

Professional Custom Antennas: engineering and production.

Flaminio Bollini
Sales Manager

In any text on antennas or electromagnetism, you can find the **definition of antenna** as a "*transducer that converts electromagnetic energy from a guided form to a radiated form and vice versa*".

Much less obvious is the definition of a **custom professional antenna**. If, by a **professional antenna**, we mean a product that truly meets all the technical specifications declared by the manufacturer, the term **custom** indicates an antenna tailored to meet the specific requirements requested by the Customer commissioning the project.

Therefore, starting with a **custom professional antenna** defined as a *certain product*, meaning completely known from a technical perspective, it must also be tailored in aspects related to its **engineering, production, and supply to the Customer**. This includes not forgetting the importance of what are referred to as **commercial requirements**.



1. Who needs professional custom antennas?

What are the **main reasons** for requesting the **design of professional custom antennas**?

In **our experience**, it is advisable to undertake an activity of this kind when there are technical and/or commercial needs that involve:

- a) Performance**, i.e. when there is a need to create an antenna with specific electrical specifications that do not exist in standard products on the market.
- b) Integrability**, i.e. when there is a need to create an antenna with specific mechanical, aesthetic or environmental characteristics that allow it to be mounted in certain installations or integrated into certain devices or equipment.
- c) Management of subsequent production**, i.e. when it is necessary to define, in addition to the technical specifications, certain "commercial" characteristics such as price, delivery times and availability guaranteed for a certain period of time.

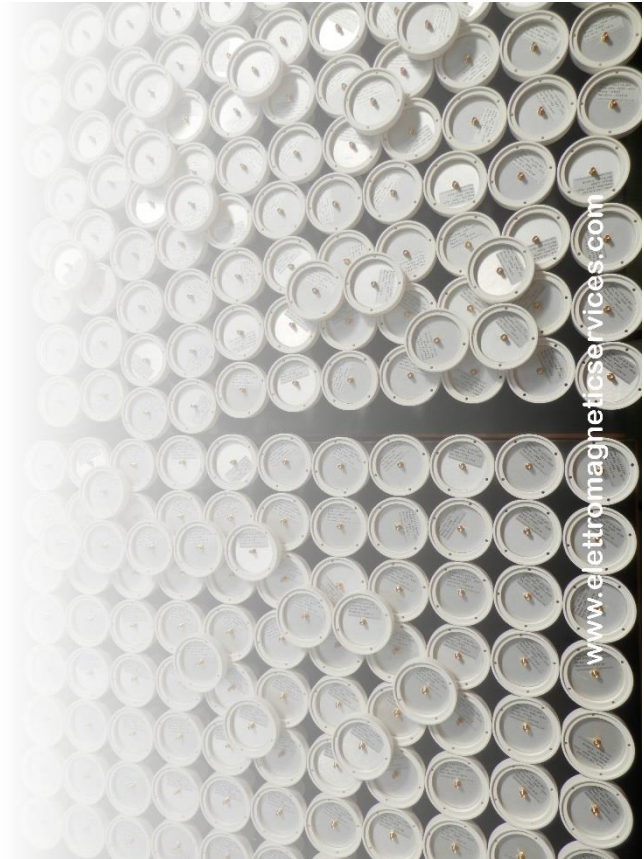
Without prejudice to the legitimacy of all these reasons, in this article we would like to focus on the last of these points, because although it is often overlooked, it is able to guarantee **real and concrete benefits** to those who intend to create a **mass production** of the antenna to be designed.

When designing a customized antenna, it is indeed necessary to consider this aspect from the outset, aiming to ensure **precise and accurate management of the procurement phase**.

However, it is important to emphasize a fundamental point straight away: achieving these benefits is NOT always a given and can only be guaranteed by seriously and thoroughly tackling a fundamental phase of the design process: **the engineering of the product**.

Going straight from prototyping to series production **is often a serious mistake**, with major consequences in terms of both time and cost.

In the next section, we present a series of assessments that **we believe should be carried out before proceeding to the production phase**, explaining their purpose and the risks of underestimating them.



2. Product engineering.

By **product engineering** we mean all the activities aimed at **making a product mass-producible**.

These activities mainly consist of: *the choice of technologies to be used for the production of the various parts, the definition and creation of production equipment, the definition of the necessary documentation (final mechanical drawings, bill of materials, assembly and testing instructions).*

This phase begins following control of the prototypes built, both by means of laboratory measurements and of functional tests in the field and, as already mentioned, **is fundamental** in those projects in which **mass production** of the developed antenna is planned.

Only through a detailed *engineering* phase it is possible to arrange a mass production that is as efficient as possible, guaranteeing **the right timing and the right price**.

It is not possible to define in advance how the product engineering should be managed; indeed, some **specific characteristics of the ongoing projects** must be assessed from time to time, both from a technical and **commercial point of view**.



2.1. The quantities involved.

Together with the *target price* which will be discussed later, **the quantities foreseen for subsequent production** are the starting data and are the most important, because they determine most of the choices that must be made during the engineering process.

In this regard, there are some **important considerations to make**.

First of all, the assessment of the number of pieces to make must be **as realistic as possible**, trying to be "honest" both with yourself and with your suppliers. In fact, it is often thought that **by optimistically communicating too many pieces** it is possible to obtain a lower production price. **This strategy**, as old as the hills, not only does not correspond to the truth but **often turns out to be counterproductive**.

The surest way of obtaining the best price is to **make accurate forecasts**. Indeed, only in this way is it possible to make right choices in line with the production you want to set up. For example, when assessing the possible creation of a certain piece of assembly equipment, **considering a higher number of pieces** than those that will actually be produced **may lead to an overly high production cost** and therefore the impossibility of proposing the antenna at a competitive price.

Furthermore, in addition to forecasting the number of pieces/year or total number, an indication of the **number of pieces** you intend to produce **for each production batch can be of great help**.

2.2. The target price.

First of all, it should be noted that the definition of the *target price* of a product, which is substantially dependent on the market on which the product will be sold, must be set **in the early phases of the project**, along with the technical characteristics of the product, as this allows you to make ad hoc design choices right from the start.

Following the project design phase, in the industrialization phase of the antenna, **a more accurate definition** of the target price that refers **to the individual production batches** and their **production rate** helps to establish both **the technologies to use** for the creation of the various pieces and **the final assembly method**.

Indeed, as a general rule, **the greater the degree of industrialization** of the antenna, **the lower the production effort and the risks** associated with it, such as the possibility of having high defect rates in the finished product and ensuing non-compliance during testing.

It will also allow you to **correctly plan** the various assembly phases.

2.3. Technologies and suppliers.

It is clear that *the quantity involved* and *the target price* **affect in a decisive way** the choice of the most suitable technologies for the production of the various pieces, but when making engineering choices it is also paramount to take into consideration the **company's know-how** as well as its **production capabilities**.

When you opt for a certain technology for the construction of a particular piece of equipment, being aware of **your level of knowledge** in that specific supply sector is of vital importance. If it is not possible to rely on one's own experience, which is certainly the most recommended option, it is advisable to try to gather as **much information as possible** and perhaps carry out **some small-scale or pre-series tests** before going ahead with the production.

Using a technology **that has never been used** before without completing a preliminary testing phase is **a mistake** that you risk **paying dearly for**. For example, imagine the problems that could arise from incorrect evaluation of the tolerances of a given technology.

Another fundamental factor that can significantly affect the choice of technology is the **evaluation of the reliability of one's suppliers**.

2.4. The skill of assemblers.

First of all, let us say that it is not our intention to offend anyone's sensibility: indeed, it is clear that nowadays **it is not possible to have specific skills** in every production sector.

By "*skill*" we mean not only **the ability and manual skills** needed to deal with certain assembly activities, but also **the capacity** to carry out productions that require specific care. This can, for example, be the case of



integrated antennas that are often mounted by personnel with expertise in electronic assemblies but without adequate and specific **radio frequency skills**.

In the **industrialization phase** it is therefore advisable to take into account the **know-how** of the people who will deal with the assembly during the production phase and in which cases it is instead more advantageous to **adopt measures** to maintain a **high degree of precision in assembly**, while guaranteeing adequate timescales.

These **stratagems** can concern various aspects of engineering, such as:

- highlighting **the various critical issues** when defining the assembly procedures;
- designing the various details and components with **precise and unambiguous references**, so as not to create ambiguity during assembly;
- creating **templates and positioning equipment** that limit assembly tolerances;
- carrying out random checks **after each critical phase**, before the piece reaches the next assembly station.



In general, making an **impartial and correct assessment of the skills** of the people who will deal with the assembly will avoid encountering a **whole series of problems** that could prove **difficult to solve**, such as reviewing the assembly process during the production phase with important deliveries on the horizon, or "adjustments" of the antennas built and not compliant.

2.5. Non-recurring costs (production equipment)

In the production of a specific product, *non-recurring costs* concern all **expenses incurred** that are **not linked to production volumes**. This includes both the **equipment** necessary for the creation of the various parts that make up the antenna, in accordance with the technologies adopted (for example the molds or punches), and the **assembly templates** or anything else necessary to **set up the production process**.

In the specific case of antennas, even the creation of a **measurement and testing bench** at the end of the assembly line can represent a non-recurring cost for a non-specialized company.

It is not always easy to understand which is the best path, i.e., the one that allows you to **obtain the most advantageous production price**. Indeed, it is necessary to estimate whether the equipment you want to create is able to guarantee **sufficient time savings to justify the cost**, without overlooking the **degree of precision** required for the creation of the piece.

In all of this, the **experience gained** in previously completed projects certainly plays a fundamental role, which allows us to rely on assessments already made in the past, **predicting and resolving in advance problems** that could prove complex.

2.6. Calibration, verification and testing times.

Take care, although this is **one of the most relevant variables**, unfortunately we usually tend to consider it of little importance, with disastrous results to say the least.

In the engineering phase, dedicating the **necessary attention** to defining **the right calibration, verification and testing methods** of the antenna being produced can lead to a **considerable saving of time**, which can translate into economic savings or the possibility of dedicating these resources to other phases of the production process.

Specifically, when the creation of a **large number of pieces is envisaged**, it is not feasible to test all the antennas individually and it is therefore necessary to make **random checks**: this entails the need to have **an antenna capable of complying with all the technical specifications** already at the end of the assembly phase, **without the need for individual calibration phases**.

We will never tire of stressing the importance of this point and how vital it is to take the utmost care when dealing with it.

It is not difficult to imagine the **economic losses** caused by being forced to check and modify each piece to make it compliant with the declared technical specifications.



2.7. The necessary documentation.

We end this chapter with some **advice**.

Whenever you decide to create a certain detail with a certain technology, it is a good idea to find out in good time the **documentation** and **files** that will have to be provided to the supplier for the order.

Indeed, it is not unusual to find yourself faced with requests that are absolutely legitimate, but extremely difficult to fulfil if you are not adequately prepared, with consequent **increases in time and costs** that were not foreseen.

Taking these variables into account allows you to obtain, in subsequent production, all those **commercial advantages** that will allow you to have a **privileged position** compared to competitors.

3. Professional custom antennas benefits.

Let us now summarize the advantages, which we could call "**commercial**", deriving from the decision to adopt **custom professional antennas** for a specific application.

Indeed, unlike normal standard products, a *custom antenna* is also able to **optimize aspects that are not purely of a technical nature**.

3.1. Price, delivery times and availability.

Have you ever been faced with a **price increase** for a standard product that you purchase periodically?

Or an **unexpected delay** in delivery times?

Or even that a product goes "**discontinued**"?

Surprises of this type are certainly not pleasant.

Especially if you propose innovative solutions and strive to **guarantee certain and well-defined purchasing conditions**, these problems can significantly **affect the relationship of trust** you are trying to establish with your customer.

We often tend to think that choosing a standard product is **the safest way** of not finding ourselves in situations of this type, **but this is not always true**.

Whoever creates a standard product **is not creating that product just for you**, but is offering it to a much wider market.

It is therefore possible that the **sales strategy could vary**, perhaps deciding to increase the price when there is an increase in demand (law of the market).

Or, when you need to place the order, the manufacturer may decide to **delay the production** of those antennas or, even worse, tell you that **that antenna is no longer available**.

How can this problem be solved?

A **safe and reliable solution** is to have a company that produces a custom antenna **exclusively for you**, establishing from the start, together with the technical characteristics, which "commercial" specifications can offer advantages over your competitors.

In this way, by being able to count on a **reliable supplier**, in addition to clearly defining the price and delivery times, you are guaranteed the future availability of the antenna you need.

In the evaluations made when choosing the best antenna, it would be a good idea **to include advantages that are not easily calculable**, but nevertheless fundamental, such as the possibility of **planning and managing the subsequent production phase accurately and without risks**.

In the next paragraph we will add two other fundamental characteristics typical of custom professional antennas: **confidentiality and exclusivity**.

3.2. Confidentiality and exclusivity.

We live in a world where it is increasingly necessary to offer **unique and exclusive** products to customers in order to stand out and win market share.

In this sense, it is appropriate to make every effort to create **innovative solutions**, and it is obvious that these efforts must be **defended and protected**.

Measures such as drawing up and signing NDAs are certainly useful and advisable.

But can you do more?

As far as antennas are concerned, the use of **an ad hoc solution, optimized for a specific application**, allows you to obtain a number of **important benefits** in terms of exclusivity and confidentiality.

Speaking of exclusivity, the possibility of associating your product with a professional custom-made antenna, optimized for your specific application, allows you to count on a **performance that is certainly better** than that of your competitors, who will not be able to find a product with the same performance on the market.

*Can you imagine **the significant advantage** this brings from a technical point of view?*

Then consider how your customers **will perceive you** when they notice the difference in quality between your products and those of your competitors.

In this way you are absolutely sure of proposing a unique and exclusive solution.

From the point of view of confidentiality, you can count on the fact that **your competitors will never become aware of the technical solutions adopted** for the design of your customized antenna, guaranteeing you absolute confidentiality on how these are created.

You'll always be **one step ahead**, while they're still trying to figure out why your products are better.

It is also important to bear in mind that in the design and development of professional custom antennas, we tend to study ad hoc solutions with a **high degree of optimization, so that the same solution cannot be easily adapted to other products or applications**.

All this gives you a **level of confidentiality that is impossible to achieve** using standard antennas.

4. Conclusions.

There is no doubt that when evaluating **the construction of a specific antenna**, in addition to all the technical characteristics it is also necessary to make a careful evaluation also regarding what are called **"commercial" specifications**.

The main commercial characteristics are:

- *Reference market and target price*
- *Delivery time*
- *Future availability*

When you buy a standard off-the-shelf antenna, **you have no control over these variables**, which leads to a **certain degree of uncertainty** about what might happen to you in the future.

The best way to overcome these problems is to opt for a **tailor-made antenna design**. In this way you will be able to **meet all your commercial needs** and at the same time you will have a product that **meets 100% of your technical requirements**.

And last but not least, it guarantees you **an absolutely unique degree of confidentiality and exclusivity**.

If you believe that your business can benefit from clear and well-defined business features, you certainly have a good reason to consider this alternative.

*All the information and experiences reported in this article are the result of the design, development and creation of professional custom antennas carried out by **ElettroMagnetic Services Srl** with the **AntennaCustomizer** design method.*

For questions, clarifications or further information regarding this or other topics related to professional antennas, feel free to write to bollini@elettromagneticservices.com

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