Contents

1. AFDEX_V21

1.1 AFDEX_V21R01 Release

AFDEX_V21R01 was released on June 29th, and its main features and improvements are introduced in AFDEX Newsletter Q2/2021.

- 2D & 3D controlling gap flow
- Analysis using binder die
- Saving 3D moment of a workpiece
- Added 3D features of Sticky-die
- 2D & 3D remeshing for each stage
- 3D roll forming analysis
- 3D shearing analysis
- Multiple damage models in a project
- Quantifying brittle fracture of a ductile material
- Added forming instability index
- Controlling the forming load applied on a specific die
- Various flow stress models at ambient temperature
- Various flow stress models at high temperature

New features or improvements of pre/post-processor in AFDEX_V21R01 are introduced in section 2.

2. AFDEX_V21R01 Main features

2.1 Import DXF file

The error of automatic numbering dies in a DXF file occurring when there is a large number of parts (assembly die) has been fixed. Also, the import DXF file dialog box can be used to change the position of upper/lower dies and to move stages. In the multi-body simulation, multiple workpieces can be set automatically.
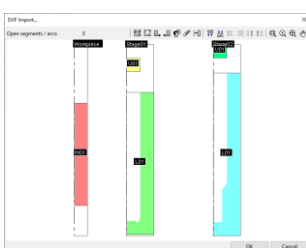

Figure 2.1 New import DXF file dialog box

2.2 Visualizing centroid of a workpiece

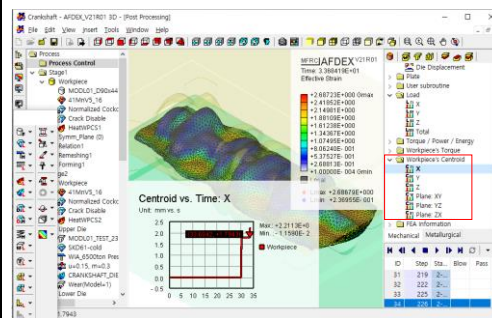AFDEX_V21R01 makes it easy to visualize the centroid of a workpiece on the post-processor in 3D analysis.

Figure 2.2 Visualization of centroid of a workpiece

2.3 Remeshing for each stage

AFDEX has been providing the multi-stage process analysis for 25 years, which controls condition of remeshing for whole processes. From the newest version, however, the remeshing control is able to set for each stage to distinguish the stage where needs the remeshing. For example, this feature can be properly used in the combined process analysis of the clinching process and the joint strength analysis.
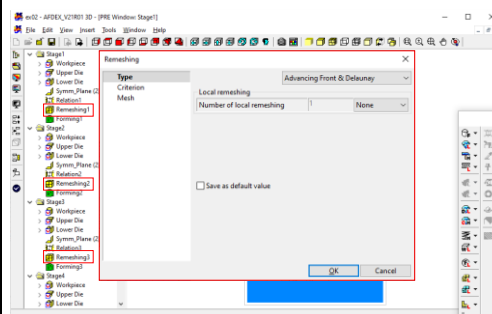

Figure 2.3 Dialog box for setting remeshing condition

2.4 Automatic step size control and mesh generation

The dialog for controlling calculation speed and accuracy of an analysis is newly added in AFDEX_V21R01. There are two ways in which user can determine them by controlling the number of step size and mesh automatically or manually. The automatic setting will automatically determine the values of step size and mesh considering the forming stroke and the shape of workpieces and tools. For the case of using 'User defined,' one can enter the numbers of mesh and step size to determine the condition of any process.
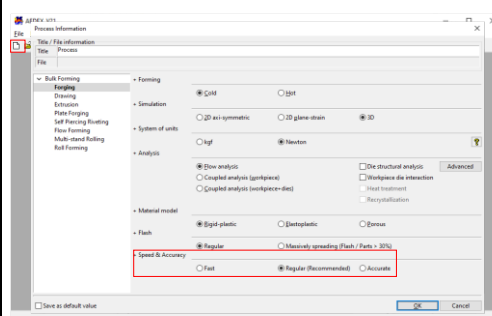

Figure 2.4 Dialog box of process information

2.5 Legend bar enhancements

In AFDEX_V21R01, one can change the size of the legend bar to optimize the results by clicking local/global button. In the previous versions, the options for changing the size of the legend bar were located inside the setting window.
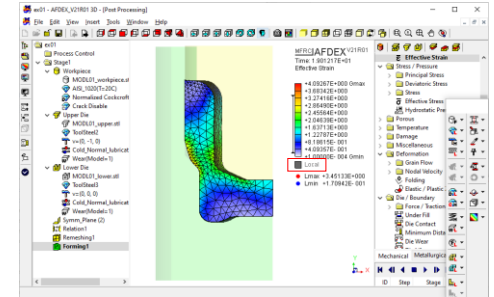

Figure 2.5 Changing the size of the legend bar

2.6 Coordinate transformation

In the older versions of AFDEX, results were displayed on only Cartesian coordinate system. However, In AFDEX_V21R01 provides the transformation between two coordinate systems: Cartesian/Cylindrical coordinate system. Now, one can check the result of the state variables selectively.
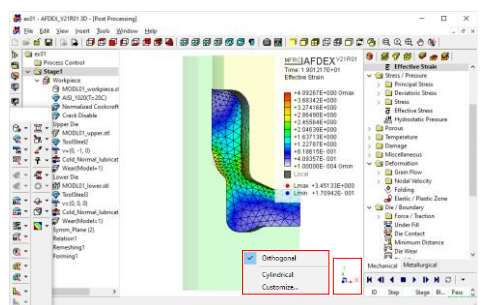

Figure 2.6 Coordinate transformation

2.7 Visualization for results of multiple damage models

AFDEX_V21R01 can visualize up to three different damage models, which was able to enter only a single result of damage model. The third damage model is set up to be normalized Cockcroft-Latham criterion as a default. This feature will be utilized in automatic mesh generation for the analyses of sheet metal forming, fine blanking, and shearing, etc.
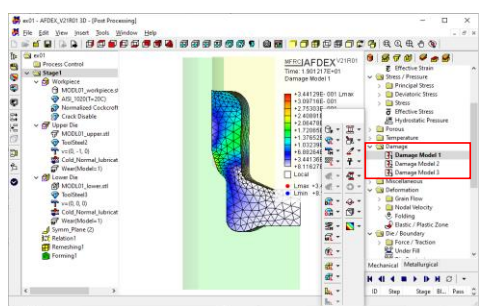

Figure 2.7 Post-processor with the results of multiple damage models

2.8 Input control for gap flow

The previous version of AFDEX has been provided the features of gap flow, but there was some complexities in using the feature. The dialog box for setting the gap flow condtions is shown in the Figure 2.8.
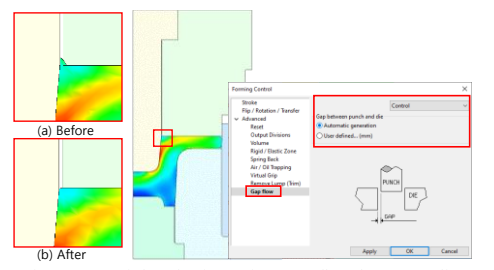

Figure 2.8 Dialog for inputting gap flow between dies

In this dialog box,　One can check the box asking if the gap flow is considered. The dialog is designed to enter a value of gap if it is selected to be considered.

2.9 Improved dialog for inputting the coefficient of friction and heat transfer of dies

Although this feature was implemented in the solver of previous versions, the dialog for the feature had not been provided in the pre-processor. Therefore, only users who had trained could run the simulation without the dialog. From the latest version, the friction behavior can be easily determined as a function of temperature, pressure and strain, while the coefficient of heat transfer for dies can be defined as a function of temperature and pressure.
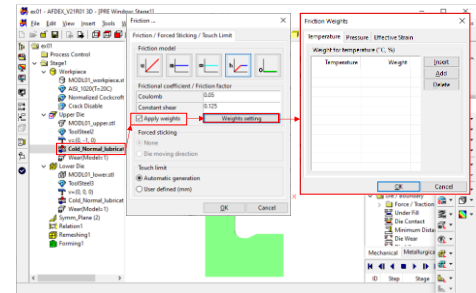

Figure 2.9 Dialog box for inputting the condition of friction

2.10 Torque of workpiece visualization

Recently, applications using multi-body simulation technique have been increased rapidly. AFDEX_ V21R01 provides both results of the moment operating on dies and workpieces, where as the previous versions show only the moment operating on dies.
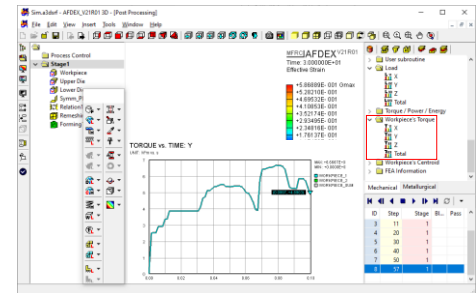

Figure 2.10 Plotting the torque of workpiece in post-processor

2.11 Input control for 3D roll forming analysis

In AFDEX_V21R01, the beta version of 3D roll forming is available. Although the roll forming simulation can be conducted by the original module, there has been some complexities to set special conditions. Now, one can control the boundary conditions between rollers before and after the forming. The new module will be released for licensed users.
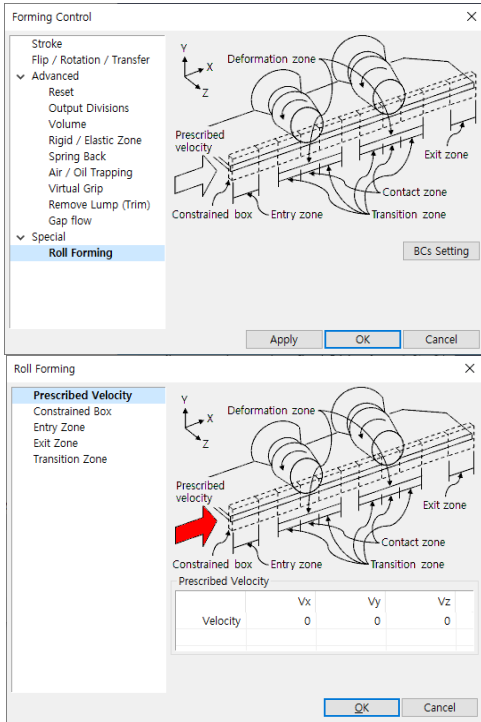

Figure 2.11 UI for controlling 3D roll forming analysis

2.12 Other

AFDIC for the simulation of special processes will not be available in AFDEX_V21R01. For the special processes, AFDEX_SP(SPecial) in the new version will replace AFDIC. Also, AFDEX_SP has been developed to replace the current pre/post-processor in near future. For more details about instructions, please refer to the tutorial manuals in the AFDEX installation folder.

3. Notice

3.1 Altair manufacturing webinar series

MFRC participated Altair Manufacturing Webinar Series 2021 held on June 22th, 2021. Dr. Mansoo Joun presented an online webinar entitled, "Perform Accurate Finite Element Modelling of Metal Forming Processes" for global users. Please find the recorded webinar video from the following link. (https://youtu.be/JyVhGVr2f_U)

3.3 APA Japan webinar series

MFRC attended APA Japan webinar series and presented the online webinar entitled, "Metal forming simulation using AFDEX" for Japanese users. The webinar was held on April 20, 2021 and was focused on the following topics: Automatic simulation of multi-stage forming process, Multi-body forming process, Fatigue life prediction of a die and optimal process design & material properties, etc. For more details, please refer to the following link: (https://www.altairjp.co.jp/resource/jp-apa-afdex)

3.2 ATCx Mexico 2021

MFRC attended a virtual ATCx Mexico 2021 and presented the webinar entitled, "Metal Forming Simulation using AFDEX." This event was held on June 2-4 and all the webinars were presented for Altair users and visitors in Mexico.

3.4 ICTP 2021

ICTP 2021 will be held by Ohio State University, USA from July 25 to 30 (EDT). MFRC and GNU(Gyeongsang National University) will attend this online event by presenting two papers. (https://www.tms.org/ICTP2021)

3.5 MSAM 2021

The 4th International Conference on Material Strength and Applied Mechanics (MSAM) will be held on 16-19 August online and offline in Macau, China. In this conference, AFDEX development team will present four papers using AFDEX. Dr. Mansoo Joun was invited to this event to give a presentation of his research about material models for cold forging. For more details, please refer to the following link: (http://www.msamconf.org/Program)