Achieving quality, consistency and delivery

within electronics manufacturing

MANUFACTURING

Introduction

As an original equipment manufacturer (OEM), when it comes to manufacturing, you're focused on three criteria: quality, consistency and delivery. You want to consistently produce high quality products that are delivered to your customers' needs in the timescales that they require.

However, for any number of reasons, you may have discovered that accomplishing this is becoming increasingly more difficult. It could be that you face pressures to meet growing demand as your company grows; the time required to develop a new product is shrinking; or you are forced to spend more time focusing on your core competencies to drive productivity and efficiency.

Achieving excellence in all three of these important areas is integral to the success of your business; future-proofing your ongoing growth and bolstering your reputation. So how can you keep all the plates spinning?

In this eBook we will consider the industry-wide challenges OEMs face when trying to achieve quality, consistency and delivery. Let's refer to this as QCD.

We will then look in detail at the potential hurdles to be overcome in three key product areas - box build assembly, cabinet builds and electro-mechanical assembly – and explore the appropriate solutions.

And finally, we will investigate how choosing to outsource to a good electronics manufacturing services (EMS) provider could help you to achieve QCD and, as a result, reap the benefits across your business.

As an OEM, when it comes to manufacturing, you're focused on three criteria: quality, consistency and delivery.

What is QCD and why do OEMs struggle to achieve it?

As an OEM you want to ensure that your products are delivered on time, month in, month out, are priced competitively enough to be attractive to your target customers and are made efficiently enough to deliver you a sustainable level of revenue and profit growth.

But whether you are a start-up or an established business, it is likely that you will have faced challenges in trying to achieve this.

There can be a variety of reasons for this situation. For example, you may have grown too fast so are struggling to meet customer demand; perhaps you are in the middle of a merger or acquisition; or you are focusing all of your resources on developing a new product.

The Project Management Triangle

The difficulties of achieving QCD can be better understood by taking into account the Project Management Triangle.

In simple terms, this diagram highlights the three key components of any project: scope (quality), time and cost. Often companies only manage to optimise on two of these and fail to address all three simultaneously.

It could be you set out to produce something quickly and to a high standard, but its cost base is too high; you try to manufacture a product quickly and at a lower cost, but in doing so you sacrifice inadvertently on quality; or you find a great way to design a high quality item, but it takes a longer time to get the product to market.

All of this means you need to think carefully about how you apply your time and resources to each of these three pillars, so that you maximise your own profitability -but still achieve QCD.

However, there are a number of top-level challenges within the electronics manufacturing industry that mean achieving QCD isn't simply a case of painting by numbers.

Supply chain

The stability and integrity of your supply chain has a significant impact on QCD. As an OEM you are interconnected with your suppliers: if one link breaks it affects the whole chain.

Global shifts in demand patterns, a changing competitive landscape, natural disasters due to environmental change, regional legislation, political unrest and industrial action: these are just some of the macro-forces OEMs and their supply chains have to prepare for and contend with.

Each of these factors can have a bearing on an OEM's ability to attain QCD. Whether it's a competitor that introduces a superior material to the market or other factors that cause products to be delivered late: these challenges are not to be underestimated.

Ensuring you have a high quality, cost effective supply chain is critical and having at least a "dual sourcing" approach can help protect you against unforeseen circumstances.

Processes and procedures

At each stage of the manufacturing process, it is important that procedures are strictly controlled and monitored. Complex processes should be documented and tracked from start to finish, while it should be possible to trace all materials back to their source.

Failing to implement adequate controls makes it nigh-on impossible to achieve QCD - and can have very serious consequences. In some cases, products may have to be recalled because they have been found to be faulty and/or failing in the field.

Even minor faults with products can severely damage a manufacturer's reputation - and dealing with the fallout creates a huge cost burden. In the interim, competitors can move in and take a slice of the market.

Staff and equipment

An OEM's staff and equipment form the backbone of its business. Without fully trained and motivated staff, who know how to work with complex machinery, achieving QCD is little more than a pipe dream.

However, it's no secret that finding experienced, skilled engineering staff has become extremely difficult in electronics manufacturing. Some companies can be relatively self-sufficient by nurturing new talent through apprenticeship and graduate schemes - but small and medium-sized enterprises often have to think outside the box.

It's also important that once the right staff are found, they stay! So think about your own business for a second. Do you have an inclusive culture that makes every member of the team feel valued? Make sure your employees know what you expect from them, but also nurture each individual and encourage them to reach their full potential.

Good people will be successful and get things done. They will thrive in a well-structured company and drive your revenue and profitability, while enhancing customer satisfaction and loyalty. People who are poorly trained and do not feel engaged will fail in even the best run companies.

Unpredictable demand and forecasting

Forecasting peaks and troughs in consumer demand can create a real headache for OEMs. Sometimes it may be unclear how many units are required until the very last moment. OEMs that struggle to manage demand are likely to find themselves in a position where they either have too much or too little stock.

Whether you need to increase production to meet certain seasonal increases in demand, or you want to include a number of product variations to meet specific geographical or market segments, responsiveness and flexibility when it comes to volume availability are fundamental in order to maintain your profit margins - and achieve QCD.

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Manufacturing agility is ever more critical in a market that is becoming increasingly consumer demand-driven and looking for fast responses from its vendors.

Industry standards

IPC, the Association Connecting Electronics Industries, sets the industry-agreed standards for the electronics manufacturing industry, which are recognised and respected across the globe and “help you assure superior quality, reliability and consistency in the electronic assemblies that go into your product”. IPC-A-610, or Acceptability of Electronic Assemblies, is the most widely used IPC standard.

OEMs must also meet certain legal requirements. There are a number of EU directives that govern the manufacturing and engineering sector.

For instance, in 2007 the EU Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) was enforced to “ensure a high level of protection of human health and the environment from the risks that can be posed by chemicals, the promotion of alternative test methods, the free circulation of substances on the internal market and enhancing competitiveness and innovation”.


Photo: baselactionnetwork

And in January 2013 the Restriction of the Use of Certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment (EEE) Directive was transposed into UK law. This prohibits the placing on the EU market of products containing more than the agreed levels of the following substances: lead (Pb), cadmium (Cd), mercury (Hg), hexavalent chromium (Cr6+), polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE).

Currently the EU is proposing to introduce a law that makes it mandatory for EU importers of tin, tantalum, tungsten and gold for manufacturing consumer goods to be certified, in order to ensure that they do not fuel conflicts and human rights abuses in conflict areas.

Taking short cuts

That's certainly a lot to juggle - and the result is that some OEMs struggle to find the right balance to address all three pillars and remain competitive.

For example, an OEM might resort to lowering on quality in order to get a product to market faster and at a lower specification. This could involve purchasing lower cost but sub-standard parts. They might purchase items on the grey market without verifying their quality and authenticity because it looks less expensive than buying from a legitimate supply route. But this can have serious consequences as the parts may be counterfeit, or remanufactured to lower specifications - all factors that can seriously impact product quality and reliability.

The OEM might get away with it occasionally - but in time it will be their reputation and business that pays the price. An OEM can suffer serious financial and reputational damage if a product fails to work in the field. It may find that its profitability and turnover is affected and, in the worst case scenario, may lose some or even all of its clients.

But it doesn't have to be this way.

Overcoming QCD challenges within manufacturing

In order to fully understand the problems facing OEMS - and how they can solve them - let's look in detail at how you can achieve QCD in three key product areas – box build assembly, cabinet build and electro-mechanical assembly.

1. Box build assembly

A box build can mean many things, from a printed circuit board (PCB) in a small plastic enclosure, to a front panel assembly equipped with display, full harness, connectors, switches and fuses etc.

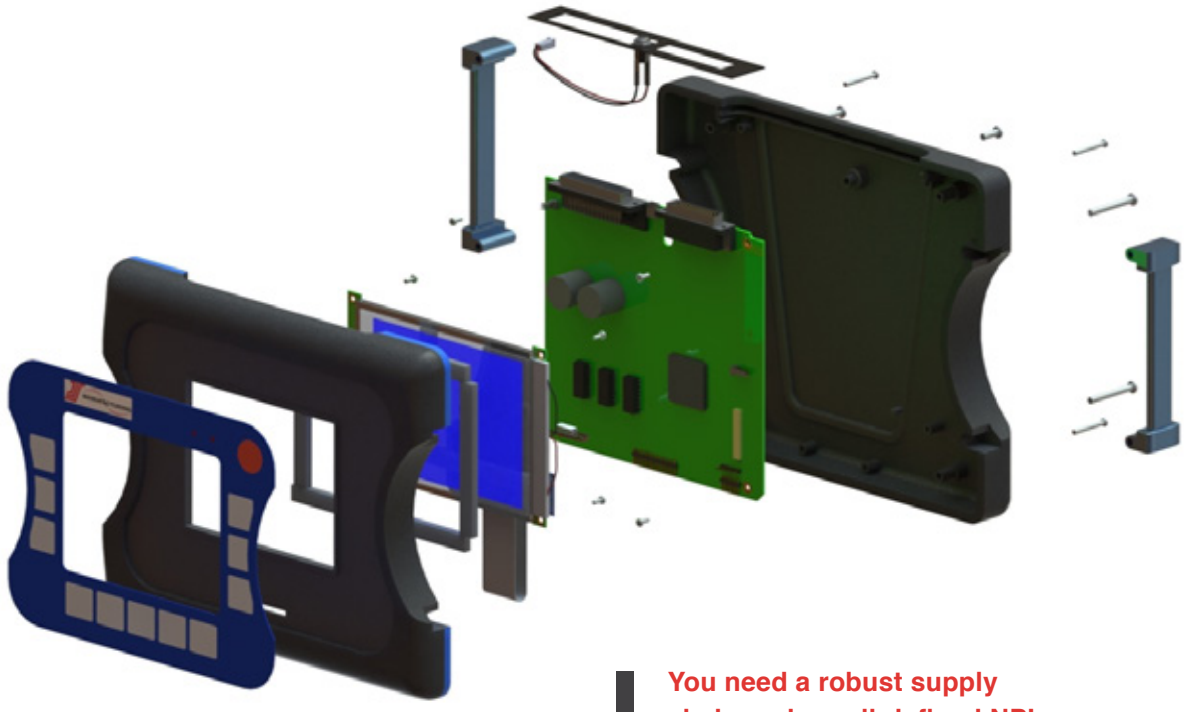
For our purposes, we're going to look in detail at an electronic box build: let's call this Product A. It consists of a plastic enclosure containing a PCB and a touchscreen display, which has software loaded onto it.

There are a number of issues that can arise for OEMs during assembly of Product A, each of which has a negative impact on achieving QCD.

The challenges – PCB assembly

Let's start with the "brains" of the device - the PCB. Unfortunately, a common misconception is that, providing you have the necessary pick and place surface mount equipment, the creation of any PCB is simply a push button process, which is simply not true. In order to create high quality, often complex PCBs, month in, month out, you need a robust supply chain and a well-defined new product introduction (NPI) and assembly process.

When it comes to component selection, a common challenge OEMs face is achieving the correct balance between specification, unit cost and availability. During the design and prototype stage it's not uncommon for the engineering team to obtain sample components direct from the manufacturer, or to source them through catalogue distribution. While this approach can help prove out the initial design relatively quickly, the standard lead-time for the parts and minimum order quantities associated with production volumes can ramp up.



You need a robust supply chain and a well-defined NPI and assembly process.

If the electronic components that are specified on the bill of materials (BOM) cannot be consistently sourced, then it goes without saying that there are going to be delays in production. If the parts are being purchased to full lead-time and stocking agreements are not in place with key suppliers, you could find yourself holding 95 per cent of the material value without being able to start the build.

The quality of the components sourced also needs verifying. Providing they are procured through franchised distribution then standard goods inwards checks should be sufficient; however, at times of component obsolescence or allocation, the grey market may need to be used.

Testing of PCBs should not be an afterthought.

Any devices secured outside of the franchised network should be subject to stringent anti-counterfeit tests and analysis, because bypassing these basic checks can cause OEMs a host of costly issues. Counterfeit electronic components can vary from parts with missing internal dies right through to older revision components, which have then been re-badged as the latest revision. While the first kind typically fail early on in the process, those parts that have been re-badged can, in theory, pass a number of additional tests without showing signs of their true origin - until it's too late.

The overall design of the PCB can cause QCD problems for OEMs. While things may look good in principle on a computer screen they might not translate well into the manufacturing process. For example, there may not be sufficient tolerances between tracks on the board, which later on in the process could result in the circuit shorting out. Or perhaps the design includes a number of components positioned closely together, each with a different thermal mass. Achieving a quality solder joint on each of these components without heat damaging the rest of the circuit board requires expert process engineering skills.

In order to reduce the overall size of a product while maximising the amount of technology available, many OEMs favour double-sided PCBs. While this approach can bring benefits, there are challenges associated with producing double-sided boards - the most obvious one being gravity! If boards are not designed with volume manufacture in mind, you could risk component losses during the assembly process as the second side of the board passes through the reflow oven, resulting in high levels of manual rework.

Testing of PCBs should not be an afterthought. Unless test points are designed in during conception it may not be possible to carry out the levels of test you require at a later stage. Although there should be a defined parts list and unique oven profile or "recipe", PCBs remain complex products in their own right, due to the large number of variables they are subjected to. Clearly, there are differing levels of board complexity and your market and price point may well determine how far you go in this area, but having confidence that your "brain" is functioning correctly prior to adding additional labour and materials surely makes sense?

The challenges – sourcing an enclosure

Once the PCB has been tested it can be assembled into a suitable enclosure and connected to the display. When it comes to sourcing enclosures, there are two options for OEMs: an "off-the-shelf" version or something more bespoke. There are a huge amount of generic, off-the-shelf enclosures to choose from, in a wide range of materials and finishes. The benefits of using a generic enclosure or case usually relate to a lower unit price, reduced minimum order quantities and increased availability. However, as it is generic, it obviously won't have been designed to fit your specific PCB inside, or necessarily function as you expect in certain environments.

Therefore, one of the challenges is making sure the PCB fits securely inside the case and that any additional electronics (displays, connecting cables, fans, LEDs etc.) don't become trapped when the front and back halves are joined together. It's also important to make sure the design of your enclosure provides the access you may need for routine maintenance or service repairs, for example. The final unit should be tested out in the field to ensure it can withstand all of the elements it was originally designed to withstand.

With a bespoke enclosure some of these challenges go away. They will be designed with the PCB and other internals in mind, to ensure there is sufficient space to avoid items crushing or putting pressure on one another. The material and finish will be specified to meet the exact needs of your market and the environment for which the product was intended to work in.

However, they can be expensive, often requiring several thousands of pounds in up front tooling. And, of course, you will need to find a supplier that can consistently deliver the product quality you require, which may take a little time. In addition, a complete set of drawings for the enclosure, with acceptable tolerance levels and clear guidelines when it comes to quality standards, must be created to avoid ambiguity at the goods receipt and build stage.

Even if your product doesn't include a touchscreen version, displays in general are sensitive devices, which require great care with regards to handling and packaging. They can often be one of the key cost drivers within any box build assembly and if the display is bespoke to your requirement, it's not uncommon to see lead-times extend out to several months. As a result, the strength of your supporting supply chain is once again a critical factor in achieving QCD. This is particularly true when it comes to failure rates and analysis. It is not uncommon for displays to pass the initial factory test but then fail when connected to the unit - is the display genuinely faulty or could there be a design or manufacturing issue that you need to address?

The solutions

OEMs can address the issues related to assembling Product A in a number of ways. For a start, it is wise to carry out an audit of the components that are being selected on either new designs or those products already out in the market. Several external companies offer "BOM scrubbing" services, which proactively monitor the components specified and then report back on any life cycle changes - for example, planned obsolescence. In addition, many provide information on standard lead-times, possible alternatives, or updates relating to current legislation.

Designing with procurement in mind will help ensure that all of the components that are required remain available throughout the planned lifetime of your product - helping to reduce the impact and cost of unexpected design changes.

You should look to source all components through trustworthy and reliable suppliers that have direct links back to the end manufacturer through franchise agreements. For those items that have extended lead-times, or perhaps are only available through a single source, it's recommended you set up stocking agreements to help guarantee a consistent level of supply. These can, of course, be tailored to suit your needs and many franchised distributors will be happy

to hold stock for you on the shelf ready for call off, providing you are happy to underwrite this through a service-level agreement (SLA) or annual contract.

Unfortunately, it's difficult to avoid component obsolescence; and when certain devices go on allocation you may be forced to source via the grey market. With new brokers appearing overnight when the supply/demand balance shifts in favour of them, it's important to do your research. Clearly, price will remain a consideration but in these types of situation the reputation the company has within the marketplace, reviews of their service and visibility of their quality processes should all take a higher priority. Check with them that they actually have access to the stock they show as "available" and ask them what kind of controls they have in place to combat the rising threat of counterfeiting. Your confidence in their answers will dictate your next move.

If you don't have the specialist tools and equipment in-house, such as X-ray, electrical testing and high magnification microscopes, to verify the parts yourself when they arrive, then it is recommended you partner with a third party supplier offering component inspection and test services as standard.

Designing your product with manufacturing in mind will help ensure the assembly process remains efficient and reduce the number of delays or discrepancies found out on the shop floor. Encourage your engineering and production teams to work closely together so that the skills and expertise from both sections can be harnessed into creating a quality product. Introduce feedback forms that follow builds around the shop floor during the assembly process. These will allow both engineering and production team members to record the progress and also make recommendations on process improvements along the way.

It's much easier to make a track change to a board, increase the size of a pad or change a component position when you only have a small number of prototype boards going through. If you have already ordered in the next batch of PCBs for volume production you may find these changes end up costing you a lot more.

Designing your product with manufacturing in mind will help ensure the assembly process remains efficient.

Poor documentation and lack of data control causes delays in manufacturing and incorrect or inferior quality goods - both of which can cost your organisation vast sums of money. When under pressure to deliver it can take great discipline to ensure the paperwork trail remains fully up to date. However, BOMs, CAD drawings, Gerber files, software and any other key pieces of data must be revision controlled and managed correctly. Any amendments that do take place during the build should be controlled through a stringent engineering change note (ECN) process.

Any drawn items, such as bespoke labels, enclosures or metalwork, should have tolerances and finishes clearly specified. Leaving these things open to interpretation can cause problems with assembly or quality control later.

Finally, in order to provide a level of comfort that the product works first time out of the box, you should consider test. The most popular types used in electronic PCB assembly are boundary scan, in-circuit test (ICT) and flying probe. The complexity of your product, the demand, and your budget will all be factors when considering which option best suits your needs - and there are pros and cons of each. In addition to board level tests, you may need to consider if additional "power up" or "functional" tests are built into your manufacturing process.

2. Cabinet build assembly

Cabinet builds can vary from single or multiple panel rack systems, through to full custom cabinet suites.

For our purposes, we're going to look in detail at a large cabinet build: let's call this Product B. It consists of a metal cabinet with a door, which is filled with electrical items, including cables, wiring looms and circuit breakers.

The challenges

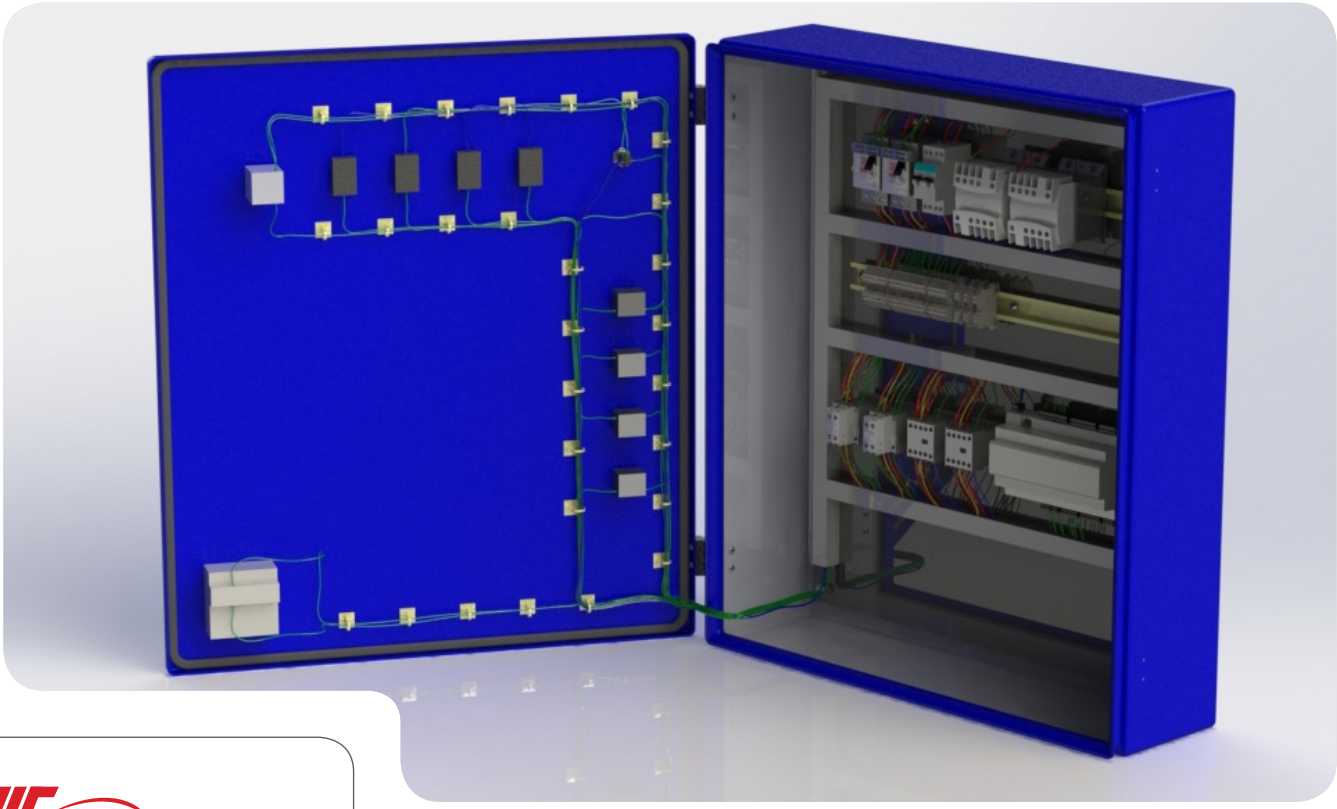
Unlike PCB assembly, where a defined parts list and, in many cases, an automated procedure exists, cabinet builds require a higher level of "interpretation" when it comes to the material required.

Similar to box build products, OEMs have the choice of either designing their own cabinet or selecting an off-the-shelf version from established enclosure suppliers, such as Schroff or Rittal.

However, the challenges at this stage remain the same - bespoke cabinets will require detailed drawings clearly outlining the dimensions, hole sizes and shapes, tolerances, paint specifications and finish etc. A suitable supplier will need to be selected, who can demonstrate they have the capability to produce your bespoke cabinet - both in terms of quality and delivery. Cabinet building is a predominately manual process and therefore relies on a skilled and agile workforce to support demand.

Many OEMs opt for an off-the-shelf cabinet, due to the range of sizes, shapes and colours that are readily available. Unlike smaller, more portable electronic box build products, the overall "look and feel" of large cabinet assemblies tends to be less important to the end user. Often a human machine interface (HMI), such as a display panel or touchscreen, is included, which provides the entire control and visualisation interface the operator needs between them and the machine.

From a material perspective the constituent parts will be specified by the OEM - so items like relays, breakers, fans, air conditioning units, HMIs, power supplies, DIN rails, meters, fuses etc. should be listed on the BOM. Unfortunately, some of the other materials needed, like cable, wire, conduit, trunking, hardware (nuts, bolts, washers etc.), crimp terminations and cable idents, don't always find themselves on a parts list.



Cabinet builds are often bespoke and configured for a particular plant or installation site, which quite often changes the hardware and consumables needed during build. To help improve efficiency, many of these items will be kept line side and replenished through Kanban systems. This makes perfect sense as it allows the operator direct access rather than having the materials picked and presented to them - for example, in kit format. However, there are challenges with this approach – mainly having the right materials, at the right time, in the right quantities.

It's not feasible for OEMs to stock every single variation of nut/bolt/washer in advance "just in case" they need it for the next project. Equally, items like crimp terminals can catch OEMs out too. The crimps themselves are often stocked by many distributors but each requires a specialist crimp tool to fit – which can run into several hundreds of pounds and be on a lead-time.

OEMs may have to consider investing in specialist lifting equipment, such as hand crank lifts or hydraulic benches.

Cable and wire can also be difficult for OEMs to manage from a stock control perspective. Unless clear instructions are provided, highlighting where material should be routed, operators are left to make these decisions themselves - resulting in different quantities of stock being consumed against each build. Clearly, from a cost perspective this creates variances, but there is also a real danger that stock is not replenished in time as the amount showing on the inventory system differs from that physically out on the shop floor.

While a large proportion of these items will be low value, often just penny parts, they can impact an OEM's ability to ship several thousand pounds worth of goods.

When it comes to the assembly process, OEMs who fail to invest time in creating clearly defined build packs will struggle to consistently deliver quality products to their customers. The experience of any wireman can only go so far and without basic drawings, schematics, wiring schedules or 3D CAD models they are forced to work "blind". While some end users may not worry about how cables or wires are physically routed they will complain if they are wired incorrectly or key configuration parts are missing.

To support cabinet builds OEMs may have to consider investing in specialist lifting equipment, such as hand crank lifts or hydraulic benches. These help raise and lower the cabinet so that operators are not forced to work in difficult or cramped positions for long periods of time.

And it doesn't stop there - depending on the physical size and weight of the product, additional equipment, such as pump or forklift trucks, could be required to move the units around the shop floor and onto delivery vehicles. Often bulky in size, the OEM will also have to juggle factory floor space to accommodate incoming "raw" cabinets, work in progress, and finished units awaiting despatch.

The solutions

To avoid ambiguity or the reputational damage associated with delivering incorrect product, you should document all aspects of the materials required and the manufacturing process that should be followed.

Your wireman may be comfortable working with missing or incomplete documentation, but what happens when they go on holiday or leave for some reason? Would another member of your team or even an outside contractor be able to complete the build to the same standard? With builds of this nature there can never be too much documentation created, the majority of which should be highly visual.

Considering the subjective nature of what can constitute as acceptable quality, if you are designing a bespoke enclosure it is a good idea to clarify with your cabinet supplier what your expectations are. Be careful not to make your own standards unreasonable though - otherwise supply will grind to a halt.

It's also worth asking them how they would react to potential peaks and troughs in your demand. Understanding where capacity constraints could arise will help you plan for future projects and delivery schedules. If your supplier is operating from a small industrial unit with only a handful of part-time employees, can you be sure they will be able to deliver the quantities you need, month in, month out?

While you may operate a Kanban system for some of the consumable items, each part should still be listed within the build pack, ideally on the BOM. This will help make sure that your total material cost is being captured and provide your purchasing team with the information they need, should additional consumables need adding. Other equipment, such as crimp tools, for example, can also be specified and ordered in advance to avoid unnecessary delays out on the shop floor.

In order to gain some level of consistency and also help control your stock levels for cable and wire, clearly define the route paths within your build packs. This will allow you to monitor your inventory based on your forecasted demand and identify when additional stocks will need ordering. It's likely you will already have a number of reels of standard equipment wire and cables on-site and the cost of these can be quite small.

However, power cables heavy in copper or some of the more specialist signal cable can dramatically increase in value and won't necessarily be immediately available from stock. It's important to note that wireman will still want some additional lengths to work with - it's no good providing them with the exact quantity down to the millimeter - so allowances for this will need to be factored in.

It's recommended that you work closely with your bare cabinet supplier so that the incoming deliveries you receive match your in-house resources and capacity. If space is already at a premium you are not going to want several months' worth of bare cabinets sitting in your logistics area. A good cabinet supplier should be able to "drip feed" the stock to you, to match your weekly/monthly requirements.

Consideration must be given to the physical build, handling and shipment of the cabinets. For example, if your product contains a back-plate should this be built on a flat surface/bench or in situ within the cabinet itself? Building the back-plate flat gives the operator good access; however, it will need fitting back into the cabinet at some point, which could require lifting equipment due to the increase in weight.

Relationships with specialist transport companies will need to be established to ensure that the completed cabinets are delivered securely to the end user. Depending on the contract you have with your customer and transport company you may find yourself responsible for the loading and unloading. Are your logistics staff fully trained in slinging and banksman duties? Do you have the right equipment to safely load and unload? What will be the overall weight for each consignment you plan to make and will this require multiple vehicles? These and more are all worthy questions to be asking from the outset to enable you to consistently deliver quality product to the end user.

3. Electro-mechanical assembly

Electro-mechanical assemblies demand high levels of skill, precision, accuracy and consistency.

For our purposes, we're going to look in detail at a complex electro-mechanical assembly consisting of a couple of PCBs and over 250 individual parts, such as gears, pulleys, bearings, fasteners, back plates, slides, rollers etc: let's call this Product C.

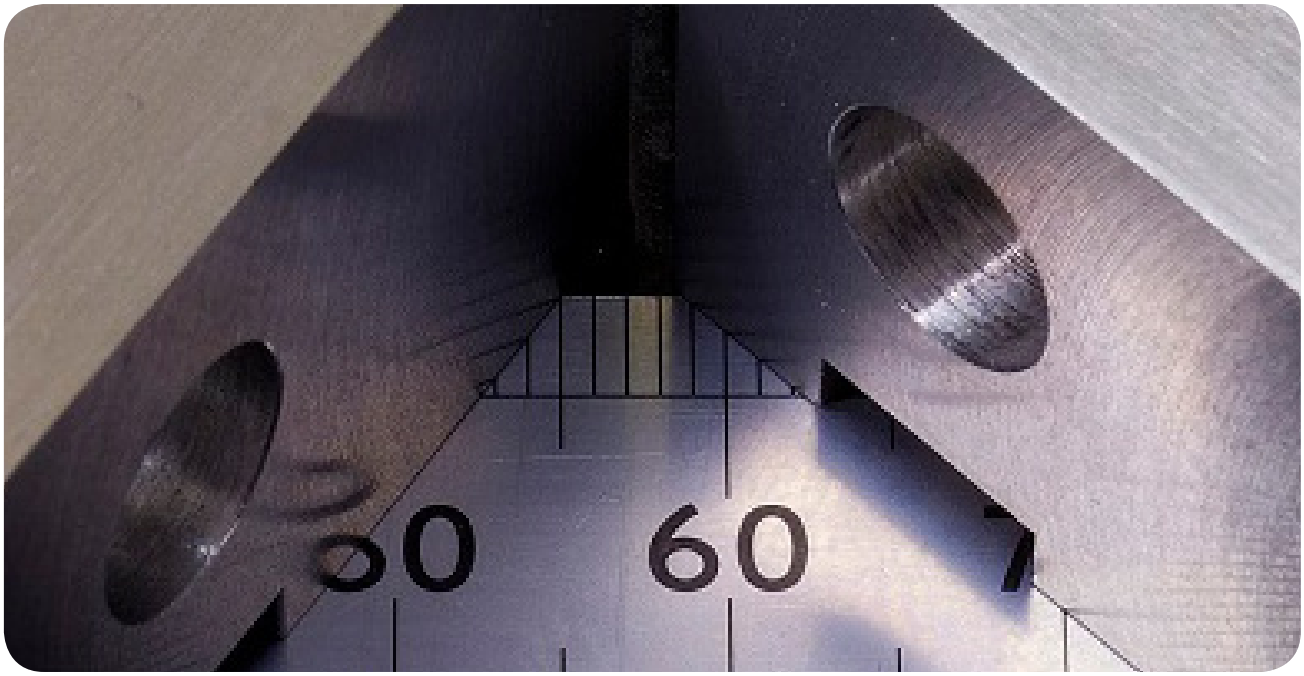
The challenges

Product C is more complicated to manufacture than Products A and B because it contains moving parts - and it is vital that these operate at high and low tolerances and work alongside the stationary parts in the product.

Many of the core challenges associated with Product A and B exist in C. The supply chain, for example, is critical. A complex electro-mechanical assembly like Product C combines electronics with moving parts and features bespoke metal work - requiring both a broad and established supply chain network. A challenge for OEMs is finding the right suppliers, who have the capability to deliver high quality parts. They also need purchasing teams with all the necessary skills in place to manage such a broad range of commodities.

The electronic component supply chain, underpinned by franchised distributors with access to global manufacturers, is very different to precision engineering specialists producing low volume machined parts to customer drawings. For these items the supplier's ability to adhere to quality standards while keeping up with demand through seasonal peaks and troughs requires very close management by the OEM. In addition they will also need to ensure that the information they supply in the form of drawings etc. is clear and up to date.

Another challenge OEMs face relates to tolerances, specifically the potential for them to build up against multiple parts. Each drawn item will have its own manufacturing tolerance; however, when several drawn items come together OEMs can find they start to conflict with each other. For example, a roller may not spin freely when attached to a back plate, two gears may struggle to engage, or the wire and cabling inside an energy chain may begin to get trapped. Often these issues won't be found until the physical build takes place. Individually, the parts produced will have passed the suppliers and OEM's initial quality and goods receipt checks.



Unfortunately, this can mean that the OEM's engineering team are required to carry out additional, unplanned work on the shop floor to help try and resolve the problem. The real challenge here for the OEMs is that each build will be different and while certain parts may fit fine in one machine they could cause issues in another. The material suppliers can also find themselves in a difficult position, as quite often they will be asked to input or confirm that the parts meet the original specification.

The solutions

In order to manage such a diverse supply base it is recommended that OEMs organise their purchasing team into clear commodities. This is an effective approach to purchasing, which considers and then groups together all parts of a similar nature, regardless of the end product.

Re-arranging your purchasing team in such a way enables each buyer to focus their skills and effort on a particular set of commodities. So, for example, you may have a single person purchasing sheet metal while another is responsible for all of the machined parts.

There are many advantages to this approach, such as the development of deep expertise in the commodity itself, the ability to access purchasing economies of scale and possessing the breadth and depth of market knowledge to understand, anticipate and deal with fluctuations in price and availability.

Having specialist buyers in place can also make a difference when searching for new sources, as they will be able to quickly identify a number of potential suppliers and then draw up a shortlist of candidates based on their experience. They will also be better placed to manage your existing supply base; and put in place objective measures relating to quality, delivery, cost, and other factors, in order to monitor and improve performance.

It's important to invest in the correct training and equipment for inspecting the large number of drawn items electro-mechanical builds contain. As a minimum your inspection room should include equipment, such as height and surface measuring instruments, digital caliper and mechanical micrometers and high magnification microscopes. While some tolerance issues will only be highlighted during assembly others - such as wrong dimensions, missing cut outs to metalwork, incorrect paint or anodizing finishes, scratches to front panels etc. – can, and should be, picked up beforehand.

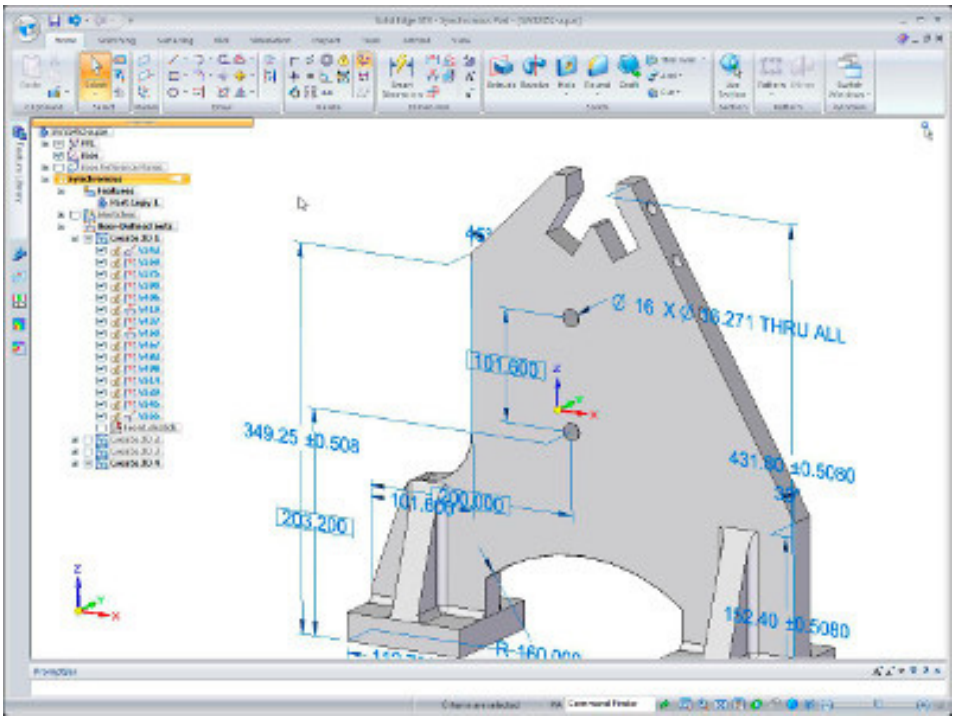
Any issues that are found either at material level or during build should be fed back to the purchasing and engineering teams. Again, a level of discipline is required here - it's often the case that problems are resolved out on the shop floor, meaning that quality issues don't always get highlighted to the correct department so that corrective actions can be put in place. Consider putting in place a robust feedback process, which is accessible by all staff.

3D CAD modelling packages can go some way in helping to identify if there will be tolerance issues during build.

A common mistake OEMs can make is having a complicated process or restricting it to those with access to computers. Unfortunately, this can limit the number of operatives that are then able to input into process improvement - many of which will be the most suited. In such a connected world, with increasing talk around the Internet of Things (IoT), it's easy to overlook more traditional approaches - such as hand written, colour-coded cards that flag up issues to line managers or senior staff.

3D CAD modelling packages can go some way in helping to identify if there will be tolerance issues during build. Many of the software packages available today allow you to simulate "real world" scenarios, which bring your design to life. Of course the software has limitations; so things like panels not fitting together correctly or the PCBs getting crushed can be identified, but the software won't always be able to determine the knock-on effect of several closely fitted parts clashing due to them all being produced on the outer limits of their tolerances, for example.

Test must be an integral part of any electro-mechanical assembly process. With the addition of moving parts an extra layer of complexity is introduced. Wires within energy chains can become trapped if they are not securely fitted or become loose. Likewise, a sliding arm moving across a metal plate could cause a system to jam if it has been fitted a couple of millimeters out. The ramifications of large metal plates and moving arms colliding into each other, or worse an operator or end user, can be huge. A robust test strategy is therefore required to ensure the product is functionally tested in order to meet the end user's requirements.



How an EMS partner can help OEMs to achieve QCD

At times it can be a real struggle to consistently produce quality products to meet your customers' demands. Partnering with an electronics manufacturing services (EMS) provider can offer a great solution for OEMs who are facing these kinds of challenges.

In fact, EMS suppliers achieve QCD on a regular basis. They have the plant, staff, processes and experience to deliver quality products on a consistent basis and to your specifications.

But how do you choose the right partner for your business?

Typically, the landscape of the EMS industry has been defined by a recognised tier system. According to this, suppliers are placed in one of three different categories based on their annual turnover.

Tier one suppliers tend to be multi-nationals with a turnover of greater than $3 billion. Tier two providers are medium-sized businesses with a turnover of between $300m and $3 billion. And tier three suppliers typically have a turnover of under $300m.

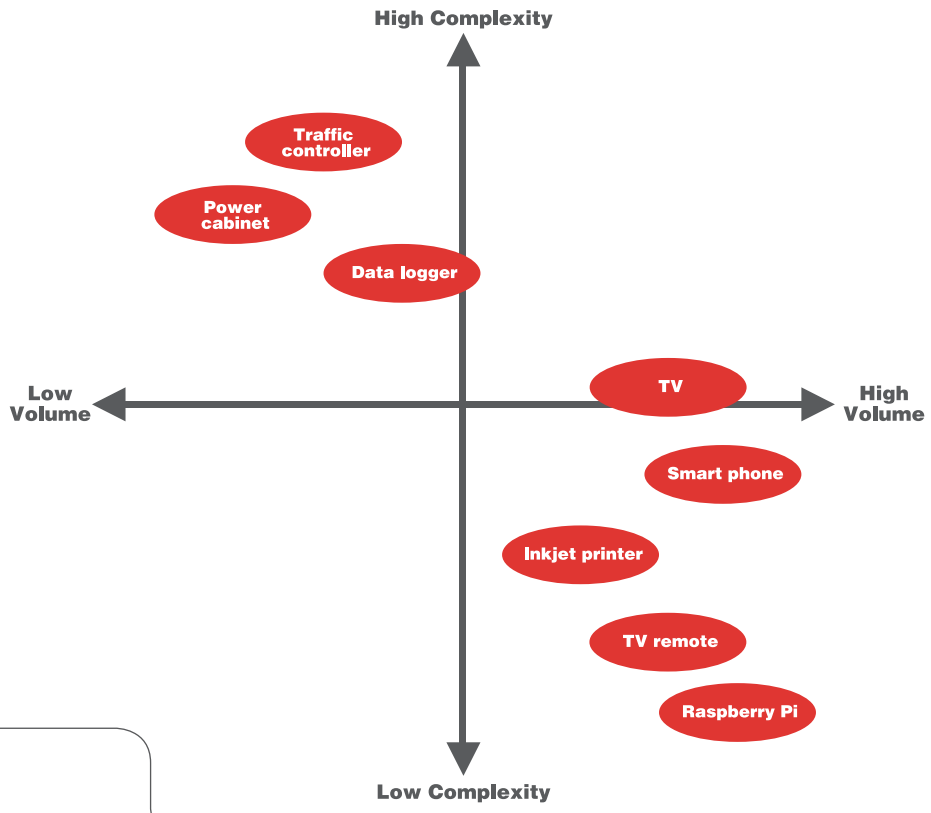
But while this model has its merits, it doesn't take into account the relative strengths and weakness of the different types of EMS provider. And this means it isn't necessarily the best paradigm to help you make a decision.

For example, some suppliers are expert at delivering a small number of units within a tight production window, while others are much more effective at producing hundreds of thousands of units day in, day out.

Ultimately, there is no "one size fits all" when it comes to choosing an EMS partner. Potential EMS partners must be able to demonstrate they have the knowledge, capabilities, skills, processes, controls and agility to manage your business, in order for you to feel comfortable about working with them.

Choosing an EMS partner

Think about the products you are looking to outsource. Where would they fit in the graph below?



Complexity refers to the number of components and how difficult a product is to manufacture; volume refers to the number of units built, with products like consumer electronics on the high end, and prototypes, medical electronics or machinery on the low end.

As a general rule, a single EMS partner will have the skills and expertise to manufacture products that cluster in one area of the graph below. If a provider is offering a broader service it may be the case that they are stretching themselves thin – which will impact negatively on QCD.

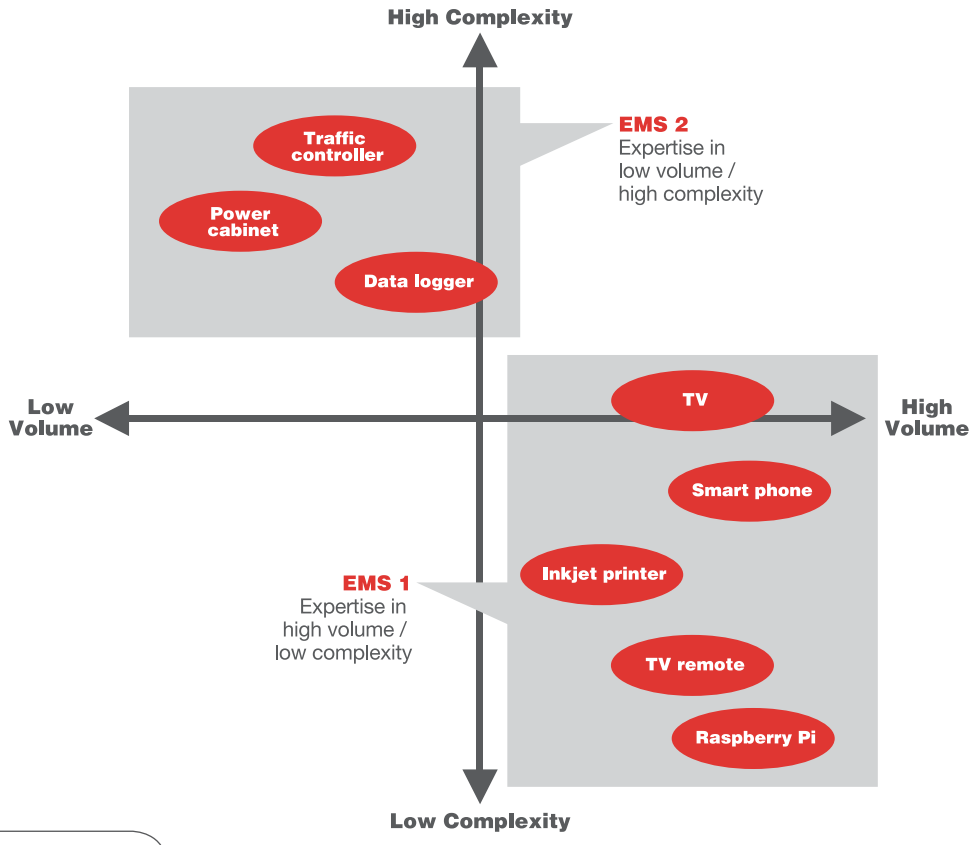
The first thing to look for is a good overall fit. Take into consideration the size of the EMS company in relation to your business, the typical volumes they build, the complexity of the products they produce, and then look at their accounts to see how they have been performing.

Here are some questions to ask:

- Does the EMS provider have the correct skills and experience for the job?
- Has the EMS provider previously worked with customers like you?
- Does the EMS provider possess quality accreditations?
- Who is in charge of the supply chain, production and engineering?
- How much will it cost to outsource?

Ultimately, it all comes down to this: the right EMS partner is someone who has the material supply chain well managed, such that they have enough material to build your products when required to do so and can respond to unforeseen peaks and troughs; they have the right equipment, processes and people to build, configure and test your products; and they have the agility to work with you and deliver what you want, when you want it, how you want it.

In other words, they can help you achieve QCD.



Conclusion

As an OEM you want to be able to consistently deliver high quality products on time, according to your customers' needs.

However, as we have seen, it can be difficult to achieve all three factors and still deliver healthy profit margins. For any number of reasons, an OEM may find itself struggling, which can have a negative impact across its business.

There are a number of industry-wide challenges to take into consideration, such as your supply chain and your adherence to legal requirements.

And there are also discrete challenges involved in each of the three key areas of manufacturing: box build assembly, cabinet builds and electro-mechanical assembly.

OEMs can overcome these difficulties in a number of ways, such as ensuring that all documentation is version controlled and up-to-date and by fully testing products before release.

You can also solve these challenges by working in partnership with an EMS provider, helping you to achieve QCD, month in, month out – bringing huge rewards for your business.

About Us

JJS Manufacturing is an Electronics Manufacturing Services partner, offering low risk, end-to-end procurement, manufacture and supply chain solutions.

Call us on **+44 (0)1455 55 55 00** to discuss any points raised in the eBook or to talk through your own outsourcing requirements. We would be delighted to hear from you.

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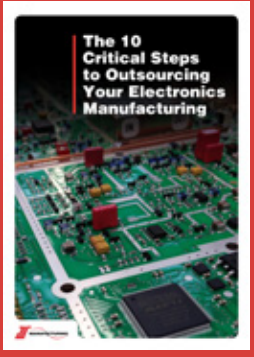

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