



APPLICATION NOTE: 206

Application: Inspection of Hydraulic Brake Cylinder Castings

Problems: 1) Filled Core
2) Voids in the Sidewalls



Filled Core



Sidewall Voids

Solution:

Brake cylinder castings must be inspected prior to machining to detect two classes of defects. The most serious defect is that of the filled core. A part with a filled core must be removed from the production line before reaching the boring operation, or the defective part will cause catastrophic failure of the boring machine. The second defect of interest is voids in the sidewall. Here the casting is underfilled, leaving voids on the casting's inner wall that will still be present after the boring operation. The voids will cause faulty operation of the hydraulic piston in the finished product. A part with sidewall voids is to be immediately rejected so as not to waste machining time on a defective part.

To solve this problem, a dual mode lighting system was employed using both back and front lighting. A backlight was used for detecting the filled core defect, and an annular ringlight was used as a front light for imaging the sidewalls. Independent control over the two lighting modes made it possible to provide good uniformity over the entire surface area of the sidewalls, independent of depth. This simplified the sidewall void detection algorithm by improving contrast between the sidewall and the voids.