Chip Detection for ShadowGage Sorters

ShadowGage Version 4.6.0 incorporates a newly designed Advanced Pixel Counter for the purpose of finding chips in small turned parts easily and accurately.

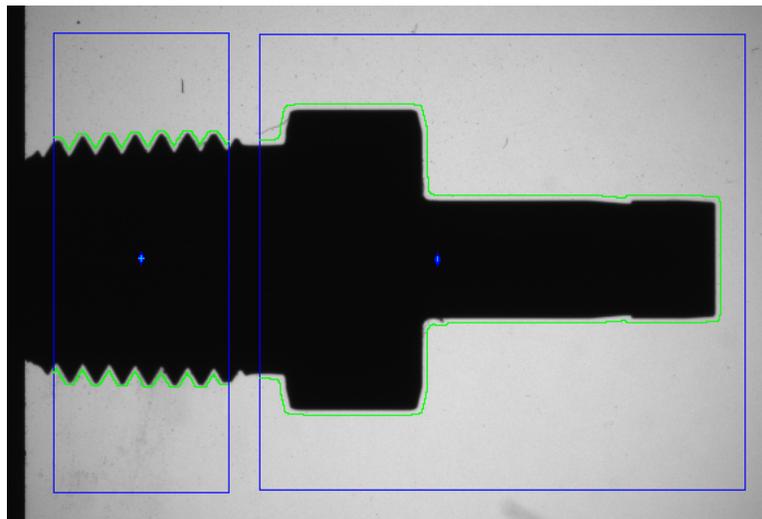The new tool operates by using a contour mask around the areas where chips may collect.

Figure 1. Two Pixel Counters deployed over the profile of a part.

As shown in Fig. 1 above, each pixel counter tool has a contour mask (green), easily created from the part itself. The contour mask is created by first finding the actual edge points of a part without any chips within the tool window (blue), and then expanding it by a user defined amount. Note that the mask on the left tool around the threads is tighter (0.005" expansion) than the mask on the right side tool (0.010" expansion).

Once the mask is obtained, each point in the contour mask is tested to see if it contains any black pixels. The tool reports the percentage of black pixels within the mask. Typically, a part without chips would produce a 0.0000 result. If a chip were to cross the contour mask at any point, the black pixels would create a non-zero result. Tolerances are then applied in the usual manner, usually with both LSL and USL set to zero.

Fig. 2 below shows how the tool picks up the smallest of chips wrapped around the part. The contour mask can be set as close as 0.002" away from the part.
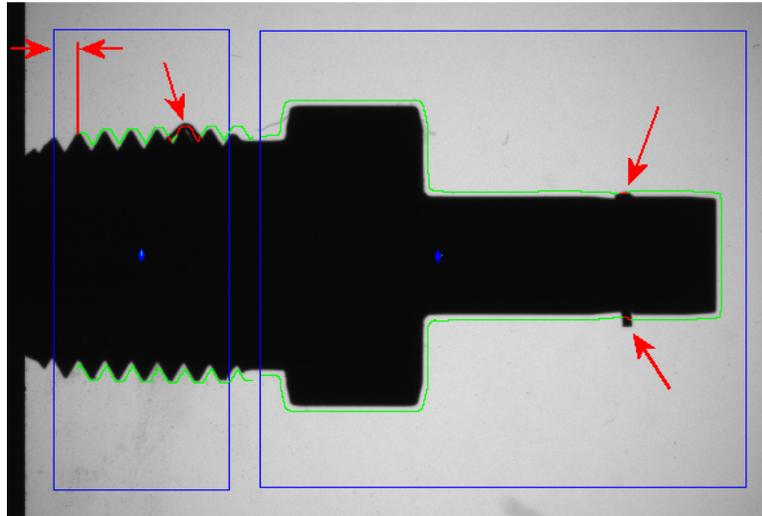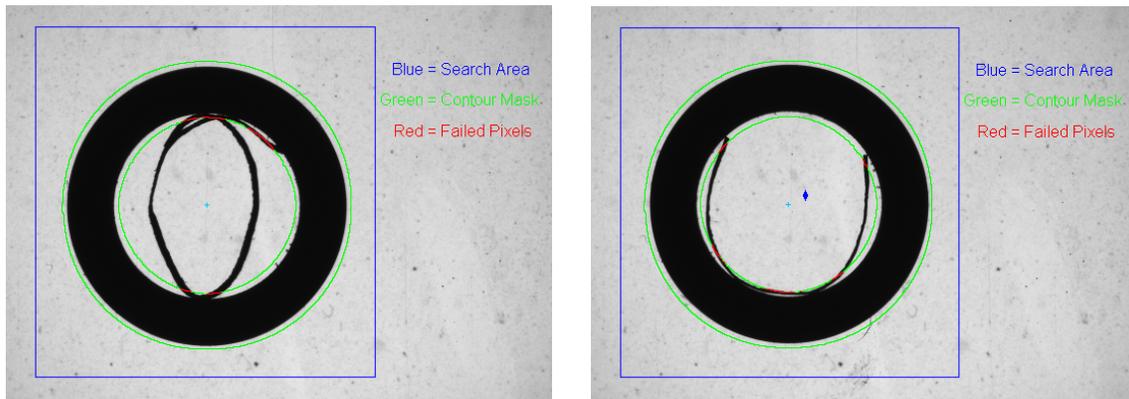

Figure 2. Small chips wrapped around the part.

The chip on the right side is fairly straight forward, anything wrapped around the part within the tool window (blue) would be detected by the contour mask. The pixels that detect the chip are shown in red.

Chips within a thread are a bit more complex, because the threads may not appear in the same position all the time. In this case, the tool provides a "Smear" feature. The contour mask is tested, and if the result is non-zero, it is shifted slightly to the right and tested again. The process continues until either a zero result is obtained, indicating that in this position of the contour mask no defects are detected, or until the user defined Smear distance is completed. Note the displacement of the contour mask to the tool window over the thread area. The Smear feature allows the contour to be tested close to the root diameter of the thread, as it can be seen that several mask pixels are red inside the threads.

Controls are provided within the tool to easily create the contour mask, as well as to program the Expansion, Smear, and Center of Mass tracking settings.

The tool can also be applied to the top view of parts which may have through holes with chips stuck inside.

The images above show examples of small chips within a through ID.

Note that the contour mask also includes the OD area, so any chips wrapped around the OD would also be detected.