6.5 Case Study No. 5
Upper Control Arm for Light DutyTruck

Component name:	Upper Control Arm for Light Duty Truck
Forging Process:	Warm and cold forging
Size, mm (in.):	2411 (9.5) x 2552 (1 0.0)
Weight, kg (lb):	3.7 3 (8.2)
Alloy:	SAE 1541
Tensile strength, MPa (psi):	755-860 (110,000-125,000) typ.
Yield strength, MPa (psi):	620 (90,000) min.
Elongation:	12%
Impact Toughness, J (ft-lb):	20 (15)
Secondary Operations:	Coining, drilling and boring, and riveting to the ball joint.
Heat treatment:	None required
Surface treatment:	Paint and bake
Number of parts:	Two per vehicle (right and left hand)
Alternate process:	Stamping
Annual Production:	More than 1,400,000

[1]Between bushing centers (fore-and-aft in vehicle position)
[2]Bushing centerline to ball joint centerline (lateral in vehicle position)
[3]Including bushings

Most product engineers are conditioned to look for hidden costs. They should also be aware of the counterpart to hidden costs, which may be more difficult to recognize: hidden cost savings. The cold forged upper control arm, Figure 6-5, which was originally conceived for light and medium duty trucks, is an outstanding example. The cold forged arm was lighter and stronger than its one-piece stamped counterpart, but not less costly to produce. The design freedom allowed by the forged arm resulted in substantial cost and weight reductions in related chassis components.

With the forged upper arm, the shock absorber mounts to a conventional lower control arm and passes through the upper control arm to the mounting point in the chassis. However, the steel stamping required a structural web, which did not provide room for the shock absorber. Instead the shock absorber was required to be mounted either fore or aft of the arm. Mounting the shock absorber inside the forged upper control arm not only allowed the use of a conventional lower control arm and spring, it also allowed the vehicle design team to reduce the chassis length substantially. Thus the weight reduction of approximately 0.91 kg (2 lb) was leveraged into a substantially larger weight reduction realized from the shorter chassis, and substantial cost savings.

Related designs on other vehicles are achieving similar success over Stampings. A mini-van application allows greater design freedom for styling, such as the aerodynamic front end. A front tension strut for the redesign of a passenger car achieves tight tolerances and good mechanical properties without requiring heat treatment.

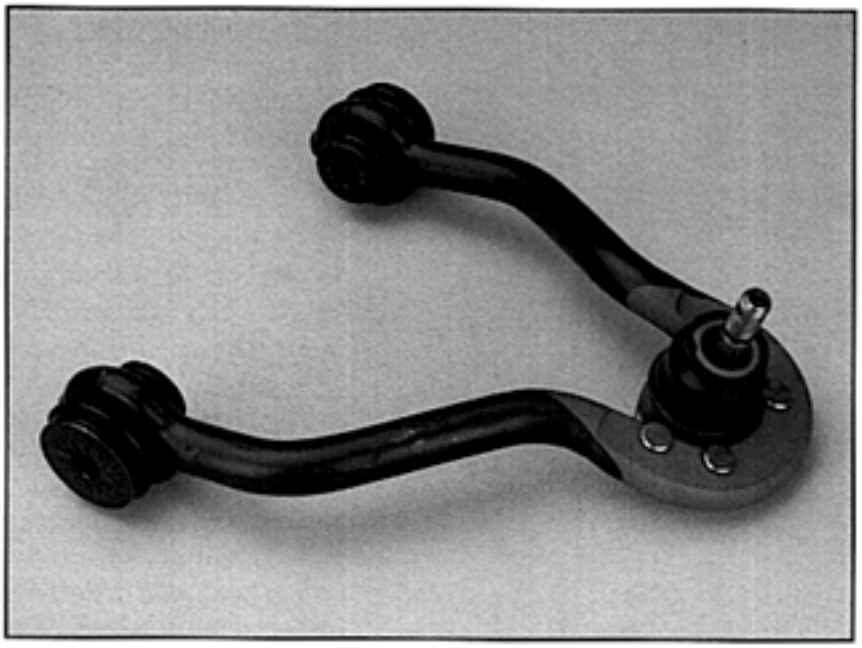

Figure 6-5