

Inside the microchip incubator

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A Globalfoundries engineer walks past a facility used for coating wafers with a photo-sensitive material in Dresden. Jeff Topping / The National

DRESDEN // The yellow glow beckons at the end of the long tunnel leading to the heart of the Globalfoundries microchips plant.

But any comparison with the classic near-death experience is quickly rebuked by the company spokeswoman, Karin Rathe: “It’s not death. The clean room is life. Atomic life.”

It is a life in which Abu Dhabi has invested billions as part of its strategy to move its economy away from reliance on oil revenues and towards leadership in the lucrative microchip industry.

Advanced Technology Investment Company (ATIC), which is owned by the Abu Dhabi Government, bought a 65.8 per cent stake in what is now Globalfoundries in March last year from its US partner Advanced Micro Devices (AMD) for US\$2.1 billion (Dh7.71bn).

ATIC recently increased its investment in Globalfoundries to 73 per cent and plans to buy the company outright and establish the emirate’s own foundry for specialised microchips.

The clean room is a very fragile life, zealously guarded.

To ensure no contaminants are carried in to spoil the delicate semiconductor wafers from which the microchips are produced, everyone entering the complex in the idyllic German countryside has to strip down in the locker room and don a hair net, a T-shirt and tracksuit to wear under a hooded jumpsuit, a cloth face mask, two sets of gloves and an unfashionable pair of white trainers.

A sterile “bunny suit” covers the lot.

Specially made notebooks and pens are provided by the company to be used inside the high-tech laboratory, where the company produces the brains behind every electronic device sold today.

There are three clean rooms in Dresden, each about two football fields in size and each built on top of a concrete base, which in turn was built on a granite foundation to stop the slightest seismic activity disturbing the wafers.

The clean rooms are divided into two areas. The first is lit with a yellow hue that protects the wafers, in much the same way red light protects exposed film, as the basic microchip designs are etched on to the silicon discs.

The second area is lit normally and is where the various layers for the final microchip are built.

The silicon discs are carried across the clean room on a rail system hanging from the roof. Each transporter uses sensors to pick up the black boxes that hold 25 wafers each.

Hundreds of engineers work in the clean room but they rarely handle the wafers. Instead, they monitor the high-tech “tools” spread out across the clean room, where expensive electron microscopes inspect each disc for impurities.

The tools are bland-looking machines connected to a customised version of Windows XP. Each performs several of the thousands of tasks that go into making a microchip, and each is worth between \$10 million and \$30m.

The microchip recipe is a closely guarded secret. None of the tools or processes can be specifically described for competitive reasons.

How many chips are produced on a wafer, how many wafers fail quality inspections and how long it takes for a wafer to go through the clean room process are all trade secrets.

These secrets are worth billions to Abu Dhabi. ATIC recently announced a \$3.6bn investment to expand the capacity of its Globalfoundries business, increasing monthly production of semiconductor wafers at Dresden to 80,000 from 30,000.

The expansion would make Globalfoundries the second-largest microchip foundry in the world behind its chief rival Taiwan Semiconductor Company (TSMC) and ahead of United Microelectronics (UMC).

“The past year has ... really accelerated the whole pace of our build-out of the industry, of where we want to be in terms of market position and how we can service our customers,” said Doug Grose, the chief executive of Globalfoundries.

Mr Grose acknowledges the company is not yet profitable. Globalfoundries is relying on the support from ATIC to ensure its long-term success.

“It’s about capacity on one hand and demand on the other,” Mr Grose said. “Filling that will get you the revenue growth that you need to stay ahead of [UMC] and close the gap with TSMC.”

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