

ATD Pressure Gas Cardox and its use in rock breaking and coal seam work

The ATD Pressure gas Cardox system is a steel tube filled with liquid CO₂ that when detonated releases a large heaving force (up to 30,000 PSI) It is based on liquid Carbon dioxide being converted to high pressure carbon dioxide gas with ignition.

The gas spreads through fissures and micro cracks in the rock and breaks it in tension, rather than compression as with explosives. It is this tension breaking mechanism that results in the reduced noise, vibration and fly rock characteristics. Much less energy is required to break the rock in this way, and therefore less must be dissipated on breakage.

Cardox was developed over 100 years ago for use in explosive coal seams in the UK, the Cardox system consists of a high-strength, reusable steel tube filled with liquid carbon dioxide, a chemical energiser, and a rupture disc. When the Cardox tube is ignited, the carbon dioxide is almost instantaneously converted from a liquid to a gas. Pressure is released from the gaseous CO₂ up to 300mpa (3000 bar), it expands through microcracks and fractures the rock. The pressure can be regulated between 1200 and 2800 bar by using rupture disks. The body is filled with liquid CO₂, a safety heater inserted in the firing head, a rupture disk in the discharge end of varied thickness to regulate pressure.

The chemical energiser is activated by a small electrical charge which causes detonation. There is no risk of igniting any gas present in the area of use as all combustion is carried out within the sealed Cardox tube. When the gas is released at such high speeds, it has the additional advantage of a refrigeration affect, which brings the temperature low enough as to ensure that any gas/air mixture could not ignite.

Cardox has many specialised applications such as rock and concrete breakage, deep sea excavation, tunnelling and shaft sinking and trenching and excavation. Cardox has been used successfully within a metre of services lines underground with no damage to the services at all. It also has applications in removing hang ups in silos and bin systems. Cardox is not classified as an explosive, but rather as a high pressure gas generator. As such, it is not bound to the same restrictions as explosive products.

Cardox tubes are reusable, by replacing the chemical energiser, rupture disk and gasket, and by refilling with Carbon dioxide the tubes can be reused many times.

All Cardox tubes are of a standard size requiring a 57mm diameter hole, differences in pressure are altered by the rupture disks only.

Cardox provides good fragmentation and breaks the rock into large, easily managed pieces with minimal fines. The product works efficiently in shaft sinking where there is no free face with very little noise or vibration produced.