

# FACILITIES & TECHNOLOGY







## Facilities & technology

Our infrastructure and method of production give us the capacity to adapt our offer to the evolution of market needs. We are ready to accompany the efforts to optimize the responsible development of Argentina's non-conventional resources.



## Quarries



We identified great potential in a series of quarries in Río Negro, which combine two elements to be emphasized: quality (meets the API 19C standard) and proximity to the oil concessions in the Neuquén basin.

These quarries are located in the Bauti Mining Property, near Provincial Route 66 and 75 km south of the city of Villa Regina.

The possibility of extracting and processing the material entirely within Río Negro is a differentiating aspect of NRG, as well as the environmental advantages of reducing truck transportation and using alternative roads rather than the usual ones, thus mitigating vehicle jams and the deterioration of the most traveled routes.

These quarries are in addition those we already have in Entre Ríos. They comprise 260 hectares in the vicinity of Ibicuy, with great availability in terms of volume of excellent quality material.

At this initial stage of the extraction process, we use excavators and special trucks. No water, chemicals or explosives are used. After extraction, the material is moved for processing plant, also in the province of Río Negro.

The quarries have sufficient resources to sustain production and allow the company to make firm delivery commitments to oil service companies and operators.





## Frac sand plant

The plant, also installed in Río Negro, is a state-of-the-art plant in order to guarantee the highest efficiency in the processes, the rational use of resources and a constant quality in the final product. It includes all the treatment stages necessary to transform the raw material into the proppant agent that each client needs.

The installation of this plant gives a positive direct impulse to the economic activity of its area of influence, and also impacts the general activity in nearby provinces (in addition to Río Negro, Neuquén, Entre Ríos and La Pampa).

## Washing plant

The raw material from the quarries undergoes a process of water washing, attrition and wet separation according to the grains size. This is performed through hydro-cyclones and special counter-flow separation equipment, thus achieving the so-called “wet cutting”.

The sand wet washing and classification plant is composed of a number of modules in series that begin with the loading of the raw sand, the passage through primary selection screens, washing and wet separation sector through hydro-cyclones. The plant also has a set of attrition cells composed of blades that cause mechanical friction between the grains in order to clean them and a spiral bank for the separation of heavy minerals and sediments. In addition to washing, the processes carried out on the sand improve the granulometric profile and roundness of the grains.



The plant has a water treatment system, which purpose is to reduce water requirement to a minimum.

The entry into the stage of specification of the final product, the granulometric profile and possible sand mixtures are carried out in the drying and classification plant, i.e., the next stage of the production process.

## ■ Drying and classification Plant

The useful fraction of washed sand enters the drying process while the rest of the washed material not having the desired characteristics is transported back to the quarry or used as raw material for the manufacture of bricks, ceramics or glass.

The drying of the useful fraction is carried out in a rotary kiln.

The plant performance may vary depending on the moisture content of the wet sand feed material.

The main elements that make up the drying and classification plant are:

### ■ Rotary Sand Dryer

Prepared to reduce the moisture content to 0.01%. The diameter of the dryer is 126 inches by 50 feet long and is completed with:

Carbon steel housing construction. - Shell drive 125 HP - Burner Management System (BMS) - Burner power: 89 MMBTU/hr - 75 HP combustion blower.

### ■ Sand Sorters

The plant has dry sand sorters capable of separating different meshes. The supporting building for the sorters is bolted and specially designed for the wind, load and use conditions of NRG in Río Negro, which prevents vibrations and extends the life and performance of the equipment.

### ■ Dust Collectors and Environmental Systems

We installed an environmental system to collect dust that might be in suspension and collect the emissions generated in the sand dryer. The construction is made of carbon steel, has a dust collector fan, lower loading bags, carbon steel service platform with ladder and safety cage and differential pressure meters, among other subsystems.



## **Finished product storage**

The storage system comprises bolted steel silos and unloaders of the finished products. Each silo has a nominal diameter of 10 meters and is 35 meters high.

The system is completed with: Hoppers - Galvanized fittings - Pressure relief valves - Level indicator nozzle - Dust collectors

## **Special Facilities**

The plant does not require any special facilities. The process is similar to that of a cereal grain drying and storage plant.

There is no generation of environmentally harmful effluents since no chemicals or mixtures that are hazardous to health or the environment are used.

## **Special Technology**

The technology used in the plant is the highest standard in the United States, where the volume of fractured sand production is 100 times greater than that currently recorded in our country.

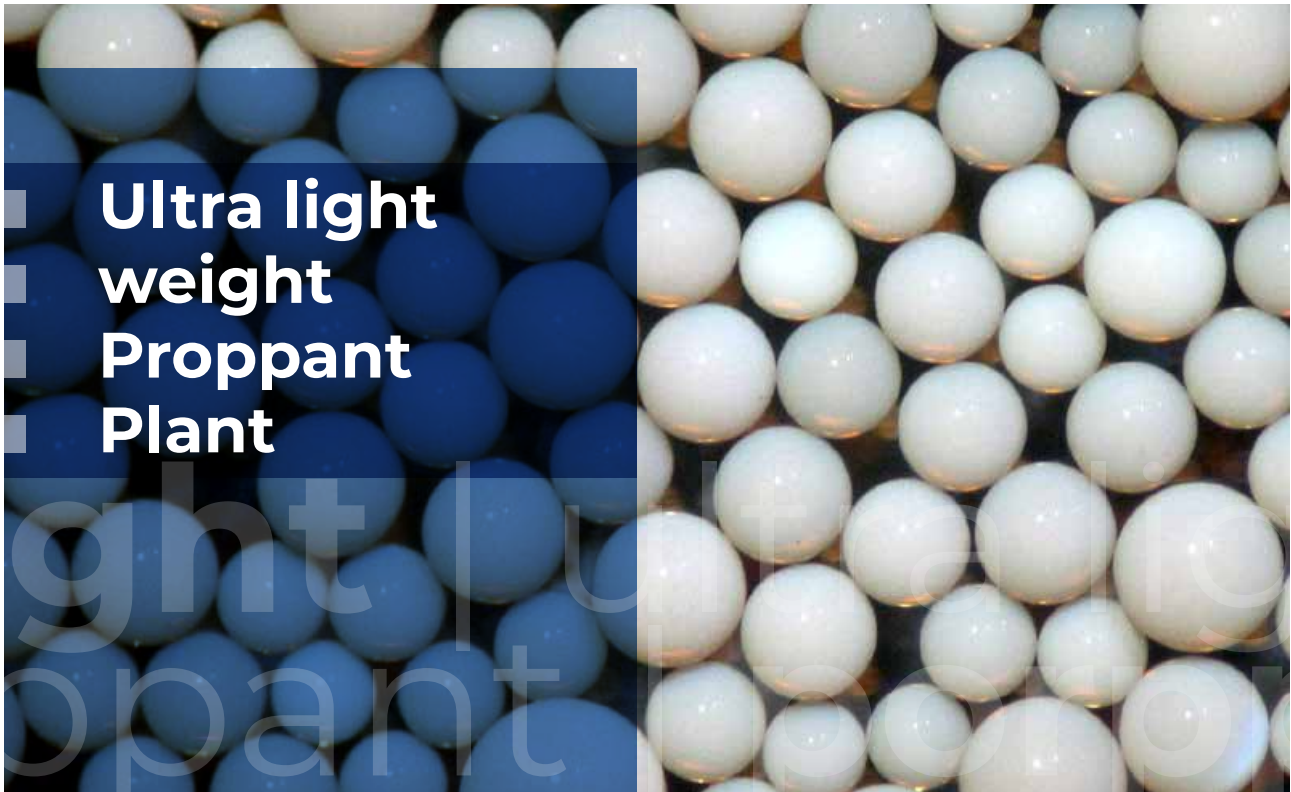
## **Disposal and destination of the waste produced**

The waste produced consists mainly of the discarded material from the wet sorting process. This includes sands whose particle sizes do not meet the specification (too coarse or too fine), soil, magnetic and non-magnetic minerals, and the clays from the hydrocyclone overflow slurry containing solid particles removed through a forced sedimentation process, which produces a thickening on the bottom of the tank and the generation of clarified water that is reused in the process.

The solids settled at the bottom of the clarifier are conveyed to a discharge cone to which a centrifugal pump is connected, designed to handle high-density fine solids. The pump extracts them in the form of a thick pulp, pumping them to a final waste pond where they will be stored for a period of 30 to 60 days. The dry classification process also generates, although in a smaller proportion, off-specification material.

Unused material is transported back to the quarry as part of the quarry remediation process, using the trucks that would otherwise return empty to search for new raw material.





The ULTRA production plant is based on a polymerization reaction designed to operate within a stainless steel batch reactor.

A set of polymeric precursors react in a temperature-ramp controlled manner, in an aqueous medium, maintained in a laminar agitation regime. The reaction products condense into small spheres of near-perfect roundness and sphericity and density similar to water.

The mechanical properties of the particles thus generated far exceed both natural sands and the synthetic agents produced by sintering.

ULTRA production is designed to operate in a closed circuit, treating and reusing the process water. Only a small amount of water is consumed for replenishment of the evaporated fraction of water.

The drained material is transported to a low speed rotary dryer. It is then screened to remove particles outside the required size range, and finally collected in bags ready for delivery.





## ■ Last mile



We offer the opportunity to achieve last mile delivery efficiently and safely while meeting our customers' needs in terms of timing.

To optimize the delivery logistics of proppant agents, NRG has its own fleet of CNG trucks with specially constructed hoppers for loading and unloading of the material. The units were manufactured in Europe and certified under the "Unece R-110" regulation of the United Nations, which is in force in the whole European Union. The trucks have the endorsement of the Ministry of Transport of Italy, considered a valid certification endorsement body in Argentina.

As indicated in Resolution 42 of the Enargas, the use of CNG-powered trucks is a global trend, as it represents a transition from the secondary energy matrix towards less polluting and more efficient fuel use patterns.

These trucks, which are cutting-edge in Europe, were recently officially approved in our country. Thus, we have become the first company in the country to have a captive fleet of CNG heavy trucks, which entails a significant reduction in noise, toxic gases and greenhouse gases emissions, as compared to those generated had we opted for a conventional diesel-based operation.

A further competitive advantages of NRG is that, given our geographical location, we use alternative roads rather than the usual ones (which are saturated), ensuring deliveries in the times and quantities as committed.

In this respect, owing to both, the reduced distances because of the proximity to the wells and the use of CNG as fuel, we have achieved an 85% reduction in greenhouse gas emissions as compared to support agents provided by other companies. This combination of shorter distances and use of CNG for the transport of own loads, implies a saving of emissions of over 600 Tn CO<sub>2</sub>/fractured well.



## Pad Handling



We signed an exclusivity agreement with National Oilwell Varco company (NOV) for the supply of their SandBank™ mobile silos system. This system is gradually replacing the box system which, while discharging sand faster than previous hoppers and generating less particulate matter, requires substantial on-site movement, which can lead to incidents.

The mobile silo system has high safety standards and lesser imprint on location. It provides greater operational efficiency in a critical service such as the supply of sand and synthetic agent in the blender.

Each system consists of 6 silos and mechanisms for gravity unloading of hopper trucks in a shorter time than any other system. In addition, it is completely enclosed, thus eliminating the problem of particulate matter, thus preventing it from affecting the health of employees.

This solution helps reduce the impact on the fracture operation area and also minimize material waste and protect health and the environment by mitigating noise and dust in suspension, thus increasing the number of fracture stages that can be performed per work day.

In order to provide these services, we construct special hoppers in the country to transport the final product to the oil locations and beds to transport the raw material from the quarries to the frac sand plant.





## Laboratory

The development plan of the quarries and the systematic quality controls of the proppant agents are performed in our own laboratory, which is in operation in the city of Cipolletti, Río Negro. This laboratory has modern equipment and highly qualified personnel in the sampling and testing protocols set by international standards. Furthermore, it is in the process of certification for quality, safety and hygiene.

NRG LAB is a laboratory specialized in quality control and analysis of proppant agents, which provides internal and external testing services under ISO 13503-2/API 19C to evaluate the respective potential as such.

We work under the strictest quality controls required by the industry, having the know-how, infrastructure and necessary laboratory equipment.

We provide services focused on the client's needs, accompanying them and working together to guarantee results traceability and compliance with quality standards according to established standards. Whenever a client may so require, it can conduct inspections and/or controls on the facilities, the laboratory equipment and the provision of the services in general.



