

India to make chips; Chip wars between China & the West

July 11, 2023

July 10, 2023: Bengaluru, India: Taiwan's **Foxconn** said on Monday it has withdrawn from a \$19.5 billion joint venture with Indian metals-to-oil conglomerate **Vedanta**.

Rajeev Chandrasekhar, the Union Minister of State for Entrepreneurship, Skill Development, Electronics & Technology, said,” This decision of Foxconn to withdraw from its JV with Vedanta has no impact on India's Semiconductor Fab goals. Both Foxconn and Vedanta have significant investments in India and are valued investors who are creating jobs and growth. While their JV VFSL had originally submitted a proposal for 28nm fab, **they could not source appropriate Tech partner for that proposal.**”



The Indian Minister said that Vedanta thru VFSL has recently submitted a **40nm fab proposal backed by Tech licensing agreement from a Global Semicon major**. He added that the proposal is currently being evaluated by **India Semiconductor Mission** of Government of India.

Foxconn and Vedanta signed a pact last year to set up **semiconductor and display production plants** in Gujarat, India through **Vedanta Foxconn Semiconductor Ltd**

(VFSL). Foxconn has said that it was working to remove the Foxconn name from what now is a fully-owned entity of Vedanta.

While Narendra Modi considers chipmaking a top priority for India's economic progress, the grave shortage of availability of chips during Covid 19 epidemic have woken up the west to the strategic importance of semiconductor technology.

July 3, 2023: Beijing: **China Retaliates** through Export Curbs **wef August 1, 2023:** China, as the world's largest source of gallium and germanium compounds used in manufacturing of semiconductors, has imposed restrictions on their export. This is in **retaliation to the US restrictions on China's access to high-end chips and tools.**

The **subsidies from the Government of China** for high-tech industries and the **Economies of Scale of Chinese Companies**, in mining and processing of the **critical metals**, have made the production costs and sales price of these products such that no foreign company could compete with the Chinese companies. This progressively led to a **monopoly by China.**

***Gallium** is a soft silver metal used to produce compound **semiconductor wafers for electronic circuits, semiconductors and light-emitting diodes.** Germanium is used in the manufacturing of **fiber optics** to transfer data and information.*

July 6, 2023: **Japan Secures Supply Chain of Critical Metals:** Other countries have now decided to secure their own supply chains and build up their **domestic chip industries**, focusing on areas where they are traditionally strong. Last week, a fund **backed by the Japanese government** proposed a **\$6.3 billion acquisition of semiconductor materials giant JSR**



Yokkaichi Clean Room at the JSR Research Center

*JSR Corporation has utilized the polymer technology cultivated over many years in the petrochemical business to develop **materials used in semiconductor manufacturing**, such as **photoresists** for circuit formation and chemical mechanical planarization (CMP) materials which are indispensable in the process of multi-layer wiring configurations in semiconductor production.*

Restraining Sale to China of Advanced Machinery for Semiconductor Chips: On **October 7, 2022**, the U.S. launched sweeping new U.S. rules, according to which, companies must apply for a license if they want to sell certain advanced computing semiconductors or related manufacturing equipment to China. The measures may **impede China's plans to boost its domestic technology industries**.

On October 10, 2022, CNBC reported that the **Chinese chip stocks tumbled sharply** as these curbs were announced by USA.

Reference: <https://www.cnbc.com/2022/10/10/chinese-chip-stocks-tumble-after-us-calls-for-new-curbs-on-high-end-tech.html?&doc=107265946>

The U.S. has also lobbied key chipmaking nations and allies, like the Netherlands and Japan, to introduce export restrictions of their own.

October 7, 2023: **Stopping Supply of Critical Machinery to China:** The Netherlands responded Friday with **new export restrictions** on advanced semiconductor equipment. This will effectively bar **Advanced Semiconductor Materials Lithography** (ASML) from exporting to China. ASML, [one of the most important semiconductor companies in the world](#). ASML, a subsidiary of Philips, located in the southern Dutch town of **Veldhoven**, near the border with Belgium, is the **only factory** capable of assembling a **revolutionary machine** that's relied upon by the world's biggest chipmakers.

ASML has sold a total of about 140 EUV systems in the past decade. The price tag for its next machine, called '**High NA**' (<https://www.cnbc.com/2021/12/10/asmls-high-na-euv-lithography-machine-is-set-to-transform-chipmaking.html>), will be more than \$300 million.

Today, ASML sells the machines to only five chipmakers. The biggest three — Taiwan Semiconductor Manufacturing Co., Samsung and Intel — made up nearly 84% of its business in 2021.

One country ASML won't ship its EUV technology to is China.

"Forty-two countries around the globe have agreed to put export control measures on China because Semiconductor Chip Technology is so critical," Wennink of ASML said.

ASML does refurbish older lithography systems, called Deep UltraViolet (DUV), and sends many of those to China. **Note:** DUV lithography machines were available from three companies: ASML, Nikon and Canon. While Nikon, in Japan, is still a competitor in DUVs, ASML is the only option for EUV. Experts say **it could take decades for any other company to catch up** with ASML.

Wennink said 96% of all machines ASML has ever sold are still working.

INTERESTING INTERDEPENDENCE: EUV machines are made up of several modules with hundreds of thousands of components, from nearly 800 global suppliers. Each module is built at one of ASML's 60 locations (*shown in the map below*) and then shipped to **Veldhoven** for assembly.



Reference: <https://www.asml.com/en/company/about-asml/locations>

While ASML would not sell EUVs to China, some of the modules of every EUV are made at ASML offices at Beijing, Shenzhen, Hong Kong and Shanghai in China also.

After each assembled machine is tested, it's disassembled for shipment to a chipmaker. The shipping requires 20 trucks and three fully loaded Boeing 747s.

Extreme Ultraviolet (EUV) lithography is the most expensive step in making the advanced microchips that power data centers, cars and iPhones.

ASML has a monopoly on the fabrication of EUV lithography machines, the most advanced type of lithography equipment that is needed to make every single advanced processor chip of today. Each of the JSR machines is among the most complicated devices ever made.

EUV stands for, an incredibly short wavelength of light that ASML generates in large quantities to print small, complex designs on microchips. The EUV light is created with tiny explosions of molten tin happening at extreme speeds and then bounced off unique Zeiss mirrors that ASML says are the flattest surface in the world. A small percentage of the EUV light particles reach the surface of a silicon wafer, where they print the minuscule designs that determine what each chip will do.

Editorial Comments by www.DiGiNews360.com

*It may be of interest to the readers of www.DiGiNews360.com to learn that the **FT Business Book of the Year** was awarded to “**Chip War**”, a book by **Chris Miller**. The book describes the decade-long battle **to control** one of the world's most critical resources – **microchip technology**—with the **USA and China in fierce competition**.*

*About **EUV lithography machines**, Miller says, “When the industry was getting ready to jump into the early stages of EUV research, none of the U.S. firms were ready to invest in an expensive and risky proposition, whereas ASML was.”*

Regarding India's new efforts to begin the production of semiconductor chips in India: www.DiGiNews360.com would like to recall that during the seventies, Indira Gandhi's 'socialism-oriented' government did not permit the American companies to establish IC assembly plants in India for using its cheap labor

Taiwan and South Korea began with such plants and are today's super-powers of Design and Manufacturing of Semiconductor Chips. China also began in 1985 with such plants. (Today robots are eliminating the need for large labor force for assembly.)