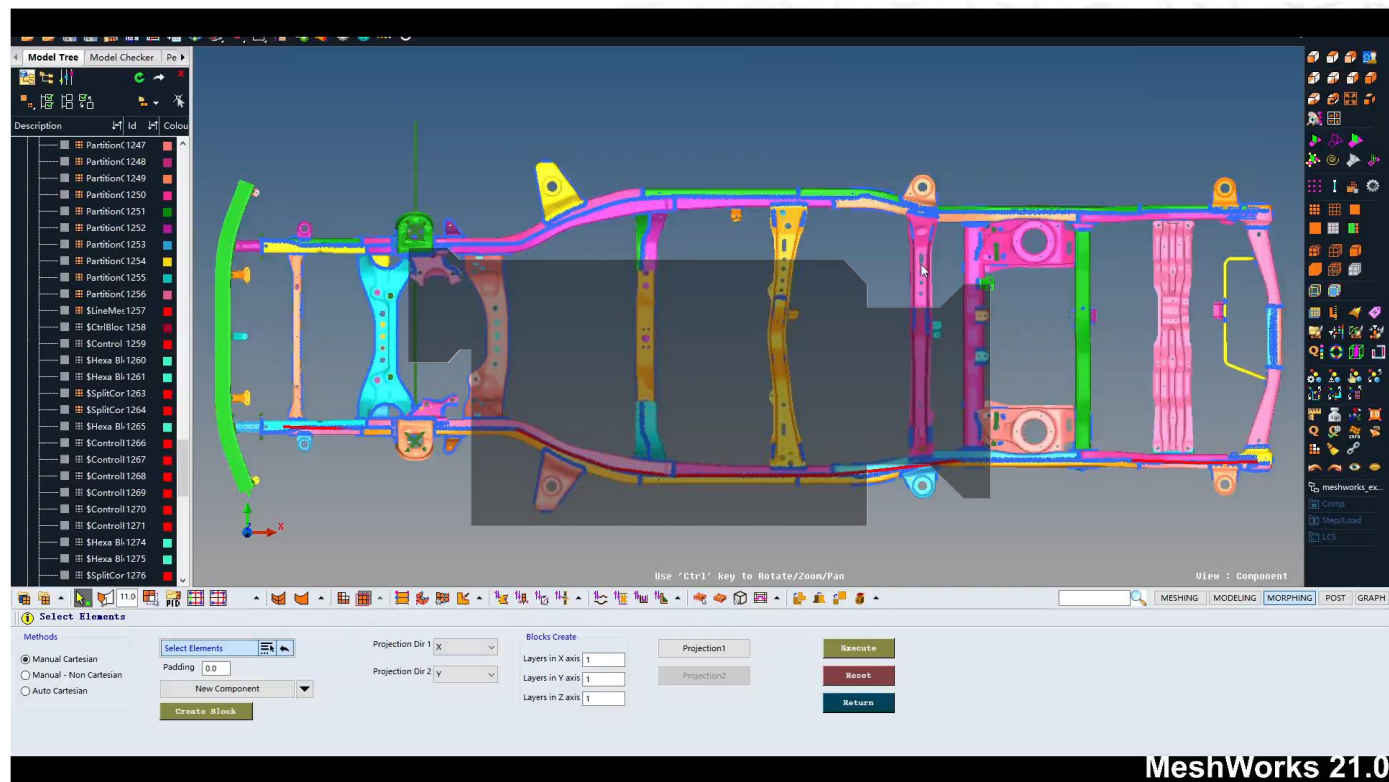
孔直径参数化



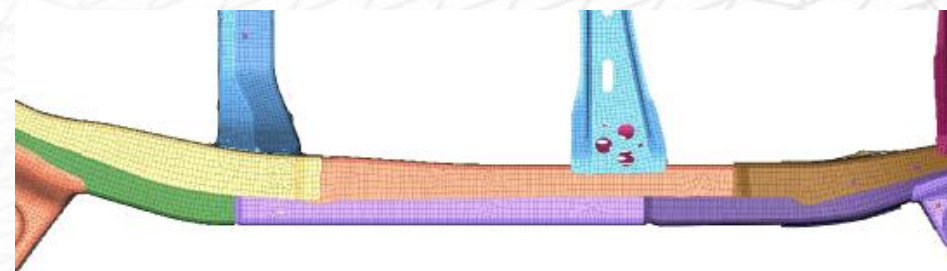
肋筋厚度参数化



参数化调整梁截面尺寸



Range: (+20mm) to (-20mm)



Range: (+20mm) to (-20mm)

料厚参数化

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

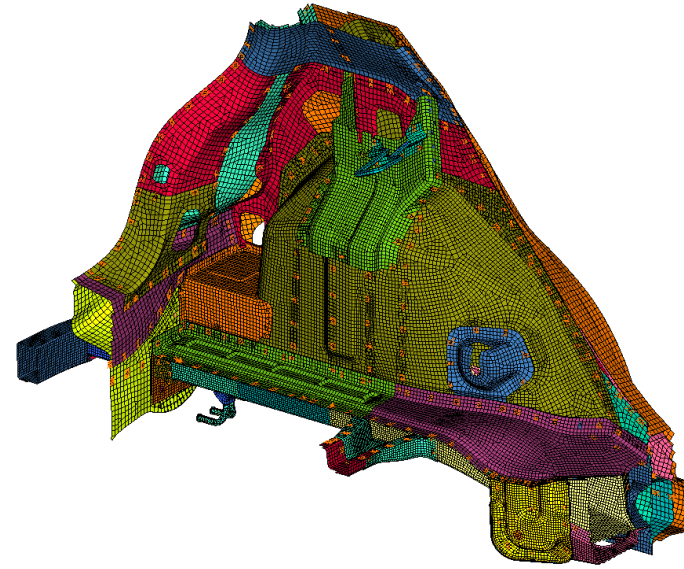
Extension/Contraction

Feature Repetition

Tailor Welded Blank

Topology

etc....



S.No	Colour	Part Id	Part Name	Section Id	Section Name	Material Id	Material Name	Min	Base Thickness	Max	Design Variable Name
1		2	OMS_Bracket	88016	OMS_Bracket_Shell	1042	Steel.3	2	2.5	3.75	test_OMS_Bracket_dv
2		3	OMS_Bracket_1	88016	OMS_Bracket_Shell	1042	Steel.3	2	2.5	3.75	test_OMS_Bracket_1_dv
3		4	FC00AAA21826	88021	Bearing_brkt.3	88022	Steel.8	4	5	7.5	test_FC00AAA21826_dv
4		1019	Staffa_superiore	1027	Staffa_superiore	1020	AISI409@600.1	1.2	1.5	2.25	test_Staffa_superiore_dv
5		1020	tubo_scarico	1017	tubo_scarico	1009	AISI_409@600	1.2	1.5	2.25	test_tubo_scarico_dv
6		1045	Staffa_sesto_fix	1026	Staffa_sesto_fix_01	1020	AISI409@600.1	1.2	1.5	2.25	test_Staffa_sesto_fix_dv
7		1052	Alette	1018	Alette	1020	AISI409@600.1	1.6	2	3	test_Alette_dv
8		1053	Canning	1019	Canning	1021	AISI441@500.2	1.2	1.5	2.25	test_Canning_dv
9		1054	Coppella_uscita	1020	Coppella_uscita	1021	AISI441@500.2	1.6	2	3	test_Coppella_uscita_dv
10		1056	Monolita	1021	Monolita	1025	Monolita.6	0.0008	0.001	0.0015	test_Monolita_dv
11		1057	Rip_term_hotend	1015	Rip_term_hotend	1006	acciaio:1	0.64	0.8	1.2	test_Rip_term_hotend_dv
12		1058	riparo_turbina	1016	riparo_turbina	1006	acciaio:1	1.44	1.8	2.7	test_riparo_turbina_dv
13		1059	Sold_noria_camin	1022	Sold_noria_camin	1022	AISI441@600.2	2.4	3	4.5	test_Sold_noria_camin_dv

Gauge Parameter	
Option	☒ Prefix Name test ☐ Impose Pair ☐ Group
☒ % Option Base ☐ Gauge Limit ☐ Snap to nearest value	☒ Name dv ☐ Min 20 ☐ Max 50 ☐ 0.05
Create Return	

材料参数化

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

Extension/Contraction

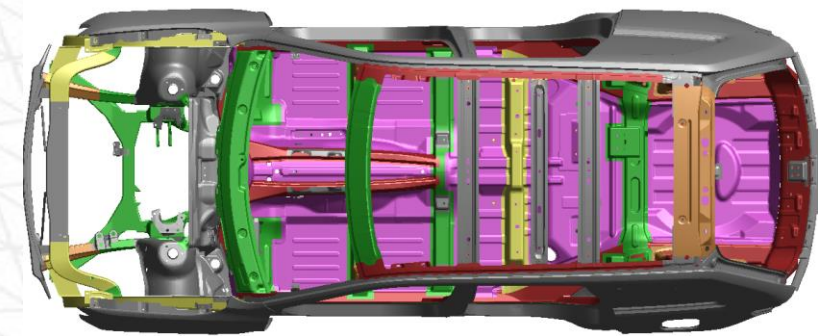
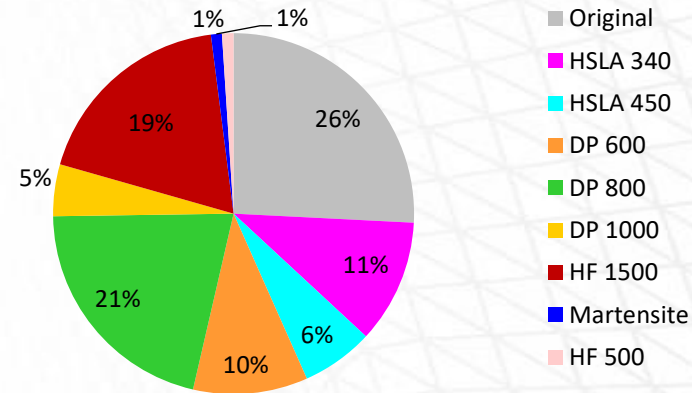
Feature Repetition

Tailor Welded Blank

Topology

etc....

Material Distribution



Material Parameter											
S.No	Colour	Part Id	Part Name	Section Id	Section Name	Section Type	Thickness	Material Id	Material Name	Material Type	
1		1108	DenS_Vary_AC	427992	AC_Comp.5	PSOLID	0	88018	AL_AC_Comp.5	MAT1	
2		12121216	Trans_case_Tet	427947	trans_case_solids	PSOLID	0	88036	Alluminum gear box.1	MAT1	
3		4606	Throttle Body	188013	Throttle Body	PSOLID	0	88002	Throttle Body	MAT1	

Choice No	ID	Materials Name	Design Variable Name
1	1003	pompa_olio	
2	1006	acciaio:1	
3	1009	AISI_409@600	
1	1004	A3K@800	
2	1006	acciaio:1	
3	1011	compress_@200	
1	1002	acciaio	
2	1003	pompa_olio	
3	1012	Fe510@300	

☒ Independent
 ☐ Group
 ☐ PART LIST
 ☐ Prefix
 ☐ Name
 ☐ Suffix
 ☐ ID

梁参数化调整

- Shape
- Gauge
- Material
- Member**
- Rib
- Hole/Slot
- Weld
- Bead
- Dart
- Doubler
- Bulkhead
- Extension/Contraction
- Feature Repetition
- Tailor Welded Blank
- Topology
- etc....

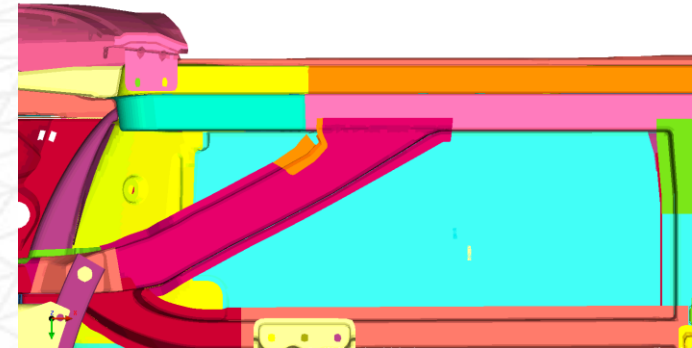
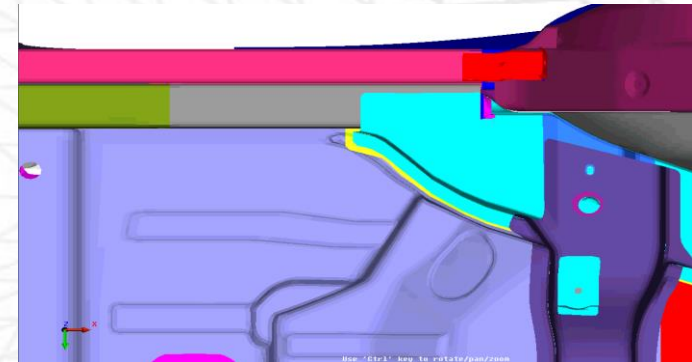
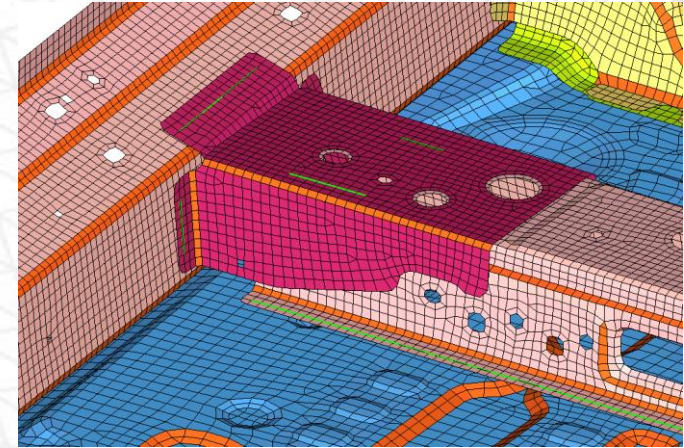
Shape

Size

Location

Remeshing

Weld



参数化调整2D/3D肋筋的数量和间隔

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

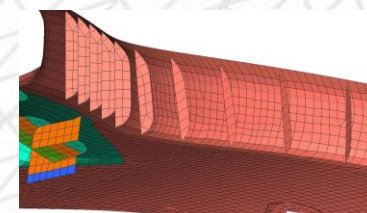
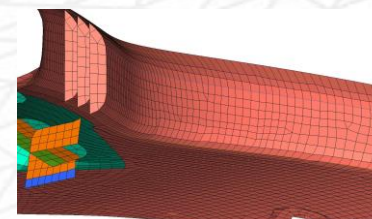
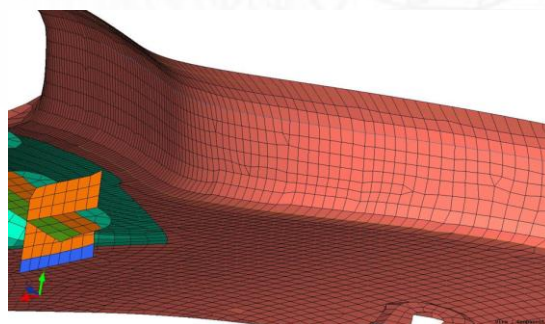
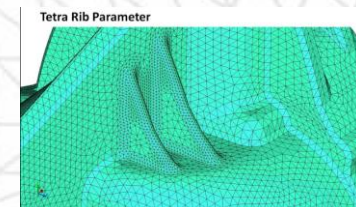
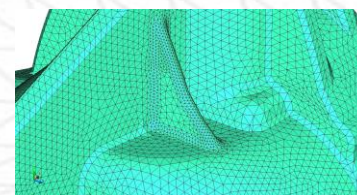
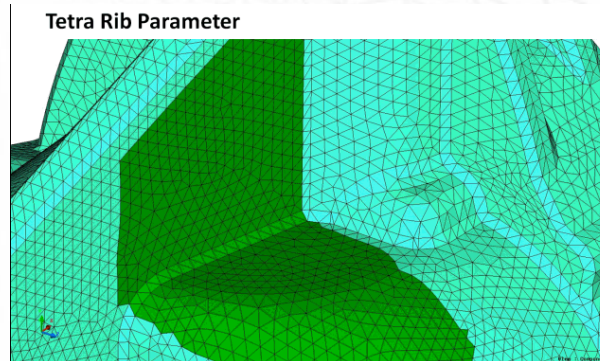
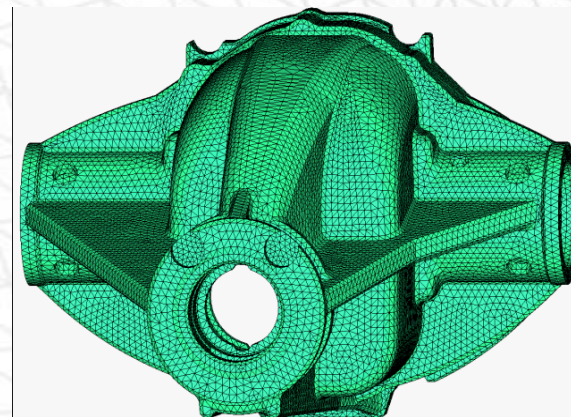
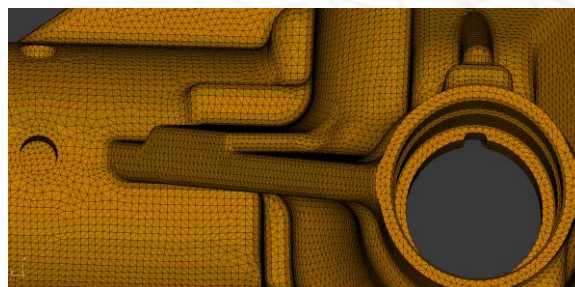
Extension/Contraction

Feature Repetition

Tailor Welded Blank

Topology

etc....



参数化调整slot或孔的数量和间隔

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

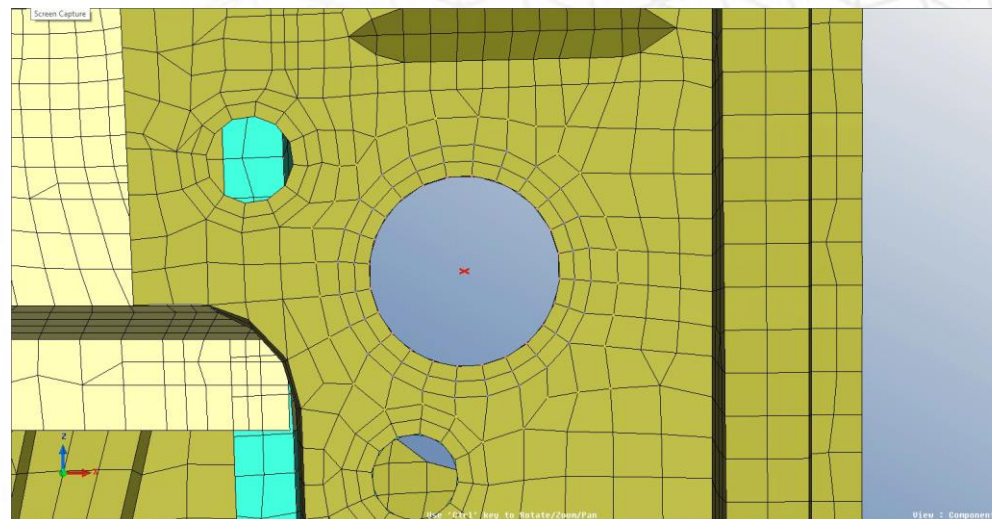
Extension/Contraction

Feature Repetition

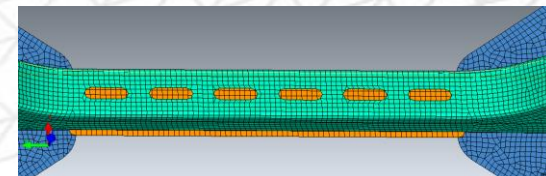
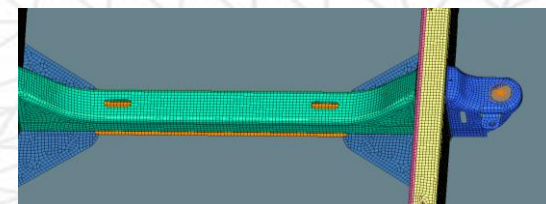
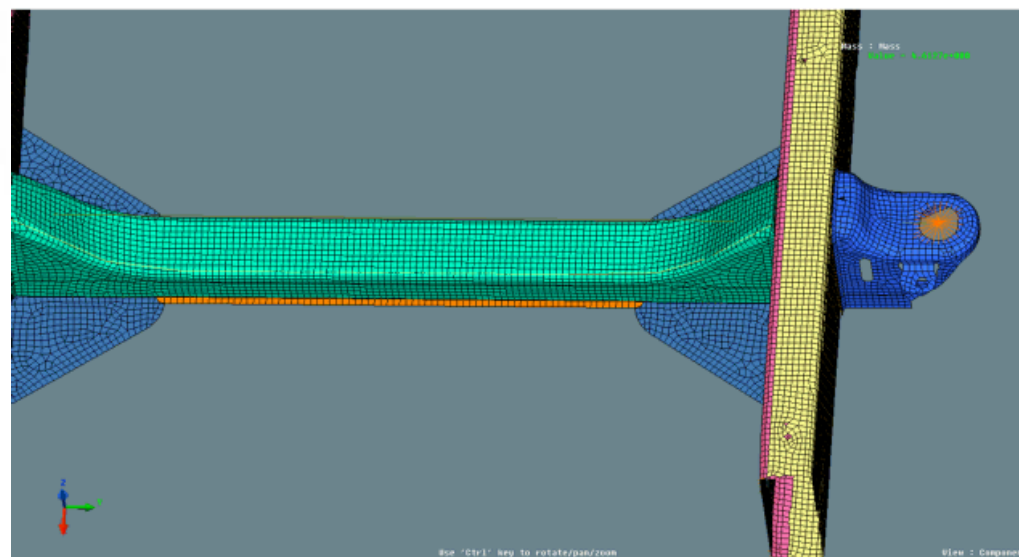
Tailor Welded Blank

Topology

etc....

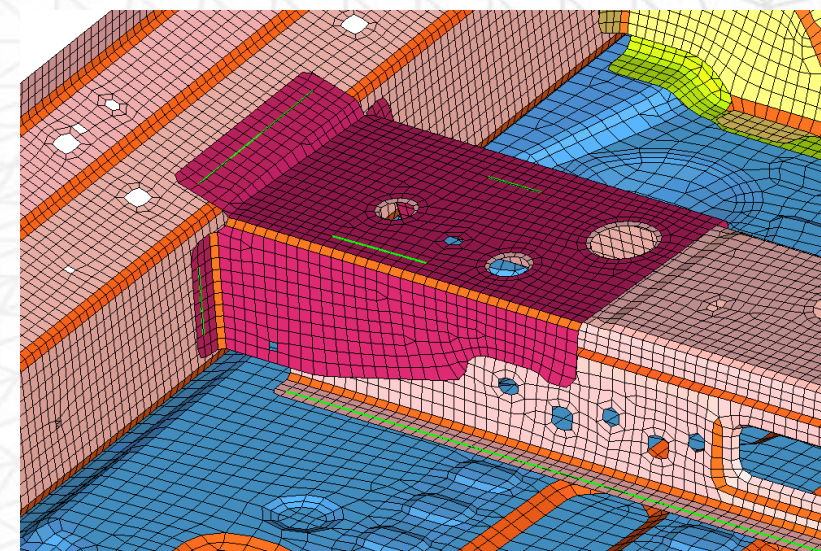
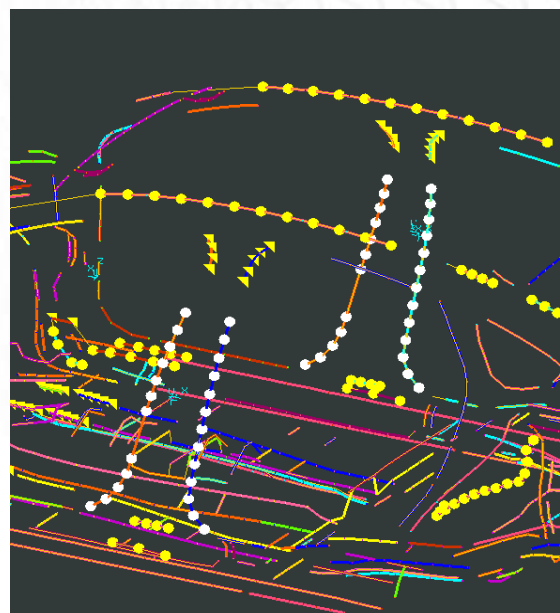
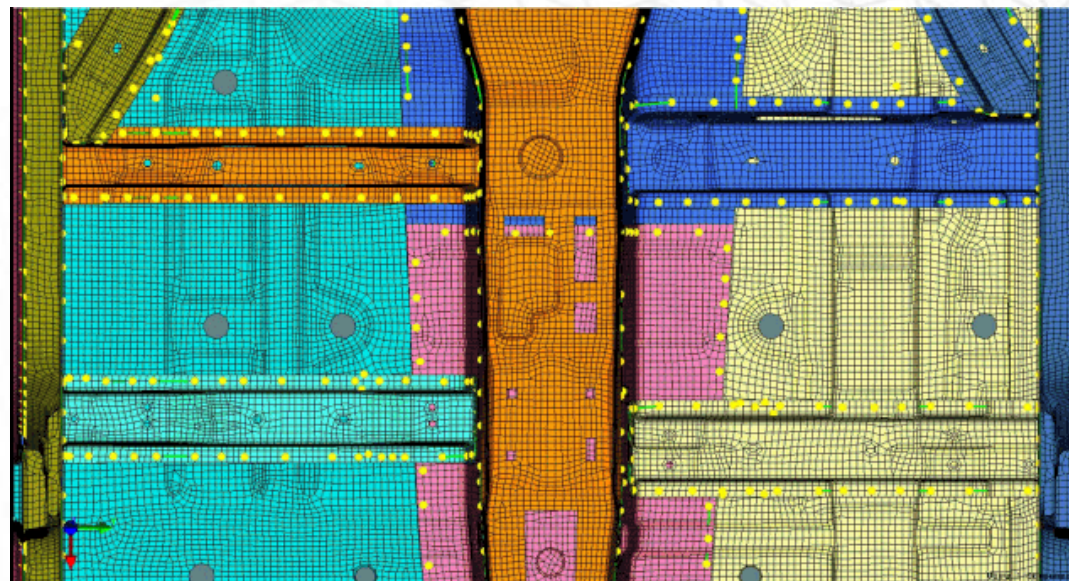


Punch Hole Parameter



参数化调整焊点数量及间距

- Shape
- Gauge
- Material
- Member
- Rib
- Hole/Slot
- Weld**
- Bead
- Dart
- Doubler
- Bulkhead
- Extension/Contraction
- Feature Repetition
- Tailor Welded Blank
- Topology
- etc....



参数化调整2D焊缝的长度和间隔

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

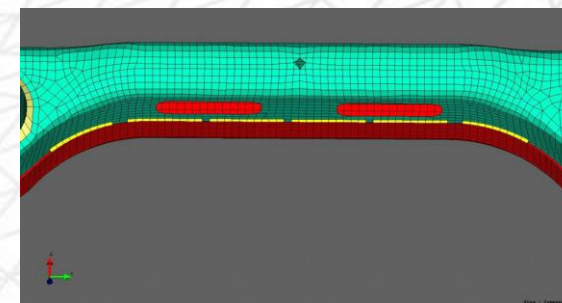
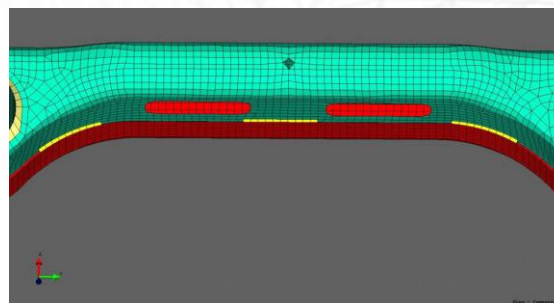
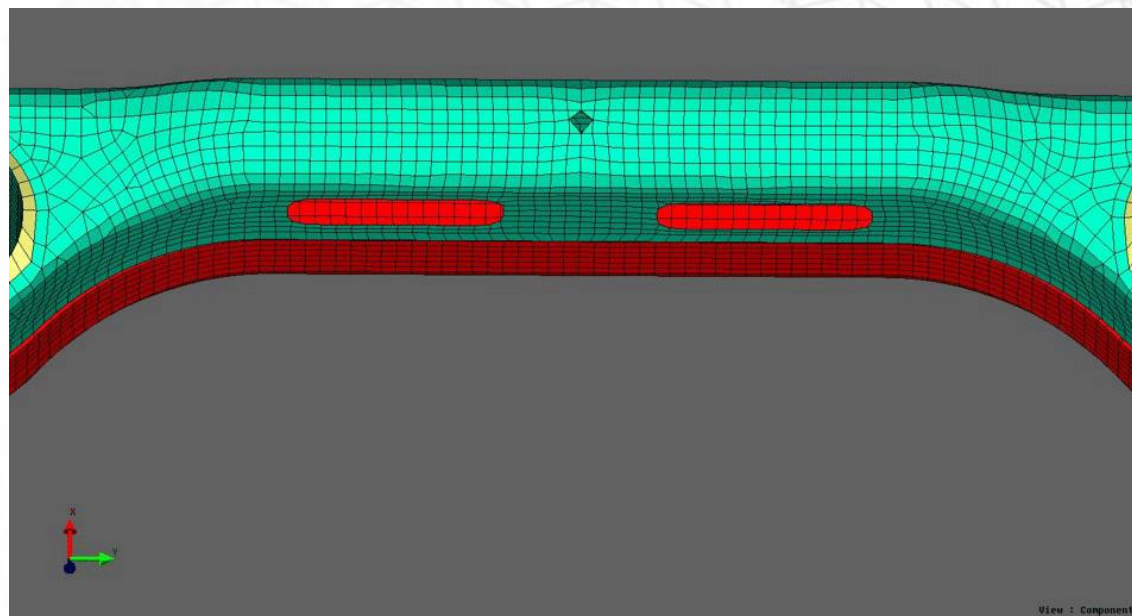
Extension/Contraction

Feature Repetition

Tailor Welded Blank

Topology

etc....



结构胶参数化

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

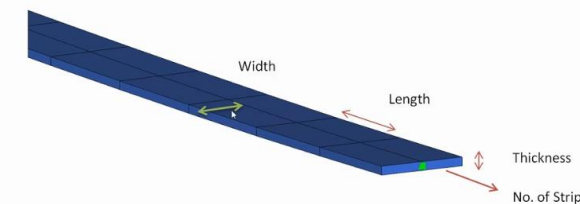
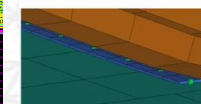
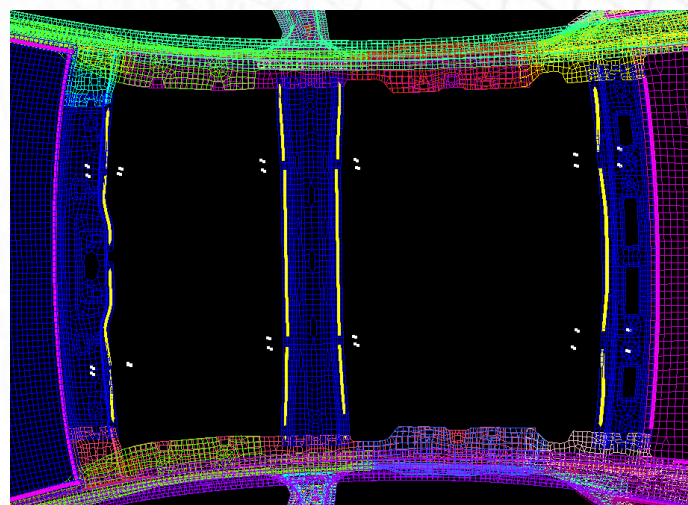
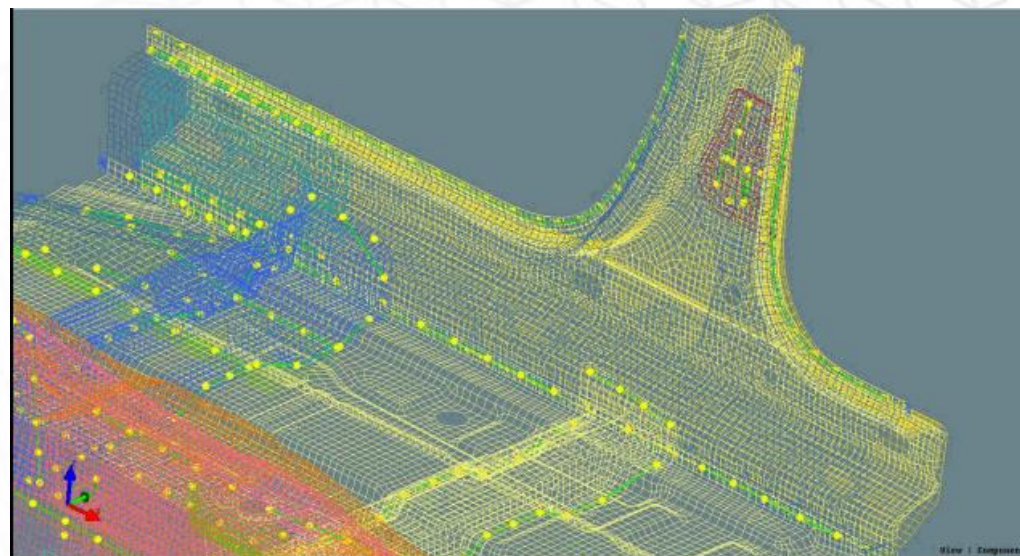
Extension/Contraction

Feature Repetition

Tailor Welded Blank

Topology

etc....



Parameters	Before	After
Young modulus	20000	$20000 * 0.2$
Poisson's ratio	0.3	0.3
Density	$7.9E-06$	$7.9E-06 * ((0.2)^2)$

Scale Factor	0.2
Power Rule of Density	2

参数化调整3D实体焊缝的尺寸

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

Extension/Contraction

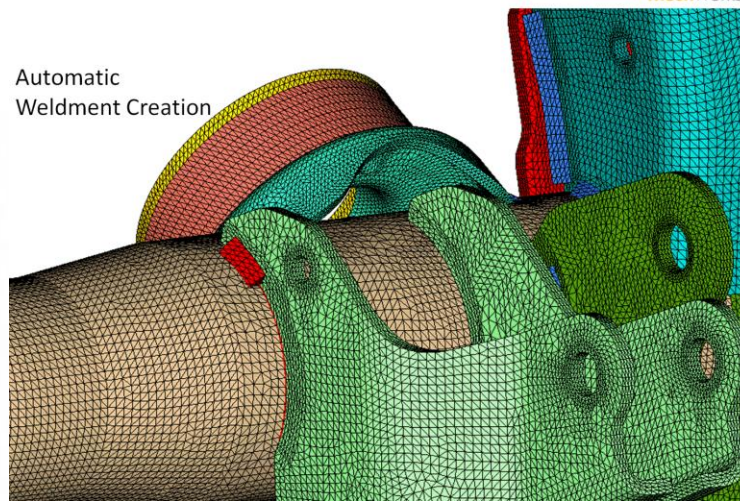
Feature Repetition

Tailor Welded Blank

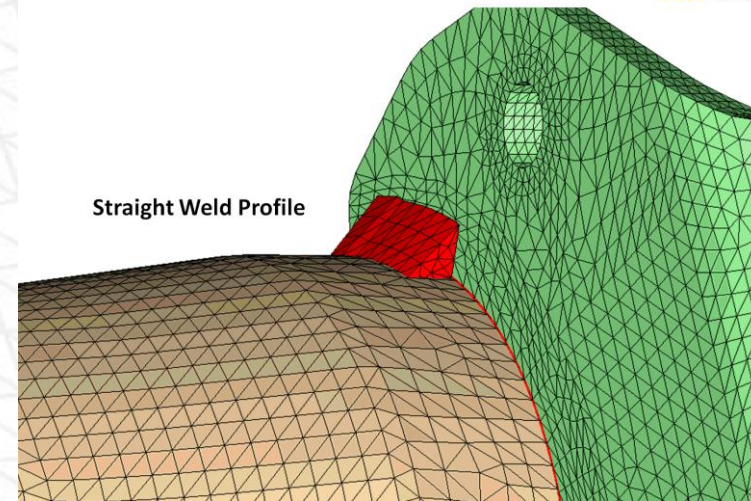
Topology

etc....

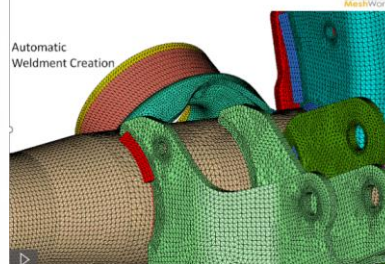
Automatic
Weldment Creation



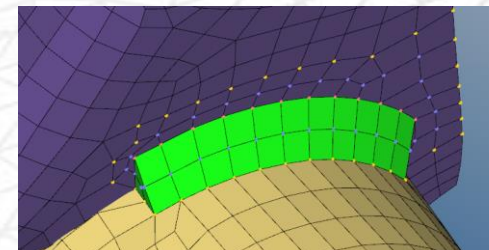
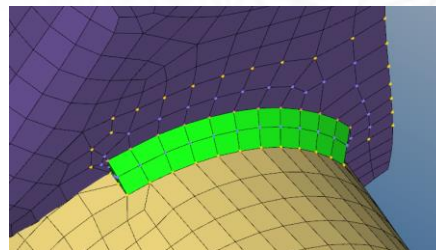
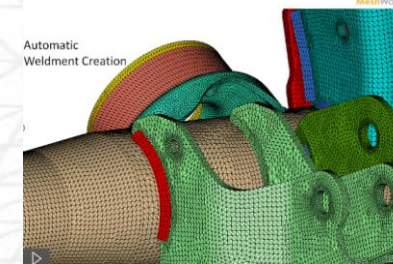
Straight Weld Profile



Automatic
Weldment Creation



Automatic
Weldment Creation



参数化调整加强筋的数量和间隔

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

Extension/Contraction

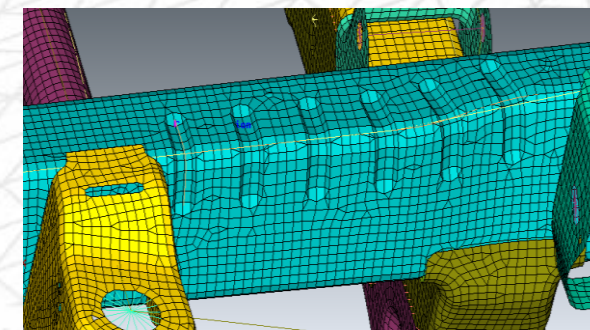
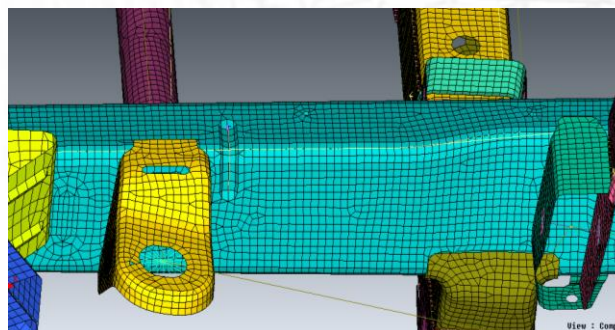
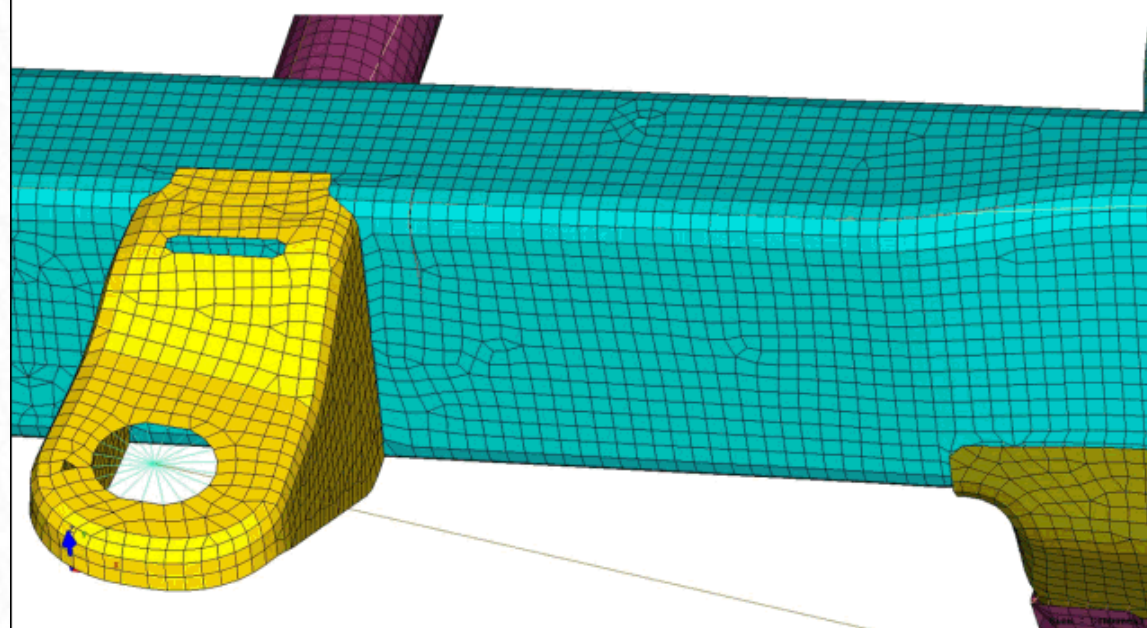
Feature Repetition

Tailor Welded Blank

Topology

etc....

Bead Parameter



参数化调整加强特征的数量和间隔

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

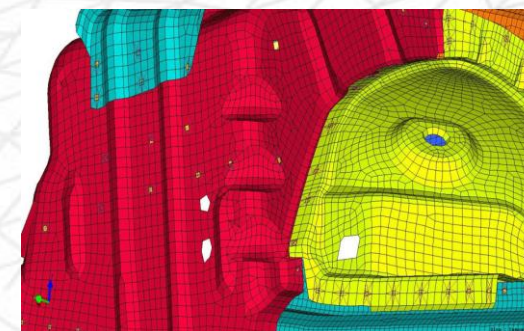
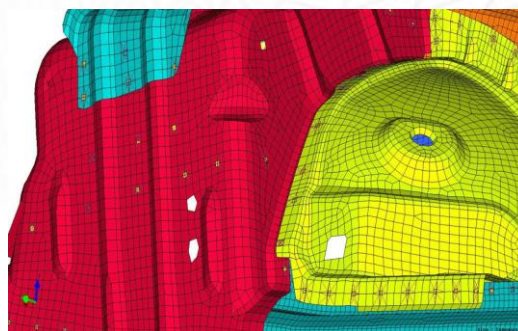
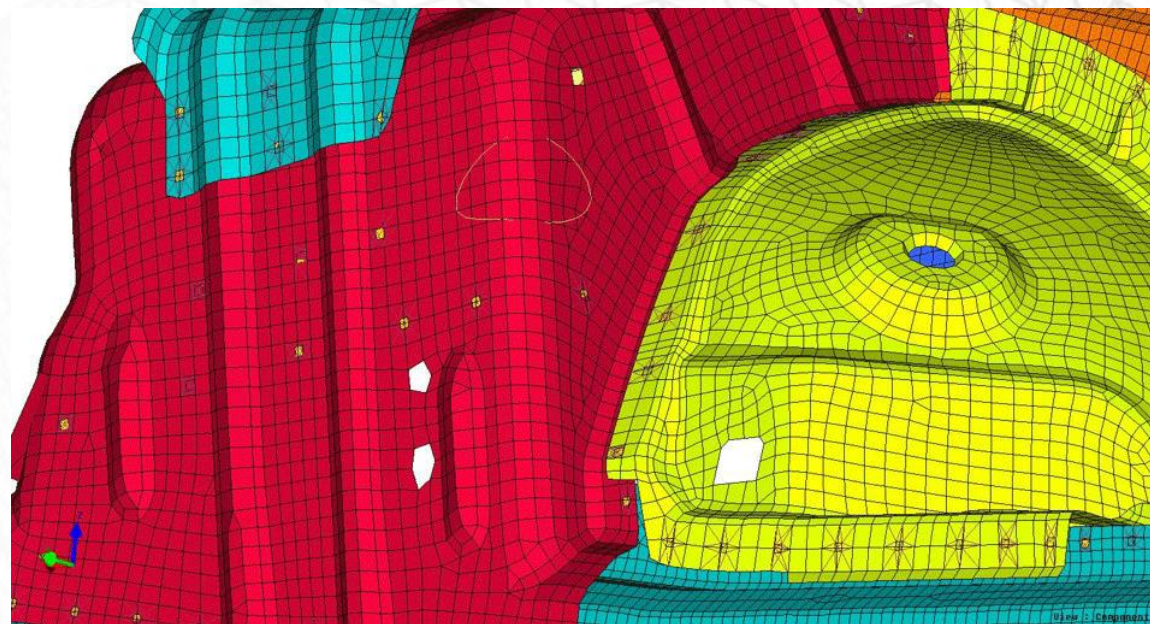
Extension/Contraction

Feature Repetition

Tailor Welded Blank

Topology

etc....



参数化调整双层加强梁的长度

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

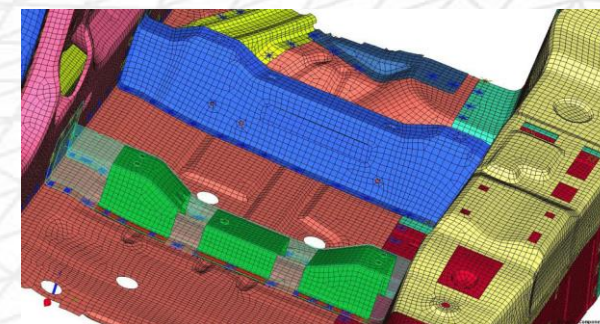
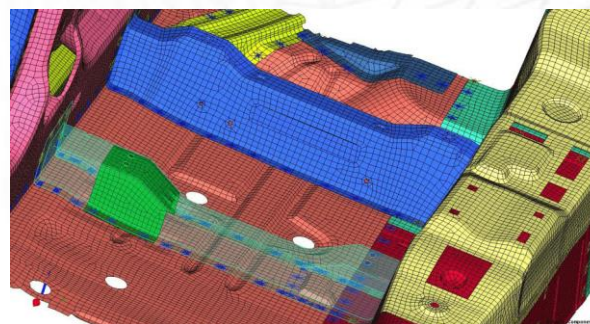
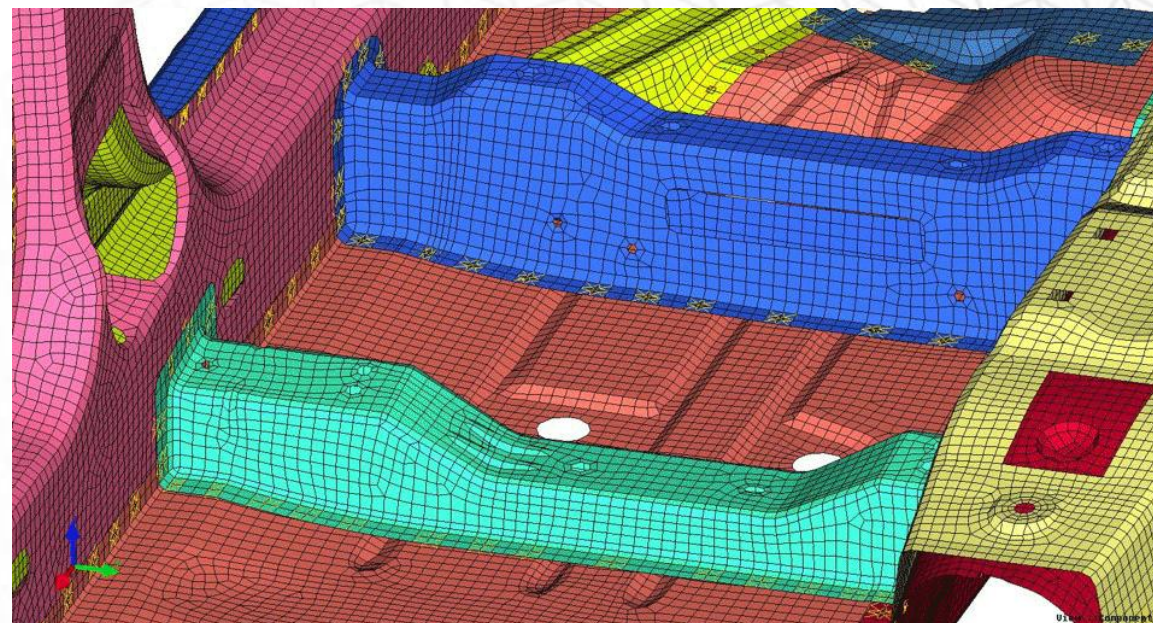
Extension/Contraction

Feature Repetition

Tailor Welded Blank

Topology

etc....



创建小支架Bulkhead及参数化调整数量和间距

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

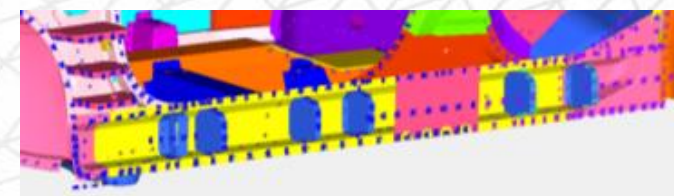
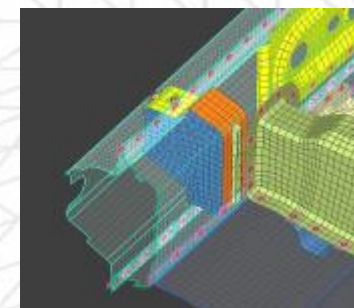
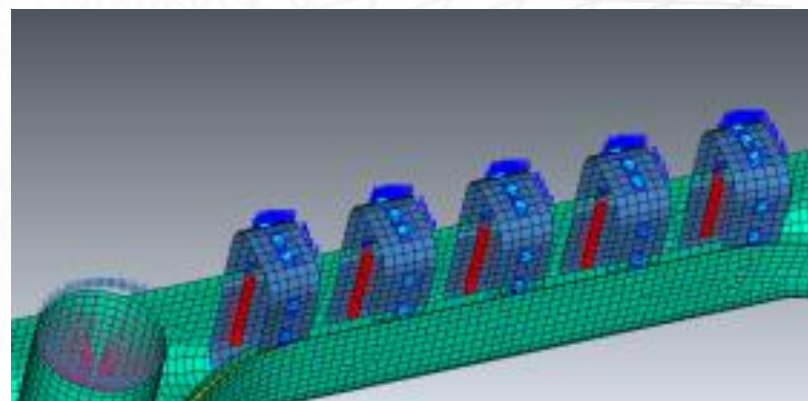
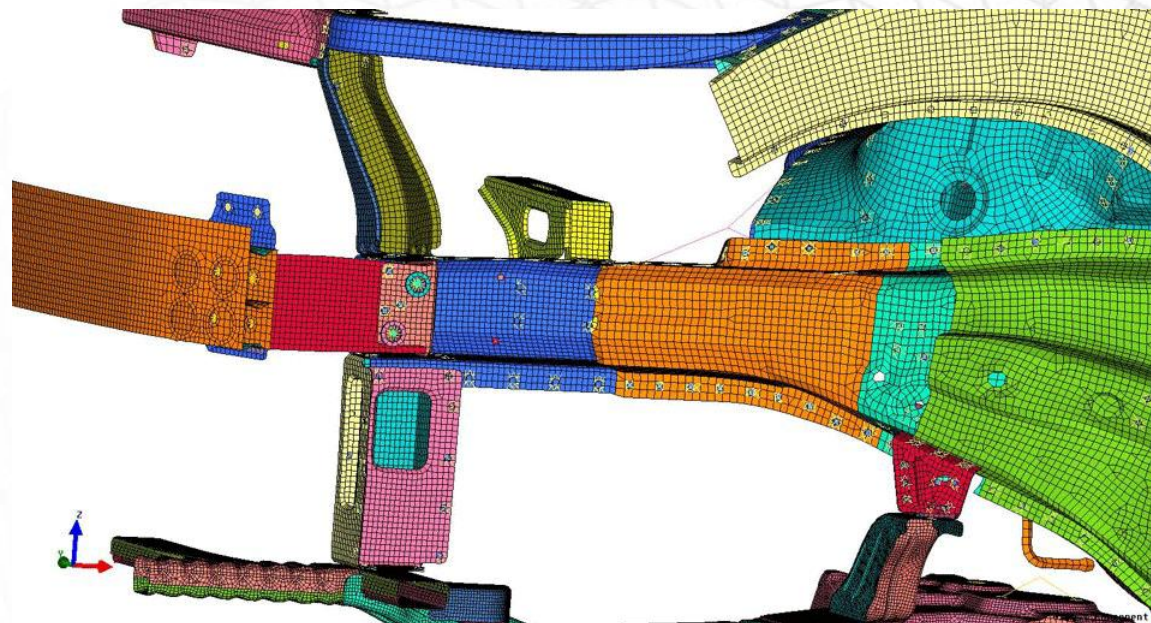
Extension/Contraction

Feature Repetition

Tailor Welded Blank

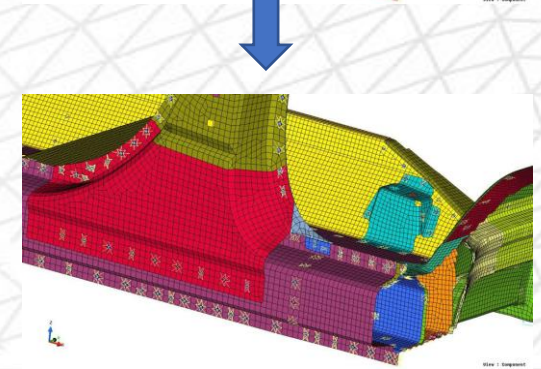
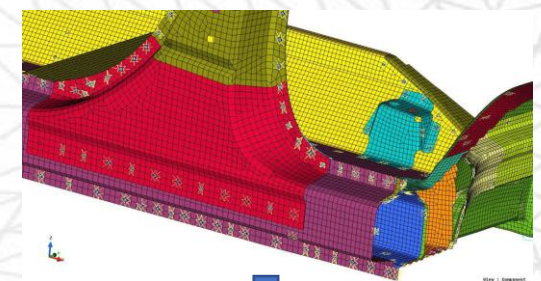
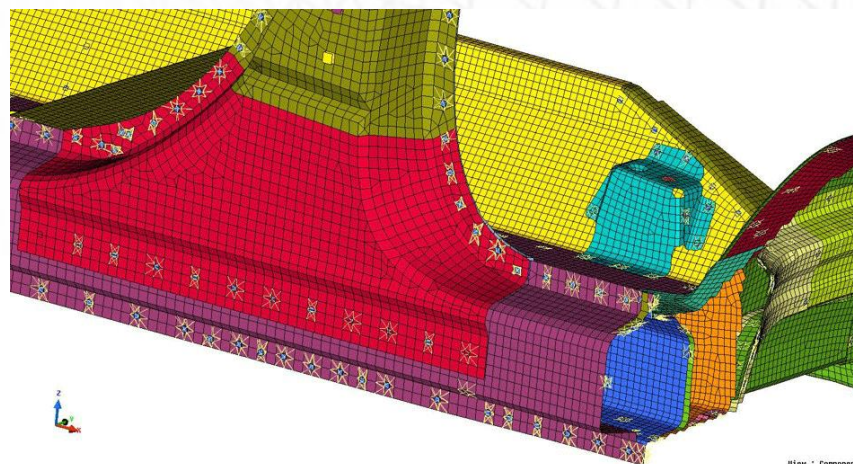
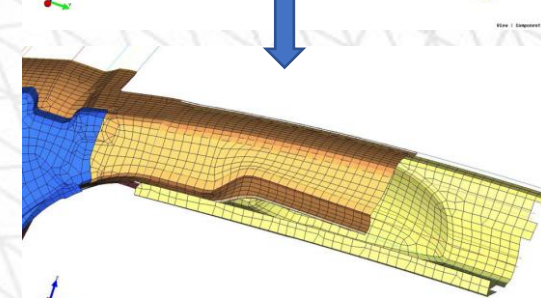
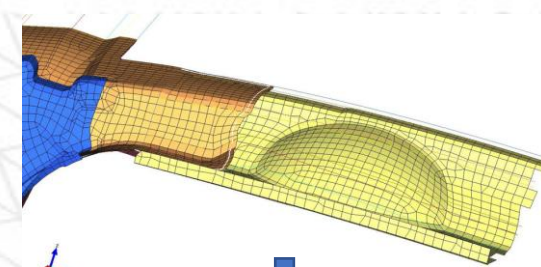
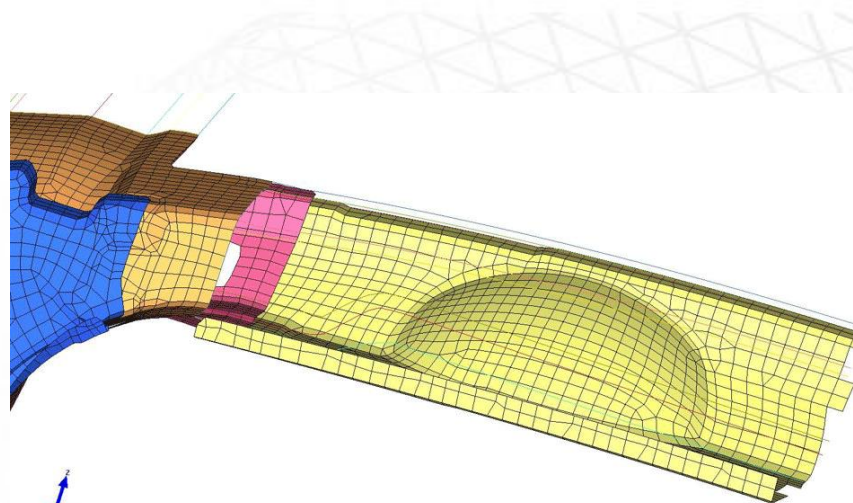
Topology

etc....



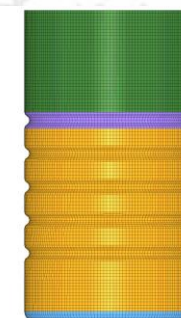
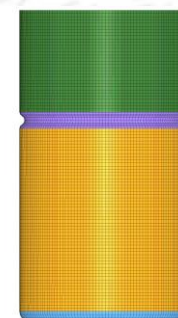
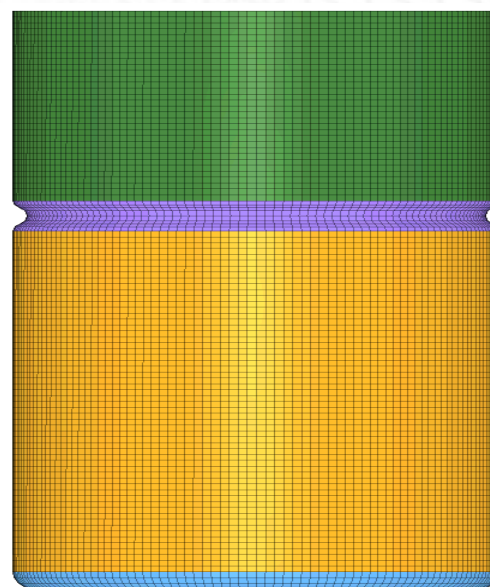
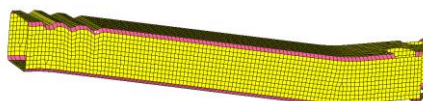
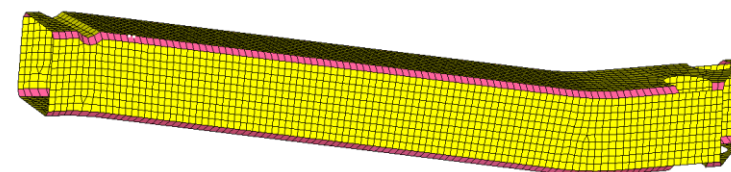
参数化调整部件的伸长或缩短

- Shape
- Gauge
- Material
- Member
- Rib
- Hole/Slot
- Weld
- Bead
- Dart
- Doubler
- Bulkhead
- Extension/Contraction**
- Feature Repetition
- Tailor Welded Blank
- Topology
- etc....



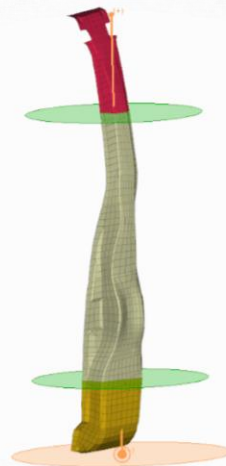
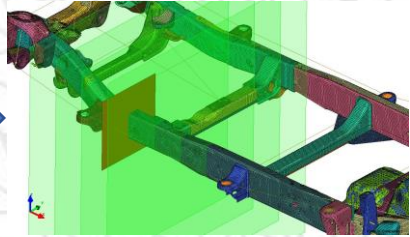
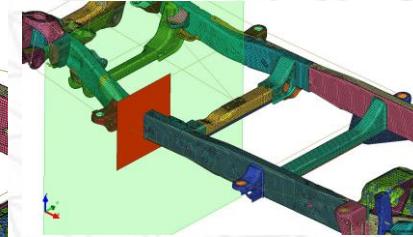
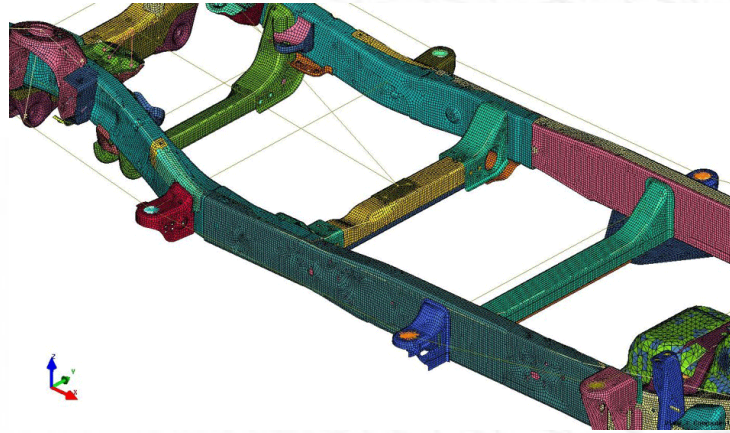
重复特征参数化

- Shape
- Gauge
- Material
- Member
- Rib
- Hole/Slot
- Weld
- Bead
- Dart
- Doubler
- Bulkhead
- Extension/Contraction
- Feature Repetition**
- Tailor Welded Blank
- Topology
- etc....

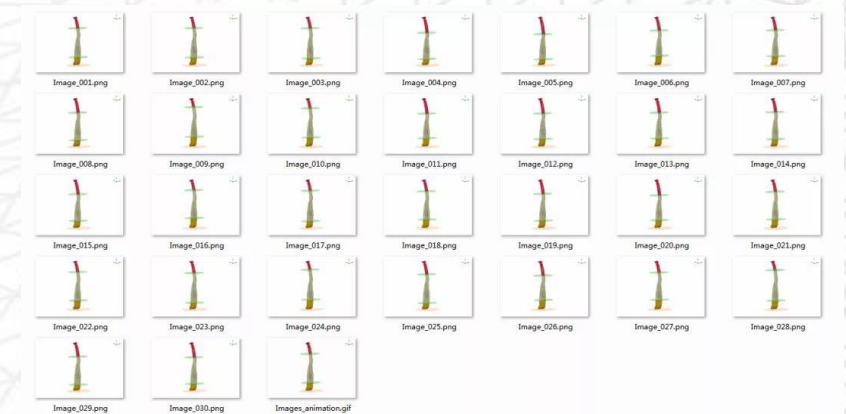


参数化调整激光拼焊板TWB的位置

- Shape
- Gauge
- Material
- Member
- Rib
- Hole/Slot
- Weld
- Bead
- Dart
- Doubler
- Bulkhead
- Extension/Contraction
- Feature Repetition
- Tailor Welded Blank**
- Topology
- etc....



模型共包括四个参数，即两个切割面位置参数和两个厚度参数



横梁位置参数化

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

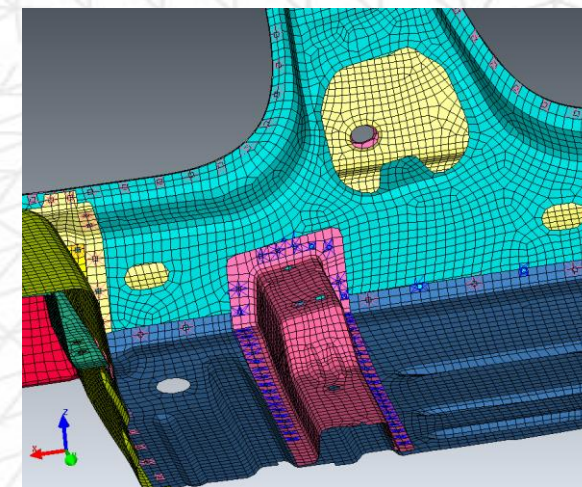
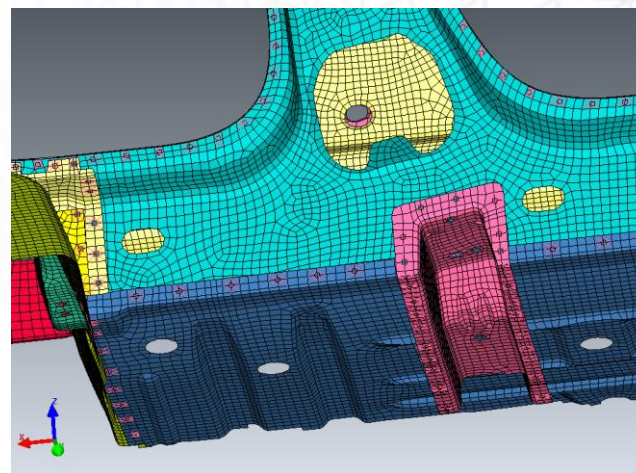
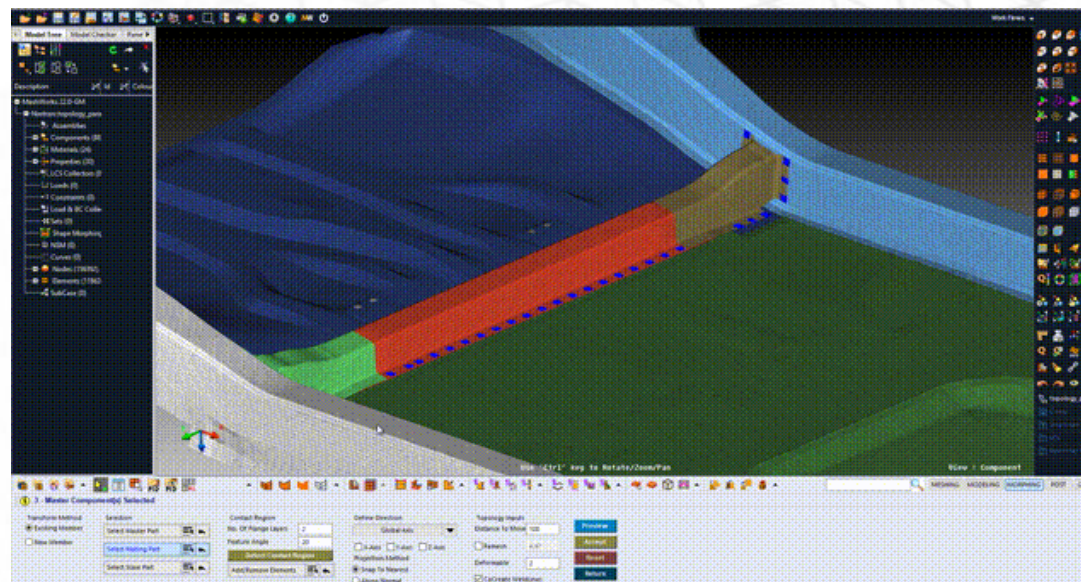
Extension/Contraction

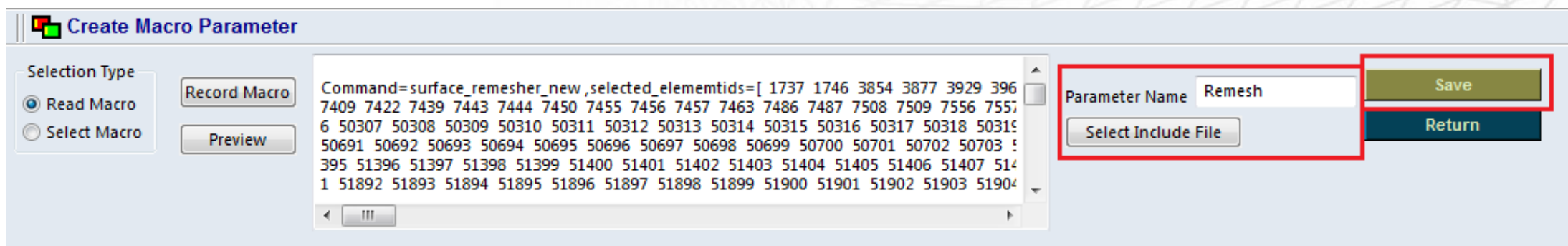
Feature Repetition

Tailor Welded Blank

Topology

etc....





PARAMETRIZATION

Shape

Gauge

Material

Member

Rib

Hole/Slot

Weld

Bead

Dart

Doubler

Bulkhead

Part Extension/Contraction

Feature Repetition

Tailor Welded Blank

Topology

etc....

Design Enablers

 Bead Geometry Created

Specify Geometry

Specify Properties

Specify Connections

Create / Parametrize

Return

File

Morpher

ControlBlocks

Parameterization

User Functions

 Shape Parameter
 General Transform Parameter
 Gauge Parameter
 Material Parameter

 Auto Parameterization Sheet Metal
 Auto Parameterization Casting
 Find Deformed Comps

 Adjust Thickness
 Weld Parameter
 Seam Weld Parameters
 Adhesive Parameters

 BulkHead Parameter
 Doubler Parameter
 PartExtensionParameter
 TWB Parameter

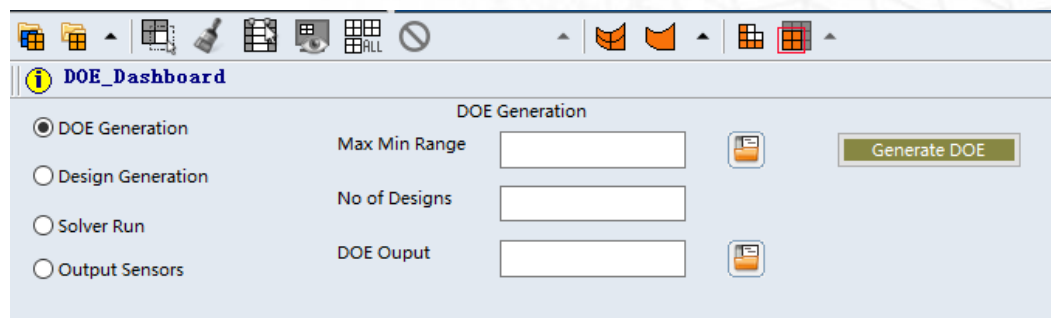
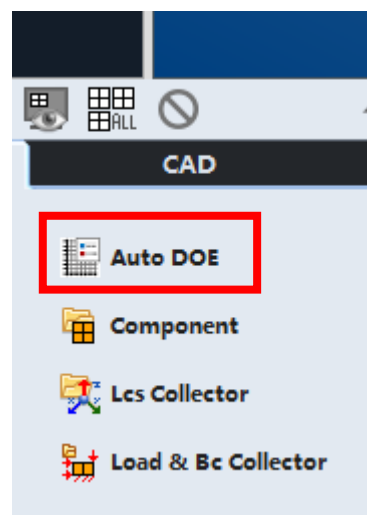
 Bead Parameter
 Punch Hole Parameter
 Darts Parameter
 Macro Parameter

 Shell Rib Parameter
 Tet Rib Parameter
 Composite Parameter
 Airbag Parameter

 Topology Parameter
 Feature Parameter
 General Parameter
 Review Parameter

网格参数化—生成DOE矩阵及生成不同设计方案模型

采用优化的拉丁超立方算法自动生成DOE矩阵



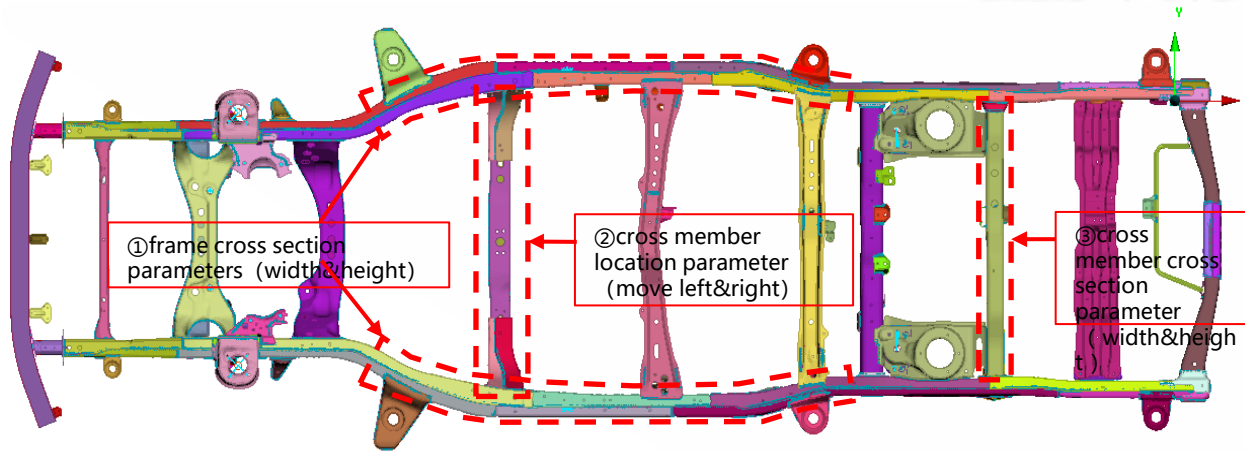
导出不同设计方案模型用于分析

Design	0001_Cross_member_Height			0001_CrossMember_Width			LongMember_Height_Offset			LongMember_Width_offset			LongMember_Rear_Height_Offset			
Design_1	-2.23	-6.565	-9.129	-9.79	-6.333	-9.344	2.401	1.951	24.506	3.103	2.787	3.043	3.152	3.075	2.624	3.024
Design_2	-8.358	-8.9	-4.596	-1.577	-2.022	1.863	-8.636	-9.077	7.993	3.029	2.94	3.054	2.921	3.051	3.086	3.881
Design_3	-2.37	-3.015	-9.813	-2.822	5.913	-7.961	-3.773	3.596	6.311	3.096	2.771	2.664	2.757	2.889	2.903	3.808
Design_4	-8.976	-8.37	-0.045	1.935	-9.265	-4.535	3.078	-8.852	15.531	3.148	3.172	2.793	3.021	2.994	2.883	2.844
Design_5	-7.286	-7.958	-2.612	-9.468	-4.698	-5.578	-8.399	-2.087	24.775	2.962	2.834	2.783	2.868	2.85	2.827	3.721
Design_6	-3.456	-3.471	-2.693	-3.273	-7.282	5.209	-1.37	-2.562	20.19	2.84	3.143	3.139	3.156	2.907	2.756	3.542
Design_7	-6.71	-2.627	-3.087	-2.211	0.959	1.184	-6.347	-2.917	9.875	2.873	2.898	2.721	3.041	2.882	3.194	3.17
Design_8	-4.156	-5.188	-3.22	-6.141	-4.246	6.998	0.103	2.952	19.09	2.82	2.672	2.838	2.63	3.059	2.76	3.399
Design_9	-9.385	-6.624	-1.532	-1.051	-0.262	-6.566	-7.895	-5.089	11.2	2.992	3.036	2.947	2.786	2.971	3.049	3.506
Design_10	-7.91	-2.774	-8.297	-8.587	-5.517	-3.541	-5.71	8.162	8.967	2.628	2.89	2.949	3.012	3.189	2.712	

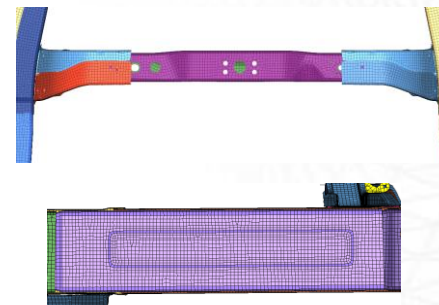
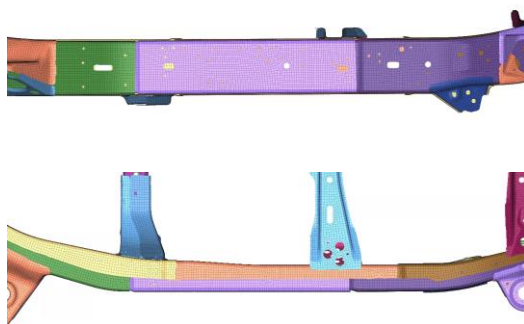




网格参数化—案例：车架DOE减重优化



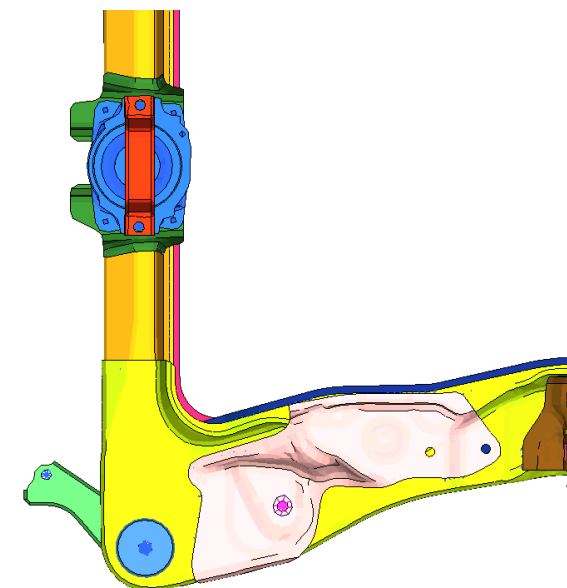
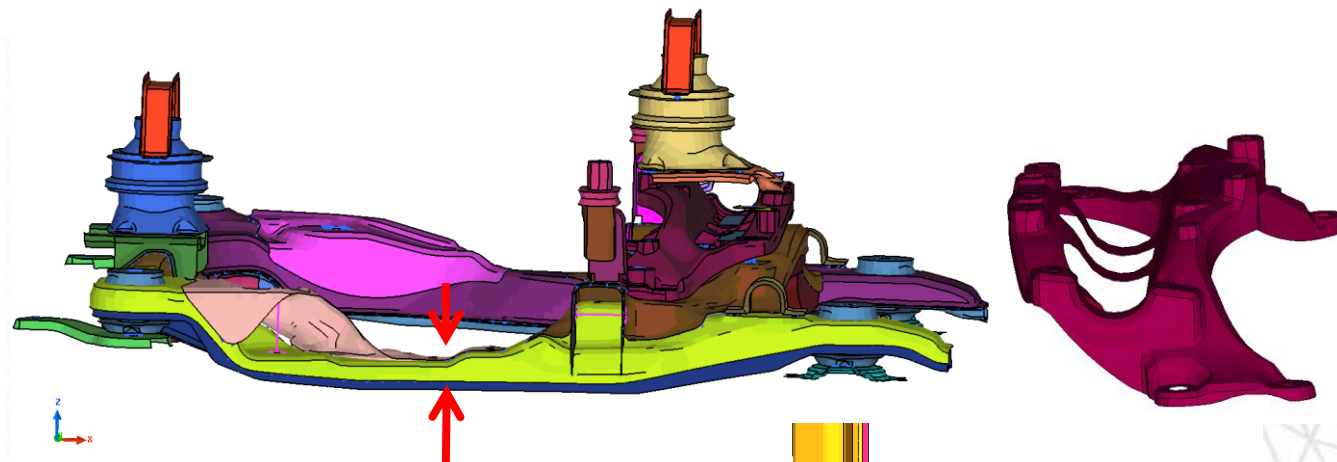
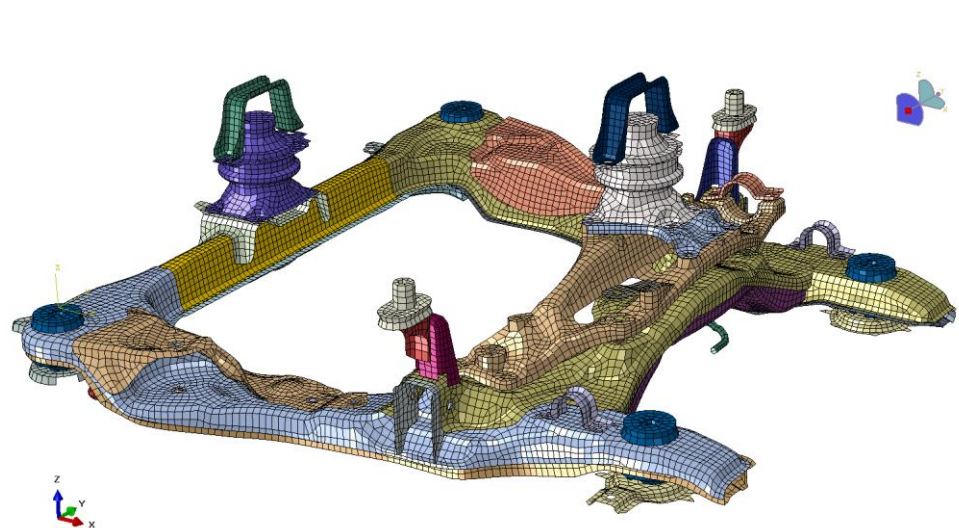
	Parameter	Range (mm)
1	Frame cross section Width	(-20,+20)
1	Frame cross section height	(-20,+20)
2	Cross member location	(-40,+40)
3	Cross member width	(-10,+10)
3	Cross member height	(-20,+20)



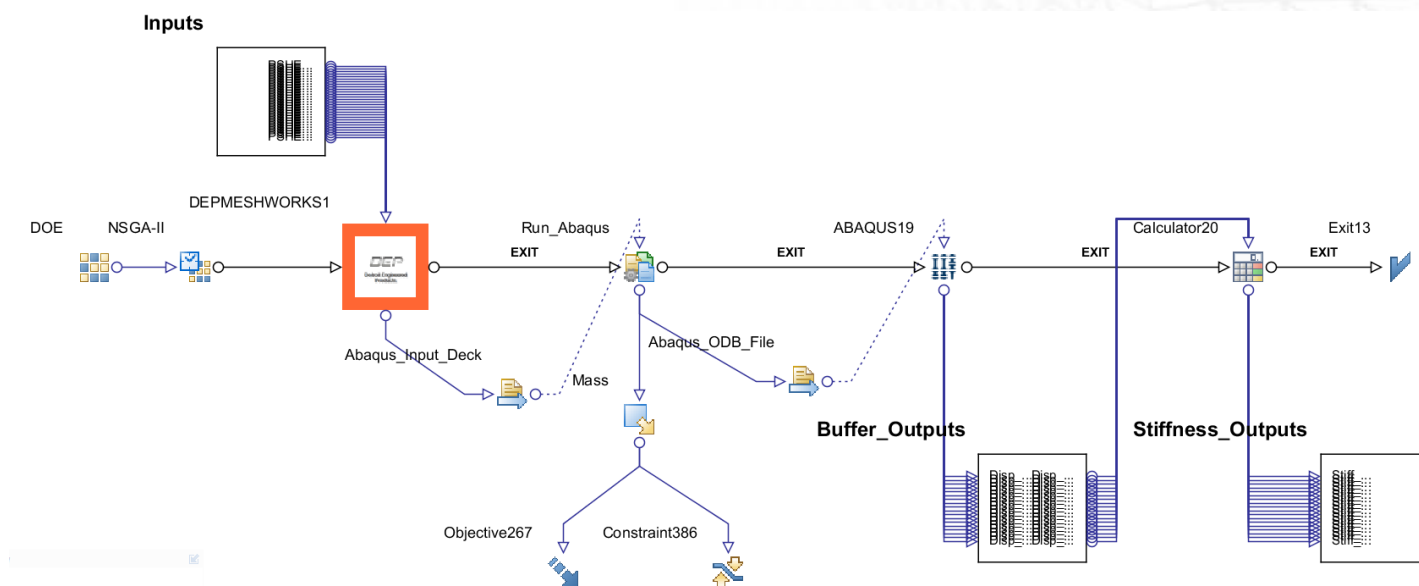
Model	Description	Min(mq)	Min(right) displacement	Min(left) displacement	Min(right) displacement	Min(left) displacement	1 (Front Y) displacement	1 (Front Y) displacement	Min(right) stiffness(N/mm)	Mass(KG)	Mass Saving Kg/Mass Saving %	Filtered in %	Min(right) Z displacement	Min(right) Z displacement	Min(right) stiffness(N/mm)
Base Line	Base Line	3000	2.87586	-2.87586	0.87527487	-0.87527487	842.45	1132.87	448073	264	0	0.0	0.560532	0.548043	448073
Design_1	Using member gauge 3.0mm	3000	2.825032	-2.825032	0.8742588	-0.880909	842.45	1132.87	448151.6552	267.2	-3.2	-1.2	0.560532	-0.5201542	448151.6552
Design_2		3000	3.768818	-3.768818	0.8781289	-0.8918841	842.45	1132.87	342028.8488	282.3	-11.7	4.4	0.560532	-0.510904	342028.8488
Design_3		3000	3.278578	-3.278578	0.8802489	-0.917344	842.45	1132.87	389190.4884	278.9	-4.7	7.8	0.560532	-0.510904	389190.4884
Design_4		3000	3.115888	-3.115888	0.8810444	-0.8919778	842.45	1132.87	413852.2843	268.2	-4.4	1.7	0.560532	-0.510904	413852.2843
Design_5		3000	3.897368	-3.897368	0.8784744	-0.8810444	842.45	1132.87	409854.8884	284.7	-6.7	6.3	0.560532	-0.510904	409854.8884
Design_6		3000	3.897368	-3.897368	0.8784744	-0.8810444	842.45	1132.87	417087.158	278.9	-4.7	1.9	0.560532	-0.510904	417087.158
Design_7		3000	3.117333	-3.117333	0.8809088	-0.8809088	842.45	1132.87	413328.7372	268.2	-4.4	2.0	0.560532	-0.510904	413328.7372
Design_8		3000	3.884444	-3.884444	0.8808088	-0.8808088	842.45	1132.87	408888.4884	282.3	-11.7	6.6	0.560532	-0.510904	408888.4884
Design_9		3000	3.129022	-3.129022	0.8810444	-0.8810444	842.45	1132.87	428848.8884	268.2	-4.4	2.9	0.560532	-0.510904	428848.8884
Design_10		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	417847.7884	284.7	-6.7	3.3	0.560532	-0.510904	417847.7884
Design_11		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_12		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_13		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_14		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_15		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_16		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_17		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_18		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_19		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_20		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_21		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_22		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_23		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_24		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_25		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_26		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_27		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_28		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_29		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_30		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_31		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_32		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_33		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_34		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_35		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_36		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_37		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_38		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_39		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188
Design_40		3000	3.877884	-3.877884	0.8810444	-0.8810444	842.45	1132.87	428777.7188	268.2	-4.4	3.0	0.560532	-0.510904	428777.7188

Name		Base Line	Optimized Design	Base Line Vs Optimal Design difference	% Change W.R.T Base line model	Opt value
Chassis frame stiffness	Bending Stiffness (N/mm)	5407	6569	1162	17.68	≥5600
	Torsional Stiffness (Nm/rad)	448073	450054	1981	0.44	≥450000
	weight(Kg)	264	258.1	5.9	2.28	Mass reduction

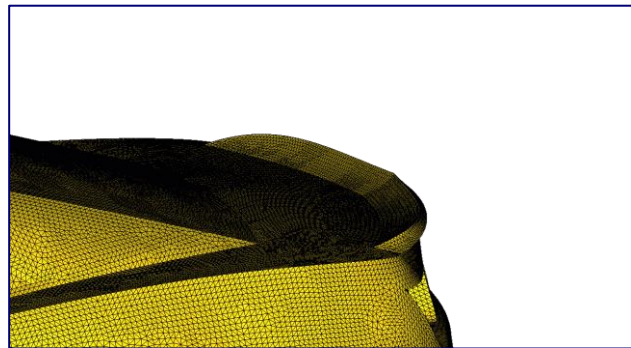
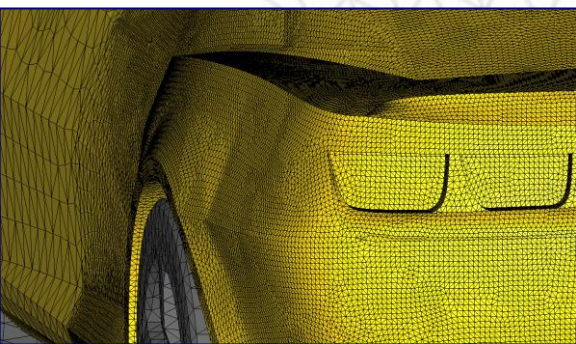
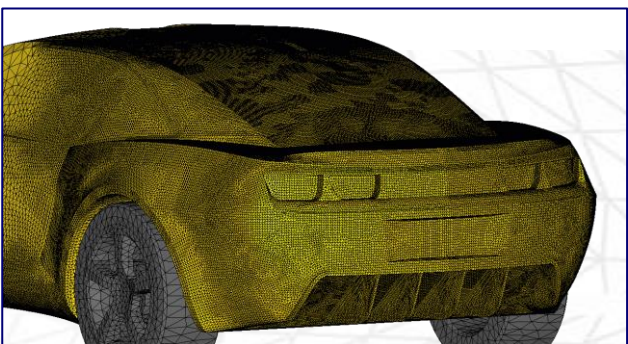
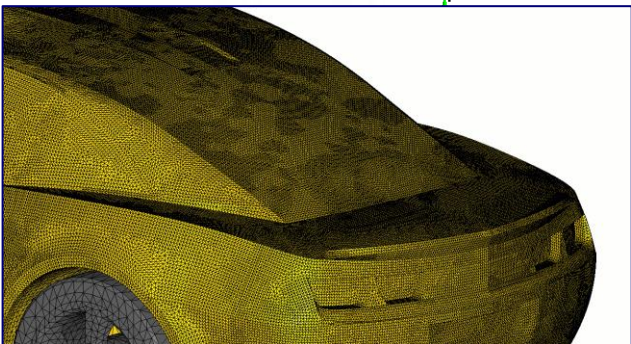
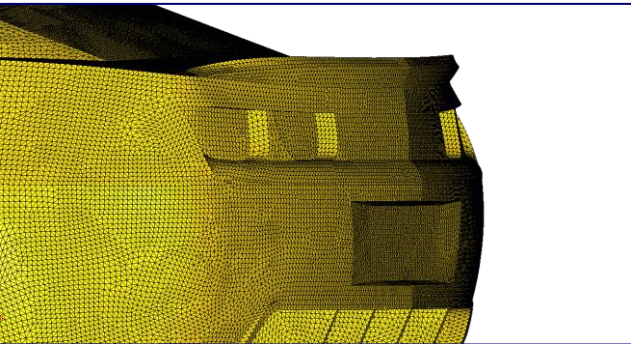
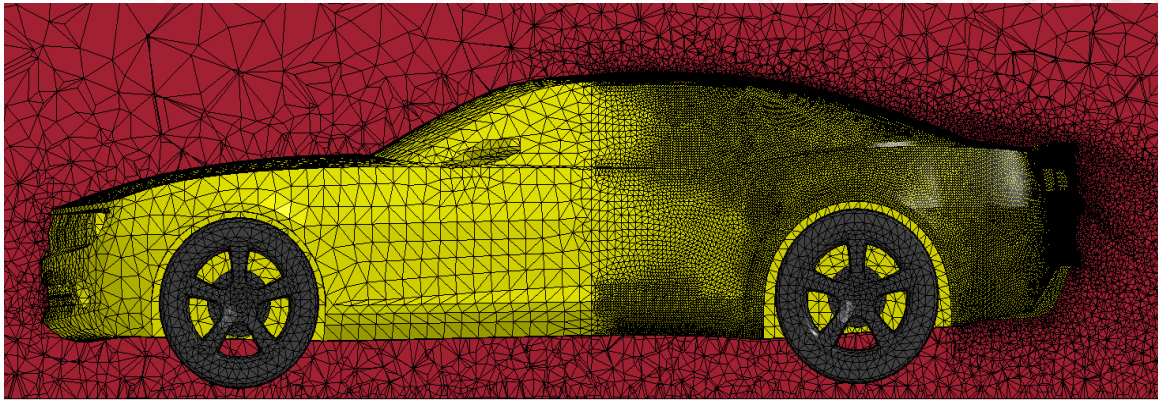
网格参数化—案例：副车架优化



8% Mass Reduction



雪佛兰科迈罗—阻力系数DOE优化




```

graph TD
    DV[Design Variables & Limits] --> MO[Isight/LS-OPT/Optimus ModeFrontier]
    OC[Objectives Constraints] --> MO
    MO --> RS[Response Surface]
    MO --> DOE[DOE Matrix]
    RS --> Opt[Optimized design]
    DOE --> MW[MESHWORKS Parameterization models]
    B1[Baseline - Durab] --> MW
    B2[Baseline - NVH] --> MW
    B3[Baseline - Crash] --> MW
    B4[Baseline - CFD] --> MW
    MW --> Durab[Durab.  
Design1  
Design2  
Design3  
:  
:  
Design 'n']
    MW --> NVH[NVH  
Design1  
Design2  
Design3  
:  
:  
Design 'n']
    MW --> CFD[CFD  
Design1  
Design2  
Design3  
:  
:  
Design 'n']
    Durab --> DS[Durab Solver]
    NVH --> NS[NVH Solver]
    CFD --> CS[CFD Solver]
    DS --> IOM[Input-Output matrix]
    NS --> IOM
    CS --> IOM
    IOM --> MO
  
```

