Application Note RACCT9033

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Water Flosser Tip Stress Simulation using X-ray CT Scan

About the sample: Water flosser tip

A water flosser tip is one of many plastic parts we used in our everyday life. Water flosser tips are thin tube-shaped with one end slightly bent. The other end often has a groove to lock it into the water flosser. These thin or bent parts are weaker than other parts and often break first when stress is applied. Stress simulations are often used to study the mechanical strength of these parts and optimize their design. X-ray CT (computed tomography) can be used to scan the volume, not just the surface, of a part, and the scanned results can be used for stress simulation.

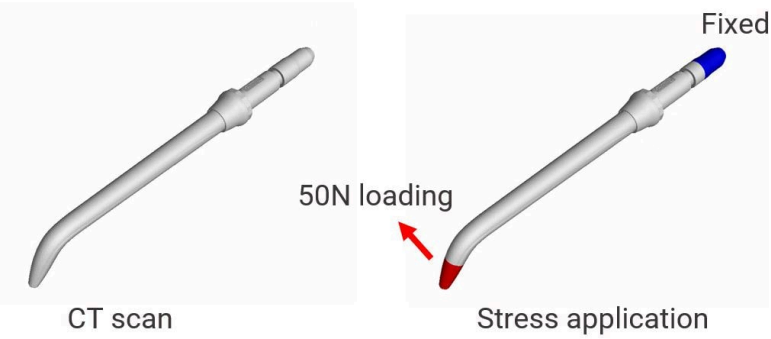
1. In this example, a water flosser tip was scanned using a micro-CT scanner, CT Lab HX.
2. The external and internal surfaces were detected using the ISO-50 surface determination technique to create a volume model.
3. Stress simulation was applied to identify mechanically weak points.

1. CT scan

A water flosser tip was scanned to produce the 3D grayscale CT image.

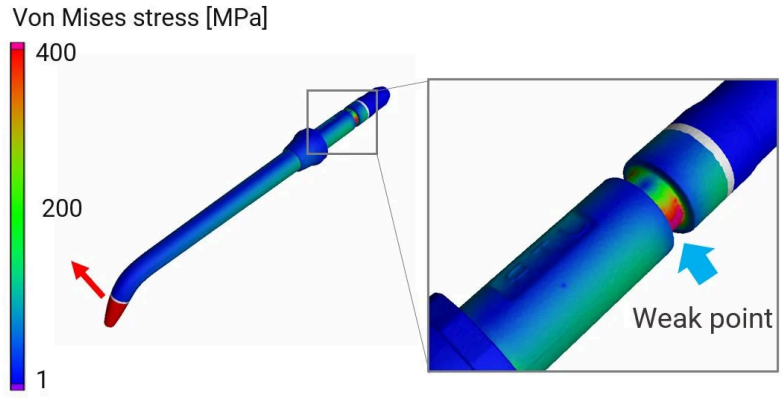
2. Surface detection

The external and internal surfaces were detected using the ISO-50 surface determination technique. A 3D rendering of the detected surface is shown on the left. On the right, the volume, to which stress of 50 N is loaded, is defined and shown in red. The volume that is fixed during the stress loading is shown in blue.



3. Stress simulation

The Von-Mises stress distribution was calculated. While most of the part is blue, indicating low stress, the thin neck is red, indicating high stress up to 400 MPa. This simulation shows the neck is the most vulnerable point that will break first under the stress used in the calculation.



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