

A Brief Introduction to One-Step Solution – Dr. Xhinai Zhu

In sheet metal stamping solution, one-step solution has been extensively used for different purpose. Some people use this approach to obtain initial blank size, while the others use it to have rough approximation of formability.

Recently, this capability has been added to LSDYNA®. The sequence of performing one step solution is that: first, the 3-D part is project to flat plane; second, the

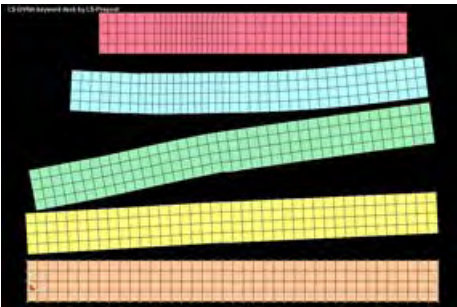
final flat geometry is obtained by using force balance.

The keyword to activate this feature is: *CONTROL_IMPLICIT_ONESTEP. It supports both quad and triangle elements.

Many benchmarks have been conducted to validate this new feature. In the following, two examples will be shown: one is flattening of U-Channel, and the other is a hood-inner.

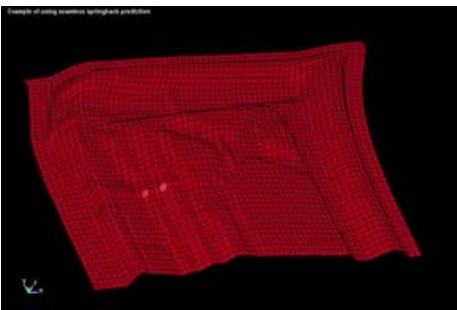


Figure 1. Deformed U-Channel (only half is shown due to symmetric condition)



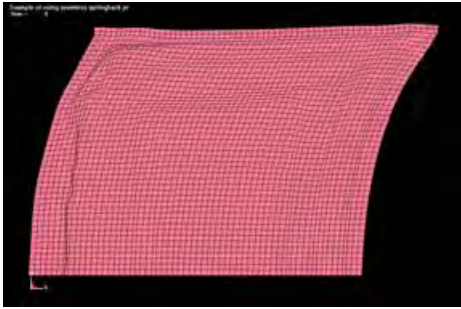
1. Red - Initial guess
2. Blue - Step 2
3. Green - Step 3
4. Yellow - Step 4
5. Beige – Final Step

Figure 2. The flattening process of this U-Channel.

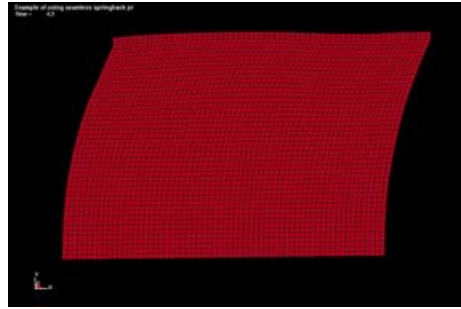


Purpose: Evaluate code developments
production applications

Figure 3. Deformed hood-inner



Initial Guess



Final mesh

Figure 4. Flattening of hood-inner

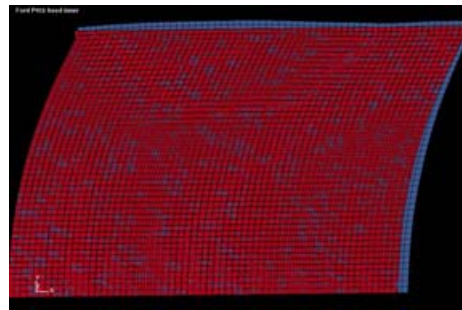


Figure 5. Comparison of the predicted blank size (the red one) and the real blank size (the blue one)

From the benchmark tests, it is found that the one-step approach implemented is now working.