

Ansys

2022/R1

Engineering Total Solution Engineering What's Ahead.

# 新技術線上研討會

3/10 (四)  
14:00-14:40

Ansys AEDT ICEPAK 新技術線上研討會

黃紀源

3/10 (四)  
15:00-15:40

Ansys Forming 新技術線上研討會

洪翌程



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## NVIDIA QUADRO RTX 4000

即時即刻加速改變

透過 GPU 加速光線追蹤、深度學習和進階著色，滿足現今嚴苛的專業工作流程需求。採用 NVIDIA Turing™ 架構和 NVIDIA RTX™ 平台的 NVIDIA® Quadro RTX™ 4000，提供串插槽 PCI-e 尺寸同級最佳的效能與功能。加速獲得深入分析和解決方案的時間，以前所未有的方式設計與創造。



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# Introduction to ANSYS Forming 成型新產品介紹

## Stamping Simulation

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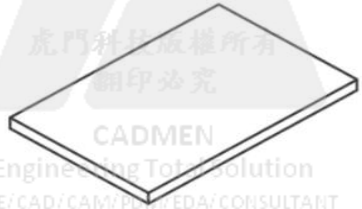
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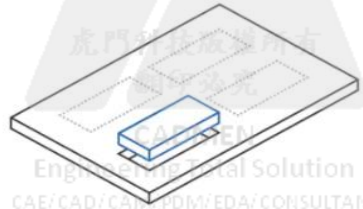




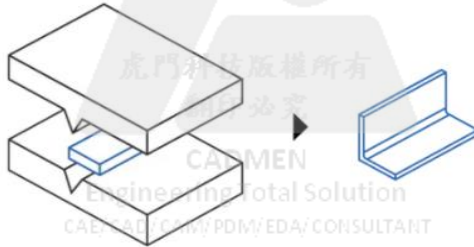
# What is Metal Forming?



Stock sheet metal



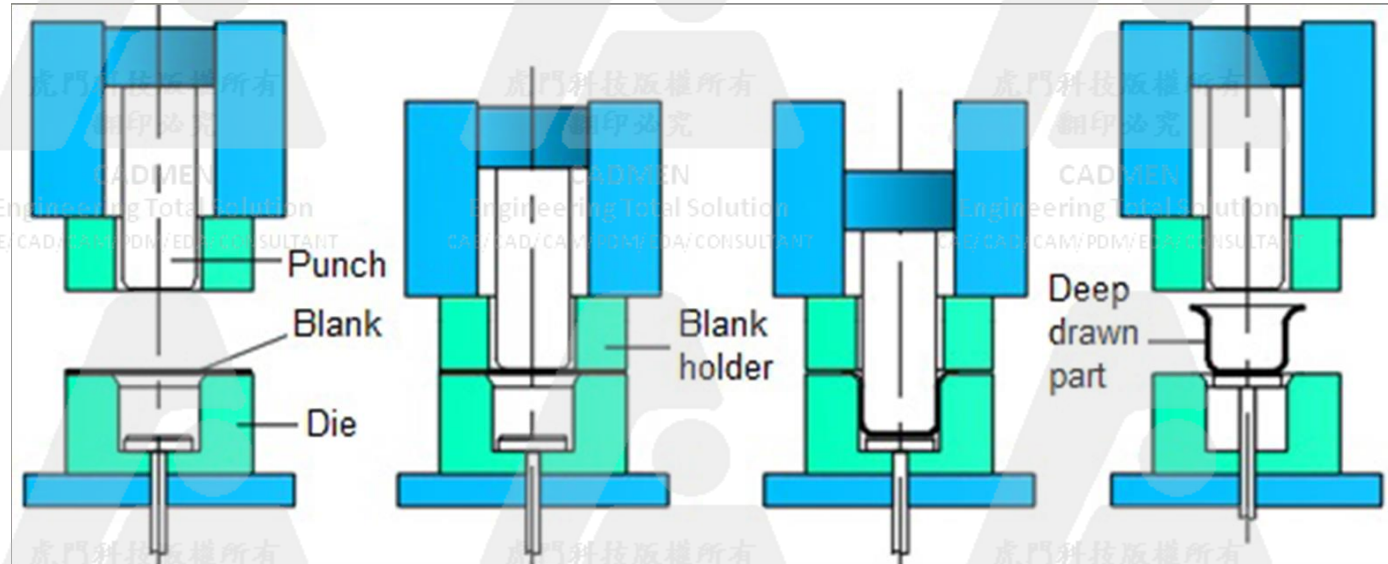
Cut out sheet metal blank



Forming



Formed metal part



Punch

Blank

Die

Blank holder

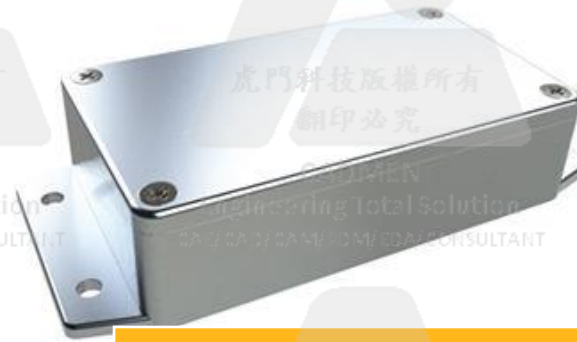
Deep drawn part



# Major Applications for Forming



Automotive Industry



Consumer Appliances



Aerospace Industry



Food and Packaged Goods

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# Introducing ANSYS Forming

An end-to-end tool for Sheet Metal Manufacturing Process Simulation – *ANSYS Forming*

- **Accurate, Fast, Easy**

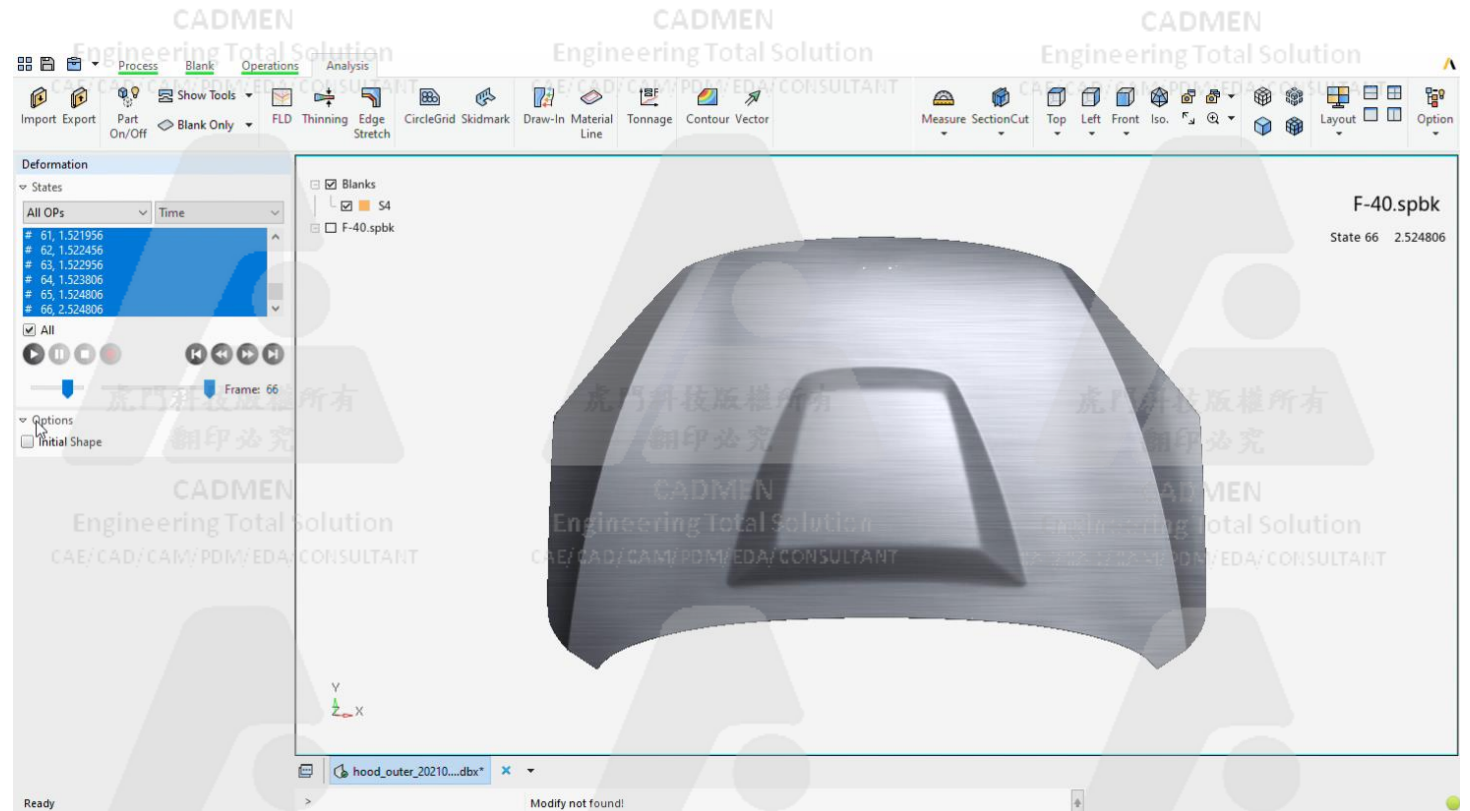
*No compromise*

- **Streamlined UX**

*One software for all metal stamping needs*

- **Trusted Solver**

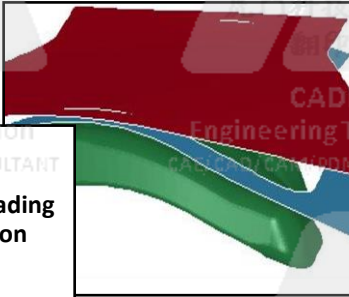
*LS-DYNA solver is already used for Metal Stamping solutions*



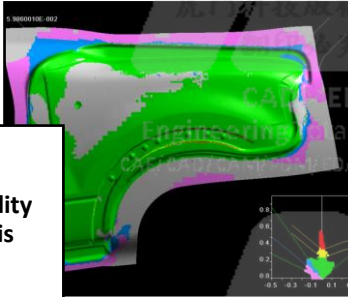


# Typical Capabilities of Forming Simulation Software

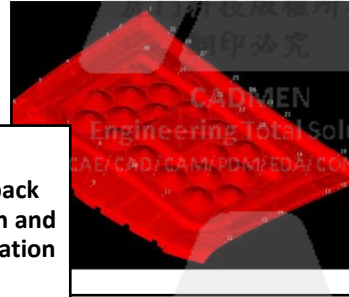
Gravity Loading Simulation



Formability Analysis



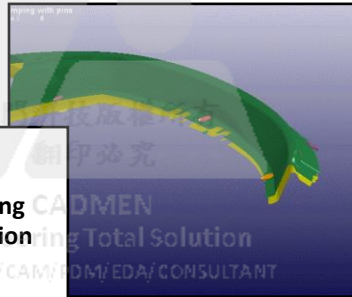
Spring back Prediction and Compensation



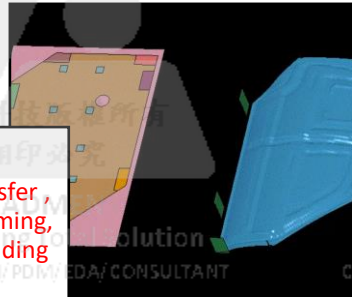
Press and Roller Hemming



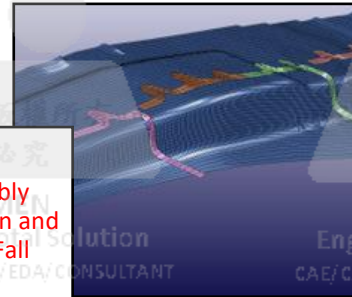
Clamping Simulation



Part Transfer, Hydroforming, Tube Bending



Assembly Simulation and Scrap Fall

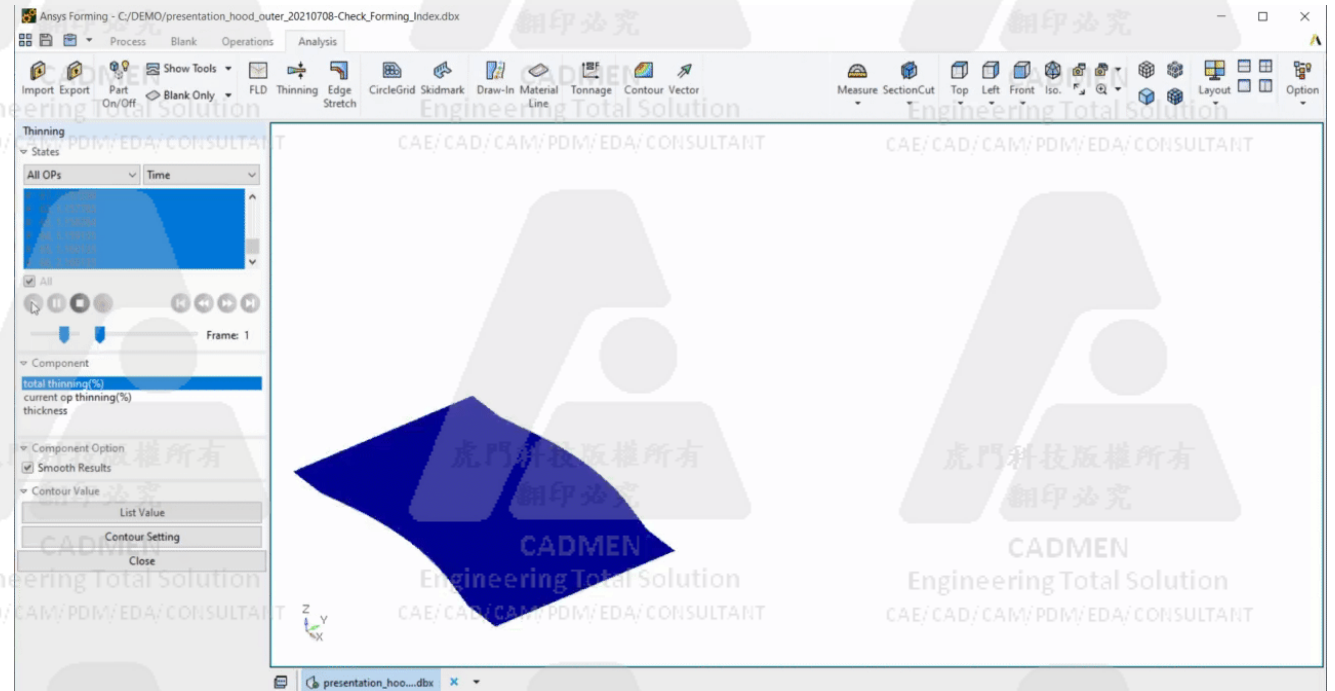


Note: Some of these capabilities are part of 2022 R1 and other are in the product roadmap

# Features available in ANSYS Forming 2022 R1

## Multi-Stage Forming Process Validation:

- Material Data library and management
- Process definition
- Tool setup & preview
- Draw bead definition
- Multiple Lancing operation
- Stamping specific post processing (FLD, Formability Index, Wrinkling, Skid mark etc.)

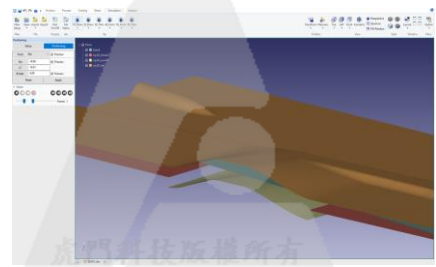


# Fully Integrated Platform

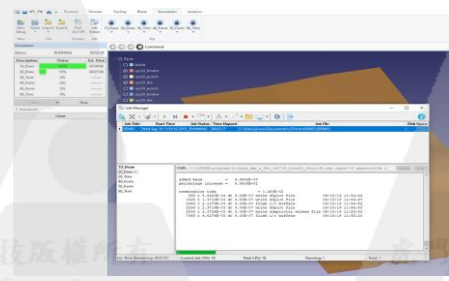
- In 2022 R1 release, Ansys Forming provides a unique platform which has a seamless fully integrated GUI with pre-post processing and uses LS-DYNA as a solver.
- Benefits of ANSYS Forming:
  - Easy to setup multi-stage forming simulations
  - Customizable template-based method allows user to easily define different forming processes
  - A job-submitter allows user to run the job easily
  - User can seamlessly evaluate simulation results when the job is running



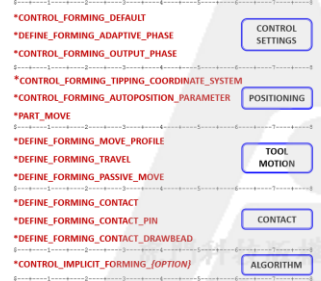
Model Setup



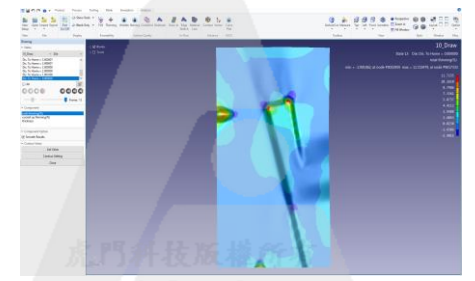
Job Runner



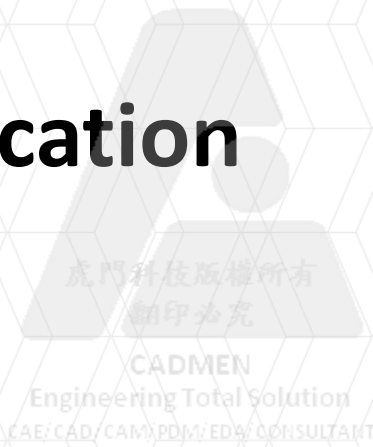
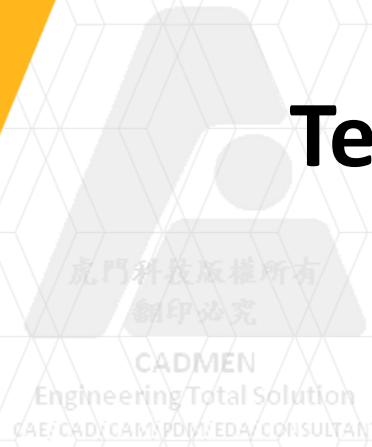
New Forming Keyword Features



Analysis







# Technology Application



# Accuracy and Efficiency

Ansys Forming takes full advantage of LS-DYNA state-of-the-art technologies to achieve accuracy and efficiency.

## Dedicated Material Library Management

- ✓ Advanced LS-DYNA Material Models for metal forming
- ✓ Extendable forming material database
- ✓ Easy to define/modify new material
- ✓ Nonlinear FLD (Formability Index)

The screenshot displays the Ansys Material Editor interface for a material named CR180BH\_TKS-FLC. The interface is divided into several sections:

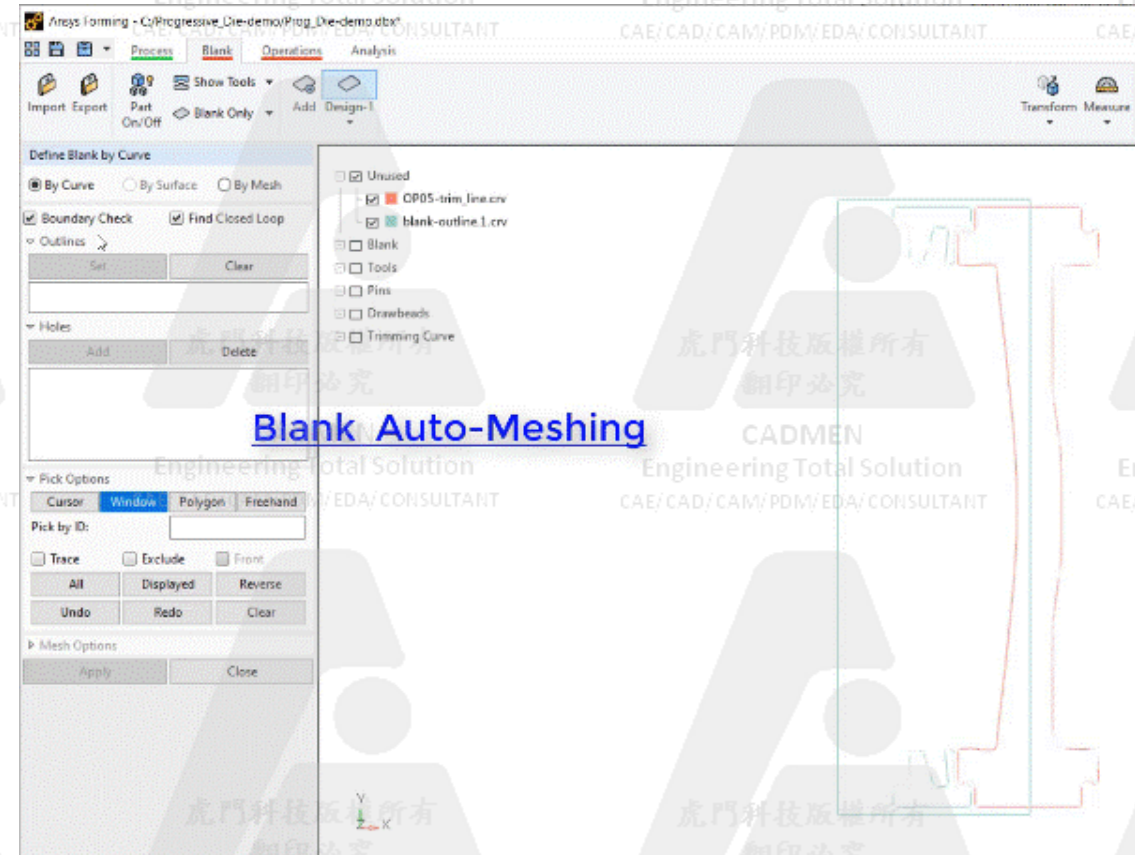
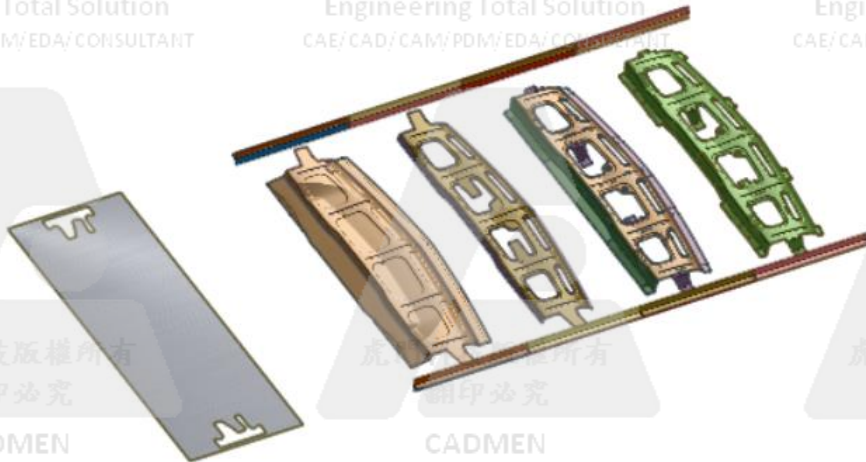
- Material Library:** A tree view on the left shows the hierarchy: Project Materials > CR180BH\_TKS-FLC > AnsysForming Library > TiwaQuest\_Materials > Various\_Steels > DP780.
- Name:** CR180BH\_TKS-FLC
- Comment:** Alternative names: BHZ180, 180BH, HX180BD, HC180B, Source: Tiwa Quest AG, Biaxial: 0.93, UniformElongation: 0.21, TensileStrength:330
- Material Type:** Steel
- Basic Properties:**
  - Density: 7.85000E-09
  - Young's Modulus: 2.07000E+05
  - Poisson Ratio: 0.30
- Yield Function:** Criterion: Barlat'89
  - R00: 1.70000
  - R45: 1.55000
  - R90: 2.10000
  - M: 3.33000
- Hardening:** Rule: Curve, Data: Edit...
- FLD:** Method: ThysenKrupp Steel
  - Tensile Strength: 330.00000
  - Total Elongation (%): 40.00
  - Reference Thickness: 1.00
  - Thickness (blank): 0.70
  - Nonlinear (Formability Index)

At the bottom, there are three plots: Yield Locus (a green closed loop), Hardening Curve (a green curve showing stress vs. strain), and FLD Curve (a green curve showing formability index vs. strain).

# Auto-Meshing of Blank and Tool Geometry

Suitable for product designers and process engineers  
Minimize prerequisites of FEA background

This strategy distinguishes Ansys Forming from any FEA-based GUI which needs user's manual editing on FE meshes.



- No need for users to edit/repair any element.
- Although the forming contact algorithm requires mesh normal consistency, a new forming solver feature has been implemented to achieve automatic normal adjustment.

Blank Auto-Meshing

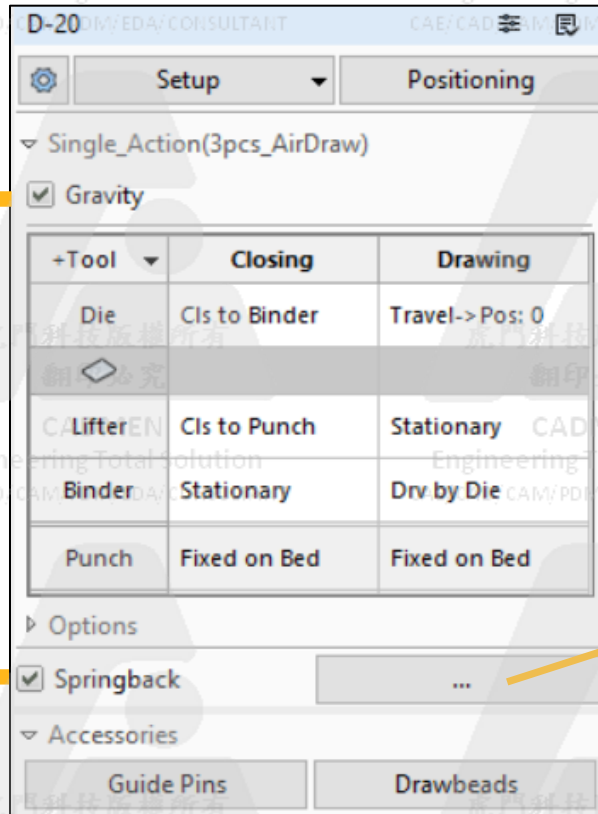


# One Click for Gravity or Springback

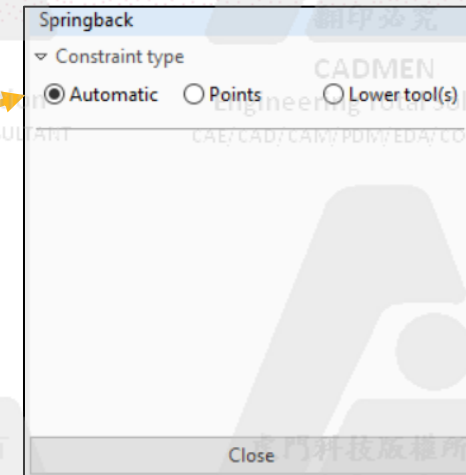
Straightforward and flexible to activate the option  
Default with an Auto-constrained springback algorithm

- Solver implemented algorithm with auto-constraints for springback prediction
- Suitable for product designers and process engineers

Gravity loading simulation



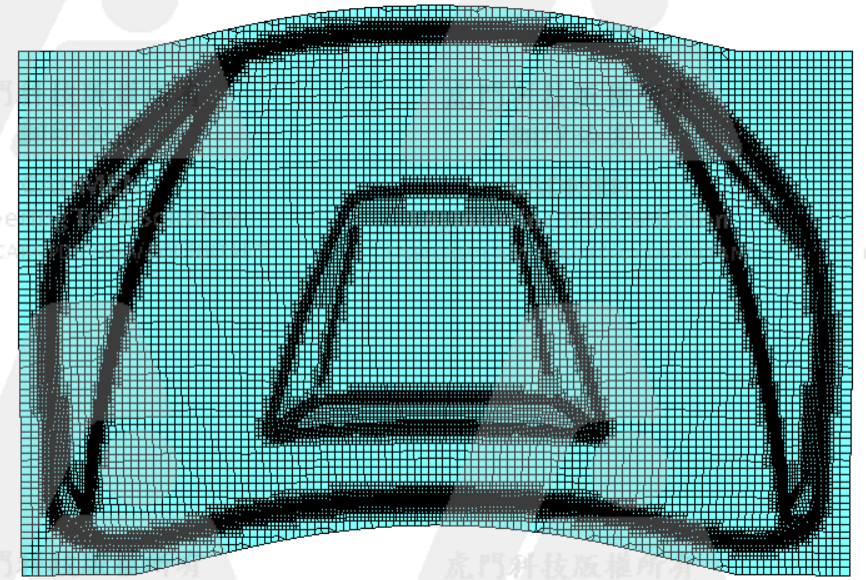
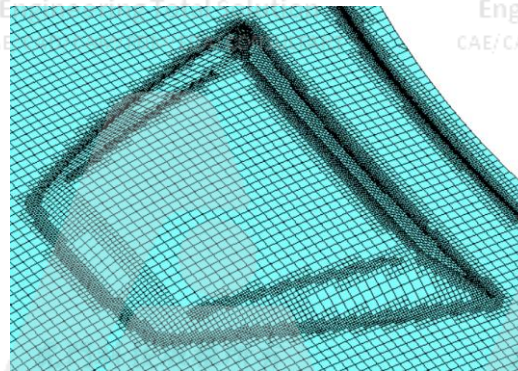
Springback prediction



# Smart Adaptivity

Efficient refinement approach for faster solution

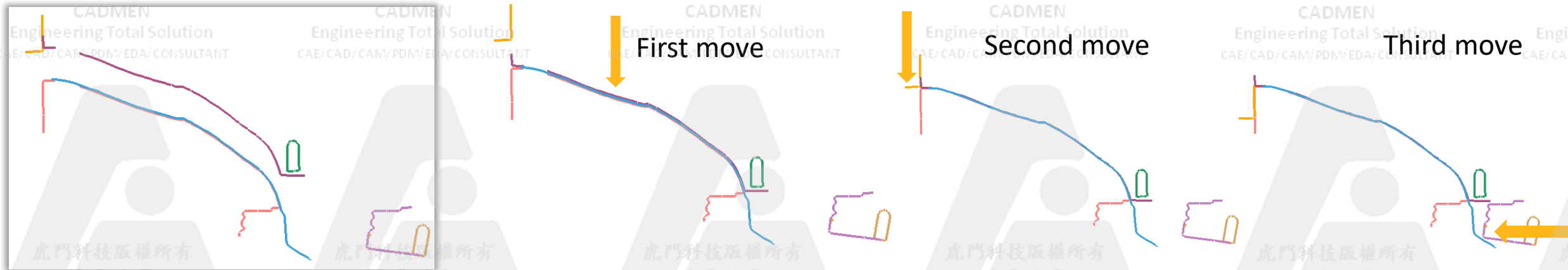
- In stamping simulation, users tend to use initial coarse mesh and refine elements through adaptivity.
- Original mesh refinement is based on contact, which depends on the mesh quality of rigid body.
  - It tends to refine more elements than necessary.
- New mesh refinement ‘Smart Adaptivity’
  - More accurate in mesh refinement
  - Only refines very necessary areas
  - Less element number and faster



# New Automatic Contact Move for tool positioning

Efficient strategy to reduce simulation time

- In stamping simulation, the initial tool position is not always close to the blank
  - Users prefer actual process setting, which may lead to large gap between the tool and the blank in initial starting position
  - Simulating the actual tool travel to close the gap is time consuming and computationally wasteful
  - Ansys Forming is enhanced by this new feature in solver to close the gap automatically







# Post-processing



# Forming Limit Diagram (FLD)



The screenshot displays the ANSYS Forming software interface. The main window shows a sequence of forming operations (OP10 to OP50) and a color-coded FLD plot of a part. A 'List Value' dialog box is open, allowing the user to pick a blank or an FLD point. The dialog has two tabs: 'Pick Blank' and 'Pick FLD'. The 'Pick FLD' tab is active, and a point is selected with the label '2: <-0.2451, 0.3956>'. The dialog includes options for 'Cursor', 'Window', 'Polygon', and 'Freehand', along with 'Input by ID', 'Apply', 'Undo', 'Redo', 'Clear', and 'Close' buttons.

Pick a location on the panel to find the corresponding point in FLD plot.

The label of any listed value can be picked manually for reposition.

Pick a point in FLD plot to find the corresponding location on the panel.

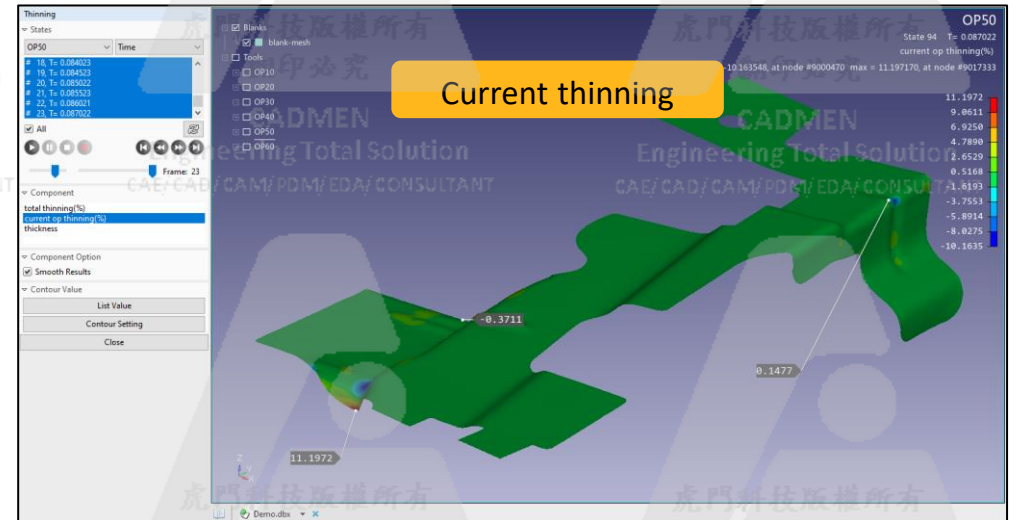
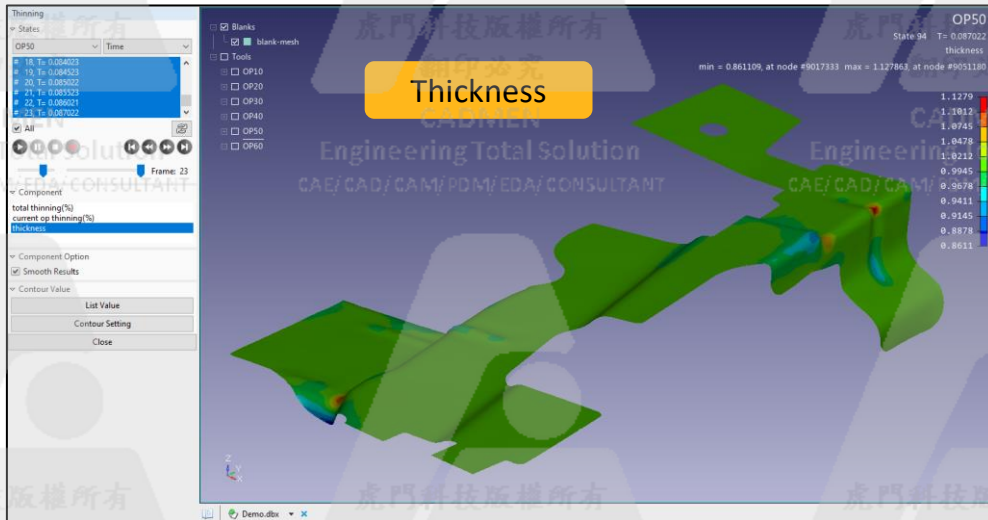
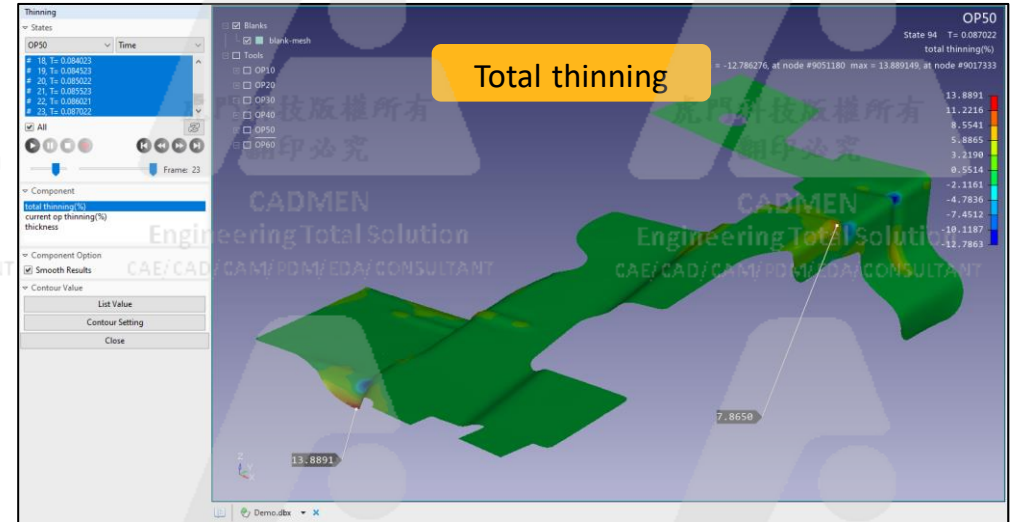
- Adjustable FLD Plot Window
- Position: pick and move
- Size: drag window frame

# Thinning



Three contour options

- Total thinning (%)
- Current thinning (%)
- Thickness





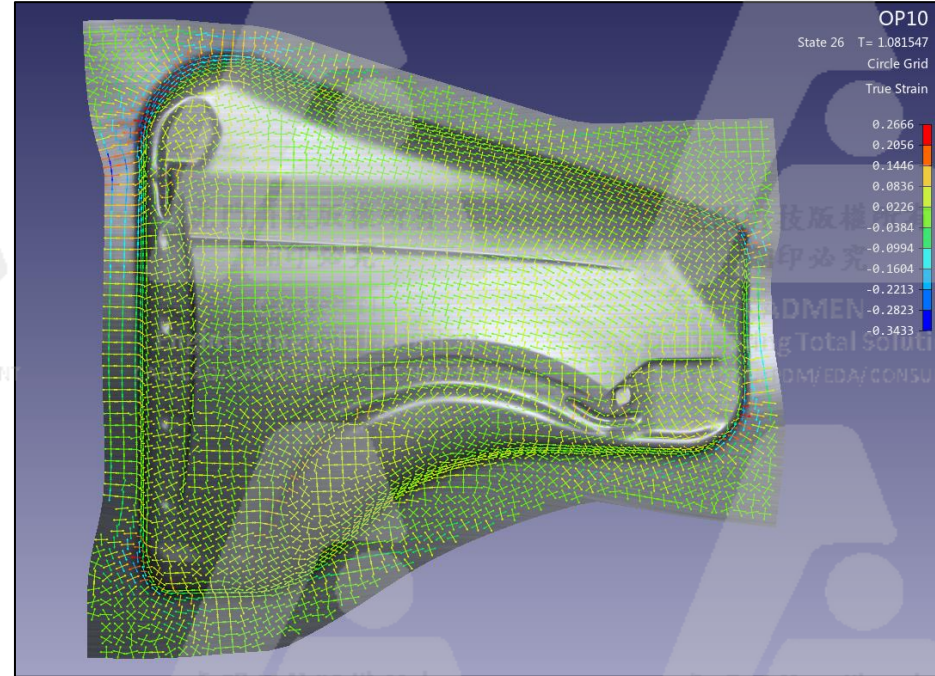
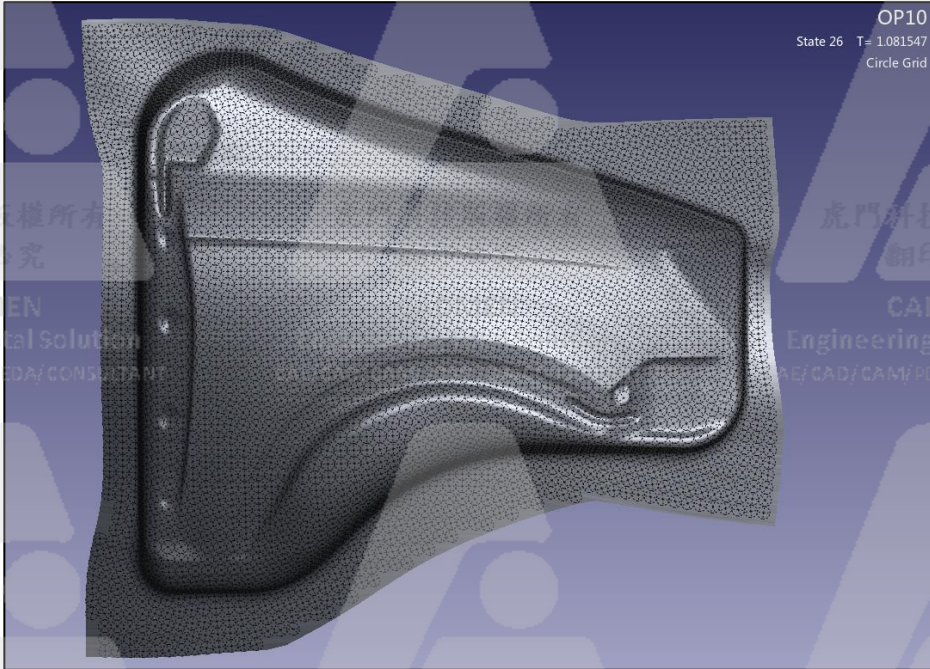
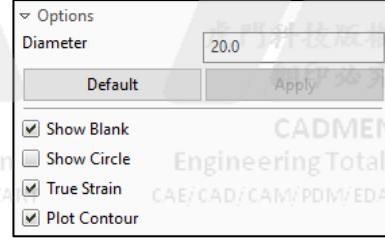
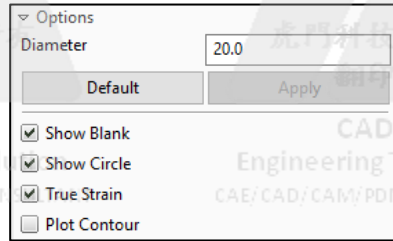
# Edge Stretch



# Circle Grid



## Circle Grid Mode    Strain Vector Mode



# Draw-In



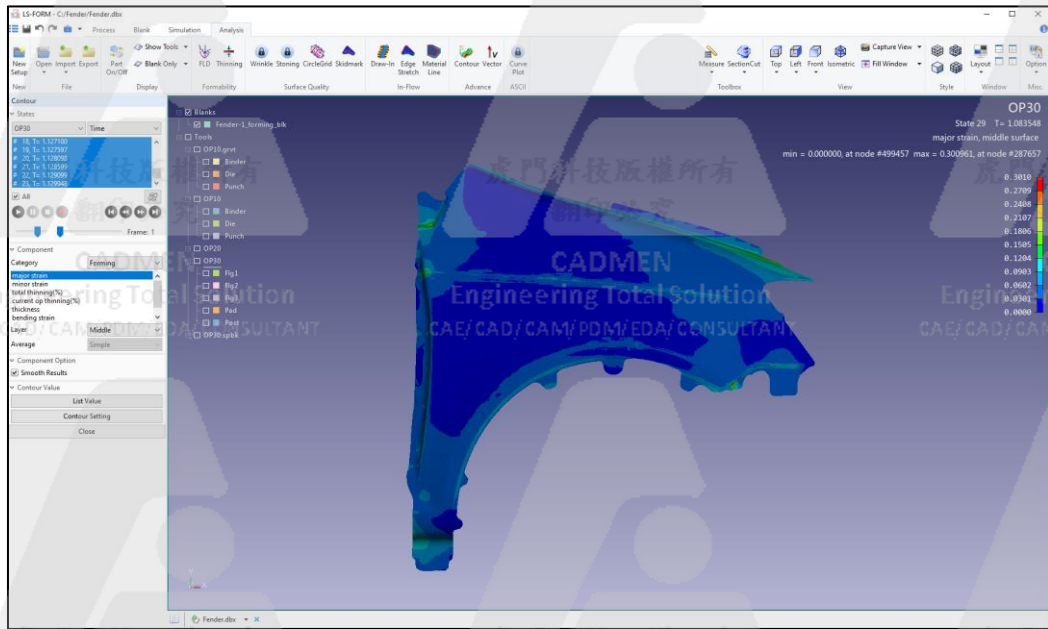
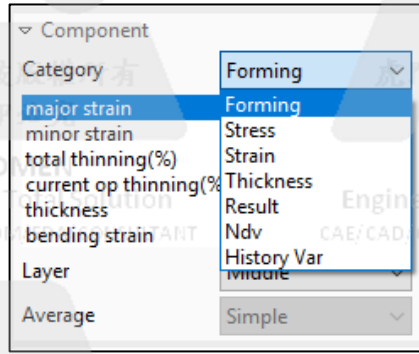
The screenshot displays the Ansys Edge Draw-in software interface. On the left, there are several panels: 'States' showing 'OP10 Binder' with displacement values, 'Options' with checkboxes for X, Y, Z, and 'Perp. to Edges', and 'Contour Value' settings. The central area shows a 3D model of a metal part with various tooling elements like 'Blanks', 'Tools', 'OP10 grvt', 'OP10', 'OP20', 'OP30', and 'OP30.spbk'. A color-coded contour plot is overlaid on the part, with a legend on the right showing values from 12.1038 to 80.1159. Three callout boxes indicate specific lengths: L= 53.3609, L= 32.6568, and L= 80.1159. The top right corner shows 'OP10 State 26 Binder: Dis. To Home = 0.000000 Edge Draw-in'.



# Contour

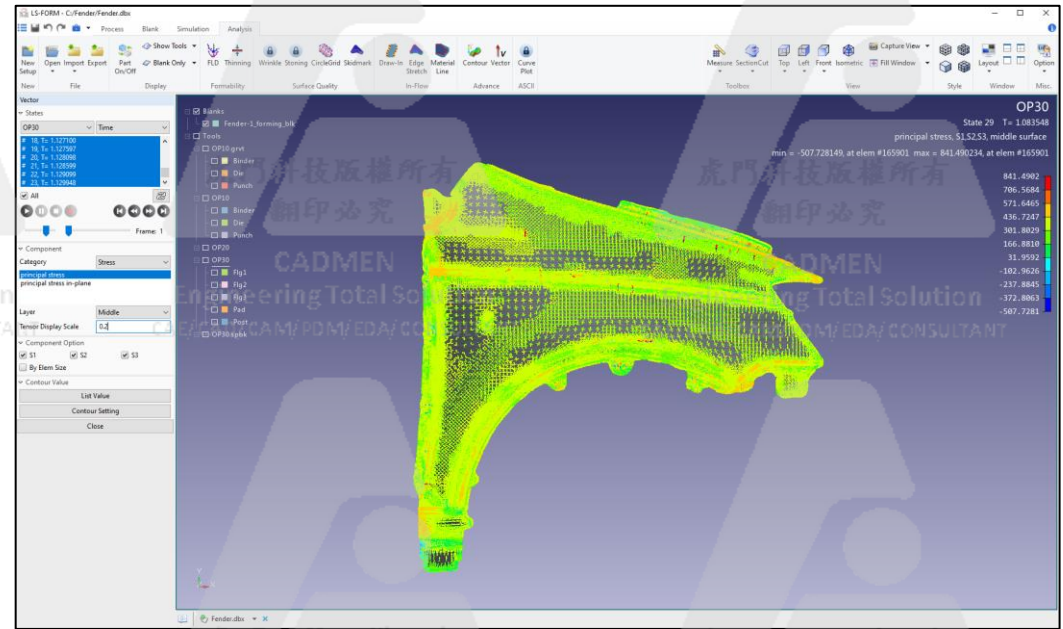
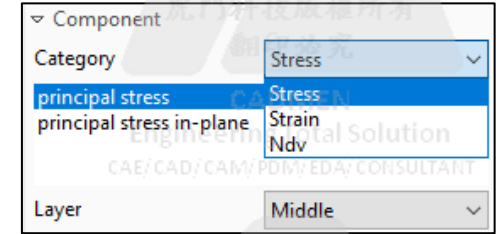


## Contour of LS-DYNA Component Results



# Vector

## Contour of LS-DYNA Component Vectors



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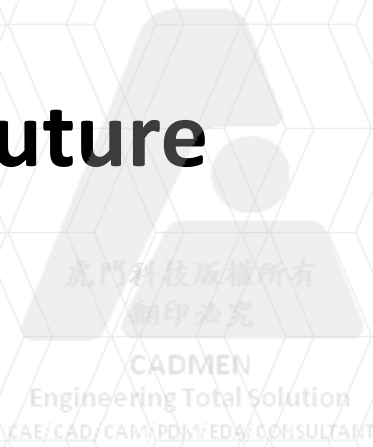
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# Operating





# ANSYS Forming Future





# Future Roadmap

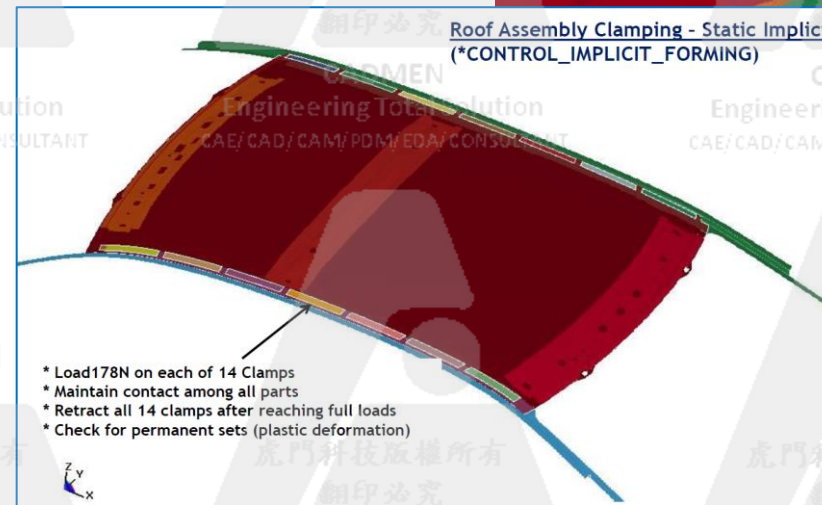
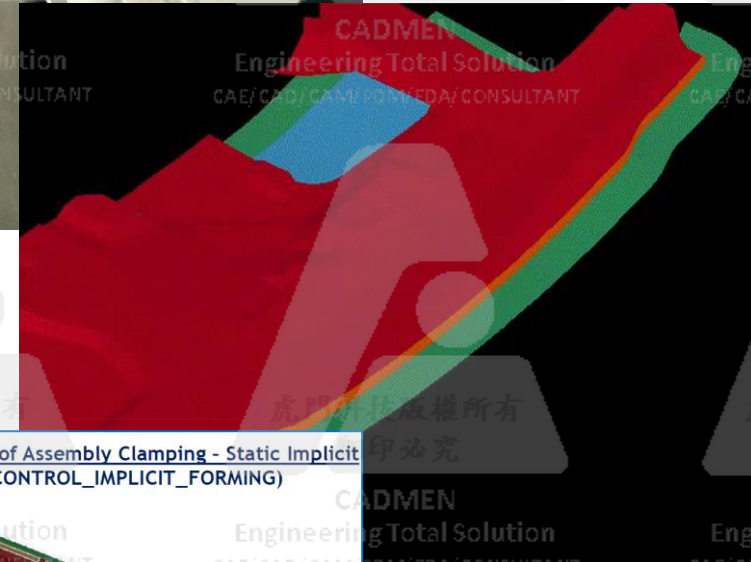
Die Surface Compensation, Clamping  
(Springback Compensation)

Forming Process Management

Hemming

Thermal Distortion

Die Face Design





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# 新技術線上研討會

4/6 (三)  
14:00-14:40

Ansys Mechanical 進階應用\_新技術線上研討會  
(Meshing · Reinforcement & Structural Optimization)

王弘政

4/6 (三)  
15:00-15:40

Ansys LS-DYNA 新技術線上研討會  
(LS-DYNA Solver & Contact Enhancements)

康盛捷

4/6 (三)  
16:00-16:40

Ansys LS-DYNA 新技術線上研討會  
(Implicit Frequency Domain Analysis)

洪翌程



## NVIDIA QUADRO RTX 4000

即時即刻加速改變

透過 GPU 加速光線追蹤、深度學習和進階著色，滿足現今嚴苛的專業工作流程需求。採用 NVIDIA Turing™ 架構和 NVIDIA RTX™ 平台的 NVIDIA® Quadro RTX™ 4000，提供單插槽 PCI-e 尺寸同級最佳的效能與功能。加速獲得深入分析和解決方案的時間，以前所未有的方式設計與創造。



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