TITAN® 9000xero® Matrix Blend

Technical Information

Description

TITAN 9000xero matrix blend is a blend of ammonium nitrate emulsion (TITAN 9000) and a functional bulk additive, resulting in a reduced weight strength bulk explosive, designed to assist with post blast fume management.

Application

- TITAN 9000xero is suitable for applications where soft, wet/damp ground conditions are encountered.
- TITAN 9000xero is sensitised and delivered via auger into dry/dewatered blastholes or pumped to the bottom of wet blastholes.
- TITAN 9000xero is a water resistant alternative to ANFO for use in ground affected by water and/or ground considered to be incompetent.

Advantages

- TITAN 9000xero is a post blast fume (NOx) reducing formulation.
- The high emulsion content provides optimal water resistance for use in dewatered or wet conditions.
- Delivery via auger or pumping provides greater flexibility for loading when bench and weather conditions change unexpectedly.

Properties

Density (g/cm^3) [1]	1.15
Minimum Diameter (mm)	150
Energy (MJ/kg) [2]	2.0
Typical VOD (m/s) [3]	3400 - 5000
RWS % [4]	54
RBS % [5]	76

NOTES:

1. Values are indicative average densities only, determined under laboratory conditions by Dyno Nobel technical personnel at Dyno Nobel's Mt Thorley Technical Centre. Observed densities may differ or vary under field conditions. Nominal in hole density only.
2. All Dyno Nobel energy values are calculated using a proprietary Dyno Nobel thermodynamic code – Prodet. Other programs may give different values.
3. These results represent a range of VODs collected from numerous Dyno Nobel blast sites throughout the Asia Pacific region over a period of time. The velocity of detonation actually recorded in use is dependent upon many factors, including: the initiation system used, the product density, blasthole diameter and ground confinement. The values stated are typical of those recorded for the product in various hole diameters, densities and ground types, and may not be achievable under all circumstances.
4. Relative Weight Strength (RWS) and Relative Bulk Strength (RBS) are determined against ANFO at a density of 0.82g/cm^3 with energy of 3.7MJ/kg.
5. RBS depends on the final density of the product at the time of loading.

Hazardous Shipping Description

Explosive, Blasting, Type E, 1.1D, UN 0241

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Phone 1800 251 872 Fax 07 3026 3999 www.dynonobel.com

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TITAN® 9000xero® Matrix Blend

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Recommendations

Priming Requirements – TITAN 9000xero is booster sensitive and requires a minimum 400g cast booster. Smaller booster types may reduce the performance of the explosive. Additional boosters should be used when the column height exceeds 10 meters or where there is risk of column disruption. Please consult your Dyno Nobel representative if you intend using detonating cord down lines.

Sensitisation – TITAN 9000xero is chemically sensitised as the product is delivered to the blasthole. Allow at least 30 minutes at 20°C for the gassing reaction to occur before the blasthole is stemmed (longer at lower temperatures). The level of sensitisation necessary (as given by the open cup density) is dependent on the depth of the blasthole.

Incorrectly sensitised gassed blends may lead to poor detonation, poor ground fragmentation and/or the formation of excessive post blast fumes (NO_X).

Maximum Hole Depth – The recommended maximum hole depth for TITAN 9000xero is 40m. Maximum hole depth is determined by the level of sensitisation.

Shelf Life – TITAN 9000 matrix has a shelf life of three (3) months, when transported and stored under ideal conditions.

Sleep Time – TITAN 9000xero has a maximum sleep time of 21 days under ideal conditions. In non ideal conditions this time may be reduced.

Recommendations (cont'd)

Reactive Ground Conditions – An alternative matrix may be required for use in reactive conditions. For use in reactive ground conditions contact your Dyno Nobel representative. It is essential that the appropriate test work be conducted to develop site specific guidelines for determining the maximum sleep time of the bulk explosive in reactive ground conditions.

Ground Temperature – TITAN 9000xero is suitable for use in ground with a temperature of 0°C to a maximum of 55°C. For applications in ground with temperatures outside this range, contact your Dyno Nobel representative.

Safe handling, transportation and storage

First Aid – You can find detailed first aid information on the relevant Dyno Nobel Material Safety Data Sheet. Refer to www.dynonobel.com for more information if required.

Safety – TITAN 9000 matrix (explosive precursor), and TITAN 9000xero matrix blends (explosives) are classified as dangerous goods and can cause personal injury and damage to property if used incorrectly.

Transportation and Storage – All Dyno Nobel emulsion matrices and explosives must be handled, transported and stored in accordance with all relevant regulations. Stock should be rotated such that older product is used first.

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TITAN® Matrix Blend Gassing Table

TITAN® 9000xero®

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USE OF TABLE

1. The left hand column in this table (Depth) indicates the height of the product column under **dry hole conditions.** In **wet hole** conditions, the value selected from the left hand column must be the sum of the product column plus the height of the water column in the hole. If the length of the product and water column exceeds the depth of the hole then the value selected from the left hand column must be the hole depth.
2. This table applies for TITAN 9000xero Matrix blend with an emulsion content of **80% w/w ONLY.**
3. Emulsion explosives behave as liquids when subjected to the gravitational stress in a vertical blasthole, and a pressure gradient in the explosive will be established. The higher the explosive column in the blasthole, the higher the internal pressure at the bottom of the column, and the larger the quantity of gassing chemicals that need to be added to provide sensitisation.
4. The open cup density is a measure of the level of sensitisation of the product. It is necessary to choose an open cup density to ensure that the density of the explosive at the bottom of the blasthole is less than the critical density. Inappropriate sensitisation may lead to poor detonation, fragmentation and generation of excessive post blast fume

   Blacked out areas indicate where critical density is reached or exceeded.
5. **To determine the required open cup density for an explosive** column of 30m (for example), find 30m in the Depth column. Moving to the right, read off the density in the unshaded column under the required open cup density (e.g. a **TOE** density of 1.28g/cm^3 in the 1.05 g/cm^3 open cup density column). In this example, this indicates that sufficient gassing chemicals should be added to the gassed explosive blend during delivery so that an open cup density of 1.05g/cm^3 is achieved.

   This level of gassing chemicals will ensure that the density at the bottom of the column will be below the critical density, and the column will detonate at full order upon initiation.
6. **To determine the approximate average in-hole density** in a column of 30m (for example), find 30m in the Depth column. Moving to the right, read off the density in the shaded column (e.g. an **AVG. IN-HOLE** density of 1.21g/cm^3 in the 1.05 g/cm^3 open cup density column).

   For depths that are not listed, Dyno Nobel recommends rounding up to the next highest depth. eg a 25m deep hole should be rounded to 26m and corresponding densities applied.
7. Blast design should be based on average in-hole density whilst blasthole loading requires the MPU operator to achieve the associated open cup density.
8. The gassing reaction takes 30-40 minutes to achieve the desired open cup density at 20°C. It is necessary to allow at least this time to elapse following completion of loading and before stemming the charged blasthole. A longer period should be allowed at lower temperatures.
9. The density values shown were calculated using a laboratory mathematical model that was validated using a specially designed fit-for-purpose pressure-volume apparatus.

	TITAN 9000xero gassed blend density g/cm^3													
Depth (m)	Avg in-hole	Toe	Avg in-hole	Toe	Avg in-hole	Toe	Avg in-hole	Toe	Avg in-hole	Toe	Avg in-hole	Toe	Avg in-hole	Toe
Open cup	0.90	0.90	0.95	0.95	1.00	1.00	1.05	1.05	1.10	1.10	1.15	1.15	1.20	1.20
1	0.92	0.94	0.97	0.98	1.02	1.03	1.06	1.08	1.11	1.12	1.16	1.17	1.21	1.22
2	0.93	0.97	0.98	1.01	1.03	1.06	1.08	1.10	1.12	1.14	1.17	1.19	1.21	1.23
3	0.95	1.00	1.00	1.04	1.04	1.08	1.09	1.12	1.13	1.16	1.18	1.20	1.22	1.24
4	0.96	1.02	1.01	1.06	1.05	1.10	1.10	1.14	1.14	1.18	1.18	1.21	1.23	1.25
5	0.98	1.04	1.02	1.08	1.06	1.12	1.11	1.15	1.15	1.19	1.19	1.22	1.23	1.26
6	0.99	1.06	1.03	1.10	1.07	1.13	1.12	1.17	1.16	1.20	1.20	1.23	1.24	1.26
7	1.00	1.08	1.04	1.12	1.08	1.15	1.12	1.18	1.16	1.21	1.20	1.24	1.24	1.27
8	1.01	1.10	1.05	1.13	1.09	1.16	1.13	1.19	1.17	1.22	1.21	1.25	1.24	1.27
9	1.02	1.11	1.06	1.14	1.10	1.17	1.14	1.20	1.18	1.23	1.21	1.25	1.25	1.28
10	1.03	1.12	1.07	1.15	1.11	1.18	1.14	1.21	1.18	1.23	1.22	1.26	1.25	1.28
11	1.04	1.14	1.08	1.16	1.11	1.19	1.15	1.22	1.19	1.24	1.22	1.26		
12	1.05	1.15	1.09	1.17	1.12	1.20	1.16	1.22	1.19	1.25	1.22	1.27		
13	1.06	1.16	1.09	1.18	1.13	1.21	1.16	1.23	1.19	1.25	1.23	1.27		
14	1.06	1.17	1.10	1.19	1.13	1.21	1.17	1.23	1.20	1.26	1.23	1.28		
15	1.07	1.17	1.10	1.20	1.14	1.22	1.17	1.24	1.20	1.26	1.23	1.28		
16	1.08	1.18	1.11	1.20	1.14	1.22	1.17	1.24	1.21	1.26	1.24	1.28		
17	1.08	1.19	1.12	1.21	1.15	1.23	1.18	1.25	1.21	1.27	1.24	1.28		
18	1.09	1.19	1.12	1.21	1.15	1.23	1.18	1.25	1.21	1.27				
19	1.09	1.20	1.13	1.22	1.16	1.24	1.19	1.26	1.22	1.27				
20	1.10	1.21	1.13	1.22	1.16	1.24	1.19	1.26	1.22	1.28				
22	1.11	1.22	1.14	1.23	1.16	1.25	1.19	1.27	1.22	1.28				
24	1.11	1.23	1.14	1.24	1.17	1.26	1.20	1.27						
26	1.12	1.23	1.14	1.25	1.17	1.26	1.20	1.28						
28	1.12	1.24	1.15	1.25	1.18	1.27	1.20	1.28						
30	1.13	1.25	1.15	1.26	1.18	1.27	1.21	1.28						
32	1.13	1.25	1.16	1.26	1.18	1.28								
34	1.13	1.26	1.16	1.27	1.19	1.28								
36	1.14	1.26	1.17	1.27	1.19	1.28								
38	1.14	1.27	1.17	1.28										
40	1.15	1.27	1.17	1.28										
45	1.15	1.27	1.18	1.28										
50	1.15	1.27	1.18	1.28										
55	1.16	1.27	1.18	1.28										
60	1.16	1.28												

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