

SPRING FAILURE INVESTIGATION

1

A failure is received, this could be a spring, wire form or wire. All information given with the sample is examined: e.g. what type of environment the spring functions in, material grades, any in-house investigations, treatments on the materials such as nitriding, heat treatment or plating.



2

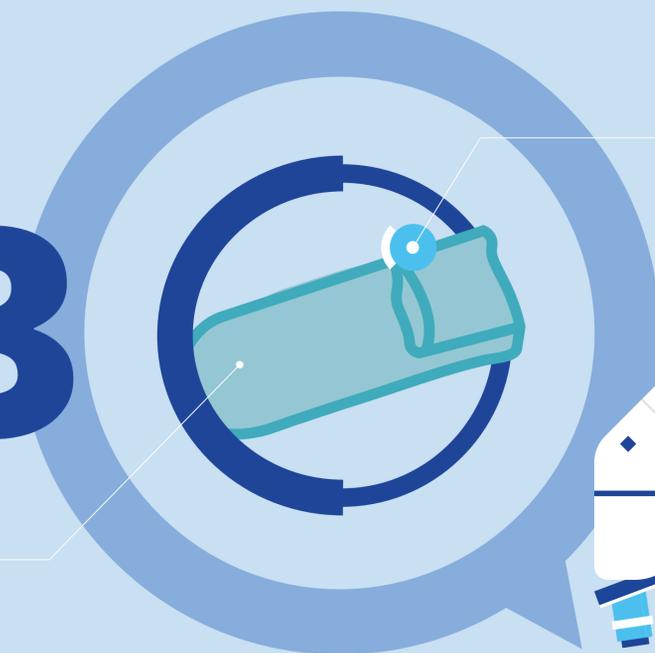
Photos are taken of the spring, including the fracture faces, taking note of any visible wear, corrosion, surface damage or cracking.

4

The sample is isothermally sectioned for further examination. The fracture faces are removed from the rest of the sample, being careful to not disturb the fracture itself, as well as a minimum of two further samples, taken away from the fracture faces.

3

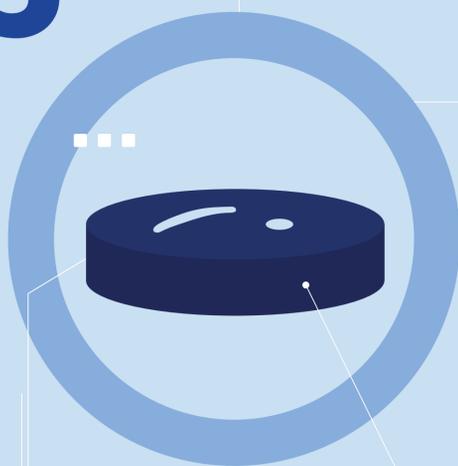
The fracture faces and surrounding wire are examined in more detail using a stereo microscope. Taking careful notes of any evidence which could help in determining the cause of failure.



Next, the samples are etched to reveal the microstructure of the wire. The etched samples are viewed under a microscope to determine if the microstructure is as expected for that grade, and there are no detrimental features, e.g. decarburisation.

5

The non-fracture face samples are then mounted in Bakelite. These are mounted in different orientations to expose the microstructure from two directions relative to the wire direction: transvers and longitudinal. The samples are then ground and polished to a 1 micron finish ready for further observations.

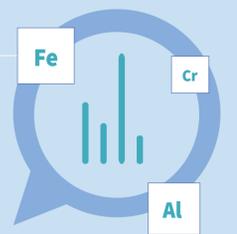


6

The polished sample is examined under a microscope looking for evidence of cracking, corrosion, material laps and inclusions etc. Any defects found on, or in, the samples are imaged and measured.

9

The fracture surfaces are mounted in a conductive compound ready for scanning electron microscope (SEM) imaging and energy dispersive x-ray (EDX) analysis. SEM imaging allows higher magnification images of the fracture surface to be taken, highlighting details that cannot be seen in an optical microscope. EDX uses the characteristic x-rays emitted by the sample to identify any contaminating elements or corrosive product which could have caused or accelerated failure.



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A hardness tests is also performed on the mounted samples. The results of which are checked against the mechanical properties outlined in the materials certificate and specification.



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After we have gathered all our findings a full failure analysis report is written and sent to the customer. Reports not only includes the root cause of failure, but we also aim to give recommendations to eliminate future failures.