Open Burning

Open burning is the process of laying out the explosive in layers that will not compress and cause an explosion when burned. In this case, the experts designated a layer of 3 inches, no deeper than 4 inches.

Ground – Burning on the ground is not an uncommon practice at military arsenals or ammo depots used to dispose of unstable, excess, or otherwise unwanted propellant and explosives. The quantities are limited and not expected to be a continuous process.

The threat to ground, water, and air contamination is minimal. The explosion threat far exceeds any contamination or migration of contaminants. When burned or exploded M6 is broken down to the vapors H_2O, CO_2, CO, N_2 and traces of NO_x and H_2. So even when burning on barren ground, there are very little of anything of the combustion products that could cause contamination

Trays – Use of metals trays is a more preferred method of open burning. Metal trays are constructed with about 4 inch walls. The trays are placed on gravel pads and all vegetation is cleared around the trays. It allows for a more homogeneous spread, mechanical advantages of spreading, more control of “pop out”, and easier clean out. The M6 is ignited and the fire propagates but does no result in an explosion.

This is the method chosen by both EPA’s prime ERRS contractors as well as the suggestion from the Army Explosive Safety Board. The labor involves; 1) the transport of the M6 from the magazines to the trays. 2) emptying the packages and spreading in the trays. 3) initiation and propagation of the burn 4) cleaning or flushing of unburned residue.

Rotary Kiln

Rotary kilns use thermal destruction in a continuous operation. The same combustion products are produced with a more complete combustion of the M6. There is little advantage of using the kiln to recovery the vapors.

M6 is fed directly into the kiln. It is unknown what the feed rate could be. The feed rate must be greater than the rate of propagation or other controls must take place. If the feed rate is too slow, the propagation can flash back on the feed. Experience with strong oxidizers and flammables has required those materials to be repackaged, such as one pound of material in one gallon of water in a separate container. The containers are then fed into the kiln to keep the burn from getting to hot or too fast.

Off-site – Off-site options are very limited. General Dynamics states that they are the only U.S. facility that is licensed for the destruction of explosives. There are other facilities that are allowed to take a minimal amount, approximately 150 pounds per year. It would do no good to increase the permits for those facilities since they are not construction or capable of taking much more than the minimal amounts.

The cost for off-site disposal was found to be $1.79 per pound. That is exclusive of all transportation, repackaging, and labor.

On-site -- On-site rotary kiln is a possibility if available. The same questions of feed rate and special packaging will require multiple test burns and trials.

The equipment is not within either prime contractors' inventory and must be subcontracted out, or contracted directly with the Agency. The process of contracting directly with the Agency would require about 2 years. And then only if HQ were to make procurement Contracting Officers available for the site specific contracts. And it would be coinciding with the procurement of several ERRS and START contracts. Subcontracting is shorter but would still require due diligence based on the cost of the subcontract.

The logistics, set up, operation, etc of the kiln would have to cause an increase in the cost compared to the less technically involved open burn process.

Super Critical Water Oxidation

Super critical water oxidation is the process of bringing water past its critical point where there is no distinction between liquid and gas. The

critical point of water is about 705° F and 3206 PSIA. At that point, water becomes a powerful oxidizer. The process is also nicknamed 'waterburning' as the resulting reaction is similar to thermal destruction. The M6 is destroyed, breaking it up into the gases and vapors that are produced in thermal destruction. The temperature and pressure is achievable. There was a pilot sized unit at the Explo facility. The through-put for that unit was too small to considered. The technology is applicable but no commercially available units exist.

The same consideration for contracting as with the on-site rotary kiln.

Arctech (Ken Shuster 703-308-8759) &

Ordnance Holding – Actodemil process

OHI has offered their technology that is being piloted at the Army's McAlester ammo depot. The process uses humic acid, phosphoric acid and CBI materials to decompose the M6. The chemistry involved is similar to the breakdown of the M6 but down in a way not to create the heat that would result in an explosion. The unit they have in operation at McAlester is capable of processing 1 ton per day. 9,000 tons of M6 exists. That is 9,000 workdays or 34+ years.

This process create liquid and the company claims that it can be used as fertilizer. Not disputing that use, the liquid would be high in Nitrogen. Nitrogen fertilizers cause plants and grasses to green up and encourage leaf growth. EPA is not in the business of selling or marketing fertilizer. And contrary to some beliefs, the highway departments are really not interested in stimulating growth on medians or the sides of roads. That just causes more maintenance and threat of grass fires. EPA may end up with 7,200,000 gallons of liquid waste.

No information on cost. The acquisition process would follow the same path as the on-site rotary kiln.

Asphalt

Almost anything can be combined with asphalt and used to pave roads. However, as the M6 decays, not only does it react and form nitric acid with then accelerates the decay, the M6 loses structural integrity. It seem that the road would just crumble away.

Remanufacture for small arms

There have been several suggestions that they M6 could be remilled or remanufactured to make smokeless powder for small arms and reloading. The chemical composition of propellant is very important but the performance of the propellant is also a function of size, shape, and homogeniality of the powder. Small arms powder typically comes in rods, discs or chips. It is important that the powder is the same size and shape to be able to reproduce the performance.

Remilling the M6 into something suitable for small arms would result in expediting the decomposition of the stability chemicals. Thus the M6 would be even more unstable.

M6 is also relatively slow. It would make a very disappointing small arms propellant.

Equipment and facilities do not exist.

Natural attenuation

Spread it out, let it decay, hope that it is spread out enough that they exothermic reaction due to decay will not result in fire or explosion.