

# Industrial Uses of Depleted Uranium

By Paul Loewenstein  
Vice President and Technical Director  
Nuclear Metals, Inc.

DEPLETED URANIUM (sometimes referred to as DU) is a by-product of the process by which the fissionable isotope U-235 is extracted from natural uranium, and thus can be considered a by-product of the nuclear industry. From an engineering standpoint, the most singular property of uranium is its great density—almost twice that of lead, and nearly as great as those of gold and tungsten. Because of this high density, thin layers of uranium are capable of absorbing as much penetrating radiation, such as gamma rays, as could be absorbed by much thicker layers of less dense metals such as lead and iron.

Uranium is much easier to fabricate than dense metals such as tungsten and rhenium, and is much less costly than heavy metals such as gold and platinum. These qualities make uranium a good candidate for objects that must be small, yet very heavy for their size. Depleted uranium is relatively abundant and available. Consequently, industrial non-nuclear usage has increased steadily during recent years.

## Applications

There are three principal non-nuclear uses of depleted uranium: radiation shielding; counterweights in airplanes, helicopters and missiles; and armor-piercing projectiles for military ordnance (Ref 1 and 2). Unalloyed uranium is used mainly in shielding and counterweight applications. Heat treated uranium alloys are used in ballistic or armor-piercing ordnance applications. Besides these three chief uses, depleted uranium has been used in several specific applications where its combination of great density, good fabricability and relatively good mechanical properties give it an advantage over alternative materials.

**Radiation Shielding.** Shipping containers made of depleted uranium are used as spent fuel casks for transportation of highly radioactive spent fuel elements from nuclear reactors to disposal sites. Casks of this type are very heavy (up to several thousand kilograms) and have to withstand and dissipate the heat generated by the

spent fuel elements. The uranium containers usually are clad with stainless steel to limit corrosion and contamination.

Containers used in transporting radioactive isotopes for medical and industrial applications are similar in purpose to those used for spent fuel elements, but are much smaller and lighter in weight.

In many devices for medical radiation therapy, depleted uranium is used as shielding against stray radiation from the radioactive isotope inside the device. Depleted uranium is used instead of alternative shielding materials such as lead, which is considerably more bulky, or tungsten, which is more costly and more difficult to fabricate into complex shapes. Uranium can function as both a shielding material and a structural material, greatly reducing the size and improving the mobility of these devices.

Uranium is used extensively in industrial radiographic equipment to house and shield isotope sources such as Ir-192, Co-60 and Cs-137. Two types