Inspecting

From cosmetics to semiconductors, all sorts of products must undergo inspection prior to shipment.
Different inspection methods are required with different sorts of products.
Examining and detecting in the micro-world.
This is also a job for Ushio light.

Finding 10 coins in a 600-km area within 60 minutes

During semiconductor production, the creation of 10-micron electronic circuit lines on the surface of a 30-cm (12-inch) silicon wafer could be compared to taking the entire Japanese archipelago, dropping it into a circle with a diameter of 3,000 km, and then drawing an uncountable number of 1-cm lines all across that surface. Inspection is an indispensable step in determining whether those lines have been drawn correctly.

The use of light in inspecting electronic circuit lines that have been drawn with light requires that the object being inspected be illuminated with light of an even shorter wavelength than that used for drawing, and then light that is reflected from the object's surface must be captured with high precision and the resulting image must be processed and analyzed using high-speed image processing technology. The precision and speed demanded of such inspection is said to be equivalent to that of finding ten coins scattered within a 600-km circle extending from Tokyo to Aomori with 60 minutes.

Ushio technology makes effective use of light properties such as reflection, transmission, absorption and projection to in inspection of things that cannot be seen, such as detecting scratches and defects in semiconductor circuit lines and television LCD screens or in spectroscopy to quantitatively analyze substances in solutions.

Replicating the light of the sun

On the other hand, "artificial sunlight" is the light that is used for inspecting the quality of products such as solar cells and cosmetics. Such products are inspected by using Xenon and metal halide lamps to illuminate them with light of constant intensity that is made up of wavelengths that mimic sunlight, and then evaluating characteristics such as UV discoloration and deterioration of strength.

Ushio's history of virtual sunlight technology goes all the way back to the 1970s, when it developed a large-scale solar simulator system for the National Space Development Agency of Japan (NASDA, currently JAXA) as part of the Sunshine Project. From nano-level semiconductors to the limitless possibilities of space development, wherever confidence and safety depend on inspection, Ushio takes charge with light.

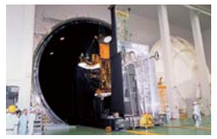


Photo courtesy of JAXA

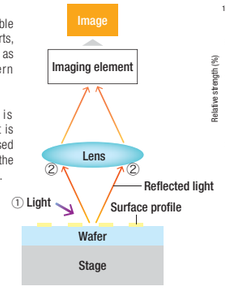
Solar simulator
Solar simulator completed in 1975 for the National Space Development Agency of Japan (NASDA, currently JAXA). For the time, this was a large-scale system, using an array of 19 of the world's largest 30-kilowatt water-cooled high output Xenon short-arc lamps in a horizontal irradiation configuration.

"Inspecting with light" The Mechanism

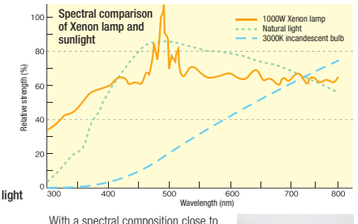
Semiconductor device circuit pattern inspection (inspection by image processing)

① Irradiation with deep UV, UV, or visible light is used in detecting circuit shorts, opens, and thickened leads, as well as surface contaminants and pattern breaks.

② The surface to be inspected is illuminated and the reflected light is enlarged with lenses. Light is focused onto an imaging element, and then the image is enlarged to allow inspection.



■ Light fastness testing



With a spectral composition close to that of sunlight, the light produced by Xenon lamps allows indoor UV degradation inspection regardless of weather.

Xenon lamp

USHIO USHIO INC.