EPI gears up for future industry growth

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Amongst the pioneers of the custom epi-wafer business back in 1988, Epitaxial Products International (EPI) is now enjoying the explosive growth of the compound semiconductor industry. The company has just embarked on a major expansion that will more than quadruple its production capacity.

Rapid sales growth has prompted Epitaxial Products International (EPI) to embark on an expansion programme that will more than quadruple the production capacity at its plant in Cardiff, UK.

Work is already well advanced on extending its plant to nearly 3720 m², which will in turn allow the stepped introduction of a further ten metal organic vapour phase epitaxy (MOVPE) reactors, extending EPI's phased resources to 16 MOVPE units. Additional measurement equipment is also on order to boost the existing range of characterization equipment.

The expansion will focus on the large-scale foundry manufacture of epi-wafers for use in the fast growing markets for high brightness LED, solar cell, laser, HBT and pHEMT applications. The company has been conducting development work for these markets for quite some time and, now that it has products available for commercial use, is ready to ramp up production to meet demand.

The new product lines have been designed to complement EPI's existing range of custom III-V epi-wafers for optoelectronic and electronic applications. Major existing product lines for the company include: wafers for telecommunication lasers, LEDs and detectors; AlGaAs lasers for CD-ROM and many high power applications; visible wavelength lasers and ultrahigh brightness LEDs. EPI says it is now the largest merchant producer of epi-wafers for visible lasers, as well as being the first merchant supplier of epi-wafers for vertical cavity surface emitting lasers (VCSELs).

Solid foundations

The expansion programme is the reward for the considerable effort the company has invested in developing its business since its foundation in July 1988. From its modest beginnings, initially aimed at commercializing InP epi-wafers, EPI now boasts approximately 100 customers worldwide. Its 1997 sales, to a mix of large electronics firms, small and medium enterprises (SMEs) and government research laboratories, totalled more than US$11 million and the company is experiencing sales growth of more than 30% this year. Orders booked in 1998 are already more than 70% up on the same period last year.

"A lot of the growth (sic) is coming from our existing customers, but there are definitely several new entrants, many of which do not want to take on the expense and responsibility of getting involved in epitaxy when they can access state-of-the-art materials technology very effectively from companies like EPI," says managing director, Dr Drew Nelson. "What is exciting is that the III-Vs industry is coming of age, with the market for several products growing very rapidly."

EPI is very much an international company. The company's biggest geographic market is North America, which takes 50% of its production. This is followed in importance by the Far East and Japan, which accounts for 30%, while Europe, together with the rest of the world, account for the remaining 20%.

Figure 1. EPI has begun an expansion programme that will more than quadruple the capacity of its Cardiff, UK, facility.
While this broad coverage poses some management challenges, Nelson says the company is well equipped to meet them. From the outset, EPI has been a global supplier of custom epi-wafers to the compound semiconductor industry, with sales and support organizations in the major technological regions of the world, he says. An example of the manner in which EPI deals with such challenges is its policy of pricing all of its products in the local currency of its customer. The company says this is an approach that has double benefits for its customers, combining the price stability of local supply with the expertise and technology of an internationally recognized industry leader.

The importance of the North American market to the company is further underlined by EPI’s recent measures to expand its presence in the region. The company has recently enhanced the technical support available at its subsidiary company, Epitaxial Products Inc, in Londonderry, New Hampshire, USA. This expansion has seen Dr Paul Rees relocate to the New Hampshire site. The company anticipates opening a production facility in North America in the near future, and is currently looking for a site to establish such a facility in the USA. “We are in detailed discussions at the moment and we want to firm up on finalizing our options pretty quickly”, Nelson says. “If all goes to plan, we should be in production in the USA during 1999. This reflects the company’s growth and our need to work closely with our customers to get them exactly what they need.”

Technology leadership

EPI has long been recognized for its high level of technology and the company commits significant resources each year to maintaining this position. It has taken part in many collaborative programmes with considerable success.

A good example of this has been the recently completed pan European GAMMA project, involving many of Europe’s leading GaAs foundries, such as Siemens, Thomson, United Monolithic Semiconductors, GEC Marconi Materials Technology and Philips. Through the two-year programme EPI has developed a state-of-the-art GaInP HBT capability, as demonstrated by the results achieved compared with the very best HBT epi-wafers currently available worldwide (Figure 2). EPI is now marketing this product worldwide and aims to have a 6-inch HBT capability in place by Q2 1999.

The company’s long history of involvement with GaInP/AlInP has also allowed EPI to demonstrate high efficiency Dual Junction Solar Cells with AMO efficiency of more than 22%. Again, this clearly demonstrates the expert materials capabilities of the company, which it plans to exploit to the full in the expanded production facilities now coming on line.

EPI has a variety of ongoing development programmes, including high performance visible lasers at 635 nm, ultra high brightness LEDs to 560 nm, GaN for blue emitters and high temperature electronics, and InGaAsN for 1.3 µm emitters and triple junction solar cells.

In addition, EPI is continuing to build on its leadership in the supply of wafers for VCSELs. EPI was the first epi-wafer supplier of these complex structures for both infrared (750 and 850 nm) and visible VCSEL wafers. Indeed, EPI’s customers have reported world record-breaking results for both wavelength ranges. Furthermore, the development programme on InGaAsN should enable the operating wavelength to be extended to 1.3 µm.

Production resources

EPI’s expansion will extend its commitment to MOVPE, although Nelson says the company does not rule out using other epitaxial growth methods. “We are not closed to using any technique, if it is more efficient and cost effective”, he says. “But our view at the moment is that MOVPE is the most flexible technique. It can handle a wide
EPI is also moving as much as possible to automation and to cassette-to-cassette handling to further improve efficiency. All of the new equipment will be designed for the maximum level of automation, with a cluster tool approach for cassette handling of wafers extending throughout the manufacturing plant.

“Our aim is not only to be recognized as the highest quality supplier of epi-wafers but also, as our production capability is built up with the expansion, to become the lowest cost supplier in the industry”, Nelson says.

Each of the MOVPE units is operated as an individual business unit, a profit and loss centre whose results are critically analysed every week. Such business feedback forms an important part of continuous improvement at the plant. Indeed, Nelson says EPI’s commitment to quality and customer focus is unparalleled. The company was the first to achieve ISO 9002 and recently won a National Quality Award as the best SME in Wales. The significance of the award was that the competition was marked against the European Quality Model, derived from the premier US Quality Model Malcolm Baldrige Awards.

Another element of this approach to quality and customer focus is a comprehensive customer survey that is held every two years. The survey makes a detailed analysis of the level of satisfaction relating to virtually every aspect of its operation including the quotation process, the quality of product, the level of service, and the price of its products.

**Key differentiators**

EPI has several key features that it believes clearly differentiates it from its competitors. Perhaps the most fundamental aspect of EPI’s business philosophy is its commitment to remain solely an epi-wafer supplier. “The company only supplies materials, not devices”, Nelson comments. “This is a very deliberate policy that is aimed at ensuring that we do not compete with our customers. Our basic philosophy is to be experts in epitaxy, from both a chemistry and materials point of view, as well as from a customer perspective. We do have a number of people who are experts in devices, both optoelectronic and electronic, but we use them to work with our customers to achieve the very best interaction and, therefore, the very best device results. Unlike many of its competitors, EPI has been profitable over each of the last four years, primarily as a result of this clear business focus.”

Confidentiality is also a major business philosophy at EPI and means the company does not offer ‘off-the-shelf’ structures that might compromise its relationship with its clients. “If we want to sell to a company that has in-house capability, that is become their second source, it is vitally important that they are confident in the knowledge that we can be trusted with their designs”, Nelson says.

The final key factor that EPI believes differentiates it from its competitors is its ability to cater for a multitude of customers, both large and small, over an extensive range of products.

As the company expands its production capacity, it is confident of attaining its goals of becoming the highest quality, lowest cost supplier in the industry.

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