Postgraduate Certificate in Explosive Engineering

Fundamentals of Explosives and Blasting

Ammonium Nitrate (AN): A common industrial chemical used as a fertilizer and, when mixed with fuel oil, as an explosive. AN is a white crystalline solid that is stable under normal conditions but can be explosive when heated or subjected to shock.

ANFO: Short for ammonium nitrate/fuel oil, a mixture of ammonium nitrate and fuel oil used as an explosive. ANFO is a simple and inexpensive explosive that is commonly used in mining and construction.

Blast Design: The process of planning and preparing for a blasting operation, including selecting the appropriate explosives, determining the charge weight and burden, and designing the pattern of holes. Blast design is critical for ensuring safe and effective blasting.

Blast Energy: The total amount of energy released during a blasting operation, measured in kilojoules (kJ) or tons of TNT equivalent. Blast energy is a key factor in determining the effectiveness of an explosion.

Blast Frequency: The number of blasts per unit of time, typically measured in blasts per day or blasts per week. Blast frequency is an important consideration in planning blasting operations, as it can affect the stability of the surrounding environment and the safety of personnel.

Blast Hole: A hole drilled in the ground to hold explosives for a blasting operation. Blast holes are typically arranged in a pattern to focus the energy of the explosion and maximize its effectiveness.

Blasting Agent: A material or mixture used for the purpose of producing an explosion, typically consisting of a fuel and an oxidizer. Blasting agents are classified as low explosives, meaning they burn rather than detonate.

Blasting Cap: A small explosive device used to initiate the detonation of a larger charge. Blasting caps are typically made of a metal casing filled with a primary explosive, such as lead azide or mercury fulminate.

Blasting Gelatin: A type of high explosive made by gelatinizing nitroglycerin and nitrocellulose. Blasting gelatin is a powerful and stable explosive that is commonly used in mining and construction.

Blasting Mat: A heavy fabric or rubber mat used to contain the fragments and debris produced during a blasting operation. Blasting mats are typically placed over the top of the blast hole to protect personnel and equipment from flying debris.

Blasting Operations: The process of using explosives to break rock or other materials, typically in mining or construction. Blasting operations involve drilling holes in the ground, loading them with explosives, and initiating the explosion with a blasting cap or other device.

Burdens: The distance between the face of a blast hole and the free face of the rock being blasted. Burdens are an important factor in determining the effectiveness of a blast, as they affect the amount of

energy transferred from the explosives to the rock.

Charge Weight: The amount of explosives used in a single blast hole. Charge weight is an important factor in determining the energy of an explosion and the amount of fragmentation produced.

Confined Spaces: Areas that are enclosed or partially enclosed and have limited access, such as trenches, pits, and tunnels. Confined spaces can present unique hazards during blasting operations, as the force of the explosion can cause the space to collapse or fill with debris.

Detonation: The rapid and instantaneous decomposition of an explosive, resulting in the release of a shock wave and a large amount of energy. Detonation is the desired outcome in blasting operations, as it is more powerful and efficient than deflagration (slow burning).

Deflagration: The slow burning of an explosive, resulting in the release of energy but not a shock wave. Deflagration is less powerful than detonation and is typically not desirable in blasting operations.

Delay Detonators: Devices used to initiate the detonation of explosives with a controlled delay, allowing for the sequential detonation of multiple charges. Delay detonators are an important tool in blasting operations, as they allow for precise timing and control of the explosion.

Detonating Cord: A cord-like explosive used to transmit the detonation wave from one charge to another. Detonating cord is typically made of a core of high explosives surrounded by a plastic or fabric casing.

Detonators: Devices used to initiate the detonation of an explosive. Detonators typically consist of a metal or plastic casing filled with a primary explosive, such as lead azide or mercury fulminate.

Dynamic: A high explosive made by gelatinizing nitroglycerin and diatomaceous earth. Dynamic is a powerful and stable explosive that is commonly used in mining and construction.

Explosion: The rapid release of energy caused by the detonation or deflagration of an explosive. Explosions can be categorized as either deflagrations (slow burning) or detonations (instantaneous decomposition).

Explosive: A substance or mixture that is capable of producing an explosion, either through detonation or deflagration. Explosives are classified as either low explosives (burning) or high explosives (detonating) based on their energy release and reaction speed.

Explosive Engineering: The branch of engineering concerned with the design, development, and use of explosives. Explosive engineering encompasses a wide range of applications, including mining, construction, demolition, and military.

Face Burden: The distance between the face of a blast hole and the free face of the rock being blasted. Face burden is an important factor in determining the effectiveness of a blast, as it affects the amount of energy transferred from the explosives to the rock.

Fragmentation: The process of breaking rock or other materials into smaller pieces during a blasting operation. Fragmentation is an important consideration in blasting operations, as it affects the efficiency and effectiveness of the explosion.

Free Face: The exposed surface of rock or other material being blasted. The free face is the target of the blast, and the distance between the free face and the face of the blast hole is known as the burden.

Gas Pressure: The pressure exerted by the gases produced during the detonation or deflagration of an explosive. Gas pressure is an important factor in determining the energy and effectiveness of an explosion.

High Explosives: Explosives that detonate rapidly and release a large amount of energy, such as dynamite, blasting gelatin, and TNT. High explosives are typically more powerful and efficient than low explosives (burning).

Initiation: The process of starting the detonation or deflagration of an explosive. Initiation is typically accomplished with a blasting cap or other device that contains a primary explosive.

Initiating System: A system used to initiate the detonation or deflagration of an explosive, typically consisting of a blasting cap or other device that contains a primary explosive. Initiating systems are an important component of blasting operations, as they allow for precise timing and control of the explosion.

Low Explosives: Explosives that burn rather than detonate, such as black powder and smokeless powder. Low explosives are typically less powerful and efficient than high explosives (detonating).

Misfire: The failure of an explosive to detonate or deflagrate as intended. Misfires can be caused by a variety of factors, including improper initiation, faulty explosives, or adverse conditions.

Nitroglycerin: A highly sensitive and powerful liquid explosive, typically used in the form of dynamite or blasting gelatin. Nitroglycerin is a colorless, oily liquid with a characteristic odor.

Nitrocellulose: A type of high explosive made by treating cellulose (a natural polymer found in plants) with nitric acid. Nitrocellulose is a white or yellowish powder that is highly flammable and explosive.

Primary Explosives: Explosives that are highly sensitive and easily detonated, such as lead azide, mercury fulminate, and picric acid. Primary explosives are typically used in blasting caps and other initiating systems.

Pyrotechnics: The art and science of producing and using controlled explosions for various purposes, such as fireworks, signaling, and demolition. Pyrotechnics is a specialized field that requires a deep understanding of explosives and their properties.

Reloadable Cartridges: Cartridges that can be reused by refilling them with explosives after they have been fired. Reloadable cartridges are an economical and environmentally friendly alternative to disposable cartridges.