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THE 'HIDDEN' MATERIAL COSTS
IN EMS PROVIDERS' QUOTE CALCULATIONS

When calculating the material costs in their quoting process, EMS companies with a large variety of prototypes and small to medium-sized productions often appear to take insufficient account of material-related '**hidden costs**'. This influences both their competitive position and their annual results. Why is this and what can you do about it?

Of course, the costs of the physical materials are included in all quotation calculations. But what about the material-related costs that are not immediately visible?

If those 'hidden costs' are not structurally included in the cost calculations, how does this affect the reliability of the quoting process?

How do the 'hidden costs' ultimately influence the financial result when an order is received and the products are produced? And what impact does this have on the company's final operating result on an annual basis?

Why are the 'hidden costs' usually not or not fully included in the calculations? The answer is simple: Especially in the fast turnaround segment, the pressure on the RFQ response times is so enormous that it is too complex and time-consuming to calculate the 'hidden costs' for each request for quote (RFQ).

But is it better to adjust the margin?
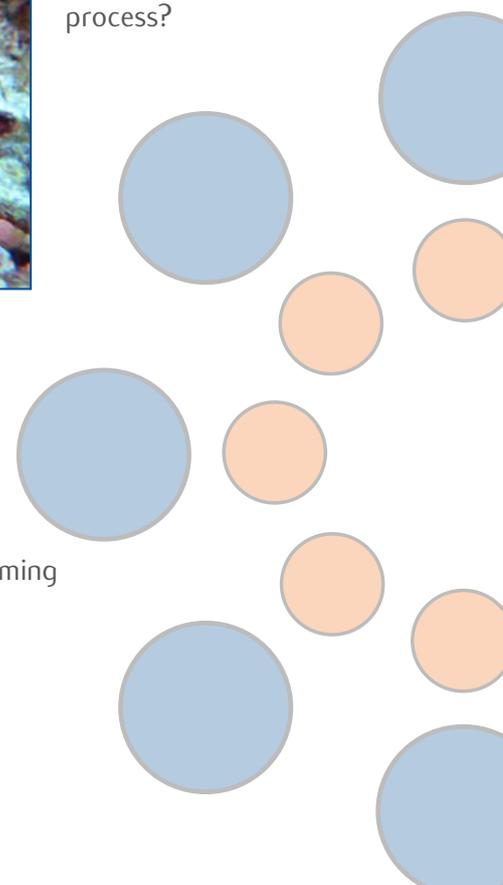
The fat margin solution.

The habit of compensating for the hidden costs in the margin surcharge is rather dubious. Although correct in theory, in practice compensating for it through the margin appears to be a potential risk for several reasons. In the highly competitive electronics manufacturing industry, that approach, as explained lateron, can turn out quite wrong.

What are those hidden costs?
1. Material purchase costs
2. Material reception and storage costs
3. Minimum order quantities (MOQs), residual materials and residual material value
4. Various other costs

1. The hidden costs of the materials purchasing process.

In addition to performing daily procurement routine tasks, the procurement department is responsible for ordering materials for orders to be produced. The daily routine tasks take time of course, but the costs associated with these tasks cannot usually be directly assigned to specific orders from specific customers. They are considered as the costs of running the department as such and are included in the company overhead costs. The material purchase costs for received orders on the other hand can be specifically allocated to those orders. The related hidden costs should therefore also be taken into account in the quoting phase. These costs should at least be known.

Most electronic components are cheap. The cost price of many components is less than a cent a piece. But the costs of getting them ordered and in stock are usually a multiple of that. And what about minimum order quantities (MOQs) and the inevitable residual materials involved?

Depending on several factors, such as the ratio between 'known' versus 'unknown' components in the BOM, the number of different items in the parts list and the series size of the job, the hidden costs per individual request for quote (RFQ) can vary enormously. With the approach of keeping the order related ordering process (the materials purchasing cycle) separate from the rest of the procurement activities, the directly related costs per individual RFQ can be determined for correct cost allocation.

The materials purchasing cycle.

By the materials purchasing cycle we mean the directly involved process steps of <u>one complete purchasing cycle for materials from one supplier.</u>
Roughly, the following steps are distinguished:
• Material sourcing
• Prepare purchase order with the materials to be ordered
• Send and process the purchase order
• Process order confirmation supplier (if received)
• Process supplier invoice
• Process payment to the supplier

Do you know what your internal costs of a materials purchasing cycle are?

2. The hidden costs of material receipt and storage.

The costs of the physical warehouse and the associated infrastructure are compensated in the overhead costs of the company. The hidden costs referred to here, however, relate to the costs involved in handling goods deliveries per purchase order, the material receipt and storage cycle.

By the material receipt and storage cycle we mean, just like in the purchasing department, the directly involved activities of <u>one goods receipt and storage cycle of one material delivery by one supplier.</u>
Every courier visit, each material delivery results in a series of activities that can be roughly distinguished as follows:

• Goods receipt
• Unpack the goods
• Sorting/processing packaging waste
• Checking and inspecting the goods
• The entry of the goods in the stock management system
• Physical storage of the goods in the warehouse/drying room

A complete goods receipt and storage cycle is performed for almost every material delivery. The more different deliveries (= different suppliers) per production order, the higher the hidden costs for that particular order. Incidental costs such as returns caused by poor quality or incorrect deliveries must, of course, be ignored.

Do you know what your internal costs of a material receipt and storage cycle are?

Note: After an extensive investigation, we had to conclude that most EMS companies cannot quantify the internal costs of a full material purchase cycle, or the costs of a goods receipt and storage cycle. The estimates varied enormously between €25 and €150 +.

3. Minimum order quantities (MOQs), residual materials and residual material value.

Minimum order quantities (MOQs) of components are a fact.
In some cases they are unavoidable. You are forced to buy a large quantity at the same time. In some cases, you can choose between exact quantities for the job size at a higher price per part from one supplier or larger quantities (often factory packaging) at a lower price from the same or a different supplier.

The residual material as a result of minimum order quantities creates a diabolical dilemma in which many different aspects play a role:
• Can the excess material be used in follow-up orders?
• Can the excess material be used for other customers?
• Does the customer want to pay for the excess materials?
• Must the residual material be stored?
• Are the storage costs for your account or for the account of the customer?
• What if a component price drops dramatically in the near future?*

 * *Newly introduced components (e.g. ICs) are known for becoming drastically cheaper soon after introduction.*

If the customer understands the problem of residual material, there is no problem.
But if you have to absorb the surplus materials and their costs, you may shift significant potential costs to the future. Ultimately, unpopularity, ageing or unusability (e.g. reduced solderability) can result in the residual material having to be written off, which is immediately at the expense of the annual operating result.

How visible are the costs of excess material for your organization?

Are they measured and how are they distributed?

4. Various other 'hidden' material costs.

Although not exhaustive, below a few important costs that are often missing in RFQ material cost calculations. These costs can also vary greatly between quoting calculations.

Customer or Customer Certification related activities:
• Special certification-related incoming goods inspections
• Special quality reporting of incoming goods
• Special treatment (e.g. counting or inspecting) of certified or expensive parts
• Inspection of materials supplied by the customer (e.g. bare PCBs)

Extra material processing, outsourced at the request of the manufacturing department, such as:
• Material preparation (e.g. cutting, stretching or preforming of THT components)
• Material retaping or repacking (special)
• Component pre-programming or selection test

Extra transport-related costs that may occur in addition to the regular costs, such as:
• Taxes that are difficult to reclaim
• Import duties
• Extra insurance costs for shipments of expensive material

Production related hidden material costs:
An unknown component in the BOM can also have an unknown shape code, which will cause production related hidden material costs:
• Release costs for production
      -check the datasheet for process (PSL) and moisture sensitivities (MSL)
      -collect and check all physical shape data
      -create shape code and footprint in all relevant libraries (SPI, AOI, X-Ray, etc.)
      -check shape code for trouble-free use in production and testing
• Necessary tooling
      -the necessary tooling (e.g. tape feeder) may not be present. This has consequences for:
            -investment in tooling
            -delivery time of the tooling

The question is whether these production-related material costs should also be counted among the hidden material costs. Alternatively they can also be counted among the "hidden" production costs.
Anyway, they must at least be known.

In addition, the question is who will be responsible for these costs. The company or the customer?
If it concerns a complex, exotic shape code, it can be decided that these costs should actually be paid by the customer because they must be made specifically for this customer (e.g. expensive SMT tape feeder).

Another aspect is the delivery time of special tooling that can conflict with the desired delivery time of the product. In most cases absense of the tooling requires an expensive special manual assembly. Who pays those additional manual assembly costs?

How visible are the remaining various costs within your organization?

Does it make sense to take into account the hidden materials costs?
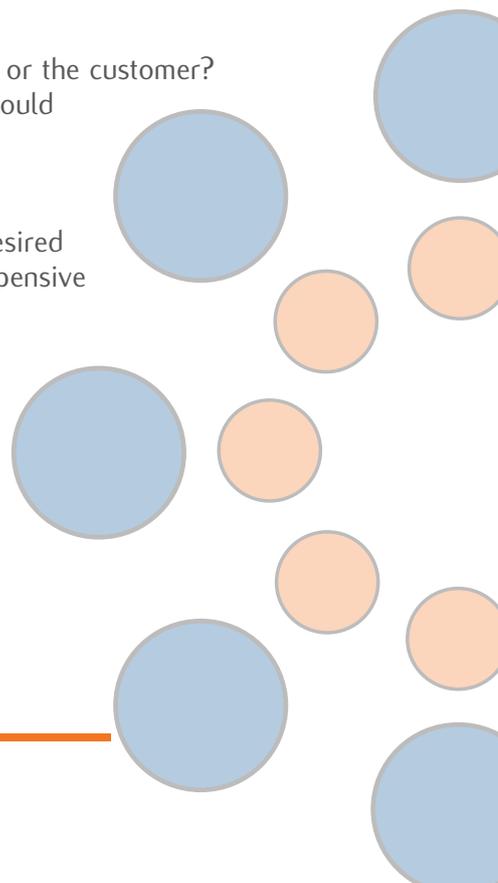
Absolutely!

For small to medium-sized orders in particular, the hidden costs, both in absolute and percentage terms, can be substantial and the differences can be considerable. The smaller the batch size, the longer the bill of materials and the higher the percentage of unknown components, the greater the impact of the hidden costs. Rather quickly a point will be reached where the total of hidden materials costs turns out to be (much) greater than, for example, the assembly costs.

An incomplete material cost calculation can therefore unnoticeably introduce an invisible loss. If the used material cost calculation model does not structurally provide the correct compensation for the hidden costs, these will form on an annual basis a large loss item.

It is therefore important a) to recognise as many hidden costs as possible and b) to be able to quantify and specify these on a per RFQ item basis. It is then up to you to decide which costs are included in the final quotation calculation and which are not. At least you know what you are doing.

But that is not the only aspect!

An additional and possibly much larger problem is that the lack of hidden costs has a more far-reaching consequence than just reducing or eliminating the profit on a single production order. The practice of covering the risks with a substantial margin constitutes a significant commercial risk.

Why?

If you know all the costs, you can apply the correct margins based on facts instead of estimates. This specific aspect can have a major impact on the annual business results from a commercial, financial and manufacturing perspective.

A detailed explanation is given in our White Paper **"Automated quoting dramatically increases your profitability".**

Summarizing the White Paper you can conclude that incomplete cost calculations for quoting affect your competitive position. On one hand, you can miss out on orders because you are too expensive if the hidden costs are low and therefore the margins too high. On the other hand, you can get orders that ultimately yield a much lower return (if not a loss) because the hidden costs appear to be high and the margins therefore too low.

What can you do about it? Is ICT a solution?

With the current way of working, the total complexity of the aforementioned hidden costs cannot be overseen, let alone correctly calculated. Certainly not within most of the desired RFQ response times.
That is why quoting automation is the most obvious solution.

But even if quoting automation is not possible, it is worth analyzing accurately whether and how the hidden costs have been recorded in your current material cost calculation model. Especially with prototypes and smaller series, it is really useful to properly organize the hidden cost calculation within the calculation model.

Quoting automation software.
Professional quoting automation software contains functionality to solve the problem of hidden costs. It makes the cost calculations much better, more complete, more consistent and it considerably reduces the risk of errors. Additionally, it dramatically simplifies the work of the quoting engineers.

Professional quoting automation software also offers the possibility of variation with different supplier scenarios, MOQs and associated prices and delivery times per individual RFQ item. Material cost calculations based on different supply scenarios can be performed in a very short time. The scenario-related hidden costs are automatically calculated accordingly and separately presented in the material costs report. The results can be viewed, drilled down and compared.

An example illustrating the large differences that may occur within the hidden costs of purchase and goods delivery:

We assume a RFQ for an order size of 100 PCBAs to be assembled, based on a bill of materials with 100 different items and a total of 275 components.
Imagine the following hidden materials costs, which we have based on the lowest end of our hidden costs investigation (see above):

A. The internal costs of a material purchase cycle:
   -General purchase costs per supplier per order €10
   -Preparation costs for the order €1.05 per BOM item

B. The internal costs of a material receiving and storage cycle:
   -General costs per supplier delivery €10.70
   -Processing costs per BOM item per delivery €1.40

Scenario 1:
• 85% (85 part codes) of the BOM is a stock item (Assume there is sufficient stock. See also the Note below)
• 15% (15 part codes) of the BOM items is unknown and will be ordered across 2 suppliers.

The hidden costs A are: (2 x 10) + (15 x 1.05) =   € 35.75
The hidden costs B are: (2 x 10.70) + (15 x 1.40) =   € 42.40
Total: € 78.15

Scenario 2:
• 15% (15 partial codes) of the parts list is a stock item (assume there is sufficient stock. See also the NB below)
• 85% (85 partial codes) of the parts list items is unknown and will be ordered across 6 suppliers.

The hidden costs A are: (6 x 10) + (85 x 1.05) =   € 149.25
The hidden costs B are: (6 x 10.70) + (85 x 1.40) =   € 183.20
Total: € 332.45

Note 1: Packing and shipping costs and the excess delivery of materials as a result of MOQs are not included in this example calculation. The chance of MOQs and surplus materials is considerably higher for 85 BOM items from 6 suppliers than for 15 BOM items from 2 suppliers.

Note 2: We assume that the purchase and goods receipt and handling costs for inventory items are already paid or offset in the hourly rates for the two departments.

The example shows that even when the costs (A and B) as such are relatively low, the differences between the hidden cost for identical RFQs can become very large.

It can be interesting to calculate the costs in this example with your own data.

Conclusions:

1. For a correct and healthy quoting policy, not taking into account the hidden material costs is a non-sustainable method.

2. For the profitability of an assembly order it is important to compensate correctly for the hidden material costs involved; even if these costs are not easy to determine.

3. The methodology for compensating for hidden materials costs with a juicy margin constitutes a significant commercial risk.

4. The use of professional quoting automation software can eliminate the negative aspects of the phenomenon of hidden costs in the materials cost calculation. Taking these costs into account reduces the risks and improves both the competitive position and the annual results.

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