

Local partner. Global expertise. Linde LienHwa's view of the semiconductor industry and our commitment in Mainland China

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As a global material provider that has grown with the semiconductor industry from its beginning, Linde LienHwa has experienced the tremendous development and expansion of the past fifty years. Moore's Law is often cited to explain the push side of this growth driven by rapid technical progress. The economic side has not been as smooth, however, and has been punctuated with periodic overcapacities and significant business downturns.

This has changed over the past decade, and we see the electronics industry much more integrated into the global economy and woven into the fabric of our lives. New economic growth now depends upon continuous development from the semiconductor sector and pulls innovation to enable the major economic growth trends of artificial intelligence and deep learning, data and sensing intensity, and pervasive connectivity. As an industry, we no longer drive our own growth as much as respond to the overall economic demand for growth.

Looking to the local market, the recent initiatives for planned, accelerated electronics growth in China present many opportunities and a few challenges for us. 2017 saw an unprecedented number of new semiconductor and display projects launch in China. While the scale of the investment does raise questions about risk and capacity, we think China's commitment to the Big Fund initiative is strong.

China is the largest single geographic market for electronics materials, and supplying its rapidly growing demand requires experience, scale, and commitment. International chip manufacturers are looking for copy-exact technology transfers, including their materials supplies. Meanwhile new domestic manufacturers need to start entirely new supply chains. As an electronic materials supplier, Linde LienHwa must meet the needs of both groups with new solutions.

Building upon a long-established presence in China as an on-site and bulk gas provider with many points of presence, Linde LienHwa has the knowledge of supplying materials over larger distances with distributed centers of production and service. Part of our product offering is on-site nitrogen generators and bulk gas installations, which must be executed at the same time as new fabs are built. We have been quite successful in winning our share of this business, and are therefore investing with our new customers from the beginning of the projects.

The on-site and bulk gas installation projects also begin our customer relationship building for sales of the special gas materials which are used once manufacturing commences. While bulk gas installations are an upfront capital investment agreed with the customer at the start of their project, special gas sales are won and lost every day based upon the value we demonstrate to our customers.

The China electronics market is fostering not only new semiconductor and display manufacturers, but also new raw material and production opportunities. Meeting all the electronics materials needs of customers requires a combination of local production investments, established international sources, and developing partner domestic sources to deliver a fully integrated and comprehensive supply chain. The requirements are not simply the delivery of a material from Point A to Point B. Instead, customers need quality assurance with leading-edge analytical capabilities and ship-to-control practices; product stewardship, which ensures safety of materials along their entire life cycle, and support for customer facilities; and logistics expertise spanning international and domestic permitting, certification, and business continuity planning.

At SEMICON China 2018, Linde LienHwa looks forward to showcasing our recent developments and investments as well as our established capabilities. Starting with our on-site nitrogen generator technology, Linde LienHwa brings industry-leading capability for variable capacity, energy efficiency, and product purity. Other than silicon wafers, nitrogen is the largest material spend many semiconductor fabs will make over the lifetime of the facility, and it is essential that customers have the best technology available.

We will also be discussing our investments for special gas production for key materials like nitrous oxide, which will see high demand growth especially from new OLED projects. Linde has pioneered the package plant technology used to produce electronics-grade nitrous oxide, and with them, we have built capacity throughout the East Asia region. By investing near our customers, Linde LienHwa creates local primary supplies with a robust secondary supply chain.

Many of our products like dopants and lithography laser gases are highly precise blends of materials. At our booth, we will explain our expanding capabilities for these products, and the technology required for blending, package preparation, and analysis. Customers depend upon the precision of our processes to enable their own high uptimes and yields.

As a material supplier, Linde LienHwa is the quality gatekeeper of the supply chain, and we create the quality value between raw material sources and electronics manufacturing. Our quality requirements extend beyond our facilities, and we will highlight our new development of fingerprinting chemical analysis. This allows us to record broad spectrum data of potential unknown, trace impurities. Linde LienHwa uses this process to detect variability throughout the supply chain, and can also be referenced when a customer's process shows unexplained variability.

2018 begins with the tailwind of an exceptional year of growth throughout the electronics industry and an unprecedented portfolio of new projects in Mainland China. We welcome our customers and industry colleagues to join Linde LienHwa at SEMICON China 2018 for discussions about how together we can grow even further. We remain committed to our motto: Local partner. Global expertise.