Technical E-Paper

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Custom antenna design: optimizing delivery time

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In recent years, the global industrial landscape has continued to face significant uncertainty. Many suppliers still struggle to meet delivery schedules due to ongoing instability in the markets for raw materials, semi-finished products, and global logistics.

As a result, these supply-related uncertainties are often poorly managed, with insufficient attention given to the relationship with the end Customer and to clear, transparent communication.

In this short article, inspired by the current context of global uncertainty, we address the topic of optimizing delivery times for a custom professional antenna.

ElettroMagnetic Services SRL

1. Introduction.

As already mentioned, the current scenario of global instability continues to cause significant disruptions to industrial production as a whole.

This issue is still affecting many companies in terms of the supply of raw materials, semi-finished products, and consequently subassemblies and finished parts.

Such a situation, experienced by anyone involved in a production process of any kind, inevitably leads to uncertainties in delivery times and makes it difficult to provide accurate forecasts during the offer definition stage.

We take this opportunity to extend the topic of delivery time optimization to custom antennas: beyond the current global context, these antennas must necessarily be produced only after a development phase that inherently involves a degree of uncertainty, primarily due to the novelty of the project itself, that is the need to create a product that has never been built before.

In this article, which draws inspiration not only from our relationships with Customers but also from our collaboration with Suppliers, we will provide a brief overview of this aspect of the design and prototyping of a custom antenna.

The purpose is, of course, to offer the Customer, who is about to commission a custom project from a specialized company, some points for reflection on the delicate subject of meeting delivery deadlines.

2. Accuracy of information and communication.

Being able to manage information correctly and promptly, not only technical but also commercial, provided to the Customer from the very first stage of the offer is a matter of fundamental importance. It is what makes the difference between a professional company and one that can, benevolently, be described as “improvised.”

Nowadays, knowing how to work well, that is being technically competent, is certainly a necessary condition, but no longer a sufficient one when dealing with a professional Customer, namely a company whose organizational and/or production stages are necessarily tied to the fulfilment of commitments made by its Suppliers.

This aspect can be summarized in the following two key points:

- From the very beginning, during the offer stage, delivery times must be clearly defined, allowing for an adequate safety margin to account for the unforeseen events that inevitably occur during development. Providing unrealistic delivery schedules in the hope of increasing the chances of securing the order usually turns out to be a double-edged sword, and it is always more advantageous to speak clearly with the Customer from the outset.
- Inform the Customer promptly of any possible delays so that, as far as possible, they can adjust their own schedule accordingly to manage the issue. There is nothing more damaging to a Supplier’s professionalism than notifying the Customer of a delay on the very day the delivery was supposed to take place.

Of course, we can all agree that complying with the two points mentioned above requires the Supplier to be able (or willing) to perform two actions that cannot be considered easy, namely:

- to devote the necessary time to careful planning of development activities;
- not to always comply with the Customer’s requests when these lead to making promises that are impossible to keep.

In most cases, pointing out the possible limitations to the Customer’s requests already in the preliminary phase helps convey an image of competence and reliability.

3. First-tier Customers and second-tier Customers.

Continuing on the topic of communication, the title of this paragraph should be seen merely as a provocation. Nevertheless, it is undeniable that within any company there are Customers who can be considered more or less "likeable."

As for structured companies, a Customer's level of "likeability" is determined solely by the revenue they generate; in the case of small firms, however, the ranking of the "ideal Customer" may also be influenced by other, more personal factors.

That said, from a professional standpoint, such a ranking should not exist, and communication with the Customer must be conducted in a way that ensures no differences in treatment are made or perceived compared to other projects.

Returning to the topic, failure to meet the delivery deadlines of a custom antenna inevitably leads the Customer to feel like a "second-tier" one. For this reason, communication with them must be:

- **prompt**, meaning "we haven't forgotten about you because we are busy with another Customer";
- **consistent**, meaning I cannot tell the Customer the opposite of what has been communicated up to that point;
- **adequate**, meaning that even in the event of problems, I must still provide the Customer with the information they need.

4. Optimization of custom antenna development times.

But how can a company specialized in the development of custom antennas optimize the delivery time of a prototype while minimizing risks and setbacks? Below are some key points whose control is essential for achieving the goals.

4.1. Internal problems (which depend on us) and external problems (which do not depend on us).

Any issue that arises within a company during the development of a product can be classified as either an internal or an external problem. As one might expect, the former depends on internal causes within the company, while the latter is due to external factors over which no control can be exercised.

Leaving aside the fact that many problems considered external could, with a bit more effort and willingness, actually fall into the category of internal problems, that is those that can be solved in-house, it is important to keep in mind that, in the eyes of the Customer, the responsibility for a Supplier's external problems always falls on the Supplier itself. Therefore, such problems should never be used as an excuse for delays, for which the Supplier is in any case perceived as responsible.

The "flux capacitor" from the movie "Back to the Future" might be a valid solution for dealing with external problems… unfortunately, it hasn't been invented yet. Jokes aside, it is essential to rely on real facts and actual capabilities when making a forecast on delivery times.

4.2. Minimizing the risk associated with the novelty of the project: experience and planning.

When dealing with the development of a custom antenna, that is a product that has never been built before, it is inevitable to carry out development activities that may conceal unforeseen technical or manufacturing issues.

In this case, the experience of the specialized company entrusted with the project is of great importance, as it allows potential critical aspects to be identified already during the preliminary offer phase, taking them properly into account when estimating delivery times.

In the case of complex projects, carrying out a preliminary feasibility study is extremely helpful, as it allows each phase of development and prototyping to be defined in detail, thereby saving time in future operational activities.

4.3. Proper management of the production phases.

The development of a custom antenna involves not only the ability to design an efficient electrical project but also the proper definition of the manufacturing phases, both for prototypes and for subsequent production. Planning these activities is often not straightforward, as it is necessary to consider all the technologies and Suppliers involved in the project, evaluating case by case whether it is more convenient to outsource certain processes or produce the required parts in-house. Naturally, delivery times can be significantly improved by organizing activities in such a way as to avoid idle periods while waiting for components from external Suppliers.

4.4. Properly balancing outsourcing.

Outsourcing — that is, delegating phases, processes, or assemblies of the final product to external companies — has often been an overused resource by many managers, even in major organizations, all sharing a questionable level of technical competence.

This is because there is a real risk of depriving the company of its original know-how, thereby making it more vulnerable to external problems. In our specific case, especially when dealing with prototyping or small-scale production, having an in-house mechanical workshop makes it possible to rationalize the decision of whether to have certain parts produced externally or, more quickly, to manufacture them internally. It is undeniable that being able to rely on both resources leads to a drastic optimization of project timelines, particularly when modifications are required during the development phase.

4.5. Proper management of Suppliers.

Beyond the mere understanding of the technologies involved in a project, it is essential to know and properly manage Suppliers, especially when dealing with small-scale productions or limited-quantity orders.

Each Supplier has its own response times and level of reliability in meeting deadlines; therefore, it is necessary to be aware of possible limitations and to anticipate delays caused by excuses or unforeseen events, for example, by providing the material directly for subcontracting or by taking into account possible “physiological” delays when placing the order.

Another key factor in supplier selection is so-called redundancy, that is the ability to always have an alternative backup Supplier to whom the order can be redirected in case the primary one fails to deliver.

4.5. Proper management of procurement.

Although directly linked to Suppliers, timely management of procurement is fundamental to meeting delivery deadlines. This means being able, already in the preliminary phase of the project, to estimate the delivery times of certain components (for example, parts that require the creation of production tools such as molds, models, or jigs), giving priority, in their definition, to those parts that involve longer manufacturing processes.

Furthermore, in emergency situations aimed at ensuring compliance with delivery deadlines, it is often necessary to increase costs by optimizing procurement according to a fixed schedule. We have personally experienced cases where we had to place two parallel orders with two different suppliers for the same component, to ensure that at least one of them would deliver the part on time.

4.6. Knowledge of materials and technologies.

During the product development phase, properly executing the engineering stage is essential to speeding up the procurement of the necessary components, especially when it is necessary to rely on external Suppliers, such as for the production of printed circuit boards. It is also good practice to assess the availability of every material or semi-finished product used in the specific project, so as not to be subject to the monopoly of a single Supplier who, in addition to dictating prices, can also determine the future availability of parts required for the design and production of the antenna.

4.7. Organization of the work environment.

A company's business card is the opportunity for the Customer to see how its workspaces are arranged and organized. This not only helps to understand the working conditions of the company's employees but, above all, to get a sense of the care with which the custom antenna is produced.

The orderliness and attention with which a prototype is assembled and built are a direct consequence of how the work environment, whether in the Research & Development or production department, is organized.

4.8. Decision-making speed.

The way decisions are made within a company determines the response time to any problem that may arise during the development process.

It is interesting to note how, in thousands of years of human history, the military hierarchy has remained essentially unchanged, while in just two hundred years of industrial revolution, factory organization has undergone radical transformations, moving from a vertical, pyramidal structure to a distributed, horizontal management model, where the connections between the various leaders of a complex multidisciplinary project often take place through professionals who are not always fully competent in the specific subjects.

In 1959, engineer Alec Issigonis, after just over two years of development, created the Mini, a historic example of efficiency in the development of a complex product, made possible by the competence and quick decision-making of a single project leader.

In the efficient design of a custom antenna, to optimize delivery times it is highly advisable to have a dedicated technical figure who can personally oversee and direct all development activities that may involve different people and/or departments. Indeed, if we imagine the path of a specific mechanical component of a custom antenna being forced to pass through various company departments like the stations of a Via Crucis, we find a process that is anything but quick and efficient: from the designer to the technical office, from the technical office to the mechanical draftsman, from the mechanical draftsman back to the technical office, from the technical office to the purchasing department… and so on.

For the Customer of a custom antenna, having the opportunity to interface with a technical project manager who can provide reassurance about the company's internal decision-making speed and clarify any doubts regarding the progress of the various development phases represents a significant guarantee that the product delivery times will be met.

5. The phases of design.

Let us now analyze the various phases of design, identifying some measures that we consider useful to adopt with the goal of optimizing the development time of a professional custom antenna.

5.1 Definition of specifications.

In this initial phase, it is necessary to identify which paths are worth pursuing and which should be discarded.

Experience and expertise gained from previous projects certainly play an important role in this. When defining the specifications, it is therefore advisable to identify technical characteristics that are mutually compatible and for which feasibility can be ensured. It is also important to identify and, if necessary, relax overly stringent requirements that would increase the project's complexity without bringing real benefits to the product.

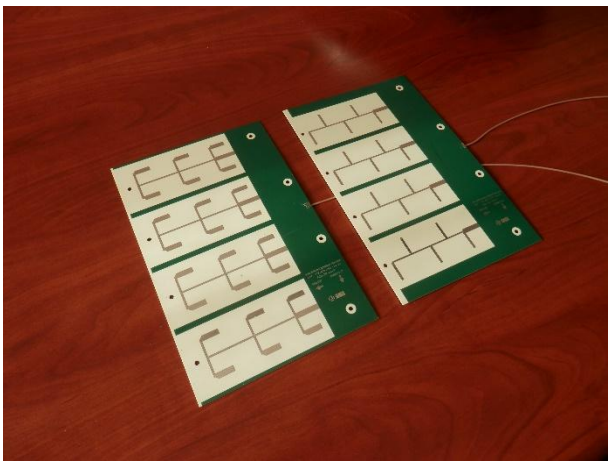
In this way, a decisive optimization of development time can be achieved, which translates into lower costs for the Customer.

5.2 Design.

The development of a new professional antenna involves two different design approaches: software-based simulation and empirical laboratory methods.

For each project, it is crucial to identify the right method to address the various aspects and to define a "hybrid" process optimized for the specific activity being undertaken.

Once again, having successfully completed numerous projects in the past makes all the difference in terms of both effectiveness and efficiency.



The design of a complex antenna most often involves the use of different methods that work synergistically across the various phases of the project.
Inexperience leads to the loss of valuable time, which should never be at the Customer's expense, as, unfortunately, all too often happens.

5.3 Prototyping.

In the prototyping phase, the greatest advantages in terms of time optimization undoubtedly come from the ability to identify the most suitable technologies for manufacturing the various components that make up the prototype.

It is therefore essential to select those technologies that ensure the creation of a product as close as possible to the one that will later be produced in series, while keeping the development process streamlined and fast.

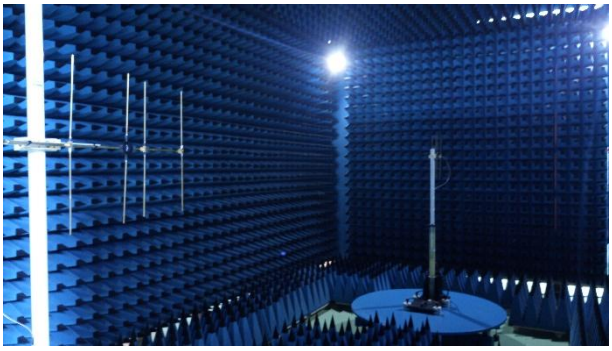
Having a wide range of technologies already available in-house reduces the need to rely on external Suppliers and, consequently, shortens development time.

5.4 Characterization measurements.

Time optimization in this crucial phase is achieved through the use of what is probably the most important tool for those who design and develop professional antennas: the anechoic chamber.

Having an anechoic chamber specifically designed and engineered to be easily adapted to the particular measurements required for each antenna under development provides enormous advantages in terms of both time and cost.

Indeed, being able to quickly set up reliable measurement configurations makes it possible to perform not only the final characterization measurements but also all the intermediate checks needed to confirm the chosen design path or to introduce the modifications necessary to obtain a product perfectly aligned with the Customer's requirements.



The ability to have an in-house laboratory where design choices can be verified in real time and the final characterization of prototypes can be carried out is a strategic resource for accelerating the development process of a custom antenna.

5.5 Production.

If all the suggestions shared so far are useful for optimizing product development time, it is also possible to identify measures capable of improving production times.

In this regard, the industrialization phase is essential, as it allows the definition of the most suitable technologies for the expected quantities, the necessary production equipment, and a network of reliable and trustworthy Suppliers.

Furthermore, proper organization of the workspace will lead to a further reduction in overall timing.

6. Conclusions.

In recent years, the international context has had a significant impact on our lives, and not only from an economic perspective.

The professional environment has also faced major consequences.

One of these is certainly the difficulty in sourcing raw materials, leading to slowdowns and delays in production processes.

Reacting to this objectively complex situation by complaining or giving up is certainly not the most appropriate approach.

While we are fully aware that many of the causes lie beyond our control, if we aim to prove ourselves as reliable and trustworthy Suppliers, we must make an effort to find solutions that at least reduce the inconvenience caused by the circumstances in which we operate.

Starting from this premise, we have sought to turn this challenge into an opportunity, identifying several measures that help speed up and optimize all those activities directly within our control, convinced that a serious and constructive discussion can bring mutual benefits.

By sharing these ideas and suggestions, we do not claim to have solved the problem, especially in such an uncertain period, but we hope to contribute to a topic of clear relevance and importance.

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

For questions, clarifications, or further information on this or other topics related to professional antennas, please contact ***bollini@elettromagneticservices.com****.*

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