

6.11 Case Study No. 11 Swing Ring Gear

Component name:	Swing Ring Gear
Forging Process:	Rolled ring (profiled) from hot press forged blank
Size, mm (in.):	
Forged:	5300 (208.5) O.D. X 467 (18.38) high
Finished:	5232 (206) O.D. X 413 (16.25) high
Weight, kg (lb):	
Forged:	17,597 (38,793)
Finished:	12,363 (27,256)
Alloy:	Steel: 4330 Vanadium modified electric furnace/vacuum degassed
Secondary Operations:	Finish machined
Heat treatment:	Quenched and tempered 302/341
Alternate process:	Casting
Annual Production:	30-40

The swing ring gear, shown in Figure 6-1 1, rotates the revolving frame on the top of the car body (track system) of a mining shovel. The gears were originally cast, but service life was not acceptable due to failure at the root of the teeth. The designers turned to forging to optimize fatigue life and impact toughness by developing a continuous grain flow in the ring profile. Vanadium modified steel was chosen to enable the forging company to develop the required mechanical properties while providing sufficient forgeability for the application.

The gear blank is rolled to shape and finish machined as follows:

Feature	Dimension, mm (in.)	
	-As Rolled	Finish machined
Outside Diameter	5296 (208-1/2)	5232(206)
Inside Diameter (stepped)	4521 (178)	4572 (180)
	4813 (189-1/2)	4864 (191-1/2)
Height	467 (18-3/8)	413 (16-1/2)

Gear teeth are subsequently machined into the outer diameter across the entire 413 mm height.

No attempts were made to produce prototypes; the designers were confident that the required properties could be developed by forging. The only concern was finding a forging company that could produce a profiled (versus rectangular) ring in the required size.

The forged gear has met all expectations by substantially reducing both repair costs and downtime.

Figure 6-11 Forging the swing ring gear.

