



Explosives, Drilling, Blasting
CUSTOMIZED EXPERTISE

PRODUCTS AND SERVICES CATALOGUE

Edition 2016

TITA NOBEL

EXPLOSIVES • DRILLING • BLASTING

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Posthumous portrait by Emilie Oesterman - Source www.nobelprize.org

« Home is where I work, and I work everywhere. »

Alfred Nobel

French leader in the field of production and marketing of civil explosives for the mining and construction industries, TITANOBEL has strong international activities, representing more than 20% of its turnover. In addition to France, TITANOBEL offers its products and services mainly in Africa, but is also active on other continents: America (Caribbean arc, Guyana), Asia (South Korea), Europe (Belgium, Spain) and Oceania (New Caledonia).



TITANOBEL is the leader in France since 1875 and the creation of his ancestor "Société Générale pour la Fabrication de la Dynamite", involving Paul BARBE, French industrial, and Alfred NOBEL, inventor of dynamite and many other advances in the field of pyrotechnics.

But the story between TITANOBEL and explosives is even older, since the current main site of production, Vonges plant, had its first production of explosive in 1691, with the manufacture of black powder for the armies of King Louis XIV.

Today, TITANOBEL is a modern company offering a full suite of products and services required by industries using civil explosives in the mining, quarrying and construction sectors.



TITANOBEL's critical values for the sustainable development of its activities are:

- ↪ SAFETY of the products
- ↪ QUALITY of production
- ↪ Respect for the ENVIRONMENT
- ↪ CUSTOMER service
- ↪ TECHNOLOGY advance
- ↪ Explosives EXPERTISE



TITANOBEL operates a system of quality management certified ISO 9001 which guarantees the excellence of its products, as proven by destructive testing (verification of levels of energy and velocity of detonation) prior to marketing. TITANOBEL is a member of SAFEX INTERNATIONAL, association of producers to improve safety and eliminate the harmful effects of the explosives.

The Research and Development department of TITANOBEL regularly develops new products, applications and delivery systems, with particular in 2013 the placing in the market of a specific explosive dedicated to avalanche triggering, and the design of specific manufacturing solutions for bulk or cartridged explosive directly on the client site.

TITANOBEL is an expert in the application of explosives, and can offer its customers optimization studies to identify the best use of the energy of its products and the best blasting results, as well as providing a wide range of services up to the full support of drilling and blasting operations.



« If I have a thousand ideas and only one turns out to be good, I am satisfied. »

Alfred Nobel



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TITANOBEL is the forerunner in the manufacture of emulsion explosive in France, and offers today the EMULSTAR range, available in several levels of energy.

EMULSTAR is offered with chemical gassing sensitization or with sensitization with glass microspheres, improving resistance to high static and dynamic pressures (underground blasting, trench blasting, decked charges in open pit blasting, blasting in cracked rocks or with water, etc.).

In 2013, the range was completed by the development of EMULSTAR M40, specially designed for storage and use at temperatures down to -40°C , without loss of pyrotechnical performance. EMULSTAR M40 is cartridged in a blue film for an easier distinction.



Pyrotechnical characteristics

	EMULSTAR						
	3000	3000 UG	6000	6000 UG	8000	8000 UG	M40
Measured							
Average density							
$\varnothing > 40 \text{ mm}$	1.26	1.26	1.28	1.28	1.28	1.28	1.28
$\varnothing \leq 40 \text{ mm}$	1.22	1.22	1.25	1.25	1.25	1.25	1.25
Gap sensitivity (cm)	4.5	4.5	9	9	≥ 10	≥ 10	≥ 10
Velocity of detonation (m/s)							
$\varnothing 30 \text{ mm confined}$	5 000	5 200	5 000	5 200	5 000	5 300	5 300
$\varnothing 80 \text{ mm confined}$	5 500	5 600	5 500	5 600	5 600	5 700	5 700
Energy liberation (underwater test)							
Shock energy (MJ/kg)	1.75	1.75	1.98	1.98	2.26	2.42	2.42
Gas energy (MJ/kg)	1.88	1.75	2.09	1.98	2.67	2.38	2.38
Total energy (MJ/kg)	3.63	3.50	4.07	3.96	4.93	4.81	4.81
RWS (relative weight strength)	124	124	139	139	169	169	169
RBS (relative bulk strength)	184	184	210	210	254	254	254
Calculated							
Oxygen balance (g/100g)	-0.3	-0.3	-1.3	-1.3	-3.4	-3.4	-3.4
Gas volume (l/kg)	902	869	820	785	732	710	710
Theoretical total energy (MJ/kg)	3.79	3.65	4.77	4.56	5.79	5.61	5.61
Strength	0.83	0.80	0.98	0.94	1.14	1.10	1.10
Detonation pressure (calculated assuming measured detonation velocities) :							
$\varnothing 30 \text{ mm confined (GPa)}$	7.6	8.2	8.1	8.1	8.1	8.8	8.8
$\varnothing 80 \text{ mm confined (GPa)}$	9.5	9.9	9.7	9.7	10.3	10.4	10.4
Resistance to compression (bar)							
Resistance to static pressure $\varnothing \leq 40 / \varnothing > 40$	3	60/380	3	60/380	3	60/380	60/130
Resistance to dynamic pressure $\varnothing \leq 40 / \varnothing > 40$	(*)	200/420	(*)	200/420	(*)	200/420	200/300

(*) depends on blasting delay

Products range

EMULSTAR is a grey paste like emulsion, cartridged in a plastic cartridge and clipped at both ends.

EMULSTAR 3000	EMULSTAR 6000	EMULSTAR 8000	
Column charge for weak rock	Column charge for medium strength rock	Column charge for strong rock Bottom charge for all type of rock	
Blasting without risks of static and/or dynamic pressure			
Standard Cartridges			
Diameter (mm)	Weight (g)	Length (mm)	Count / box (u)
50	1087	415	23
60	1560	430	16
70	2080	430	12
80	2500	410	10
90	3125	405	8
100	4170	450	6
110	4800	450	5
130	6000	450	4

EMULSTAR 3000 UG	EMULSTAR 6000 UG	EMULSTAR 8000 UG	EMULSTAR M40
Column charge for weak rock	Column charge for medium strength rock	Column charge for strong rock Bottom charge for all type of rock	Column or bottom charge for all type of rock, down to – 40°C
Blasting with risks of static and/or dynamic pressure (cracked rock, presence of water, confined area, etc.)			
Standard Cartridges			
Diameter (mm)	Weight (g)	Length (mm)	Count / box (u)
25	250	410	100
30	400	420	63
35	500	410	50
50	1087	415	23
60	1560	430	16
70	2080	430	12
80	2500	410	10
90	3125	405	8
100	4170	450	6
110	4800	450	5
130	6000	450	4

Packaging and transportation

Cardboard boxes of 25 kg or 24 kg (for diameter 110 mm and 130 mm)

Classification IMCO 1.1.D - UN 0241 - Explosive type E



Conditions of use

Best used within one year from manufacturing date. EMULSTAR must be initiated with a detonator loaded with 0.6 g of PETN (class 8D) or a detonating cord 20 g/m.

EMULSTAR UG must be used when the blasting pattern or the rock characteristics may provoke important interactions between explosive charges (desensitization due to static or dynamic compression).

EMULSTAR M40 must be used when storage or application is conducted at temperature from – 10°C to – 40°C.

Maximum temperature for use: + 70°C

Maximum temperature for storage: + 50°C

TITANOBEL offers two systems for rock splitting (dimension stone / ornamental rock excavation, bank earthwork and perimeter control blasting underground) and demolition works.

CISALEX is a thin polypropylene tube filled with a special emulsion explosive of low energy. It is particularly used for demolition work in case of thin cast walls and slabs, but also for splitting ornamental rocks and dimension stones and for underground perimeter control blasting.

CISALITE is a continuous string of cartridges filled with a low energy emulsion. The outside diameter of CISALITE is larger than that of CISALEX. The integrity of priming along the length of the string is ensured by detonating cord attached at two points on each cartridge. CISALITE is designed for pre-splitting or post-splitting works of rock bank earthworks.

Pyrotechnical characteristics

	CISALEX 13	CISALEX 17	CISALITE
Measured			
Average density	0.9	0.9	1
Velocity of detonation (m/s)	3 900	4 000	3 600
Energy liberation (underwater test - MJ/kg)	3.26	3.26	3.20
Energy per meter (kJ/m)	332	620	1 280
Calculated			
Gas volume (l/kg)	871	871	878
Strength	0.75	0.75	0.75
Total theoretical energy (MJ/kg)	3.37	3.37	3.40
Detonation pressure (GPa)	3.4	3.6	2.9

Conditions of use

Best used within one year from manufacturing date.

CISALEX must be initiated with a 12 g/m or 20 g/m detonating cord attached to each cartridge. CISALITE must be initiated with the integrated 12 g/m detonating cord.

CISALEX 13 is recommended for blast holes with diameter from 30 to 42 mm.

CISALEX 17 is recommended for blast holes with diameter from 37 to 64 mm.

Packaging and transportation

	CISALEX 13	CISALEX 13	CISALEX 17	CISALITE
Cartridge diameter (mm)	13	17	17	25
Cartridge length (mm)	250	500	500	430
Gross weight per cartridge (g)	32	64	110	180
Net weight per cartridge (g)	25	52	95	180
Linear charge (g/m)	104	104	190	400
Number of cartridges per box	600	350	200	93
Total length per box (m)	150	175	100	40
Net explosive weight per box (kg)	15	18	19	17

Classification IMCO 1.1.D - UN 0241 (CISALEX) and UN 0463 (CISALITE)

CISALEX can be supplied with the following accessories:

- CISALEX 13 : Connection tubes - 1000 units per bag
 Conic centring devices - 1000 units per bag
 Empty intermediary tubes - 300 m per box
- CISALEX 17 : Centring connection tubes - 1000 units per bag
 Empty intermediary tubes - 160 m per box



TITANOBEL offers BOOSTEX 65 for the safe initiation of low sensitivity explosives. BOOSTEX 65 consists of a 65 mm diameter plastic waterproof case filled with 420 g of high performance pentolite explosive.

It is used for the initiation of low sensitivity explosives such as bulk emulsions and ANFO, in blast holes with diameter greater than 75 mm. It is designed to be very safe and easy to use with all types of detonators and detonating cords, with:

- ↪ A central hole to easily set the detonator or the detonating cord,
- ↪ A slot where the detonator can be safely blocked,
- ↪ A bright color making it easy to find on the blasting site,
- ↪ A protection skirt for the downline of the shock tube or detonating cord.



Packaging and transportation

Cardboard boxes of 50 units of 420 g net explosives each

Classification IMCO 1.1.D - UN 0042 - Boosters without detonator

Characteristics and conditions of use

Using a detonator (minimum 0.6 g of PETN—class 8D):

Slide the detonator through the central hole, then set it in the slot and block it with the blue protective cap.

Using a detonating cord (minimum 6g/m):

Slide the detonating cord through the central hole, then block it with a knot.

When priming with BOOSTEX 65 in wet conditions, place the primer in the bottom of the blast hole and after charging commences, pull the BOOSTEX 65 up approximately one meter.

Velocity of detonation: 7 800 m/s

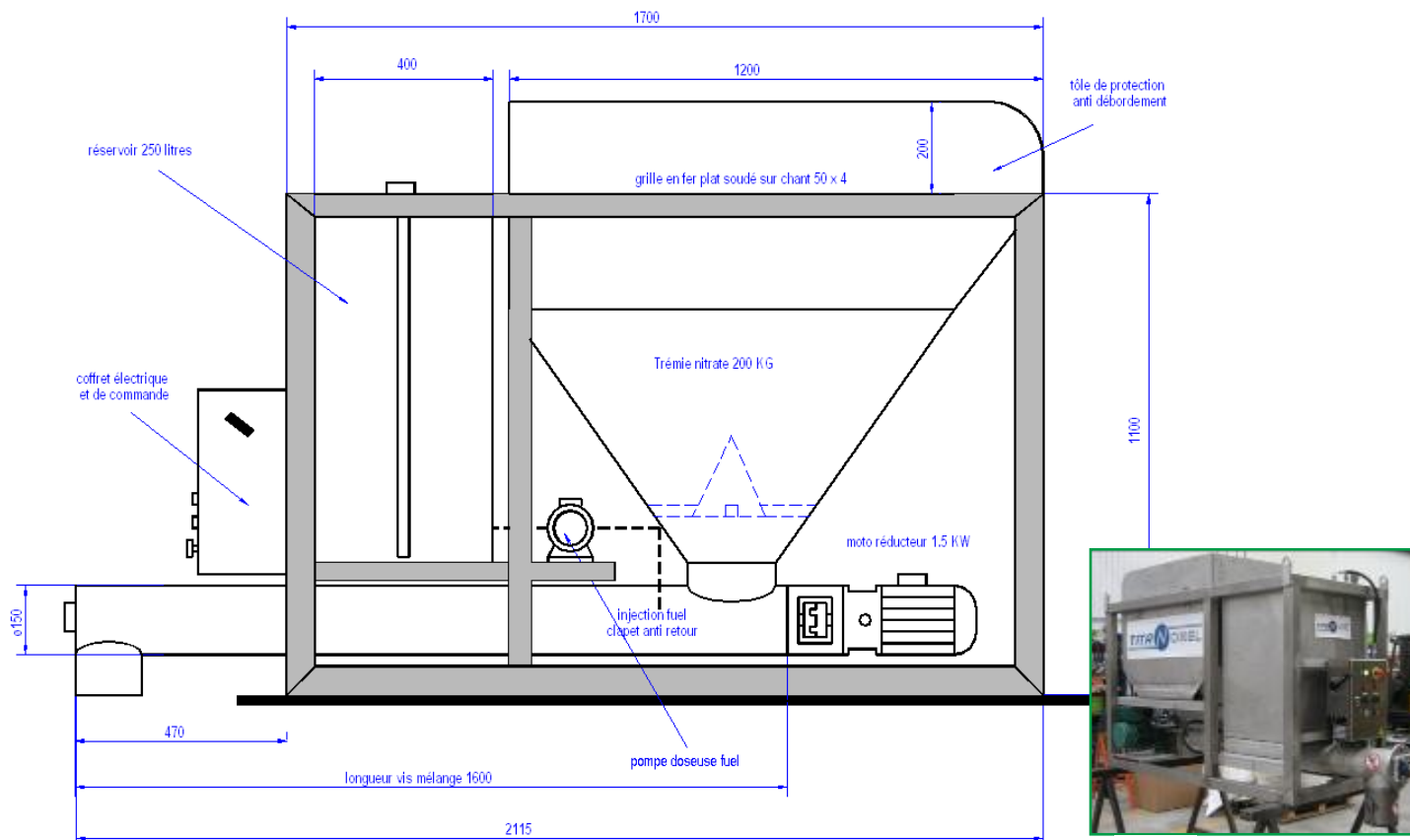
Detonation pressure: 26 GPa (260 kbar)

Maximum temperature for use: + 70°C

Maximum temperature for storage: + 50°C



ANFOMIX is equipment offered by TITANOBEL for the preparation of ANFO on site. The ANFO manufactured by ANFOMIX is more homogeneous than that made with a manual preparation and therefore more powerful. ANFOMIX allows manufacturing in a dedicated workshop or directly on site. The unit is designed according to the client's requirements.



The ammonium nitrate is poured inside the hopper, through a grid allowing manual granulation of the ammonium nitrate. The diesel fuel is automatically mixed with the ammonium nitrate at a correct rate. The transfer screw mixes the two components and transfers the ANFO to the discharge. The ANFOMIX is operated from an electrical control panel.

Standard equipment

Dimensions: 2115 mm x 800 mm x 1300 mm

Capacity of fuel tank: 250 l

Mixing capacity: 25 kg to 100 kg/min (fixed output defined by the client)

Handling by lifting rings

Electric installation IP 55

Protection frame in steel

Weight: about 600 kg

Capacity of nitrate hopper: 200 kg

Structure all stainless steel to limit corrosion

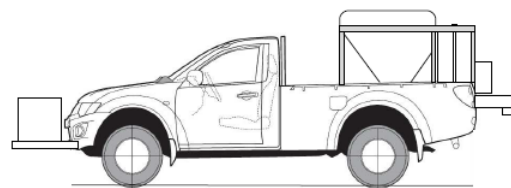
Starting by button go / no go

Emergency stop button

The electrical supply is not included in the equipment and the ANFOMIX must be connected to an external electrical power source.

Utilization on site

The standard ANFOMIX unit is designed to enter in the back of a 4x4 pick-up vehicle. The unit is supplied with 25 kg ammonium nitrate bags. ANFOMIX can manufacture ANFO directly into the blast hole or into a wheelbarrow.



Electric supply is ensured by a power generator isolated from the ANFOMIX unit to avoid any accident. The output is reduced to obtain a production level adapted to the on-site conditions.

Utilization in dedicated plant

The ANFOMIX unit can also be used in a dedicated plant. In that case, it is necessary to install the unit on a frame allowing elevation of about one meter for bagging of the ANFO. The output is increased to obtain a higher production level, with supply of nitrate with big-bags.

On-site manufacturing

In addition to ANFOMIX equipment, TITANOBEL can also offer bulk ANFO trucks, allowing on-site manufacturing and delivery of the ANFO directly into the blast holes.

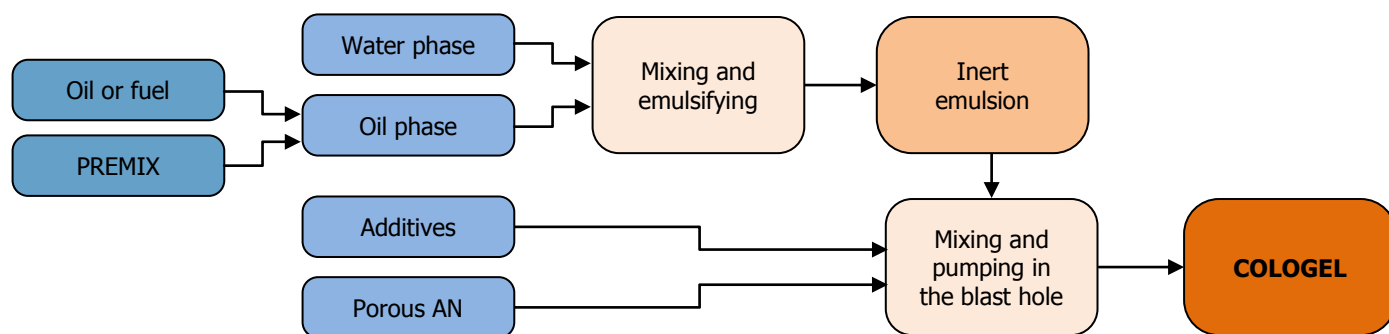


COLOGEL on-site manufacturing system allows for the production of an inert bulk emulsion on site, which can then be pumped and sensitized into open pit blast holes.

The manufacturing unit comprises equipment for the preparation of the water phase and for preparation of the oil phase. The two phases are loaded into the truck together with different additives. The truck ensures mixing, emulsifying and sensitization of the explosive and delivery into the blast hole. The chemical reaction (sensitization of the explosive) occurs within the blast hole. The explosive formulation includes 30% of porous ammonium nitrate, ensuring optimum efficiency.

All raw materials are non explosive, thus the amount of explosives to be stored on site is considerably reduced. The most critical part of the process is the quality of the emulsifiers, and this is ensured by TITANOBEL, who provides a non-hazardous mixture prepared at its own plant (PREMIX).

Manufacturing process



The truck can also be supplied with an inert emulsion pre-prepared in an on-site plant and stored pending use, or manufactured in our factory in France and transported to point of usage.

Pyrotechnical characteristics

	COLOGEL
Density	from 1.15 to 1.25
Shock energy (*)	1.64 MJ/kg
Gas energy (*)	1.85 MJ/kg
Total energy (*)	3.48 MJ/kg
Velocity of detonation	from 5 300 to 5 500 m/s
Shelf life	> 10 days in normal conditions of use
Water resistance	Very good

*) Measured by underwater destructive test

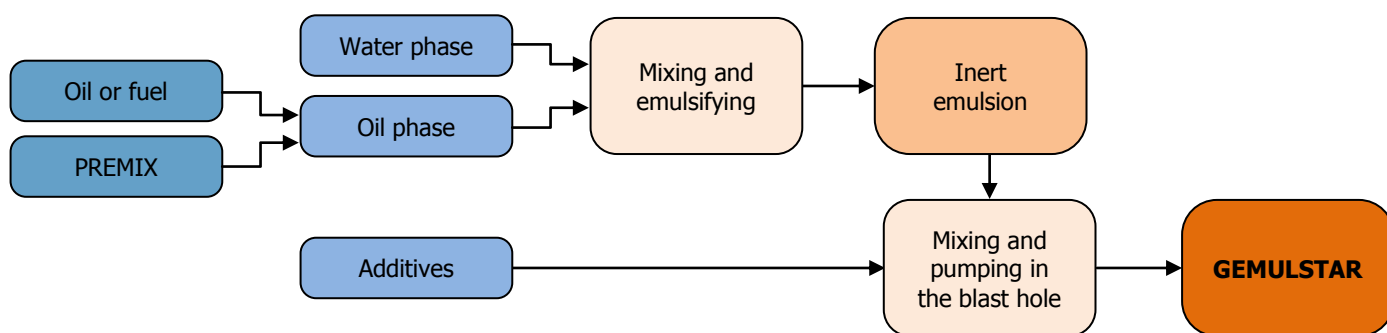


GEMULSTAR on-site manufacturing system allows for the production in a plant of an inert bulk emulsion, which then can be pumped and sensitized into underground blast holes.

The manufacturing unit comprises equipment for the preparation of the water phase and for preparation of the oil phase. The two phases are then mixed and emulsified to give an inert emulsion. It is transferred to one ton tanks, transported to the charging face and loaded into the UGPS (underground pumping system). The UGPS loads the blast holes and sensitizes the explosive. The chemical reaction (sensitization of the explosive) occurs within the blast hole. The UGPS allows simultaneous loading with two loading pipes. The UGPS can be placed on a truck tray or on a chassis type Jumbo.

All raw materials are non explosive, thus the amount of explosives to be stored on site is considerably reduced. The most critical part of the process is the quality of the emulsifiers, and this is ensured by TITANOBEL, who provides a non-hazardous mixture prepared at its own plant (PREMIX).

Manufacturing process



The UGPS is supplied with an inert emulsion pre-prepared in an on-site plant and stored pending use, or manufactured in our factory in France and transported to point of usage.

Pyrotechnical characteristics

	GEMULSTAR
Density	from 0.7 to 1
Shock energy (*)	1.67 MJ/kg
Gas energy (*)	1.75 MJ/kg
Total energy (*)	3.42 MJ/kg
Velocity of detonation (confined in diameter 30 mm)	from 4 500 to 5 000 m/s
Shelf life	> 10 days in normal conditions of use
Water resistance	Très bonne

*) Measured by underwater destructive test

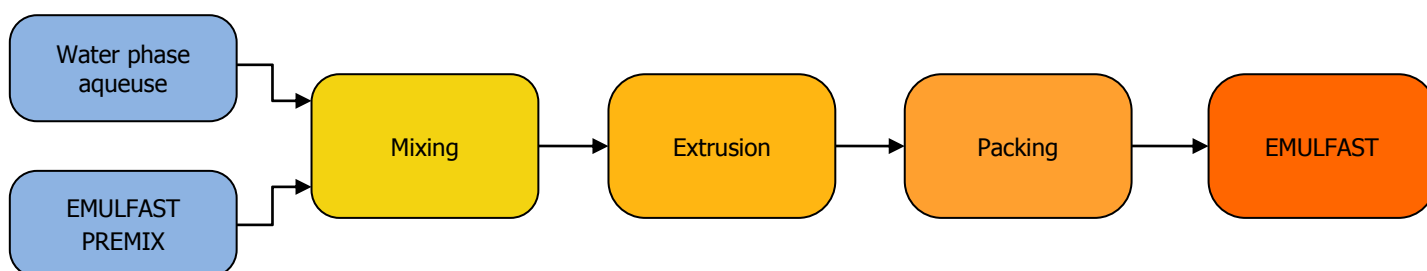


EMULFAST on-site manufacturing system allows for the production in a dedicated plant on site, a cap sensitive cartridged explosive emulsion, which can initiate bulk explosive (ANFO, COLOGEL or GEMULSTAR). The EMULFAST explosive is made from the same water phase as COLOGEL or GEMULSTAR.

The manufacturing unit has a raw material preparation drum, a mixer, an extrusion press and a packing machine. This equipment is designed to the customer's needs, and the size of the cartridge can be adapted according to the customer's specific requirements.

All raw materials are non explosives, thus the amount of explosives to be stored on site is considerably reduced. The most critical part of the process is the quality of the emulsifiers and sensitizing agents, and this is ensured by TITANOBEL, who provides a non-hazardous mixture prepared at its own plant (PREMIX). Operations conducted at the client's site consist of a simple mixture of the PREMIX with a water phase (solid nitrates diluted in water), extrusion and packing.

Manufacturing process



Pyrotechnical characteristics

	EMULFAST
Density	1.23
Shock energy (*)	2.05 MJ/kg
Gas energy (*)	2.21 MJ/kg
Total energy (*)	4.26 MJ/kg
Velocity of detonation	5 700 m/s
Shelf life	One year under normal conditions of use
Water resistance	Very good

(*) Measured by underwater destructive test



Packing machine



TITANOBEL

REARMEMENT

START

MURGE

LAVAGE

AIR D'HOE

PURGE

EXTENSIBLE

ON

OFF

MARCHES / ARRET

CYCLE

TROU

SURVIVANT

ENROULEUR

DEBIT

BAG

DEBIT

POMPE FOT



TITANOBEL offers for initiation of the explosives a complete range of detonators: pyrotechnic detonators to be crimped on safety fuse or detonating cord, electric detonators fired with a blasting machine, non-electric detonators and electronic detonators.

Electric detonators

Electric detonators are available with different delay numbers, lengths of wire and electric safety levels.

Electric detonators are available in instantaneous (n° 0, detonation delay less than 1 ms), short delays from n° 1 to n° 20 (from 25 to 500 ms in steps of 25 ms) for open pit blasting and delays from n° 1 to n° 12 (from 500 ms to 6 s in steps of 500 ms) for underground blasting. They are loaded with 0.8 g of PETN.

The level of electric safety is characterized by the necessary intensity to initiate the detonator. Two levels are available: medium intensity (MI) or high intensity (HI).

Electric detonators coming from different manufacturers or with a different level of intensity are never to be used together on the same blast. In addition to a good design and a meticulous set up, a successful blast also requires a good lead-in line, a resistance check with an ohmmeter before and after stemming and an appropriate initiation instrument in good working condition.

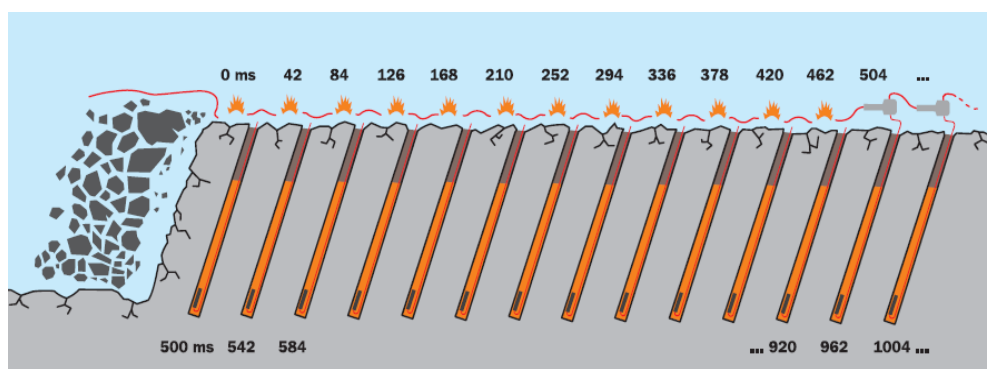
Non-electric detonators

The range comes in a classic system (down the hole detonator and surface connector) and in dual delay system (detonator and connector together on the same item). The two systems can be used together. Detonators and connectors are available with different lengths of tube and different delays.

Using non-electric detonators allows:

- ↳ Greater safety, as the system is insensitive to electric energy sources (radio frequency, stray currents),
- ↳ Higher flexibility to sequence the initiation of the blast, without limitation by a given number of delay numbers,
- ↳ Easier stock control, as the number of items to store is much less significant than with electric initiation.

Once all detonators are connected, the blast must be checked visually. The blast can be initiated either with an electric detonator or detonating cord connected to the first non-electric detonator of the blast, or with a specific initiation system connected to a shock tube lead-in line going from the shot firing place to the first detonator of the blast.



*Detonation transmission principle
(500 ms detonator down the hole and 42 ms surface connector)*

Electronic detonators

For initiation of high quality and complex open pit, underground or demolition blasts, TITANOBEL offers electronic initiation systems.

The system consists of:

- ↳ A logger that stores the identification number of each detonator and assigns to each detonator a delay or a number during the logging process,
- ↳ A blaster, controlling the initiation of the blast through one or several loggers.

Fully programmable by 1 ms steps, the electronic detonators communicate with the other elements of the system through a specific BUS line. They are available in different lengths according to the client requirements.

In a specific configuration, the system can simultaneously control by remote radio transmission several blasts at different locations of the mine from a centralized firing position.

The use of the electronic detonator is reserved for people who have followed this initiation system specific training, which can be provided by TITANOBEL.

Packaging and transportation

Except for pyrotechnic detonators, all our detonators are available in 1.4.S packaging. This packaging allows IMCO 1.4.S classification and shipment of complete boxes by air (passenger plane) or shipment by sea together with class 1.1.D explosives in the same container (provided there is no contradiction with local regulations).

Once opened, the box of detonators is no longer conform with 1.4.S packaging, and the detonators must be transported separately from class 1.1.D explosives.

Our detonators are sold per complete boxes of a same item.



TITANOBEL offers a range of detonating cord with different explosive core loads. TITACORD is a flexible plastic tube with a high VoD (velocity of detonation) explosive core made of PETN wrapped in plaited textile layers. The cord is coated with polypropylene in order to ensure a good resistance to traction. Finally, an external polyethylene or PVC coating ensures the detonating cord to be waterproof.

Products range

	TITACORD 12	TITACORD 20	TITACORD 40	TITACORD 70
Quantity of PETN per meter	12 g/m	20 g/m	40 g/m	70 g/m
Color	Red	Yellow	Blue	Orange
Velocity of detonation	7 000 m/s	7 000 m/s	6 500 m/s	6 300 m/s
External diameter	5.0 mm	6.2 mm	7.9 mm	9.7 mm
Resistance to traction	78 daN (80 kg)	78 daN (80 kg)	78 daN (80 kg)	78 daN (80 kg)
Reel length	250 m	200 m	100 m	75 m
Applications	Splitting of dimension stones		Splitting of rock bank (post or pre-splitting)	
	Connection between blast holes in mass blasting	Lateral initiation of low sensitivity explosives (ANFO, bulk emulsion)		

Packaging and transportation

Cardboard boxes with one spool per box

Classification IMCO 1.1.D - UN 0065 - Flexible detonating cord

Conditions of use

Recommended initiation: 0.6 g PETN detonator (class 8D) or other detonating cord.

Water resistance: excellent provided that ends of the cord are protected.

Avoid any excessive traction that could lead to break the explosive core.

Avoid twisting, low radius curvature and friction of the cord.

Limit uncovered lengths of detonating cord in order to reduce noise pollution when blasting.

Maximum temperature for use: + 50°C

Maximum temperature for storage: + 50°C





TITANOBEL offers a range of ANFO packaged in bags, used as a column explosive charge, when conditions are dry in the blast holes. ANFO provides an excellent coupling between explosive and rock. Strengthened with aluminum, it's a very energetic explosive with a very high energy output.



Products range

ANFOTITE 1+	Explosive composed of fuel and ammonium nitrate, with light pink color, adapted for blast holes with diameter above 76 mm.
ANFOTITE 2+	Explosive composed of fuel and ammonium nitrate, with light pink color, adapted for lower diameters and loading with compressed air (underground blasting).
ANFOTITE 3+	ANFO strengthened with addition of aluminum, with light grey color, adapted for high resistance rock.

Pyrotechnical characteristics

	ANFOTITE 1+	ANFOTITE 2+	ANFOTITE 3+
Measured			
Average loading density	0.85	0.83	0.90
Critical diameter (mm)	75	35	30
Velocity of detonation (m/s)			
Ø 30 mm open air	No initiation	No initiation	No initiation
Ø 36 mm confined	2 000	3 000	3 500
Ø 80 mm confined	3 700	3 700	3 900
Energy liberation (underwater test)			
Shock energy (MJ/kg)	1.11	1.05	1.37
Gas energy (MJ/kg)	1.82	1.59	2.06
Total energy (MJ/kg)	2.93	2.74	3.43
Calculated			
Gas volume (l/kg)	988	980	896
Theoretical total energy (MJ/kg)	3.83	3.87	4.73
Detonation pressure (calculated assuming measured detonation velocities) :			
Ø 30 mm confined (GPa)	0.85	1.87	2.76
Ø 80 mm confined (GPa)	2.91	2.84	3.42

Packaging and transportation

25 kg multilayer bags.

Classification IMCO 1.1.D - UN 0082 - Explosive type B

Conditions of use

Best used within one year from manufacturing date.

Initiation with a cartridged explosive in small diameter, with 20 g/m detonating cord, a cartridged explosive or BOOSTEX 65 in large diameter holes.

Not to be used in wet blast holes (destroyed by water), as bottom charge in hard or very hard rock (low detonating pressure), in highly fragmented rock or with karsts and in blast holes with diameter under critical diameter

When loaded with compressed air, the loading nozzle must have a diameter less than or equal to 30 mm.



TITANOBEL buys technical ammonium nitrate for its own needs (manufacturing of ANFO and explosive emulsion) . This product is commercially available for our export customers.

We can offer porous ammonium nitrate in 25 kg bags or 0.8 to 1.2 ton bags, and also dense ammonium nitrate for manufacturing of explosive emulsion (only in big-bags).

It is recommended to store the ammonium nitrate away from rain and below a temperature of 32°C, to avoid caking problems.

Technical ammonium nitrate must be stored, transported and used according to local legislation and regulations in force.

Packaging and transportation

25 kg bags or 0.8 to 1.2 ton big-bags

Classification IMCO 5.1 - UN 1942 - Oxidizing agent



Black powder is the first ever product manufactured at the TITANOBEL main plant in Vonges. Production first started in 1691 for supply of the French Royal Army, during the reign of King Louis XIV. Today TITANOBEL offers a wide range of black powder for civil or military applications.

TITANOBEL manufactures black powder and therefore can adapt the product to specific technical requirements.

Standard range of products

Black powder for hunting and sport shooting	PN mousquet for struck percussion rifles using paper or metal cartridges. PNC for smooth-bore weapons. PNF4-P for transmission for flintlock and matchlock weapons. PN F1 high quality propulsive powder for long weapons. PN F2 high quality propulsive powder for short weapons.
Black powder for fireworks	PN MC30 and MC30-1, PN without sulfur, Pulverin, PN fine grain, PN mousquet, used for different applications in fireworks.
Black powder for antique weapons	PN 5FA for muzzle loading replicas of old weapons used in re-enactments and hunting.
Black powder for blasting	PN G40—MC30 GR for splitting of dimension stone.
Military black powder	Powders qualified by French army (PN1 to PN7 with or without graphite, specific indices PN L1, PN P1, PN P2, PN FA20, PN FA21, PN FA30, PN slow fuse, etc.). Powders qualified by US army (class 1 to 7 according MIL-P 223 C specifications). Other standard powders (grade A1, type O, type F and F', type FF and FF', etc.).

Pyrotechnical characteristics

Please consult us.

Packaging and transportation

25 kg cardboard boxes in bulk in a plastic bag or in 500 g can
Classification IMCO 1.1.D - UN 0027 - Black powder

Conditions of use

Best used within 3 years from manufacturing date for products packaged in plastic bag, 5 years for products packaged in can.

Store in dry conditions (black powder is destroyed by water).



Blasting equipment

TITANOBEL offers blast initiation equipment for the control and initiation of blasts, with electric or non-electric detonators. TITANOBEL also offers a maintenance and certification service for these instruments:

- ↳ Blast initiation instruments for electric detonators, with several firing capacity,
- ↳ Ohmmeters for checking of the electric circuit and good connection of all detonators,
- ↳ Blast initiation instruments for non-electric detonators.

Measuring equipment

TITANOBEL offers a wide range of measuring equipment for blast holes positioning, drilling control and vibration control:

- ↳ The laser profiler defines with accuracy the geometry of the free face, and accordingly establishes the position of the blast holes and defines the depth and angle of drilling.
It is available in 2D version for a day-to-day follow-up of the positioning, or in 3D version, enabling a comprehensive modeling of the free face and an accurate measurement of volumes.
- ↳ The burden probe allows measuring the toe burden of the free face. A transmitting probe is lowered down the hole and a receiver picks up the signal, locates the transmitter, and displays the measurement of the toe burden thickness.
For better safety, an ultrasound system allows the measurement to be recorded away from the free face.
- ↳ The cable 3D system tracks the profile of the drill hole with a probe with dual axis tilt sensor and digital compass, allowing the user to determine the burden at any point in the face.
The sensor is connected by cable to a receiver on the surface, which collects the information, which is processed on a computer to obtain a 3D model of the drilling in relation to the rock mass to be blasted.
- ↳ Our seismographs, with or without integrated printer, allow to monitor the nuisance caused by blasting on the surrounding environment and characterize the performance of the blast. The seismographs also provide a record of the air pressure generated by the blast (noise pollution).

Blasting accessories

TITANOBEL also offers a large range of accessories useful for a successful blasting:

- ↳ Single or double connecting wire 51/100° made of copper or iron, firing line 12/10°,
- ↳ Antistatic plastic stemming rods with possibility of screwing a cartridge extractor or a flat head, stemming rod kit with connecting screws and wearing rings, rope stemming rod with different diameters,
- ↳ Pre-loading tubes and separators for underground blasting,
- ↳ Wing shutters for blast holes diameter 28 to 64 mm, conic shutters for blast holes collar protection in open pit,
- ↳ Polyethylene cover and plastic antistatic and waterproof tube for ANFO,
- ↳ Blasting alarms (fog horn, light and folding alarm, manual alarm with hand pump or ring by crank),
- ↳ Antistatic multimeter length 30 m for checking depth of the blast holes and explosive column length,
- ↳ Cracking cement for cracking rock or concrete in sensitive areas,
- ↳ Safety fuse in 15 m reels, electric igniters and friction starter.

To extend its range of customer services, TITANOBEL offers drilling and blasting services through its specialized subsidiaries. TITANOBEL has a fleet of more than 60 hydraulic drills for open pit drilling of holes up to 140 mm in diameter.

TITANOBEL currently operates drilling and blasting contracts in France, Senegal and New Caledonia. From these bases, TITANOBEL can operate elsewhere within these regions. The service includes design of the drilling and blasting patterns, marking of the drilling pattern, drilling of the blast holes, explosive loading and firing of the blast.



TITANOBEL also offers explosives application training ranging from basic safety elements to expert training for specific use of the explosive, design of drilling and blasting pattern, control of vibration, underground blasting, and special blasting, such as pre-splitting of dimension stone or avalanche triggering.

The standard training course equips the trainee to pass the blasting officer certificate exam (Certificat de Préposé au Tir - CPT, a diploma of the French national education required for using explosives in France). It may be completed with optional modules on specific aspects of blasting:

- | | |
|---------------------------------|---------------------------|
| ↳ Underground works | ↳ Deflagrating explosive |
| ↳ Underwater works | ↳ Safety fuse |
| ↳ Avalanche triggering | ↳ Bulk mechanized loading |
| ↳ Blasting in smelting furnaces | ↳ Electronic priming |

In addition to the CPT, operators in France must undergo a refresher training (CPT upgrading each year). CPT initial and upgrading training sessions are held regularly in the French regions, and can receive French speaking candidates from abroad.

Beyond the training sessions conducted in France, TITANOBEL can arrange for its international customers made to measure training sessions in French or English, responding to the specific requirements of the client and each training program is determined in consultation with the client.



Training Session
« Explosives and Blasting »
25 and 26th October 2011

Kraomita Malagasy
KRAOMA - MADAGASCAR



TITANOBEL is also an expert in blasting and explosives, through its technical engineers operating throughout France and abroad, and the pyrotechnical test center located at TITANOBEL's Vonges production site.

TITANOBEL technical engineers can offer audit services of the client's blasting practices, with recommendations for the optimization of the blasts, as well as analysis of the different implementation problems encountered by the client. They may also help the client in the design of delicate blasts, which for example may require the use of electronic detonators.

Vonges pyrotechnical test center performs a variety of tests on most energy products from the market, pyrotechnical or not:

- ↳ Characterization of civil explosives and realization of simulation tests (sensitivity to priming, determination of the energy of explosion of a product, velocity of detonation, etc.),
- ↳ Tests of pyrotechnical safety according to UN and NATO standards,
- ↳ Tests of detonation and retention of oil on the ammonium nitrates according to EC standards,
- ↳ Services of all kinds (casting and compression of explosives, tests of air and underwater pressures, thermal flux measurements, behavior to impacts, flame, fire, etc.).



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