SemiGen

WHITE PAPER

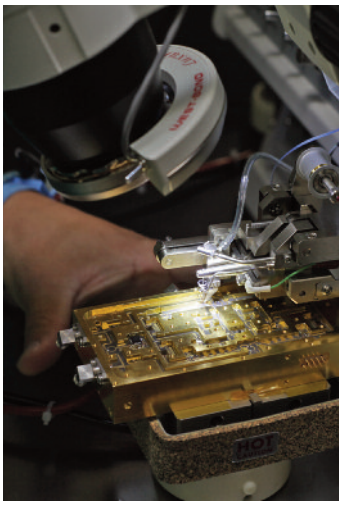
THE ADVANTAGES OF OUTSOURCING YOUR RF/MICROWAVE ASSEMBLY TO AN ONSHORE CONTRACTOR

Understanding the subtle–and not so subtle–costs of going overseas

SemiGen

Shifting landscapes suggest RF/Microwave companies keep manufacturing closer to home.

Outsourcing of manufacturing occurs across a broad spectrum of industries, and the philosophy of employing it is changing rapidly as companies are increasingly positioning themselves as brands as opposed to manufacturers. The outsourcing decision for RF/Microwave (RF/MW) companies, however, has a unique set of circumstances when compared to conventional digital electronics. The straightforwardness of digital electronics is conducive to high levels of automation and the employment of relatively unskilled workers. Quality and compliance in the digital world can also be determined through the use of functional test equipment, working on the basis of logic one and zero levels whose repeatability, accuracy and calibration are relatively clear-cut. Moving these types of manufacturing and test procedures overseas thus becomes a relatively simple decision.



RF/MW manufacturing and testing, on the other hand, often relies upon much more precisely defined, and sometimes difficult to define procedures. In fact, RF/MW manufacturing is to a large degree an artisan-based process that is learned by being immersed in the business and is often passed along through ties of family or friendship. RF/MW testing also requires more complex tools such as spectrum analyzers and frequency counters whose accuracy, repeatability and calibration have large variables. As a result, test specifications and methods are more critical and once again rely more heavily on the knowledge and experience of operators and engineers.

These challenges have become even greater in the last decade or so. Product lifecycles have been compressed, increasing the pressure to get new products to market fast and putting pressure on manufacturing costs. Future sales of new products have become harder to predict so OEMs are understandably wary of investing in new manufacturing equipment. Meanwhile, performance expectations and multifunction requirements are increasing and the quest for reduction in footprints is omnipresent. Each of these issues leads to tighter manufacturing specifications and the risk of variables in the manufacturing process which causes problems. Meanwhile, the RF/MW workforce is shrinking as experienced people retire, or in some cases move on, to more lucrative or less demanding opportunities.

VALUE OF OUTSOURCING RF/MW MANUFACTURING

A considerable number of RF/MW OEMs are addressing these challenges by taking a close look at outsourcing some or all of their manufacturing. One key advantage of outsourcing is that the OEM can focus on its core competency–which typically involves research and development, engineering and sales and marketing–while the contract manufacturer in turn focuses on its core competency. Management of the OEM will have more time to spend on understanding customer needs and developing products that outperform competitors. In many cases, greater concentration on engineering and marketing makes it possible for OEMs to improve their position in the marketplace.

Additionally, outsourcing to the right contract manufacturer often makes it possible to improve manufacturing and quality control. Contract manufacturers utilize leading-edge automated equipment and highly experienced staff members for multiple OEMs' products. This means the contract manufacturer can afford to maintain a higher level of manufacturing technology and expertise than a typical RF/MW OEM with less than $100 million in sales. The right contract manufacturer will already have all or most of the equipment required to bring the product to market, so the OEM's capital investment required will

SemiGen

be eliminated or greatly reduced. By relying upon the equipment and people that the contract manufacturer already has in place, OEMs can handle their peaks and valleys without having to lay off people or let equipment sit idle.

Outsourcing RF/MW manufacturing to a contract manufacturer also can eliminate or reduce a number of costs that are less obvious and therefore sometimes not considered in the decision of whether or not to outsource. For example, by reducing the OEMs' manufacturing head count, outsourcing reduces the OEMs' exposure to employment-related expenses and risks such as benefits costs, workers compensation insurance, liability for accidents occurring on the job and other potential legal liabilities, etc. Outsourcing manufacturing can also reduce or eliminate the need for administrative infrastructure required to support the manufacturing operation, such as human resources, purchasing, accounting, etc.

VALUE OF ONSHORE MANUFACTURING

Countries such as China, Singapore, Thailand, Malaysia and others are often considered the obvious locations for RF/MW OEMs considering outsourcing to a contract manufacturer. Offering the advantages of low-cost labor and a rapidly developing manufacturing infrastructure, these and other developing countries have become the default location for companies wishing to outsource production in order to lower costs. For example, since China opened its economy about three decades ago, the country has offered a very attractive combination of cheap labor, inexpensive technical resources, an undervalued local currency and local governments willing to offer attractive incentives to companies seeking to start up production there.

However, a combination of economic forces is eroding the cost advantages of developing countries while at the same time the United States is becoming a more attractive place to build electronics products. A recent study from the Boston Consulting Group stated that: "Our analysis concludes that, within five years, the total cost of production for many products will be only about 10 to 15 percent less in Chinese coastal cities than in some parts of the U.S. where factories are likely to be built. Factor in shipping, inventory costs, and other considerations and–for many goods destined for the North American market–the cost gap between sourcing in China and manufacturing in the U.S. will be minimal."

But onshore outsourcing has advantages for RF/MW manufacturers that go far beyond the general improvement in the U.S. competitive position. The highly complex nature of RF/MW manufacturing means that it's often difficult to completely document every aspect of what is required to produce a quality product, and in some cases the requirements of the product are not even fully known. This leads to complexities in transferring a manufacturing process to a contract manufacturer. These complexities can be overcome, and in many cases the expertise of the contract manufacturer can lead to an improvement in product quality. However, the unique nature of RF manufacturing can make it challenging to transfer an RF/MW process to an overseas contract manufacturer. Language difficulties may make it difficult to communicate the myriad of details needed to maintain the OEM's high-quality standards. And cultural differences may cause the contract manufacturer's engineers to avoid asking questions that would reveal that they did not fully understand the OEM's process or instructions.

The large physical distance between an overseas contract manufacturer and a U.S.-based OEM exacerbates these difficulties. It typically costs $4,000 in travel expenses to send an employee to Asia for a very short visit to a contract manufacturer. These costs do not include the costs of the employee's time. It takes a minimum of a week for an employee to fly to Asia, spend a day or two at the contract manufacturer, fly back and acclimate to the time-zone changes, and resume his or her previous level of productivity. The time expended on such a trip by an engineer with a fully loaded cost of $100,000 per year adds another

SemiGen

$2,000 to the cost. At a total cost of $6,000 per visit, the OEM faces the difficult tradeoff between the need for close communications with the overseas contract manufacturer versus limiting trips to keep costs under control.

When working with an overseas RF/MW contract manufacturer, it is also often necessary to ship U.S.-made equipment such as bonders and test equipment overseas. Shipping delicate equipment into developing countries is expensive, risks damage to the equipment and often takes months, which can delay the product introduction. Shipping equipment may also be complicated by local regulations that prevent importation of certain types of equipment.

Outsourcing RF/MW manufacturing to an onshore contract manufacturer also avoids several other concerns and risks involved in working with an offshore source. The limited intellectual property protection in developing countries creates the risk that proprietary information provided by the OEM to an offshore contract manufacturer will later end up in the hands of a competitor. In some cases, the offshore contract manufacturers have themselves gone into competition with their customers. RF/MW OEMs who are involved in the defense industry or whose products have potential military applications also must comply with International Traffic in Arms Regulations (ITAR) and export control regulations. Working with an onshore contract manufacturer provides much greater protection of intellectual property rights and also makes it much easier to comply with these regulations.

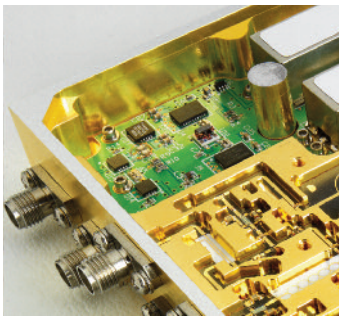
WHAT TO LOOK FOR IN A CONTRACT MANUFACTURER

Whether you're looking onshore or offshore, any credible RF/MW contract manufacturer should be able to provide complete fabrication and test capabilities including singulation, assembly, wire bond, test, repair, kitting and stocking of components. A quality system should be in place that assures the integrity of every product manufactured, such as compliance with ISO 9001:2008, MIL-STD and J-STD requirements. Full RF test capabilities through 40 GHz and ITAR compliancy should be final tick boxes that will give you confidence there will be no bumps in the road to delivery. In the RF/MW field, a contract manufacturing company should also be able to demonstrate an ability to attract, retain, and enhance the capabilities of a skilled staff such as wire bonders and die-attach workers. So look for third- and fourth-generation family members on the floor. These team members have an innate ability to spot problems immediately, and take enormous pride in fixing them. A supplier should also be able to provide anecdotes on how they acted as an extension of an OEM's design and manufacturing team. When interviewing, go beyond the instinct that the sharing of a common speaking and design language will make it possible to operate with considerably less data than an offshore contract manufacturer. Ask how they have been able to document tribal knowledge and create a reproducible process for their customers.

BIG OR SMALL? WHAT'S RIGHT FOR YOU?

Bigger firms with large assembly lines are the obvious choice when high volumes and automation concerns are driving decisions. But even if these needs are the norm, the advantages of identifying at least one small local supplier cannot be overlooked. These nimble firms generally take on the projects that plague production teams because the bigger shops are not interested. Their overhead expenses are lower so they generally don't require a specified minimum number of pieces per month. They work with OEMs on projects ranging from prototype builds to thousands of pieces per month and can scale up or down quickly to handle increasing volumes. They can easily switch gears and take on repair work or even a complete product line.

SemiGen



SemiGen of Manchester, NH is one such supplier. They are experienced in assembling and testing a wide variety of RF/MW products such as:

- **Amplifiers**
- **Receivers**
- **Switches**
- **Drivers (chip/wire)**
- **Duplexers**
- **FETs**
- **Power supplies**
- **Detectors**
- **Diodes**
- **Mixers**
- **Multifunction assemblies**
- **Oscillators**
- **Attenuators**
- **Filters**
- **Transistors**
- **Transmitters**
- **Up/down converters**

CONCLUSION

RF/MW manufacturing is considerably more difficult than conventional electronics manufacturing so it requires skilled artisans with many years of experience to do it right. Many RF/MW OEMs are finding difficulty maintaining these resources internally or are finding their high cost makes it difficult to stay competitive. Onshore outsourcing makes sense for RF/MW products because it eliminates hidden costs and the time-zone, language and cultural barriers that often make it difficult to transfer a process overseas. SemiGen's high-quality, on-time and affordable U.S.-based RF/MW contract manufacturing services provide the people and equipment needed to produce a quality RF/MW product, enabling the OEM to focus its management time and capital budget on research and development, engineering, brand identity and sales.