

# Comentários sobre o Desmonte de Rochas com Explosivos

## **Quality control (Part 02 of 02)**

By Bruno Pimentel.

Hello my friends, in today's article we will be continuing our article on quality control, but first, as always, we leave here the link to our newsletter for you to check if you missed any article and I also invite those who have not yet subscribed to do so and be automatically notified by LinkedIn when we publish new articles:

Português: <https://www.linkedin.com/newsletters/desmonte-de-rocha-c-explosivo-6941709482355748864/>

English: <https://www.linkedin.com/newsletters/rock-blasting-6959820770344595456/>

In the first article on this topic we made a series of general comments, but there are 3 main points that we want to reinforce before moving on to today's article:

1. We need to understand that the basic starting point for any quality analysis is the control of the operation and the information, because if we don't know what we're doing, if there is a very large variation or if we don't have correct information, it's impossible to be sure than what we're really looking at.
2. We need to know what we want to evaluate, if it is the quality of our operation, if it is the efficiency of our blast plan, if it is the suitability of the explosives we use, and several other points, because this definition will be the starting point to determine the parameters we need to control.
3. Finally, we need to know the base standard, that is, the quality reference that we are going to use to compare our parameters, that even knowing that there is a great variation between the scenarios of the different operations, there is an acceptable minimum that we need to comply with. in order not to lose the performance of the products we use, to guarantee safety and to be able to have minimal control over the results of our detonation.

Bearing this in mind, the starting point is that every operation needs to have at least basic quality control, regardless of the scenario, to ensure that we are meeting the minimum quality and safety standards necessary to carry out our detonations, and the from this acceptable minimum, we may have a series of additional controls according to our objectives.

So in today's article, we want to continue the theme a little more specifically, because as we said in the last article, we divided the quality controls into 4 main groups, which help us to have a better idea about the sets of parameters that affect our explosive rock blasting operations:

- Product quality control
- Blast plan quality control
- Operational quality control
- Blasting quality control

So, from now on, we will talk about each of these 4 groups, just to have an overview of their importance, but as we said in the last article, in addition to understanding the importance of each of them, we need to keep in mind that there is an interaction and interdependence between them, because, for example, we can have an ideal blast plan and the most energetic explosives available, but if we do not have operational quality in the preparation of our blast, we will not apply the prepared plan and probably most of the explosive energy will be wasted, or in a more critical scenario, will generate several undesired effects. In the same way that we can have an extremely skilled team, but without the time and resources to carry out the activity, so while we evaluate each point separately it is important that we all keep in mind that when one group is underestimated it impacts the quality of the others.

In addition, we need to understand that situations can change according to the scenario of each operation, which is why the basic standard of reference needs to be based on these scenarios, evaluating the available resources and the objectives of each of them.

- **Product quality control**

When it comes to rock blasting with explosives, the first point we need to guarantee is the quality of the products, explosives and accessories that we will be using in our blasts, starting with the knowledge we have about them, as this will establish the minimum acceptable levels of quality for each one, then guaranteeing their quality as a product, because like any product we have different brands, types and models, and finally, guaranteeing the quality of the conditions of application of these products, as they can directly influence their performance.

For this we have to keep in mind that the quality of the explosives and accessories we use is fundamental, both to guarantee the safety of their handling, as well as to guarantee a good performance of our blast.

So we can say that the quality control of the product needs to help us to have a guarantee that we are using the correct products and in the correct way, so that we can maximize the use of explosive energy in our blasts, at the same time that we are safe when handling them. But for that, we need to maintain an effective quality control of the products we use, which must start with an inspection of the products delivered by the supplier, and follow with the guarantee that they are within the desired standard, and that we will store and apply them according to the correct recommendations.

Unfortunately, it is common to find operations that do not have any control over the quality of the products used, and this allows manufacturers to deliver whatever quality they want, and that most of the time problems are only identified after the blast has a bad result. In addition to the fact that it is always difficult to prove that the quality of the product was really to blame for the result, especially after it has already been detonated.

For example, boxed explosives will normally have a wide range of speed variation in the catalogue, so a supplier may initially deliver a product that has a high VOD, but over time, change its composition or the raw materials used, and that will imply a decrease in the velocity of the explosive, and that will directly impact the result of our blast, and if we don't control our explosive, we will have no idea what's going on.



It is always recommended, when using explosives finished by the manufacturers, that we carry out at least sporadic quality controls on the products, and when using finished products in the application, that we have complete control of the entire process.

We must always carry out a qualitative control of the products used, starting with a visual analysis of all accessories and explosives before use, verifying that the basic parameters, such as color, consistency, components, and all other elements of each product, are complying with minimum standards.

We have already seen several occasions in which the connector separated from the shock tube, that the booster had less explosive charge, that the cartridges are hard due to excess paraffin, and several other situations, from the most diverse suppliers, which could easily be identified in a quick visual inspection during its application.

In the same way, whenever possible, we should carry out some small tests sporadically, for example, evaluating the burning time of the mantopins, tests of lateral triggering by detonating cord, blast test for sympathy, and several other simple tests, which can go indicating the quality of the explosives and accessories that we are using.



This is essential, so that we know more and more about these products, as well as to guarantee the quality during their application.

On the other hand, we can carry out a series of quantitative analyzes of the performance of explosives, which, despite the need for equipment to be carried out, will provide us with much more reliable data to determine if the products are within the necessary specifications.

We can perform some measurements before the application of explosives, such as density and viscosity, which will give us basic information to compare with the catalog information. Just as we can make a series of measurements during the blast, to evaluate the actual performance of the explosives, where we can make measurements of VOD, delay accuracy, vibration measurement and other technical parameters that can indicate the quality of the explosive or detonated accessory.



We don't want to expand on this topic, but the quality of the products used are the starting point for a good blast, and we must always keep in mind that explosives and accessories are perishable items, which have an expiration date, which may have suffered errors during manufacturing or damage during shipping and storage, so ensuring that the products we are using have the minimum quality required is the first step in ensuring the safety and results of our blast.

- **Blast plan quality control**

After we guarantee the quality of the explosives that we will use in our blast, another fundamental point is to guarantee the quality of our blast plan, as it is responsible for establishing all the parameters that we must use in our blast.

Although we always say that the execution of the blast plan is largely responsible for the final result of our blast, its elaboration has a fundamental role, because when well defined, it serves as a guide for its realization.

For this, it is important that the blast plan is consistent with reality, ensuring that the design parameters are suitable for the scenario of each blast, as well as that it is possible to be applied in the field, because as absurd as it may seem, we have already seen several fire plans that had nothing to do with the blast to be performed. In addition, it is necessary to have complete control of your application, recording any necessary changes, so that it can be analyzed and continue to evolve over time, until reaching the required quality standard.



To guarantee the quality of the blast plan, we need to guarantee the availability and quality of the information necessary for its elaboration, as well as we need to monitor its parameters so that they can be adjusted to each blast, both in terms of adapting to reality, as well as to ensure greater accuracy and performance of our blasts.

There are several factors that can affect the quality of the blast plan, which need to be well known and monitored, such as:

- Drilling
- Explosives
- Rock characteristics
- Free face
- Stemming
- Others



These factors are the starting point to guarantee the basic elements of the blast plan, where for example the quality of the drilling will affect the distribution of the explosive, or the quality of the explosive will affect the amount of energy available to carry out the fragmentation.

So, to guarantee the quality of our blast plan, we first need to ensure that the basic information is of good quality, second that our blast plan is adequate to the reality of the blast and third that we can run our blast plan within the established parameters.

For this, we usually go to each blast measuring the level of assertiveness of the execution of our blast plan, as well as the level of necessary changes, and from there we adjust our standard plan so that it delivers our goals more efficiently to each blast.

So we usually do a series of simple measurements, which will allow us to verify the main parameters of our blast plan, where we can measure the drill pattern, the hole configurations, plug, free face, and we can also evaluate the type of rock, presence of structures, body geometry, and all other parameters that help us to evaluate the information used, the adequacy of the blast plan and the execution of its variables.



- **Operational quality control**

Another fundamental point is to guarantee the operational quality control, which is responsible for the execution of our blast, and is the one that most influences the final result, as it is the one who ensures that the standards are being followed and that everything is being done correctly. best possible way.

The quality of operation is the one who must guarantee the execution of the blast plan, as well as make all the necessary adjustments so that it has a better performance. So for that, we need to ensure that our team has the knowledge and conditions necessary to carry out this activity.

At this point, experience and established procedures are the key factors to ensure a safe and efficient operation, so when we are measuring the quality of our operation, we are directly measuring the quality of the workmanship and the activity procedures, but also not we can forget about the importance of resources, conditions and time so that the activity can be performed in the best possible way.



To ensure the quality control of our operation, we need to ensure that we have well-established procedures, that the team is well-trained and that we are able to follow the recommendations for the application of the products we are using.

Each type of product will require a different level of control, where, for example, on the one hand we have the boxed ones, which are already finished at the factory and have a plastic packaging that protects them, and on the other hand we have the pumped explosives, which we need to finish their manufacture, and may have several properties that make their application difficult under certain conditions, so the control levels will adapt to these conditions.

We need to understand that no matter how simple our operation is, for example, how to blast a few holes, using only cartridges and electronic detonators, we need to ensure that we handle and apply the products correctly, otherwise the detonator may not trigger the cartridge, we may use the wrong amount, it may be that part of the charge separates and does not detonate, and several other problems that we may have that will affect the safety and the result of the blast.

On the other hand, we can have very complex operations, where the level of precision and control are the only way to perform a good blast, where, for example, we can have a scenario of underground production blasts, with very long ascending holes, where we will use pumped emulsion, very fluid, in very fractured rocks and with the presence of dynamic water, where there is a great difficulty in guaranteeing that the explosive stays inside the hole, and this is just the starting point.

So each scenario will imply that we establish specific controls, but in all of them, we need to guarantee the correct use of the products, and also, the fulfillment of the parameters of our blast.

So, no matter how simple the operation, handling explosive products requires efficiency throughout the operation. Therefore, it is necessary to be aware of the different points that can affect security and performance, such as:

- Safe and correct handling of explosives and accessories;
- Follow the blast plan parameters;
- Loading quality;

- Correct amount of explosive to be used in each hole;
- Adequate stemming;
- Well-made connections;
- Others.



- **Blasting quality control**

Por fim, para terminar o nosso artigo de hoje, o ultimo ponto se refere ao controle da blast em si, onde precisamos garantir que todos os outros passos tenham feito o seu papel de forma adequada, para que ao acionar a nossa blast, todos os parâmetros contribuam para uma boa performance.

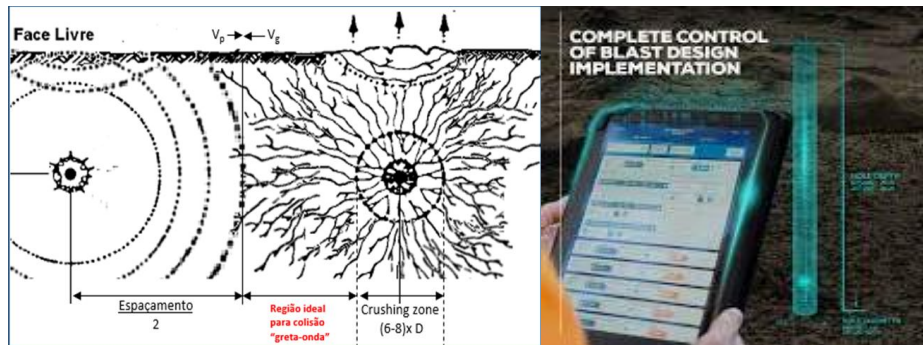
Para isso, precisamos garantir que as recomendações foram seguidas, assim como, que os elementos de segurança e boas práticas foram utilizados, pois eles vão nos garantir uma finalização adequada e segura do nosso processo.

Um monitoramento adequado das nossas blasts, nos permite analisar o que foi realizado e quais foram os resultados alcançados, que devem nos orientar no processo de otimização e melhoria das nossas blasts.



During the blast itself, there is a series of measurements and monitoring that we can carry out, which will help us to identify the performance of our blast or operational errors that we may have made, and these are fundamental points to analyze the quality of the products used, our blast plan and our operation as a whole, thus allowing us to continue to be evaluated and improving the process with each blast.

During the blast we can evaluate the sequencing of the holes, the relief, the efficiency of the plug, the generation of gases, vibrations and wave area, the blast velocity of the explosives, and several other parameters that are very useful in the evaluation of quality and performance from our blast.



At some point, we will bring an article with a complete example of quality control for an operation, but it is important to understand that there will be numerous possibilities, based on the scenario and resources we have in each operation, but that this is a point that cannot be neglected, as quality control is essential to maintain the safety and efficiency of any operation.

That's it, for today we're going to stop here, because although this topic could be extended to several articles, the idea is just to raise the importance of the topic and serve as an incentive for operations to assess the conditions they are in and what they need. do to ensure the quality and safety of its operations, and of course we will return to the topic at another time with more examples and recommendations.

I believe that from now on we will use some of the next articles to talk a little more about specific and diverse topics, which may not apply to all operations, but serve as examples for other discussions to be raised.

As always, please comment and share, so that we have safer and better blasts!!

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