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TAKING COST OUT OF THE EMS SUPPLY CHAIN

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ABSTRACT
In outsourcing, unit cost is rarely total cost. Most electronics manufacturing services (EMS) providers focus on developing efficient processes and systems which help to reduce total cost. In some cases, these strategies are widely deployed within the industry, but in other cases these strategies are deployed only within a few companies who have focused on a specific market niche. This paper looks at three niche strategies which focus on reducing cost within the supply chain:

- Reducing cost through increased value-add by a core technology supplier
- Tapping expertise in non-EMS business units to reduce cost in custom components
- Teaming with the supply base for efficiency-based cost reduction.

Key words: outsourcing, EMS, supply chain cost reduction.

INTRODUCTION

Cost reduction pressure within the electronics industry continues unabated. At the same time, the pressure for achieving high levels of quality is also present. Materials typically represents 70-80% of the unit cost of an outsourced product, so obviously the supply chain is a key point to look at for cost reduction. However, there are limits to the amount of material cost reduction that can be obtained through price negotiation or qualification of substitute parts. In some cases, options to substitute parts are limited by product qualification or regulatory constraints.

Achieving continuing cost reduction often requires a focus on eliminating waste and inefficiency in the supply chain. In some cases, suppliers are willing partners in this effort and may have established programs to tap. In other cases, the EMS provider may need to identify potential opportunities for cost reduction and develop a business framework that supports enhanced efficiency.
This paper looks at three examples of ways EMS providers have found ways to take cost out of the supply chain. In two of these examples, the EMS provider's parent company is also a supplier of custom components.

EXAMPLE 1 – INCREASED VALUE-ADD BY A CORE TECHNOLOGY SUPPLIER

Narragansett Technologies lives the philosophy it espouses to its customers: focus on your core competencies and outsource everything else. Narragansett Technologies, and its two divisions, Narragansett Imaging and Narragansett EMS, originally made a name for itself in the digital imaging market as a division of the Philips Components group, designing and manufacturing medical camera tubes and digital imaging modules.

Today the Narragansett EMS division is focused on utilizing its skills in high mix low volume manufacturing of digital imaging systems and subsystems. The applications and products include medical, biometrics, defense, traffic control and professional imaging. A majority of the business is centered on diagnostic medical imaging subsystems products and its complex assembly and test requirements. Its core value proposition is the ability to deliver its customers custom imaging systems and subsystems. The difference in the model is that the company outsources its board-level technology.

The Company's business model developed as it and the customers of its imaging business began to understand what a significant portion of the total system functionality its proprietary products were providing. This led to the realization that the additional tasks being performed at the customer site were not adding significant value and would be better performed at Narragansett's facility as the imaging products were being assembled. The Company's success in building higher level systems for its imaging customers led to it winning an increasing amount of work for system builds that was not based on its own imaging modules.

This business model benefits customers since the logistics behind the procurement and assembly of many specialist parts is placed in the hands of a specialist in that field. The advantages include:

- Utilization of a traditional EMS business framework which includes assembly services, product lifecycle management, supply chain management, manufacturing engineering and order fulfillment.

- Access to specialized capabilities associated with the core imaging technology such as image quality testing or x-ray imaging. In almost every case this is testing too specialized to be transferred to a traditional EMS provider cost effectively.

- Economies of scale in specialized components that would not be possible in a company making a wider range of product types.

- Access to continued imaging technology enhancement and sustaining engineering services through close alignment with the Company's imaging division.

In order to remain efficient, the Company stays focused on the areas where it is able to add value. This means that while specialized assembly and test are performed in-house, functions that are more generic can be outsourced. This adds flexibility in board-level manufacturing options in terms of capability, capacity and cost. Supplier qualification and program management focus have been appropriately developed to support this business model.

From a medical device manufacturer's perspective, the business model opens the door to the comparative question: when is it better to outsource a complete subassembly to an EMS company with resources and knowledge to build a critical product instead of keeping the assembly work in-house or at a general EMS provider? The issues that should be evaluated include:

- Percentage of product cost relating to the technologically complex subassembly
- Project volumes
- Engineering support required for customization of the subassembly to align with desired end product requirements
- Production infrastructure required to support the technologically complex subassembly
- Required post-manufacturing infra-structure and support.

As a niche strategy, this package of services does deliver value and often solutions difficult to find in mainstream EMS business models. For example, in one project the Company is combining their digital camera with an image intensifier. The end product is a digital x-ray camera that undergoes final assembly at the customer's facility. While the customer has the production resources to assemble the product, they lack the required functional test capability for the subassembly. In that phase of the process, image quality is tested through a process known as characterization which involves use of specialized x-ray equipment in a lead-lined room. The test identifies specific phantoms to determine if image quality conforms in resolution, contrast and distortion. In Narragansett's area of specialization, this type of test capability is fully utilized over a range of products. The customer gets the advantage of access to the needed test capability without the non-recurring engineering (NRE) or capital equipment expense that would be associated with developing this capability for a standalone project.

EXAMPLE 2 – TAPPING EXPERTISE IN NON-EMS BUSINESS UNITS

Compartmentalizing the design process across multiple suppliers can create the potential for miscommunication, adding time and cost to the design process. Some of the key issues OEMs should consider in outsourcing system-level design include:

- Design for manufacturability (DFM) support requirements
- Material selection considerations
- Understanding the implication of tooling decisions on total cost
- Application-driven design considerations.

Understanding likely support team requirements is especially important in products which are lower volume or designed for specialized applications, as outsourcing choices may be limited to regional EMS providers with vertical integration, The end result in this situation is often use of a team of several suppliers for different aspects of product development and support.

In some cases, DFM or tooling fabrication expertise are still adequately provided by their subcontracted partners as part of the service. However, when multiple vendors are handling these projects without focused coordination, areas of responsibility can overlap or simply not be covered by any of the suppliers.

Associates at Fawn Industries, Inc.'s sister divisions, Fawn Electronics Company, Inc., and Fawn Plastics Company, Inc. have seen compartmentalized disconnect within their respective customer bases. The Company's EMS division uses the expertise found in its sister division in supporting system-level design and manufacturing projects. Even when projects do not fit the volume or application focus of its internal molding capabilities and a third-party plastics supplier choice is needed, internal expertise may be tapped in evaluating additional supply base options or for sourcing tooling.

One recent example of this type of collaboration involved medical instrumentation used in a hospital wireless data collection application. The product had been designed by a third-party design house and was failing initial field tests. The OEM's original design team had done a good job on the electronics, but had demonstrated less expertise in specifying the plastics. The issue was that material selected for the photo eye lens was allowing in too much ambient ultraviolet light, which disrupted the signal the unit was trying to receive. A change in material selection solved the problem.

Often small issues such as this can create product introduction delays and add cost to the product development process.

An additional challenge for any OEM is understanding the long-term cost impact of the choices made in the design process. For instance, some Asian plastics houses offer low or no cost tooling. What is not clearly stated is that the customer does not own their tool. If a choice is later made to move the business, the tool is not provided. In some cases, the solution may be as simple as fabricating a new tool, but in the other cases the actual packaging design is owned by the supplier as well and simply licensed for use in that product.

Time to market and cost of tool changes are also considerations. Stereo lithography can provide prototypes in less than two weeks. There may be value in creating a soft tool for prototype parts if qualification testing requires a production-like scenario for the prototype units. Soft tools can also be used when pre-production quantities don't initially support the cost of a multi-cavity hard tool.

Disconnect between the tool design and molder can also drive hidden cost. It is important to understand potential molding issues and life of the tool in the design stage. The molder should also be able to support the tool with regular maintenance. Repair and warranty responsibility should be clearly defined between the tool fabricator and molder to ensure that each supplier is providing appropriate levels of support.

Choices of custom vs. off-the-shelf components can also carry hidden costs. Painted screws, custom components or components with limited sources of supply can create long-term costs if availability becomes limited or a sole-source discontinues the product or leaves the business.

Design capabilities are also important. Workstations with 3-D modeling software such as Pro-Engineer allow design change assumptions to be visually "tested" for fit in the package prior to implementation. They can also help with reverse engineering when trying to reconstruct documentation on an older package design.

Using a supply base teaming model which ensures that packaging expertise integrates with electronics manufacturing expertise is critical in developing a functional, high quality product in a short period of time. However, further tapping this teamed expertise in tooling choices, DFM and component selection decisions can ensure a lower total cost over the life of the product.

EXAMPLE 3 – TEAMING WITH THE SUPPLY BASE TO REDUCE HIDDEN COSTS

Another area of hidden cost is in inventory. This cost can be particularly hard to measure because inventory-related costs often are resident at the customer, the EMS provider and the supply base.

EPIC Technologies uses Lean manufacturing principles to drive cost reduction in this area. In the Company's Synchronous Flow Manufacturing (SFM) model, Lean initiatives are in place across the entire product realization process. In some cases, cost savings may be immediate when added schedule flexibility translates to immediate decreases in work-in-process or finished goods inventory requirements. In other cases, cost savings may roll up over time in a given project as joint improvement initiatives are pursued.

Longer term cost savings are driven by joint continuous improvement focus in the areas of supply base management and design for manufacturability/testability (DFM/DFT). The speed at which these savings are realized is dependent upon the level of responsiveness of the supply base and customer.

From a supply base standpoint, the SFM philosophy incorporates the following principles:

- Strong focus must be placed on developing and qualifying suppliers that embrace lean manufacturing principles of short cycle times, flexible batch sizes and high quality.
- Suppliers must be responsible for managing production to forecast, yet deliver to "pull signals" vs. requiring firm release dates over an extended lead-time.
- Appropriate buffer sizes for current production rates must be established, maintained and continuously monitored for adequacy.
- Material buffers should be maintained in close proximity to the manufacturing facilities to allow frequent release of small batches to the production floor and maximum flexibility in responding to changing demands.
- The material pipeline must be proactively and regularly monitored over the medium-to-long-term horizon through bond reports to identify and resolve potential supply disruptions.

The Company has addressed that focus with a kanban "pull" system, postponement of commitments and utilization of Electronic Data Interchange (EDI). Strategic Suppliers produce to the MRP forecast and ship to EDI release signals. Buffers are established at key locations in the pipeline and are regularly reviewed and revised as market and demand conditions vary. Consignment, in-house stores and Vendor Managed Inventory (VMI) programs are used with strategic suppliers to maintain buffers closest to the point of use.
Pipeline status or "bond" reports are regularly reviewed with supplier teams to ensure buffers and replenishment streams are able to support planned production within a range of variation levels based on past historical demand, current forecasts, customer service lead-time guarantees to their end market, manufacturing lead-times and transit lead-times.

On the factory floor, a two-bin system and color-coded cards identify raw material and WIP status. Material shortages are easily visible on a walk through of the material area.

How does this translate to cost reduction? In one example, a large medical device manufacturer selected EPIC as its primary electronics manufacturer in 2005 based on the Company's Lean Operating philosophy. The customer was outgrowing internal floor space and needed suppliers who could minimize inventory on the factory floor and significantly improve flexibility and on-time delivery in printed circuit board assemblies. The business was moved from a larger EMS provider in 2005. It set up first products on kanban and implemented lean operating methodologies during Q4 2005 (First 10 assemblies) and 2006 (balance of 50+ assemblies) A min/max system was established, whereby bin replenishment is triggered upon consumption of the first bin. Bin size is based on order replenishment lead time.

The results after two years of production include:

- Order lead time on printed circuit board assemblies has been reduced from over 3 weeks with previous supplier down to 3-5 days currently
- Inventory turns on printed circuit board assemblies has improved from 4 turns to 26 turns today
- OTD performance has improved from 55% in 2004 to 97% today
- Cost reductions resulting from DFx and Lean initiatives of over $1.1M (11%) for FY 2007.

However, this strategy is not without implementation challenges. For instance, each customer typically has an Approved Vendor List (AVL). The bulk of suppliers on that list may be common with other customers and therefore already supporting kanban min/max planning systems. Suppliers of custom and/or mechanical components may not be existing suppliers and may be reluctant to change their lot sizes or production frequency to accommodate the SFM system. In some cases, the customer's pricing may be based on annual or quarterly builds of these components. In other cases, a sole-sourced supplier may feel they have the leverage to set delivery terms. In those situations, the total cost of non-compliance must be analyzed and discussed with the customer and supplier. In some cases, the supply base complies and in other cases there are some holdouts who may require less than optimum inventory buffers.

When suppliers, the EMS provider and customers team in implementing a Lean manufacturing strategy, the end result is an optimized kanban strategy that reduces working capital, delivers a high percentage of on-time delivery performance to customer request, and optimizes flexibility in meeting unanticipated demand and high inventory turns. Partial implementation is likely to result in much smaller cost reduction improvements.

CONCLUSION

A wide range of business models exist in the EMS industry. OEMs with specialized support needs may find that niche strategies such as those described above address their cost reduction goals best. Often the most cost effective outsourcing decision isn't expecting a contractor with a less specialized business model to take hard-to-source projects along with the high volume, predictable demand production. The best choice may be instead to place those special needs projects in a contractor whose business model is optimized to support that niche.

The keys to success in any of these approaches are understanding the linkage between project requirements and specialized support capabilities in initial EMS provider selection and listening to EMS provider recommendations for process, design or supplier changes which can drive cost reduction.

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