

6.2 Case Study No. 2 Socket Plate

Component name:	Socket Plate
Forging Process:	Hot impression die
Size, mm (in.):	108 x 95 x 17 (4.2 x 3.7 x 0.65)
Weight, kg (lb):	0.14 (0.31)
Alloy	Aluminum KN432
Tensile strength, MPa (psi):	345 (50,000)
Yield strength, MPa (psi):	215±20(31±3)
Hardness	100-119 Brinell
Elongation:	12%
Secondary Operations:	Machining
Heat treatment:	T4
Alternate process:	Casting
Annual Production:	More than 3,000,000

The socket plate, shown in Figure 6-2, is a vital part of air conditioning compressors installed on passenger cars. The plate replaces a crankshaft in the five cylinder reciprocating compressor, resulting in a more compact design that is easier to package in the engine compartment. Performance requirements were driven by a new family of compressors that handle newly developed, environmentally friendly refrigerants. The forged plate replaced a casting, which had failed during development.

The plate incorporates five sockets, which receive the five high strength steel connecting rods, and produces a precise reciprocating motion. The plate must offer high resistance to wear and galling because no lubricant compatible with the refrigerant was available. In addition to wear resistance, the forged plate offers ductility high enough to permit swaging without cracking, fatigue strength high enough to preclude microcracking at the base of the ball sockets, and metallurgical stability that ensured that the properties will be retained despite the thermal cycles encountered in the automotive underhood environment.

The forging company contributed to the program by developing both the forging process and material to optimize both the mechanical properties of the alloy and the dimensional tolerances of the plate. Prototypes were produced in production forging tools, since it was the only way to achieve all of the material properties required by the application.



Figure 6-2