Partner Spotlight: MFRC

Dr. Man-Soo Joun, President of MFRC, discusses forging and metal forming simulation software, AFDEX, which is available through the Altair Partner Alliance.

APA: What prompted the development of your software? What problem(s) is AFDEX meant to solve?

Man-Soo: 25 years ago when I first started my career as a university professor, there was a large number of forging companies scattered not too far off campus. Right away, I instinctively found it to be quite interesting and attractive, but there were some difficulties involved in the process development which severely bothered those working in the industry. The forging process is invariably connected with simulation technology which was not available at that time, so I came to dream about a forging simulator for process designers, which later led me to develop such a simulator for myself.

AFDEX is a cutting-edge forging simulator and design tool based on finite element method, which is continuously moving ahead in order to function as a general solution provider for almost all the metal forming processes, ranging from bulk metal forming to plate and sheet metal applications.

## APA: What are the benefits of using AFDEX for metal forming simulation?

Man-Soo: Time and cost, first of all, involved in forging process development can be dramatically reduced. The technology embedded in AFDEX can provide part designers with the essential material properties necessary for accurately predicting their life expectancy. AFDEX is also well known for its easy-to-use functions, and the resulting high and reliable solution accuracy, which enables non-professionals to enjoy readily accessible results in the field.

APA: Are there any unique applications that AFDEX works for that your competition cannot?

Man-Soo: Put simply, AFDEX is developed to successfully analyze multi-phase forging processes as automatically as possible. This allows designers to find unrivalled benefits, whose results are related to pre-manufactured parts or based on the previous forging process information. Compared to other software, some standout features include an optimized re-meshing scheme, metal flow line prediction, and AFDEX/MAT, our acquisition module of new material properties.

APA: How much time does it take to learn and start using AFDEX?

Man-Soo: For an engineer of basic knowledge in CAD and plasticity, it usually only takes a few hours of training since the whole flow is intelligently arranged for high user friendliness. When it comes to general applications, such as the 'remesh' function for example, AFDEX does not require much work from the user because the existing upper and lower dies only contain the number of finite elements to be employed, while still beautifully yielding an optimized mesh configuration for the problem at hand. As a users seeks more advanced and/or complicated features of AFDEX, there are self-educating materials available, technical support services online, and periodic technical seminars for the higher level issues.
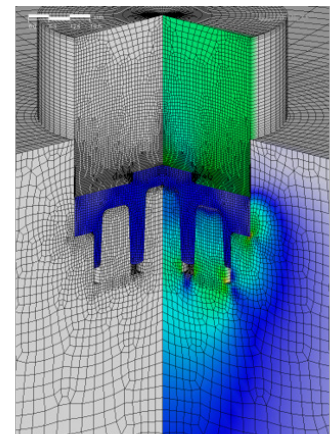
Elastoplastic FE Analysis Considering Die Elastic Deformation (2D)
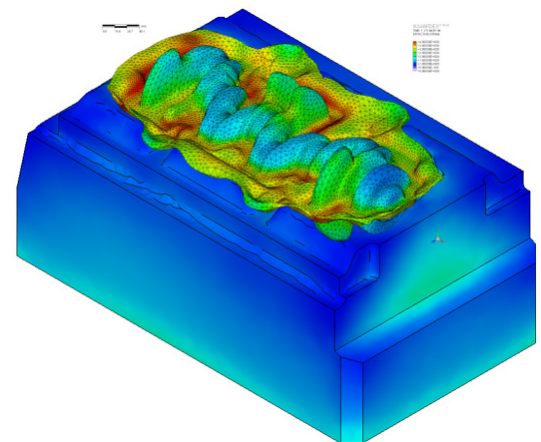
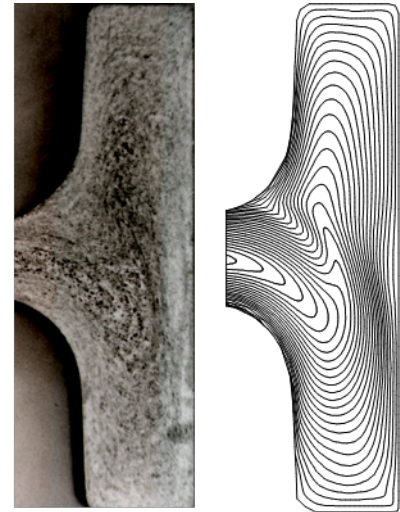FE Analysis Considering Die Elastic Deformation (3D)

APA: What's next for MFRC... what can we look forward to?

Man-Soo: As the name AFDEX suggests, the software is an advisor for plastic and metal forming engineers, so we are determined to become reliable partners with design engineers through the Altair Partner Alliance. Our MFRC team will be present at the Forge Fair 2017 in Cleveland, OH (April 4-6) where we look forward to showcasing our software's capabilities as well as networking with attendees from the forging industry. We will again be attending the Hannover Messe in Germany (April 24-28, 2017) as well as actively participating in the Altair Technology Conferences in the UK (May 2017) and Germany (June 2017).

On the software development side, a new analysis module for elastic die deformation was added to AFDEX's functionalities last year. Currently, the research focus is on introducing specialized modules for powder metallurgy, additional heat treatment processes, induction heating and microstructure evaluation. These functionalities are expected to be operational before the end of this year. We will continue supporting users in the area of plastic forming process, while providing material information in its initial stage and fortifying the prediction of the metallurgical phenomenon accompanied as well.

Hot Forging of Bearing Race

APA: What are the biggest challenges or problems that customers in your target market face and how do you address their needs?

Man-Soo: Plastic process engineers put a high value on the reliability of the solution they achieve, while the solution itself tends to be inescapably under the degenerative numerical effect. The issue of re-mesh, which raises the biggest resulting numerical problem, is a good example in which AFDEX shows a remarkable merit over other software. Meanwhile, we are actively reflecting the professional ideas and know-how the process experts prefer and recomment. That's because the metal forming processes are heavily dependent on the creativity of the process designers. Time to time when such an unforeseen process is encountered, we swiftly strive to develop new functions to accommodate such a case which appeals more to the creative mind.

APA: Describe a typical workflow using AFDEX.

Man-Soo: Running AFDEX starts with preparing the geometric information for the die and material at hand. Then the preprocessor imports the input data to the relevant specific stage, based on previous CAD operation, while material properties and frictions are typed in directly or called from the built-in library. The data for the stroke and special functions at each stage accompany those as well. Any possible errors that come along with the inputting course are checked, and AFDEX is ready to analyze the project. It is quite noteworthy to pay attention to the time required for the whole preparation job before the run. It takes only a few minutes. That's it. In a standard continuous multi-phase forging process the whole simulation can be made automatically without any human intervention during the run.

APA: Is there a use case that highlights your software's strengths?

Man-Soo: A great use case to highlight AFDEX's real strength would be the tracking of Metal Flowline, which is quite pivotal in forging. Is easily seen in the bearing parts industry, metal flowline is the decisive factor to the product quality. Two decades ago, Korean bearing companies started to use AFDEX for their quality-proven innovative bearing parts, leading to the remarkable automotive industry growth in Korea. We encourage you to visit our homepage and refer to the materials for the innovation, noting the fact that there was no software to provide metal flowlines in the world at that time. Those 3-D metal flowlines in AFDEX surpass any kind of results that other software may produce in terms of its accuracy and convenience.

For more information about AFDEX, visit the solution page.