

Designing of *Tailor Made* Commercial Explosives Formulations: Part 01

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Until now, the selection of an explosive for a mining operation is based largely on the cost of the explosive - the explosive selected has to be the cheapest that would deposit rock on the mine floor. Continuous rise in costs of labor and equipment, it is now realized that the cheapest explosive does not necessarily give the lowest overall mining costs. Thus development of new explosives and blasting agents are the need of the hour for explosives manufacturing and mining industries alike.

To use explosives most profitably, mine planners and explosives engineers need reliable indices of their performance. Or else identification of correct explosives can never be made with precision.

Survey of literature, disappointingly, shows that very limited work have been done on development of explosives, with reference design aspects.

There are many parameters those can help in designing proper explosives for a particular purpose. In simple terms – Tailor-made explosives can be designed. Variations could be made, in type of input chemicals, percentages of input chemicals, process conditions, density of explosives, and so on. Changes in these parameters can largely change the output parameters like, heat energy and gaseous energy both of which are manifestation of the input parameters.

Heat Content or Enthalpy is one such important parameter. There are several known laboratory and theoretical methods by which measures of enthalpy can be done. Use of Bomb Calorimeter is one such experimental method. Other theoretical methods are determination of enthalpy of each ingredients used in the formulations. For example, the theoretical calculation of heat energy of Ammonium Nitrate Diesel Oil (ANFO) is 917 Kcal/kg.

Bomb calorimeter also shows the same value i.e. 900 – 930 Kcal/kg for ANFO. When the same experiment is carried out with different percentages of input materials in the basic ANFO formulation, then both theoretical and calorimeter values matches with negligible difference, may be due to experimental error in using the calorimeter.

We have developed an Energy Calculation formula, named as - **GPeng**. Values obtained through **GPeng** have been compared with the values obtained in calorimeter. Both the values are matching in each formulations tested. Other thermodynamic and thermo-chemistry parameters like, Entropy, Gibbs Free Energy, Volume Expansion, Oxygen Factor, Strength Factor, RWS, ABS, and RBS can be obtained by use of **GPeng**.

Large numbers of parameters are used to form a Regression Analyses from which designing of proper explosives is made for a particular type of rock.

Explosives manufacturers and mining & blasting engineers may contact us for designing proper commercial mining explosives. This would help in optimization of explosives cost as well as mining cost in totality.

