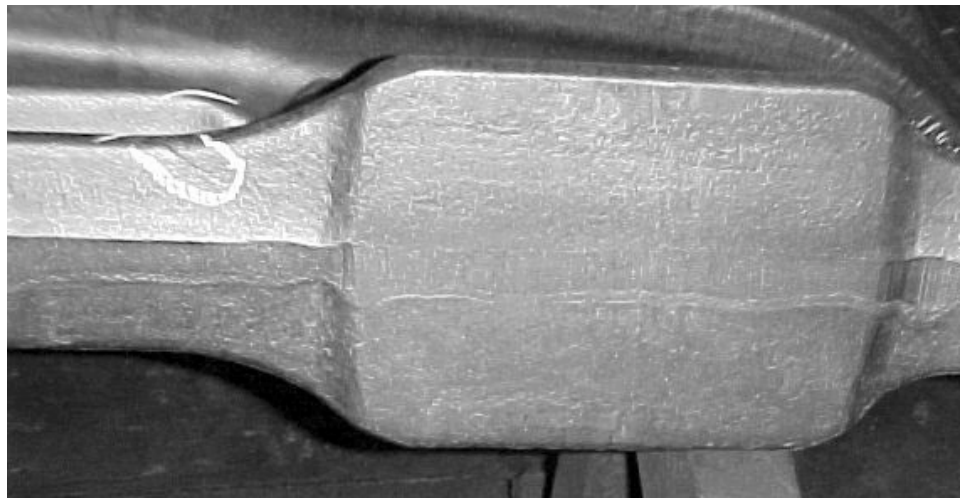


Axle Beam Forging

Background:

Process simulation can be used to determine the root cause of a defect that occurs during a multiple operation forming process. A major commercial vehicle part manufacturer discovered a problem with an axle beam forging. A lap (or fold) defect was evident on the finish forged product. History and experience guided the designers to concentrate their efforts to remove this lap on the blocker and finisher operations. In this case, modifications to the final operations did not result in a defect-free forging.



The axle beam is shown with a forging lap circled. The part has been final forged and the flash trimmed as shown.

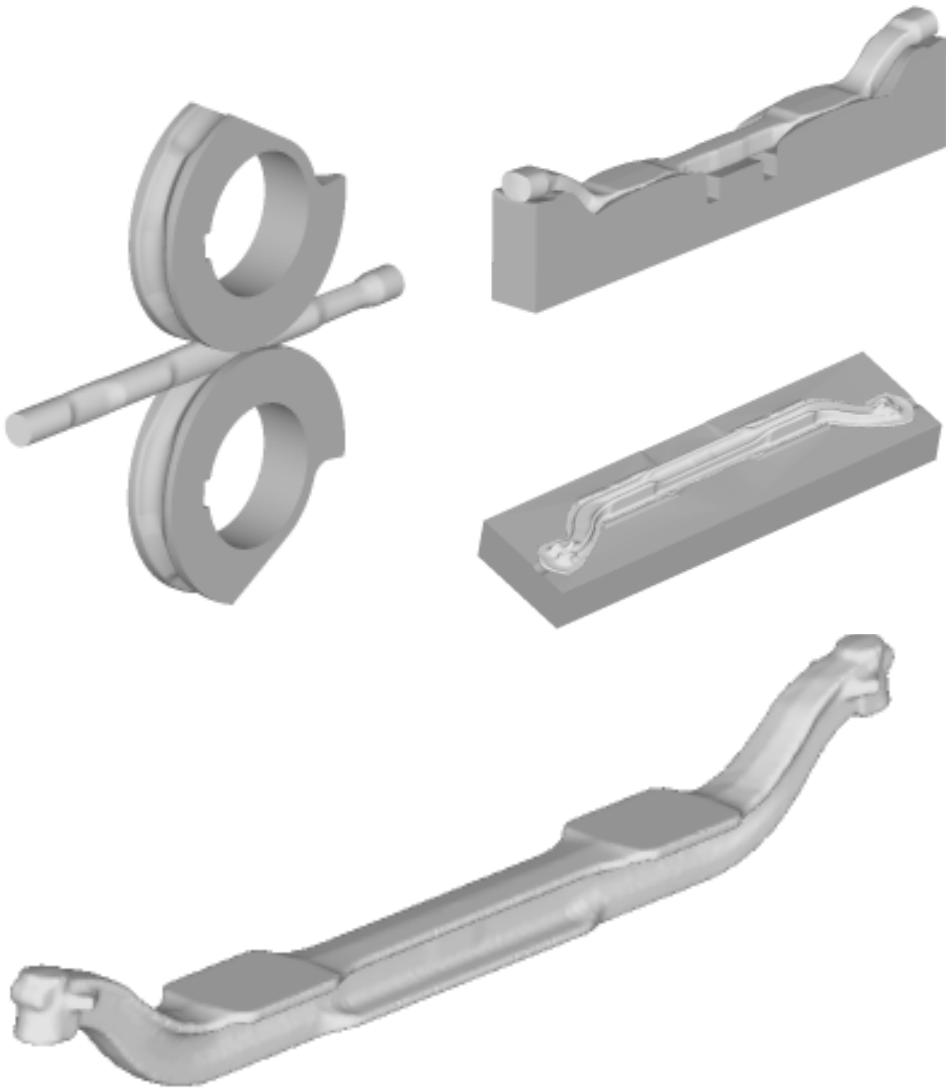
Process Simulation:

DEFORM™-3D was used to simulate the entire forging process from the billet through the final forged part. The simulation clearly highlighted the fold during the bending operation. Of course, the defect was not healed in the subsequent forging operations, but was simply moved around to the location as seen in the finish forged axle beam. After the designers reviewed the defect formation in the DEFORM™ postprocessor, it clarified the root cause of the problem. After verifying the fold being initiated in the bender, the designers modified the pads on the bottom die. This changed the flow of material and eliminated the lap.

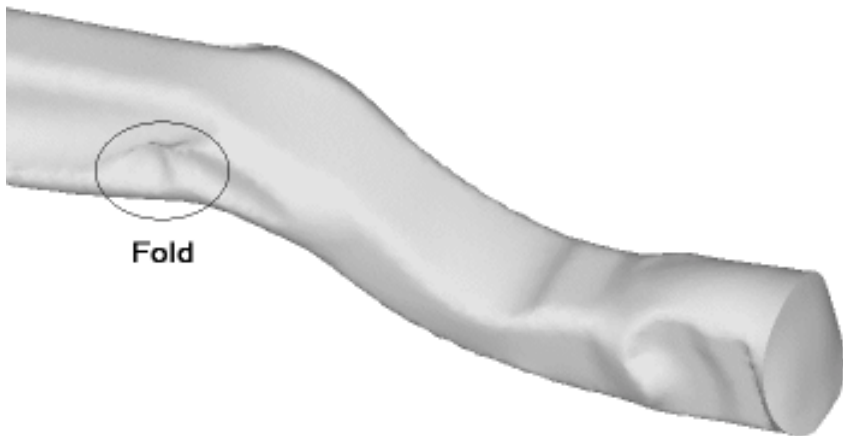
Summary:

While intuition and experience led the forging designers to concentrate on the blocker and finisher operations, it was not the root cause of the problem in this case. DEFORM™-3D provided these designers with critical information that allowed them to “see” the defect occurring during the bending operation. Once the source of the problem was clearly established, the problem was overcome.





Shown above are the four operations in the process: initial preform in the forming rolls (top left), after bending (shown in bottom die - top right), after blocker operation (shown in bottom die - middle right) and the finished axle beam after flash removal (bottom center).



DEFORM predicted the fold in the bender operation as shown above.

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