Blasting with ammonium nitrate

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BLASTING WITH AMMONIUM NITRATE

By G. A. GREAVES, Chief Inspector of Explosives, Mines Department.

THE mixture of ammonium nitrate prills with 6 per cent. of distillate fuel oil, known as "ANFO", is now widely used for blasting in dry ground.

Farmers and clearing contractors use ANFO for stump-blasting, dam sinking and timber clearing.

Prilled ammonium nitrate is now manufactured in Western Australia at Kwinana and it provides a cheaper means of blasting. It is also much safer to use than the conventional nitroglycerine explosives, but accidents can occur unless every care is taken with detonators and priming charges.

Ammonium nitrate

Ammonium nitrate is produced in the form of small round pellets called "prills" and this substance is not in itself classified as an explosive. It is, however, an active oxidiser which melts and runs to liquid at the comparatively low temperature of 337° F.

In a fire the presence of any easily oxidisable organic material with ammonium nitrate may cause violent reaction or even explosion. It is therefore necessary to store bags of nitrate in a cool, dry place where there is the least danger of fire. Generally it should be stored in a shed of iron or brick with a clean cement floor and detached from other buildings. No goods or material having flammable properties should be kept in the same place with ammonium nitrate.

If the nitrate does become involved in a fire the most effective extinguisher is water in copious amounts. Water cools the material and prevents further reaction or decomposition.

Mixing ANFO

ANFO explosive mixture is made by blending together ammonium nitrate prills and diesel fuel oil. The prills are actually porous and oil is soaked into them so that with good prills there is no surplus oil and the explosive mixture is dry and free-running like the original nitrate. It is usual at mines and quarries to add an oil-soluble dye to distinguish the explosive mixture from untreated prills.

The correct proportion of oil is 6 per cent. by weight and, since oil is lighter than water, this is obtained by adding 3 pints to a 50 lb. bag of prills or 5 pints to an 80 lb. bag. It is necessary to ensure that only the correct amount of oil is used since the best blasting mixture is that which contains 6 per cent. by weight of oil. If more or less oil is used, the mixture will explode but there is a loss of power and the blast is less effective.

ANFO mixing can be done very effectively in a hand operated cement mixer but can also be done in a wooden box, a steel trough or even on a plastic sheet. The mixed material is an explosive—therefore it should be handled with care. It is an insensitive explosive which does not normally cause accidents by itself but if any other explosive should detonate in or near the ANFO then it will explode with the full effect for which it was intended.

Priming of ANFO

To obtain the best results from ANFO explosive it must be mixed with the correct 6 per cent. by weight of oil and it must be adequately primed. It is a false economy to use small primers since the charge may explode with less than its full strength. Generally a whole 1 x 8 in. plug of gelignite should be used or otherwise a solid booster of Anzomex or HDP type. The detonator should be securely inserted into the primer and the priming charge placed well into the ANFO charge.

ANFO is quickly desensitised by water and should not be used in wet holes unless the charge is fully enclosed in a plastic bag which will prevent water reaching the mixture.

Explosives Regulations

Ammonium nitrate is not a classified explosive under the Explosives Act and the regulations do not apply to its storage and conveyance. If, however, it is kept or conveyed with any explosives then the total quantity of nitrate plus explosives is regarded as explosive.
material which is subject to the regulations. This is because the explosive could cause detonation of the nitrate.

A small quantity of explosives not exceeding 50 lb. and 100 detonators may be kept without licence provided it is enclosed in a locked wooden box and located in a lock-up building which is not a dwelling place. The detonators must always be kept separately from the explosives at a distance of more than 10 feet.

The mixing of ammonium nitrate and fuel oil is regarded as manufacture of an explosive. This is provided for in the Explosives Regulations by the issue of a special licence called “Licence to Manufacture a Blasting Agent” which is issued on payment of the fee of $2 and must be renewed annually.

Any person who intends to use ANFO explosive for land clearing or farm work should first apply to the Explosives Branch of the Mines Department for the licence and should restrict the keeping of gelignite and boosters within the limit of 50 lb. for which no storage licence is required. A permit to purchase explosives is issued without charge at any police station and this becomes the owner’s authority to possess explosives.

Safety with ANFO

The shock of the primer or booster causes ANFO to explode so the greatest care must be taken once the charge has been primed.

Three fatal accidents have occurred in Western Australia when ANFO was being used for blasting. In each case the charge was primed for firing and there was a human error in dealing with the fully primed explosive.

Primers or boosters should be carefully placed in the mixture only just before it is charged for use and from there on the operator must regard the whole charge as a normal explosive system which is only as safe as the detonator and primer which will fire the charge.

It is possible that mixed ANFO could explode in a fire and for this reason the mixture should not be kept in storage unless it is in an explosives magazine. Mix only sufficient for immediate use and avoid having a surplus to dispose of.

Licences for keeping explosives in quantity greater than 50 lb. and for the manufacture of ANFO blasting agent are issued by the Explosives Branch of the Mines Department which is now located at Albert House, 10 Victoria Avenue, Perth. Applications can be made by letter stating the location of the property and enclosing the $2 licence fee.

BLAST HOLES FOR WATER

Blast holes created with “Nitro Prill” explosive are an efficient way of obtaining water for livestock or irrigation on some sites in the South West.

Selection of a site is the most important step. If bulldozer construction is possible the site is probably too dry. A high water table or water source to readily fill the blast hole is needed.

When a large storage is needed, long trench-like blasts are more successful than holes more than 25 feet in diameter.

Gullets for cores of dams that cross boggy streams can often be blown when normal equipment cannot be used.

Exercise great caution when using explosives. For technical advice on “Nitro Prill” contact the manufacturers or an explosives expert such as the Explosives Branch of the Mines Department, Albert House, 10 Victoria Avenue, Perth (Tel. 25 9966).

For further details contact a Soils or Irrigation Adviser through your local office of the Department of Agriculture.