



MeshFree-免網格分析軟體

主題:工具機領域分析教學

台灣邁達斯
翁嘉駿

jim.weng@midasuser.com.tw

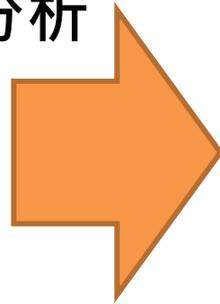
NFX CAE/CFD中高階分析軟體

midas **NFX**



midas NFX 2019

1. 線性結構
2. 模態分析
3. 非線性分析
4. (穩態/瞬態)熱傳&熱應力分析
5. 線性動態分析(時域/頻域)
6. 非線性動態分析
7. 電熱耦合分析
8. 多體動力學分析
9. 最佳化設計(拓樸/尺寸)
10. CFD分析-自然/強制對流
11. CFD分析-網格變形&重疊
12. CFD分析-高階項目

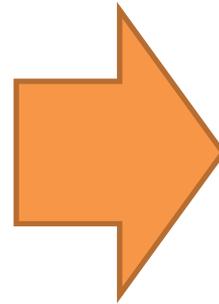


研發人員
CAE工程師
CFD工程師

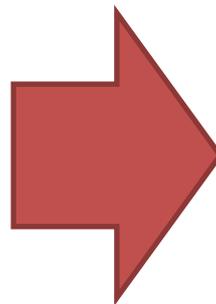
midas **NFX**



1. 線性結構
2. 模態分析
3. 熱傳&熱應力分析
4. 拓樸最佳化設計
5. 線性動態
6. 瞬態結構&熱分析



**機構/設計/繪圖
工程師**



**研發人員
CAE工程師
CFD工程師**

專業分析人員的小棉羊-代步工具



 midas MeshFree

MeshFree標準版

- 1. 靜剛性分析
- 2. 模態分析
- 3. 熱傳&熱應力分析
- 4. 拓樸最佳化設計
- 5. 動剛性分析
- 6. 瞬態結構&熱分析

MeshFree進階版

 midas NFX 2019

- 1. 靜剛性分析
- 2. 模態分析
- 3. 熱傳&熱應力分析
- 4. 拓樸最佳化設計
- 5. 動剛性分析
- 6. 瞬態熱傳&熱應力分析
- 7. 非線性接觸分析
- 8. 複合材料分析



MeshFree-免網格分析軟體

免網格分析軟體的優點

台灣邁達斯
翁嘉駿

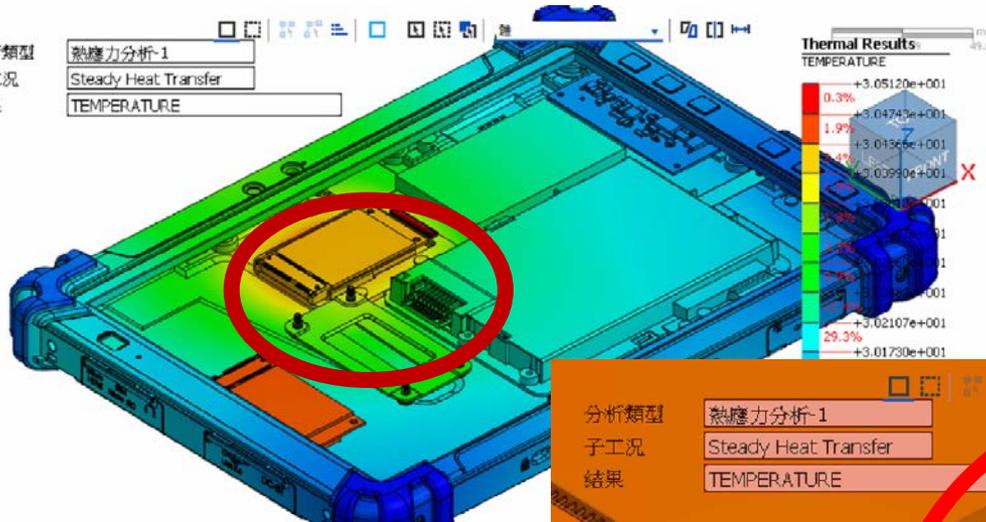
jim.weng@midasuser.com.tw

工業平板電腦分析-免網格

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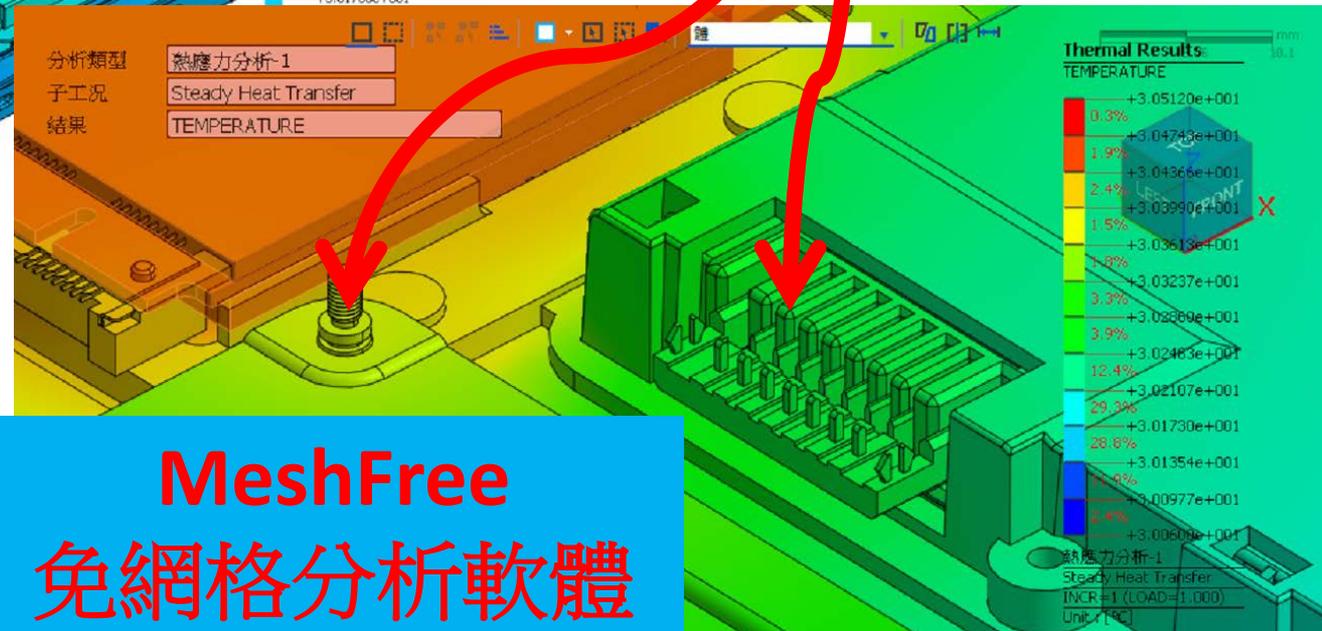
分析類型
子工况
結果

熱應力分析-1
Steady Heat Transfer
TEMPERATURE



幾何細小特徵

- 1.免修模
- 2.免網格



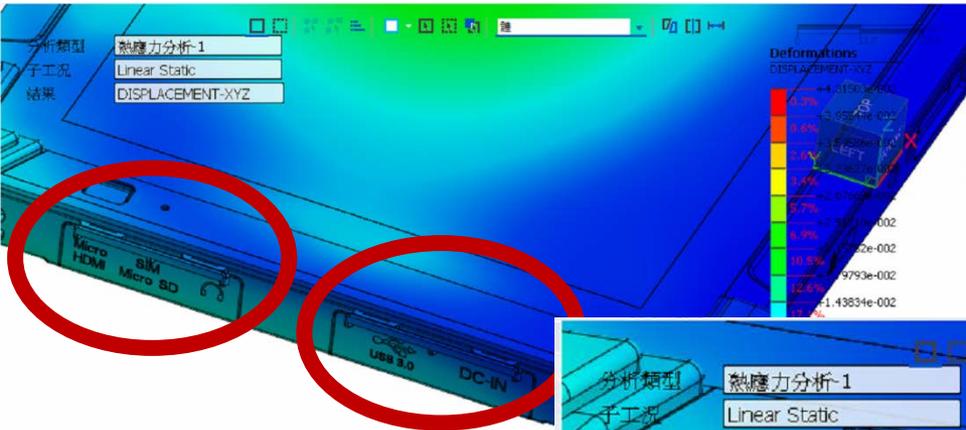
MeshFree
免網格分析軟體

工業平板電腦分析-免網格

MIDAS
MESH FREE

浮水印

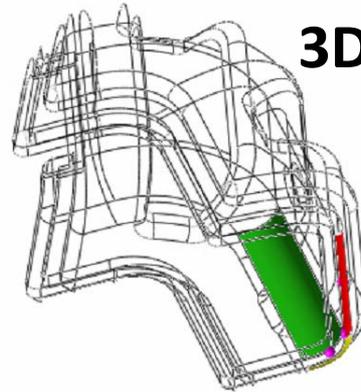
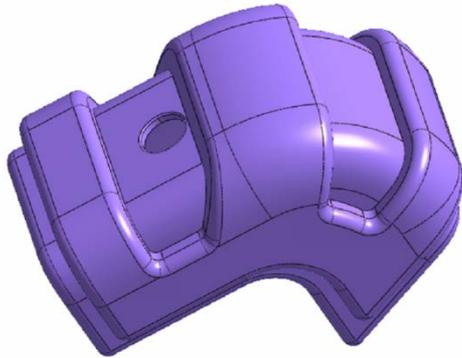
- 1.免修模
- 2.免網格



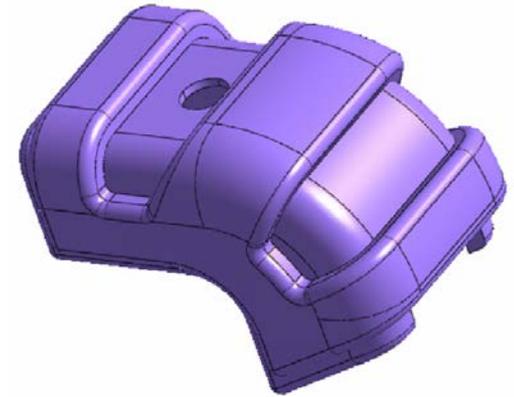
MeshFree
免網格分析軟體

工業平板電腦防撞橡膠

MIDAS
MESH FREE



3D模型-清理後

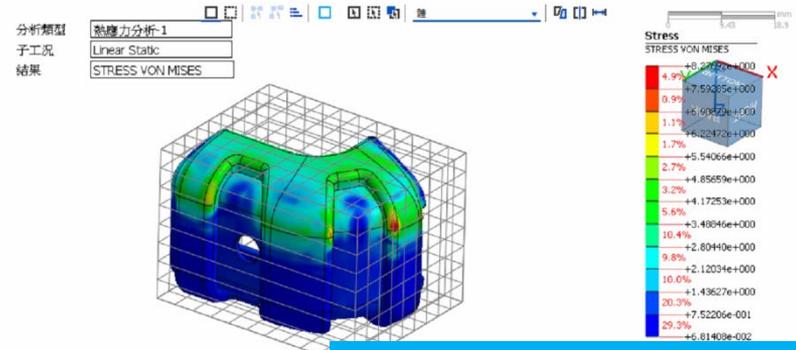


有限元素模型



G:1 N:24,711 E:113,982

節點/元素數量



MeshFree
免網格分析軟體

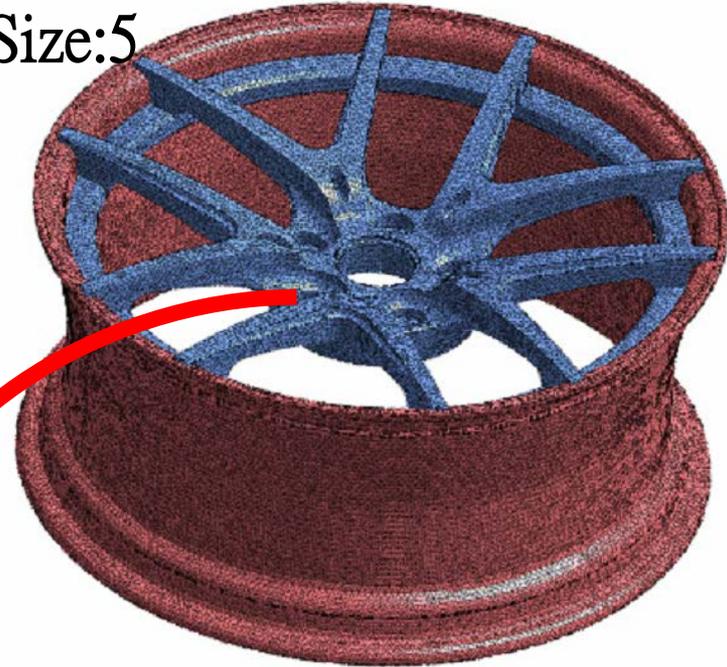
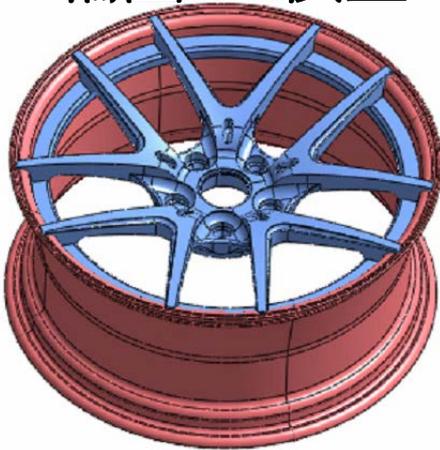
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輪圈-有限元素模型



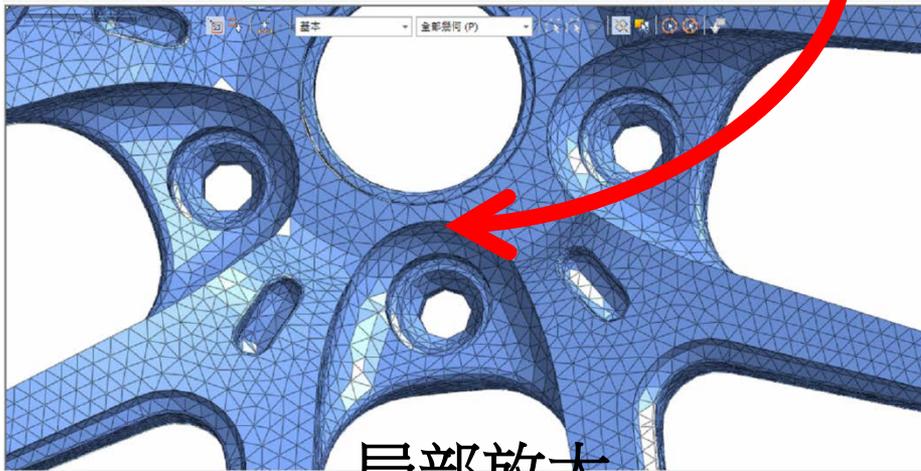
Element Size:5

輪圈-3D模型



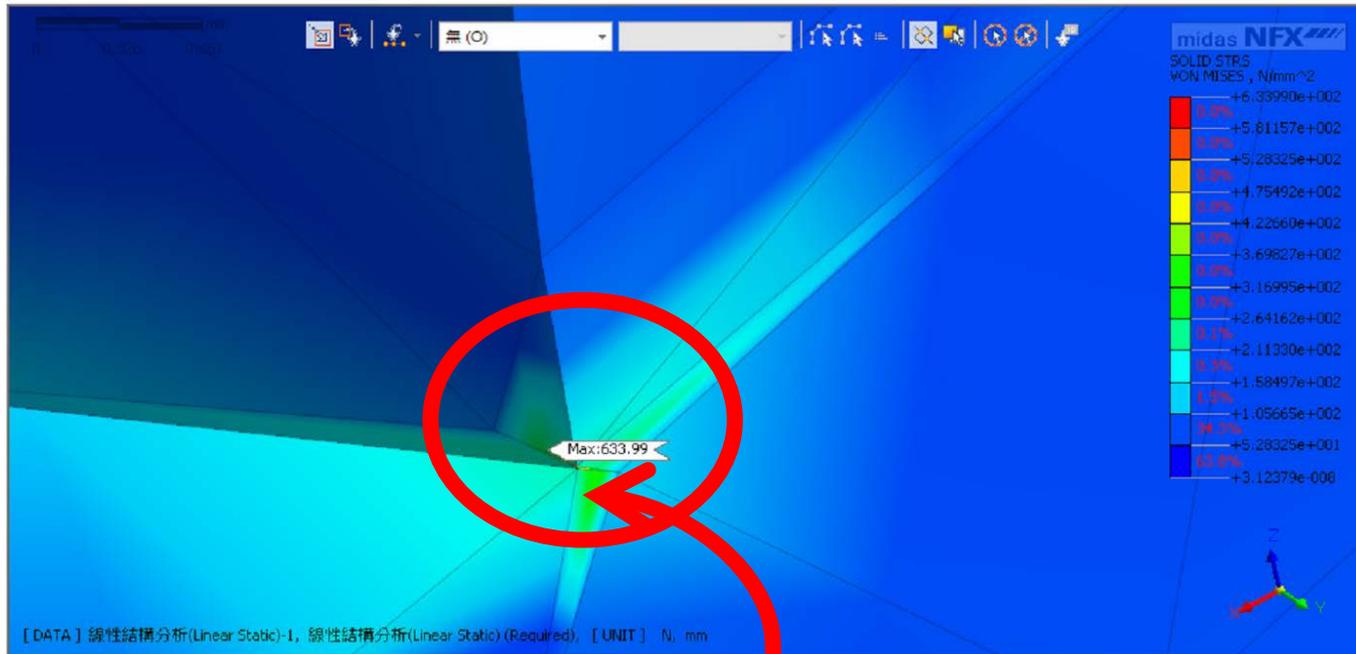
節點/元素數量

G:2 N:626,397 E:369,404



局部放大

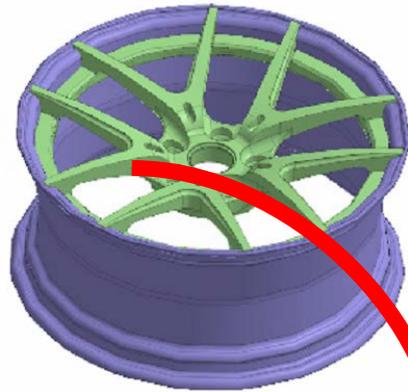
網格品質對於分析結果影響



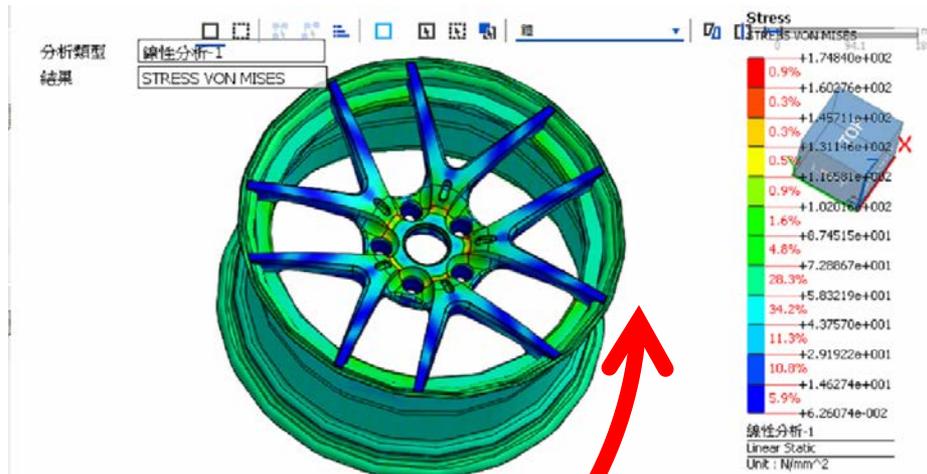
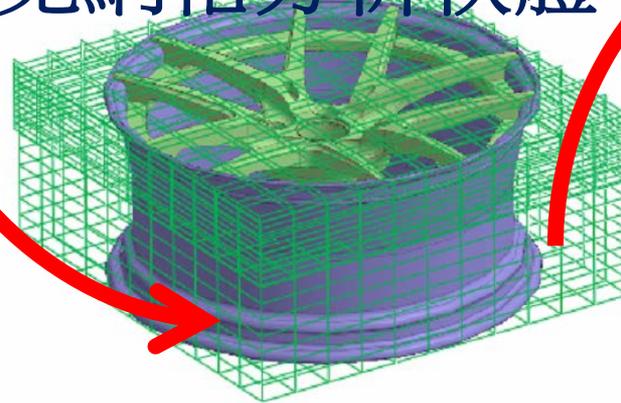
網格品質較差區域

- 1.應力計算容易出錯
- 2.容易告成分析無法收斂

3D模型直接求解



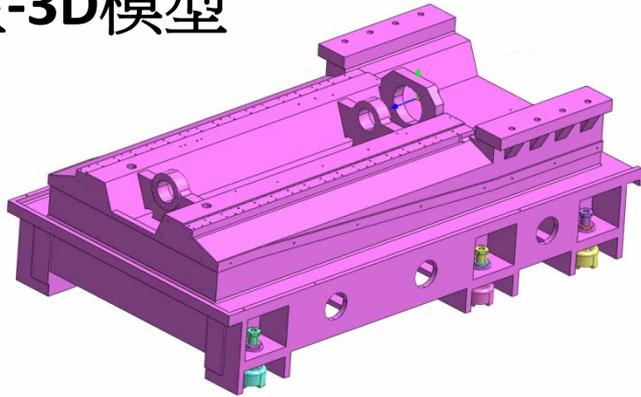
MeshFree 免網格分析軟體



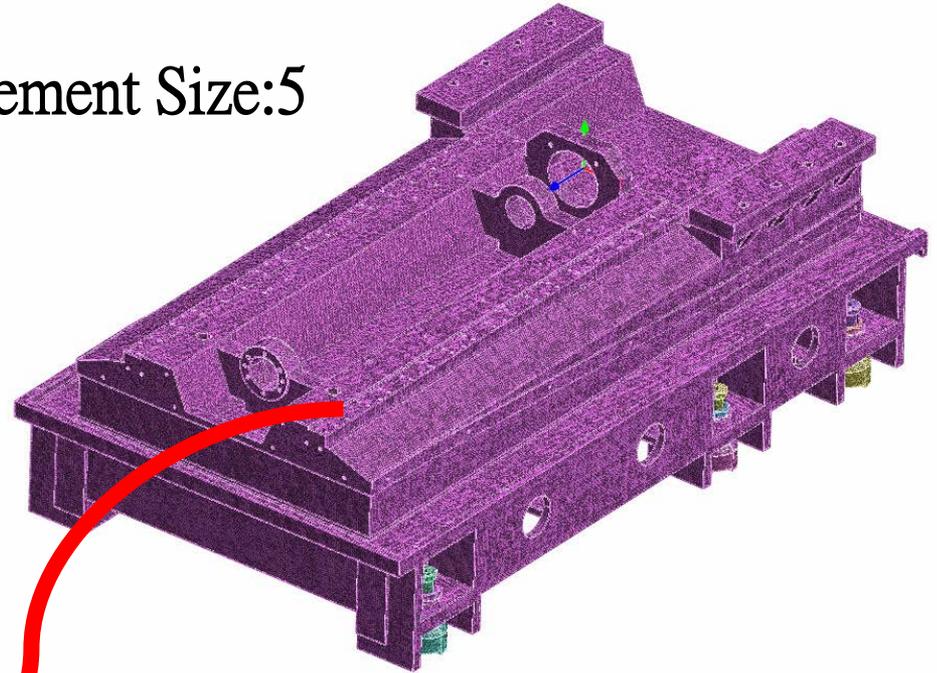
底座-有限元素模型(未清理幾何)



底座-3D模型

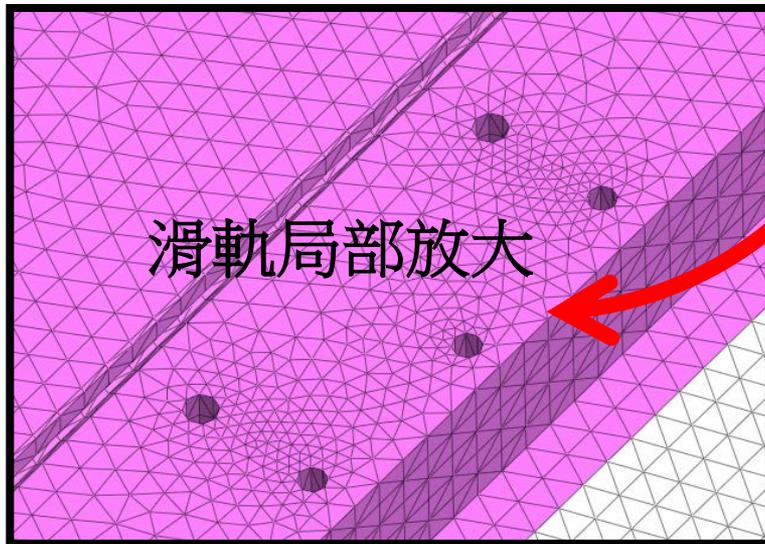


Element Size:5



節點/元素數量

G:19 N:1,196,627 E:5,818,011

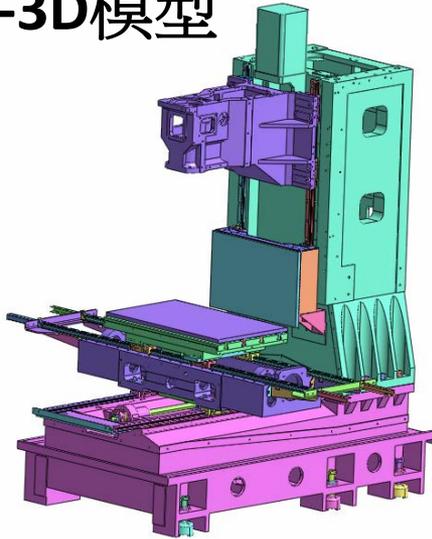


滑軌局部放大

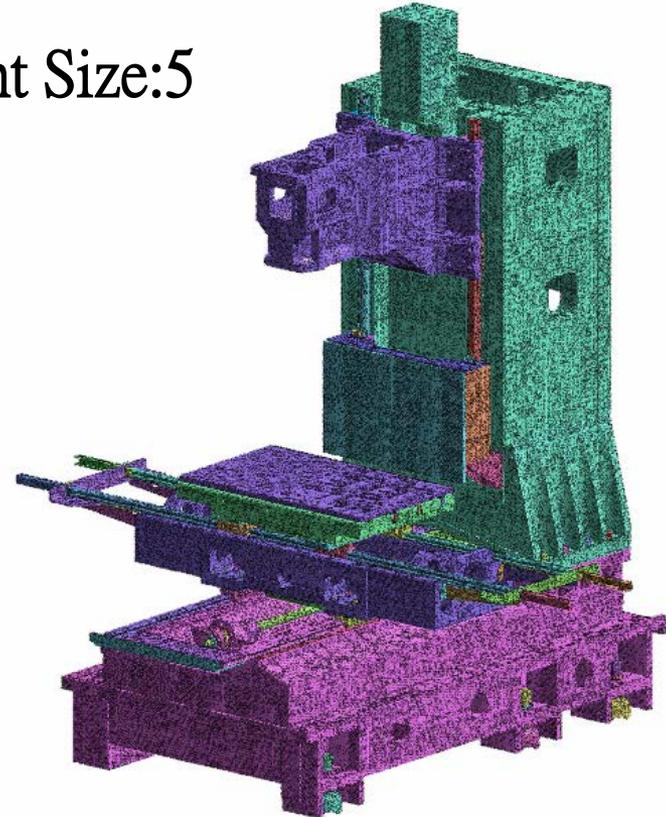
整機-有限元素模型(未清理幾何)



整機-3D模型



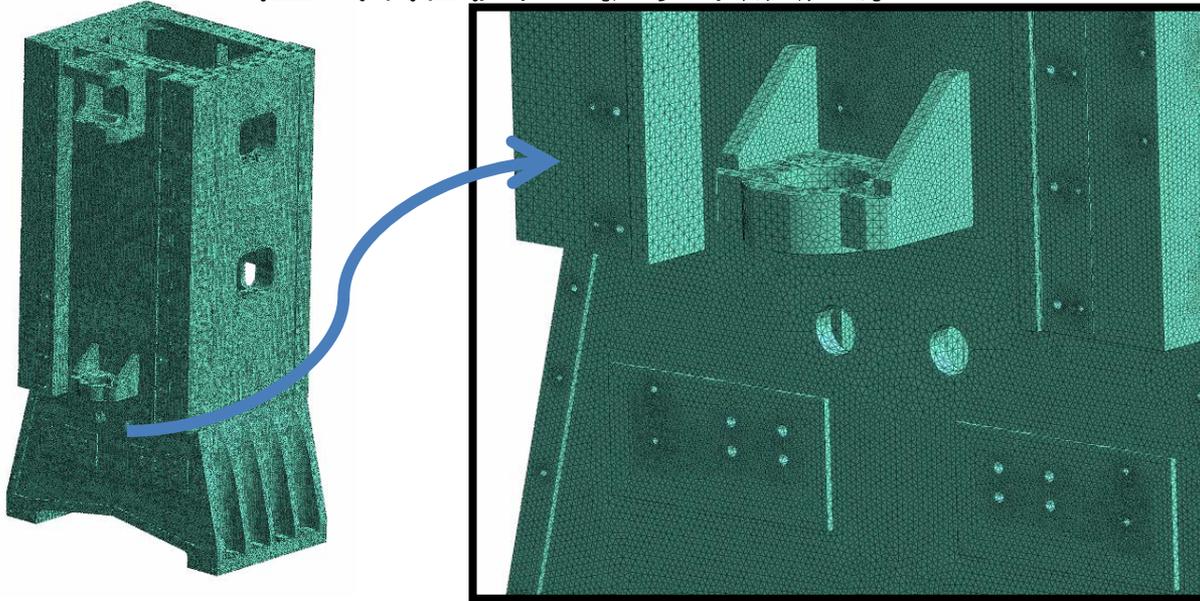
Element Size:5



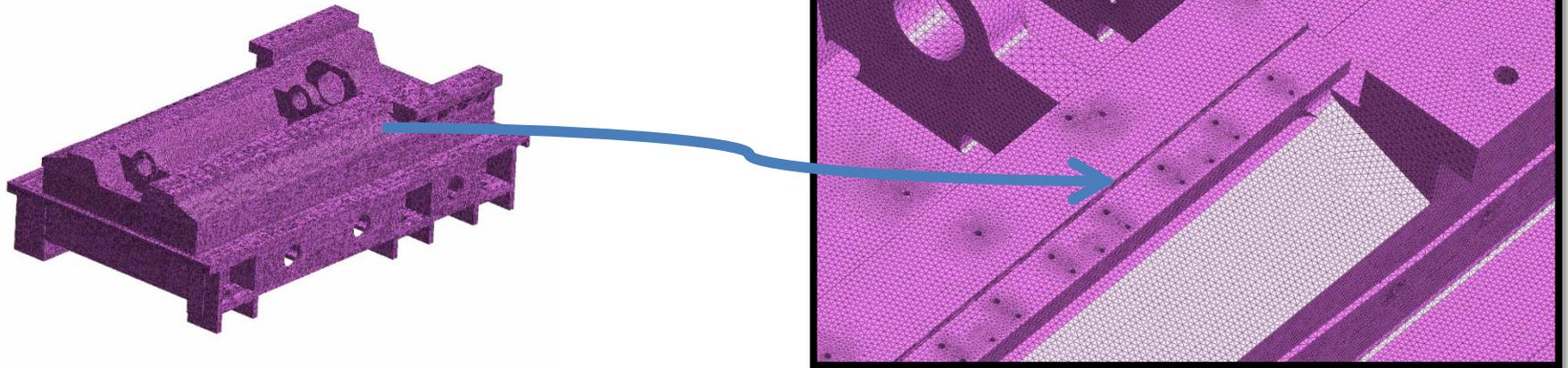
節點/元素數量

G:299 N:24,132,599 E:16,043,669

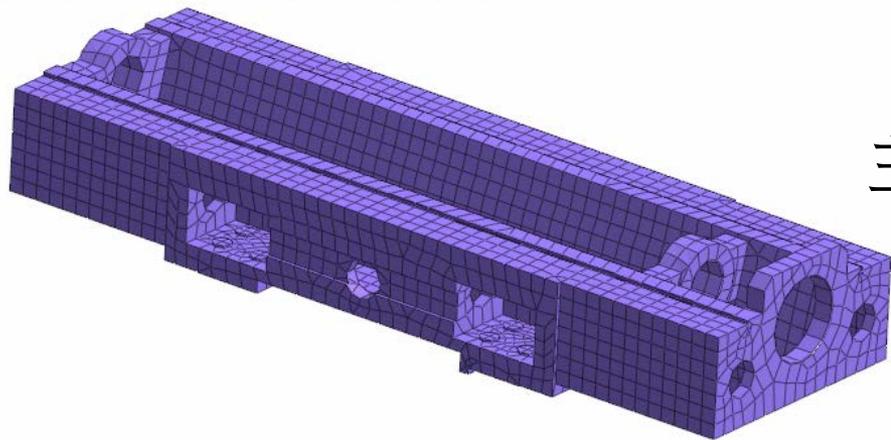
立柱-網格模型(局部放大)



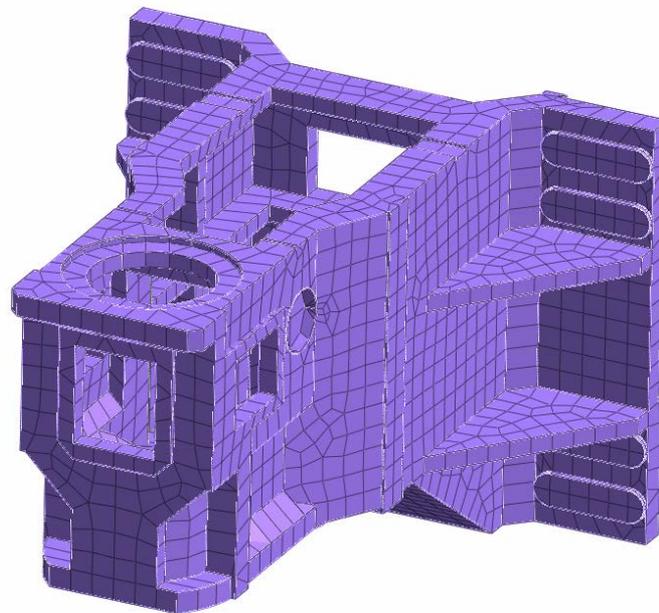
底座-網格模型(局部放大)



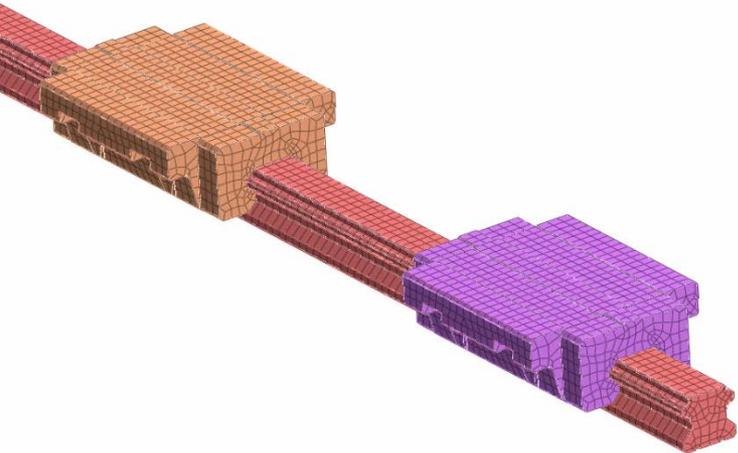
夾具台-混合網格(六面體+五面體)



主軸頭-混合網格(六面體+五面體)



滑軌-混合網格(六面體+五面體)

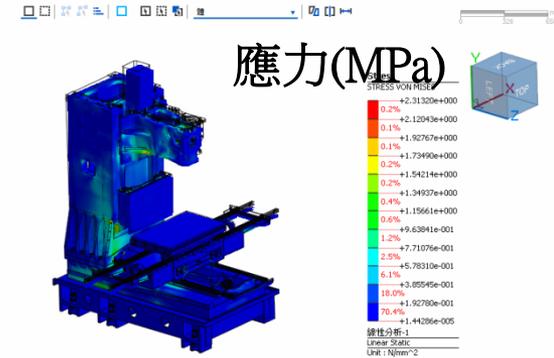


3D模型直接求解

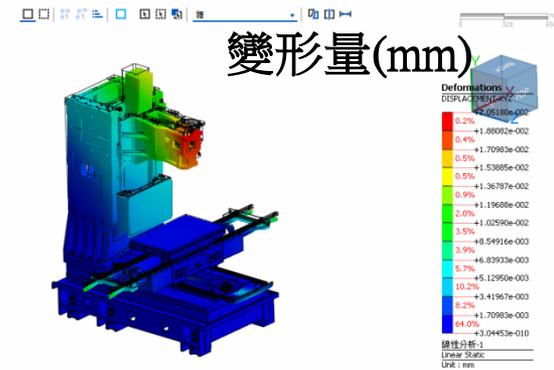
- 1.免修模
- 2.免網格

MeshFree
免網格分析軟體

分析類型 線性分析-1
結果 STRESS VON MISES



分析1
ACEMENT-XYZ





MeshFree-免網格分析軟體

操作範例

台灣邁達斯
翁嘉駿

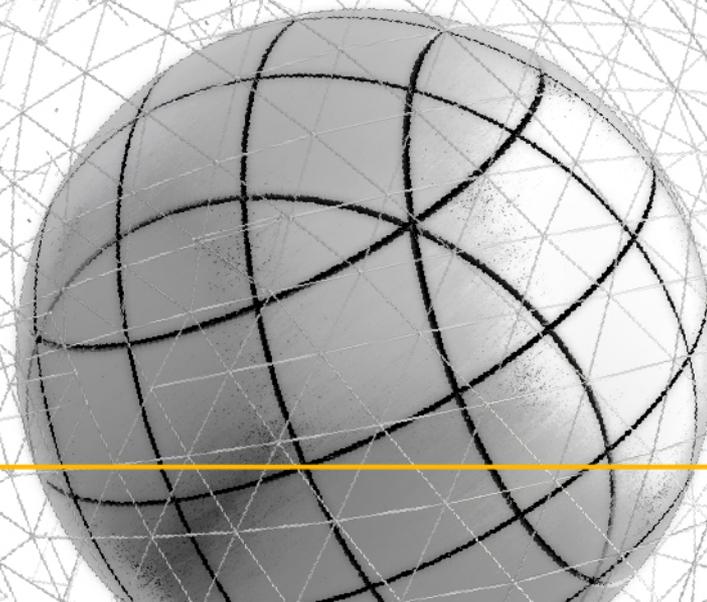
jim.weng@midasuser.com.tw





線性結構_底座結構強度分析

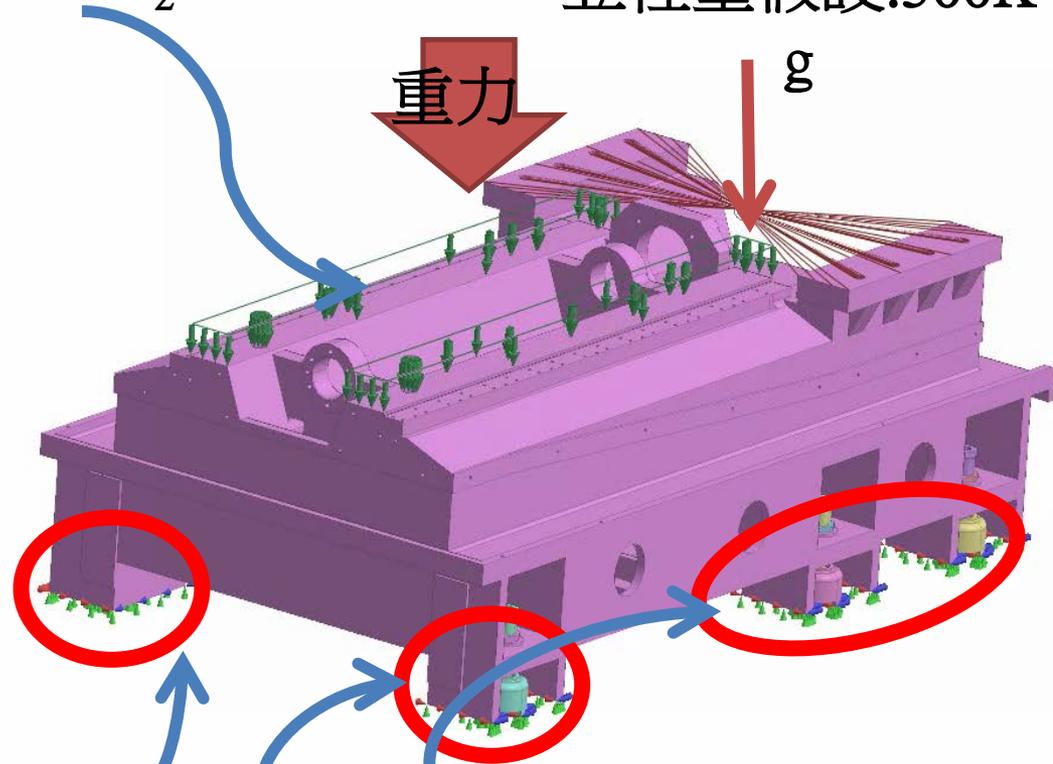
Simple, but Everything.





滑軌均壓: 20 Nt/mm^2

立柱重假設: 500K



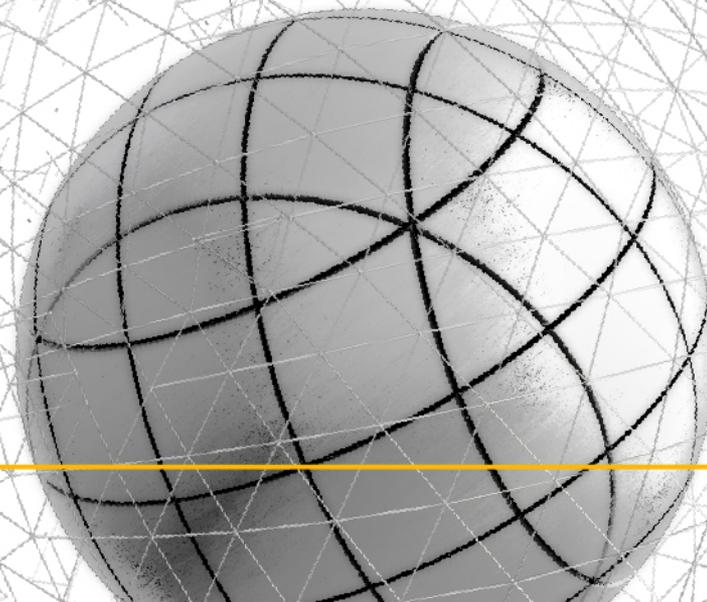
固定X,Y,Z

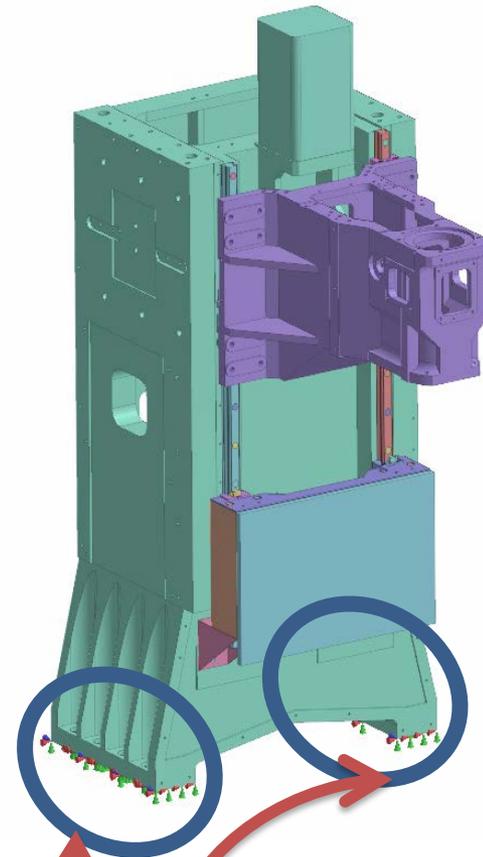
材料: Alloy Steel



模態分析_立柱模態分析

Simple, but Everything.





固定X,Y,Z

材料: Alloy Steel



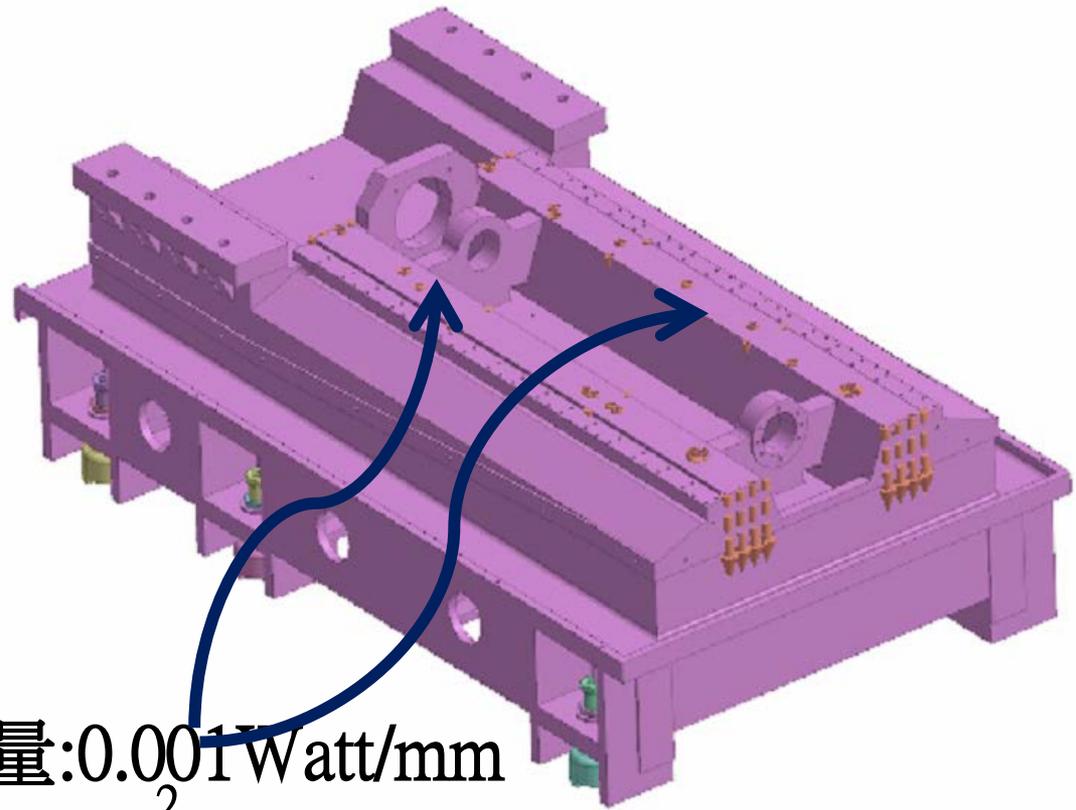
熱_底座熱分析

Simple, but Everything.





初始溫度: 25 °C
 環境(工作)溫度: 28 °C
 空氣熱對流係數: 1×10^{-5} (W/mm² °C)



熱通量: $0.001 \frac{\text{Watt}}{\text{mm}^2}$

材料: Alloy Steel

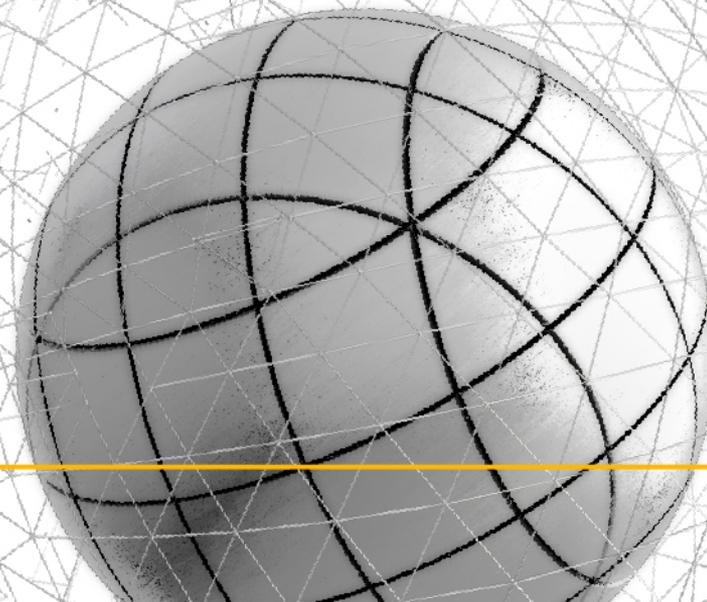


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熱應力_底座熱變形分析

Simple, but Everything.



分析類型

名稱 熱應力分析-1

分析類型

標準



進階



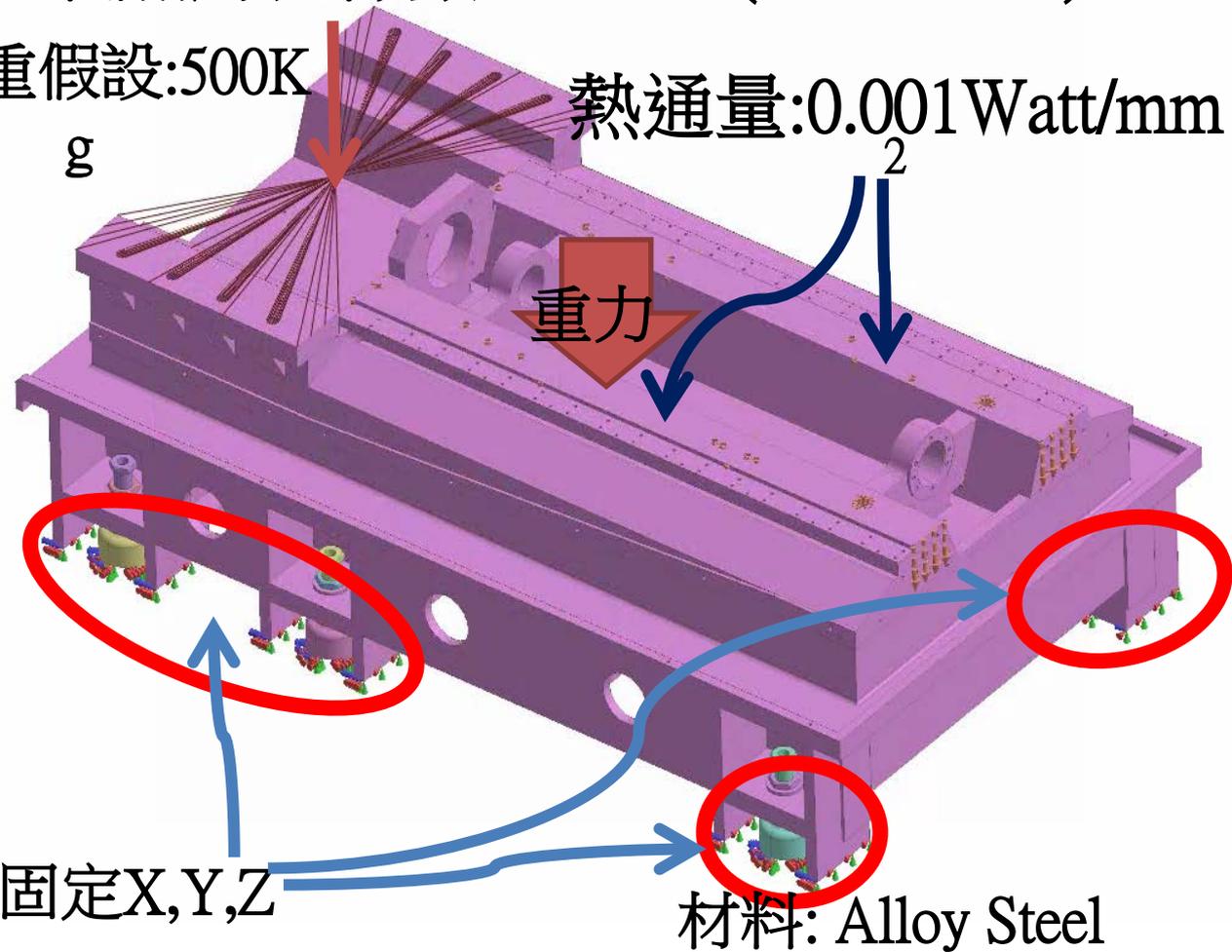
初始溫度:25 °C

環境(工作)溫度:28°C

空氣熱對流係數: 1×10^{-5} (W/mm² °C)

立柱重假設:500K

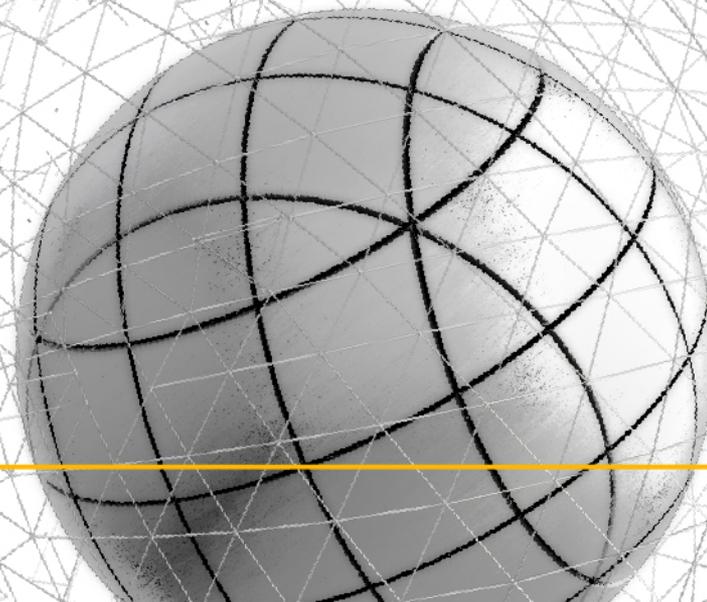
熱通量:0.001Watt/mm²





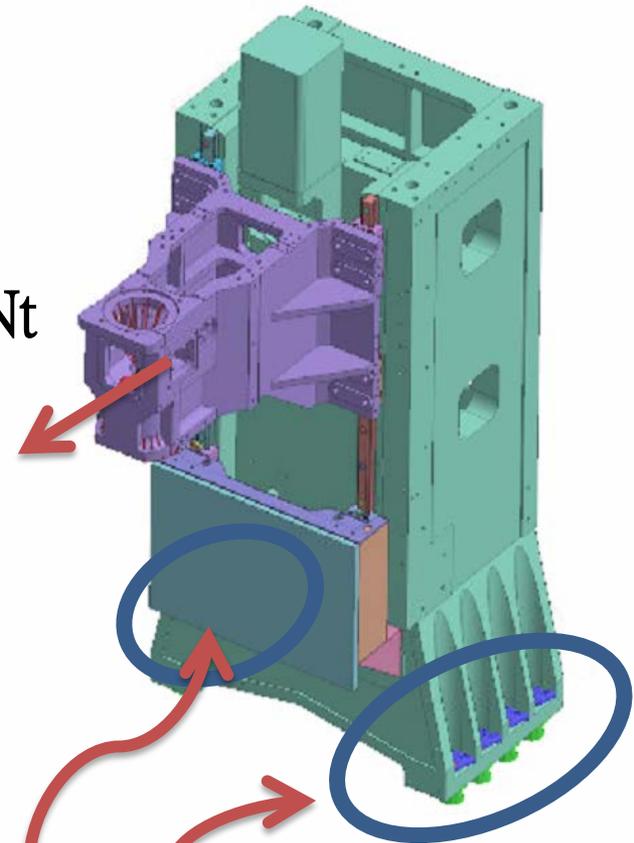
預力模態_立柱預力模態分析

Simple, but Everything.





$F=5000Nt$



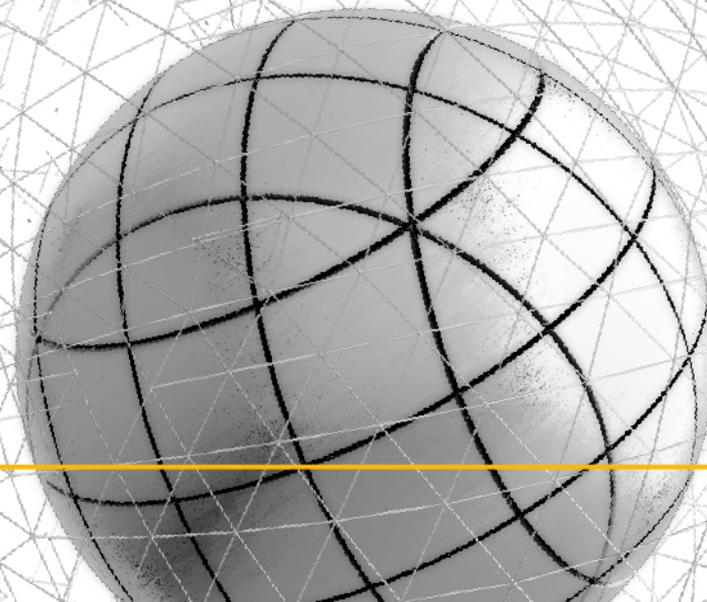
固定X,Y,Z

材料: Alloy Steel



拓樸_底座剛度拓樸改善設計

Simple, but Everything.



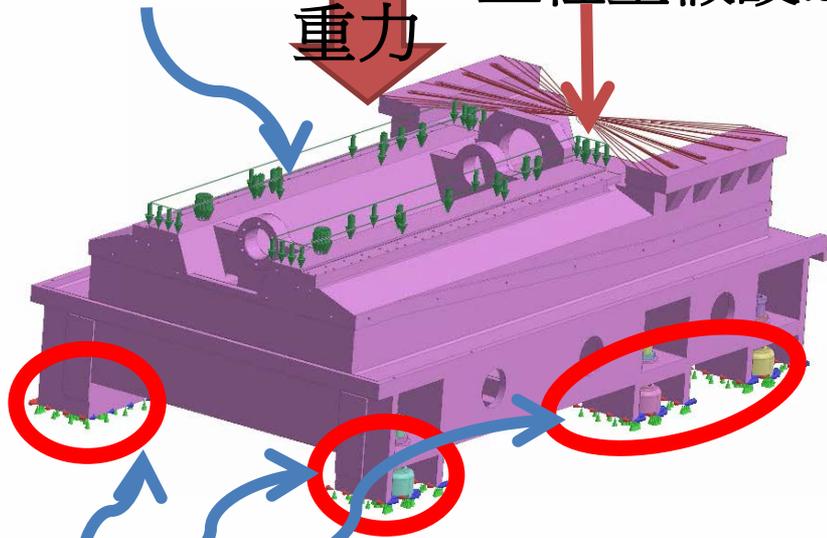
基座組件-靜剛度拓樸改善設計

MIDAS
MESH FREE

滑軌均壓: 20 Nt/mm^2

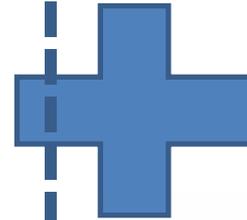
立柱重假設: 500 Kg

重力

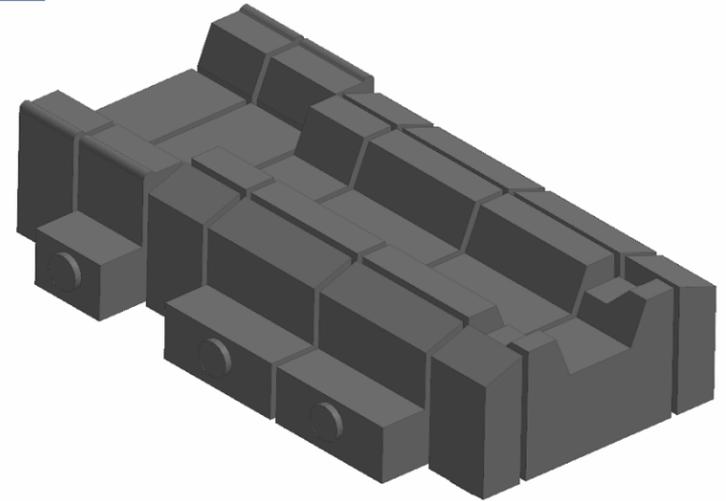


固定X,Y,Z

非設計區域



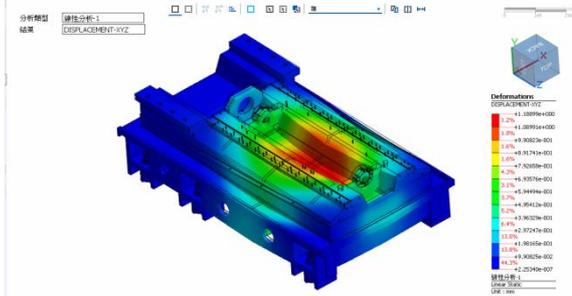
設計區域



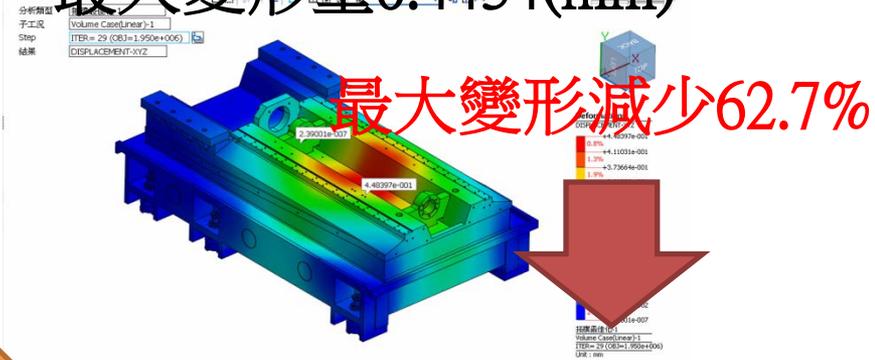
基座組件-靜剛度拓樸改善設計



最大變形量1.189(mm)

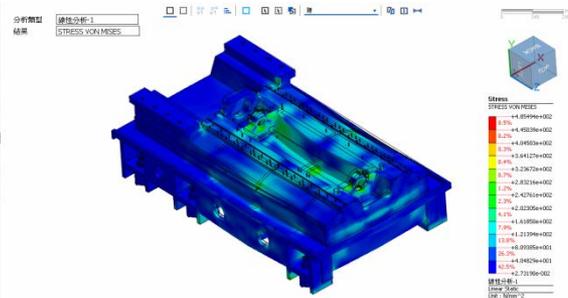


最大變形量0.4434(mm)

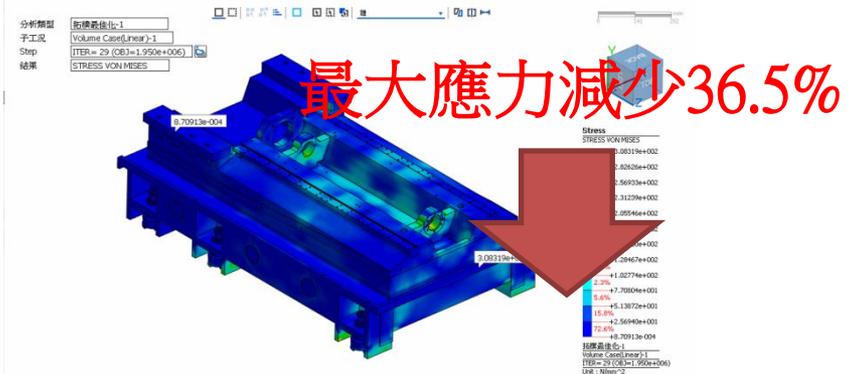


拓樸設計

最大應力485.5(MPa)

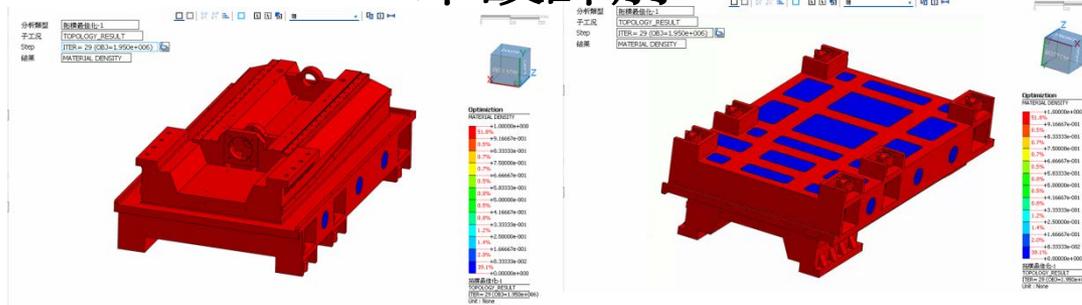


最大應力308.3(MPa)



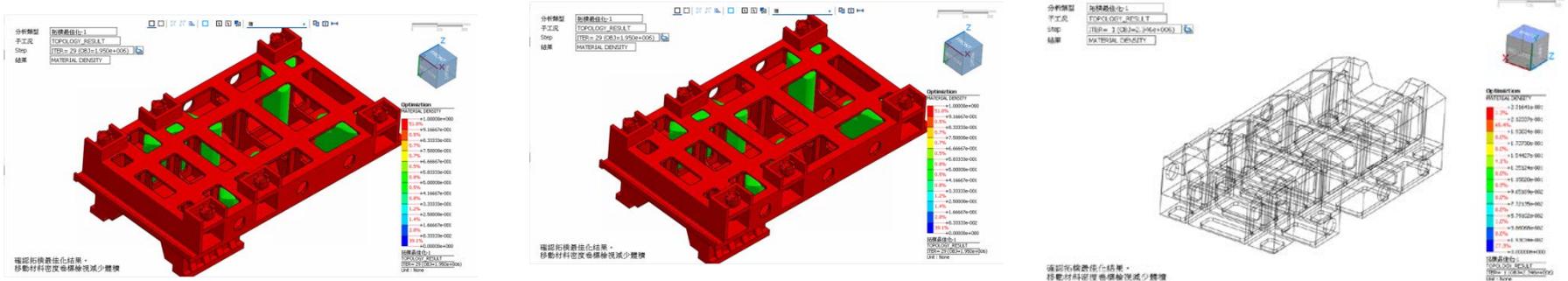
基座組件-靜剛度拓樸改善設計

未設計前



設計區:可變更的範圍

拓樸設計建議

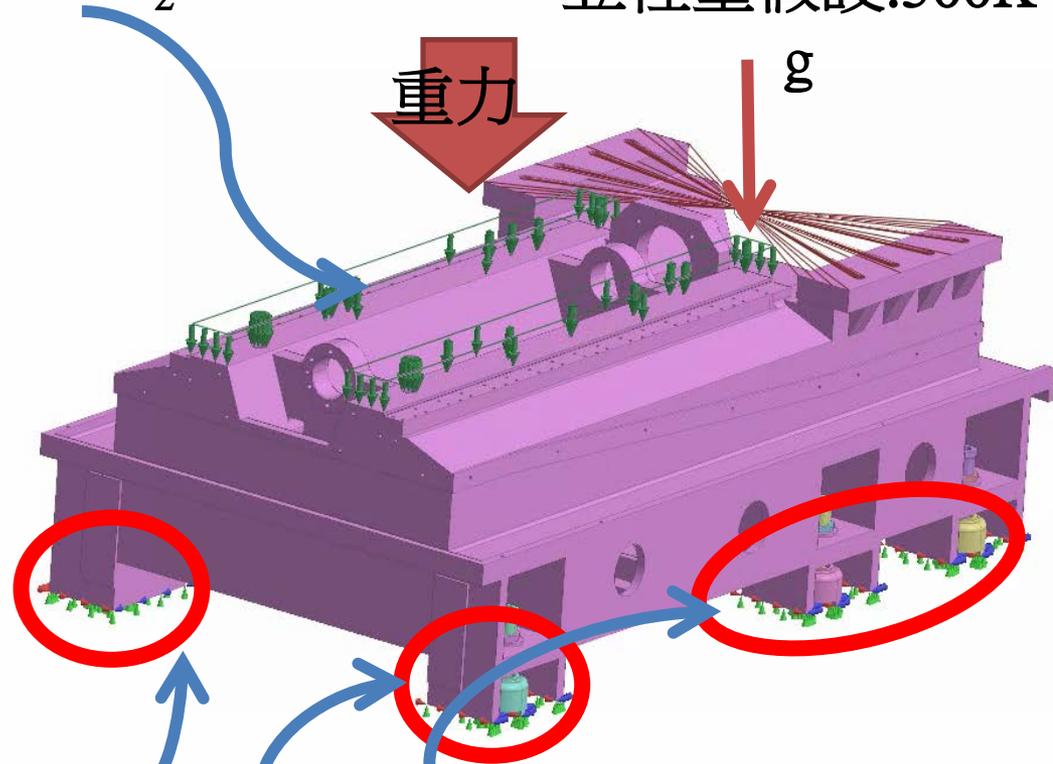


設計區域-材料分佈建議



滑軌均壓: 20 Nt/mm^2

立柱重假設: 500K



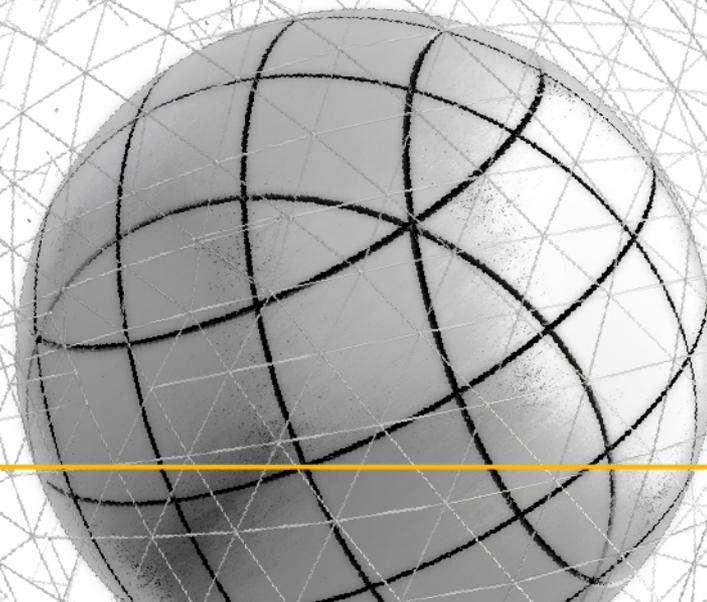
固定X,Y,Z

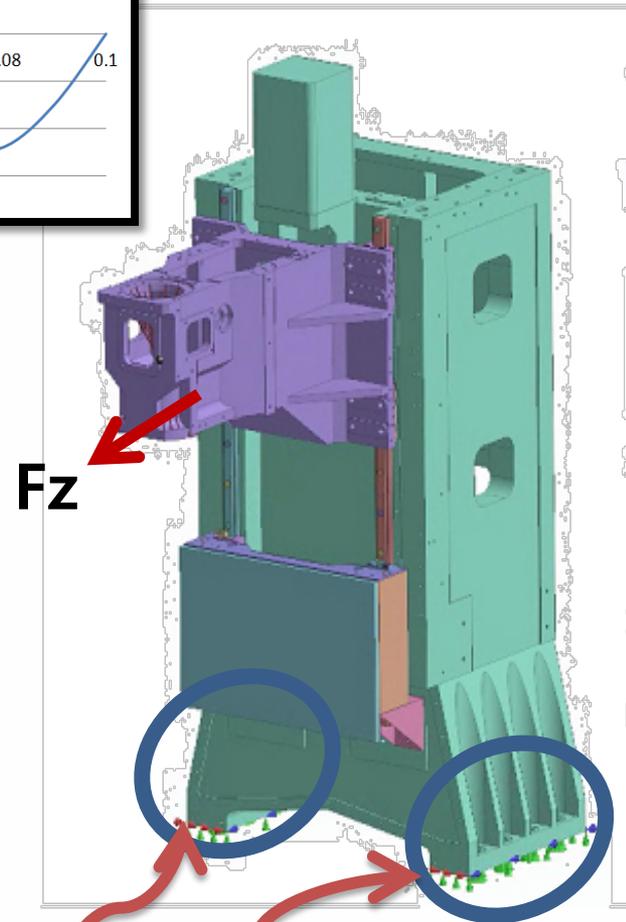
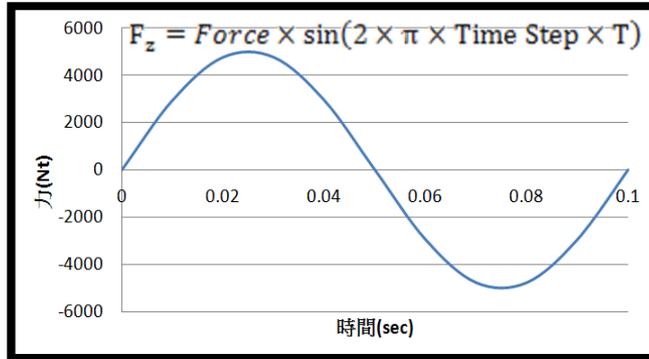
材料: Alloy Steel



瞬態響應_立柱瞬態結構分析

Simple, but Everything.





瞬態響應-模態法

固定X,Y,Z

材料: Alloy Steel

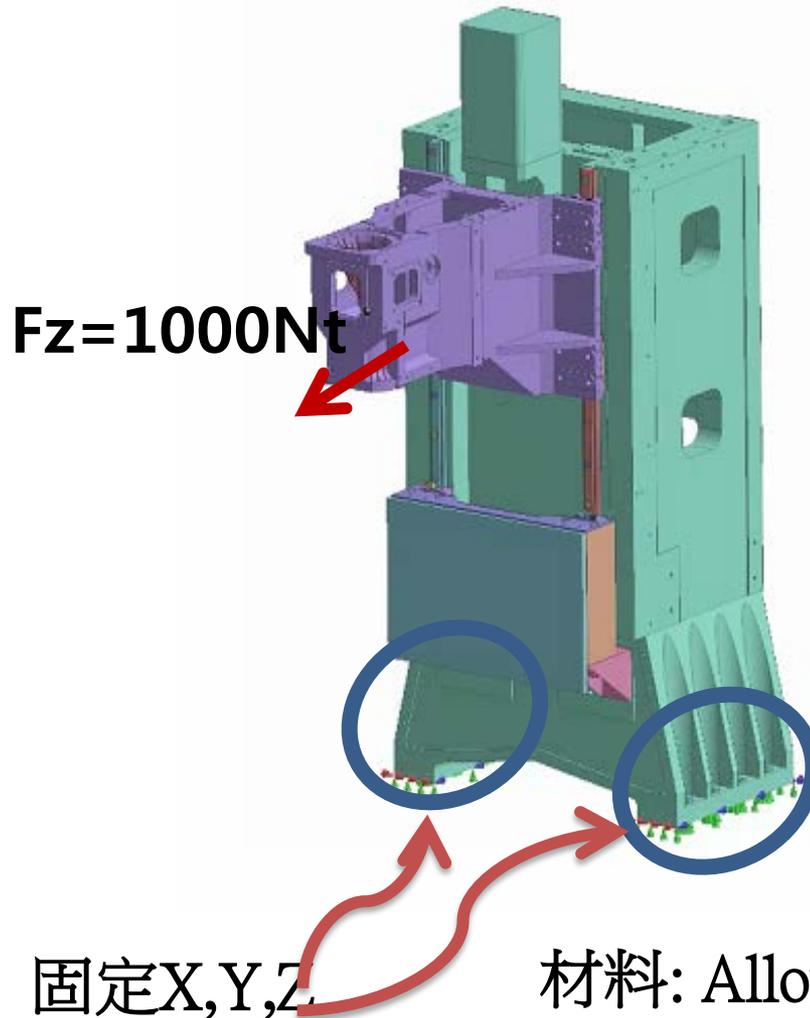


頻率響應_立柱動剛度分析

Simple, but Everything.



頻率響應-模態法



固定X,Y,Z

材料: Alloy Steel



分析類型: 頻率響應-模態法-1
Step: FREQ=2.0000e+003

分析結果數值查詢

顯示	位置	值
<input checked="" type="checkbox"/>	59.1, 987, 660	1.30502e-004
<input checked="" type="checkbox"/>	-79, 1.25e+003, 692	1.99533e-004
<input checked="" type="checkbox"/>	44.5, 1.22e+003, 650	1.60754e-004

分析步

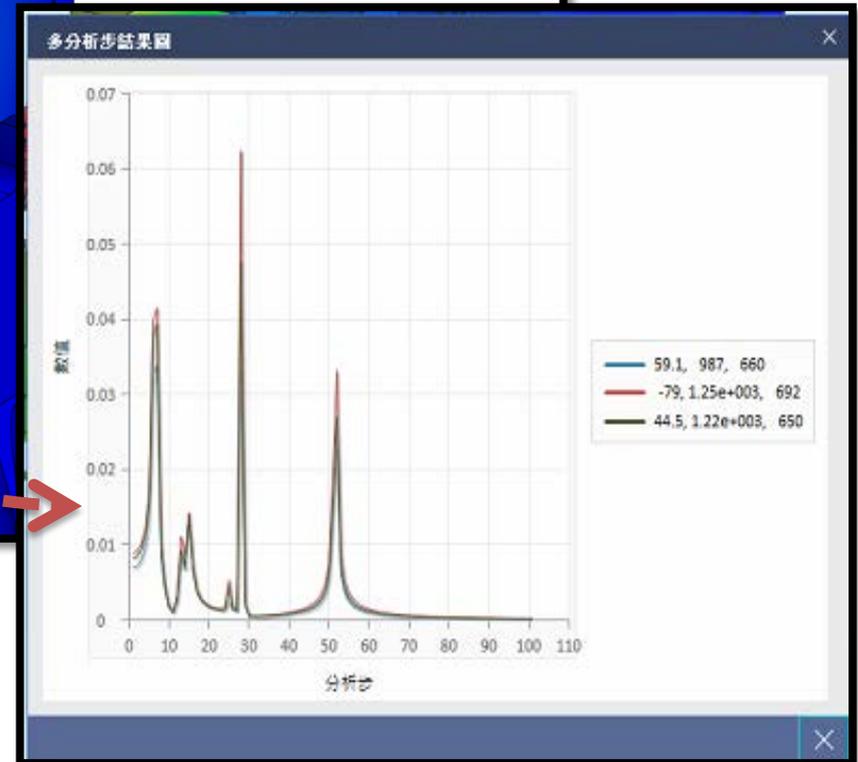
多分析步結果表

多分析步結果圖

分析步: 結果

- Modal Frequency Response : FREQ=0.0000e+000
- Modal Frequency Response : FREQ=2.0000e+001
- Modal Frequency Response : FREQ=4.0000e+001
- Modal Frequency Response : FREQ=6.0000e+001
- Modal Frequency Response : FREQ=8.0000e+001
- Modal Frequency Response : FREQ=1.0000e+002
- Modal Frequency Response : FREQ=1.2000e+002
- Modal Frequency Response : FREQ=1.4000e+002

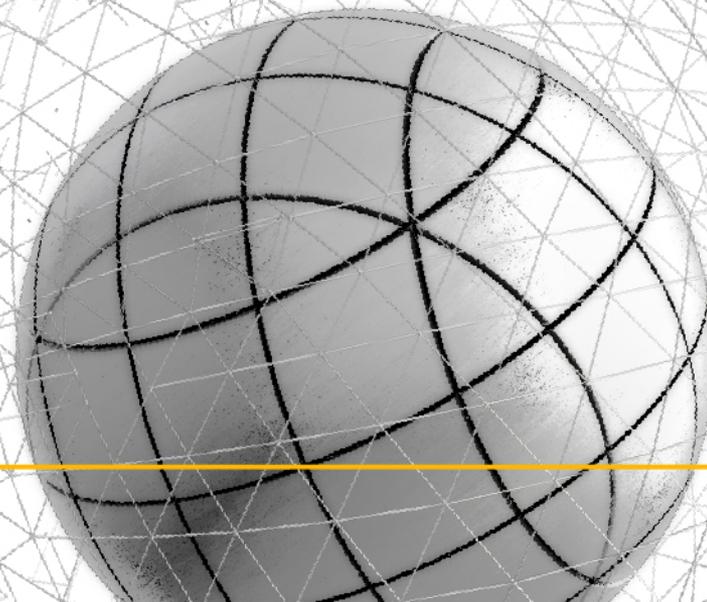
檢查選定點的數值。 \n 點擊該點檢查結果。





瞬態熱_工具機瞬態熱分析

Simple, but Everything.

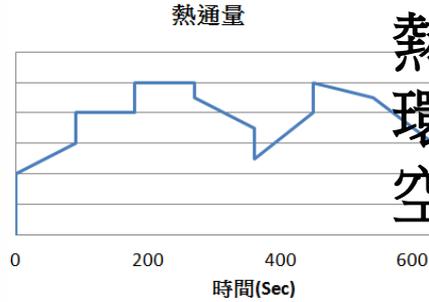
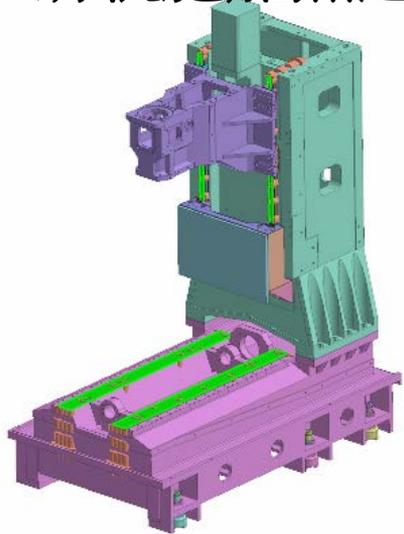


初始溫度:20 °C



時間(sec)	熱通量	環境溫度	熱源
0	0	21	0
0.0025	0.0004	21	0.00004
90	0.0006	23.2	0.00006
90.0025	0.0008	23.2	0.00008
180	0.0008	25.8	0.00008
180.0025	0.001	25.8	0.0001
270	0.001	28	0.0001
270.0025	0.0009	28	0.00009
360	0.0007	28.5	0.00007
360.0025	0.0005	28.5	0.00005
450	0.0008	29	0.00008
450.0025	0.001	29	0.0001
540	0.0009	27	0.00009
540.0025	0.0009	27	0.00009
630	0.0006	25	0.00006
630.0025	0.0004	25	0.00004
720	0.0001	23	0.00001

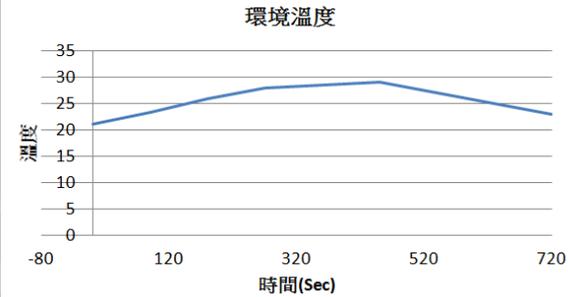
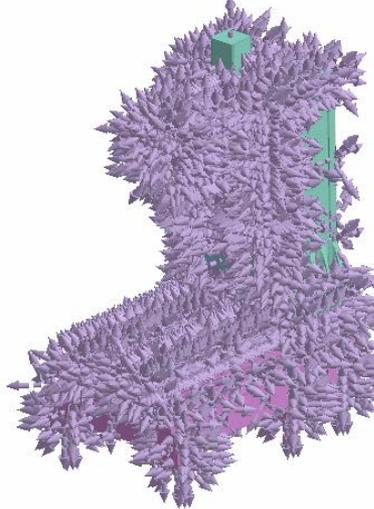
滑軌施加熱通量



熱對流

環境(工作)溫度:

空氣熱對流係數: 1×10^{-5} (W/mm² °C)



主軸施加熱源

