

### 6.3 Case Study No. 3 Countershaft

|                       |                         |
|-----------------------|-------------------------|
| Component name:       | Countershaft            |
| Forging Process:      | Upsetter forging        |
| Max O.D., mm (in.):   | 150 (6.0)               |
| Length, mm (in.):     | 400 (16)                |
| Weight, kg (lb):      | 16 (35)                 |
| Alloy:                | Steel, SAE 8620H        |
| Secondary Operations: | Finish turned, complete |
| Heat treatment:       | Normalized and cleaned  |
| Number of parts:      | One                     |
| Alternate process:    | Five piece assembly     |
| Annual Production:    | Approximately 1 00,000  |

The one piece countershaft is used in automotive powertrains. It was originally produced as three separate forgings: two gear blanks and a shaft with an integral gear. After each piece was forged, extensive machining was required on each to facilitate assembly. Two keys were required at assembly to secure the gear blanks to the shaft, as shown in Figure 6-3 bringing the piece count to five.

The one piece design, also shown in the figure, generated a substantial cost reduction by reducing machining costs, eliminating assembly cost, and eliminating the purchased and hidden costs associated with the keys.

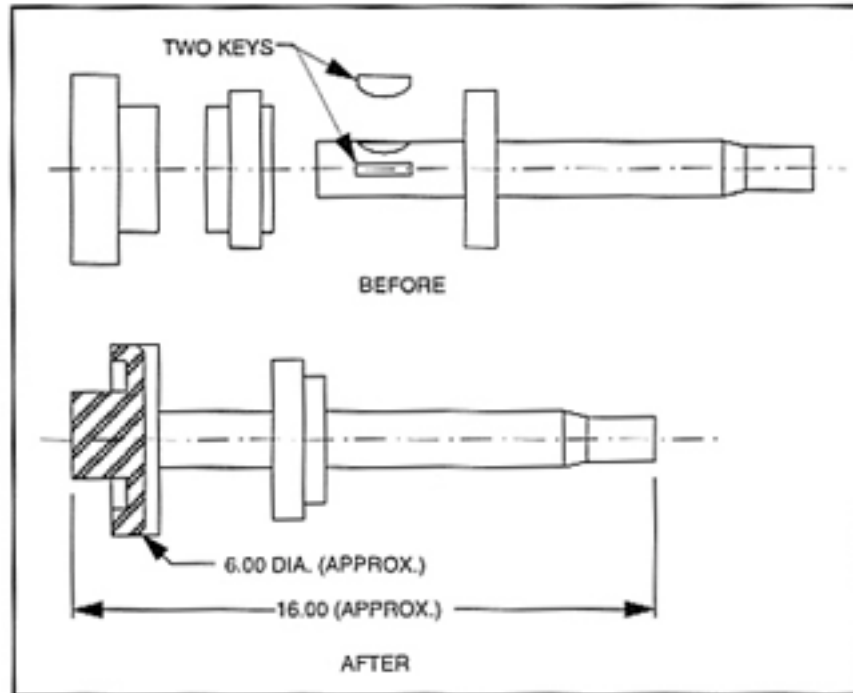


Figure 6-3