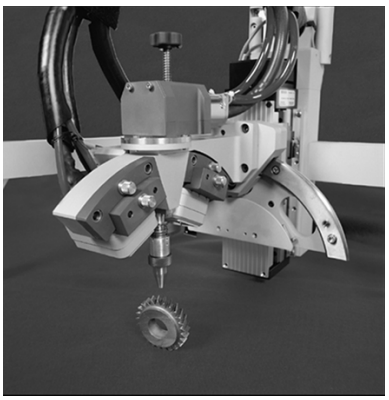
Retained Austenite Measurement Repeatability Tests



The TEC 4000 X-Ray Diffraction System

The Application Note, "Retained Austenite Measurements Using X-Ray Diffraction Techniques," described how the TEC 4000 X-Ray Diffraction System can be used to measure retained austenite in steels. A study has been conducted to determine the optimum measurement time to achieve repeatable results at the lower detection limits of the technique.

Retained austenite measurements can be performed on the TEC 4000 System in less than seven minutes. The system is set up to use chromium radiation to measure two austenite peaks and two martensite peaks. It is important to use at least two austenite peaks to check for preferred orientation and course grain size since these factors can lead to erroneous results. (Should these factors be present, the psi angle oscillation feature, described in the Application Note "Retained Austenite Measurements Using X-Ray Diffraction Techniques," of the x-ray diffraction analyzer can be used to minimize the harmful effects.)

A series of tests was performed to determine the measurement precision achievable for different lengths of time.

A National Institute of Standards and Technology (NIST) sample nominally containing 2 percent retained austenite (actual content - 2.07%) was selected for testing. Ten measurements each were made at 100 seconds, 200 seconds, and 400 seconds. Since the detection limit for retained austenite using x-ray diffraction is generally accepted as 0.5 percent, this limit was compared to the experimental results (Table 1). The average and standard deviation were calculated for each series of tests. Comparison of these results indicates that testing at 100 seconds for each of the four peaks (two austenite and two martensite) is sufficient for retained austenite measurements even at very low concentrations.

Table 1
2% Retained Austenite Measurement Repeatability Tests

100 Seconds	200 Seconds	400 Seconds
1.29	1.91	2.66
2.47	3.34	2.21
3.39	3.41	1.56
1.61	2.73	3.34
3.06	1.94	1.63
2.13	1.59	1.96
2.12	2.30	2.58
1.63	3.46	1.48
0.87	2.78	1.84
2.26	2.85	1.42
$x=2.08\pm0.77$	$x=2.63\pm0.67$	$x=2.07\pm0.63$

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