

Early 1990s

Transition to 200-mm (8-inch) wafers

~Process Technology ~

The 200mm (8 inch) processing equipment began to appear from around the time of vertical furnace release by Kokusai Electric in 1988. A 200mm vertical batch LPCVD equipment was released from the same Kokusai Electric in 1986, and the preparation for the 200mm shift was starting. In 1991, the release of various equipment continued, such as fully automatic coater/developer from Tokyo Electron, an ion implanter from ULVAC, a vertical epitaxial equipment from Kokusai Electric. This is a proof that the transition and process improvement of 200mm progressed largely in the 1990s. Many of the Japanese semiconductor companies which were dominant in the global market at the time built 200mm factories in the early 1990s; NEC in Kyushu, Hitachi in Kofu, and Toshiba in Yokkaichi.

Meanwhile, in the case of 200mm, reduction of human operations by full automatization became an important theme in order to cope with particle contamination problems and handling of heavier weight wafer cassettes, and the joint efforts of both device manufacturers and equipment manufactures were made against the two-fold requirement of automatization and large diameter wafer processing.

Temperature variations in high-temperature processes, and the temperature drop due to convection during insertion/removal of wafers at diffusion/anneal/ LPCVD became problems in the large diameter processing. As a result, a vertical furnace shaped like a turned down bowl appeared and was adopted.

This vertical furnace also had the merit of being able to handle automation by horizontal movement compared with a horizontal type furnace in which the wafer is vertically placed. Also, in LPCVD, thermal distortion and film thickness uniformity variation in the wafer became problems. Especially in complicated processes such as doped poly-silicon and high-temperature oxide film, a special boat (disk holding type) was devised to improve the gas flow uniformity, and a single wafer processing apparatus was devised, but the reduction in productivity could not be completely solved.



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Vertical diffusion furnace