

INSIGHTS ON STATE-OF-THE-ART QUALITY CONTROL

Learn how semi-automated processes can reduce cutting time down to 90 minutes, when preparing crankshaft specimens for hardness testing.

By Lars Hagsted Rasmussen MSc,
Application Specialist, Struers

CRANKSHAFT

PREFACE

Quality assurance is a critical process in automotive manufacturing. Quality control ensures customers receive products that meet their needs and are free from defects. If quality assurance processes are not supported by appropriate quality control procedures or these are done insufficiently or in the wrong way it potentially can put customers at risk.

Manufacturers are under constant pressure to meet market demands for safety, operational stability, environmental standards, and durability while at the same time improving productivity and remaining competitive in a global market.

At Struers, we aim to support manufacturers in meeting these demands in the global marketplace.

Our range of technology and expertise helps manufacturers prepare, analyze and ensure the highest quality of raw and processed solid materials in the manufacturing process.

In this materialographic report, we describe the cutting procedure used to make 13 cuts of a crankshaft in order to create the desired downsized specimens for subsequent materialographic testing. This process takes 90 minutes to complete.



Lars Hagsted Rasmussen
MSc, Application Specialist, Struers

THE FIELD OF STUDY

Cutting a geometrically complex crankshaft is challenging. Numerous re-clamping procedures are time-consuming and it is difficult to align the shaft for multiple cuts.

Only very specific areas of the component are relevant for materialographic test. In this case, 13 cuts in the crankshaft are needed to produce the required materialographic specimens for quality control.

The use of standard clamping tools are often inefficient in this process when the aim is to bring down lead time of quality control results. However, automation is possible, when used in conjunction with custom-made clamping tools. This allows for a significant decrease in cutting time.



Exhibit 1: The result of 13 cuts to produce the required specimens for hardness testing.

Solution



Cutting
Axitom-5



Premium cut-off wheel
58A35

SEMI-AUTOMATED CUTTING OF A CRANKSHAFT IN 90 MINUTES

Cutting:



- Equipment: Axitom-5
- Cut-off wheel: Premium cut-off wheel 58A35
- Feed-rate: 0.5 mm/s
- Clamping: Customized jig and base plate (Cat. No. 06316908)

This cutting process uses a [Struers Axitom-5](#) and a premium cut-off wheel (58A35) to accommodate size and the need for a multi-cutting function. In this case, 13 cuts are needed to produce the required specimens for metallographic testing.

Clamping:

To overcome the difficulties in fixating the crankshaft, we developed a customised jig used in the first two cutting sequences and subsequently we used a standard clamping tool.

Cutting parameters:

To cut the crankshaft, several cutting sequences are needed. Multicut sequences are needed for the cross sectional cuts and one single cut for each of the cuts through the piston pin. The final cutting sequence was completed using base plate clamping tool (Cat. No. 06316908).

This shaft was cut with a standard feed-rate of 0.5 mm/s, but if the surface on the cross-section of the cuts is not important, feed-rate could be increased to 1.0 mm/s or more.

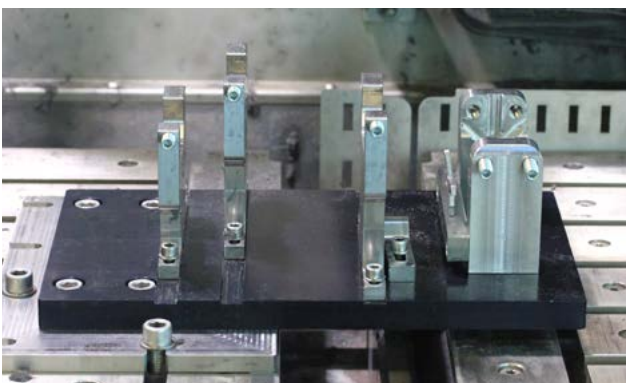


Exhibit 2: Custom fixture without crankshaft.

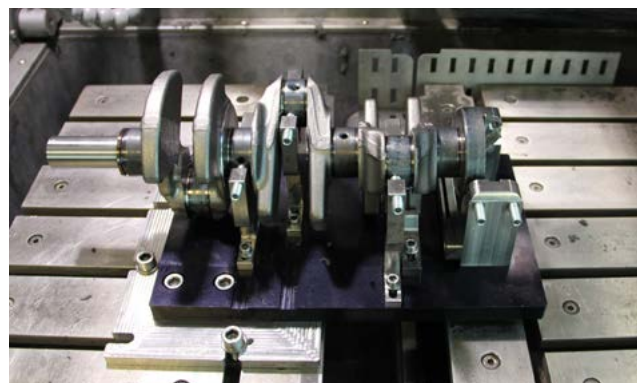


Exhibit 3: Fixture with mounted crankshaft ready for cross sectional cutting.

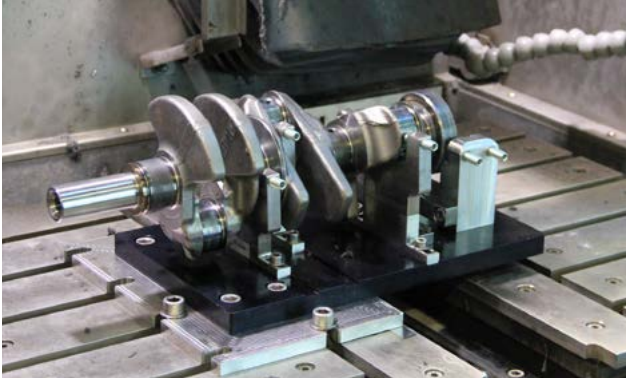


Exhibit 4: Fixture with mounted crankshaft ready for cross sectional cutting.



Exhibit 5: Cutting program for cross sectional cuts.

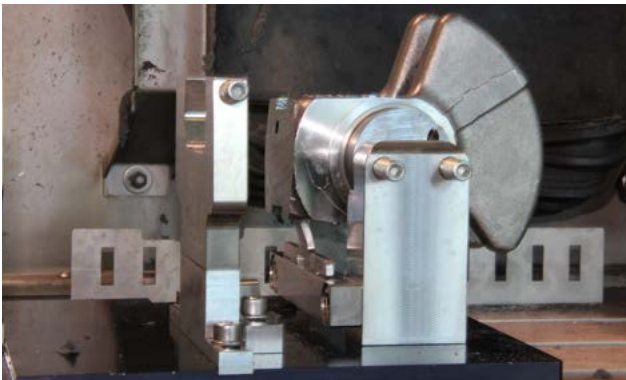


Exhibit 6: Setup for cutting the bearing surface.

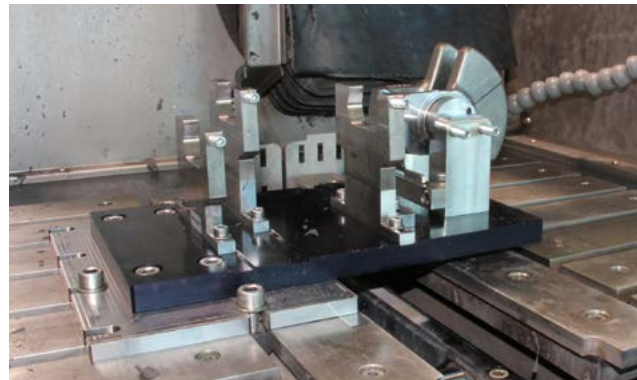


Exhibit 7: Setup for cutting the bearing surface.



Exhibit 8: Cutting program for cutting the bearing surfaces.



Exhibit 9: Final cuts are made with a baseplate clamp.

RESULT AND OVERVIEW

This fast semi-automated process is done in only 90 minutes and includes clamping tool fixation, re-clamping and the cutting operation.

A cutting process allowing better accommodation for the size of the item and the need for the multi-cutting function.

Customised jigs and standard clamping tools allow for precise alignment of the item in all 13 cuts, and the efficiently selected cutting method allows for fewer re-clamping operations. Once the cutting process is complete, specimens are ready for materialographic preparation.



Exhibit 10: The result of 13 cuts.

Solution



REACH OUT TO LEARN MORE

Concerned about Quality Control in the automotive industry?

[Feel free to reach out to me or other application specialists](#) for more information about this particular report or other quality control themes that might concern you.

[Visit us here](#) for more information about Struers and quality control in the automotive industry.



APPLICATION SPECIALISTS

Based on years of experience and expertise from a wide variety of industries, the Struers Applications Specialists team enables our customers all over the world to discover new opportunities for enhancing quality control, failure analysis and productivity, and to develop new applications and methods in order to meet evolving needs.