

Danger of Miscarriage Found for Chip Workers

By JOHN MARKOFF

Special to The New York Times

SACRAMENTO, Calif., Dec. 3 — Women exposed to certain chemicals while working in the nation's semiconductor factories face a significantly higher risk of miscarriage, a broad industry-financed study has found.

The study is the third in four years to find that a class of chemicals called glycol ethers — widely used in the process of etching microelectronic circuits on semiconductors — have toxic side effects.

The three-year, \$3.8 million study was conducted by researchers at the University of California School of Medicine at Davis and found a 40 percent higher incidence of miscarriages among women workers exposed to chemicals in the chip-making process, compared with other women in the industry.

The study also found a 30 percent lower pregnancy rate among women exposed to the chemicals, compared with women working on other jobs in the industry. But researchers said they did not understand the cause of the disparity.

The semiconductor industry employs 225,000 workers, about 35,000 of whom work in so-called clean rooms where the chemicals are used. About 70 percent of the clean-room workers are women.

Industry Outlines New Steps

The Semiconductor Industry Association, which financed the research, responded to the study by saying today that it would introduce new technology to minimize worker exposure to potentially hazardous chemicals; recommend that its members accelerate efforts to eliminate the use of glycol ethers, and recommend that companies share information about technologies that offer safe alternatives.

The association also said it would form a task force of industrial-hygiene and medical experts to make specific additional recommendations by the end of March.

"We believe it's an excellent study," said Craig Modahl, a health and safety manager at the Intel Corporation and chairman of a Semiconductor Industry Association task force on the issue.

"We believe we have good controls," he said. "Clearly, the controls need to be better. The days of ethylene-based glycol ethers are numbered."

The chemicals are also used by thousands of workers in other industries, including aerospace and printing.

Companies Briefing Workers

The association executives also said member companies were briefing their workers today about the health risks found in the study. Several companies, including Intel and the International Business Machines Corporation are permitting women workers who become pregnant to take other jobs outside of chip fabrication areas.

Mr. Modahl of Intel would not be specific on how quickly glycol ethers

would be phased out of the production process for the entire industry. He did say Intel's most advanced chip-making factories, as well as I.B.M.'s, are already using alternative chemicals.

"We know that these alternatives have been available for some time," said Ted Smith, executive director of the Silicon Valley Toxics Coalition, an alliance of environmentalists and community and worker groups. "It shows that the industry cares more about the next generation of chips than they do about the next generation of children."

Mounting Evidence

A previous study in 1988 at the Digital Equipment Corporation and a report this past October by I.B.M. on its own chip factories have shown similar results.

The study, the most comprehensive yet of the health of workers in the chemical-intensive semiconductor industry, presents a significant challenge

An industry study cites a widely used chemical.

to the nation's chip makers, which for more than three decades maintained that theirs was a clean industry.

Members of the Davis research team said, however, that they believed the semiconductor industry has lately been responding to the health threats to its factory workers.

"I can tell you about a lot of other industries where you wouldn't get your foot in the door, and you wouldn't get a nickel for this kind of study," said Marc B. Schenker, professor of medicinal and chief of the division of occupational and environmental medicine at the Institute of Toxicology and Environmental Health, at the University of California at Davis.

How Study Was Conducted

One component of the study tracked approximately 900 women semiconductor workers who became pregnant at some point during the three-year study period. Among women not exposed to the chemicals, 10 percent, or 45 of the pregnant women, had miscarriages. Among women whose jobs involved exposure to the chemicals, 14 percent, or 63 women, had miscarriages.

The researchers noted that because of rapid technical progress in the semiconductor industry it was difficult to pinpoint exactly which chemicals were linked to the increased miscarriage risk. The production process in the plants that were studied was frequently changed during the course of the study, they said.