Radiation Safety Newsletter

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Ohio University Department of Risk Management & Safety | Radiation Safety Office

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LEGEND: **REQUIRED READING** **SUGGESTED READING**

Recommended Standards of Practice for Ionizing Radiation Exposure

The following are Recommended Standards of Practice related to minimizing radiation exposure. Soon after X-rays were discovered in 1895, the harmful effects were also discovered and published. The first report of harmful physical effects was initially published in the *British Medical Journal* in 1896. As more individuals sustained radiation injuries, and when radiologist William Ironside Bruce died in 1921, public concern rose and lead to the development of organizations such as the US-based National Council on Radiation Protection and Measurements, and the International Commission on Radiation Protection.

These agencies have developed many recommendations and guidelines that aid health care and research facilities in the development of policies and procedures to reduce patient, health care workers and researchers exposure to X-rays and other forms of radiation. One of the most important principles that resulted is ALARA. The general philosophy followed by most facilities in minimizing radiation dose is that all exposures must be justified; and, further, that they must be kept "As Low As Reasonably Achievable" (ALARA); economic and social factors are also taken into account. The ALARA concept applies to all workers who may be exposed to radiation. It also represents a commitment by facilities to provide an environment where ALARA can be effectively implemented on a daily basis. Personnel should be involved in supporting ALARA policies and procedures in any facility using Ionizing Radiation (IR).

Today, there are several regulatory agencies that establish the various guidelines, recommendations and mandatory policies related to the use of IR. These groups reflect the research of the following agencies' publications: American College of Radiology (ACR); Center for Disease Control and Prevention Radiation Safety Committee; Conference of Radiation Control Program Directors (CRCPD); International Commission on Radiological Protection (ICRP); National Council on Radiation Protection and Measurements (NCRP); and the US Nuclear Regulatory Commission (NRC), as well as "Agreement" State agencies.

Standard of Practice I

Workers should complete entry-level education related to radiation safety as well as annual continuing education (newsletters).

Standard of Practice II

Shielding devices should be properly cared for according to guidelines provided by experts in the radiation safety community.

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Nuclear fusion energy in a decade? Lockheed Martin is betting on it.

What if the nuclear reaction that heats the sun could be replicated to power cities on earth? Lockheed Martin is betting that it can be done — and within a decade. The defense giant said Wednesday it is building a compact nuclear fusion reactor.

The key term here is "compact." Although nuclear fusion has been studied for decades, Lockheed is hoping to build a reactor small enough to fit on the back of a truck and ship around the globe.

"Many of the approaches [to nuclear fusion] right now have significant drawbacks," Tom McGuire, compact fusion lead for Lockheed's California-based "Skunk Works" team, said in a phone interview. Some of those drawbacks include instability associated with the reaction, he said, or scaling problems, which means the reactor needs to be very large in order for fusion to work.

"What's different about our physics is it's inherently small and stable," McGuire said. The Skunk Works Group's first step is proving that its model works, he said. Eventually, the company hopes that "instead of a construction project, we can make them in a factory," he said.

With the announcement, Lockheed joins a host of ongoing global efforts to study the potential of nuclear fusion. For example, the European Commission last week announced a $1 billion (850 million euro) initiative to develop nuclear fusion as an energy source by 2020.

Here's how nuclear fusion works: When two extremely hot atoms collide, their nuclei combine to form one, releasing massive amounts of energy. Unlike nuclear fission, which powers the world's reactors today, nuclear fusion does not release harmful radioactive material, making it a clean form of energy. This Lockheed video explains how scientists want to harness the energy released in the fusion reaction, to potentially fuel airplanes or power cities. ■

To read complete article, click here!

How Much Radiation is in a Single Banana?

Your bananas are radioactive.

Don't worry; they're perfectly safe. But the average banana contains at least 0.1 micro Sieverts (0.1 uSv) of radiation, which is equal to 10 urem. Not enough to harm anyone, but it's something.

In fact, this is what's known as the Banana Equivalent Dose, or the amount of radiation exposure you'll receive from eating a single banana. It's due to the natural-occurring radioactive isotope potassium-40, which in fact has a half-life of 1.25 billion years, contained in each and every banana you've ever eaten.

"Although the amount in a single banana is small in environmental and medical terms, the radioactivity from a truckload of bananas is capable of causing a false alarm when passed through a Radiation Portal Monitor used to detect possible smuggling of nuclear material at U.S. ports." –Wikipedia

The human body has learned to cope, and in some instances thrive, when exposed to natural levels of radiation. Cosmic rays, ultraviolet rays. Potatoes, sunflower seeds, and Brazilian nuts. Airplanes and cigarettes and dental x-rays. The human body, even. We're surrounded by radiation.

The dose makes the poison, as Paracelsus would say.

To read complete article, click here!

Feds to clean site of Hanford's 1976 'Atomic Man' accident

Workers are preparing to enter one of the most dangerous rooms on the Hanford Nuclear Reservation -- the site of a 1976 blast that exposed a technician to a massive dose of radiation, which led to him being nicknamed the "Atomic Man."

Harold McCluskey, then 64, was working in the room when a chemical reaction caused a glass glove box to explode. He was exposed to the highest dose of radiation from the chemical element americium ever recorded -- 500 times the occupational standard.

Hanford, located in central Washington state, made plutonium for nuclear weapons for decades. The room was used to recover radioactive americium, a byproduct of plutonium.

Covered with blood, McCluskey was dragged from the room and put into an ambulance headed for the decontamination center. Because he was too hot to handle, he was removed by remote control and transported to a steel-and-concrete isolation tank.

During the next five months, doctors laboriously extracted tiny bits of glass and razor-sharp pieces of metal embedded in his skin.

Nurses scrubbed him down three times a day and shaved every inch of his body every day. The radioactive bathwater and thousands of towels became nuclear waste.

McCluskey also received some 600 shots of zinc DTPA, an experimental drug that helped him excrete the radioactive material.

He was placed in isolation in a decontamination facility for five months.

Within a year, his body's radiation count had fallen by about 80 percent and he was allowed to return home.

But his radiation-related medical problems proliferated.

He had a kidney infection, four heart attacks in as many months and cataract surgery on both eyes, followed by a cornea transplant and a precipitous drop in his blood platelet count, which required transfusions.

Friends at first avoided him until his minister told people it was safe to be around him. The accident sapped his stamina, and he was unable to hunt, fish or do any of the things he had planned for his retirement. He was studied extensively by doctors for the rest of his life and died of coronary artery disease in 1987 at the age of 75.

Hanford contains the nation's greatest collection of nuclear waste, and for more than two decades has been engaged in the dangerous work of cleaning up that waste.

The space now dubbed the McCluskey Room is located inside the closed Plutonium Finishing Plant and is scheduled for cleanup this summer.

"It's been largely closed up since the accident," Geoff Tyree, a spokesman for the U.S. Department of Energy in Richland, said Wednesday. "It was restricted for the potential for airborne radiation contamination."

Since 2008, the Department of Energy and contractor CH2M HILL Plateau Remediation Company have been preparing the plant for demolition.

"About two-thirds of the Plutonium Finishing Plant is deactivated -- cleaned out and ready for demolition," said Jon Peschong, an assistant DOE manager in Richland.

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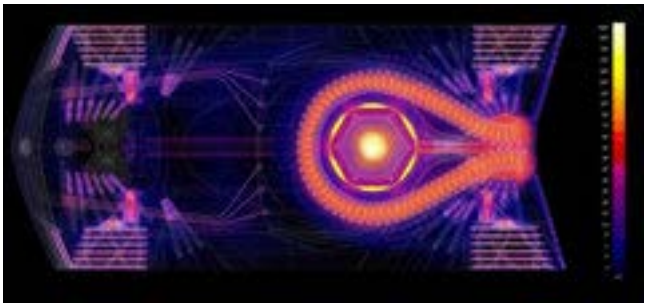
Atomic Car Revisited: Thorium Could Power a Vehicle for 100 Years?



A car that could run for 100 years on one tank of fuel? It sounds like a far-fetched idea, but it is just what a company is apparently claiming possible with the use of an atomic fuel that was abandoned during the Nixon administration. We're talking about the sounds-too-good-to-be-true substance called "Thorium."

Thorium is a naturally occurring radioactive element. It was discovered in 1828 by a Norwegian mineralogist and identified by a Swedish chemist, who then named it after the Norse god, Thor.

According to this video from The Young Turks (which is informative, if a little low-rent at times), if put to use properly, would be low pressure and have lower chances of danger to the environment and humans than a uranium-based reactor. The thorium reactors can be much smaller too. Like a conventional reactor, the heat produced would create steam that would power a turbine.

The report claims that small amount of the dense thorium could produce tremendous amounts of heat. A company called Laser Power Systems is attempting to employ this power source in a vehicle. The company claims that: "1 gram [of thorium] yields more energy than 7,396 gallons of gas." By their math, 8 grams of the substance could power a thorium turbine car for a century. This is not the first time this fuel has been suggested for cars. The concept of an automobile use was brought up in the 2011 documentary "The Thorium Dream". Click here to watch clip.

It has also been envisioned as a power source futuristic-looking designs like the Cadillac World Thorium Fuel Concept, shown here.

Could this be a viable fuel for car? The testing in the 1960s found that the Thorium tetrafluoride used in a molten salt reactor was easier to process and quicker to stop a chain reaction, but light water reactors are far more common. In the LWR, thorium produces the same levels of toxic waste as our good ole' uranium reactor. So there still may be a long way to go before we're driving atomic cars. ■

To read complete article, click here!

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"Cleaning out the McCluskey Room will be a major step forward."

When specially trained and equipped workers enter the room this summer, they will encounter airborne radioactivity, surface contamination, confined spaces and poor ventilation, the DOE said.

They will be wearing abrasion-resistant suits that protect them from surface contamination and chemicals. A dual-purpose air system will provide cool air for breathing and cool air throughout the suit for worker comfort, allowing them to work for longer periods of time. The suits are pressurized, to prevent workers from coming into contact with airborne contaminants.

The McCluskey Room "is going to be the toughest work ahead of us as we finish cleaning the plant and getting it ready for demolition by the end of September 2016," Tyree said. ■

Check out the full read here!

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Standard of Practice III

Workers should practice the fundamental principles of radiation protection: time, distance, shielding. All other standards of radiation safety are based upon these three principles.

Standard of Practice IV

Workers should follow federal and state regulations and guidelines for radiation safety, as well as facility policies and procedures to minimize occupational exposure to radiation.

Standard of Practice V

Workers should follow regulatory agencies' recommended guidelines and facility policies and procedures for wearing Personal Protective Equipment (PPE) and leaded shielding devices (lead aprons).

Standard of Practice VI

Female personnel, who suspect or know they are pregnant, should take the appropriate precautions to limit fetal exposures to radiation. It is recommended that the individual declare the pregnancy to the RSO. Disclosure of the pregnancy is voluntary. However, the declaration of pregnancy must be in writing, or the individual and fetus will be subject to the radiation dose as other personnel. Upon declaration of pregnancy, the facility and RSO must take appropriate measures to ensure the occupational exposure to the fetus does not exceed 0.5 rem (5 mSv) during the entire pregnancy.

Standard of Practice VII

Workers should follow regulatory agencies' recommended guidelines and facility policies and procedures for protection from exposure to the general public.

Standard of Practice VIII

Principle Investigators (PI's) are responsible for orienting and documenting training given to those who visit IR areas, **no matter who it is** on an annual basis. This should be coordinated with the Radiation Safety office.

Standard of Practice IX

Ohio University policies and procedures for radiation exposure safety should be annually reviewed and updated as necessary to reflect current federal and state regulatory requirements. This includes best lab practices and individual lab or facility procedures. ■

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