The hydrogen bomb

INTRODUCTION

The Hydrogen bomb was first suggested by Edward Teller in 1942 but active work on it was pursued in the summer of 1942 by Oppenheimer, Teller, Los Alamos and others. The first thermonuclear bomb was exploded in 1952 atEnewetak by the United States, the second in 1953 by Russia (then the USSR). Great Britain, France, and China have also exploded thermonuclear bombs, and these five nations comprise the so-called nuclear club—nations that have the capability to produce nuclear weapons and admit to maintaining an inventory of them. Several other nations either have tested thermonuclear devices or claim to have the capability to produce them, but officially state that they do not maintain a stockpile of such weapons; among these are India, Israel, and Pakistan. South Africa's apartheid regime built six nuclear bombs but dismantled them later.

What is Hydrogen Bomb?

Hydrogen bomb is based on nuclear fusion reaction and it deriving a large portion of its energy from the nuclear fusion of hydrogenisotopes. The hydrogen bomb functions by the fusion, or joining together, of lighter elements into heavier elements. The hydrogen bomb is also known as a thermonuclear bomb because extremely high temperatures are required in order to initiate fusion reactions.

Hydrogen bomb is based on process called " Nuclear fusion". Nuclear fusion is the process by which atomic nuclei join together to form a heavier nucleus. The fusion of two nuclei with lower mass thaniron generally releases energy while the fusion of nuclei heavier than iron absorbs energy. In the simplest case of hydrogen fusion, two protons have to be brought close

enough for their mutual electric repulsion to be overcome by thenuclear forceand the subsequent release of energy.

H2+H3⇒He4+n+Q

Energy release Q= 17. 6 MeV

Design of hydrogen bomb

All thermonuclear weapons existing in the world today appear to be based on a scheme usually called the " Teller-Ulam design". It contain the Staged explosion of fission (primary) bomb and fusion (secondary bomb). The fusion bomb is triggered by rapid shock driven compression (Ulam) which is enhanced by radiation pressure (Teller) from released X-ray and γ-ray flux.

Primary fision device contain :-

core: U239 and U235 plus H2+H3 Booster

shell: U238 Tamper

High explosive lenses

Secondary fusion device contain:-

Radiation Channel

U239 PU spark plug

Li6 , H2 , H3 fusion cell

U238 Tamper

Design of modern Hydrogen-bomb Hydrogen bomb design is based on a bomb casing containing implosion fission bomb and a cylinder casing of U238 tamper). Within the tamper is the Li6 Deuteride fusion fuel and ahollow rod of Pu239 in the centre of the cylinder. Separating the cylinder from the implosion bomb is a shield of U238 and plastic foam that fills the remaining space in the bomb casing The detonation of the trigger bomb will cause the following sequence of events:

1. The fission bomb implodes, emitting X-rays.
2. X-rays heat the interior of the bomb and the tamper prevents premature detonation of the fuel.
3. The heat causes the tamper to expand and burn away, exerting pressure inward against the lithium deuterate. The lithium deuterate is squeezed by about 30-fold.
4. The compression shock waves initiates fission in the plutonium rod.
5. The fission rod gives off radiation, heat and neutrons.
6. The neutrons enter the lithium deuterate and generate tritium.
7. The combination of high temperature and pressure is sufficient for tritium-deuterium and deuterium-deuterium fusion reactions to occur , producing more heat, radiation and neutrons.
8. The neutrons from the fusion reactions induced fission in the uranium 238 pieces from the tamper and shield.
9. Fission of the tamper and shield pieces produced even more radiation and heat .
10. The bomb explodes.

USES AND APPLICATIONS

Hydrogen bombs are used as weapons in many countries. Apart from their use as weapons, nuclear explosiveshave been also tested and used for variousnon-military uses. When long term health and clean-up costs were included, there was no economic advantage over conventional explosives. Synthetic elements such aseinsteiniumandfermium, created by neutron bombardment of uranium and plutonium during thermonuclear explosions, were discovered in the first thermonuclear bomb test. In 2008 the worldwide presence of new isotopes from atmospheric testing beginning in the 1950s

was developed into a reliable way of detecting art forgeries, as all paintings created after that period contain traces ofcesium-137andstrontium-90, isotopes that did not exist in nature before 1945. An important aspect of fusion energy in contrast to many other energy sources is that the cost of production isinelastic. The cost of wind energy, for example, goes up as the optimal locations are developed first, while further generators must be sited in less ideal conditions. With fusion energy, the production cost will not increase much, even if large numbers of plants are built. It has been suggested that even 100 times the current energy consumption of the world is possible. Some problems which are expected to be an issue in this century such asfresh water shortagescan actually be regarded merely as problems of energy supply. For example, in desalinationplants, seawatercan be purified throughdistillationorreverse osmosis. However, these processes are energy intensive. Even if the first fusion plants are not competitive with alternative sources, fusion could still become competitive if large scale desalination requires more power than the alternatives are able to provide. Despite being technicallynon-renewable, fusion power has many of the benefits of long-term renewable energy sources as well as some of the benefits of the much more limited energy sources as hydrocarbons and nuclear fission. Like these currently dominant energy sources, fusion could provide very high power-generation density and uninterrupted power delivery.

RESULT AND DISCUSSION

In 1945 an atomic bomb was dropped on Hiroshima, it killed at least 70, 000 Japanese and many were injured. It is assumed that the hydrogen bomb is 1000 times more powerful than an atomic bomb.[5] So if we use fusion

power as source of energy rather than weapons then it should be more beneficial for us. Fusion power would provide much more energy for a given weight of fuel than any technology currently in use, and the fuel itself (primarilydeuterium) exists abundantly in the Earth’s ocean: about 1 in 6500 hydrogen atoms in seawater is deuterium. Although this may seem a low proportion (about 0. 015%), because nuclear fusion reactions are so much more energetic than chemical combustion and seawater is easier to access and more plentiful than fossil fuels, some experts estimate that fusion could supply the world’s energy needs for millions of years. Therefore Hydrogen bomb has both advantages and disadvantages but if we use fusion power as energy source then it should be more beneficial for all of us.